

The role of society in energy transitions

A research agenda that integrates understanding of the social processes with technical analysis of climate and energy systems is necessary to catalyse a transition to a low-carbon world.

Humans emit about 30 billion tonnes of CO₂ each year through energy consumption, electricity distribution lines criss-cross more than 75 million kilometres of the earth, and companies trade nearly 1.4 billion tonnes of coal annually. Yet although the effect of energy-related emissions on the climate is well explored, the role that society plays in shaping these systems remains poorly understood.

Decades of research has produced some fairly well-established strategies to reduce the energy sector's greenhouse gas emissions. Policymakers know that pursuing a low-carbon agenda will ultimately mean moving away from coal-based electricity production, increasing renewables' share of the energy mix, and nudging economies along sustainable paths rather than replicating old modes of carbon-intensive development. Such strategies focus on altering the processes of energy production to cut emissions, often overlooking the role of people that comprise communities with an endless appetite for energy.

To redress this, *Nature Climate Change* and *Nature Energy* present a joint Collection on Energy, Climate and Society (<http://www.nature.com/energyclimatesociety>). It brings together scholarly perspectives on how sociological, political and technological research can be incorporated into problem-centred research, how people and society can be conceptualized in this context, and how these can feed into strategies to engage the public on climate and energy issues.

Sovacool and colleagues (*Nature Clim. Change* <http://dx.doi.org/10.1038/nclimate3027>; 2016) argue that one of the key challenges for this agenda is to overcome the “stylized assumptions” of human behaviour that can be found in many policy analyses in the field. Data-driven theories of social interactions should replace these simple representations, to illuminate the inflexibility of people's energy choices. This means developing understanding of how risk, social networks and governance can influence the pace of transition to a low-carbon future.

Rai and Henry (*Nature Clim. Change* <http://dx.doi.org/10.1038/nclimate2967>; 2016) describe how agent-based modelling can be used to explain how the actions of



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a disparate set of social actors can produce outcomes of importance to the global climate. This approach contrasts with one of the most common means of simulating the social impact of climate change and energy policies that seek to address it — integrated assessment models. Geels and colleagues (*Nature Clim. Change* <http://dx.doi.org/10.1038/nclimate2980>; 2016) suggest a ‘bridging’ approach to align these models’ behavioural assumptions with socio-technical analyses and action research.

Wong-Parodi and colleagues (*Nature Clim. Change* <http://dx.doi.org/10.1038/nclimate2917>; 2016) argue that such tools must be embedded in a decision-science approach. They say that by engaging a broad spectrum of researchers and participants, climate-friendly energy policies can be formulated that are both realistic and respectful of the constituents they seek to aid.

Incorporating social and behavioural research into problem-centred technical assessments also requires a deeper understanding of how humans interact with energy systems. Paul Stern and colleagues (*Nature Energy* <http://dx.doi.org/10.1038/nenergy.2016.43>; 2016) suggest that this means realizing households are more complex than the two-dimensional rational units that they are often assumed to be. They outline the important role of non-financial factors such as identity, status and social norms on households’ energy choices.

Recognizing this complexity also means re-conceptualizing the role people play in the transformation of energy systems, Schot and colleagues argue (*Nature Energy*

<http://dx.doi.org/10.1038/nenergy.2016.54>; 2016). They discuss how consumers can be more than passive energy users, and act as stakeholders engaged in the development of new social routines around energy use.

Embracing these perspectives allows decision-makers to formulate new ways to engage the public on climate and energy issues, ultimately encouraging society towards low-carbon behaviours. Sovacool and colleagues argue (*Nature Energy* <http://dx.doi.org/10.1038/nenergy.2016.24>; 2016) that this could be through reframing energy issues as matters of justice, using concepts such as due process, transparency and equity to influence energy practices. Or it could be through altering the processes of public participation in formal energy decisions, such as constructing wind farms. Bidwell explores how problem definitions, degrees of inclusion, and the allocation of authority can influence public engagement and dictate the success of such projects (*Nature Energy* <http://dx.doi.org/10.1038/nenergy.2016.51>; 2016). Keohane and Victor (*Nature Clim. Change* <http://dx.doi.org/10.1038/nclimate2937>; 2016) outline how political research can similarly help drive the decentralization of climate policymaking, improving the institutional structures established to catalyse change in this arena.

Around 25% of global greenhouse gas emissions come from the production of heat and electricity, according to the IPCC. The International Energy Agency expects demand for energy to grow by about one-third by 2040, even if countries adopt new low-carbon policies. At the same time, energy sector emissions are expected to grow by around 16%. If countries are going to keep their pledge to prevent the world warming by more than 2 °C above pre-industrial levels, it's clear that something is going to have to change.

At the heart of this change will be people, as agents of change rather than abettors of stasis. But catalysing change requires a better understanding of how society interacts with the energy systems at the core of its activity. The joint Collection aims to provide the foundations of an integrated research agenda to map, illuminate and construct the path towards a low-carbon world. □