

## RADIATIVE FORCING

### Earth's energy balance

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The energy balance of the Earth, and therefore the climate system, can be considered in terms of the net imbalance between absorbed shortwave radiation and outgoing longwave radiation at the top of the atmosphere. Positive values indicate that the energy is being added to the climate system, which can manifest as warming of the surface or in the oceans. Increased knowledge of the energy imbalance is needed for understanding the climate system, events such as the recent slowdown in warming and future potential warming rates.

Richard Allan of the University of Reading, UK, and co-workers study satellite data, atmospheric reanalyses and global climate model simulations to

reconstruct and investigate changes in the top-of-the-atmosphere net downward radiative flux imbalance. The authors consider the changes for 2000–2012 relative to 1985–1999 and find that there is a larger imbalance in the recent period —  $0.62 \pm 0.43 \text{ W m}^{-2}$  compared with  $0.34 \pm 0.67 \text{ W m}^{-2}$ . The reconstructed energy balance is able to capture interannual variability, for example, changes due to the Mount Pinatubo eruption and natural climate cycles such as El Niño/Southern Oscillation. The finding for 2000–2012 highlights that surface warming can slow down even with a positive energy imbalance as a result of changes in ocean heat uptake. BW

## AGRICULTURE

### Demand–supply pinch

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The greatest climate change impacts on agriculture are not expected until towards the end of the twenty-first century. However, the greatest growth in food demand is expected in the next 20 years. This demand growth creates a potential pinch point in which relatively small-magnitude climate change impacts could pose significant challenges for food security.

David Lobell from Stanford University and Claudia Tebaldi from the National Center for Atmospheric Research, US, estimate global wheat and maize yields over this critical period. They find that climate change increases the chance of climate trends causing a 10% yield loss over a 20-year period from less than a 1 in 200 chance — under internal climate

variability alone — to a 1 in 10 chance for maize and 1 in 20 chance for wheat. The probability of climatic conditions that halve yield trends over a 10-year period also greatly increased, with a roughly 1 in 4 chance for maize and 1 in 6 chance for wheat. Such impacts, while still relatively unlikely, may warrant further consideration in risk planning. AB

## ENERGY POLICY

### Financing clean energy

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Scaling up renewable energy can help achieve energy security, mitigate greenhouse-gas emissions and boost the economy. Therefore, financial schemes to support the adoption of clean energy are an essential part of wider economic and climate change policies.

In the United States, a novel initiative to finance clean energy-generation investments, known as Property-Assessed Clean Energy (PACE), was in place over the period 2008–2010. A. Justin Kirkpatrick and Lori S. Bennear of Duke University, USA, analyse the effect of PACE financing on the adoption of residential photovoltaic installations in California. Under the scheme, property owners obtain a loan from the local municipality and repay it through a property tax assessment. In this way, the assessment for repayment transfers to a new owner. The researchers analyse PACE programmes in Palm Desert, Yucaipa and Sonoma County, and find that they increased the adoption of photovoltaic installations by roughly 108% over the state average.

The transferability of financing and the effects of endorsement by municipalities on expected benefits are among the likely causes of the scheme's success. MC

*Written by Alastair Brown, Monica Contestabile and Bronwyn Wake.*

## SOCIAL SCIENCES

### Climate online discussions

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A democratic approach to environmental policy calls for communities' participation in policy development through open discussions. Online channels, including social media and blogs, can help understanding of the public's debate about environmental issues and be used to test policy tools.

Using concept mapping analysis, Nigel Martin of The Australian National University and John Rice of Griffith University, Australia, looked at 1,702 blog comments from 344 individuals to analyse the public debate around the creation and implementation of US climate policy following the re-election of President Barack Obama in November 2012. They compared discussions around a top-down (leadership from the US President) and a bottom-up (grass-roots activism from individuals) approach to climate policy. Overall, the findings show that debates focused much more on climate science consensus and uncertainty than the development of acceptable policy options. Political party positions emerge as additional barriers to public engagement with policy development. Finally, the results point to the risk of online discussions being dominated by individuals trying to promote their own agendas. Therefore online channels might need to be better designed to help develop broadly acceptable policy solutions. MC