



## Ecology and Political Upheaval

Small changes in climate can cause wars, topple governments and crush economies already strained by poverty, corruption and ethnic conflict By JEFFREY D. SACHS

**Careful study** of the long-term climate record has shown that even a minor shock to the system can cause an enormous change in outcome, a nonlinear response that has come to be called “abrupt climate change.” Less well recognized is that our social and economic systems are also highly sensitive to climate perturbations. Seemingly modest fluctuations in rainfall, temperature and other meteorological factors can create havoc in vulnerable societies.

Recent years have shown that shifts in rainfall can bring down governments and even set off wars. The African Sahel, just south of the Sahara, provides a dramatic and poignant demonstration. The deadly carnage in Darfur, Sudan, for example, which is almost always discussed in political and military terms, has roots in an ecological crisis directly arising from climate shocks. Darfur is an arid zone with overlapping, growing populations of impoverished pastoralists (tending goats, cattle and camels) and sedentary farmers. Both groups depend on rainfall for their livelihoods and lives. The average rainfall has probably declined in the past few decades but is in any case highly variable, leaving Darfur prone to drought. When the rains faltered in the 1980s, violence ensued. Communities fought to survive by raiding others and attempting to seize or protect scarce water and food supplies.

A drought-induced famine is much more likely to trigger conflict in a place that is already impoverished and bereft of any cushion of physical or financial resources. Darfur was also pushed over the edge by ethnic and political conflict, with ambitious, violent and unscrupulous leaders preying on the ethnic divisions. These vulnerabilities, of course, have not been unique to Darfur. Several studies have shown that a temporary decline in rainfall has generally been associated throughout sub-Saharan Africa with a marked rise in the likelihood of violent conflict in the following months.

Africa is certainly not alone in experiencing the linkages of climate shocks and extreme social instability. Rainfall shifts associated with El Niño cycles have had similarly cata-

strophic consequences. The massive 1998 El Niño produced huge floods off the coast of Ecuador, which destroyed a considerable amount of export crops and aquaculture. That led to a failure of loans to Ecuador’s already weak banking system, which in turn helped to provoke a bank run, an unprecedented economic collapse and eventually the ouster of the government. Halfway around the world the same El Niño caused an extreme drought in Indonesia, coinciding with Asia’s massive financial crisis. Indonesia’s drought and resulting food shortage contributed to financial and political destabilization and to the end of President Suharto’s 31-year rule. As in Ecuador, the short-term economic collapse was by far the largest in Indonesia’s modern history.

Climate skeptics who ask impatiently why we should care about “a degree or two” increase in the global mean temperature understand neither the climate nor the social and economic systems in which we live. Both climate and society are subject to great instability, nonlinear responses and high unpredictability. Climate changes may influence storms,

droughts, floods, crop yields, disease vectors and much more, well beyond what the current “average” forecasts suggest. And the resulting ecological effects, especially on societies already facing hunger or financial and political fragility, can be enormous and dire. Our public debates tend to neglect these powerful effects because we focus on politics and only rarely on the underlying environmental pressures.

Once we recognize the ecological risks to our economic well-being and even to our national security, we will begin to look much harder for practical approaches to mitigating the pressures that our global society is now placing on the earth’s ecosystems. We will then need to increase our preparations for the intensified shocks that are surely on their way. The intertwined strategies of mitigation and adaptation will be the topics of future columns. ■

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