**Moving into Terrorism: How climate-induced rural-urban migration may increase the risk of terrorism**

Justin Schon, College of William and Mary

Stephen Nemeth, Oklahoma State University

How can we expect climate change to affect terrorism? Research on climate-conflict links argues that climate and conflict are unlikely to exhibit a direct relationship. Instead, these links are likely to be indirect, often through negative shocks to agriculture. Even then, politics remains a far stronger influence on conflict than climate. Terrorism appears particularly unlikely to be directly linked to climate change, since climate change disproportionately affects rural areas and terrorism disproportionately affects urban areas. Yet, we argue that there is a process through which climate change could increase the risk of terrorism. This process involves failure to adapt in rural areas, rural-urban migration, and then a failure of cities to incorporate new population influxes. Meanwhile, rural-urban migration is likely to trigger path-dependent urbanization processes that will increase the share of the world’s population living near country borders. We expect this process to increase the motivation and opportunity for terrorism as climate change continues. Policies that help rural areas adapt through new livelihood strategies and cities adapt to large population influxes are critical to reducing this threat.

# Introduction

The danger of armed conflict arising from environmental change has become a growing concern for conflict scholars (Gurr 1985; Homer-Dixon, Boutwell, and Rathjens 1993; Diehl and Gleditsch 2001; Homer-Dixon 1991). Global climate change threatens to create a world where traditional ways of life, settlement patterns, and governance structures will have to undergo significant changes to adapt to a new normal. People and governments will have varying levels of success in their attempts to adapt, both in rural and urban areas. Where this adaptation fails, political violence is one of many behaviors that is likely to increase. Despite broad consensus on these points, the exact process linking climate change to political violence remains unclear (Koubi 2019; Theisen 2017; Caruso, Petrarca, and Ricciuti 2016). Because the full effects of climate change are not yet evident, in this paper we will conduct an exploratory theoretical analysis. We will not argue that climate change will necessarily increase terrorism - especially since it is extremely difficult to identify an explanatory process from climate change to terrorism, let alone a *predictive* one. Instead, we articulate a key process through which climate change could increase the risk of terrorism (Telford 2020).

Traditionally, the link between climate change and violence has been viewed through a Malthusian lens. That is, climate change contributed to violence by reducing the availability of natural resources. Aggrieved groups would seek out whatever resources remained, drawing them into conflict with one another (Hardin 1968; Ehrlich 1968; Horner 1997). There has been some support for this; historical and anthropological records find an association between conflict and conditions of scarcity (Johnson and Earle 1987; Allen et al. 2016). The character of this conflict can be both intra-state – such as ones stemming from the clash of two groups over scarce water or other resources – or inter-state – when two countries may clash over limited shared or transboundary resources (Gleick 1993; Toset, Gleditsch, and Hegre 2000; Gizelis and Wooden 2010).

Scholars have progressively shifted away from this view as they have considered the role of adaptation. Some countries have governments and economies that are able to adapt. Economic wealth and state capacity can play critical roles in facilitating adaptation, whereas a lack of economic resources and state capacity can allow climate change to have consequences that make violence and terrorism more likely (Homer-Dixon 2010).[[1]](#footnote-1) In rural areas, damage to existing agricultural industries from climate change can be mitigated with changes in water use, farming practices, and a variety of other adjustments (Abel et al. 2019). If rural adaptation fails, rural-urban migration becomes increasingly likely as people seek alternative livelihoods (Mueller et al. 2020; Kaczan and Orgill-Meyer 2019). This can create population influxes in cities that can be difficult to manage (Chen, Guo, and Wu 2011). Successful urban adaptation therefore involves finding ways to incorporate new residents and care for growing populations. When cities fail to incorporate new population influxes, large enclaves can form that contain disaffected young people, closed and difficult-to-monitor social networks, and grievances that can motivate many forms of violence (Liu et al. 2015; Adida 2014; Verkaaik 2004). This includes terrorism.

Our emphasis on specifying a process from climate change to terrorism, not a direct link, is important. While there are some terrorist organizations focused solely on the environment, like the Earth Liberation Front (Leader and Probst 2003), this is a rarity. Instead, environmental demands are often subsumed within broader ideological goals. For instance, the separatist Free Aceh Movement (GAM) referenced environmental damage when they cited “how our fatherland has been exploited and driven into ruinous conditions by the Javanese neo-colonialists” (Di Tiro 1976). This was but one component of their larger call for self-determination from Indonesia. The Movement for the Emancipation of the Niger Delta (MEND) did the same, noting the grievous environmental conditions of the Niger Delta region of Nigeria, but doing so within a call for a more equitable distribution of oil rents (Ajala 2018). As a result, we believe that we are unlikely to see climate change being used as a direct justification for violence by most terrorist organizations.

Further, we believe two other factors impede our ability to find a direct link between climate change and terrorism. The first is that while some studies do find relationships between various types of climate factors and conflict (Burke et al. 2009; Landis 2014; O’Loughlin, Linke, and Witmer 2014; Fjelde and von Uexkull 2012; Von Uexkull et al. 2016; Selby et al. 2017; Linke et al. 2018; Scartozzi 2020), the most severe anticipated consequences of climate change have not yet been observed (Böhmelt et al. 2014; Wischnath and Buhaug 2014; Buhaug 2010; Mach et al. 2019). Secondly, some of the effects of climate change on violence are likely to be slow to unfold. With the exception of a few studies that have evaluated conflict trends with data that stretches across centuries (Tol and Wagner 2010; Zhang et al. 2007), the vast majority of studies measure the conflictual effects of climate change over a much shorter period of time. The temporal distinction is important; it is likely that the effect of long-term climate change on conflict will be different than its short-term effect (Buhaug 2015).

Given these challenges, we argue for an indirect linkage between climate change and terrorism. That is, we believe that climate change will affect terrorism through rural-urban migration. We display the general process that we argue links climate change and terrorism in Figure 1. As readers can see, there are two main “off ramps” that we argue can prevent climate change from increasing the risk of terrorism. These “off ramps” are rural adaptation and urban adaptation. Ideally, countries would be ready to respond to climate change with policies that support both kinds of adaptation. Absent that idealistic scenario, we expect that adaptation in one arena will be sufficient to prevent a climate-terrorism link from forming.

Figure 1: How Climate Change Could Increase the Risk of Terrorism



Rural-urban migration includes an additional feature that increases the risk of terrorism: Since many of the world’s cities are near country borders, rural-urban migration is likely to trigger path-dependent urbanization processes that will increase the share of the world’s population living near country borders. We will argue that this increases the opportunity for terrorist action by facilitating transnational ties and the establishment of rear bases (Salehyan 2011).

We develop our argument through the rest of the paper as follows: We begin by showing how terrorist organizations and rebel groups differ. These distinctions, which not only indicate a rural/urban divide between rebellion and terrorism, are important because they suggest rebel groups may be more vulnerable to climate change than terrorist organizations. We then describe how rural-urban migration connects the rural consequences of climate change with urban terrorism. This informs our discussion of how climate change is likely to fuel continued clustering of populations in border regions, which may provide opportunity space for terrorist groups. We conclude with speculation about what governments can do to prevent climate change from resulting in terrorism.

# Rural rebellion vs. urban terrorism

To date, the study of a linkage between climate change and conflict has primarily focused on civil war, rather than terrorism. While this has helped us better understand conflict and the potential deleterious effects of climate change, the same cannot be said for the study of terrorism. Part of this disjoint may be due to the theoretical and methodological difficulties of the concept of climate change (Scartozzi 2020). This may also be due to the conceptual and practical differences between terrorism and civil war violence; differences that range from the grievances that motivate the participants, the size of the organizations, and their geographical preferences (Koren 2017; Özdamar 2008). This is not to say that using the civil war literature as a foundation is without value, as there is some overlap in the actors that conduct terrorism and those that take part in civil wars (Kalyvas 2004; Findley and Young 2012; Stanton 2013; Byman 2016).[[2]](#footnote-2)

Of particular note in this regard is Findley and Young (2012)’s study on the spatial dimensions of terrorism and civil war. They note in their analyses of terrorism and civil war in six countries – Bangladesh, Argentina, El Salvador, Peru, Lebanon, and Mozambique – that the spatial overlap between civil war violence and terrorism primarily existed within the capital cities of each country. That is, terrorism retains an urban character even during civil wars. That being said, terrorism would only expand out from the capital cities into the countryside during civil wars. This observation, though, must be taken with a grain of salt since violent events during civil war could also plausibly be over-reported as terrorism due to the difficulty of distinguishing violence against civilians in general from terrorism specifically (Weinberg, Pedahzur, and Hirsch-Hoefler 2004; Weidmann 2015; Stanton 2019; Nemeth and Mauslein 2019; Sambanis 2008).[[3]](#footnote-3)

Appropriately defining civil war and terrorist violence has been, and continues to be, a robust debate. We abide by the Global Terrorism Database’s definition of terrorism; it is “the threatened or actual use of illegal force and violence by a nonstate actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation” (START 2021, 11). This is contrasted with the UCDP definition of civil conflict, which forms the basis of much of the current work on civil war, and serves as our definition as well; civil conflict is “a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in a calendar year” (Pettersson 2021, 1).

Like Findley and Young (2012), we note a number of practical differences between these two forms of violence. The first is that these conceptualizations differ in the production of violence; terrorist violence is one-sided in that the act of violence is perpetrated by the terrorist actor only and in a wide variety of contexts. That violence may be inflicted upon the perpetrator after the terrorist act has occurred is tangential. Civil war violence, on the other hand, implies reciprocity. Second, terrorism has a messaging function – for a broad range of potential issues - that is meant to resonate with an audience beyond that of the victim. Alternatively, civil war violence typically only relays information about the resolve or capability of the combatants(Reiter 2003). While it is true that armed groups often fight over the narrative that civilians use to understand violence in civil war, participant’s use of violence does not usually impart any additional political, economic, religious, or social message on behalf of the participants (Schon 2020b).

All told, there exists meaningful differences between those actors that engage in civil war and those that engage in terrorism. Moreover, it is important to remember that the great majority of terrorist actors are those that fall beneath the public’s attention – their violence is sporadic, their capabilities are minimal, their grievances abstract, and their appeal is minor. Additionally, while civil war is a significant concern, relatively few countries face a meaningful risk of this type of violence. This is contrasted with terrorism, which has left few countries unscathed. As a result, it is important for us to craft more targeted theories that treat terrorism as the unique category that it is.

One of these is the way that climate change will impact violent non-state actors. Because we believe that, in many cases, terrorism and civil war violence are distinct, their organizational characteristics are likely to be different as well. Given this, we believe that these organizations will differ in their ability to weather and adapt to climate change (Salehyan and Hendrix 2014). In particular, we believe that terrorist organizations should be more resilient to climate change.

One of these characteristics is size; all that is required for the creation of a terrorist organization is the convergence of a small group of individuals – or a single lone wolf – with an agenda against the state. Crenshaw (1981, 384) notes that terrorism is “essentially the result of elite disaffection.” Gurr’s (1979) study of terrorism during the 1960s finds terrorist organizations to be quite small; 86% have fewer than 50 members, 8% have between 50 and 500, and only 6% have more than 500. Nearly 30 years later, Jones and Libicki (2008) find that this continues to be true. They note that 90 percent of organizations have fewer than 1,000 members, and 55 percent had fewer than a hundred.

This is often reflected in the operational tempo of terrorist organizations. Using data from the Global Terrorism Database (GTD), after deleting “unknown” perpetrators and attacks classified as either “doubtful” or “unknown,” we find that the average “group” active between 1970 and 2019 conducted nearly 27 attacks over their lifetime (START 2021; LaFree and Dugan 2011). Moreover, groups in the 75th percentile conducted only 5 attacks while those in the 90th are responsible for 22. In fact, many terrorist perpetrators, both domestic and transnational, are known as “one-hit wonders” notable for a single attack (Brock Blomberg, Engel, and Sawyer 2010; Vittori 2009). These attacks have been meaningful; in fact, the 1993 World Trade Center attack was perpetrated by one of these types of actors (Perliger 2014). This operational profile, because it often precludes establishing enough of a pattern to identify perpetrators, may also impede effective state response (Carter 2016).

Since these groups are smaller, ephemeral, and often created for a singular purpose, there is less need for a far-reaching organizational structure. Many terrorist organizations intentionally lack connections between the leadership and cadre, this level of decentralization enables groups to maintain a low profile even where government scrutiny is highest (Grabosky 1988; Kilberg 2012). The Earth Liberation Front (ELF), for example, has no clear leadership. This has allowed the organization to effectively carry out operations while largely avoiding state power (Leader and Probst 2003; Joosse 2007). This decentralization does come at a cost; recruitment and group maintenance will come from individual operatives’ social networks, slowing growth but still ensuring concealment (Sambanis 2008). It may also be that the temporary nature of many terrorist organizations simply hinders the development of any organizational structure. As a result, it is more subject to collective action problems, hampering its ability to remain cohesive as well as to conduct operations (Heger, Jung, and Wong 2012).

Lastly, the factors of smaller size and decentralization mean that terrorist organizations are better suited for operations in urban areas. Urban centers will be operationally cheaper for terrorist organizations. Cities have a wealth of targets readily and easily available for terrorist groups. Cities are economic, cultural, and often political centers for their countries; striking at these targets has resonance not only for the national, but an international, audience (Beall 2006). Communications and transportation networks also often radiate from city centers. Attacks on these targets can cripple information and commercial exchanges for an entire country. Not only are these targets important but they are found in high density, thus increasing the effectiveness and lethality of terrorist attacks (Beall 2006). Given these attributes, it is unsurprising that the probability of terrorism is highest in areas with large populations and high population densities (Nemeth, Mauslein, and Stapley 2014). All told, these factors suggest that most terrorist groups will face few difficulties responding to changes brought about by climate change.

We contrast this with rebel organizations. While we acknowledge that the label of rebel organization does not automatically imply that they are better structured or more effective than their terrorist counterparts, there are important differences between the average rebel group and the average terrorist organization. For one, creating an effective rebel group involves higher costs. Weinstein (2005) notes that rebel entrepreneurs require environments with ready access to economic and/or social endowments to allow them to become viable. Staniland (2012, 152) cites the strength of social ties in creating effective insurgencies; he argues that group entrepreneurs with overlapping social ties (vertical and horizontal linkages) have “a rich set of preexisting relationships to one another and ties to local communities through which they can construct nascent organizations.” Larson and Lewis (2018) find that kinship networks found in ethnically homogenous localities are particularly important, facilitating a culture of secrecy that allows groups to grow without interference. Terrorist organizations, particularly if they are oriented around an ideological goal or created for a temporary purpose, may not need these robust ties (Stohl and Stohl 2007).

Once rebel organizations are established, the continual harnessing of people and material - often over a territorial expanse – for battle against the state requires both a large force and an effective organizational structure (Johnston 2008; Heger, Jung, and Wong 2012). While determining the size of an organization is difficult due to a variety of internal and external factors, previous work has found that rebel organizations tend to be quite large, often having between 500 and 5,000 members – a significant disjoint from most terrorist organizations (Aronson and Huth 2017; Collier 2003).

The way that these fighters are organized is also important. Johnston (2008) notes that, in the cases of Liberia and Sierra Leone, organizations that were more centralized were more militarily effective than ones with some subunit autonomy. Sinno (2011) finds the same for the combatant factions in Afghanistan – centralized organizations were more effective than their decentralized counterparts. This is in contrast to the average terrorist organization, whose relatively temporary nature and narrow grievances leads to more cohesion and allows leaders to pursue decentralization strategies (Perkoski 2019).

Geographically, we also note that rebellion tends to be more of a rural phenomenon while terrorism is more of an urban phenomenon (Höglund et al. 2016). Because rebel organizations rely on greater numbers of people, they benefit from environments that make state governance and surveillance difficult (Fearon and Laitin 2003; Collier and Hoeffler 2004; Alesina and Spolaore 2003; Kalyvas 2006). Such regions then are likely to be sparsely populated, located in difficult terrain, and in isolated regions far from state control – all factors that have been linked to the onset of civil war (Fearon and Laitin 2003; Buhaug and Rød 2006; Buhaug and Lujala 2005; Collier and Hoeffler 2004). The challenges that hinder state governance in rural areas can also hinder the operations of rebel groups, but rebel groups that can overcome these challenges benefit from being in rural areas (Lewis 2020; Koren 2018).

These organizational and geographical characteristics mean that rebel groups are likely to be more negatively impacted by climate change. We believe this to be true for three reasons. First, larger groups are likely to be heavily reliant on the contributions of others (Weinstein 2007). Damaging climatic events such as drought, excessive rainfall, or extreme temperatures are likely to lessen the size of supporters’ contributions – or even their willingness - to aid their organizations, reducing their operational capacity (Keels 2019).[[4]](#footnote-4) Second, climate affects vegetation. Many groups have used dense and abundant foliage as an asset in their operations against other organizations and the government (Salehyan and Hendrix 2014; Meier, Bond, and Bond 2007; Witsenburg and Adano 2009). An absence, or shortage, of this is likely to significantly impact the operations of those organizations. Lower-level violence, like terrorism - because it is sporadic, perpetrated by a few individuals, and urban - is likely to occur independent of this. Third, organized violence will only take place if people’s basic needs are met (Koren 2018). Here too, spontaneous and lower-level violence are likely to continue to occur, as fewer people are needed to conduct operations.

# Rural-urban migration connecting climate change’s rural consequences with urban terrorist groups

While terrorism is primarily a threat to urban areas, climate change disproportionately threatens rural areas (Mueller et al. 2020). This is due to climate change most directly affecting agriculture (Falco, Galeotti, and Olper 2019). For climate change and terrorism to plausibly be linked, the negative consequences of climate change in rural areas need to connect to terrorist groups operating in urban centers.

Rural-urban migration is a critical and direct mechanism for climate-terrorism links to form. The World Bank estimates that there will be roughly 150 million people internally displaced due to climate change by 2050 (Rigaud et al. 2018). These large internal migration flows are likely to primarily involve rural to urban movements (Mueller et al. 2020). Gradual population shifts from rural to urban areas can be managed without difficulty. Climate change, however, is arguably accelerating the speed of rural to urban population shifts, which then becomes extremely difficult to manage. In these circumstances, violence in general and terrorism specifically become greater threats.

The Syrian case illustrates how rural-urban migration in response to climate change may increase violence in general (Ash and Obradovich 2019; Kelley et al. 2015). From 2006-2010, Syria experienced a drought that motivated thousands of people to move to cities. This movement, which increased the country’s urban population by 50% from 2002 to 2010, put a strain on the country’s cities. Large clusters of unemployed and disaffected people formed, and their rising grievances may have combined with high mobilization potential from close spatial proximity to increase the potential for mass protests to emerge in 2011. International influences from the Arab Spring and domestic political challenges in Syria were almost certainly the factors that were the most directly responsible for the onset of Syria’s civil war (Selby et al. 2017; Daoudy 2020), but the Syrian government’s failure to adequately respond to new population influxes in urban areas was an important added stress that made violence more likely. The Syrian Civil War has experienced widespread violence from conflict activities, but the war has also included a substantial amount of terrorist activity (Lynch 2013; Byman 2016; Lister 2016).

In Egypt, rural-urban migration has already increased the risk of terrorism. Two-thirds of the country’s urban population, in fact, lives in neighborhoods that were built since 1950 (Sims 2012). Population influxes into Cairo triggered the spread of peripheral “ashwaiyyat,” or slums. These slums are socially insular, with residents who have autonomous lifestyles as part of a socially fragmented city. This has increased the difficulty of governing and securing the city. In 1992, Imbaba, a slum with over one million inhabitants, was ‘taken over’ by the militant Islamist group Al-Gam’a al-Islamiyya (IG). This helped fuel a broader rise in Islamist terrorism in Egypt during the mid-1990s (Bayat and Denis 2000). Beyond the Middle East, South Asian countries such as Pakistan and Bangladesh have experienced similar challenges with urbanization fueling Islamist terrorism (Blank, Clary, and Nichiporuk 2014; Kugelman 2014; Office of the Director of National Intelligence 2017).

Kenya provides a similar example, although with the twist of a large portion of its population influx to its capital city Nairobi being migrants and refugees from another country, Somalia. During the 1980s, drought in Somalia led to several thousand people leaving the country and settling in Nairobi. They settled in what was at the time a relatively quiet and peripheral part of the city in the neighborhood of Eastleigh (Carrier and Lochery 2013). When Siad Barre was forcibly removed from power in 1991 as part of the government’s collapse, hundreds of thousands of additional Somalis fled to Kenya (Kapteijns 2013; Verdirame 1999). Many of them settled in the small existing Somali enclave in the Eastleigh neighborhood. They quickly turned Eastleigh into a crowded, busy hub of activity. Government services, however, did not keep up (Asoka, Thuo, and Bunyasi 2013). Kenyan police also harassed Somalis in Eastleigh on a regular basis (Independent Policing Oversight Agency 2014; Yarnell and Thomas 2014; Parker 2002). This lack of needed government services and frequent state harassment produced a large number of Somalis with grievances against the Kenyan government, and Somalis in Eastleigh formed tight-knit social networks that were difficult to monitor. This simmering strain yielded people willing to be recruited by Al Shabaab for terrorist activity, including the infamous Westgate shopping mall attack in 2013 that killed at least 67 people.

Shifts to urban areas like these are likely to benefit terrorist organizations relative to their rebel counterparts. First, migrants are likely to rely on their pre-existing social networks to find an appropriate destination that is near other migrants (Schon 2018). This results in the uneven distribution of migrants in a receiving city. This spatial concentration is beneficial for migrants, since it provides them with a welcoming population of others who share similar background and experiences (Adida 2014). But, at the same time, this also exposes people to those with similar grievances (Gurr 1970; Sayles 1984; Cederman, Gleditsch, and Buhaug 2013). Their concentration in a small area means that it is more likely that they will meet other aggrieved migrants than they would have in a rural area, thereby simplifying recruitment for the terrorist organization. This spatial concentration also simplifies targeting for opposing groups, meaning that these areas are likely to adopt a pre-emptive policy of violence. Lastly, the shift to urban areas means that organizations will have to become smaller, so as to escape the attention of security forces.

# Population clusters in border areas increase opportunity for terrorism

 In addition to domestic factors that allow rural-urban migration to increase the risk of terrorism, population influxes into urban areas can also generate transnational dynamics that increase the risk of terrorism by increasing opportunity. These transnational dynamics result from the path-dependent nature of urbanization, given that movement into urban areas means movement into *existing* cities. Existing cities are often already near country borders, so rural-urban migration is likely to increase the share of the world’s population living in border regions. Worldwide, many urban areas are already located within 100 km of a border between countries, as shown in Figure 2.[[5]](#footnote-5) This path-dependent process of rural-urban migration increasing the size of existing cities is therefore likely to further urbanize border regions.

Figure 2: Cities with over One Million People within 100 km of a Land Border[[6]](#footnote-6)



 Recently released gridded population data allows us to observe how urbanization is already occurring. We use Global Human Settlement Layer data in combination with shapefiles from the cshapes R package to estimate the size of populations living within 100 kilometers of a land border in 1975, 1990, 2000, and 2015 (Weidmann, Kuse, and Gleditsch 2010; Florczyk et al. 2019). Our estimates are based on 250 x 250 meter raster grids, where the size of the population living within 100 kilometers of the border is calculated using Zonal Statistics in ArcMap Version 10.7.1. We find that in 2015, approximately one billion more people were living within 100 kilometers of a land border than in 1975. This means that more than twice as many people are living in border regions now than they were in 1975. This is shown in Table 1.

Table I: Population Totals, 1975-2015

|  |  |  |  |
| --- | --- | --- | --- |
| Year | World Total Population | Population in border region | % in border region |
| 1975 | 4,061,348,355 | 903,506,369 | 22.2464633 |
| 1990 | 5,309,597,005 | 1,223,587,328 | 23.0448248 |
| 2000 | 6,126,529,207 | 1,523,977,383 | 24.8750529 |
| 2015 | 7,349,329,050 | 1,904,472,194 | 25.9135519 |

As climate change progresses, we expect urbanization to accelerate even further. With this, terrorist groups may find ways to use neighboring countries as rear bases when they need sanctuary from state forces (Salehyan 2011). Clustering populations in border regions may also facilitate the development of smuggling infrastructures to move illicit goods across borders (Alusala 2010; Andreas 2011; Majidi 2018), which may further bolster terrorist operations.

# What should be done

 We have argued that climate change increases the risk of terrorism via rural-urban migration. This internal migration is poised to accelerate urbanization, and rapid population influxes are difficult for cities to manage effectively. As a result, slums and urban ghettos have formed, are likely to continue forming, and are likely to grow where they already exist. These spaces often contain dense, opaque networks that states struggle to monitor. These networks are heavily populated by people that are disadvantaged or frustrated by their perceived exclusion from economic and political power. In these social environments, terrorist groups have many options for recruitment.

 Effective policy responses should then focus on one of two issues. First, governments should coordinate with rural populations to support adaptation efforts in response to changing climatic and environmental conditions (Agrawal and Perrin 2009). Rural-urban migration is far from inevitable in response to climate change, but it is far more likely if farmers are unable to adjust their livelihood strategies (Bardsley and Hugo 2010). Second, when rural-urban migration occurs, cities need the resources to expand infrastructure and social services, as well as to find housing options. These efforts may carry substantial up-front costs, but policies such as housing provision can be far cheaper in the medium and long run than responding to large homeless populations. Furthermore, governments do not want criminal gangs or terrorist groups to fill in gaps in governance that they leave behind.

 The process that we lay out linking climate change with terrorism is not inevitable. Both in rural and urban areas, effective adaptation strategies do have the potential to serve as “off ramps” from the process. These strategies, however, are not easy. They require resources, effective governance, and cooperation within and across societal groups. For the sake of minimizing terrorism, we must hope that governments and societies are up to the challenge.

# Works cited

Abel, Guy J., Michael Brottranger, Jesus Crespo Cuaresma, and Raya Muttarak. 2019. "Climate, conflict and forced migration." *Global environmental change* 54:239-249.

Adida, Claire. 2014. *Immigrant Exclusion and Insecurity in Africa: Coethnic Strangers*. New York: Cambridge University Press.

Agrawal, Arun, and Nicolas Perrin. 2009. "Climate adaptation, local institutions and rural livelihoods." *Adapting to climate change: thresholds, values, governance*:350-367.

Ajala, Olayinka. 2018. "Formation of Insurgent Groups: MEND and Boko Haram in Nigeria." *Small Wars & Insurgencies* 29 (1):112-130.

Alesina, Alberto, and Enrico Spolaore. 2003. *The Size of Nations*. Cambridge: MIT Press.

Allen, Mark W, Robert Lawrence Bettinger, Brian F Codding, Terry L Jones, and Al W Schwitalla. 2016. "Resource scarcity drives lethal aggression among prehistoric hunter-gatherers in central California." *Proceedings of the National Academy of Sciences* 113 (43):12120-12125.

Alusala, Nelson. 2010. "Informal cross-border trade and arms smuggling along the Uganda–Rwanda border." *African Security Review* 19 (3):15-26.

Andreas, Peter. 2011. *Blue helmets and black markets: The business of survival in the siege of Sarajevo*: Cornell University Press.

Aronson, Jacob, and Paul K Huth. 2017. "The Size of Rebel and State Armed Forces in Internal Conflicts." *Peace and Conflict 2017*.

Ash, Konstantin, and Nick Obradovich. 2019. "Climatic stress, internal migration, and Syrian civil war onset." *Journal of Conflict Resolution*:0022002719864140.

Asoka, Gilbert, Aggrey Thuo, and Martin Bunyasi. 2013. "Effects of Population Growth on Urban Infrastructure and Services: A Case of Eastleigh Neighborhood Nairobi, Kenya." *Journal of Anthropology & Archaeology* 1 (1):41-56.

Bardsley, Douglas K, and Graeme J Hugo. 2010. "Migration and climate change: examining thresholds of change to guide effective adaptation decision-making." *Population and Environment* 32 (2-3):238-262.

Bayat, Asef, and Eric Denis. 2000. "Who is afraid of ashwaiyyat? Urban change and politics in Egypt." *Environment and Urbanization* 12 (2):185-199.

Beall, Jo. 2006. "Cities, terrorism and development." *Journal of International Development: The Journal of the Development Studies Association* 18 (1):105-120.

Blank, Jonah, Christopher Clary, and Brian Nichiporuk. 2014. *Drivers of Long-Term Insecurity and Instability in Pakistan: Urbanization*: RAND Corporation.

Böhmelt, Tobias, Thomas Bernauer, Halvard Buhaug, Nils Petter Gleditsch, Theresa Tribaldos, and Gerdis Wischnath. 2014. "Demand, supply, and restraint: determinants of domestic water conflict and cooperation." *Global Environmental Change* 29:337-348.

Brock Blomberg, S, Rozlyn C Engel, and Reid Sawyer. 2010. "On the duration and sustainability of transnational terrorist organizations." *Journal of Conflict Resolution* 54 (2):303-330.

Buhaug, Halvard. 2010. "Climate not to blame for African civil wars." *Proceedings of the National Academy of Sciences* 107 (38):16477-16482.

Buhaug, Halvard. 2015. "Climate–conflict research: some reflections on the way forward." *Wiley Interdisciplinary Reviews: Climate Change* 6 (3):269-275.

Buhaug, Halvard, and Päivi Lujala. 2005. "Accounting for scale: Measuring geography in quantitative studies of civil war." *Political Geography* 24 (4):399-418.

Buhaug, Halvard, and Jan Ketil Rød. 2006. "Local determinants of African civil wars, 1970–2001." *Political Geography* 25 (3):315-335.

Burke, Marshall B, Edward Miguel, Shanker Satyanath, John A Dykema, and David B Lobell. 2009. "Warming increases the risk of civil war in Africa." *Proceedings of the national Academy of sciences* 106 (49):20670-20674.

Byman, Daniel. 2016. "Understanding the Islamic State—A Review Essay." *International Security* 40 (4):127-165. doi: 10.1162/ISEC\_r\_00235.

Carrier, Neil, and Emma Lochery. 2013. "Missing states? Somali trade networks and the Eastleigh transformation." *Journal of Eastern African Studies* 7 (2):334-352.

Carter, David B. 2016. "Provocation and the strategy of terrorist and guerrilla attacks." *International Organization*:133-173.

Caruso, Raul, Ilaria Petrarca, and Roberto Ricciuti. 2016. "Climate change, rice crops, and violence: Evidence from Indonesia." *Journal of Peace Research* 53 (1):66-83.

Cederman, Lars-Erik, Kristian Skrede Gleditsch, and Halvard Buhaug. 2013. *Inequality, grievances, and civil war*: Cambridge University Press.

Chen, Junhua, Fei Guo, and Ying Wu. 2011. "One decade of urban housing reform in China: Urban housing price dynamics and the role of migration and urbanization, 1995–2005." *Habitat International* 35 (1):1-8.

Collier, P, and A Hoeffler. 2004. "Greed and Grievance in Civil War." *Oxford Economic Papers* 56 (4):563-595.

Collier, Paul. 2003. *Breaking the conflict trap: Civil war and development policy*: World Bank Publications.

Crenshaw, Martha. 1981. "The causes of terrorism." *Comparative Politics* 13 (4):379-399.

Daoudy, Marwa. 2020. *The origins of the Syrian conflict: Climate change and human security*: Cambridge University Press.

Di Tiro, Hasan. 1976. Declaration of Independence of Acheh - Sumatra. Acheh, Sumatra.

Diehl, Paul, and Nils Petter Gleditsch. 2001. *Environmental conflict: An anthology*: Routledge.

Ehrlich, Paul. 1968. *The Population Bomb*, *New York*: Ballentine Books.

Falco, Chiara, Marzio Galeotti, and Alessandro Olper. 2019. "Climate change and migration: Is agriculture the main channel?" *Global Environmental Change* 59:101995.

Fearon, James, and David Laitin. 2003. "Ethnicity, Insurgency, and Civil War." *American Political Science Review*:75-90.

Findley, Michael G, and Joseph K Young. 2012. "Terrorism and civil war: A spatial and temporal approach to a conceptual problem." *Perspectives on Politics*:285-305.

Fjelde, Hanne, and Nina von Uexkull. 2012. "Climate triggers: Rainfall anomalies, vulnerability and communal conflict in sub-Saharan Africa." *Political Geography* 31 (7):444-453.

Florczyk, A.J., C. Corbane, D. Ehrlich, S. Freire, T. Kemper, L. Maffenini, M. Melchiorri, M. Pesaresi, P. Politis, M. Schiavina, F. Sabo, and L. Zanchetta. 2019. GHSL Data Package 2019. Luxembourg: Publications Office of the European Union.

Gizelis, Theodora-Ismene, and Amanda E Wooden. 2010. "Water resources, institutions, & intrastate conflict." *Political Geography* 29 (8):444-453.

Gleick, Peter H. 1993. "Water and conflict: Fresh water resources and international security." *International security* 18 (1):79-112.

Gurr, Ted. 1979. "Some Characteristics of Political Terrorism in the 1960s." In *Politics of Terrorism*, edited by Michael Stohl. Marcel Dekker.

Gurr, Ted Robert. 1970. *Why Men Rebel*. Princeton: Princeton University Press.

Gurr, Ted Robert. 1985. "On the political consequences of scarcity and economic decline." *International Studies Quarterly* 29 (1):51-75.

Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science* 162:1243-1248.

Heger, Lindsay, Danielle Jung, and Wendy H Wong. 2012. "Organizing for resistance: How group structure impacts the character of violence." *Terrorism and Political Violence* 24 (5):743-768.

Höglund, Kristine, Erik Melander, Margareta Sollenberg, and Ralph Sundberg. 2016. "Armed conflict and space: exploring urban-rural patterns of violence." In *Spatializing Peace and Conflict*, 60-76. Springer.

Homer-Dixon, Thomas F. 1991. "On the threshold: environmental changes as causes of acute conflict." *International security* 16 (2):76-116.

Homer-Dixon, Thomas F. 2010. *Environment, scarcity, and violence*: Princeton University Press.

Homer-Dixon, Thomas F, Jeffrey H Boutwell, and George W Rathjens. 1993. "Environmental change and violent conflict." *Scientific American* 268 (2):38-45.

Horner, Jim. 1997. "Henry George on Thomas Robert Malthus: Abundance vs. Scarcity." *American Journal of Economics and Sociology* 56 (4):595-607.

Independent Policing Oversight Agency. 2014. Monitoring Report on Operation Sanitization Eastleigh, Publicly Known as Operation Usulama Watch.

Johnson, Allen W, and Timothy Earle. 1987. *The evolution of human societies: From foraging group to agrarian state*. Stanford, CA: Stanford University Press.

Johnston, Patrick. 2008. "The geography of insurgent organization and its consequences for civil wars: evidence from Liberia and Sierra Leone." *Security Studies* 17 (1):107-137.

Jones, Seth G, and Martin C Libicki. 2008. *How terrorist groups end: Lessons for countering al Qa'ida*. Vol. 741: Rand Corporation.

Kaczan, David J, and Jennifer Orgill-Meyer. 2019. "The impact of climate change on migration: a synthesis of recent empirical insights." *Climatic Change*:1-20.

Kalyvas, Stathis. 2004. "The Urban Bias in Research on Civil Wars." *Security Studies* 13 (3):1-31.

Kalyvas, Stathis N. 2006. *The logic of violence in civil war*: Cambridge University Press.

Kapteijns, Lidwien. 2013. *Clan Cleansing in Somalia: The Ruinous Legacy of 1991*. Philadelphia: University of Pennsylvania Press.

Keels, Eric. 2019. "Praying for Rain? Water scarcity and the duration and outcomes of civil wars." *Defence and Peace Economics* 30 (1):27-45.

Kelley, Colin P, Shahrzad Mohtadi, Mark A Cane, Richard Seager, and Yochanan Kushnir. 2015. "Climate change in the Fertile Crescent and implications of the recent Syrian drought." *Proceedings of the national Academy of Sciences* 112 (11):3241-3246.

Khalil, James. 2013. "Know your enemy: On the futility of distinguishing between terrorists and insurgents." *Studies in Conflict & Terrorism* 36 (5):419-430.

Koren, Ore. 2017. "Why insurgents kill civilians in capital cities: A disaggregated analysis of mechanisms and trends." *Political Geography* 61:237-252.

Koren, Ore. 2018. "Food abundance and violent conflict in Africa." *American Journal of Agricultural Economics* 100 (4):981-1006.

Koubi, Vally. 2019. "Climate change and conflict." *Annual review of political science* 22:343-360.

Kugelman, Michael. 2014. *Pakistan's Runaway Urbanization: What Can Be Done?*: Asia Program, Woodrow Wilson International Center for Scholars.

LaFree, Gary, and Laura Dugan. 2011. "Global Terrorism Database, 1970-2010." *Harvard Dataverse, V1*. doi: <https://doi.org/10.7910/DVN/OZSTZS>.

Landis, Steven T. 2014. "Temperature seasonality and violent conflict: The inconsistencies of a warming planet." *Journal of Peace Research* 51 (5):603-618.

Larson, Jennifer M, and Janet I Lewis. 2018. "Rumors, kinship networks, and rebel group formation." *International Organization* 72 (4):871-903.

Leader, Stefan H, and Peter Probst. 2003. "The earth liberation front and environmental terrorism." *Terrorism and Political Violence* 15 (4):37-58.

Lewis, Janet I. 2020. *How Insurgency Begins: Rebel Group Formation in Uganda and Beyond*: Cambridge University Press.

Linke, Andrew M, Frank DW Witmer, John O’Loughlin, J Terrence McCabe, and Jaroslav Tir. 2018. "Drought, local institutional contexts, and support for violence in Kenya." *Journal of Conflict Resolution* 62 (7):1544-1578.

Lister, Charles R. 2016. *The Syrian Jihad: Al-Qaeda, the Islamic State and the Evolution of an Insurgency*: Oxford University Press.

Liu, Ye, Zhigang Li, Yuqi Liu, and Hongsheng Chen. 2015. "Growth of rural migrant enclaves in Guangzhou, China: Agency, everyday practice and social mobility." *Urban Studies* 52 (16):3086-3105.

Lynch, Marc. 2013. "The Political Science of Syria's War." The Political Science of Syria's War, Washington, DC.

Mach, Katharine J, Caroline M Kraan, W Neil Adger, Halvard Buhaug, Marshall Burke, James D Fearon, Christopher B Field, Cullen S Hendrix, Jean-Francois Maystadt, and John O’Loughlin. 2019. "Climate as a risk factor for armed conflict." *Nature*:1.

Majidi, Nassim. 2018. "Community Dimensions of Smuggling: The Case of Afghanistan and Somalia." *The ANNALS of the American Academy of Political and Social Science* 676 (1):97-113.

Meier, Patrick, Doug Bond, and Joe Bond. 2007. "Environmental influences on pastoral conflict in the Horn of Africa." *Political Geography* 26 (6):716-735.

Moghadam, Assaf, Ronit Berger, and Polina Beliakova. 2014. "Say terrorist, think insurgent: Labeling and analyzing contemporary terrorist actors." *Perspectives on Terrorism* 8 (5):2-17.

Mueller, Valerie, Glenn Sheriff, Xiaoya Dou, and Clark Gray. 2020. "Temporary migration and climate variation in eastern Africa." *World Development* 126.

Nemeth, Stephen C, and Jacob A Mauslein. 2019. "Geography and the certainty of terrorism event coding." *Journal of Global Security Studies* 4 (2):227-240.

Nemeth, Stephen C, Jacob A Mauslein, and Craig Stapley. 2014. "The primacy of the local: Identifying terrorist hot spots using geographic information systems." *The Journal of Politics* 76 (02):304-317.

Nordkvelle, Jonas, Siri Aas Rustad, and Monika Salmivalli. 2017. "Identifying the effect of climate variability on communal conflict through randomization." *Climatic Change* 141 (4):627-639.

O’Loughlin, John, Andrew M Linke, and Frank DW Witmer. 2014. "Effects of temperature and precipitation variability on the risk of violence in sub-Saharan Africa, 1980–2012." *Proceedings of the National Academy of Sciences* 111 (47):16712-16717.

Office of the Director of National Intelligence. 2017. "Global Trends Annex: The Next Five Years By Region." <https://www.dni.gov/index.php/the-next-five-years/south-asia>.

Özdamar, Özgür. 2008. "Theorizing terrorist behavior: Major approaches and their characteristics." *Defence Against Terrorism Review* 1 (2):89-101.

Parker, Alison. 2002. *Hidden in Plain View: Refugees Living Without Protection in Nairobi and Kampala*. New York: Human Rights Watch.

Perkoski, Evan. 2019. "Internal Politics and the Fragmentation of Armed Groups." *International Studies Quarterly* 63 (4):876-889.

Perliger, Arie. 2014. "Terrorist networks’ productivity and durability: a comparative multi-level analysis." *Perspectives on Terrorism* 8 (4):36-52.

Pettersson, Therése. 2021. "UCDP/PRIO Armed Conflict Dataset Codebook v21.1."

Reiter, Dan. 2003. "Exploring the bargaining model of war." *Perspectives on Politics* 1 (1):27-43.

Rigaud, Kanta Kumari, Alex de Sherbinin, Bryan Jones, Jonas Bergmann, Viviane Clement, Kayly Ober, Jacob Schewe, Susana Adamo, Brent McCusker, Silke Heuser, and Amelia Midgley. 2018. "Groundswell : Preparing for Internal Climate Migration." World Bank. <https://openknowledge.worldbank.org/handle/10986/29461>.

Salehyan, Idean. 2011. *Rebels without Borders: Transnational Insurgencies in World Politics*. Ithaca: Cornell University Press.

Salehyan, Idean, and Cullen S Hendrix. 2014. "Climate shocks and political violence." *Global Environmental Change* 28:239-250.

Sambanis, Nicholas. 2008. "Terrorism and civil war." In *Terrorism, economic development, and political openness*, edited by Philip Keefer and Norman Loayza, 174-206. Cambridge: Cambridge University Press.

Sayles, Marnie. 1984. "Relative Deprivation and Collective Protest: An Impoverished Theory?" *Sociological Inquiry* 54:449-465.

Scartozzi, Cesare M. 2020. "Reframing Climate-Induced Socio-Environmental Conflicts: A Systematic Review." *International Studies Review*.

Schon, Justin. 2018. "Using ERGMs to Disaggregate Displacement Cascades." *Journal of Social Structure* 19 (1).

Schon, Justin. 2020a. How Seasonal Migration May Reduce Security Threats from Climate-Induced Migration. University of Florida Gainesville United States.

Schon, Justin. 2020b. *Surviving the War in Syria: Survival Strategies in a Time of Conflict*. Cambridge: Cambridge University Press.

Selby, Jan, Omar S Dahi, Christiane Fröhlich, and Mike Hulme. 2017. "Climate change and the Syrian civil war revisited." *Political Geography* 60:232-244.

Sims, David. 2012. *Understanding Cairo: The logic of a city out of control*: Oxford University Press.

Sinno, Abdulkader H. 2011. *Organizations at war in Afghanistan and beyond*. Cambridge: Cornell University Press.

Staniland, Paul. 2012. "Organizing Insurgency: Networks, Resources, and Rebellion in South Asia." *International Security* 37 (1):142-177.

Stanton, Jessica A. 2013. "Terrorism in the context of civil war." *The Journal of Politics* 75 (4):1009-1022.

Stanton, Jessica A. 2019. "Terrorism, civil war, and insurgency." In *The Oxford Handbook of Terrorism*, 348-365. Oxford University Press Oxford.

START, National Consortium for the Study of Terrorism and Responses to Terrorism. 2021. "Global Terrorism Database [Data file]." accessed April 28, 2021. <http://www.start.umd.edu/gtd>.

Stohl, Cynthia, and Michael Stohl. 2007. "Networks of terror: Theoretical assumptions and pragmatic consequences." *Communication Theory* 17 (2):93-124.

Telford, Andrew. 2020. "A climate terrorism assemblage? Exploring the politics of climate change-terrorism-radicalisation relations." *Political Geography* 79:102150.

Theisen, Ole Magnus. 2017. "Climate change and violence: insights from political science." *Current Climate Change Reports* 3 (4):210-221.

Tol, Richard SJ, and Sebastian Wagner. 2010. "Climate change and violent conflict in Europe over the last millennium." *Climatic Change* 99 (1-2):65-79.

Toset, Hans Petter Wollebæk, Nils Petter Gleditsch, and Håvard Hegre. 2000. "Shared rivers and interstate conflict." *Political geography* 19 (8):971-996.

Verdirame, Guglielmo. 1999. "Human Rights and Refugees: The Case of Kenya." *Journal of Refugee Studies* 12 (1):54-77.

Verkaaik, Oskar. 2004. *Migrants and militants : fun and urban violence in Pakistan*. Princeton, N.J.: Princeton University Press.

Vittori, Jodi. 2009. "All struggles must end: The longevity of terrorist groups." *Contemporary Security Policy* 30 (3):444-466.

Von Uexkull, Nina, Mihai Croicu, Hanne Fjelde, and Halvard Buhaug. 2016. "Civil conflict sensitivity to growing-season drought." *Proceedings of the National Academy of Sciences* 113 (44):12391-12396.

Weidmann, Nils B. 2015. "On the accuracy of media-based conflict event data." *Journal of Conflict Resolution* 59 (6):1129-1149.

Weidmann, Nils B, Doreen Kuse, and Kristian Skrede Gleditsch. 2010. "The geography of the international system: The CShapes dataset." *International Interactions* 36 (1):86-106.

Weinberg, Leonard, Ami Pedahzur, and Sivan Hirsch-Hoefler. 2004. "The challenges of conceptualizing terrorism." *Terrorism and Policical Violence* 16 (4):777-794.

Weinstein, Jeremy. 2005. "Resources and the Information Problem in Rebel Recruitment." *The Journal of Conflict Resolution* 49 (4):598-624.

Weinstein, Jeremy. 2007. *Inside Rebellion: The Politics of Insurgent Violence*. New York: Cambridge University Press.

Wischnath, Gerdis, and Halvard Buhaug. 2014. "On climate variability and civil war in Asia." *Climatic Change* 122 (4):709-721.

Witsenburg, Karen M, and Wario R Adano. 2009. "Of rain and raids: Violent livestock raiding in northern Kenya." *Civil Wars* 11 (4):514-538.

Yarnell, Mark, and Alice Thomas. 2014. Between a Rock and a Hard Place: Somali Refugees in Kenya. Washington, DC: Refugees International.

Zhang, David D, Peter Brecke, Harry F Lee, Yuan-Qing He, and Jane Zhang. 2007. "Global climate change, war, and population decline in recent human history." *Proceedings of the National Academy of Sciences* 104 (49):19214-19219.

1. Wealth, state capacity, and climate are of course endogenous, but that does not detract from the point that these factors are inter-related. [↑](#footnote-ref-1)
2. For a discussion of the difficulty of labeling perpetrators of violence as “insurgent”, “rebel”, or “terrorist”, see Khalil (2013) and Moghadam, Berger, and Beliakova (2014). [↑](#footnote-ref-2)
3. Both conceptually and in systematic coding, terrorism is widely recognized as a form of violence that is extremely difficult to distinguish from other types of violence. Substantial debate continues over the concept and how best to systematically code it in datasets. [↑](#footnote-ref-3)
4. Although see Nordkvelle, Rustad, and Salmivalli (2017) for a discussion on the duration of dry and wet intervals and their relationship to conflict. [↑](#footnote-ref-4)
5. Black dots display cities that are within 100 km of a land border. Land borders were identified by using the Intersect tool in ArcMap version 10.7.1 to convert the cshapes polygon shapefile for 2015 into a multi-line shapefile. [↑](#footnote-ref-5)
6. Also used in: Schon (2020a). [↑](#footnote-ref-6)