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Geomorphology and the consequences of global climate change

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Popularist accounts, mediated through the lens of the physical science community behind the successive reports of the Intergovernmental Panel on Climate Change, see a direct linkage between global climate changes and their impacts on passive human populations. Conversely, at the same time, there has been a huge research effort directed towards understanding land use and land cover changes caused by human activity, the associated impacts on land surface processes, ecosystem services and biodiversity, and their feedbacks on climate. In reality, however, global environmental change is mediated through, and by, four large-scale drivers which go beyond these two approaches to the global change problem: the globally-scaled controls of hydroclimate and sea level; the spatially and temporally discontinuous impacts of direct human activity; and the spatial context provided by topographic relief. These drivers are not all active in every landscape system and their relative importance varies between environments and biomes. An important task for geomorphology, at the spatial scale of 1 – 10 000 sq km and over timescales of decades to centuries, is to provide an alternative perspective on patterns of landscape vulnerability, akin to those already produced by ecosystem science and conservation biology. In meeting this challenge, geomorphology needs to focus more strongly on how knowledge gained from intensively studied small scale systems - typical of the Anglo-American process-based geomorphology of the last half century - to the time and space scales associated with adaptive strategies to climate change. Furthermore, geomorphology needs to promote an understanding of core geomorphological principles within the wider scientific community, emphasising the fact that landscape change under climate change is unlikely to be simply progressive and linear; highlighting the variable magnitude, mode and timeframes of morphological adjustment (responsiveness) from different geomorphic elements; identifying the key uncertainties in landscape responses; and promoting better-informed, landscape-based decision making. Ultimately, a geomorphology for the 21st century should have a strong underlying focus on making communities more resilient to the effects of climate change, particularly in helping those who are the most vulnerable and least able to cope with a rapidly changing environment.