

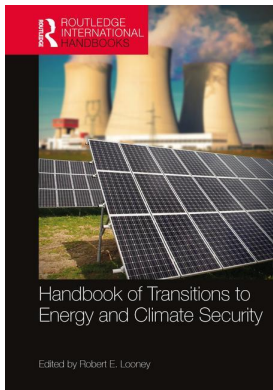
This article was downloaded by: 10.3.98.104

On: 04 Mar 2021

Access details: *subscription number*

Publisher: *Routledge*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: 5 Howick Place, London SW1P 1WG, UK



Handbook of Transitions to Energy and Climate Security

Robert E. Looney

The climate and security imperative

Publication details

<https://www.routledgehandbooks.com/doi/10.4324/9781315723617-3>

Francesco Femia, Caitlin Werrell

Published online on: 29 Nov 2016

How to cite :- Francesco Femia, Caitlin Werrell. 29 Nov 2016, *The climate and security imperative* from: Handbook of Transitions to Energy and Climate Security Routledge

Accessed on: 04 Mar 2021

<https://www.routledgehandbooks.com/doi/10.4324/9781315723617-3>

PLEASE SCROLL DOWN FOR DOCUMENT

Full terms and conditions of use: <https://www.routledgehandbooks.com/legal-notices/terms>

This Document PDF may be used for research, teaching and private study purposes. Any substantial or systematic reproductions, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The publisher shall not be liable for an loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

The climate and security imperative

Francesco Femia and Caitlin Werrell

Climate change, “a large-scale, long-term shift in the planet’s weather patterns or average temperature,”¹ has significant implications for human, national, regional and international security. It does so by acting as a “threat multiplier,” exacerbating existing risks to the security of communities, nations, and regions, and placing strains on the resource–security underpinnings of state legitimacy.² The threat comes not from climate change by itself, but rather, from how it interacts with the existing security landscape, and how it interfaces with the ability or inability of governments to effectively manage these conditions, and provide basic resources, and/or prosperity, to their respective publics. This suggests that climate change may present a serious challenge to state sovereignty in a number of places around the world. Given that international security rests on an international system of viable, sovereign states, it follows that climate change may present a significant threat not just to critical infrastructure, but to international security as well. However, the future does not need to look so dire. There are a range of practical and structural solutions for addressing climate change in a way that is commensurate to the likelihood and scale of the threat, and these solutions form the basis of an international “climate and security imperative.”

Growing appreciation of existing climate risks

Increasingly, climate change is being assessed and addressed according to the risks it poses to security. This is in part due to better and more data on the links between climate change and other indicators of human and national security, and the ability to monitor and predict future trends. For example, in 2008, the U.S. Intelligence Community produced a National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030,³ and the UK Ministry of Defence produced a Global Strategic Trends report,⁴ which included robust sections on climate risks and likely future scenarios.

In addition to assessing the future risks of climate change to security, there is an increasing amount of work evaluating the current risks. The U.S. Department of Defense, for example, in its 2014 Climate Change Adaptation Roadmap, noted that climate was “an immediate risk to national security.”⁵ A chapter on the observed intersection of climate change and human security was included in the Intergovernmental Panel on Climate Change (IPCC) 5th

Assessment Report.⁶ This growing evidence of current human and national security risks associated with climate change is coupled with a gradual shift from addressing climate change as a “tolerable” risk primarily to infrastructure, to a possibly “strategically-significant risk” to national security.⁷ This gradual up-scaling and incorporation of climate risks into broader risk assessments and policies is part of an ongoing need to better prepare for and mitigate the security risks amplified by a changing climate. While a considerable amount of progress has been made over the last several decades, there remains a gap between the risks nations and peoples face, and the capacity and political will to respond to these risks. This chapter explores both what has been done, and what remains to be addressed.

How security establishments view the climate change threat

Security establishments, including the U.S. military and intelligence community, and in over 70 countries around the world, have identified climate change as a national security threat.⁸ This is reflected in a range of strategic documents, assessments, actions and statements made by national security, military and intelligence institutions across the globe – including important outputs from the United States such as the Quadrennial Defense Review and the National Intelligence Council’s “Global Trends 2030: Alternative Worlds”⁹ and from the UK Ministry of Defence¹⁰ among others. The reasons for this appreciation are clear. Observations of existing climate change impacts on security have increased in the past decade, and projections regarding the influence of climate change on future security are consistently dire. Generally speaking, security practitioners have described climate change as a “threat multiplier.”¹¹ This essentially means that it has the potential to exacerbate other drivers of insecurity. This includes factors such as water, food and energy insecurity, which are drivers that can contribute to significant infrastructure risk, state fragility, and even conflict.¹²

Infrastructure and geostrategic threats

In this context, security establishments in the United States, and globally, generally acknowledge two broad types of risks presented by the “threat multiplication” of a changing climate: “infrastructure” threats and “geostrategic” threats. Though this is an imperfect categorization – as there are indeed connections between the two, and nuances that the categories cannot fully capture – it is a helpful guide to understanding how security communities approach this threat.

Infrastructure threats

Climate change has direct security implications through its effect on the critical infrastructure underpinning a nation’s security. This includes sea level rise, storm surge and other extreme weather risks to military installations and personnel that can both inhibit a nation’s readiness to conduct critical military and humanitarian assistance operations, and severely damage essential civilian infrastructure, including the financial centers, agricultural hubs, and energy grids that undergird a nation’s economic viability. Using the case of the United States as an illustrative example, this involves the multiplication of direct threats to military installations and capabilities.

The latest climate change projections forecast a future of more intense and frequent extreme weather events in North America, including slow-onset risks such as sea level rise (SLR) and droughts, and more quick-onset risks such as floods and storms. These events, either separately or occurring in a cascading manner, can devastate coastal zones, energy infrastructure and agricultural hubs in the United States whose viability rests on predictable rainfall patterns.¹³ U.S.

domestic military installations are also at risk. For example, the U.S. Department of Defense (DoD) has devoted resources to assessing and preparing for climate change-driven phenomena, including the potential impact of more frequent and intense dust storms, droughts and rising temperatures, as well as extreme temperatures, on military installations in the Southwest United States.¹⁴ The DoD also examines the impact of sea level rise on its numerous coastal military installations, including the low-lying Hampton Roads region, which according to the former Secretary of Defense Leon Panetta, is home to the “greatest concentration of military might in the world.”¹⁵ According to Matt Connolly, the critical military infrastructure at Hampton Roads is vulnerable in the following key ways:¹⁶

- Rising sea levels and climate disruptions are a “present security threat, not strictly a long-term risk.”
- The Hampton Roads region, home to 1.7 million people and over two dozen military sites, is the second most vulnerable region in the U.S. to hurricanes, storms, and sea level rise.
- Some scenarios project that the sea level around Norfolk will rise by seven feet or more in the next 100 years.
- A U.S. Army Corps of Engineers risk assessment found that, by the second half of this century, 60 to 80% of Naval Station Norfolk could be flooded during storms the size of Hurricane Isabel in 2003.

U.S. military installations abroad are also at serious risk. For example, the U.S. Navy’s Task Force Climate Change (TFCC)¹⁷ and cross-agency efforts such as SERDP and ESTCP¹⁸ conduct assessments of, and offer solutions to, the current and projected impact of sea level rise on naval installations worldwide.

The damage and degradation of military infrastructure driven by a changing climate can have implications for other military capabilities as well. Extreme weather events in “theater,” for example (i.e. regions of the globe where the U.S. military conducts operations), can increase the vulnerability of armed forces by disconnecting them from reliable water and fuel supplies. The protection of military convoys transporting water and fuel is at times a very dangerous mission. For example, casualties resulting from attacks on vulnerable fuel convoys represented “one-third of U.S. Army casualties in Afghanistan in 2007.”¹⁹ This is one of the reasons why the DoD devotes resources to equipping its armed forces with portable water desalination and filtration devices, as well as mobile hybrid and renewable energy systems. The U.S. Army’s “Energy to the Edge” program is one such effort to reduce the operational risks associated with protecting traditional fuel corridors.²⁰

Geostrategic threats

On a broader and more diffuse level, climate change also presents a geostrategic threat by exacerbating stresses on the critical resources underpinning national security, including water, food and energy. These stresses, at their most acute, can degrade a nation’s capacity to govern, which can have implications for national, regional and international security. Decreases in water, food and energy availability can devastate livelihoods, and contribute to a broad range of destabilizing trends, including mass population displacement, migration, and political unrest. These pressures in turn can contribute to state fragility, internal conflict, and potentially, state collapse.²¹ Climate change can also indirectly change or disrupt existing international security dynamics in geostrategically-significant environments, such as the South China Sea and the Arctic.²²

Cumulatively, these threats can place significant strains on a world order built on an international system of cooperating sovereign states. As state sovereignty is built on a legitimacy founded on a state's ability to both provide basic resources and/or prosperity – what one may call “output legitimacy” – and/or to offer a voice to its publics – “input legitimacy” – the effect of climate change, particularly on the output legitimacy of states, can have a profound influence on international security, and more broadly, world order.²³ Here is a look at four broad categories for how climate change interacts with and multiplies geostrategic threats:

- increased state fragility;
- heightened globalization of hazards;
- added risks to key geostrategic environments;
- direct threats to state sovereignty.

Increased state fragility

Climate change may increase the fragility of states. This impact is perhaps most acute on already fragile states. The populations of nations that are poorly-governed and resource-stressed are likely to be on the front lines of a changing climate. Fragile states such as Sudan, Ethiopia and the Central African Republic in Africa, Pakistan and Bangladesh in South Asia, and fragile states in the Middle East and North Africa such as Yemen and Syria,²⁴ are projected to experience some of the most dramatic effects of climate change in terms of rainfall variability and sea level rise.²⁵ According to the U.S. National Intelligence Council's 2015 Worldwide Threat Assessment, climate change will stress already stressed global food supplies, presenting a particularly acute problem in “Africa, the Middle East, and South Asia.”²⁶ The following are two short case studies to further illustrate this point.

Libya

Libya is a clear case of this nexus between existing state fragility, climate change and water insecurity. Increases in drought days along the most populated coastal areas of Libya bordering the Mediterranean are, according to recent studies, likely to double from 101 days to 224 days a year.²⁷ Libya is also highly dependent on non-renewable groundwater from aquifers shared with neighboring states – water that is delivered to the coastline via the “Great Manmade River Project” constructed under the Ghaddafi regime. This means that in the not-too-distant future, Libya may run out of groundwater, and find itself more dependent than ever on rainfall in the winter – rainfall that is experiencing a sharp decline as a result of a changing climate.²⁸ Given that Libya is already experiencing a significant amount of political instability, and continues to be a destination for refugees and migrants throughout Africa, this added stress from climate change could contribute to chronic instability and/or state failure. An increase in water stress is a prime example of how climate change can act as a “threat multiplier.”

Syria

Another example of how climate change can increase the fragility of a state is Syria. In 2010–2011, Syria was considered by many political analysts to be a relatively stable state compared to other countries experiencing the so-called “Arab Spring.”²⁹ However, there were underlying climatic and natural resource stresses that made the country far more vulnerable than it seemed. In 2011,

a study commissioned by the National Oceanic and Atmospheric Administration (NOAA) determined that climate change was very likely to be a major contributing factor in winter precipitation decline in and around the Mediterranean basin, including North Africa and the Middle East, since 1971. Syria, according to that study, was one of the hardest hit, experiencing a very significant decline from 1971–2010.³⁰ A subsequent study showed that the extreme drought Syria experienced from 2007–2010 (the worst in its history of records), was made 2–3 times more likely because of climate change.³¹ As highlighted in a 2012 report by the Center for Climate and Security – building off research conducted by the United Nations³² – this drought, coupled with significant natural resource mismanagement by the al-Assad regime, including the subsidization of water intensive crops such as cotton and wheat, and the widespread use of wasteful agricultural practices, such as flood irrigation, contributed to the decimation of a significant percentage of Syria’s agricultural sector, and its pastoral rangeland. This directly contributed to a mass internal displacement of around two million farmers and herders during the period of the drought.³³ That displacement, which was reported on but largely missed by political analysts assessing Syria’s fragility,³⁴ may have been a key factor in driving political unrest in the country, which has ultimately led to Syria being one of the most fragile countries in the world.³⁵

In the absence of significant adaptation efforts, a slowing of the rate of climatic change, or significant improvements in natural resource governance, such nations are likely to become even more fragile than they already are, leading to the possibility of an increased incidence of state failures.

Heightened globalization of hazards

Climate change-related weather events also have the capacity to disrupt global markets that are critical for the resource security of states. Due to the global nature of these markets, climatic events in one part of the world can have dramatic impact on locations sometimes thousands of miles away. This phenomenon can be described as “the globalization of hazards.”³⁶ Take, for example, the global wheat market and the case of Egypt. Egypt, like many of its neighbors, is one of the world’s most highly dependent on the global wheat market.³⁷ In 2010, major drought and heat wave events in China and Russia – the latter explicitly connected to climate change by two separate studies,³⁸ devastated local wheat harvests, which drove China to make extraordinarily large purchases of wheat on the global food market.³⁹ This was a major factor in driving up the price of wheat in Egypt by about 300% in 2010–2011.⁴⁰ Egyptian “bread subsidy” policies were unable to bring the price down in many rural areas.⁴¹ While urban protests were occurring in Cairo and other cities, the appeal of the revolutionary movement in Egypt broadened to the countryside, which saw at least three major food riots in 2011.⁴² In this way, a climatic hazard in China and Russia contributed in a significant way to food insecurity in Egypt, due to the latter’s dependence on the global food market. Such “globalized hazards” are likely to increase, as extreme weather events become more frequent, and more intense.

Added risks to key geostrategic environments

Climate change also places pressure on shared geostrategic, and often geographically ill-defined, environments, which may exacerbate existing international tensions, or create new ones. Two of the clearest examples of this nexus between climate change and key geostrategic environments are the South China Sea and the Arctic Ocean.

The South China Sea is a critical geostrategic choke point. According to a report from the Center for a New American Security (CNAS), ocean-going vessels carry \$1.2 billion in U.S. trade annually through its waters. On top of this, sovereignty over parts of the Sea is bitterly contested by adjacent countries, and the U.S. and China have perennially competed over its control (with the U.S. viewing Chinese expansionism in the sea as a threat to international security, and the security of key allies and partners in the region).⁴³ On top of this dynamic, a warming ocean coupled with over-fishing is driving fish stocks northward into contested waters.⁴⁴ As nations bordering the sea, such as Vietnam, are heavily dependent on fish stocks in the South China Sea as a source of protein for their populations (30% of protein intake in Vietnam, for example), Vietnamese fishing fleets are likely to venture further north into waters that are subject to competing claims between China, its neighbors, and the United States.⁴⁵ These dynamics could lead to an increasing number of regional security disputes. Such disputes can quickly escalate into international security incidents when the United States becomes involved in support of a claimant.⁴⁶

In the Arctic, by contrast, there has been extraordinary cooperation between nations in what might otherwise be a “Wild West” of ice and water. This may be due to the existence of successful cooperative forums, such as the Arctic Council, but there are other dynamics at play as well. Some scholars argue that as climate change contributes to increasing economic activity in the Arctic, greater cooperation between Arctic nations may become more common due to a perception that “stability is good for business.”⁴⁷ However, it would be unwise to ignore the possible international security consequences of diplomatic tensions elsewhere in the world (such as disputes between Russia and the United States in Eastern Ukraine and Syria) on the security landscape in the Arctic.⁴⁸ Since the outbreak of violence in Ukraine, for example, the North Atlantic Treaty Organization (NATO) requested that all members suspend military cooperation with Russia (including in the Arctic), and Russia has withdrawn from a major forum for military cooperation in the Arctic, the Arctic Security Force Roundtable.⁴⁹ A future of an even more open Arctic, coupled with disagreements over security dynamics elsewhere in the world, could provide additional opportunities for tension, and even conflict, between major powers, and this has possible negative consequences for the maintenance of world order. While the current probability of conflict in the Arctic is low,⁵⁰ this will be an important space to watch in the future.⁵¹

Direct threats to state sovereignty

Climate change may also contribute to the disappearance of certain low-lying states through its contribution to sea level rise, as well as the loss of significant territory for other states. This includes small island states such as the Maldives,⁵² and large swaths of countries, such as the low-lying coastal zones of Bangladesh.⁵³ Essentially, climate change presents an existential threat for some countries – a potentially total loss of sovereignty. The international community has no experience in managing the disappearance of nations as a result of environmental processes.⁵⁴ In fact, there are no international legal norms designed to account for such an eventuality, including no formal recognition of “climate refugees” or “environmental refugees.”⁵⁵ The loss of entire states, or large zones within states, may contribute to a mass increase in stateless people in the international system, which could present both a humanitarian and international political and security crisis of the highest order.⁵⁶ The full nature of the consequences of such an event is not broadly understood, and that uncertainty presents a unique and unprecedented challenge to international security.

The 3 Ds of prevention and response

Addressing both the infrastructure and geostrategic risks of climate change means managing the unavoidable, and avoiding the unmanageable.⁵⁷ First, governments and societies must commit the resources necessary to manage climate change impacts on critical infrastructure, on food, water and energy security, and on geopolitical dynamics in strategically-significant parts of the world. Second, governments and societies must take measures to avoid worst-case climate change scenarios which may be very difficult for nations and international institutions to manage effectively. These solutions involve applications across the so-called “3 Ds” of security: defense, diplomacy and development.

Defense

Nearly all militaries are tasked with addressing both likely and unlikely threats to their respective nations, and developing plans and contingency plans for all such eventualities. This includes the high impact, high likelihood risk of climate change. While the previous section explored how climate change can impact military infrastructure, in particular, this section explores the broader “risk matrix” that militaries contend with, and how those risks affect the three distinct yet interrelated elements of military effectiveness: readiness, operations and strategy.

Readiness: Military “readiness” involves the capacity of a military’s infrastructure to assist in the execution of operations in a timely and effective manner. This includes the maintenance of a secure, stable military infrastructure, including installations, supply lines and logistics, for the purposes of being able to carry out missions on short notice. Sea level rise and increased storm surge, for example, have the ability to degrade essential coastal military installations that are critical for operational effectiveness, including major military infrastructure such as the Hampton Roads region in the U.S. Mid-Atlantic, which is home to the largest number of military sites in the world.⁵⁸ As mentioned previously, droughts, wildfire and extreme temperatures can also have a significant effect on a military’s readiness.

Operations: Outside of operational restrictions that flow from degraded military readiness, climate change can also have a direct influence on military operations, including war-fighting operations and humanitarian missions. The effects of climate change can significantly stress military supply chains, and challenge the logistical capacity of militaries in their operational environments. Mega droughts and flooding events in the war-fighting “theater,” for example, can affect the water supplies of armed forces. Drought can also increase the probability of non-state actors, including terrorist organizations such as the Islamic State, seizing water resources to use as leverage against opponents and target populations.⁵⁹ The increase in the scale and frequency of natural disasters, and the possibility of an increased incidence of “cascading disasters” or “cascading consequences” where multiple disasters happen either simultaneously or in close proximity to one other, may also make it more difficult for militaries to provide humanitarian assistance and disaster relief (HADR).⁶⁰

Strategy: Military strategy can also be affected by the increasing probability of destabilizing security conditions in strategically-significant regions of the world. In the Middle East and North Africa, climate stresses on water security, coupled with natural resource mismanagement, demographic change, and continued political tension, are very likely to increase the probability of persistent instability in the future. Melting ice in the Arctic region, in concert with ongoing tensions between Arctic nations, such as Russia and the United States, may increase the likelihood of conflict. Rainfall variability in the broader Asia-Pacific region, coupled with increasing urbanization, a growing coastal population, and a greater demand for more energy, will

pose enormous risks to security in a part of the world that is of increasing importance to the international security community, including the U.S. military in the context of the “U.S. Asia-Pacific rebalance” strategy.⁶¹ In the South China Sea, fish stocks migrating northward due to a warming ocean may pressure the fishing fleets of nations to move into disputed waters. As mentioned previously, this may precipitate increased tensions between China, its smaller neighbors, and the United States, who support the claims of smaller nations in the region, and these events can draw in military assets and actions.⁶² Cumulatively, these pressures could increase the likelihood of militaries being called on to resolve conflicts, or provide post-conflict assistance. All of these dynamics will put stresses and strains on military strategies.⁶³ Glacial melt and flooding in Central Asia, a region that depends on Himalayan glaciers for most of its freshwater, coupled with existing security dynamics (such as the proliferation of nuclear materials and the persistence of international terrorist organizations), can prove to be a very volatile mix.

Diplomacy and Development

Climate change is also likely to strain diplomacy and development, though it also opens up opportunities in this space. These risks and opportunities exist in the context of both policy responses to climate-related threats to international security, as well as policy responses to climate change itself.

Diplomacy: As climate change challenges state fragility, exacerbates food, water and energy insecurity worldwide, and alters the landscape in which geopolitical dynamics play out, inter-governmental institutions, national governments and communities at the sub-national level will be forced to develop more innovative and sophisticated ways of addressing these complex crises. Disputes over addressing climate change can also spill over into other areas of international security cooperation, potentially fraying relationships between states and within intergovernmental institutions. However, given that climate change represents a threat to international security, responding to the threat also provides opportunities for increasing cooperation – on climate change and a broader array of issues. This includes strategic engagement opportunities. As an example, for diplomatic reasons, it is in the interest of the United States to support the climate resilience of its allies, partners and prospective allies in the Asia-Pacific region, as it advances its “Asia-Pacific rebalance” strategy. This could enhance its diplomatic leverage in the region, and increase its influence vis-à-vis regional actors with which the U.S. enjoys “cooperation,” such as China.⁶⁴

Development: The least developed nations are the most vulnerable to the effects of a changing climate. Developing countries are also most likely to experience instability and conflict as a result of dynamics exacerbated by a changing climate. In this context, government agencies and international institutions will need to ensure that assistance to developing nations is climate sensitive, as well as sensitive to the possible effects of climate change on instability and conflict. Making sure that climate policies and investments themselves are conflict-sensitive, is also of great importance, as maladaptation could do more harm than good, no matter the intentions.⁶⁵ Support for climate resilience in the developing world will also need to address fundamental power structures and inequities that drive instability and conflict in certain countries, in order to avoid reinforcing structures responsible for persistent poverty. As the G7-commissioned “A New Climate for Peace” notes:

*Climate change will stress our economic, social, and political systems. Where institutions and governments are unable to manage the stress or absorb the shocks of a changing climate, the risks to the stability of states and societies will increase.*⁶⁶

In the developing world, why those existing economic, social, and political systems exist will need to be better appreciated in order for investments in climate resilience to be most effective.

How does climate change compare to other security priorities?

Climate change is similar to other so-called “new security risks” or “transnational security risks,” in that it is widely recognized as a high probability, high consequence risk.⁶⁷ This effectively means climate change is happening, and has potentially very significant, negative implications for international security. Despite this general consensus, the response to climate change from most governments, to date, has not yet been commensurate to the risk. The detonation of a weapon of mass destruction, for example, has been considered as a low probability, yet high consequence risk by experts.⁶⁸ This suggests that though the probability of such a weapon being detonated by a state or a non-state actor is low, such an event would be unacceptably catastrophic. Further, low probability events happen all the time. Given the legitimate “low tolerance” for such an eventuality, a regime of international laws, and significant state resources, have been marshaled and deployed to track and prevent the proliferation of weapons of mass destruction. Though significant intolerable risks related to climate change have been identified, an approach comparable to non-proliferation efforts has not fully materialized in the climate change sphere of policy-making. The scale and comprehensive nature of recent international agreements on climate change suggest that this may be changing. However, it is worth noting that even the most recent and ambitious international climate agreement in Paris is not legally-binding, unlike most major agreements regarding nuclear, biological and chemical weapons.⁶⁹

Though comparisons between the probability and consequence of different transnational security risks are useful, placing climate change in a hierarchical “rank” of security risks can falsely separate it from other risks, and contribute to a fractured understanding of the risk landscape. Climate-driven water insecurity, for example, can increase the probability of state instability, which in turn could enhance the influence of non-state actors, who could help facilitate the proliferation of the fissile materials necessary for producing nuclear weapons,⁷⁰ interconnections make the case that it may be less important to rank climate change next to other security risks, and more important to treat climate change as part of a comprehensive “risk” or “threat” matrix.

Securitization vs. militarization

There exists an academic dialogue regarding the “securitization” of climate change which involves analysis of the “climate and security” discourse. This dialogue, however, tends to artificially conflate the recognition of climate change as a security risk, with the concept of “militarizing” responses to climate change.⁷¹ It is important to address this mischaracterization, as “securitization” does not imply “militarization.” The former suggests that climate change presents risks to security, while the latter implies that climate change is being primarily considered as a military problem, and that responses to it should therefore be led by military institutions.

In practice, evidence suggests that the treatment of climate change, and other transnational challenges, as a “security” problem has broadened the scope of responses to its risks, rather than narrowing that scope to military or security-oriented institutions. For example, intergovernmental security institutions and militaries, such as the UN Security Council and the U.S. Department of Defense, recognize the critical role of civilian agencies in combating “new security threats” such as poverty, health vulnerabilities, water and food insecurity, and a changing climate. The United Nations Security Council, for example, released a Presidential

Statement on Climate Change which identifies a non-security intergovernmental organization, the UN Framework Convention on Climate Change (UNFCCC), as a “key instrument for addressing climate change.”⁷² The U.S. Department of Defense’s 2010 Quadrennial Defense Review (QDR) report includes a section on climate change which states that civilian agencies, such as the Department of State and the Department of Energy, should be leading actors in addressing the climate risk.⁷³ In other words, rather than narrowing the field of action, the climate and security dialogue broadens the scope and scale of action to include a greater number of agencies with different competencies. This helps ensure that few stones are left unturned in the effort to address the high probability, high consequence threat of a changing climate.

Better understanding climate and security risks

In order for climate change to be addressed in a manner that is commensurate to the threat to international security it poses, its “risk profile” must first be elevated among security establishments across the globe. This will require the improvement of analytical tools aimed at assessing climate risks to security, as well as improved channels for delivering prognoses of climate and security risks to senior government officials with the authority and resources to act robustly, and to act early. For example, evidence suggests that the predictive tools and indices governments and analysts use to assess the fragility of states are outdated, and may not adequately account for climate and natural resource-related risks to state fragility.⁷⁴ This has led analysts to miss vulnerabilities in seemingly stable states.

Brittle states

One of the reasons improved risk assessments are necessary is because the international security landscape plays host to a number of seemingly stable states that are nevertheless quite vulnerable under the surface, from a resource perspective. It is important to distinguish such “brittle states” from “fragile states,” as in brittle states, the appearance of stability can lead analysts and policy-makers to fail to anticipate fragilities, and to make poor political, economic and natural resource management choices. These states may score relatively high in “state fragility indices”⁷⁵ when compared against states that are more widely considered as “failed” or on “the brink of failure,” such as Somalia, Sudan and the Central African Republic.⁷⁶ Often, measurements of the fragility of such states focus primarily on social, political and economic circumstances that suggest the likelihood of collapse to be low. However, such measurements often fail to fully take into account significant natural resource vulnerabilities and climatic stresses under the surface that may make them far more fragile than they seem.⁷⁷

The problem is not so much the lack of data, as it is a lack of an appropriate use of existing data. Nations and analysts must better account for climate and natural resource stresses in the tools they use to determine the degree of a state’s fragility. They must also ensure that information about environmental drivers of instability reaches senior decision-makers that are responsible for foreign, defense and national security policy. A failure to do so may result in further misdiagnoses of state fragility, and unpreparedness for the security breakdowns that can follow.

Underestimating and oversimplifying the connections between climate change and security

Popular commentary, often dependent on the drama of “two-sided” debate, tends to either oversimplify or underestimate climate change effects on security.⁷⁸ This dynamic can have a

deleterious effect on public policy, and should therefore be corrected as much as possible. Syria, for example, is not the first “climate war,” and climate change is not a proximate cause of the Syrian refugee crisis, despite the implications of some newspaper headlines to the contrary. If these kinds of simplistic claims are accepted at face value, commentators risk absolving governments, such as the al-Assad regime, of a responsibility to protect their publics. Similarly, the underestimation of climate change risks to security could lead governments and societies to miss critical vulnerabilities. In the case of Syria, there is evidence that climate change was a contributing factor to Syria’s fragility.⁷⁹ Ignoring or underestimating this contribution could also risk leaving governments and populations unprepared.

A reasonable level of certainty

Though the future is not entirely predictable, evidence that climate change can contribute to state fragility, and other stresses on security, is growing. While additional research is critical for enhancing that certainty, policy-makers cannot wait for perfect certainty before making decisions, particularly in a complex and rapidly-changing environment, where delayed action could be implicated in state failure, conflict and humanitarian crisis.

Dr. Jay Gulledge notes that unlike academic scholars, governments are more concerned, by necessity, with false negatives than false positives.⁸⁰ If a government fails to detect a risk, and that risk materializes, that government will be held accountable for failing to protect its public. In terms of climate change impacts on security issues such as state fragility, there is a sufficient degree of certainty to justify comprehensive action to mitigate climate risks. Demanding that governments rest policy decisions on near-perfect certainty about climate change impacts before acting is not sensible, and inconsistent with how governments treat a range of other critical security risks. As General Gordon Sullivan, USA (ret.) stated:

People are saying they want to be perfectly convinced about climate science projections ... But speaking as a soldier, we never have 100% certainty. If you wait until you have 100% certainty, something bad is going to happen on the battlefield.⁸¹

In short, governments and publics must lower the “certainty threshold” for triggering preventive solutions to climate change, in order to avoid potentially catastrophic scenarios.

Existing risks and black swans

While the medium and long-term risks of climate change are projected to be destabilizing, climate change is affecting international security already. NASA notes that the globe is warming at a faster rate than it ever has before.⁸² The U.S. Department of Defense’s 2014 Climate Change Adaptation Roadmap highlights that climate change presents “immediate risks to national security.”⁸³ The National Oceanic and Atmospheric Administration implicates climate change in the significant decline in winter precipitation across the Middle East and the Mediterranean from 1971–2010.⁸⁴ Arctic ice melt is fundamentally changing the geopolitical landscape of the High North. The IPCC 5th Assessment Report’s Human Security chapter recognizes that climate change can indirectly increase the likelihood of violent conflict.⁸⁵

Though climate impacts are already occurring, and likely to get worse, lower probability climate events, or “black swans,” must also be planned for. Abrupt climatic changes, and gradual changes that precipitate abrupt stresses to food, water and energy security, have the potential to be destabilizing.⁸⁶ Changes in the jet stream, more rapid than expected sea level rise and glacial

melt, and global disasters such as simultaneous shocks to major grain-producing nations, are a few potential abrupt consequences. While climate change models are strong in their predictive power, unknowns remain.

What to do: a few recommendations

Addressing climate change risks involves managing the unavoidable, and avoiding the unmanageable. Governments and international institutions must commit the necessary resources for managing climate change impacts on infrastructure, food, water and energy security, and geopolitical dynamics. These solutions involve applications across the so-called “3 Ds” of security: defense, diplomacy and development.

Defense

There are a range of actions militaries and security establishments can take, in concert with their civilian partners, to address this multi-tiered threat. These include:

- including a robust consideration of climate-related security threats in national defense strategies;
- elevating the “threat profile” of climate change within defense ministries;
- designating a senior defense official as a climate change lead;
- expanding traditional international security cooperation to encompass environmental and climate security matters;
- conducting annual assessments of the implications of climate change for operational missions;
- including attention to climate risks in security assistance programs, particularly as it relates to conflict avoidance and prevention;
- raising the profile of climate change at international defense summits and other security forums;
- developing cooperative military strategies for addressing climate impacts on military operations;
- incorporating climate concerns into military–military and civilian–military cooperation on disaster risk reduction; and
- addressing climate change at international and regional security institutions (NATO, UN Security Council, African Union, ASEAN Defense Ministers Forum, etc.).

Diplomacy

Foreign ministries, heads of state and diplomatic corps across the globe can take practical steps to address the broader security risks associated with a changing climate. These include:

- designating a senior diplomatic official with a “climate and security” mandate;
- elevating climate change as a priority within foreign ministries;
- addressing climate change concerns at multi-lateral institutions with security competence, such as the UN Security Council and the G7;
- creating new international institutions to address climate-related challenges;
- elevating climate and security issues as a strategic priority in all bi-lateral relations;
- responsibly integrating diplomatic and development efforts with military efforts to address the observed and projected security risks of climate change;

- promoting the appointment, by the UN Secretary General (UNSG), of a UN Special Representative for Climate and Security;
- advancing the creation, by the UNSG of a Joint Task Force on Climate and Security consisting of expert representatives from relevant UN institutions, to produce an assessment of the capacity of the UN as a whole to address the security implications of climate change; and
- developing the international legal and institutional structures to manage migration as a climate adaptation strategy.

Development

As most vulnerabilities associated with a changing climate will be related to the level of a nation's or a community's economic and political development, government agencies and international institutions concerned with development should:

- ensure that development assistance is sensitive to the possible effects of climate change on instability and conflict;
- advance climate policies and investments that are conflict-sensitive;
- integrate climate and security factors in development agency investments in conflict prevention and post-conflict reconstruction;
- ensure a robust consideration of climate change-related human and national security risks in periodic reviews of development assistance strategies and programs;
- improve understanding of how climate change pressures interact with state stability and state legitimacy; and
- commit significant resources to climate resilience in unstable parts of the world, and develop climate mitigation and adaptation strategies that are consistent with international security priorities.

Conclusion

Populations are urbanizing and growing, sea levels are rising, and extreme weather events are developing more frequently and intensely. Such dynamics will place additional strains on the food and water resources that underwrite the security of nations and populations around the world, and this may increase the scale of mass migration. Despite this, policies designed to comprehensively address the full picture of climate risks are lacking, despite recent advancements among security institutions, and in international climate negotiations. Waiting for security and humanitarian crises to hit the front pages before acting has often proven a great failure of the international community. Whether or not the international community learns from that failure will be the measure of its resilience.

In this context, improving, augmenting, and possibly even creating new international, regional, national and sub-national structures for addressing climate change, may be critical for a secure future. This is a step that will require far more than technical or technological fixes. Rather, it will require that nations, and international institutions, place climate change at the top of the international security agenda, and find ways of collaborating on reducing those risks that present the greatest challenge to a functioning world order. Such an international climate and security imperative is both necessary, and achievable.

Notes

- 1 Met Office, “What is Climate Change?” Met Office, 2010, www.metoffice.gov.uk/climate-guide/climate-change.
- 2 CNA Corporation, *National Security and the Threat of Climate Change* (Arlington, VA: CNA Corporation, 2007); US DoD, 2014, *Climate Change Adaptation Roadmap* (Washington, DC: U.S. Department of Homeland Security, 2014).
- 3 T. Fingar, *National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030*, Statement to the House Permanent Select Committee on Intelligence, House Select Committee on Energy Independence and Global Warming, 25 June 2008.
- 4 United Kingdom Ministry of Defence, *Global Strategic Trends – Out to 2045*. 5th ed., 2014. Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/348164/20140821_DCDC_GST_5_Web_Secured.pdf.
- 5 U.S. Department of Defense, 2014 *Climate Change Adaptation Roadmap* (Washington, DC: U.S. Department of Homeland Security, 2014).
- 6 Y. Hijioka et al., “Asia,” in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2014), 1327–1370.
- 7 U.S. Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review* (Washington, DC: U.S. Department of Homeland Security, 2014).
- 8 American Security Project, *Climate Security Report*, American Security Project, 2012, Washington, DC, www.americansecurityproject.org/climate-security-report/.
- 9 US DoD, 2014 *Climate Change Adaptation Roadmap* (Washington, DC: U.S. Department of Homeland Security); National Intelligence Council, *Global Trends 2030: Alternative Worlds* (Washington, DC: National Intelligence Council, 2012).
- 10 United Kingdom Ministry of Defence, *Global Strategic Trends – Out to 2045*.
- 11 CNA Corporation, *National Security and the Threat of Climate Change*; U.S. Department of Defense, 2014 *Climate Change Adaptation Roadmap* (Washington, DC: U.S. Department of Homeland Security, 2014).
- 12 U.S. Department of Defense, *National Security Implications of Climate-Related Risks and a Changing Climate* (Washington, DC: U.S. Department of Defense, 2015).
- 13 K. Burks-Copes, *Risk Quantification for Sustaining Coastal Military Installation Assets and Mission Capabilities* (No. RC-1701) (Washington, DC: SERDP and ESTCP, U.S. Department of Defense, 2014).
- 14 C. A. Alaimo, “Military Taps UA Expertise to Cope with Impact of Climate Change,” *Arizona Daily Star*, March 3, 2012, http://tucson.com/news/local/wildfire/military-taps-ua-expertise-to-cope-with-impact-of-climate/article_22e62435-a227-568d-9db9-3ba40f9ce8f5.html#ixzz1oGdBhrGm.
- 15 Leon Panetta, “Secretary of Defense Speech: Hampton Roads Chamber of Commerce,” October 19, 2012, US Department of Defense, <http://archive.defense.gov/Speeches/Speech.aspx?SpeechID=1729>.
- 16 M. Connolly, *New BRIEFER: Hampton Roads, Virginia and the Military’s Battle against Sea Level Rise* (Washington, DC: Center for Climate and Security, 2015).
- 17 U.S. Navy, “Climate Change: Task Force Climate Change (TFCC),” Green Fleet, accessed February 23, 2016, <http://greenfleet.dodlive.mil/climate-change/>.
- 18 SERDP, “Climate Change and Impacts of Sea Level Rise,” SERDP and ESTCP, accessed January 23, 2016, www.serdp.org/Featured-Initiatives/Climate-Change-and-Impacts-of-Sea-Level-Rise.
- 19 Joshua Zaffos, “U.S. Military Forges Ahead with Plans to Combat Climate Change,” *Scientific American*, April 2, 2012, www.scientificamerican.com/article/us-military-forges-ahead-with-plans-to-combat-climate-change/.
- 20 A. Z. Sanders, “Rapid Equipping Force Develops ‘Energy to the Edge’ Program,” Fort Belvoir, VA., August 5, 2011, United States Army, www.army.mil/article/62936/.
- 21 L. Rüttinger, Dan Smith, Gerald Stang et al., *A New Climate for Peace: Taking Action on Climate and Fragility Risks* (Washington, DC: Woodrow Wilson International Center for Scholars, European Union Institute for Security Studies, 2015).
- 22 F. Femia, and C. E. Werrell, “A Climate-Security Plan for the Asia-Pacific Rebalance: Lessons from the Marshall Plan,” in *The U.S. Asia-Pacific Rebalance, National Security and Climate Change*, ed. C. E. Werrell, and F. Femia (Washington, DC: Center for Climate and Security, 2015).
- 23 V. A. Schmidt, “Democracy and Legitimacy in the European Union,” in *The Oxford Handbook of the European Union*, (Oxford: Oxford University Press, 2012).

- 24 N. Haken et al., *Fragile States Index* (Washington, DC: Fund for Peace, 2015).
- 25 Y. Hijjoka, E. Lin, and J. J. Pereira, *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Asia*. IPCC 5th Assessment Report, 2014 (Cambridge and New York: Cambridge University Press).
- 26 J. R. Clapper, *Worldwide Threat Assessment of the US Intelligence Community*, Statement for the Record, Senate Armed Services Committee, James R. Clapper Director of National Intelligence, February 26, 2015, Washington, DC. www.dni.gov/files/documents/Unclassified_2015_ATA_SFR_-_SASC_FINAL.pdf.
- 27 J. W. Busby, K. L. White, and T. G. Smith, *Climate Change and Insecurity: Mapping Vulnerability in Africa*, Climate and Energy Paper Series (Washington, DC: The German Marshall Fund of the United States, 2010).
- 28 F. Femia, and C. E. Werrell, *A New Libya in a New Climate: Charting a Sustainable Course for the Post-Gaddafi Era* (Briefer No. 5) (Washington, DC: Center for Climate and Security, 2011).
- 29 C. E. Werrell, and F. Femia, eds, *The Arab Spring and Climate Change* (Washington, DC: Center for Climate and Security, Stimson Center, and Center for American Progress, 2013).
- 30 M. Hoerling, J. Eischeid, J. Perlwitz et al., "On the Increased Frequency of Mediterranean Drought," *J. Clim* 25 (2012): 2146–2161, doi: 10.1175/JCLI-D-11-00296.1.
- 31 C. P. Kelley, S. Mohtadi, M.A. Cane, et al., "Climate Change in the Fertile Crescent and Implications of the Recent Syrian Drought," *Proc. Natl. Acad. Sci.* 112 (2015): 3241–3246, doi: 10.1073/pnas.1421533112.
- 32 E. Wadid, B. Katlan, and O. Babah. *Global Assessment Report on Disaster Risk Reduction. Drought Vulnerability in the Arab Region Special Case Study: Syria*. Geneva: ISDR. 2010, www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/Erian_Katlan_&_Babah_2010.pdf.
- 33 F. Femia, and C. E. Werrell, *Syria: Climate Change, Drought and Social Unrest* (Washington, DC: Center for Climate and Security, 2012).
- 34 C. E. Werrell, F. Femia, and T. Sternberg, "Did We See It Coming?: State Fragility, Climate Vulnerability, and the Uprisings in Syria and Egypt," *SAIS Review of International Affairs* 35 (2015): 29–46, doi: 10.1353/sais.2015.0002.
- 35 Haken et al., *Fragile States Index*.
- 36 T. Sternberg, *Chinese Drought, Wheat, and the Egyptian Uprising: How a Localized Hazard Became Globalized, The Arab Spring and Climate Change* (Washington, DC: Center for Climate and Security, Stimson Center, and Center for American Progress, 2013).
- 37 Ibid.
- 38 S. Rahmstorf, and D. Coumou, "Increase of Extreme Events in a Warming World," *Proceedings of National Academy of Science* 108 (2011): 17905–17909. doi: 10.1073/pnas.1101766108; F. Otto, N. Massey, G.J. van Oldenburgh, et al., "Reconciling Two Approaches to Attribution of the 2010 Russian Heat Wave," *Geophysical Research Letters* 39 (2012): L04702, doi: 10.1029/2011GL050422.
- 39 T. Sternberg, "Chinese Drought, Bread and the Arab Spring," *Applied Geography* 34 (2012): 519–524, doi: 10.1016/j.apgeog.2012.02.004.
- 40 Sternberg, *Chinese Drought, Wheat, and the Egyptian Uprising*.
- 41 S. Johnstone, and J. Mazo, *Global Warming and the Arab Spring, The Arab Spring and Climate Change* (Washington, DC: Center for Climate and Security, Stimson Center, and Center for American Progress, 2013).
- 42 Sternberg, *Chinese Drought, Wheat, and the Egyptian Uprising*.
- 43 P. M. Cronin, ed., *Cooperation from Strength: The United States, China and the South China Sea* (Washington, DC: Center for New American Security, 2012).
- 44 M. D. King, "Climate Change and Vietnamese Fisheries: Opportunities for Conflict Prevention," in *The U.S. Asia-Pacific Rebalance, National Security and Climate Change?*, ed. C. E. Werrell, and F. Femia (Washington, DC: Center for Climate and Security, 2015).
- 45 Femia, and Werrell, "A Climate-Security Plan."
- 46 King, "Climate Change and Vietnamese Fisheries."
- 47 M. Bert, *A Strategy to Advance the Arctic Economy* (Memorandum no. 14) (Washington, DC: Council on Foreign Relations, 2012).
- 48 U. Friedman, "The Arctic: Where the U.S. and Russia Could Square off Next," *The Atlantic*, March 28, 2014.
- 49 A. J. Bailes, "A New Arctic Chill? Reactions in the North to New Tensions with Russia," *Scottish Global Forum*. 2015, www.scottishglobalforum.net/alyson-bailes-arctic-chill.html#_ftnref3.

- 50 T. C. Gallaudet, *Charting the Arctic: Security, Economic, and Resource Opportunities*, 2015, Committee on Foreign Affairs, Subcommittee on Europe, Eurasia, and Emerging Threats and Subcommittee on the Western Hemisphere, US House of Representatives, November 17, 2015, <http://docs.house.gov/mceetings/FA/FA14/20151117/104201/HHRG-114-FA14-Wstate-GallaudetT-20151117.pdf>.
- 51 J. Stavridis, "Once Again, Europe Needs America," Politico, 2016, www.politico.eu/article/europes-security-disorder-demands-american-help-pressure-refugees-social-strain-open-borders/; E. Rosenberg, D. Titley, and A. Wiker, *Arctic 2015 and Beyond: A Strategy for U.S. Leadership in the High North* (Washington, DC: Center for New American Security, 2014).
- 52 R. McLean, L. A. Nurse, et al., "Small Islands," in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2014).
- 53 Hijioka et al., "Asia."
- 54 J. G. Stoutenburg, *Disappearing Island States in International Law* (Leiden: Brill, 2015).
- 55 B. Glahn, "Climate Refugees? Addressing the International Legal Gaps," International Bar Association, June 11, 2009, www.ibanet.org/Article/Detail.aspx?ArticleUid=B51C02C1-3C27-4AE3-B4C4-7E350EB0F442.
- 56 L. Goff, and N. Samaranyake, "Climate Change, Migration and a Security Framework for the Asia-Pacific Rebalance," in *The U.S. Asia-Pacific Rebalance, National Security and Climate Change?* ed. C. Werrell, and F. Femia (Washington, DC: Center for Climate and Security, 2015).
- 57 R. M. Bierbaum, J. P. Holdren, M. MacCracken, et al., *Confronting Climate Change: Avoiding the Unmanageable and Managing the Unavoidable* (Washington, DC: United Nations Foundation and Sigma XI, 2013).
- 58 U.S. Department of Defense, *2014 Climate Change Adaptation Roadmap* (Washington, DC: U.S. Department of Homeland Security, 2014).
- 59 M. D. King, "The Weaponization of Water in Syria and Iraq," *Washington Quarterly* 38 (2016), 153–169.
- 60 National Homeland Security Consortium, "Protecting Americans in the 21st Century: Communicating Priorities for 2012 and Beyond," 2012, www.iafc.org/files/1DISASTERmgmtHOMEsec/hs_2012NHSCWhitePaper.pdf.
- 61 Femia, and Werrell, "A Climate-Security Plan."
- 62 White House, *Fact Sheet: U.S. Response to Typhoon Haiyan* (Washington, DC: White House, 2013).
- 63 Center for Climate and Security, *Why Do Militaries Care about Climate Change?* Climate Survey 101 (Washington, DC: Center for Climate and Security, 2015).
- 64 Femia, and Werrell, "A Climate-Security Plan."
- 65 G. D. Dabelko, L. Herzer, S. Null, et al., eds, *Backdraft: The Conflict Potential of Climate Change and Adaptation* (Washington, DC: Environmental Change and Security Program, Woodrow Wilson Center, 2013).
- 66 Rüttinger et al., *A New Climate for Peace*.
- 67 World Economic Forum, *Global Risks 2014*. 9th edn. (Geneva: World Economic Forum, 2014).
- 68 R. G. Lugar, *The Lugar Survey on Proliferation Threats and Responses*, 2005, https://fas.org/irp/threat/lugar_survey.pdf.
- 69 United Nations Framework Convention on Climate Change, Adoption of the Paris Agreement, Proposal by the President, 2015.
- 70 C. Parthemore, *Climate Change & Nuclear Risks* (Washington, DC: Center for Climate and Security, 2016).
- 71 B. Hayes, and D. Deering, "The Secure and Dispossessed: Security for Whom?" *Open Democracy* 2016, www.opendemocracy.net/daniel-deering-and-ben-hayes/interview-with-dr-ben-hayes-on-his-recently-released-co-edited-book-ent.
- 72 Permanent Mission of Spain, Permanent Mission of Malaysia, Open Arria Formula Meeting on the Role of Climate Change as a Threat Multiplier for Global Security, 2015, www.spainun.org/wp-content/uploads/2015/06/Concept-Note_ClimateChange_20150630.pdf.
- 73 US Department of Defense, *Quadrennial Defense Review Report* (Washington, DC: U.S. Department of Defense, 2010).
- 74 Werrell, Femia, and Sternberg, "Did We See It Coming?"
- 75 Ibid.
- 76 Haken et al., *Fragile States Index*.
- 77 Werrell, Femia, and Sternberg, "Did We See It Coming?"

- 78 C. Werrell, and F. Femia, *On Syrian Refugees and Climate Change: The Risks of Oversimplifying and Underestimating the Connection* (Washington, DC: Center for Climate and Security, 2015).
- 79 Kelley et al., "Climate Change in the Fertile Crescent."
- 80 J. Gullede, *Countries Should Assess Climate Risk the Way They Assess Other Security Risks* (Washington, DC: Center for Climate and Security, 2015).
- 81 CNA Corporation, *National Security and the Threat of Climate Change*.
- 82 H. Riebeek, "Global Warming: Feature Articles," National Aeronautics and Space Administration, 2010, <http://earthobservatory.nasa.gov/Features/GlobalWarming/page3.php>.
- 83 U.S. Department of Defense, *2014 Climate Change Adaptation Roadmap* (Washington, DC: U.S. Department of Homeland Security, 2014).
- 84 Hoerling et al., "On the Increased Frequency of Mediterranean Drought."
- 85 W. N. Adger, J. M. Pulhin, J. Barnett, et al., "Human Security," in: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2014).
- 86 P. Schwartz, and D. Randall, *An Abrupt Climate Change Scenario and Its Implications for United States National Security*, 2003, California Institute of Technology Pasadena, Jet Propulsion Lab, <http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA469325>.