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## update

## Climate wars

Links between climate and societal instability, conflict and war have increasingly been suggested and analyzed (Diamond 2005), thereby fusing traditionally distinct academic disciplines such as (bio-)geography, (agro-)ecology and economics, history and peace research. Studies exploring these relationships are particularly pertinent in times of anthropogenic climate change.

Recent research has provided quantitative support for such climate–culture linkages, but most of these studies have either been based on correlative evidence (e.g., Zhang et al. 2007), analyzed short-term climate fluctuations (e.g., Burke et al. 2009) or addressed specific hypotheses on the causes of human conflict (Beck and Sieber 2010). However, in order to make conflict predictions under climate-change scenarios reliable and to engage in conflict prevention or mitigation, it is important to be certain about causal relationships and to fully understand the mechanistic links between past climatic changes and historical conflicts. Two new studies have attempted this.

Hsiang et al. (2011) made use of the recurring yet irregular El Niño Southern Oscillation (ENSO) climatic changes as a natural experiment. This allowed them to show, on a global scale and for a time period of more than half a century, that (within the same localities and societies) civil conflicts were more likely to arise during El Niño events as compared to La Niña periods. Furthermore, no such effect was observed for countries outside the ENSO-affected zone of the world. This provides strong evidence that climate is indeed causal to these events. However, the authors can only speculate on a variety of mechanisms for how (warmer and drier) El Niño periods could lead to conflict. Effects mediated by decreased agricultural productivity and/or economic disturbance (e.g., resulting from increases in natural disasters

and diseases) seem plausible, but psychological effects of unusual weather conditions on a large number of individuals may also increase a society's conflict potential.

Zhang et al. (2011) presented a detailed causality analysis based on a time series of climatic fluctuations over a 300 year period in pre-industrial Europe. They provide strong support for the idea that climatic variation caused fluctuations in agricultural productivity, and hence food availability and prices. The latter was identified as the root cause for a number of societal phenomena such as migrations, epidemics, population growth and war. A temperature-based model based on these mechanisms could successfully predict periods of crisis and harmony for past eras with less-detailed historical records.

An important future direction of research in this field will certainly be the identification of natural factors and societal traits that explain variation around such climate-determined patterns. Demography and economic performance have sometimes been analyzed in this context (Samson et al. 2011, Hsiang et al. 2011). However, it will require the further integration of the above-mentioned disciplines to sort out the ultimate causes of why certain regions and/or societies navigated smoother and less violent routes through times of crisis than others (my current location, Switzerland, is a prime example within the last few centuries).

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## update

### Emerging research opportunities in global urban ecology

Biogeographers have examined how human activities have affected patterns of biological diversity from a variety of perspectives, with special attention often given to oceanic islands. With the current accelerating pace of environmental change, these effects are increasingly evident at global scales. Human industry, commerce, agriculture and transportation all have the potential now to affect natural systems globally through an assortment of drivers; primary among these are land-use change, species introductions and climate change.

Human activities and their consequences come to a unique focus in urban areas, an expanding form of land use that is attracting increasing research attention from ecologists (Grimm et al. 2008). Urban areas contain similar environmental conditions worldwide and act as a focal point for species introductions and extinctions. These human-dominated environments offer unique opportunities to investigate the broad-scale dynamics of human-mediated biotic interchange (La Sorte et al. 2007), its consequences for  $\beta$  diversity (La Sorte et al. 2008) and the regional factors and biological traits associated with native species extinctions (Hahs et al. 2009, Duncan et al. 2011).

Urban areas typically contain spatially heterogeneous collections of native and non-native species (McKinney 2008); these unique assemblages can be examined based on their compositional (Niemelä et al. 2002) and phylogenetic structures (Ricotta et al. 2009). Three nested sampling approaches are currently used to investigate urban systems at broad spatial scales: urban plots or transects, the entire urban matrix and the urban matrix embedded within a regional context (Werner 2011). Each sampling approach provides a unique inferential basis, although the third allows for more refined interpretation, controlling for regional differences.

A recent study in *Global Ecology and Biogeography* adopts a novel perspective and examines how avian assemblages sampled within plots of intact vegetation in urban and semi-natural areas differ based on several common macroecological relationships. Pautasso et al. (2011) compiled data on species composition and abundance from all around the globe, although the majority of the samples are from Europe and North America. A primary finding of the study was a lack of evidence for differences in the species–area, species–abundance or species–biomass rela-