RANGE SHIFTS

Soils set limits

Ecol. Lett. https://doi.org/10.1111/ele.13416 (2019)

Credit: Imagebroker / Alamy Stock Photo

Plant and animal ranges are expected to shift towards cooler areas such as the poles or higher elevations under climate change. However, despite their more favourable climates, other characteristics of these new habitats might be less advantageous for expansion. For example, soil type changes with climate and with elevation on mountains, which might affect range shifts for plants.

With warming-induced elevation shifts, trees are expected to infringe upon meadows and meadows on bare soils. Kevin Ford and Janneke HilleRisLambers from the University of Washington, USA, investigated the impact of climate and soil on the ranges of meadow and tree species by transplanting seedlings and different soil types along a climate gradient on Mount Rainier (USA). Climate and soil type affected the establishment of the transplants. Although responses differed among species, meadow soil was generally more favourable than bare ground under the more benign conditions expected with climate change, indicating that meadows may shrink faster owing to expanding forests than they can expand upwards.

These results highlight the importance of non-climatic factors in determining the adaptation capacity of species under climate change. *AF*

https://doi.org/10.1038/s41558-019-0651-1

ENGINEERING

Vulnerable bridges

PLoS ONE **14**, e0223307 (2019)

Bridges in the United States and around the world are both ageing and deteriorating through a combination of increased demand and inadequate maintenance. Little is known about how individual components and overall bridge performance are likely to be affected by future thermal stress from climate change.

Susan Palu and Hussam Mahmoud of Colorado State University, USA, evaluate the vulnerability of 89,089 supported steel girder bridges, by far the most common bridge design in the United States, under the combined effect of accumulated debris and dirt in the expansion joints and elevated temperatures due to climate change. Each bridge was evaluated in terms of the structural performance of the main girders under RCP 2.6, 6.0 and 8.5 scenarios and with alternative debris types. They find that bridges located in the Northern Rockies and Plains, the Northwest and the Upper Midwest are most at risk, regardless of the scenario. For a 1 °C increase in temperature, the integrity of the bridges is reduced by 2%. Other aspects of bridges will be impacted by climate change, and further work is needed to prioritize repair and maintenance. *AY*

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CLIMATE ADAPTATION

Nudge to flood insurance

Behav. Public Policy https://doi.org/10.1017/bpp.2019.31 (2019)

As climate change increases the frequency and severity of extreme weather events such as hurricanes, more households will be exposed to flood risks. Despite the high costs of recovering from flooding, many people do not purchase flood insurance, and are thus unprotected. This is consistent with a general tendency to neglect low-probability risks when making decisions.

Jacob Bradt from Harvard University, USA, tests whether behavioural science principles could be leveraged to design an effective intervention that would increase consumer demand for flood insurance. He found that participants who read a description of US coastal flooding projections due to climate change, plus a description of damages from salient tropical cyclones that recently affected the United States, and saw images of coastal flooding were willing to pay about US$21 per month more for flood insurance than participants receiving a brief training designed to aid in the interpretation of risk probabilities. These results suggest that information that elicits an affective response and prompts consideration of relevant recent events can nudge respondents toward more risk-aware adaptation decisions. *JR*

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HYDROCLIMATE

Long live water vapour

Atmos. Chem. Phys. **19**, 12887–12899 (2019)

The residence time or lifetime of atmospheric water vapour conveys the time and distance travelled between evaporation and subsequent precipitation. But how it responds to different climate drivers is not well understood, feeding into climate model uncertainty in hydroclimate change.

Øivind Hodnebrog of the CICERO Center for International Climate Research, Norway, and co-authors in Europe, the United States and Japan study this through climate models. They isolate the response of water vapour to greenhouse gases (carbon dioxide, methane), aerosols (black carbon, sulfate) and solar radiation. They also compare the fast response — the immediate adjustment of water vapour to the presence of a climate driver — with the slow response after surface temperature equilibrates. Water vapour lifetime increased by about 25% in a high-emissions scenario, and black carbon showed the highest impact, particularly in the fast response. These results highlight the role that black carbon emissions can play in the hydrological cycle and give insight into future water vapour lifetimes and the associated circulation cells that transport moisture from source to sink. *BL*

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