

Team discovers important interaction between land use and climate change in driving species distribution shifts

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Climate change is altering where species live all over the planet. With global warming, species are moving towards the poles and up elevation where temperature is lower. However, along with global climate change, the world is also experiencing massive changes in land-use which may also impact where species live. Could both of these forces be influencing current changes in species distributions?

Fengyi Guo, an MPhil student in the School of Biological Sciences at the University of Hong Kong (HKU), decided to explore this question with her adviser Dr Timothy Bonebrake (HKU) and Dr Jonathan Lenoir, a Junior Research Scientist at the National Center for Scientific Research (CNRS) in France. Their findings, recently published in *Nature Communications*, highlight the importance of land-use change, which interacts with [climate](#) change to drive species distribution shifts along elevation. By reanalyzing data on 2,798 elevational range shifts of plants and animals across 43 sites globally, they found that species shifts tend to be constrained by surrounding forest cover. In cooler regions of the world, species shift at lower rates with increasing forest loss. Conversely, in warmer regions like the tropics, the shift rate is accelerated with intensive deforestation.

The results of this research have several implications for understanding global change impacts on biodiversity. An emphasis on climate change for understanding how species change their distributions has been

important in recent years but must be understood in the context of land-use change as well. Additionally, the results show that tropical species may be especially vulnerable to the dual effects of climate and land-use changes. Finally, how species respond to both habitat loss and changing climates should be considered carefully for effective conservation and management of biodiversity.

Increasing documentation of evidence for species redistribution under climate change in recent years made this research possible. "While the importance of land-use change for climate-driven species shifts has long been recognized, how land-use change is important or to what extent it affects species redistribution was never fully appreciated" noted Miss Guo. "Most of the studies we reviewed in this work stated that land-use remained unchanged over time while the data suggested otherwise and our results showed that these changes may have important implications."

Dr Bonebrake added further that "this work also sheds light on possible [climate change impacts](#) on the species of Hong Kong - while warming may be causing species to shift their distributions here, both forest recovery in country parks and forest loss from development in recent decades may hinder our ability to detect changes as species distributions shifts will be a consequence of multiple interacting human impacts".

Overall the research emphasizes how species must contend with multiple human impacts on the natural world. While some species may be able to move (and do move) in response to [climate change](#) and/or land-use change, others may not. Those [species](#) that are unable to respond effectively to warming or habitat loss face a high risk of extinction.

Provided by The University of Hong Kong

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