

POLITICAL SCIENCE

Local governance

Glob. Environ. Polit. **14**, 107–129 (2014)

Urban policy measures can significantly contribute to the reduction of global carbon dioxide emissions given that 50–80% of those emissions come exclusively from cities. However, the success of subnational initiatives hinges on the extent to which they spread across municipalities.

Based on annual data, Lukas Hakelberg, of the European University Institute, Florence, Italy, analysed the impact of transnational municipal networks (TMNs) on the adoption of local climate strategies across 274 European cities over the period 1992–2009. He found that networks significantly helped the spread of local strategies across cities in Europe. In particular, statistical results show that learning processes, among TMNs members, led to strategy adoption. Therefore, municipal networks should be part of a polycentric governance system to tackle climate change. However, the analysis also showed that TMNs do not successfully influence the laggards among their constituencies, which mainly use membership in TMNs to signal engagement with climate strategies but do not actually fulfil their commitments. *MC*

CRYOSPHERE

Trickledown effect

J. Glaciol. **60**, 205–214 (2014)

Approximately 20% of Antarctic ice shelves have collapsed since the 1970s, with hydrofracturing — where water enters through tiny crevasses and pushes the ice apart — thought to be the cause.

Peter Kuipers Munneke, of Utrecht University, the Netherlands, and

co-workers use a firn (an ice–air matrix of partly compacted snow) model to study the long-term processes leading to iceshelf collapse. Increased temperatures are increasing surface melt and thus water is available to enter the firn at the ice surface, where it refreezes. This process does not weaken the iceshelf. However, once all of the air has been displaced by the refrozen meltwater over a number of years, the iceshelf is susceptible to water entering and causing hydrofracturing, and ultimately collapse.

Firn air depletion is found to be a top requirement for hydrofracturing but it does not necessarily indicate that a collapse will occur. Climate-model projections suggest many more iceshelves could collapse in the next 200 years, however some could be protected by increased snowfall. *BW*

CLIMATE IMPACTS

Warming by degrees

Climatic Change <http://doi.org/rcw> (2014)

Projected impacts of climate change under different levels of warming help policy makers set mitigation targets and plan adaptation. Unfortunately, there is little empirical and modelling evidence in support of these relationships. This is largely an artefact of the way that climate impact models developed — until recently, nearly all incorporated emissions-based scenarios with associated socio-economic assumptions that cannot be scaled to different levels of temperature change.

Nigel Arnell, from the Walker Institute, University of Reading, UK, and co-workers undertook a spatially explicit assessment of the global impacts of climate change on water resources, river flooding, coasts, agriculture,

ecosystems and the built environment associated with different levels of global mean temperature in 2050. Climate uncertainty was explored using a 21-member model ensemble, but response uncertainty was not similarly investigated, as this would be a very large task.

The relationships between global mean temperature and indicators of climate change impact developed in this work can be used to start quantifying previously qualitative representations of the impacts of given levels of climate change. In addition, impacts in data-poor regions can be estimated and response functions developed for use in integrated assessment models. *AB*

HYDROLOGY

The rains are coming

Earth's Future <http://doi.org/rdq> (2014)



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Precipitation is expected to become more extreme under climate change. Understanding of extreme rainfall trends and expected changes will allow — with planning and adaptation — the avoidance of damage and loss. The historical and projected trends in extreme precipitation in the contiguous United States are investigated by Emily Janssen, of the University of Illinois, USA, and colleagues, through the use of observations and models from an intercomparison project (CMIP5).

They find that there has been an overall increasing trend in extreme precipitation events from 1901 to 2012. Generally this has been a gradual increase with more statistically significant increasing trends in the eastern US. The model simulations show a lower, but still increasing trend, which underestimates extreme events compared with observations. Looking at model projections suggests further increases in extreme precipitation frequency in a high-emission scenario. This needs to be considered carefully, given the knowledge that the model tends to be on the low side of observations. *BW*

Written by Alastair Brown, Monica Contestabile and Bronwyn Wake.

ECOLOGICAL IMPACTS

Size matters

Glob. Change Biol. <http://doi.org/rcx> (2014)

Large trees constitute an important component of forest ecosystems, providing shelter and nest sites for wildlife and contributing disproportionately to forest carbon storage. As the temperature increases, trees can suffer because of declining water availability and escalating respiration and tissue maintenance costs that cannot be matched by enhanced photosynthesis.

Using 500,000 measurements of eucalypt growth from temperate Australia, Lynda Prior and David Bowman, from the University of Tasmania, Australia, investigate the relative sensitivity of large trees to increasing temperature. They found that, compared with 11 °C, growth rates at a mean annual temperature of 21 °C were 57% lower for large eucalypt trees and 29% lower for small ones. This suggests that high temperatures impose a greater growth penalty on the larger trees. The authors argue that the reduced growth rates expected in a warmer world will impede recovery from extreme events, exacerbating the effects of increased drought stress, and more frequent fire incidence, on the tall eucalypt forests of Australia and the ecosystem services they provide. *AB*