

## RENEWABLE ENERGY

### Sharing the light

*Earth's Future* <http://doi.org/cf5m> (2017)



Credit: Derek Meijer/Alamy Stock Photo

Solar power is undergoing an explosion in capacity with costs falling rapidly. Nevertheless, large-scale deployment of conventional photovoltaic panels in the manner of 'solar farms' creates a land use trade-off with agricultural production.

Michael Loik from the University of California, Santa Cruz and co-authors describe a promising new technology that can generate electricity while allowing enough light transmission for crop production underneath. The 'windows' — called Wavelength-Selective Photovoltaic Systems (WSPVs) — absorb some of the blue and green wavelengths of the light spectrum (green light is typically not utilized by plants) by means of a dye that then transmits a portion to narrow solar panels within the windows. The remaining light, though altered, passes through where it can be utilized by plants for growth.

The technology shows great potential for integrating electricity generation and food

production in greenhouses, so Loik and colleagues investigate whether the 'window'-modulated light affects plant development and physiology. They found minimal effects on the number and fresh weight of fruit for a number of commercial crop species grown under WSPVs. For tomatoes, they even found a small decrease in water use compared with those grown in conventional greenhouses. These panels therefore seem to offer a promising way to decarbonize food production. **AB**

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## GLACIOLOGY

### Melting from below

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The stability of the Antarctic Ice Sheet and its potential contribution to global sea-level rise under climate change is uncertain. The East Antarctic, with greater ice mass, is thought to be more stable. However, the Totten Glacier, which includes the floating Totten Ice Shelf (TIS), has shown changes in its ice velocity, thickness and grounding line location.

To determine the drivers of changes in the TIS, Chad Greene from the University of Texas at Austin, USA, and co-authors use satellite images to generate a 14-year time-series of ice velocity and compare to oceanic wind stress calculated from reanalysis data. They show that wind stress causes upwelling of warm, salty water — modified Circumpolar Deep Water (mCDW) — further verified by in situ observations from the continental shelf. A 19-month time delay from upwelling to accelerated ice flow is apparent; this time is needed for mCDW to cross the continental

shelf, reach under the TIS, and cause melt to facilitate flow.

These results highlight that warmer ocean and air temperatures are not the only risk to glacial stability, with changes in surface winds potentially influencing ocean circulation, bringing warm waters into contact with ice shelves. **BW**

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## URBAN PLANNING

### Emissions reduction policy

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Credit: Westend61/Getty

Despite the Trump administration's withdrawal from the Paris Agreement, many large metropolitan regions in the US have expressed interest in continuing to pursue residential energy conservation and compact growth programmes that reduce CO<sub>2</sub> emissions.

To better understand the efficacy and feasibility of programmes targeting residential and transportation sectors, John Landis at the University of Pennsylvania and colleagues derive CO<sub>2</sub> emissions projections for 2030 for 11 US metropolitan areas under a series of policy scenarios; they vary the degree to which they impose residential energy conservation standards, promote compact growth, and encourage less automobile use. The programmes are further characterized in terms of their effectiveness and likelihood of generating opposition.

They show that residential energy conservation mandates across new and existing homes could reduce residential CO<sub>2</sub> emissions in 2030 by 30%. This approach is also seen as being cost-effective, scalable and generally resistant to pushback. Conversely, compact growth programs could reduce CO<sub>2</sub> emissions from cars by as much as 25%, but the reduction falls into the 0–7% range if not accompanied by aggressive efforts to reduce automobile use. These programmes have the potential to incur considerable political pushback. **AY**

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## TRANSPORTATION

### Reducing emissions

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Transport-related greenhouse gas emissions grew by 13.3% in the EU-28 during 1990–2014, contributing the second-highest volume of emissions after the energy sector. In order to design effective mitigation policies, it is necessary to understand the key drivers of this increase, particularly to achieve the objective of the European Commission Transport White Paper: a 60% reduction in transport emissions by 2050, relative to 1990. Lidia Andrés and Emilio Padilla from Universidad Autónoma de Barcelona, Spain, use a regression-based model to quantify the factors influencing European emissions from road, rail, and domestic aviation and waterborne transport, and in doing so, highlight strategies for future emission reductions. The authors outline that economic activity, transport volume, modal share, and energy mix all influence emissions in Western and Eastern Europe, but that the most variability is related to population and transport energy intensity. Policies targeting improved energy efficiency — replacing old vehicles, using high quality fuels, and infrastructure improvements — could therefore greatly reduce transport emissions. Future policies should additionally promote a shift from road to rail, and from oil-based fuels to electricity. These results provide effective solutions to meet the aims of the Transport White Paper. **GS**

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