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Climate Change, Water Security, and U.S. National Security

By Carolyn Kenney March 22, 2017

The first months of Donald Trump's presidency have raised serious concerns about the new administration's understanding of climate change and the associated security risks. President Trump's vocal skepticism of climate change and his appointment of several prominent climate deniers to his Cabinet, along with deep proposed budget cuts to government activities aimed at slowing or adapting to climate change, could see the new administration do untold damage to the environment, human health and security, economic development, and international peace and stability.

The Trump administration's disengagement comes at a time when severe weather conditions spurred on by climate change are having devastating effects in the United States and around the world. In California, for example, despite a recent respite, the state's long-running drought cost the state's agricultural sector an estimated $2.7 billion in 2015 alone, and the state is expected to experience chronic water shortages in the future.[1] In southern Africa, for example, millions are at risk of starvation following a two-year drought and above-average temperatures.[2] And in Sri Lanka, the worst drought in 40 years has left more than 1 million people affected by acute water shortages.[3]

These worrying signs early in the Trump administration contrast sharply with the legacy of former President Barack Obama. Before leaving office, President Obama signed a Presidential Memorandum on Climate Change and National Security designed to elevate and address the national security implications of climate change. Hailed as an historic step, the memorandum directed federal departments and agencies to "ensure that climate change-related impacts are fully considered in the development of national security doctrine, policies, and plans."[4] Released alongside a National Intelligence Council, or NIC, report, "Implications for US National Security of Anticipated Climate Change," the memorandum reflected the consensus among U.S. national security experts that climate change is a core national security concern and should be addressed as such.[5] Indeed, even some within the Trump administration agree with this consensus: Trump's Secretary of Defense James Mattis, in his written testimony following his confirmation hearing, noted that climate change poses a serious threat to American interests abroad.[6]

Both Obama's presidential memorandum and the NIC report argue that extreme and more frequent weather events, droughts, heat waves, rising sea levels, and ocean acidification—all driven or exacerbated by climate change—will increasingly threaten food and water security, energy and transportation infrastructure, and other crucial systems in the decades to come. These disruptions can seriously stress or overwhelm affected governments' ability to respond to crises, threatening human security and eroding state legitimacy. Deteriorating conditions or severe crises can undermine economic livelihoods and contribute to decisions to migrate. Taken in the aggregate, these stresses can create political instability and amplify conditions that lead to conflict, especially in already fragile or unstable regions.[7] And, as many recent crises have demonstrated, instability and violence in one country often do not remain confined solely within that country's borders. Both reports therefore conclude that it is in the United States' national interest to try and address the underlying drivers of crises abroad to prevent future instability and avoid more expensive crisis interventions.

While the Trump administration's approach to the issues outlined in the memorandum and the NIC report are shaping up to be hostile, the fact that such challenges exist is unequivocal.[8] The administration would do well to heed the advice of climate and national security experts and ensure that the United States continues to address these issues.

Climate change and water security

Perhaps the most pressing area of concern at the nexus of climate change and national security is that of water security. As outlined clearly in a recent World Bank report, the effects of climate change will come through the water cycle—affecting food, energy, urban, and environmental systems as populations, cities, and economies continue to grow and strain increasingly limited water resources.[9] According to the World Bank, roughly 1.6 billion people already live in countries with water scarcity, and that number could double in just two decades.[10] The continued impacts of climate change on water supplies, if not properly managed, will have far-reaching consequences for national and international security. Indeed, these consequences are already visible.

In recent years, there have been regular reports of heightened social tensions and even violent conflict, partially as a result of climate-induced disasters related to water security, such as prolonged droughts and increased desertification. One of the more notable cases demonstrating this has been that of Syria, where prolonged drought linked to climate change and the Syrian government's poor response to it—while not a direct cause of the conflict in the country—played a role in exacerbating the social, economic, and political conditions that led to the outbreak of conflict in 2011 and the resulting refugee crisis, in which more than 4.9 million Syrians have fled the country as of March 2017.[11] A more recent example is that of Tunisia, where there have been concerns that the country might be heading toward a "thirst uprising."[12] Since July 2016, there have been several protests in regions across the country sparked by water scarcity from prolonged drought and years of poor resource management.[13]

Some of the most critical questions that come next include how and where serious climate-related national security concerns might manifest in the future, and what the United States and the international community are doing to try to prevent, respond to, and mitigate them.

Water supply and demand

At the most basic level, the greatest challenges regarding water security and climate change come back to issues of supply and demand. According to U.N. predictions, the world population will reach 8.5 billion by 2030 and 9.7 billion by 2050, with Africa expected to account for half of this growth.[14] As populations grow, so do economies, both of which require increased water resources. For instance, it takes about 4,000 gallons of water to produce roughly two pounds of beef; 240 gallons of water to manufacture one cell phone; and three to six gallons of water to produce one gallon of gasoline.[15] Additionally, as countries become more prosperous and incomes rise, water use increases dramatically—and often unsustainably.[16] As a result of these pressures, the United Nations projects that by 2050, global water demand will increase by 55 percent, with the greatest demands coming from manufacturing, thermal electricity generation, and domestic use.[17]

On the supply side, the amount of total surface water around the world is expected to remain fixed in the coming decades.[18] However, the distribution of this water varies greatly and could become more uneven, with many already water-stressed regions becoming more so in the future, as snowmelt and precipitation patterns become more variable around the world due to climate change.[19] The decline in surface water is projected to hit hardest in the least developed countries, where water availability is most critical for agriculture, energy production, and economic development.[20] Also of note is the fact that there are currently 150 million people who reside in cities with perennial water shortages, and as demographics shift, this number is projected to increase to almost 1 billion people by 2050—with much of this growth happening in the developing world.[21]

Climate change will also affect groundwater found in aquifers, which contain roughly 30 percent of the world's available freshwater.[22] Groundwater reservoirs will be directly affected by climate change through recharge patterns—in areas where total surface water declines, groundwater resources are also likely to decline.[23] And as temperatures rise, the risk of increased groundwater salinity grows, meaning the quality and usability of water resources will decline in some areas.[24]

If nothing is done to increase water efficiency and better manage and protect both surface water and groundwater in the face of a changing climate, demand could exceed current sustainable water supplies by 40 percent by 2030.[25]

Effects of water scarcity

The consequences of water scarcity, as with the distribution of water supplies, vary greatly around the world as a result of a number of factors, including political, social, and economic conditions; existing infrastructure—or lack thereof; and policy decisions. Of particular concern are the impacts of water scarcity on human livelihoods and social tensions, which can contribute to cycles of poverty and violence.

If not appropriately addressed, water scarcity has the potential to negatively affect economic performance at all levels, as economic growth requires greater water resources. This in turn inhibits poverty alleviation, which is highly dependent on economic growth. Water scarcity also adversely affects agricultural production, food security, and commodity prices, all of which directly affect human livelihoods and contribute to cycles of poverty. This is especially true for the almost 78 percent of the world's poor who rely on agriculture, livestock, or aquaculture to survive.[26]

Additionally, as water supplies become constrained, social tensions over access to available resources can escalate and even turn violent. This is especially likely in fragile states that have a history of conflict and in areas where access to water resources has been politicized. The United Nations has found that while disputes over natural resources are rarely the sole driver of violent conflict, they certainly can be a contributing factor when other drivers are present, such as poverty, ethnic polarization, and poor governance.[27]

The case of Darfur in Sudan highlights some of the consequences of water scarcity when combined with complex political, social, and economic conditions. As with most conflicts, the origins of the violence in Darfur are highly complex and driven by many forces; any discussion of environmental drivers should in no way exculpate those who have carried out violent acts or enacted destructive policies. However, as highlighted by the United Nations, "regional climate variability, water scarcity and the steady loss of fertile land" in the country played an important underlying role in the conflict that broke out in 2003.[28] These underlying environmental factors combined with increased population and livestock density to help foster violent competition among various groups in the region, 75 percent of whose livelihoods were directly dependent on natural resources.[29] While these environmental and demographic shifts were taking place, the Sudanese national government in Khartoum took steps to undermine and eventually eliminate local governance systems that had evolved to prevent resource conflicts.[30] With few mechanisms to resolve disputes, the region was left vulnerable to violent conflict driven in part by competition for resources—competition propelled, in turn, by environmental and demographic trends. The United Nations estimates that between 2004 and 2008, as many as 300,000 people died and 2.7 million people were displaced as a result of the conflict.[31]

Main areas of concern

To determine where water scarcity may drive security risks, it is critical to understand both future water constraints and a particular state's ability to cope with such stresses in the context of the other social, economic, and political challenges it might face. One way to identify these areas of concern is by cross-referencing indices that track water constraints and state fragility around the world. Projecting the effects of climate change, shifting and expanding demographics, and economic changes is extremely difficult and subject to countless variables, but there are a number of tools that can provide a general picture of where these factors are likely to strain water supplies in the future.

One such tool, developed by the World Resources Institute, or WRI, is the Aqueduct Projected Water Stress Country Rankings.[32] To develop the data set, WRI used a number of climate models and socioeconomic scenarios to project future water stress under three different scenarios—"business-as-usual," "optimistic," and "pessimistic"—in 167 countries in 2020, 2030, and 2040.

Examining the top 50 countries in Aqueduct's business as usual scenario across all three time spans gives a sense of which regions will experience the most severe water stress if action is not taken to improve water efficiency and resource management. Not surprisingly, the Middle East and North Africa account for the highest proportion of high-risk countries across all three time spans, with 18 countries likely to face high water stress in each period. Europe accounts for the next highest proportion with 12 countries facing water stress in 2020 and 14 countries in both 2030 and 2040. Next is Asia with 11 countries in 2020 and 2030 and 12 countries in 2040. Also of note here is the United States' presence on the list for each time span.

But projecting future water stress does not account for a state's ability to respond to these trends. While it is difficult to predict a state's ability to cope with future stress, there are several indices that highlight current state fragility and coping abilities, which can help pinpoint areas of concern. One index that captures these elements is the Fragile States Index 2016 by the Fund for Peace.[33] Using their own analytical platform, the Fund for Peace analyzes millions of documents from three primary sources each year to inform scores on 12 social, economic, and political indicators, which then allows them to rank 178 states by their own measurement of fragility.

Looking at the Fragile States Index and the Aqueduct index together, eight countries stand out: Afghanistan, Iran, Iraq, Lebanon, Libya, Pakistan, Syria, and Yemen. These countries appear in the top 50 on Aqueduct's business as usual list of the most water-stressed countries in 2020, 2030, and 2040 and also appear in the top 50 on the Fragile States Index rankings for 2016. In addition, of the top 50 fragile states, Eritrea appears as one of the top water-stressed countries in 2020 and 2030; Timor Leste in 2020; and both Haiti and Sri Lanka in 2040. Some countries not included in this cross-reference still warrant concern given historical tensions over water, such as Palestine and Israel, as well as India and Pakistan.[34]

It is clear from these various lists that some of the greatest areas of concern with regard to water security will continue to be the Middle East, North Africa, and South Asia, and mostly in countries that have experienced or continue to experience protracted conflicts.

TABLE 1

Cross comparison of fragile and water-stressed states

Ranking	Fragile States Index 2016	Aqueduct business-as-usual scenario 2020	Aqueduct business-as-usual scenario 2030	Aqueduct business-as-usual scenario 2040
1	Somalia	Bahrain	Bahrain	Bahrain
2	South Sudan	Kuwait	Kuwait	Kuwait
3	Central African Republic	Qatar	Qatar	Qatar
4	Sudan	San Marino	San Marino	San Marino
4	Yemen	Singapore	Singapore	Singapore
6	Syria	United Arab Emirates	United Arab Emirates	United Arab Emirates
7	Chad	Saudi Arabia	Saudi Arabia	Palestine
8	Congo (D.R.)	Israel	Israel	Israel
9	Afghanistan	Oman	Palestine	Saudi Arabia
10	Haiti	Yemen	Oman	Oman
11	Iraq	Kyrgyzstan	Kyrgyzstan	Lebanon
12	Guinea	Libya	Lebanon	Kyrgyzstan
13	Nigeria	Palestine	Yemen	Iran
14	Pakistan	Iran	Iran	Jordan
15	Burundi	Jordan	Jordan	Libya
16	Zimbabwe	Lebanon	Libya	Yemen
17	Guinea Bissau	Kazakhstan	Kazakhstan	Macedonia
18	Eritrea	Pakistan	Morocco	Azerbaijan
19	Niger	Iraq	Iraq	Morocco
20	Kenya	Syria	Pakistan	Kazakhstan
21	Cote d'Ivoire	Morocco	Macedonia	Iraq
22	Cameroon	Armenia	Syria	Armenia
23	Uganda	Turkmenistan	Azerbaijan	Pakistan
24	Ethiopia	Azerbaijan	Armenia	Chile
25	Libya	Uzbekistan	Turkmenistan	Syria
26	Myanmar	Afghanistan	Uzbekistan	Turkmenistan
27	Liberia	Macedonia	Greece	Turkey
28	Mauritania	Turkey	Turkey	Greece
29	Mali	Greece	Chile	Uzbekistan
30	North Korea	Spain	Afghanistan	Algeria

Continues

Ranking	Fragile States Index 2016	Aqueduct business-as-usual scenario 2020	Aqueduct business-as-usual scenario 2030	Aqueduct business-as-usual scenario 2040
31	Congo (Republic)	India	Spain	Afghanistan
32	Rwanda	Chile	Mexico	Spain
33	Nepal	Mexico	Dominican Republic	Tunisia
34	Sierra Leone	Mongolia	Mongolia	Mexico
35	Timor-Leste	Dominican Republic	Algeria	Dominican Republic
36	Bangladesh	Eritrea	Tunisia	Estonia
37	Angola	Italy	India	Mongolia
38	Egypt	Belgium	Belgium	Belgium
39	Djibouti	Monaco	Italy	Italy
40	Lebanon	Tunisia	Monaco	India
41	Burkina Faso	Algeria	Eritrea	Andorra
42	Mozambique	Andorra	Estonia	Monaco
43	Sri Lanka	Peru	Andorra	Australia
44	Malawi	Tajikistan	Australia	Portugal
44	Swaziland	Australia	Tajikistan	Tajikistan
46	Cambodia	China	Portugal	Sri Lanka
47	Iran	United States of America	China	United States of America
48	Gambia	Portugal	United States of America	China
49	Zambia	Timor-Leste	Peru	Albania
50	Papua New Guinea	South Africa	Ukraine	Haiti

Sources: Fund for Peace, "Fragile States Index 2016," available at http://fsi.fundforpeace.org/ (last accessed March 2017); World Resources Institute, "Aqueduct Projected Water Stress Country Rankings," available at http://www.wri.org/resources/data-sets/aqueduct-projected-water-stress-country-rankings (last accessed March 2017).

U. S. and international community responses

The United States has undertaken a number of efforts in recent years to address climate change and water security, such as through President Obama's executive orders directing agencies to integrate various dimensions of climate change into their planning, including national security, and through their leadership role in negotiating the Paris Agreement. Under a Trump administration, however, many of these efforts remain vulnerable to attack. Although there are still some measures which are not as easy to dismiss.

As mandated by the Senator Paul Simon Water for the World Act of 2014, President Trump—with the help of the U.S. Agency for International Development, the State Department, and other federal departments and agencies—must submit to Congress a Global Water Strategy by October 1, 2017 outlining how the United States plans to "increase access to safe water, sanitation and hygiene in high priority countries;

improve the management of water resources and watersheds in such countries; and work to prevent and resolve intra- and trans-boundary conflicts over water resources in such countries."[35] Presumably, government agencies have been working on contributions to this strategy since this law was enacted, and hopefully a Trump administration will come to see the necessity of continuing to provide resources for completing and eventually implementing such a strategy, as mandated. In the process of doing so, the administration will have the opportunity to see the evidence, including the conviction of many in the military and intelligence community, that climate change is indeed a critical factor in maintaining national and international security.

Absent U.S. leadership in this area, there are a number of other multilateral organizations and individual countries that have shown a desire to act on these issues. For example, in addition to the historic Paris Agreement on combatting climate change, which has been ratified by 134 parties and passed the threshold for entry into force, the United Nations' Sustainable Development Agenda includes two goals which directly address climate change and water security: SDG number six on ensuring "the availability and sustainable management of water and sanitation for all" and SDG number 13 on taking "urgent action to combat climate change and its impacts."[36] Furthermore, Germany has now taken over the G-20 leadership and has identified the implementation of the Paris Agreement and the Sustainable Development Goals as their main priorities, both of which are critical to addressing issues of water security.[37]

Conclusion

As consistently argued by the U.S. military and intelligence community, scientific and academic experts, the United Nations, the World Bank, and America's closest allies, climate change is a threat multiplier; it has the potential to exacerbate existing social, political, and economic tensions to devastating effect. If humans continue to ignore climate change and its impacts, such as on the world's critical water supply, the consequences will only grow more dire. In a world of increasing uncertainty, it is essential to not only change behaviors that lead to further climate change but also to work to prevent and mitigate the now unavoidable impacts the world will face as a result of it.

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