Thinking back to look ahead

Throughout history human societies have had to confront and adjust to climatic and environmental hazards. A long-term perspective that draws on such experiences must inform today's climate policies, argue **Jago Cooper** and **Christian Isendahl.**

Scenarios, projections, pathways. Understandably, there's a lot about the future in the assessments of the Intergovernmental Panel on Climate Change (IPCC). We would like to plan for the changes to come, both anticipated and unanticipated, and not leave future generations too much to do. Such planning could benefit immensely from looking at past human experience of climate and environmental change. Strangely, the IPCC does not consider this aspect in any meaningful way. Policymakers are thus deprived of valuable context in which to interpret the assessment; they also miss out on the lessons offered by the interactions between past societies, their environments and climate.

We argue that climate policies aimed at mitigating and adapting to hazards should be informed by our knowledge of past human experience. Archaeologists, environmental historians and others are slowly building a rich archive of cases that consider diverse spatial and temporal contexts. It is apparent from these efforts that the insights into social-ecological relationships provided by archaeological cases transcend their immediate contexts. The archive is particularly suitable for understanding how small but cumulative changes might affect social-ecological systems. It could help us to go beyond simplistic analogies by elucidating those factors that build long-term resilience and those that introduce vulnerabilities. We expand on this by considering some key aspects relevant to mitigation and adaptation.

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Civil engineering

It is tempting for societies to counter natural hazards by investing in infrastructure such as, for example, dams and reservoirs to counter rainfall variability, levees to protect against sea-level rise or terraces to avoid erosion. The archive of past human experience shows, however, that engineering solutions to counter hazards have triggered unforeseen and often fatal long-term consequences.

For example, the Hohokam of the Southwest United States invested heavily in infrastructure so as to mitigate the impacts of short-term climate variability; local population densities increased as a result. The network of canals (Photo 1) and dams they built ran to some 700 kilometres in length with over 100,000 acres of irrigated land – the largest known system in the pre-Columbian Americas. However, this water management

Photo 1: Artist Michael Hampshire's rendition of the Hohokam settlement at Pueblo Grande, Arizona. An elaborate network of irrigation canals can be seen in the background. Photo of painting courtesy of The Pueblo Grande Museum, Phoenix, Arizona.

system was ill prepared to handle lower-frequency, extreme-weather events (for example, prolonged droughts and flash floods that knocked out the irrigation system), which ultimately proved catastrophic and led to a dramatic decline in the population (Hegmon *et al.* 2008).

A key lesson from such case studies is that the focus on frequently occurring but low-impact hazards often renders societies vulnerable and at increased risk to events that occur rarely but can deal body blows. This understanding of trade-offs should inform risk assessments of modern infrastructure projects.

Settlement locations and architecture

Pre-Columbian settlements in the Caribbean islands occupied the leeward sides of hills. In contrast, subsequent European-influenced settlements are found in river valleys and the mouths of estuaries. As a result the modern inhabitants are left exposed to extreme wind shears, coastal storm surges and post-cyclone flooding – hazards that the earlier settlements were far more resilient to. The cities of Phoenix and Mexico City are built in locations where their Ancestral Puebloan and Aztec ancestors also had large towns and cities and remain vulnerable to similar hazards. A long-term perspective was clearly lacking when these settlements came up, but it should not be ignored in future urban planning. Although large-scale movement of populations from urban areas is not feasible, planners should guard against the unwitting expansion into vulnerable locations.

The Zimbabwe plateau provides an example of how decisions about future urban settlements could benefit from understanding the drivers of past urbanisation. The pre-colonial settlement system in Zimbabwe had been one of self-organising landscapes with relatively short-lived farming communities, sometimes lasting only a few decades. The colonial towns of Bulawayo and Harare were established by clearing pre-existing farming communities via taxes; the process was aided by the availability of cheap energy to fuel transport systems. Energy is no longer cheap, and the increasing costs associated with securing its supplies call for alternative strategies to post-colonial cities: for example, distributed networks of smaller scale urban settlements. The strategy of "urbanizing the rural areas and ruralizing the urban areas" (UN-Habitat 2009) may help to buffer

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Photo 2: Urban farming in Coney Island, New York.

against the stresses on urban dwellers and systems. Instead of increasing investments that conserve the colonial structure and tend to challenge long-term sustainability, planners need to consider fostering diversity by re-enacting a dispersed, less-energy-intensive settlement system.

Current architectural planning seeks to enhance the capacity to withstand impact. One example is the increased use of expensive, imported concrete and steel for building in the Caribbean. Many past societies, however, developed successful long-term strategies that focused on anticipating locally specific hazards and increasing the speed of recovery. For example, pre-Columbian house structures in Cuba have lightweight wall and roof structures built around robust, deeply embedded hardwood house posts. Following a hurricane the wattle wall and thatch roof structures can be rebuilt quickly from locally available and freely accessible materials (Cooper 2012a). Such examples support the adoption of alternative architectural philosophies – as reflected in recent thinking on disaster management (Watson and Destefano 2010, Amaratunga and Haigh 2011) – focused on resilience rather than fortitude in the face of extreme-weather events.

We need to re-imagine the city as a place where food can be grown.

Food security

In today's globalised world our food tends to take a long route from farm to table, relying on international trade routes that pass through several bottlenecks. Sudden disruption of such delivery systems – via climate change or political volatility – can severely affect the food security of particular regions. Case studies from pre-Columbian Cuba, Southwest United States and Central America suggest that the more resilient societies relied on food from diverse sources that were secured via robust social relationships.

For example, the food consumed in pre-Columbian settlements in northern Cuba was sourced from offshore reefs and coastal and upland areas spanning ecological niches up to 50 kilometres from the individual settlements. These food supply systems were built around reticulate trade and exchange networks that were underpinned by community cohesion and the sedentary nature of the populations over the long term (Cooper 2012b). This approach meant that there was an inherent capacity to cope with short-term systemic shocks and the disruption of particular supply routes.

The archaeology of urban food systems provides additional insights into the scale and management of urban farming and its importance in increasing food security in cities – both in times of crisis and in energetically inefficient distribution systems. For example, urban farms in the

An Applied Archaeology for Future Earth

In April 2014 an international group of archaeologists met in Austin, Texas, to discuss case studies covering ten millennia of human experience of climate variability and environmental change. The presentations focused particularly on research linked to the Integrated History and Future of People on Earth (IHOPE) project and the Global Human Ecodynamics Alliance (GHEA). Both IHOPE and GHEA seek to combine insights from human and Earth-system history to inform efforts to achieve global sustainability. In Austin the group also spoke to the interim secretariat of Future Earth to explore ways of communicating insights generated from research to a wider community and highlighting its relevance to policy. Archaeologists integrate the human, social and natural sciences to provide a long-term perspective on human-environment interaction; they are thus well placed to contribute to the evaluation of key aspects of socio-ecological systems.

pre-Columbian Aztecs and Maya highlight the benefits of alternative city planning that successfully bridged the current divide between rural food production and residential urban consumption (Isendahl and Smith 2013). The city dwellers' knowledge of farming practices not only maintained resilience but also bestowed on the community an autonomous sustenance capacity at times of political turmoil and breakdown.

It is becoming apparent from case studies across the world that agricultural production was an integral part of urban living until increased globalisation kicked in. This suggests that we need to re-imagine the city as a place where food can be grown (Barthel and Isendahl 2013) (Photo 2).

Implications for governance

Addressing the aspects discussed above depends ultimately on effective governance practices. Considerations of scale are particularly important. People experience the impacts of hazards at the highly personal and localised scale. Disaster management and planning, though, are increasingly centralised: many local communities have less leeway in devising their own responses. Large-scale governance is unavoidable in today's world where hazards are regional and often transcend political boundaries. However, the archaeological record supports empowering local communities to enhance the success of mitigation measures.

A host of case studies of water-management systems, for instance in the Southwest United States and the Maya, demonstrate that infrastructural solutions for sustainability induced by larger-scale governance institutions impose high maintenance costs and generate trade-offs or backlashes: these in turn undermine longer term sustainability.

The power of the past is not just in providing tangible case studies that capture the public's imagination, demonstrate the impact of climatic and environmental change and communicate the real vulnerability of societies both past and future. It is also the thematic lessons it provides that can help reconceptualise issues of risk, vulnerability and resilience that are so relevant as we look towards disaster risk reduction post-2015. This is why knowledge from the past is crucial to help create a better future Earth.

Empowering local communities enhances the success of mitigation.

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This commentary draws on discussions at a recent meeting involving Future Earth and the IHOPE and GHEA projects (see box).

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