Climate Change and Violence

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Rapid global climate change is now a fact of 21st century life. Human activity, especially the production huge quantities of several greenhouse gases primarily from the burning of fossil fuels, has initiated a general warming trend in our atmosphere and on our planet. This trend will continue and likely will accelerate unless we find a way to return the composition of our atmosphere to a pre-industrial era norm. Because of the longevity of greenhouse gases, even a slowing of the warming trend won't occur until decades after we stop producing such a large load of such gases.

The specific effects on specific regions will vary, as ocean and wind currents shift. Some places are experiencing increased rainfall, whereas many others are having prolonged droughts. In 2007, the Intergovernmental Panel on Climate Change (IPCC) released a report that included a number of projections of likely climate change effects by the end of this century, under varying assumptions of how world governments, industries, and people responded. The best case scenario (huge reductions in greenhouse gases, beginning almost immediately) yielded an average global temperature increase of 1.8°C (5.2°F) and an average sea level increase of 28 cm (11 inches). The worst case scenario yielded increases of 4.0°C (9.2°F) and 43cm (17 inches). Other projections, some of which have already become apparent, included: increases in hot extremes, heat waves, and heavy precipitation; decreases in precipitation in subtropical areas; increases in tropical cyclones; increased weather variability and drought. More specific projections included: (1) 5-8% increase in the proportion of Africa that is arid and semi-arid; (2) major flooding of heavily populated areas of Asia from rising sea levels and storms; (3) complete inundation of low-lying small islands; (4) severe water shortages in Australia and New Zealand;

(5) drought in southern Europe; (6) decreased soil moisture and food crops in Latin America; and (7) increased winter flooding and summer heat waves in North America. More recent research being prepared for the next IPCC report suggests that the new best case scenario will be worse than the old worst case scenario, with sea levels rising a least 1 meter. Considering that 13% of the world's population lives in low-lying coastal areas, this latter projection is particularly disturbing.

There are at least three ways that rapid global warming and its consequences increase the risk of violent behavior (Anderson & DeLisi, 2010). One involves the effects of uncomfortably warm temperatures on irritability, aggression, and violence. A second involves the indirect effects global warming has on factors known to put children and adolescents at risk for becoming violence-prone individuals. The third involves the effects of rapid climate change on populations whose livelihoods and survival are suddenly at risk.

Heat and Aggression

Much research has established that uncomfortably warm temperatures can increase the likelihood of physical aggression and violence (Anderson, Anderson, DeNeve, & Flanagan, 2000). Three types of studies have tested and found considerable support for this heat hypothesis. *Experimental studies* are the first type. These studies, usually conducted in controlled laboratory settings, have found that under certain circumstances uncomfortably hot temperatures increase physical aggression.

The second type, *geographic region studies*, compare violence rates in different geographic regions to see whether hotter regions are associated with higher violence rates. For example, do hotter cities have higher violence rates than cooler cities? Different regions differ in many ways other than climate, and some of these other differences (e.g., poverty,

unemployment, age distribution) are risk factors for violence. The best geographic region studies, therefore, include statistical controls for these extraneous factors. Even when these other factors are controlled, temperature predicts violent crime rates. For example, hotter U.S. cities still yield significantly higher violence rates than cooler cities, even after statistically controlling for 12 social risk factors, including age, education, race, and economic factors (Anderson & Anderson, 1996).

The third type of heat hypothesis study compares aggression/violence rates within the same region but across several time periods that differ in temperature. “Time period" studies vary considerably in terms of the time periods for which violence and temperature are assessed. Overall, the results show remarkable consistency in finding that hotter time periods (days, seasons, years) are associated with higher levels of violence, even when other relevant variables (e.g., poverty) are statistically controlled. Anderson and DeLisi (2010) studied U.S. crime rates over 55 years and found that a 1°C increase in average annual temperature leads to over 7.5 more assaults and homicides per 100,000 population. Similarly, hotter summers yield larger summer increases in violent crime than cooler summers.

In sum, the heat hypothesis has been repeatedly confirmed—uncomfortably hot temperatures increase the likelihood of physical aggression and violence. Laboratory studies suggest that this effect is largely the result of heat induced increases in irritability and in hostile interpersonal perception biases. Other research suggests that these effects can be further traced to thermoregulation and emotion regulation areas of the brain. The implication for global warming is that at the level of the individual person, increased exposure to uncomfortably hot temperatures will increase the likelihood of interpersonal conflict and violent crime. A common

response to high heat in industrialized countries is increased use of air conditioning in buildings, cars, buses, and trains. Unfortunately, this response increases greenhouse gases.

Development of Violence Prone Individuals

The heat/aggression link discussed in the previous section operates immediately and directly on the individual. Global warming will (is) increasing the violence risk of many individuals in a slower and more indirect way as well. Some of the economic and social consequences of global warming increase the proportion of children and youth exposed to risk factors known to increase the likelihood of becoming a violence prone individual— someone who frequently uses physical aggression or violence to deal with conflict and to get desired resources. Studies of violent youth and violent criminals reveal a host of social, psychological, and economic risk factors that play a major role in who becomes a violence prone person. These include: poverty, poor prenatal and childhood nutrition, broken families, low IQ (intelligence), growing up in violent neighborhoods, psychopathy, low education, disorganized and unstable neighborhood, frequent moves to new locations. Many of these risk factors are highly interrelated. For example, low IQ can result from poor nutrition and a poor social and educational environment.

Victims of flooding, prolonged droughts, civil unrest and wars (see next section), are exposed to many of the known risk factors for the development of violence prone adolescents and adults. Although it sometimes takes years for these effects to become apparent in violence statistics, longitudinal studies have shown that even fairly brief exposures (e.g., a few months) to some of these risk factors can put the individual child (or fetus) on a high-risk developmental trajectory.

Civil Unrest, Ecomigration, Genocide, and War

Both of the prior links between global warming and violence focus on violence at the individual level. This third link focuses on larger groups of people—communities, tribes or clans, societies, and countries. This is a particularly complex set of phenomena. Emerging research from several disparate fields shows that rapid climate change often leads to dramatic increases in violence. There are several ways that rapid climate change (heating or cooling) can produce this group level effect. For example, in subsistence economies—which are primarily involved in herding, hunting, and/or agriculture— rapid changes in climate lead to a decrease in the availability of food, water, shelter, and other necessities of life. Depending on the level of social/political organization and resources, such shortages can lead to civil unrest and civil war, to migration to adjacent regions and conflict with the people who already live in that region, and even to genocide and war. Although it would be overly simplistic to blame the many bloody conflicts in Africa during the latter 20th and this first decade of the 21st century on climate change and environmental disasters, it also would be incorrect to ignore the role played by the economic hardships (including starvation) wrought by the prolonged droughts and resulting resource shortages in that region. Civil unrest, revolutions, genocidal wars, and regular wars require recruits and leaders who are willing to risk a lot in order to gain needed resources.

Historical research provides evidence that environmental disasters, many linked to relatively rapid climate changes, can lead to increases in group level violence. In the recent past, evidence of such effects comes from the U.S. Dust Bowl of the 1930s, clashes between Bangaldesh and India since the 1950s, and hurricane Katrina in the U.S. in 2005 (Reuveny, 2008). Similarly, rapid climate changes that occurred in Eastern China over the last millennium have been linked to warfare and dynastic change (Zhang et al., 2007). Further evidence of such

effects comes from a recent study of wars in Africa (Burke, Miguel, Satyanath, Dykema, & Lobell, 2009).

Implications

Collectively, these three ways in which global warming leads to increased human violence suggest a rather dire future. However, action can be taken. The most obvious is that the nations of the world need to get serious about reducing greenhouse gases. In addition to all of the technological and lifestyle changes being actively discussed, it also seems worthwhile to consider an infrequently discussed option, the potential benefits of better efforts at population control.

Perhaps less obvious are actions that could reduce the likelihood of climate change induced violence. There is some limited evidence that the heat/aggression effect on individuals can be reduced by simply making people aware that when they are uncomfortably hot they tend to react to minor provocations in inappropriately hostile ways. However, the immediacy and subtlety of the heat effect on irritability, hostile perception biases, and aggression makes it doubtful that such an educational intervention will have a large impact.

On the other hand, the other two ways in which global warming increases human violence appear to be good candidates for intervention. If governments began preparing now to feed, shelter, educate, and relocate at-risk populations to regions in which they can maintain their livelihoods and their cultures, we could dramatically reduce both the development of violence prone individuals and the civil unrest, ecomigration, and war problems. This will cost world governments huge amounts of money, and will require more international cooperation than our planet has ever seen. Failure to do so will result in additional disasters for millions of people.

References

Anderson, C.A., & Anderson, K.B. (1996). Violent crime rate studies in philosophical context: A destructive testing approach to heat and southern culture of violence effects. *Journal of Personality and Social Psychology, 70,* 740-756.

Anderson, C.A., Anderson, K.B., Dorr, N., DeNeve, K.M., & Flanagan, M. (2000). Temperature and aggression. *Advances in Experimental Social Psychology, 32,* 63-133. New York: Academic Press.

Anderson, C.A., & DeLisi, M. (2010). Implications of global climate change for violence developed and developing countries. Chapter to appear in J. Forgas, A. Kruglanski, & K. Williams (Eds.). *Social Conflict and Aggression.*

Burke, M.B., Miguel, E., Satyanath, S., Dykema, J.A., & Lobell, D.B. (2009). Warming increases the risk of civil war in Africa. *Proceedings of the National Academy of Sciences, 106: 49,* 20670-20674.

DeLisi, M. (2005). *Career Criminals in Society*. Thousand Oaks, CA: Sage.

IPCC, 2007. Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. & Hanson, C.E. (Eds.). *Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK.

Reuveny, R. (2008). Ecomigration and Violent Conflict: Case Studies and Public Policy Implications. *Human Ecology. 36,* 1-13.

Zhang, D.D., et al., 2007. Climate Change and War Frequency in Eastern China over the Last Millennium. *Human Ecology,* 35, 403–414.

Biography

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