Oxford Research Encyclopedia of Climate Science

Summary and Keywords

Climate Change and Geopolitics

Historic discussions of climate often suggested that it caused societies to have certain qualities. In the 19th-century, imperial representations of the world environment frequently "determined" the fate of peoples and places, a practice that has frequently been used to explain the largest patterns of political rivalry and the fates of empires and their struggles for dominance in world politics. In the 21st century, climate change has mostly reversed the causal logic in the reasoning about human–nature relationships and their geographies. The new thinking suggests that human decisions, at least those made by the rich and powerful with respect to the forms of energy that are used to power the global economy, are influencing future climate changes. Humans are now shaping the environment on a global scale, not the other way around. Despite the widespread acceptance of the 2015 Paris Agreement on climate-change action, numerous arguments about who should act and how they should do so to deal with climate change shape international negotiations. Differing viewpoints are in part a matter of geographical location and whether an economy is dependent on fossil-fuels revenue or subject to increasingly severe storms, droughts, or rising sea levels. These differences have made climate negotiations very difficult in the last couple of decades. Partly in response to these differences, the Paris Agreement devolves primary responsibility for climate policy to individual states rather than establish any other geopolitical arrangement. Apart from the outright denial that humanity is a factor in climate change, arguments about whether climate change causes conflict and how security policies should engage climate change also partly shape contemporary geopolitical agendas. Despite climate-change deniers, in the Trump administration in particular, in the aftermath of the Paris Agreement, climate change is understood increasingly as part of a planetary transformation that has been set in motion by industrial activity and the rise of a global fossil-fuel-powered economy. But this is about more than just climate change. The larger earth-system science discussion of transformation, which can be encapsulated in the use of the term "Anthropocene" for the new geological circumstances of the biosphere, is starting to shape the geopolitics of climate change just as new political actors are beginning to have an influence on climate politics.

Introduction

Historical assumptions that climates shape human societies in particular places have been widespread in many human cultures (Behringer, 2010). But in the 21st century, these modes of thinking are being dramatically reversed because it is recognized that the scale of human activities is now such that they are influencing the global climate. Many so-called climate deniers still refuse to accept these new insights into the human situation (Oreskes & Conway, 2010), and, at least implicitly, they insist that the geographical context for human affairs is simply a given set of conditions. But despite opposition to tackling

climate on the part change climate deniers, which in the United States in particular, is heavily supported by the lobbying efforts of fossil-fuels companies, the recognition that human choices and decisions about which economic systems will be built in coming generations will have dramatic effects on the future of the global climate finally shaped the climate-change agreement in Paris in December 2015.

The Paris Agreement, which was ratified by most states in the year following its signing, commits its signatories to adopting increasingly stringent regulations to limit national emissions of greenhouse gases (Falkner, 2016). Although the agreement is not an international legally binding treaty, it does represent a comprehensive attempt to follow through on the commitments, made in the 1990s United Nations Framework Convention on Climate Change, to work to prevent dangerous anthropogenic changes to the climate system. The focus on the efforts of individual nation-states is in part a recognition that the international order is composed of at least notionally sovereign states whose rivalries make a single, imposed legal solution to greenhouse gas emissions politically impossible in present circumstances. The Trump administration emphasized this point in its rejection of the Paris Agreement in 2017.

The term "geopolitics" simultaneously refers to the rivalries of states; the role of geographical settings in human affairs, in international politics in particular; and the modes of knowledge and representation that shape related political discourse and policy formulation (Agnew, 2003). How the world is represented in political discourses matters because such contextualizations structure political reasoning. Geographic descriptions of the world, for example, of the North and the South, developed and developing states, civilized and barbarian, are frequently simply taken for granted as "the way the world is," beyond discussion and, hence, politics. This connection between how the world is represented and the political consequences of understandings of the climate factor in particular goes back into 18th- and 19th-century European discussions of why some societies succeeded and others failed and related explanations of major historical events. Climate often got the blame for setting nomadic peoples in Asia in motion and, among other things, causing the fall of the Roman empire. More pernicious uses of these arguments supported racist justifications for modern European empire and frequently managed to provide climate "explanations" for the fate of peoples neglected by imperial rule when famines occurred in the 19th century (Davis, 2001).

But in the 21st century, the connections between peoples and environments are understood very differently. Historically, the industrial powers and, recently, the global economy have been powered by fossil fuels which, when burned, cause greenhouse gas levels to rise in the atmosphere, setting the resultant anthropogenic climate changes in motion. Geopolitics is now about the struggle to control this process, evade or accept responsibilities for the changes, and shape international institutions to deal with the consequences. Its reasoning process structures much of the political discourse related to climate change and the arguments about how to shape policies that either tackle the

problem, or in the case of the Trump administration's first few months in power, in 2017, actively thwart American efforts to address the issue.

The now very frequent invocations of climate science as the basis for collective action in the face of imminent peril often fail to garner adequate policy responses when judged in terms of that science. How insecurities in the face of climate change are understood is now an integral part of contemporary geopolitics (Dalby, 2017). Which politicians invoke which kinds of threats to their societies matters in terms of policy formulation. Some advocate policies to bring about the rapid decarbonization of economies and develop renewable energy innovations; fossil-fuel lobbies and petroleum-producing states in particular counterargue, either dismissing the science or suggesting that policy measures must not impinge on their profits. Others look to fence building to prevent what is portrayed as threatening climate-change-induced migration. Looming on the policy horizon is the matter of geoengineering to try to adjust the amount of solar radiation entering the lower atmosphere to slow climate change. Climate change and geopolitics are now mutually imbricated in many complicated ways.

From Determinism to Environmental Security

How climate is invoked in political discussions is tied to diverse cultures; hence climate comes to be part of public discourse in numerous different ways. How state policymakers and political advocates of diverse ideological stripes situate "their" states in the world and in relationship to other states and within a wider world system is a crucial part of how political identities are constructed and appropriate courses of action rendered legitimate. These processes are key to how geopolitics works and how politicians and public opinion shape policies.

Environmental Determinism

In the 19th century, European and American thinking about climate and other geographically variable natural phenomena often suggested causal relationships with human affairs. Mild climates and access to the sea supposedly favored the rise of European civilization, whereas African societies, for example, were thwarted in their development by tropical heat restrictions on their endeavors. The virtue of hard work was emphasized by cultures that worked hard for the wealth that they wrought from the soil. Friedrich Ratzel (1897), considered to be the founder of modern political geography, suggested that many things could be explained by such geographical contextualizations. His ideas about how geographical context shaped human behavior were widely influential in geography theorizing in the United States, where such writers as Ellen Semple (1911) and Ellsworth Huntington (1945) used such formulations to try to explain the course of

human history. To this day, common understandings of "political geography" frequently suggest that environmental contexts and the climate conditions in particular places explain political behavior.

Related to such considerations were 19th century concerns with Darwin, natural selection, and the evolution of species. In geographical terms, states were sometimes analogized to species, and the assumption frequently was that states would either grow or die. Territorial aggrandizement fit rather well with imperial impulses in the latter part of the 19th century and the first half of the 20th century. If stingy or fickle nature also provided an alibi for the failures of European imperial administrators to deal with famines and other disasters, then it usefully supported colonization, too (Davis, 2001). But these "naturalizations" suggested the inevitability of imperial rivalries and the possibilities of warfare on the largest scale, driven in part by the constraints nature created in particular places, and the opportunities elsewhere. Likewise, these geopolitics was premised on assumptions that rivalry and competition are the most important forms of human behavior, rather than activities based on cooperation and collaboration (Kearns, 2009).

The most pernicious use of determinist reasoning came from Nazi thinking in the 1930s and 1940s that provided justifications for the conquest of much of Europe in terms of the supposed "need" for more room for the German people to live (Snyder, 2015). This tied states to organicist versions of Darwinism in which states supposedly either expanded or died; racialist theories were linked to struggles for survival. Clearing space for German expansion required, among other things, the extermination of Jewish people and many others deemed inferior. Not surprisingly, Soviet thinkers vociferously denounced geopolitical thinking as imperialist ideology and refused to countenance discussing matters in its terms. The term "geopolitics," so tainted by Nazi thinking, fell out of use in the middle of the 20th century but was revived, first by Henry Kissinger, who used it as a term related to the rivalry of the great powers, and more recently, shorn of its determinist and imperial connotations, as a term that emphasizes contextual thinking about foreign policies and national identities in international politics and global governance.

Halford Mackinder's (1904) famous article on the geographical "pivot" of history, often regarded as the key text in the emergence of 20th-century geopolitics, suggested that geography has been a key part of the course of human history. His division of the world into a continental "pivot," or (in his subsequent 1919 book) "heartland," region that lay beyond the range of naval power in central Asia and was partly surrounded an inner crescent of littoral states, in turn further circled by an outer ring of islands and the Americas, suggested that whoever controlled the heartland had the potential to rule the world. This was an imperial view of the world, one that took for granted great power rivalry and had little suggestion that peoples outside Europe might have different priorities than playing the imperial roles that such systems implied were required.

Cold War Geopolitics

Updated after World War II, and with the littoral states surrounding the heartland sometimes interpreted in Nicholas Spykman's (1944) terms as "the rimlands," this rationale for the geographical advantages of Asia was implicit in much of American Cold War thinking. The connection with climate persisted as a minor theme because Russian "expansionism" was often linked to arguments that Asian weather made agricultural productivity unreliable and hence encouraged Soviet efforts to gain access to warmer climates more conducive for food production.

However, though these geographical specifications mattered, many American Cold War preoccupations were with technologies that could either transcend some aspects of geography or exploit it for military purposes (Farish, 2010). Most obviously, nuclear weapons had the potential to transform environments quite directly, and missiles that could deliver the bombs to the other side of the planet in half an hour apparently made traditional geographical notions of defense redundant. During the 1950s, when these technologies were being developed, much research went into geophysics to understand both how missiles might be directed and how radio transmissions and conditions in the ionosphere were related to communications. The physical effects of nuclear weapons on the atmosphere and the relatively little understood stratosphere were also key issues linking war and weather. Electromagnetic pulses and damage to the ozone were among the factors investigated.

Likewise, issues of climate and meteorology were Cold War concerns not least because investigations into the weaponization of nature. Fallout patterns from nuclear weapon detonations in the atmosphere offered numerous lessons in how the global atmosphere functioned (Masco, 2015). Weapons tests in the atmosphere led to concerns about electromagnetic pulses and ozone depletion, as well as to widespread fears of radioactive fallout and contamination "down-wind" of detonations. Concerns about the health effects of radiation were a key factor in mobilizing opposition to nuclear weapons in the 1950s and 1960s and lead to the Partial Test Ban Treaty of the early 1960s where the United Kingdom, U.S.S.R, and United States agreed to conduct further tests underground to prevent the spread of contamination in the atmosphere. Although it is widely understood as an arms control treaty, it is perhaps better understood as an environmental one (Soroos, 1997), where environment and geopolitics are conjoined directly even if climate per se isn't a major consideration.

Agricultural production was also part and parcel of American foreign policy, both as a concern with the potential ramifications when grain production in the Soviet Union suffered after a series of poor harvests. Monitoring weather patterns was key to predicting the success of the harvests, and satellite monitoring of weather conditions became part of intelligence gathering operations. This linked up with anxieties about rapidly growing populations in what had become known as the Third World, and famines, in India in particular, in the 1960s. Interpreted in biological terms as a case of population growth exceeding food supply, environmentalism linked carrying capacity directly to geopolitical concerns with war and peace (Ehrlich, 1968). This led to discussions of food as a weapon and also triggered a rapid acceleration of research into enhancing crop yields

in what became known as the "green revolution," an effort that was sometimes linked to American efforts to promote development in ways that would thwart the appeal of communist movements (Perkins, 1999).

Carbon dioxide and its potential role in climate change was also part of the foreign policy discussion. President Kennedy addressed the "carbon dioxide problem" at the United Nations. Whether it was possible to control the climate artificially was discussed in a report to President Johnson, in 1965. The destruction of Southeast Asian ecosystems as a result of the American war efforts in Vietnam, Cambodia, and Laos, and in particular the military's deliberate defoliation of those countrysides, raised concerns about the use of environmental modification as a weapon of warfare and subsequently led to the international Environmental Modification Convention banning the use of environmental modification as a weapon of war.

The America's fascination with technology as a mode of transforming nature, its plans to use weather modification as a weapon, and related inquiries into geophysics gradually became the "big science" of climate-change monitoring and modeling (Edwards, 2010). Simultaneously, the use of satellites began dramatically improving weather forecasting. Growing alarm about the destruction of the ozone layer in the 1970s fed into discussion of rapid-onset climate change the disruptions of a major nuclear war might cause. These concerns were exacerbated in the early 1980s by the fear that nuclear warfare could, by sending large clouds of smoke and debris into the atmosphere, cause substantial short-term climate change because of the cooling effect of the smoke, a situation named a "nuclear winter" (Turco, Toon, Ackerman, Pollack, & Sagan, 1983). The idea of a nuclear winter directly connected climate change and geopolitics in an especially graphic way. In 1985, a major scientific conference in Villach, Austria, confirmed the growing consensus among scientists that humanity was on a path to changing the climate system.

The Politics of Global Environmental Change

The dangers of environmental disruptions were especially important in Soviet thinking after the Chernobyl nuclear meltdown, in 1986, made it clear that radioactive fallout was a very practical mode of destruction. The evacuation of the areas surrounding Chernobyl was suggestive of things to come; it fed into a nascent policy concern about environmental refugees, the assumption being that environmental destruction would set numerous displaced populations in motion. This, along with the discovery, in the 1980s, of a major hole in the stratospheric ozone over Antarctica showed clearly that global environmental matters were important and, increasingly, part of the global political agenda. The Chernobyl meltdown came two years after the poisoning of numerous Indians in Bhopal following an industrial accident, in 1984, and as an alarm was being raised about the destruction of the Amazon rain forest, as well. Over a decade earlier, Southern leaders, most famously, Indian prime minister Indira Gandhi at the Stockholm Conference on the Human Environment, in 1972, had argued that many of the environmentalists' arguments about protecting nature were really Northern attempts to prevent Southern states from benefiting from development. Poverty was the Southern states' greatest problem, development the solution, and concerns about protecting nature should not, so the argument went, be used to keep the developing states in poverty.

These differing viewpoints were related to contemporary political rivalries among states and to disputed claims about the historical legacies of colonization and injustice, which states should lead in international affairs, and how the world order should be structured. Such formulations impute the value of climate responsibilities in the international system in ways that former colonial and industrial powers frequently refuse to accept (Ghosh, 2016). Policy responses to climate change draw on these different geographical representations of the world; various sources of climate danger and opportunity are specified in terms of how they affect "our" society. From this follow political arguments about how societies and governments ought to behave based on their understandings of the identities in particular places in the world and their role in the larger patterns of progress, rivalry, and history. These matters of geopolitical culture profoundly shape political responses to environmental issues and climate change (Chaturvedi & Doyle, 2015).

In the 1980s, attempts to reconcile environment and development revolved around discussions of sustainable development in which new modes of development could supposedly be made consistent with maintaining resource supplies and environmental quality. The key document that codified this compromise was the report *Our Common Future*, released in 1987, of the World Commission on Environment and Development (popularly known as the Brundtland Report after Gro Harlem Brundtland, the Norwegian chair of the commission). Notably, the report drew from the discussion at the climate conference in 1985 at Villach, where scientists had called attention to the dangers of

climate change as a long-term problem. *Our Common Future* also warned that resource scarcities would cause serious conflict if development didn't address economic problems.

The sustainable development agenda laid out in *Our Common Future* fed into both the formulation of the Intergovernmental Panel on Climate Change, which produced its first comprehensive report on global climate change in 1990, and the planning for a major summit meeting of heads of government, as well as civil-society organizations, to address global environmental issues. The Earth Summit in Rio de Janeiro, in 1992 (officially, the United Nations Conference on Environment and Development) focused on many issues, but pride of place was given to climate change and deforestation. The conference launched both the United Nations Framework Convention on Climate Change and the Convention on Biodiversity, overarching international agreements that significantly shaped subsequent environmental diplomacy.

By the late 1980s, a series of agreements had also been negotiated, notably the Montreal Protocol, in 1987, to tackle the depletion of stratospheric ozone. One of the key themes in the ozone-layer protection regime (which consists of a number of subsequent agreements, most recently, the Kigali agreement, in 2016, to phase out hydrochlorofluorocarbons) has been a series of financial transfer mechanisms. These are effectively a tradeoff of development funds supplied by Northern industrial states to developing ones to compensate them for foregone development opportunities as a result of these agreements' curtailing of production and the use of particular chemicals. Because the industrial states had benefited in the past from the use of now banned chemicals, the logic was that developing states that had not caused the environmental problem should be assisted in finding alternative technological pathways to development. This focus on North–South justice has carried through to many of the climate negotiations, too. One of the benefits of ozone depletion chemical phaseouts is that these chemicals are also major greenhouse gases, so these protocols are also effectively climate-change agreements, even if their primary purpose is ozone-layer protection.

Environmental Security

A crucial part of the argument in *Our Common Future*, and in subsequent discussions of the need for the North to take action on the South's problems were concerns that resource scarcity would lead to conflict, which, in turn, would compromise development efforts. Peace is a prerequisite for development, and likewise, so the logic went, development is likely to prevent conflict if it ameliorates the scarcities likely to fuel conflict. While these premises were widely taken for granted in policy discussions leading up to the Rio Earth Summit (Mathews, 1989) some scholars were less sure that these connections worked in practice in many contexts in the South. While warfare clearly coincided with environmental destruction in many places, and areas of deforestation, as well as other forms of destruction, looked like warzones, the exact causal relationships were not supported by empirical conflict studies and international security research. Even if there were conflicts over scarce resources in particular places, it was far from clear to researchers that these necessarily would have serious implications for international security. Despite some suggestive rhetoric, the case being made that environmental change constituted a "new threat" to Western security interests that would replace the Soviet Union as a security priority in the 1990s wasn't convincing to most policymakers.

The subsequent environmental security discussion combined these empirical questions of conflict with policy deliberations about security and what actions were deemed appropriate responses to changing environmental conditions (Dalby, 2002). Two major research programs were launched in the 1990s to investigate the conflict potential of environmental change (Baechler, 1998; Homer-Dixon, 1999). Both examined the situations in developing states where environmental change was apparently causing conflict. One noteworthy early conclusion was that the likelihood of climate change setting off major wars was low, not least because there were no obvious coalitions of likely protagonists that might fight and no clear way that warfare might help deal with the issue (Homer-Dixon, 1994). More explicitly in geopolitical terms, the states with large military capabilities were among those causing the largest emissions of greenhouse gases. In most cases, downstream riparians are militarily less powerful than upstream states, which are capable of using river-flow adjustment as a coercive device. And, as has subsequently become clear, most of the states that are suffering the consequences of rising sea levels and agricultural disruptions due to changing weather patterns are simply not in a position to use military force to resolve their difficulties.

While some of this analysis reproduced themes that had long since been dismissed as environmental determinism, much of the research corroborated long-held conclusions from political ecology that pointed to the disruptions caused by development as part of the cause of conflict in many cases, a matter of "slow violence," in Rob Nixon's (2011) terms. The rapid changes unleashed in the Global South by local development efforts, not least the dispossessions caused by dam building, the spread of industrial agriculture and commercial property arrangements, and resource extractions from forestry and mines did

indeed generate violent environments (Peluso & Watts, 2001). But the assumption that exogenous environmental factors were the cause of subsequent conflict turned out to be much too simple an explanation. Dramatic landscape transformation is part and parcel of the development and urbanization processes currently underway in the processes of globalization and modernization (Duffield, 2007). This context is crucial to understanding the consequences of "maldevelopment," in Guenter Baechler's (1998) terms, which is often linked to overt conflict in disrupted areas.

This picture gains further complexity when the obverse of the environmental-scarcity-linked-to-conflict argument is considered. In the early years of the 21st century, research into conflict over resources started to systematically investigate the links between resource extraction and violence (Bannon & Collier, 2003). The findings of these studies suggested that conflict was related to struggles to control resources and, more explicitly, the payments for resources on the international markets. "Conflict diamonds," ones mined, often by small scale artisanal methods in conflict zones, gained the headlines, but the extraction of other minerals and the fights over the revenue streams they generated were a much more obvious source of conflict. Not least when these revenue streams were used to buy weapons and perpetuate military efforts in contexts where there were few other obvious economic opportunities (Le Billon, 2012).

This inversion of the earlier scarcity assumptions and the focus on the disruptions caused by development suggests that the scarcity-leading-to-conflict argument is misplaced, and that both better international governance of commodity chains and stepped-up peacemaking efforts in particular states need to look much more to the particularities of the rural political economy and the failures of governance as the key to violence, rather than to environmental degradation as an exogenous variable linked to conflict initiation or perpetuation. In recent years, it has become clear that traditional "Northern" notions of environmental management and "conservation" are inadequate for dealing with most environmental change, not least because they frequently ignore both the historical legacy of colonial disruptions and the dramatic effect of contemporary large-scale resource extractions (Dauvergne, 2016).

None of this is to deny either the importance of environmental change at the global scale or the catastrophe of contemporary famine and disasters for human beings caught in their grip. But the crucial point that the critical literature on resources emphasizes is that contemporary environmental changes are driven by many causes, and that climate change is playing out in landscapes already dramatically altered by the global political economy (Parenti, 2011). Geopolitics is now in part about how state policies shape environments and change contexts in ways that may have numerous security consequences for people in particular places (Selby & Hoffman, 2015).

Most recently these discussions have intersected with the burgeoning literature on the Anthropocene. The scale and speed of the contemporary transformations of the earth system, begun inadvertently by humans long ago (Davies, 2016), is now changing the earth system so rapidly and comprehensively that even if the precise geological designations

are still being debated, it is appropriate to think in terms of a new geological epoch, one that is being shaped by human actions. Mostly, this has been caused by the rich and powerful actors in the global economy since the middle of the 20th century, a period when those capable of making investment decisions in production, land-use, and energy use on a large scale have generated a "great acceleration" in global change (McNeill & Engelke, 2016). What is clear is that, barring some major asteroid or volcanic episode in the near future, humanity is now determining the future configuration of the planet. All this is especially germane to discussions of climate change because greenhouse gasses are one of the key, novel, forcing mechanisms in the earth system, and climate geopolitics is now increasingly about this reshaping of the human context (Hommel & Murphy, 2013).

Climate Politics in the Anthropocene

Many of the concerns about the technological manipulation of nature, environmental destruction, North–South relations, sustainable development, conflict, and resource wars have returned to prominence in recent years in the increasingly intense debate about climate change and how to both reduce its speed and cope with the inevitable disruptions (Webersik, 2010). Repeated concerns that climate change will cause warfare have re-energized the environmental security discussion from the early 1990s and added an urgency to policy debates about how to cope with rapid environmental change at the global scale. Beginning the late 1990s an increasing emphasis on climate change as a danger was gradually added into the environmental security discussion (Barnett, 2003).

Climate Security

Human vulnerability to increasingly severe weather events has added a human security dimension to the discussion that emphasizes the impacts of climate change on urban systems and on the rural poor, who are the most directly affected by droughts and food shortages (Dalby, 2009). In particular, the discussion of who should pay for processes set in motion by the industrial states, when the states most likely to be directly affected—in the coastal areas of developing states, island nations, and rural areas of Asia and Africa—have not contributed much to greenhouse gas emissions, has raised questions of geopolitics and about the responsibilities major powers have to the larger international community.

Although there was substantial institutional opposition in Washington to even discussing these matters during the years immediately following 9/11, military and security thinkers eventually began the process, and numerous reports shed public light on the discussion from 2007 onward (Campbell et al., 2007; CNA, 2007; German Advisory Council on Global Change, 2008). While much of the debate was over immediate priorities such as the potentially devastating impact of hurricanes and storms on military facilities and the

possible security consequences of droughts and famines in peripheral parts of the global economy, more far-reaching thinking looked to the long-term consequences of continuing with current modes of carboniferous capitalism. If fossil-fuel consumption continues to expand, and the current trends in energy use and production suggest that it will, then rapidly accumulating greenhouse gases will have many disruptive effects. These will be of sufficient magnitude to be analogous in scale to warfare and hence, so the argument suggests, are a matter of priority for the security of many states.

The dilemmas of climate change, now sometimes portrayed in these terms as new security threats, are so because they are a consequence of the success of the modern fossil-fuel-powered modes of political economy that most states have in various ways been seeking to secure. This is coming back to haunt modern states; climate security now looms as an item on the geopolitical agenda and is discussed as such by militaries in many states (CNA, 2014). It does so because though climate change clearly has consequences that affect states, it is the question of how states can be transformed to deal with climate change that will to a substantial degree determine just how much of a security issue climate turns out to be in particular situations. The rapid spread of renewable energy systems is changing the economics of many states and offering new and different development possibilities in the Global South.

The American military is increasingly concerned about climate change, both as a matter of disasters requiring interventions to provide emergency assistance and logistical support to governments and aid agencies trying to aid victims, and, ironically, as a matter of how to deal with the threats rising sea levels and increased storm activity present to its bases and facilities. The documentary *The Age of Consequences*, 2017, brought these matters to the attention of a large popular audience in the United States, ironically, at the same time the Trump presidential campaign, and subsequently the Trump administration, was denying the importance of climate change and, following earlier Republican efforts in Washington, actively working to undermine climate initiatives (Dalby, 2016). Nonetheless, this documentary portrayal of climate change also frequently pointed to disruptions in the Global South as conflict accelerants or threat multipliers requiring the intervention of forces that use huge quantities of fossil fuels in their operations. The military may be a most useful agency in raising the alarm about the consequences of climate change (Mabey, 2007), but militarizing the resultant policy responses may be counterproductive, not least because it deals violently with symptoms instead of addressing the need for new forms of economic development that are not dependent on fossil fuels (Gilbert, 2012).

There has been a prolonged academic discussion about the possibilities of climate-change-induced conflict, one fraught with methodological difficulties in making any clear case that climate causes conflict (O'Loughlin, Witmer, Linke, Laing, Gettleman, & Dudhia, 2012). The case of Syria has been discussed at length (Gleick, 2014), and though drought there may have been a factor in the turmoil that eventually led to the civil war, it is clearly but one factor in the causes of the subsequent war. In part, the contemporaneous fluctuations in world food prices, a knock-on effect of the 2010 drought-induced Russian ban on wheat exports, which have been related to the Arab Spring events and the

international financial crisis (Swain & Jägerskog, 2016), were part of the larger context of the crisis, and raise crucial questions about the interconnected nature of global crisis and the failures of contemporary global governance (Homer-Dixon et al., 2015). Despite this focus on global interconnections, there remain numerous attempts to focus on local environmental causes of conflict in particular places, a series of arguments that have been heavily criticized on methodological grounds because, as with much earlier environmental determinism, they fail to adequately take into account the social contexts that make societies vulnerable (Buhaug, 2015). Detailed, comparative case-study work has repeatedly suggested that it is the political and institutional context that matters in local conflicts in which water issues in particular are linked to climate (Zografos, Goulden, & Kallis, 2014).

When climate-induced instabilities are linked to larger geopolitical questions of terrorism and insurgency, as is frequently the case in contemporary Africa, these instabilities can supposedly provide justification for external military interventions (Buxton & Hayes, 2016). Hence getting the causalities clear in these arguments, and understanding that conflict is frequently about resource access rather than environmental scarcity, is crucial to sensible policy formation and the promotion of good governance that can deal with contemporary disruptions, whether they are directly related to meteorological hazards or not (Ide, Link, Scheffran, & Schilling, 2016). Rural disruptions and the marginalization of impoverished peoples frequently have more to do with the operation of international property markets and the expansion of commercial agriculture than they do directly with climate change per se (Dunlap & Fairhead, 2014). Likewise, attempts to use military methods to deal with conservation problems and, notably, the illegal hunting of endangered species frequently end up militarizing environments instead of facilitating peaceful development (Duffy, 2016; Lunstrum, 2014). The interconnections between climate and conflict are much more complicated than simple linear correlations of weather events and social outcomes suggest, however tempting such interpretations are for headline writers.

In addition, the urgent need to deal with climate change has sometimes invoked metaphors of warfare and calls for emergency action (Spratt & Sutton, 2009). Such rhetoric, used both as an attention-getting device and to stress the point that conventional politics has yet to grapple with the scale and speed of environmental change, invokes policy action on a scale analogous to the preparation for and prosecution of war (McKibben, 2016). What is far from clear is whether this is effective as political strategy or whether, as Deudney (1990) warned in the early stages of the environmental security discussion, it fosters inappropriate policy by aligning advocacy with the wrong social institutions for taking effective action. What is clear is that the most important causes of climate change are not coming out of peripheral agricultural places in the Global South; they are located in industrial production processes, suburban consumption modes of economy, and among the petroleum production regions. Failure to clearly focus security policy on those places, and not on relatively small-scale conflict in rural areas,

reduces security policy to violently dealing with some symptoms of climate change instead of addressing the causes at the source (Dalby, 2014).

These considerations of climate insecurities emphasize the importance of taking into account specific geographical contexts when presenting the dangers and suggesting policy solutions (Selby & Hoffman, 2015). This has proven to be especially difficult in attempts to negotiate international agreements on climate change in that states frequently understand the issue in very different ways based on their geographical circumstances. Low-lying coastal states face very different hazards than those without coastlines. States that depend on petroleum or coal exports will face different challenges than those without such infrastructure; if climate-change agreements constrain the use of fossil fuels, their economies will be very directly affected. Developing states are challenged to build new energy systems that are not dependent on fossil fuels, at least, if they take climate change seriously. Tying aid to clean development mechanisms may shape forestry policy and land use profoundly, especially where greenhouse-gas offsets in the form of plantations are counted as carbon sinks. For the atoll states of the Indian and Pacific Oceans, climate change in the form of rising sea levels may remove them from the map altogether.

This is the ultimate disaster for national security thinking, the complete elimination of a state. Whereas earlier forms of geopolitics anticipated the elimination of states by direct conquest by stronger powers, now the elimination of states is a matter of indirect geographical forces. United Nations delegates from small island states sometimes compare climate change to chemical warfare (Dalby, 2016). The greenhouse gases produced by industrial states indirectly cause the elimination of low-lying territories. When states face imminent inundation, migrants will have to move to other territories, or die trying. Their security depends on how they are portrayed by the politicians in the states they are trying to reach. If such migrants are seen as human beings in need of succor and assistance, then their security will likely be much more assured than if they are portrayed as dangerous foreigners trying to come "here" to take "our" jobs and resources (Null & Risi, 2016).

Emphases on borders, policing, and violent responses to change on the part of many politicians suggest that a fortress mentality frequently shapes policy responses to potential migrations (White, 2014). The fence that India has built round most of Bangladesh is only one of the most obvious responses to potential distress migration. If the gates in these fences are closed, migrants leaving low-lying areas when the next major storm moves north in the Bay of Bengal will not be able to cross into India in search of personal security. Candidate and then President Trump repeatedly argued that a wall should be built on the Mexico's border with the United States to stop the flow of illegal immigrants. The consequence of these fences and walls is to make borders more violent as those compelled to try to cross them to reach safety are faced with ever more difficult and dangerous journeys (Jones, 2016).

United Nations Framework Convention on Climate Change

Trying to forge universal agreements to deal with climate change has been on the United Nations agenda since the formal adoption of the Framework Convention on Climate Change in 1994. Apart from the much-derided Kyoto Protocol, a formal arrangement incorporating all states has not been forthcoming. American political opposition to formal treaties, such as the protocol, has delayed or derailed many diplomatic initiatives. Until a deal was made between the United States and China, in 2014, Chinese objections to constraining its fossil-fuel use, given its developing nation status, were also a major obstacle to reaching an international agreement. Such geopolitical standoffs, based in part on the very different geographical, economic, and energy profiles of states, stymied the early efforts to deal with the climate question.

The 1990s effort, and the emergence of the Kyoto Protocol which took effect in February 2005, under the auspices of the UN Framework Convention on Climate Change, divided the countries of the world into two major categories: Annex 1 countries included all the industrialized and wealthy states in the system that had historically produced larger amounts of greenhouse gases and had high consumption rates; Annex 2 comprised the developing states. Following from the environmental-justice arguments that had underpinned the ozone-layer protection regime, the suggestion was that polluting states should cut back on their emissions, and then the developing states would join the agreement later, when their development levels and technological capabilities had advanced sufficiently to ensure them prosperity without being unfairly constrained by limits to fossil-fuel consumption.

These early climate negotiations led to the formation of loose coalitions of states that shared some policy priorities. Most obviously, the Alliance of Small Island States formed a negotiating block whose members shared an immediate and pressing concern that rising sea levels and increased storm severity and frequency presented an immediate existential threat to their survival (Barnett & Campbell, 2010). Their insistence on the need for drastic and rapid action faced opposition from other developing states, not least the petroleum-exporting states that rely on fossil-fuel revenues for their development funds. The G-77 grouping of developing states was seriously strained on these lines; China's short-term desire to use coal to power development was very obviously at odds with the atoll states' worries about sea levels.

Using 1990 as a baseline, the Kyoto Protocol required modest reductions in emissions. Some states met their targets, including Russia, which effectively met the requirements because of the collapse of the Soviet-era economy in the early 1990s. Some did not meet their targets, notably Canada, which despite its high profile in negotiating the agreement, allowed the continued development of the controversial Tar Sands to produce petroleum. (Canada later withdrew from the agreement.) But though national statistics may have suggested success, in many cases due to globalization, industrial production plants were moved to developing states, in particular to China, so that the overall use of fuels in fact

was not substantially reduced. Offshoring and outsourcing "dirty" factories and energy-intensive parts of commodity chains obscured the larger patterns and increased the emissions in developing states—for products that were consumed elsewhere.

Other blocks also gradually emerged and in the process the geopolitical division of the Annex categories was eroded. The BASIC group (Brazil, South Africa, India, and China) was complemented by other groupings, such as the Climate Vulnerable Forum and the Durban Alliance. These groups effectively added nuance to the basic formulation that had informed the negotiations under the UN Framework Convention on Climate Change, the "combined but differentiated responsibilities" and "respective capabilities" (CBDR/RC) framework (Brunnee & Streck, 2013). This mode of thinking assumed that states in different stages of development had different responsibilities with respect to the global effort but also highlighted the important point that affluent states had many more options in dealing with their own emissions (Blaxekjaer & Nielson, 2015). From this, it also follows that developed states could provide financial assistance to the poorer states, which in many cases were vulnerable to storms, as well as agricultural disruptions; climate justice is a key theme in the complex political claims that cut across climate negotiations (Höhne et al., 2017).

The rapid increase in carbon dioxide emissions in China also changed the international dynamics. As China emerged as a huge contributor to greenhouse gases, the United States' preeminent importance in any comprehensive agreement was partially eclipsed (Terhalle & DePledge, 2013). In turn, this increased the importance of Chinese and American cooperation, and behind-the-scenes negotiations after President Obama's speech on climate as a security priority, at the Brandenburg Gate in 2013, led to the 2014 agreement whereby China agreed to move to cap its emissions relatively quickly. This change in Chinese policy reflected its new status as a major emitter and its gradual shift from being a developing country to a relatively mature economy was key to laying the groundwork for the Paris Agreement the next year.

Operating with states as the basic unit for thinking about climate leads to some perverse consequences (Harris, 2013). States and nations don't burn fossil fuels; individuals, institutions, and corporations do, and part of the problem with climate governance is that emissions are repeatedly assigned to states, and in the process, the direct responsibilities for climate change are obscured. The negotiating strategies of state governments, then, frequently end up delaying and postponing potentially effective actions. These constraints don't apply to many other forms of government or to many corporations that can act to reduce greenhouse gas emissions. International civil society and lobbying by nongovernmental organizations have also played a part in shaping international efforts on climate change (Rieteg, 2016). Partly as a result of these structural factors, new forms of governance are gradually emerging, as cities, states, citizens, and corporations begin to grapple with their vulnerabilities in these new circumstances and to craft policies for a more sustainable future (Bulkeley et al., 2014).

Following the collapse of the Copenhagen climate talks in 2009, new negotiation approaches were developed (Dimitrov, 2016). Against the backdrop of shifting geopolitical priorities, with respect to China in particular and India to a lesser extent, a framework in which all states had the flexibility to participate so as to accommodate their varied geographical attributes, instead of as members of a block of nations, as in the Kyoto Protocol, was developed. The desire of the Alliance of Small Island States for rapid action was accommodated when a "high ambition" coalition emerged during the final sessions leading up to the adoption of the 2015 Paris agreement. This grouping aspired to limit the global average temperature increase to closer to 1.5 degrees Celsius, less than the 2 degrees Celsius that had been formally adopted in Copenhagen.

The 2015 Paris Agreement

The Paris Agreement, wherein states make nationally determined contributions has the advantage of widespread legitimacy because all states are included. States can claim the reductions introduced inside their borders by whatever innovations happen to reduce emissions, regardless of whether these are actually a consequence of effective national government policies. The "no-backsliding" provision in the agreement—that each subsequent set of national contributions will reduce emissions further—operates effectively as a ratchet mechanism that should gradually reduce greenhouse gas production globally. But, contrary to the earlier aspirations, at the Bali and Durban Conference of Parties to the UNFCCC in particular, the Paris Agreement isn't an international legally binding arrangement; nor is there a compliance mechanism. However, the arrangement does require that states live up to their commitments to a series of increasingly stringent nationally determined greenhouse-gas emissions targets (Falkner, 2016).

Before Paris, the long-standing failure of comprehensive negotiations to deal with the climate-change issue, and the lack of a binding agreement with the necessary power to dramatically alter the use of fossil fuels globally, raised the question of whether climate change is a matter the great powers will have to settle among themselves, enforcing an arrangement with which the lesser states will have little choice but to comply (Brenton, 2013). The accession of the Trump administration to power in Washington makes such a deal among the great powers unlikely, at least in the short term. Any arrangement that incorporates China, the United States, Japan, and Europe would account for the majority of fossil-fuel consumption worldwide; hence the argument that it is easier to move quickly with a few large powers in an arrangement of "mini-lateralism" than to try to achieve universal agreement in multilateralism (Eckersley, 2012).

Such an arrangement would have to be worked through the finer details of international trade agreements, because these now determine many of the details about how things are produced and traded in the global system. Just as carbon emissions and related matters are traded in increasingly common carbon markets (Newell & Paterson, 2010), similar mechanisms, and the fraught issues of intellectual property, will be key to shaping the future of the global economy once political leaders decide that this is a priority worth their attention. It will be so because in our increasingly interconnected world, the global economy is the key to providing security for most of humanity; how decisions are made about what gets produced where and by whom are in part about international trade agreements and, insofar as these connect directly to how the global economy functions, are a matter of geopolitics (Stiglitz & Kaldor, 2013).

As the world entered the second decade of the 21st century and climate change continued, there was a growing recognition that time was getting short if the rapid accumulation of greenhouse gases in the atmosphere was to be constrained. This needs to be done in time to prevent major rapid disruptions of key parts of the climate system,

with all the unknowable consequences this will have for human societies. Should the political leaders of the great powers, or some larger collection of leaders in the United Nations, fail to deal with the rapid increase in greenhouse gases, then the question becomes, what other options might there be? Part of the answer is that although other governance mechanisms and initiatives elsewhere are emerging, there is no clear indication that these will be able to diminish the use of fossil fuels, reduce deforestation, limit methane production, and undertake other measures rapidly enough to prevent dangerous climate change. If they don't, then the prospect of attempted technical fixes to adjust the planetary thermostat loom in the form of geoengineering.

Geoengineering

The possibility of deliberately and artificially engineering the planet's climate has emerged for serious consideration. Cold War concerns with geophysics and weather modification on a small scale have returned in a new guise to consider the global atmosphere as an object of potential control. This is among the most controversial topics in the conversation about how to move toward a sustainable planet (Royal Society, 2009). Under the loose rubric of geoengineering, these suggestions include many novel technologies (Vaughan & Lenton, 2011). The simplest one is to mimic the cooling effect of volcanoes by using aircraft to inject sulphate aerosols into the upper atmosphere, effectively providing a sun shade for the surface of the earth and marginally reducing the amount of radiation that will cause warming. Such shading is often called solar radiation management or, more recently, albedo modification (National Research Council, 2015), but it is complemented by ideas for sequestering carbon dioxide, pulling it out of the atmosphere by ecological or industrial methods.

All of these proposed interventions are controversial, but their more articulate advocates suggest that given the trajectory of carbon dioxide emissions, the fact that, in Rockström et al.'s (2009A, 2009B) terms, there are nine key planetary boundaries within which humanity should live as a "safe operating space," we have already crossed the climate threshold and show little sign of slowing the use of carbon fuels, then temporary geoengineering is probably going to be necessary to buy time to build new energy systems that don't aggravate warming (Keith, 2013). In the absence of more effective political initiatives geoengineering may effectively become climate-change policy (Luke, 2010). If this is the case, the prospects for dealing with other planetary boundaries are bleak given that technical solutions are proffered instead of more careful thinking about how to live sensibly in a biosphere (Hamilton, 2013).

The potential difficulties associated with using geoengineering techniques are considerable, precisely because we live in one highly interconnected biosphere. The possibilities of one state blaming another for ecological disruptions caused by its geoengineering efforts and such accusations leading to conflict cannot be ignored (Urpelainen, 2012). Nonetheless, some optimism on this score is warranted given that the interconnections between various ecological phenomena and between different parts of the climate system practically require that engineering initiatives, should they be tried, will need to be coordinated if there is to be much chance that national attempts will not be working at cross purposes (Horton, 2013). If nationalist discourses coupled with secret and military research into climate modification, instead of open, universally accessible climate science, become the national security priority for states facing climate disruption, and blaming other states for peculiar weather patterns becomes the norm, this may end up looking like a reversion to some of the stranger geopolitical arguments of the 1950s. None of which bodes well for the future.

Future Geopolitics: Changing the Climate

Given the looming possibility that humanity may dramatically alter how some key parts of the surface of the planet function and, in the process, initiate a phase shift in the biosphere, much bigger questions of how the future will be shaped are coming to the fore. No longer is environment a matter of a given set of physical parameters within which humanity operates. Pollution may be a matter of poison or ecological damage, but the larger issues of climate change and the wholescale eradication of many species in the process of ecological conversion require a serious discussion of what kind of planet current policies should facilitate a transition to. Nothing less is now involved in thinking about environmental geopolitics.

But this is about more than just climate (Hulme, 2011). The Anthropocene framework encapsulates much of the recent work in earth-system science, and has emphasized the crucial point that the rich and powerful parts of humanity are creating an increasingly artificial world, one in which at least some components of the earth system are being changed so much that they are being pushed outside the parameters of the last 10,000 years of the planet's history (Steffen, Grinewald, Crutzen, & McNeill, 2011). The Holocene is when human civilizations have arisen, and insofar as its clear that they can flourish within these conditions, earth-systems scientists have suggested that this period be understood as the "safe operating space" for humanity (Rockström et al., 2009A, 2009B). It is not at all clear that large-scale organized civilization is possible beyond this space; hence the importance of keeping the global average temperature close to the conditions of the Holocene period. Pushing beyond the "earth-system boundaries" that constitute the safe operating space could initiate a very different configuration of the biosphere with unknown consequences for societies across the globe; hence the importance of constraining dangerous climate change (Steffen et al., 2015).

Although slowing climate change is a top priority, the policies to deal with change that are already in motion have spawned a discussion of both how to ensure that climate adaptation mechanisms don't inadvertently cause conflict (Dabelko, Herzer, Null, Parker, & Sticklor, 2013) as well as how to use strategies of sustainable development to ensure a new climate of peace (*A New Climate for Peace*, 2016) through strategies of peaceful transitions to a post-carbon-fueled economy (Brauch, Oswald Spring, Grin, & Sheffren, 2016). If, however, geopolitical thinking emphasizes climate disruptions in the Global South as a security threat to the North, requiring military interventions to deal with insurgencies and redoubled efforts to prevent migration, as the Brexit discussion in the United Kingdom and the Trump administration suggests in the United States, then the future of geopolitics may yet look much more like 19th century realpolitik than an appropriate set of adaptive measures to deal with coming disruptions. But this focus on conflict and rivalries, in the case of the Trump administration, coupled with a renewed emphasis on fossil fuels and the importance of firepower in international politics, will

likely aggravate rather ameliorate future difficulties in dealing with climate, in particular, and other international issues, in general (Dalby, 2017).

Conclusion

The increasing alarm with which climate change is being discussed in the aftermath of the Paris Agreement is in part a recognition that climate change is already happening; no longer is it being considered a problem for the future or the long-term future. In addition, it is gradually dawning on decision-makers that climate change isn't a simple linear warming, nor an "environmental" problem unrelated to key functions of states. In the early 21st century, it is understood as a matter of changes that are already starting to happen with unforeseen effects that potentially affect all states, albeit in different ways (Mayer, 2012). Hence the widespread support for the Paris Agreement process despite American objections.

The point about the Anthropocene is that human activities are now of such a scale that they are remaking the context in which political actions take place (Biermann et al., 2016). The global economy is effectively making places, and needs to be understood as such. This economy is shaping the future configuration of key geographical factors, and theorizing about security and politics has to engage with the rapid transformation of the planet. This requires a more fundamental rethinking of the rapidly changing global context (Kareiva & Fuller, 2016) than much of the resilience discussion has, so far at least, seriously contemplated (Mobjork, Smith, & Ruttinger, 2016). Anthropogenic change is now a key factor in the changing global political order.

This is the context in which the future of climate geopolitics, in particular, has to be discussed. It's a direct reversal of early-20th-century notions of environmental determinism, and it requires an engagement with such fields as geophysics and the engineering plans of both corporations and states in discussing the future configuration of planetary systems. The future context of geopolitics is now being decided in decisions that are made about energy systems, and how climate is going to be tackled in coming decades, whether explicitly in accordance with the Paris Agreement process or through other policy initiatives. The rich and powerful parts of humanity are increasingly shaping the future configuration of many parts of the planet, providing the changing context for cooperation or rivalry among states and other actors. Understanding this key point is essential to 21st-century geopolitics.

Further Reading

Buxton, N., & Hayes, B. (Eds.). (2016). *The secure and the dispossessed*. London: Pluto.

Dalby, S. (2017, July 7). **Firepower: Geopolitical cultures in the Anthropocene**. *Geopolitics*. Advance online publication.

Dauvergne, P. (2016). *Environmentalism of the rich*. Cambridge, MA: MIT Press.

Davies, J. (2016). *The birth of the Anthropocene*. Berkeley: University of California Press.

Falkner, R. (2016). The Paris agreement and the new logic of international climate politics. *International Affairs*, *92*, 1107–1125.

McNeill, J. R., & Engelke, P. (2016). *The great acceleration: An environmental history of the Anthropocene since 1945*. Cambridge, MA: Harvard University Press.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Ingo, F., Bennett, E. M., . . ., Sörlin, S. (2015). **Planetary boundaries: Guiding human development on a changing planet**. *Science*, 637.

References

Agnew, J. (2003). *Geopolitics: Re-visioning world politics*. London: Routledge.

Baechler, G. (1998). Why environmental transformation causes violence: A synthesis. *Environmental Change and Security Project Report*, *4*, 24–44.

Bannon, I., & Collier, P. (Eds.). (2003). *Natural resources and violent conflict: Options and actions*. Washington, DC: World Bank.

Barnett, J. (2003). Security and climate change. *Global Environmental Change*, *13*, 7–17.

Barnett, J., & Campbell, J. (2010). *Climate change and small island states: Power, knowledge and the South Pacific*. London: Earthscan.

Behringer, W. (2010). *A cultural history of climate*. London: Routledge.

Biermann, F., Bai, X., Bondre, N., Broadgate, W., Chen, T.-C. A., Dube, O. P., . . . Seto, K. C. (2016). Down to earth: Contextualising the Anthropocene. *Global Environmental Change*, *39*, 341–350.

Blaxekjær, L. O., & Nielsen, T. D. (2015). Mapping the narrative positions of new political groups under the UNFCCC. *Climate Policy*, *15*, 751–766.

Brauch, H. G., Oswald Spring, U., Grin, J., & Sheffren, J. (Eds.). (2016). *Handbook on sustainability transition and sustainable peace*. Berlin: Springer.

Brenton, A. (2013). "Great Powers" in climate politics. *Climate Policy*, *13*, 541–546.

Brunnée, J., & Streck, C. (2013). The UNFCCC as a negotiation forum: Towards common but more differentiated responsibilities. *Climate Policy*, *13*, 589–607.

Buhaug, H. (2015). **Climate-conflict research: Some reflections on the way forward**. *WIREs Climate Change*, *1*.

Bulkeley, H., Andonova, L. B., Betsill, M. M., Compagnon, D., Hale, T., Hoffmann, M. J., et al. (2014). *Transnational climate change governance*. Cambridge, U.K.: Cambridge University Press.

Buxton, N., & Hayes, B. (Eds). (2016). *The secure and the dispossessed*. London: Pluto.

Campbell, K. M., Gulledge, J., McNeill, J. R., Podesta, J., Ogden, P., Fuerth, L., et al. (2007). *The age of consequences: The foreign policy and national security implications of global climate change*. Washington, DC: Center for Strategic and International Studies.

Chaturvedi, S., & Doyle, T. (2015). *Climate Terror: A Critical Geopolitics of Climate Change*. New York: Palgrave Macmillan.

CNA Corporation. (2007). *National security and the threat of climate change*. Alexandria, VA: CNA Corporation.

CNA Military Advisory Board. (2014). *National security and the accelerating risks of climate change*. Alexandria, VA: CNA Corporation.

Conca, K. (2015). *An unfinished foundation*. Oxford: Oxford University Press.

Dabelko, G., Herzer, L., Null, S., Parker, M., & Sticklor, R. (Eds.). (2013). *Backdraft: The conflict potential of climate change adaptation and mitigation*. Environmental Change and Security Program Report 14 (pp. 1–60), Washington DC.

Dalby, S. (2002). *Environmental security*. Minneapolis: University of Minnesota Press.

Dalby, S. (2009). *Security and environmental change*. Cambridge, U.K.: Polity.

Dalby, S. (2014). Rethinking geopolitics: Climate security in the Anthropocene. *Global Policy*, *5*(1), 1–9.

Dalby, S. (2016). Climate change and the insecurity frame. In S. O'Lear & S. Dalby (Eds.), *Reframing climate change: Constructing ecological geopolitics* (pp. 83–99). London: Routledge.

Dalby, S. (2017, July 7). **Firepower: Geopolitical Cultures in the Anthropocene**. *Geopolitics*. Advance online publication.

Dauvergne, P. (2016). *Environmentalism of the rich*. Cambridge, MA: MIT Press.

Davies, J. (2016). *The birth of the Anthropocene*. Berkeley: University of California Press.

Davis, M. (2001). *Late Victorian holocausts: El Nino famines and the making of the Third World*. London: Verso.

Deudney, D. (1990). The case against linking environmental degradation and national security. *Millennium*, *19*, 461–476.

Dimitrov, R. (2016). The Paris agreement on climate change: Behind closed doors. *Global Environmental Politics*, *16*(3), 1–11.

Duffield, M. R. (2007). *Development, security and unending war: Governing the world of peoples*. Cambridge, U.K.: Polity.

Duffy, R. (2016). War by conservation. *Geoforum*, *69*, 238–248.

Dunlap, A., & Fairhead, J. (2014). The militarisation and marketisation of nature: An alternative lens to "climate-conflict." *Geopolitics*, *19*, 937–961.

Eckersley, R. (2012). Moving forward in the climate negotiations: Multilateralism or minilateralism? *Global Environmental Politics*, *12*(2), 24–42.

Edwards, P. N. (2010). *A vast machine: Computer models, climate data, and the politics of global warming*. Cambridge, MA: MIT Press.

Ehrlich, P. (1968). *The population bomb*. New York: Ballantine.

Falkner, R. (2016). The Paris agreement and the new logic of international climate politics. *International Affairs*, *92*, 1107–1125.

Farish, M. (2010). *The contours of the American Cold War*. Minneapolis: University of Minnesota Press.

German Advisory Council on Global Change. (2008). *Climate change as a security risk*. London: Earthscan.

Ghosh, A. (2016). *The great derangement: Climate change and the unthinkable*. Chicago: University of Chicago Press.

Gilbert, E. (2012). The militarization of climate change. *Acme*, *11*, 1–14.

Gleick, P. (2014). Water, drought, climate change, and conflict in Syria. *Weather, Climate and Society*, *6*, 331–340.

Hamilton, C. (2013). *Earthmasters: The dawn of the age of climate engineering*. New Haven, CT: Yale University Press.

Harris, P. (2013). *What's Wrong with Climate Politics and How to Fix It*. Cambridge: Polity.

Höhne, N., Kuramochi, T., Warnecke, C., Röser, F., Fekete, H., Hagemann, M., . . . Gonzales, S. (2017). The Paris agreement: Resolving the inconsistency between global goals and national contributions. *Climate Policy*, *17*, 16–32.

Homer-Dixon, T. (1994). Environmental Scarcities and Violent Conflict: Evidence from Cases. *International Security*, *19*(1), 5–40.

Homer-Dixon, T. (1999). *Environment, scarcity, and violence*. Princeton, NJ: Princeton University Press.

Homer-Dixon, T., Walker, B., Biggs, R., Crépin, A.-S., Folke, C., Lambin, E. F., . . . Troell, M. (2015). Synchronous failure: The emerging causal architecture of global crisis. *Ecology and Society*, *20*(3), 6.

Hommel, D., & Murphy, A. B. (2013). Rethinking geopolitics in an era of climate change. *GeoJournal*, *78*, 507–524.

Horton, J. B. (2013). Geoengineering and the myth of unilateralism: Pressures and prospects for international cooperation. In W. C. G. Burns & A. L. Strauss (Eds.), *Climate change engineering* (pp. 168–181). Cambridge, U.K.: Cambridge University Press.

Hulme, M. (2011). Reducing the future to climate: A story of climate determinism and reductionism. *Osiris*, *26*(1), 245–266.

Huntington, E. (1945). *Mainsprings of civilization*. New York: Mentor. Reprint 1959.

Ide, T., Link, P. M., Scheffran, J., & Schilling, J. (2016). The climate-conflict nexus: Pathways, regional links and case studies. In H.-G, Brauch, U. Oswald Spring, J. Grin, & J. Scheffran, (Eds.), *Handbook on sustainability transition and sustainable peace* (pp. 285–304). Berlin: Springer-Verlag.

Jones, R. (2016). *Violent borders*. London: Verso.

Kareiva, P., & Fuller, E. (2016). Beyond resilience: How to better prepare for the profound disruption of the Anthropocene. *Global Policy*, *7*(S1), 107–118.

Kearns, G. (2009). *Geopolitics and empire: The legacy of Halford Mackinder*. Oxford: Oxford University Press.

Keith, D. (2013). *A case for climate engineering*. Cambridge, MA: MIT Press.

Le Billon, P. (2012). *Wars of plunder: Conflicts, profits and the politics of resources*. London: Hurst.

Luke, T. (2010). Geoengineering as global climate change policy. *Critical Policy Studies*, *4*(2), 111–126.

Lunstrum, E. (2014). Green militarization: Anti-poaching efforts and the spatial contours of Kruger National Park. *Annals of the Association of American Geographers*, *104*, 816–832.

Mabey, N. (2007). *Delivering climate security: International security responses to a climate changed world*. London: Royal United Services Institute.

Mackinder, H. J. (1904). The geographical pivot of history. *Geographical Journal*, *23*, 421–442.

Mackinder, H. J. (1919). *Democratic ideals and reality: A study in the politics of reconstruction*. London: Constable and Co.

McKibben, B. (2016, August 15). A world at war. *New Republic*. Retrieved from **https://newrepublic.com/article/135684/declare-war-climate-change-mobilize-wwii**.

Mathews, J. T. (1989). Redefining security. *Foreign Affairs*, *68*(2), 162–177.

Masco, J. (2015). The age of fallout. *History of the Present: A Journal of Critical History*, *5*(2), 135–168.

Mayer, M. (2012). Chaotic climate change and security. *International Political Sociology*, *6*(2), 165–185.

McNeill, J. R., & Engelke, P. (2016). *The great acceleration: An environmental history of the Anthropocene since 1945*. Cambridge, MA: Harvard University Press.

Mobjork, M., Smith, D., & Ruttinger, L. (2016). *Towards a global resilience agenda: Action on climate fragility risks*. The Hague: Clingendael–the Netherlands Institute for International Relations.

National Research Council (2015). *Climate intervention: Reflecting sunlight to cool earth*. Washington, DC: National Academy of Sciences.

A new climate for peace: Taking action on climate and fragility risks. (2016). [Report commissioned by the G7]. Retrieved from **https://www.newclimateforpeace.org/**.

Newell, P., & Paterson, M. (2010). *Climate capitalism*. Cambridge, MA: Cambridge University Press.

Nixon, R. (2011). *Slow violence and the environmentalism of the poor*. Cambridge, MA: Harvard University Press.

Null, S., & Risi, L. H. (2016). *Navigating complexity: Climate, migration, and conflict in a changing world*. Washington, DC: United States Agency for International Development.

O'Loughlin, J., Witmer, F. D. W., Linke, A. M., Laing, A., Gettleman, A., & Dudhia, J. (2012). Climate variability and conflict risk in East Africa, 1990–2009. *Proceedings of the National Academy of Sciences*, *109*, 18344–18349.

Oreskes, N., & Conway, E. (2010). *Merchants of doubt*. New York: Bloomsbury.

Parenti, C. (2011). *Tropic of chaos: Climate change and the new geography of violence*. New York: Nation Books.

Peluso, N., & Watts, M. (Eds.). (2001). *Violent environments*. Ithaca, NY: Cornell University Press.

Perkins, J. H. (1999). *Geopolitics and the green revolution: Wheat, genes and the Cold War*. Oxford: Oxford University Press.

Ratzel, F. (1897). *Politische geographie*. Munich: R. Oldenbourg.

Rieteg, K. (2016). The power of strategy: Environmental NGO influence in international climate governance. *Global Governance*, *22*, 269–288.

Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin, F. S., III, & Lambin, E. F. (2009a). Planetary boundaries: Exploring the safe operating space for humanity. *Ecology and Society*, *14*(2), 32.

Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin, F. S., III, & Lambin, E. F. (2009b). A safe operating space for humanity? *Nature*, *461*, 472–475.

Royal Society. (2009). *Geoengineering, science, governance and uncertainty*. Royal Society: London.

Selby, J., & Hoffman, C. (Eds.). (2015). *Rethinking climate change, conflict and security*. London: Routledge.

Semple, E. C. (1911). *Influences of geographic environment, on the basis of Ratzel's system of anthropo-geography*. New York: Henry Holt.

Snyder, T. (2015). *Black earth: The holocaust as history and warning*. New York: Tim Duggan Books.

Soroos, M. S. (1997). *The endangered atmosphere: Preserving a global commons*. Columbia: University of South Carolina Press.

Spratt, D., & Sutton, P. (2009). *Climate code red: The case for emergency action*. New York: McGraw-Hill.

Spykman, N. (1944). *The geography of the peace*. New York: Harcourt Brace.

Steffen, W., Grinewald, J., Crutzen, P., & McNeill, J. (2011). The Anthropocene: From global change to planetary stewardship. *Ambio*, *40*, 739–761.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Ingo, F., Bennett, E. M., . . . Sörlin, S. (2015). **Planetary boundaries: Guiding human development on a changing planet**. *Science*, *637*.

Stiglitz, J., & Kaldor, M. (Eds.). (2013). *The quest for security: Protection without protectionism and the challenge of global governance*. New York: Columbia University Press.

Swain, A., & Jägerskog, A. (2016). *Emerging security threats in the Middle East: The impact of climate change and globalization*. Lanham, MD: Rowman and Littlefield.

Terhalle, M., & Depledge, J. (2013). Great-power politics, order transition, and climate governance: Insights from international relations theory. *Climate Policy*, *13*, 572–588.

Turco, R., Toon, O. B., Ackerman, T. P., Pollack, J. B., & Sagan, C. (1983). Nuclear winter: Global consequences of multiple nuclear explosions. *Science*, *222*, 1283–1292.

Urpelainen, J. (2012). Geoengineering and global warming: A strategic analysis. *International Environmental Affairs*, *12*(4), 375–389.

Vaughan N. E., & Lenton T. M. (2011). A review of geoengineering proposals. *Climatic Change*, *109*, 745–790.

Webersik, C. (2010) *Climate change and security: A gathering storm of global challenges*. Santa Barbara, CA: Praeger.

White, R. (2014). Environmental insecurity and fortress mentality. *International Affairs*, *90*, 835–851.

World Commission on Environment and Development. (1987). *Our common future*. Oxford: Oxford University Press.

Zografos, C., Goulden, M. C., & Kallis, G. (2014). Sources of human insecurity in the face of hydro-climatic change. *Global Environmental Change*, *29*, 327–336.

Simon Dalby

Balsillie School of International Affairs, Wilfrid Laurier University