



RESEARCH BRIEF – APRIL 2012

CLIMATE SHOCKS AND POLITICAL VIOLENCE: BEYOND SCARCITY, BEYOND AFRICA

EXECUTIVE SUMMARY

Contrary to conventional wisdom, environmental scarcity is not always a trigger of political violence. In fact, political violence may be more prevalent in times of environmental abundance, when there are more resources and opportunities for violent tactics—and more incentive to engage in such actions. Much of the research on climate change and conflict has focused on Africa. However, the climate-conflict link is not unique to Africa; it's a phenomenon of low levels of economic development and high levels of agricultural dependence. This study's analysis of the relationship between drought and political violence finds that political violence is more prevalent following years of "good" rainfall, and that drought suppresses violence. These results provide support for what the authors call the mobilization model of environmental conflict, which seeks to explain how fluctuations in environmental factors and political violence may be related.

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CHALLENGING CONVENTIONAL WISDOM ON CLIMATE CHANGE, SCARCITY, AND INSECURITY

Conventional wisdom on environmental scarcity and conflict revolves around two propositions: first, that scarcity fosters grievances and encourages competition over resources, triggering conflict; and second, that factors related to social vulnerability—including poverty, poor governance, and dependence on agriculture—make it likely that the African continent will become ground zero for future climate-related violence.¹ As political scientist Thomas-Homer Dixon wrote in the *New York Times*, "By weakening rural economies, increasing unemployment and disrupting livelihoods, global warming will increase the frustrations and anger of hundreds of millions of people in vulnerable countries,"² in turn increasing the risk of conflict.

This study challenges this conventional reasoning. This research indicates that political violence is, in fact, more prevalent in times of environmental abundance than in times of scarcity, and that while the link between environmental shocks and conflict is strongest in less developed and more agriculturally dependent societies, these features are not unique to Africa.

HEIGHTENED STRESS, DIMINISHED CONFLICT

Acute environmental stress may not always lead to heightened conflict. In fact, in some cases, environmental disasters may have the opposite result. For example, since 2010, the terrible drought in Somalia has greatly weakened the Harakat al-Shabaab al-Mujahideen, the primary armed opposition group

to the transitional government. Drought has forced farmers and herders to flee the rural areas that are considered al-Shabaab strongholds, undercutting the movement's economic base. Al-Shabaab has resorted to theft and blockage of food aid as a means of coercion, angering tribal groups in areas it controls. The resulting infighting forced the militants to withdraw from parts of Mogadishu in August 2011. In short, prolonged drought and famine in the region has made it more difficult for al-Shabaab to conduct military operations.

Similarly, in Afghanistan's Korengal Valley, drought—and the economic downturn it causes—has had an inhibiting effect on violence. As journalist Sebastian Junger, who chronicles U.S. counterinsurgency operations, has noted, "If the price of wheat goes up because of a bad harvest, the amount of fighting drops because the fighters have less money to spend on ammo."³ The conflict in Afghanistan is not a conflict about environmental scarcity; nevertheless, environmental scarcity can affect the level of violence in the conflict over time.

Political violence is, in fact, more prevalent in times of environmental abundance than in times of scarcity.

Are these anecdotes emblematic of larger patterns? And if so, why might this be the case? Drought diminishes resources. During periods of environmental distress, individuals will be more concerned with basic survival than with politics, and may lack the material to pursue their political aims. In addition, when food and water are scarce, it becomes more difficult to maintain fighters in the field. Gathering food and water becomes a more labor-intensive task, and households can no longer afford to send young, productive individuals to the battlefield.

ANOTHER PARADOX OF PLENTY

The corollary to this theory is that political violence may increase in periods of relative plenty.

There are at least three non-exclusive reasons why political violence may decrease during periods of acute environmental stress and increase in periods of relative plenty. Together, they comprise what the authors refer to as the mobilization model of resources and conflict.

First, economic prosperity may increase opportunities for self-enrichment: violence becomes more attractive when resources for looting and sustaining militant groups are readily available. The example of cattle raiding—a common practice in the Sahel zone—is particularly illustrative: cattle are more valuable to steal when they are well fed and water is plentiful. As rainfall increases and more resources become available, violent actors may find it more lucrative to expropriate assets through coercion, or pressure governments for a bigger share of the wealth.

Second, more rain may affect the tactical environment, making it easier to coordinate violent attacks and evade capture by state forces. Even minimally capable governments are generally better armed and organized than the dissident elements they face; the effects of rainfall on vegetation and rural infrastructure may help to level the playing field between government and opposition forces. Higher levels of rainfall mean denser, lush foliage, which provides cover that facilitates ambush attacks and impedes the movement of conventional government forces. Moreover, rainfall may wash out rural infrastructure and make roads (especially dirt roads) impassable, creating remote safe havens from which dissidents can mount attacks.

Third, participation in violence may be more feasible after basic material needs are met. Higher rainfall levels are associated with better harvests, higher incomes, lower consumer prices for food, and the satisfaction of basic needs. This in turn frees individuals' time, energy, and resources to participate in other activities, including the pursuit of political goals, community needs, and ideological expression.

AFRICA, SOCIAL VULNERABILITY, AND THE CLIMATE- CONFLICT LINK

Over the past decade, much of the discourse regarding climate change and conflict has focused on Africa. Africa has received roughly four times the scholarly attention related to climate change and conflict, in terms of books and articles, as Asia, another region with high physical vulnerability to climate change.⁴

There are two probable reasons for this disproportionate scrutiny. First, many of the most threatening aspects of climate change—sea level rise, degradation of water resources, increasing incidence of drought and extreme weather events—are projected to dramatically impact the less-developed countries of Sub-Saharan Africa.

Second, Sub-Saharan Africa has, on average, lower GDP per capita, less democratic political institutions, and is more dependent on agriculture than other regions of the world. The physical impact of climate change, in conjunction with high social vulnerability and low adaptive capacity, are argued to make Africa particularly risk-prone.

That Sub-Saharan Africa has lower GDP, less democratic political institutions, and is more dependent on agriculture than the rest of the world are all empirical facts. That these attributes make Sub-Saharan

Africa more prone to climate-related security threats is an untested assumption, prompting consideration of why the impact of environmental shocks may be felt differently in different countries and world regions.

During periods of environmental distress, individuals will be more concerned with basic survival than with politics, and may lack the material to pursue their political aims.

Economic development, political democracy, and lower agricultural dependence should mitigate the relationship between climate change and political violence.

Certainly, poverty, both at the national and household level, intensifies vulnerability, as communities that are economically marginalized and have fewer resources are less able to muster the material means needed to adapt to environmental change.

Democratic governments are more accountable to the public, and therefore more likely to provide broad-based public goods including disaster preparedness policies and disaster relief.

And while industrial output is not immune from climate shocks, agriculture is clearly more dependent on good weather conditions. Drought and extreme heat can severely damage crops, and economies that are dependent on agriculture are more sensitive to weather and climate for overall growth.

This study assesses how these propositions play out by comparing countries at similar climate risk, but different levels of development. Take the Netherlands and Madagascar, which are both physically vulnerable to rising sea levels,

but have GDPs per capita of \$47,159 and \$421 (in 2010 USD) respectively.

With more resources to invest in adaptation, the Netherlands has been able to construct an extensive system of dikes and floodgates. With more accountable political institutions, the Netherlands is also better equipped to ensure public funds are used prudently; Transparency International ranks the Netherlands 7th (of 178) in controlling public sector corruption, while Madagascar ranks 123rd. And with only three percent of the Dutch workforce employed in agriculture, in contrast to nearly 80 percent in Madagascar, the Dutch are less likely to experience large income shocks due to erratic weather patterns than are their Malagasy counterparts.

This comparison demonstrates why we expect that development, democracy, and dependence on agriculture might mediate the relationship between climate shocks and political violence, but it requires further investigation. What do the data tell us?

METHOD: TRIAL BY DROUGHT

To test the potential link between environmental abundance and political violence—and whether economic development, political democracy, and agricultural dependence mediate this relationship—this study focuses on drought.

Drought, such as that which has gripped the Horn of Africa since mid-July 2011, has negative impacts on rural livelihoods and food security. Especially in regions with underdeveloped irrigation systems (such as in Sub-Saharan Africa, where less than five percent of cultivated land is irrigated), dry conditions suppress agricultural yields. And while climate models are complex and human effects are difficult to forecast, the IPCC's forecasts are relatively consistent in their

projections of future rainfall patterns, and these forecasts are being continually improved by natural scientists.

This study statistically analyzes the correlation between drought and violent events. To measure political violence, it relies on data from the National Consortium for the Study of Terrorism and Responses to Terrorism's Global Terrorism Database (GTD)⁵ which contains detailed information on over 87,000 terrorist events around the world since 1970.

Although the term "terrorism" denotes different things to different people, the GTD's inclusion criteria are quite broad, encompassing many types of violent attacks against state and non-state actors, ranging from suicide bombings against civilians in Israel to rebel attacks against government forces in Colombia and acts of sabotage by the African National Congress in South Africa.

The drought measure comes from the global Palmer Drought Severity Index (PDSI). Designed to measure departures from normal surface-level moisture supply and soil demand, PDSI scores range from -10 (dry) to +10 (wet), with zero indicating normal conditions for a given area.

While there is no consensus in the meteorological literature as to how drought should be measured, these data are widely used and commonly accepted.⁶ And whereas many researchers have focused exclusively on rainfall, the PDSI is more effective at capturing drought conditions since it also accounts for temperature, which can destroy crops and reduce water availability through evaporation.

If the conventional wisdom linking environmental scarcity to conflict is correct, the study should find a negative correlation between PDSI and violent events in a country in a given year. Alternately, if the mobilization model is correct, the study should find a

positive correlation, indicating that attacks are more frequent during comparatively wetter years.

The study's statistical models suggest two main findings.

First, "wetter is more violent." All other factors held equal, relatively wet years—defined as those in the 75th percentile—see 9.4 percent more attacks than relatively dry years—defined as those in the 25th percentile. This finding is counter to the conventional wisdom, instead suggesting that "better" weather conditions for agricultural productivity, food security, and economic growth are also "better" conditions for engaging in politically and economically motivated violence, including communal violence and civil conflict.

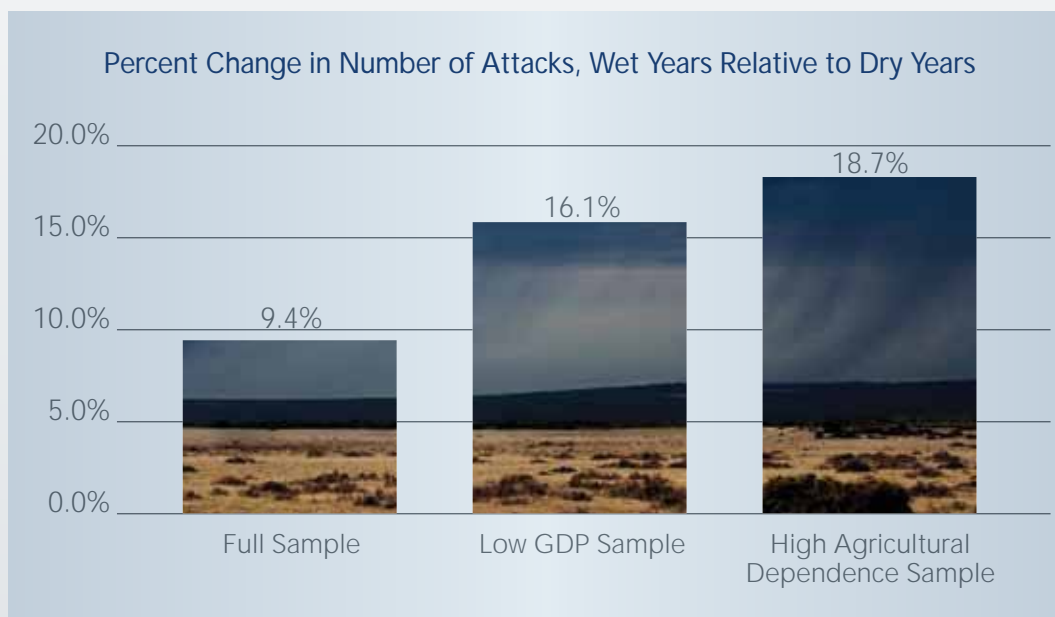
Second, the climate-conflict link is not unique to Africa. It is a phenomenon of low economic development and agricultural dependence more generally, regardless of region. When the study examines countries above and below the median of GDP per capita (\$5345, roughly equal to Egypt's GDP per capita in 2006), the correlation between drought and

political violence holds in poorer countries, but not in comparatively wealthier ones. In less-developed countries, 16.1 percent more attacks occur the year after relatively wet conditions than the year after relatively dry ones. For countries above median GDP per capita, there is no significant correlation. In other words, economic development inoculates countries from the climate shock-conflict link.

Similarly, when the study examines countries above and below the median in agricultural dependence (14 percent of GDP, roughly equal to Bolivia in 2009), a strong, positive correlation between water availability and political violence emerges in more agriculturally dependent countries. Here, 18.7 percent more attacks occur in years after relatively wet conditions than the year after relatively dry conditions. In countries below the median in agricultural dependency, no such correlation is present, confirming that reducing agricultural dependence breaks the climate shock-conflict link.

The study finds less robust evidence that undemocratic countries see a stronger link

Figure 1



Climate change will lead to the U.S. military being asked to shoulder a greater disaster relief burden, even as military spending is declining.

between climatic conditions and political violence. However, since democracy is highly correlated with GDP per capita and with industrialization, independent effects are difficult to capture.

BEYOND AFRICA

The table below lists the countries that display all of the attributes that purportedly make Sub-Saharan African countries more prone to environmental violence: low levels

of development, weak or non-democratic political institutions, and high levels of agricultural dependence. Thirty countries make the list, based on their values for these variables from 2008.

While Sub-Saharan African countries comprise the majority of the list at 17, Asia and Central Asia contribute nine countries, home to 388 million people; the Americas contribute one (Haiti), and North Africa and the Middle East contribute two (Sudan and Yemen).

While these findings do not point to novel policy prescriptions beyond the obvious points that development and agricultural modernization are laudable goals, they should help to focus policymakers' attention on the types of countries that are at most threat from increased violence due to climate change.

Table 1. At-Risk States, based on Democracy, Development, and Agricultural Dependence

Americas	Asia	Central Asia	Sub-Saharan Africa	North Africa & Middle East
Haiti	Bangladesh	Afghanistan	Burkina Faso	Sudan
	Bhutan	Kyrgyzstan	Cameroon	Yemen
	Cambodia	Tajikistan	CAR	
	Laos	Uzbekistan	Cote d'Ivoire	
	Pakistan		DRC	
	Papua New Guinea		Eritrea	
			The Gambia	
			Guinea	
			Nigeria	
			Rwanda	
			Sierra Leone	
			Somalia	
			Tanzania	
			Togo	
			Uganda	
			Zambia	
			Zimbabwe	

On the basis of these results, the study suggests that the climate change–conflict discussion could be expanded to include a broader set of cases—involving abundance as well as scarcity—and regions beyond Africa. Doing so has practical implications for global peace and security. Devastating floods in Pakistan, drought in Yemen, and environmental degradation in Haiti can all affect the global security landscape. The 2010 Quadrennial Defense Review—the most prominent public statement of U.S. Department of Defense priorities—notes that climate change will lead to the U.S. military being asked to shoulder a greater disaster relief burden, even as military spending is declining. Knowing where and under what conditions climate shocks translate into political instability and violence will be important for establishing national priorities in times of greater fiscal austerity. 🌍

ENDNOTES

- ¹ This brief is based on Idean Salehyan and Cullen S. Hendrix, *Climate Shocks and Political Violence*, currently in working paper format. The working paper is available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1913359.
- ² Thomas Homer-Dixon, “Terror in the Weather Forecast,” *New York Times*, April 24, 2007.
- ³ Sebastian Junger, *WAR* (New York: Twelve, 2010), 100.
- ⁴ Author calculations based on Google Scholar search for keywords “climate change” and conflict for period 2000–2011, conducted February 6, 2012.
- ⁵ National Consortium for the Study of Terrorism and Responses to Terrorism, *Global Terrorism Database*, 2009, accessed July 6, 2011, www.start.umd.edu/gtd.
- ⁶ Aiguo Dai, Kevin E. Trenberth, and Taotao Qian, “A Global Dataset of Palmer Drought Severity Index for 1870–2002: Relationship with Soil Moisture and Effects of Surface Warming,” *Journal of Hydrometeorology* 5(6): 1117–1130 (2004); Nathaniel Guttman, “Comparing the Palmer Drought Index and the Standardized Precipitation Index,” *Journal of the American Water Resources Association* 34(1): 113–121 (1998).

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