

New approaches to low-carbon innovation in China

From the project 'Low Carbon Innovation in China: Prospects, Politics and Practices'
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Introduction

There are significant overlooked opportunities regarding low-carbon transition in China, with potential global impact. This leaflet summarises research which has looked at three areas of low carbon innovation in the country – agriculture, energy and transport. It explains how they depend not just on high-tech solutions, but also on changing social and political conditions.

Dramatic and rapid reductions in greenhouse gas emissions are needed to stay within 2°C scenarios. How can the radical, global transformations in the systems that shape the production and consumption of energy be achieved?

Given the size of its emissions and economy, China is central to achieving such transformations. Its UN climate commitment (INDC) has set ambitious targets for cutting carbon emissions. Innovation is crucial to achieving these targets, but our research

indicates current dominant understandings of innovation do not provide sufficient support.

Innovation today is mostly described in terms of 'high-technology' – a narrative that resonates in China with the political imperative for 'indigenous innovation' (*zizhu chuangxin*) as a driver for national competitiveness and growth.

Our research offers a different understanding of innovation, with findings from three key domains of low-carbon innovation in China: solar-generated energy, electric urban mobility, and food & agriculture.

READ MORE: Tyfield, D., Ely, A., and Geall, S. (2015) *Low Carbon Innovation in China: From Overlooked Opportunities and Challenges to Transitions in Power Relations and Practices*, *Sustainable Development* 23(4): 206-216



Limits of high-tech solutions

Chinese and international low-carbon innovation policies – and the approach taken by the UNFCCC technology mechanism – focus almost exclusively on high-technology innovation.

However, low-carbon transitions are complex and dynamic processes that are both technological and *social*. Therefore, it is necessary to pay attention to:

1. Social and political issues changing in parallel with new technologies, with these shaping each other in turn (investigated in terms of changing power relations).

2. The widespread use of technologies that are not 'high-tech', but are significant for carbon reductions (investigated in terms of social practices).

Both of these concerns are particularly important in China, where society continues to change at extraordinary pace and where cheaper, lower-tech innovation – including solar water heaters, electric bikes and agro-ecological farming – is often of greater significance, as much of China remains relatively poor.

Low-carbon policies: bottom-up and top-down

Tackling climate change is high on the Chinese central government agenda, but this does not necessarily translate into successful, top-down coordinated action.

Policy tends to target the global competitiveness of the largest and most technologically advanced state-owned enterprises.

However, these dynamics often compromise innovation, with half-hearted adoption of high-level government projects, especially where these top-

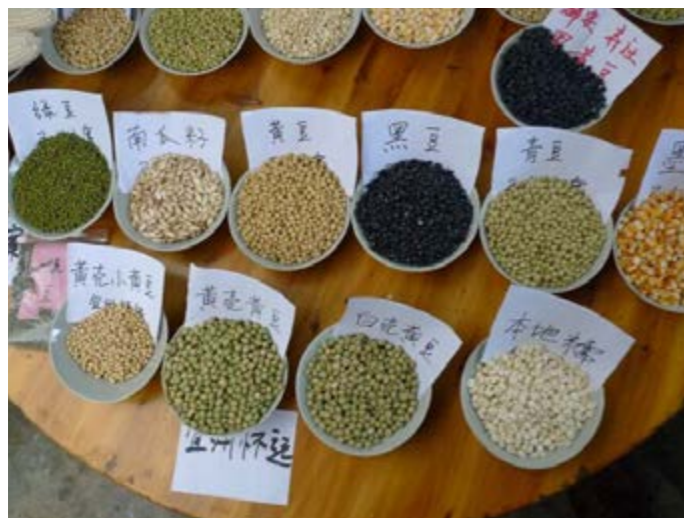
down directives do not align with fast economic growth.

Furthermore, growing citizen participation in environmental affairs, crucial for achieving the momentum behind any low-carbon transition, has been largely overlooked.

Our research suggests the state could deploy its significant resources to give transformative support to accelerate innovation in existing bottom-up, and often 'low-tech', innovation successes in China.

READ MORE: Tyfield, D., Ely, A., Urban, F., Geall, S., Zuev, D., Urry, J. (2015) *Low-carbon innovation in China: prospects, politics and practices*. STEPS Working paper 69

Geall, S. 2013 (ed) *China and the Environment: The Green Revolution*, London: Zed Books



Agriculture: Low-Tech and High-Tech

The dominant focus of state support for low-carbon innovation in Chinese food and agriculture has been the development of genetically modified crops as a potential component of intensive, high-input agriculture and livestock systems. An example is phytase maize, an 'indigenous' Chinese innovation that is intended to increase energy efficiency in meat supply chains and reduce phosphorous pollution.

High levels of public anxiety about food safety and significant political disagreement, however, seem to have taken the government by surprise, creating significant delays in the commercialisation of this crop.

At the same time, 'lower-tech' but overlooked alternatives exist. They include low external input and organic community-supported agriculture (CSA) farms around first-tier cities; and new (digital) networks connecting farmers and consumers that have encouraged seed saving and traditional forms of seed exchange.

These examples illustrate how changing *social* relations may significantly help to avoid the high-carbon lock-ins and rebound effects likely to result from greater intensification of China's existing livestock system.

READ MORE: Ely, A., Geall, S. and Song, Y. (2014) *Pathways Towards Sustainable Maize Production and Consumption in China: Prospects, Politics and Practices*. STEPS Working Paper 72

Ely, A., Geall, S. & Song, Y. (2015) *Transgenic versus Agro-ecological Approaches for Sustainable Agri-food systems in China: Prospects, Politics and Practices*, in Sausmikat, N. (Ed.) *Sustainable Agriculture in China: Land policies, food and farming issues*, Stiftung Asienhaus

Energy: Technology and Society

China has become the world's largest investor, producer and exporter of solar photovoltaics (PV); an intellectual property- and research-intensive industry that the Chinese government has centrally supported.

Yet systemic barriers to the installation of solar PV modules remain, many of which are *social* rather than technological. These include policies that have assumed

higher levels of knowledge/know-how and monitoring capacity than currently exists. Policies also assume property rights, or rights of access to roof-spaces for installation, that often do not apply.

Conversely, in the often-neglected case of solar water heaters, China has the world's largest installed capacity. In this case, fewer barriers exist, as this 'disruptive' technology is more compatible with existing social practices, so it is more actively and widely adopted.

READ MORE: Urban, F. and Geall, S. (2014) *Pathways Towards Renewable Energy in China: Prospects, Politics and Practices*. STEPS Centre Working Paper 70

Mobility: Demand and Supply

Electric cars and electric bicycles have received radically different treatment in China. The former has been the focus of ambitious industrial policy, while the latter has received effectively no government support, and is officially banned in many localities.

Electric bicycles (also known as electric two wheelers, E2Ws) are, however, effectively ubiquitous in Chinese cities, numbering some 180 million on recent estimates, while electric cars are struggling to achieve sales beyond programmes of government procurement.

The key but overlooked challenge is to develop a vehicle that has unquestionable market appeal *and* lies at the centre of a new system of urban mobility. It must appeal to intensely competitive status aspirations, while being sufficiently inexpensive to be widely accessible.

A key opportunity exists for the Chinese state to throw its weight behind the development of a new model of urban mobility based upon (indigenous) E2Ws and their further innovation into new, compact, lightweight and 'smart' vehicles.

READ MORE: Tyfield, D., Zuev, D., Li, P. and Urry, J. (2014) *Low Carbon Innovation in Chinese Urban Mobility: Prospects, Politics and Practices*. STEPS Working Paper 71

Tyfield, D. (2014) *Putting the Power in 'Socio-Technical Regimes' – E-Mobility Transition in China as Political Process*, *Mobilities* 9(4): 479-492

Systems and connections

A systemic transition is required in how China eats, moves, and heats and powers its homes. Our research has revealed some of the complex interdependencies involved in such changes.

Our research found that a greater focus on wider options beyond high-tech are needed: on the dynamics of bottom up vs. top down change; on social aspects; and ultimately on the practices of everyday life.

This perspective, attentive to issues of changing power relations and social practices, can improve understanding and strategic insight regarding low-carbon transition, and highlight how China could enhance its significant promise and opportunity in this respect.



About the project

The project '**Low Carbon Innovation in China: Prospects, Politics and Practice**' is led from Lancaster University and is a collaboration between British and Chinese researchers to investigate different models of innovation and their potential role in low carbon transitions. The project is funded by the Economic and Social Research Council (ESRC).

For more information visit:

steps-centre.org/project/low-carbon-china

Twitter: @lowcarbonchina

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