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Policy piece

Modelling the effects of climate change in Africa

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In this issue of the African Journal of Ecology, we have put together a few papers related to climate change modelling (Platts, Omney & Marchant, 2015; Padonou *et al.*, 2015; Walther & van Niekerk, 2015). The Intergovernmental Panel of Climate Change (IPCC) report on the potential effect of human induced climate change on Africa states that ‘Africa as a whole is one of the most vulnerable continents due to its high exposure and low adaptive capacity’ (Niang *et al.*, 2014). The panel concludes that:

1 Evidence of warming over land regions across Africa, consistent with anthropogenic climate change, has increased.

2 African ecosystems are already being affected by climate change, and future impacts are expected to be substantial.

And that under the Special Report on Emissions Scenarios (SRES) A1B and A2, which assume continued rapid economic development and population growth, the following effects will occur:

1 Mean annual temperature rise over Africa, relative to the late 20th century mean annual temperature, is likely to exceed 2°C by the end of this century.

2 A reduction in precipitation is likely over northern Africa and the south-western parts of South Africa by the end of the 21st century.

However, whilst the warming trend is clear, the world’s climate system is complex, so future projections are fundamentally laced with uncertainty. So much so, that ‘climate chaos’ is a better way of describing what is happening to the earth’s weather patterns rather than ‘global warming’ (Wirth, 1989). It is not just a question of being warmer, there is strong evidence globally for increased frequency of weather extremes such as heat-waves and rainstorms (Coumou & Rahmstorf, 2012) and it is these spikes that can have catastrophic ecological and social consequences.

The difficulty of translating climate modelling into policy is illustrated by the infamous ‘climategate’ affair just prior to the 2009 conference of the parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen, when emails obtained by hacking into the University of East Anglia’s Climate Research Unit were publically released. Scientists dealing with the inherent uncertainty of climate modelling were accused of making the data fit their own political agendas (Grundmann, 2012), and although the modelling approach used in the IPCC policy documents was ultimately vindicated (Brumfiel, 2006; Wahl, Ritson & Ammann, 2006), it wasted a great deal of scientific time and money of research groups working on scant resources under terrific pressure. The scandal also undermined the public credibility of climate science, just at a time when we needed confidence to alter the unsustainable behaviour that has led to our current problems.

So how should we interpret the ecological implications of climate modelling? It is clear that species and biome distributions are largely determined by climate: deserts are in areas of low rainfall, and tropical rain forests are exactly that forests in high rainfall areas in the tropics. But equally we know that climate projections are uncertain and are necessarily simplistic representations of a dynamic system with extremes. The other papers in this issue also illustrate some of the ecological complexities that underlie these broad patterns. Human-mediated management regimes are a major determinate of species distribution and diversity (Attia *et al.*, 2015; Habtemicael, Yayneshet & Treydte, 2015), but so are densities of megaherbivores such as elephants (Ndoro *et al.*, 2015). In areas prone to flooding, waterlogging affects species dominance (Naidoo & Naidoo, 2015), and toxic algal blooms associated with an interplay between nutrient loads of water flow could have major effects on aquatic life (Mankiewicz-Boczek *et al.*, 2015). Even more difficult to include in models is the role of fine-grained habitat heterogeneity (Plavsic, 2015), as it is not just the effect of one species on another that can determine the presence, absence and population density, but also the spatial arrangement of resources within the potential range of a species.

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In translating our work into policy, it is beholden on the African ecological scientific community to present decision-makers with realistic, evidence-based information on the relationship between climate and ecology. To do otherwise risks losing our credibility, which we can ill afford to do when so much is at stake.

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