Global Warming and Violent Behavior

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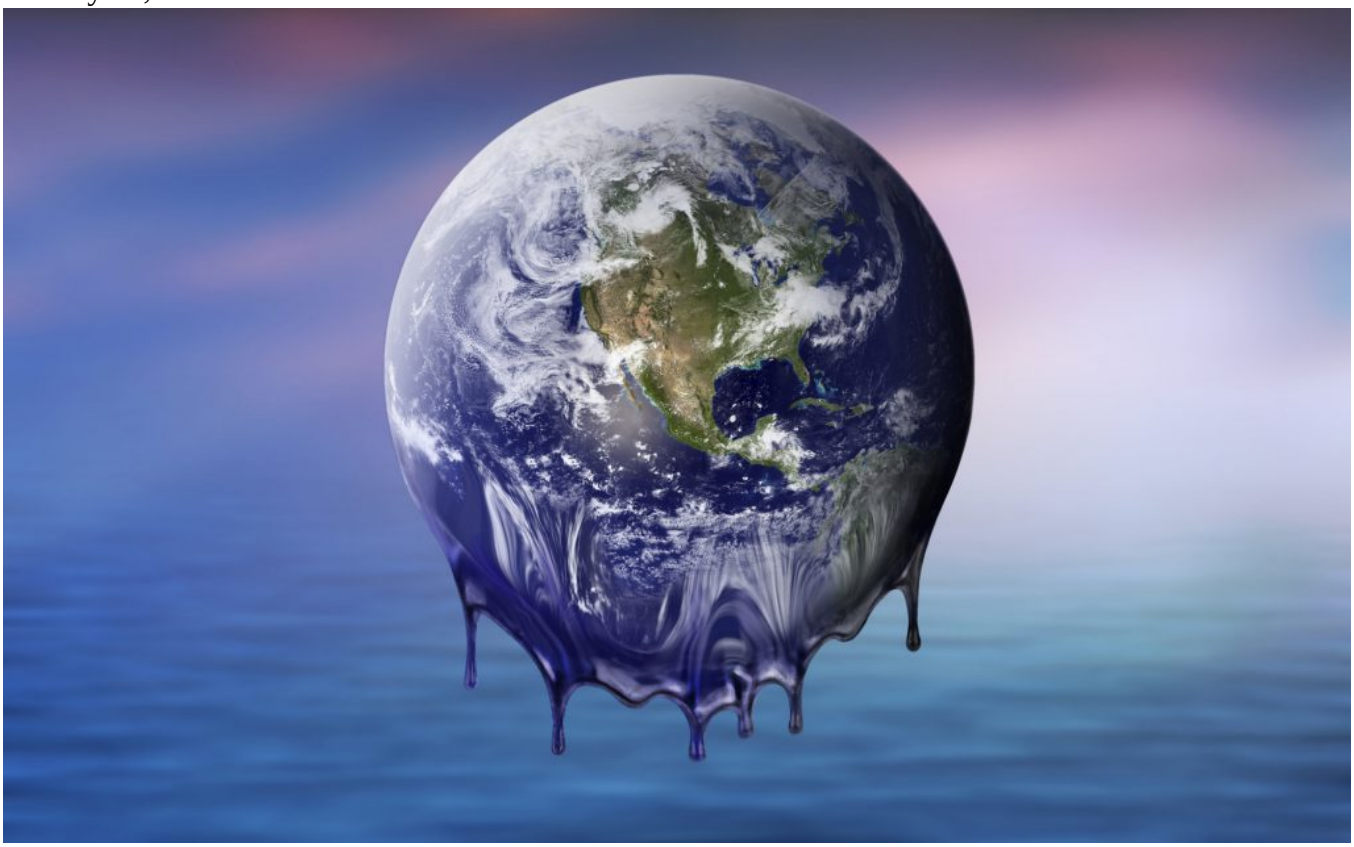

Environmental scientists from multiple disciplines have overwhelmingly acknowledged human-driven climate change as fact. Similarly indisputable is the fact that the effects of rising temperatures will be global in scope and resoundingly negative: droughts, coastal city flooding, decreased food production, and extreme weather, to name just a few. What you may not have considered, however, are some of the subtler psychological and social consequences of rapid climate change — including aggression and violent conflict. A growing body of evidence shows that rapid global warming can (and is) increasing violent behavior in three different ways.

Immediate Effect of Heat Stress on Aggression and Violence

When people get uncomfortably hot, their tempers, irritability, and likelihood of physical aggression and violence increase. This is perhaps best demonstrated in a series of laboratory studies conducted by APS Fellow Craig A. Anderson and his colleagues (Anderson, 1989, 2001; Anderson & Anderson, 1984, 1996, 1998; Anderson, Anderson, Dorr, DeNeve, & Flanagan, 2000; Anderson, Bushman, & Groom, 1997; Anderson & DeLisi, 2011). Across several studies, undergraduate participants completed measures of perceived hostility, anger, or behavioral aggression, but were randomly assigned to do so in one of several temperature-controlled rooms. For some, the room they sat in was a comfortable temperature (e.g., 75^{o} F). For others, the room was particularly cold (e.g., 57^{o} F) or hot (e.g., 97^{o} F), and

participants themselves indicated that these rooms were quite uncomfortable. In one study, participants in the cold and hot rooms perceived a series of filmed interactions as being more hostile and aggressive than participants in the comfortable room. In another, participants in the cold and hot rooms scored higher than those in the comfortable room on a state hostility scale. In a final study, participants in warmer and cooler rooms, relative to those in comfortable rooms, responded to an opponent's ambiguous provocation during a competitive reaction-time task with outbursts of intense blasts of noise. The researchers conclude, based on the collection of studies, that uncomfortably hot temperatures increase aggression.

Although laboratory forms of aggression may seem trivial, other studies illustrate the deadly implications of these findings. Researchers Aldert Vrij, Jaap van der Steen, and Leendert Koppelaar (1994) randomly assigned 38 Dutch police officers to complete a firearms training simulator in either a comfortable-temperature room (70^{o} F) or a warmer-temperature room (81^{o} F). In the simulation, officers responded to a scenario being displayed life-size on a projector screen in front of them. The scenario involved approaching a shed in response to a burglary alarm and being confronted with a suspect brandishing a crowbar. Officers' responses were recorded and coded by the researchers, along with the officers' post-scenario impressions. The officers completing the simulation in the warmer room were more likely than those in the cooler room to perceive the suspect as being aggressive, were more likely to consider them to be a threat, and were more likely to draw their firearm from its holster (85% vs. 59%). Findings such as these illustrate the contributing role that temperature plays in escalating minor disputes into full-blown assault or homicides.

Numerous cross-sectional and time-series studies using real-world heat and violence data provide converging evidence. Cities and regions with higher temperatures tend to experience more violent crime than cooler regions, even after controlling for a dozen sociocultural factors such as age, race, poverty, and culture of honor. Further ruling out alternative explanations, some studies have assessed temperature and violence within the same geographic region over time. Across hours, days, months, and even years, similar trends emerge: When it is hotter, violence increases. From Chicago to Brisbane to Vancouver to Dallas, whether looking at domestic violence or physical assault, the same relationship emerges. In one of the most thorough and illustrative studies, Anderson and DeLisi (2011) compared data from the 1950–2008 FBI Uniform Crime Reports for violent crime (rates of homicide and assault per 100,000 people) and nonviolent crime (rates of burglary and motor vehicle theft per 100,000 people) with average annual temperature data from the National Oceanic and Atmospheric Administration for the same years. Average annual temperatures were significantly positively correlated with violent crime rates but not with nonviolent crime rates. More importantly, this relationship persisted even after controlling for numerous alternative explanations (e.g., incarceration rates). The researchers estimated, based on these findings, that a 1^{o}C increase in average temperature — a fairly conservative estimate of climate change in the following decades — will likely yield a 6% increase in violent crime rates, as many as 25,000 more serious and deadly assaults per year in the United States alone.

Rapid Climate Change and the Creation of Violence-Prone Individuals

In addition to the direct heat effect, there are least two indirect ways that rapid climate change (whether rapid heating or rapid cooling) increases the risk of violence. One involves known developmental

pathways that lead infants, children, and adolescents to become violence-prone adults.

A major outcome of rapid climate change is food insecurity. Increased drought, extreme weather, and wildfires are all on the rise, and all of them represent threats to vital crop production and large-scale food shortages. And although the starvation associated with food scarcity is a problem in and of itself, it has the added detriment of contributing to individual-level aggression. Studies have shown that malnourishment — both prenatal and in early children — is a precursor to adulthood antisocial behavior, aggression, and violence. Illustrating this, in a longitudinal study of Mauritanian children conducted by Jianghong Liu and her colleagues (2004), 3-year-olds who were malnourished were found, more than a decade later, to be more aggressive and antisocial and more likely to show signs of conduct disorder than were sufficiently fed children. Given that hundreds of millions of people are estimated to be affected by climate-driven food insecurity, the magnitude of malnutrition effects on aggressive behavior should not be underestimated.

Increasingly frequent and extreme weather destroys homes and jobs and requires considerable emergency and recovery spending. The economic impact is disproportionately felt by disadvantaged and vulnerable populations, resulting in increased rates of poverty and income disparity. As with malnourishment, this is a problem by itself, but it also can lead to increased aggression: Income disparity can lead to life dissatisfaction, resentment, dissent, a desire for retribution, and even violence. In one example, political scientists Christopher K. Butler and Scott Gates (2012) studied the impact of adverse weather on East African cattle herders. They developed a model, grounded in game theory, of conflict in the region that takes into account available resources, their distribution, property rights, and the role of the state. The authors conclude that droughts and climate-driven resource shortages lead to income disparity increased among the herders, which, in turn, foments resentment and conflict that manifests itself as the banditry and retaliatory aggression often seen in the region.

In fact, many of these same climate-change-driven factors aid in terrorism recruitment: Uncertainty and frustration about one’s livelihood, seeing others who seem unfairly unaffected, and the belief that there are no other viable options to sustain oneself may all contribute to terrorism. These factors are thought to have played a role in regional conflicts such as those in Sierra Leone, Palestine, and Managua. And, given that droughts and other climate-driven natural disasters already are increasing in intensity and frequency (as was predicted years ago by climate-change models), it seems likely that conflict and violence will continue to worsen as resources become scarcer and wealth disparity increases.

Rapid Climate Change and Intergroup Conflict: War and Civil War

That rapid climate change will (and already is) negatively affecting the livelihoods and aggressive tendencies of individuals is obvious, but it is informative to consider how entire populations respond to these effects. Among the most prominent group-level effects anticipated is *ecomigration*, where entire groups migrate in response to the physical, economic, or political instability brought about by an ecological disaster. Although ecomigration is not, in and of itself, a sign of aggression, it can lead to hostility and conflict through a sudden increase in competition for an area’s resources, bringing together people with opposing or incompatible worldviews, concerns about the intentions of both the migrant group and the local population, and a host of socioeconomic issues. Indeed, there are numerous

historical examples of climate disasters leading to ecomigration, war, and even dynastic collapse.

As a recent example, consider the possible role of droughts on ecomigration and conflict in the Syrian civil war. After a very unusual years-long drought (now seen by many as climate-change induced) destroyed much of the country's arable land and cattle, rural farmers and herders migrated en masse to cities. Unrest regarding the government's perceived role in the disaster and failure to do more to help grew, creating conditions that were fertile for conflict and terrorism. A comparable drought in Uganda similarly led to an escalation in food prices, violent internal strife, and mass migration of more than a million people, who clashed with armed cattle herders from Sudan who were fleeing from the same drought. Kenya, Sudan, and Ethiopia also have seen similar climate-driven conflicts, leading researchers to predict, based on models that include decades of data and dozens of countries, that civil wars, protests, coups, rebellions, riots, and large-scale conflicts are all likely to rise as temperatures increase and as changes in rainfall become increasingly extreme.

Ecomigration-driven conflict should not be seen solely as an African or Middle Eastern issue, nor is it one exclusively limited to droughts. A confluence of socioeconomic factors and environmental disasters in the past 6 decades has led to the cumulative migration of more than 10 million Bangladeshis into India. This influx of migrants was a source of continuous tension in the region, as many Indians believed the migrants were stealing farmland. Ultimately, the tension led to a rampage in 1983 that left 1,700 Bengali migrants dead. And more recently, Hurricane Katrina displaced hundreds of thousands of Americans, many of whom fled to neighboring states seeking refuge. Homicide rates in cities where refugees were taken in rose in the following months, and polls suggested that tensions were mounting between refugees and residents. Federal aid and other moderating factors prevented these tensions from escalating into armed conflicts, but the incident stands as an example of the role climate change plays in violent behavior. Indeed, there is a growing research literature examining the relationship between weather-related (and therefore climate-change related) disasters and outbreaks of violence. A recent study in *Science* reported on the huge increase in "water conflict events" that have occurred in the last decade or so.

Moving Forward

It is easy to overlook the relevance of psychological science to climate change. Therefore, it is unsurprising that many people also overlook the important role that psychological scientists can play in reducing climate change and its effects. One obvious way is to apply what we know about attitude change, decision-making, and behavior change to help educate the general population (e.g., public service announcements, teaching modules), public policymakers, and politicians. For example, psychological studies show that fostering a long-term perspective in people makes them more likely to consider their legacy and engage in more proenvironmental behavior. Other psychologists have found that when you frame climate change in global terms, rather than in terms of specific, localized disasters, people become more peaceful and reconciliatory — something that could prove very useful as a means of counteracting the effects of climate change on aggression. Clearly, there is a need, and indeed there are many ways, for psychologists to weigh in on the issue of climate change and its relation to violent behavior.

In the future, psychological scientists also may find themselves conducting more interdisciplinary

research — working hand-in-hand with climatologists, political scientists, and economists. Some of the best psychological studies on the relationship between temperature and aggression have proven just how fruitful it can be to integrate climatological data into analyses of behavioral data. Incorporating techniques and data from other fields may help to build more accurate models of climate-change effects that include subtler, less-frequently considered outcome variables. An interdisciplinary approach also may prove vital in bridging the gap between what scientists know, what the general public believes, and what government policies exist. œ

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