Climate change mitigation: modelling socio-politically feasible pathways

Webinar series "Net zero, can we get there as a society?"

Webinar "Accounting for the Social dimension in planning the transition"

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Current practice in energy systems models

- There is a wide variety of energy system models, at different scales, supply and/or demand, with different focuses in temporal, geographical, technological, economic detail
- Energy planning has focused mostly on energy supply due to the difficulty of modelling future changes in demand – yet end-use services have been the predominant driver of energy supply expansion (Grubler, 2013).
- Policy makers and policies remain outside the model structure; political factors rarely included but changes in economy are sometimes
- Societal responses are sometimes represented by adding detail on societal heterogeneity in responses to policies and the importance of the roles of different actors
- Challenges to including more detail on the demand side include:
  - a limited evidence base
  - the need for interdisciplinary input
  - the difficulty of representing associated rebound and spillover effects (Sorrell et al., 2020)

The research gap – calls for improvements in energy systems modelling

- Research on deep decarbonisation that leads to *'the development and implementation of policy strategies that are both cost-effective and sociopolitically feasible'* (Geels et al., 2017)
- Research that explores the "dynamic political feasibility space" that covers decarbonisation pathways for which all costs, including social and political costs, could realistically be borne (Jewell & Cherp, 2020)
- '*Innovative and practical methodologies are required to provide the means to enact transitions. Currently, the field of integrative research does not appear to meet this challenge in a practical sense'* (Hirt et al., 2020)
- '*Integrating insights from social sciences into models endogenously…can be done only when truly robust, generalizable, and quantifiable evidence from empirical research and model validation are successful'* (Trutnevyte et al., 2019).
- Climate and energy policies sometimes fall short of delivering positive social outcomes as well as climate goals (Lamb et al., 2020)

Six essential capabilities for energy transition models (Köhler, Holtz & Kubeczko, 2018)

Capability requirement	Details
Representing non-linear behaviour	Variations of the rate of change and other dynamics through which the end-state of the transition is not proportional to changes in the initial state.
Representing qualitatively different system states	As new elements are included, old ones are dropped, elements might adapt, and interactions between elements are reconfigured.
Representing societal changes	Changes in social values and norms, and in decision making structures.
Representing diversity and heterogeneity	Heterogeneity is especially impactful within groups of actors (end users, energy sector companies…) and within stocks of technologies.
Representing dynamics at and across different scales	Spatial, temporal, functional (e.g. economy, policy, science), institutional (e.g. constitutions, laws and directives)
Incorporating open processes and uncertainties	Contingencies, including unpredictable events such as the development of radical innovations and highly impactful political decisions.

Growing number of socio-technical models

- A transitions model for sustainable mobility (Köhler et al., 2009)
- A model of technological innovation systems (Walrave & Raven, 2016)
- Socio-technical regime transitions modelling (Papachristos, 2011)
- A dual-narrative modelling approach of socio-technical transitions in India (Moallemi et al., 2016)

The BLUE model (Behaviour Lifestyles and Uncertainty Energy) includes uncertainties due to sector- and actor-specific behavioural elements, including:

1. market heterogeneity
2. intangible costs and benefits
3. hurdle rates
4. replacement rates
5. refurbishment rates
6. demand elasticity

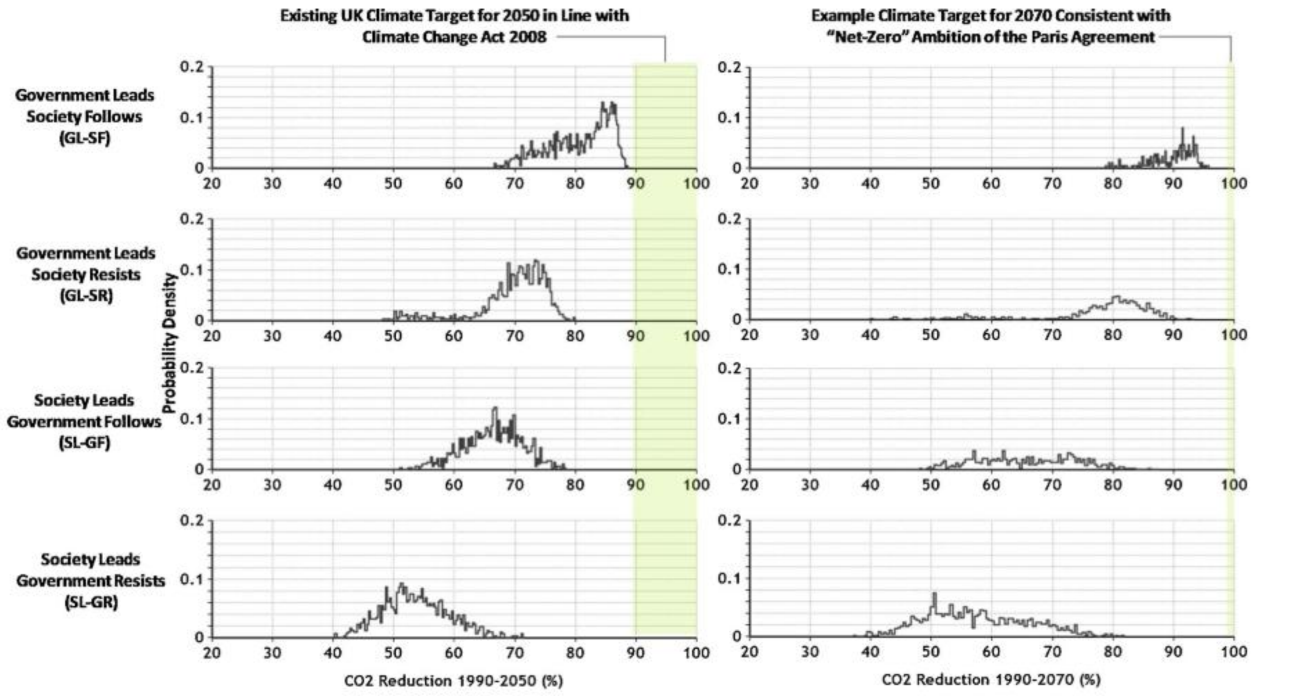
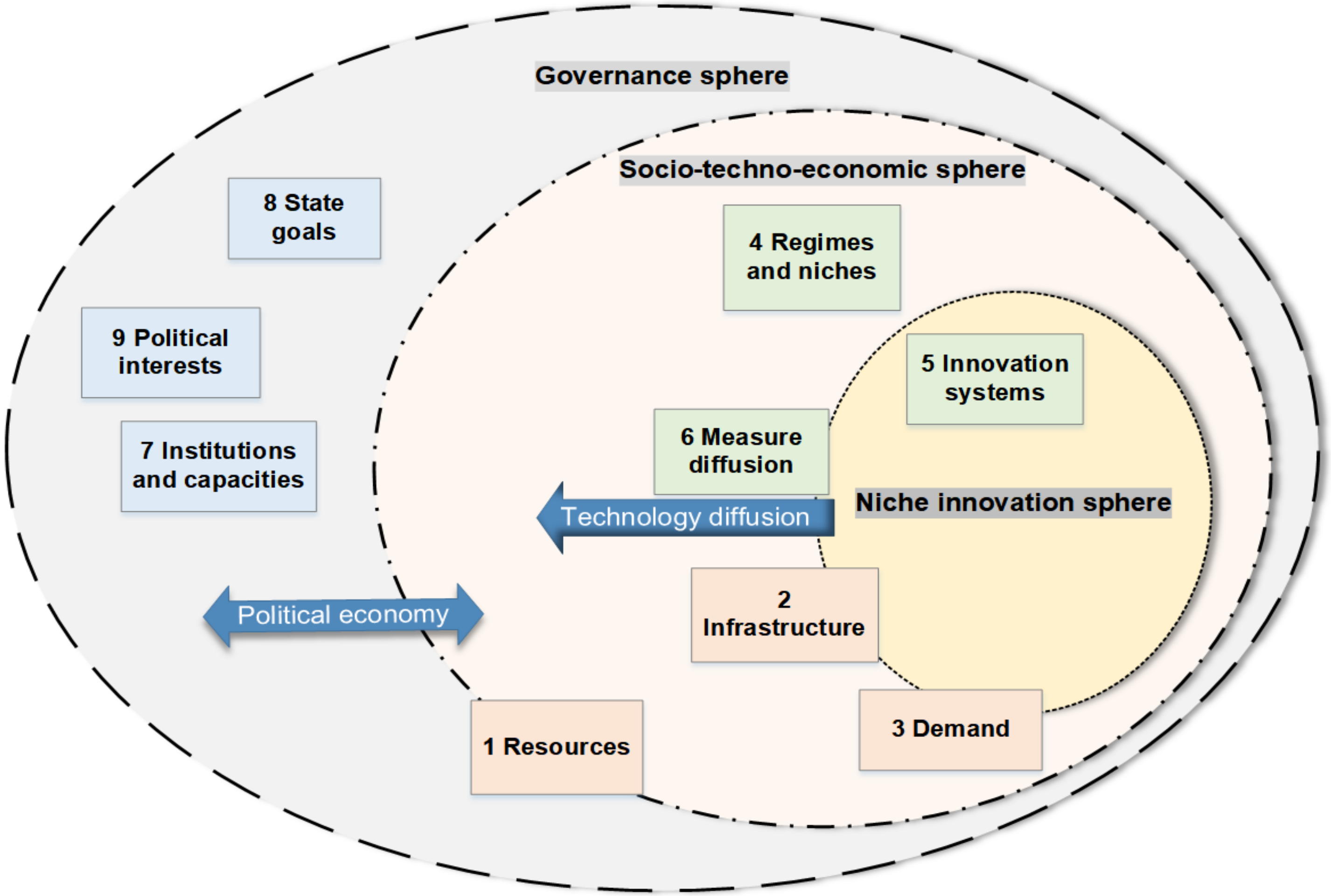


Fig. 8. Emissions reductions against climate targets for the year 2050 and for the year 2070 in different transition scenarios (n = 500 simulations

Li, F. G. N. and Strachan, N. (2019) 'Take me to your leader: Using socio-technical energy transitions (STET) modelling to explore the role of actors in decarbonisation pathways', *ERSS*.

TEMPEST (Technological EconoMic Political Energy Systems Transition) Foundational map

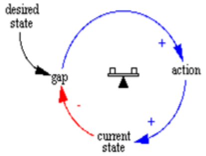
TEMPEST is being developed as part of the OSTET project at UCL – Operationalising Socio-Technical Energy Transition modelling



TEMPEST structure

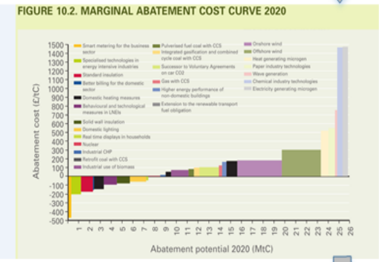
The word “measure” is used to indicate any change in technology, behaviour, or other factor that leads to energy and/or emissions reductions, on the demand or supply side of the energy system

National: Target setting and tracking



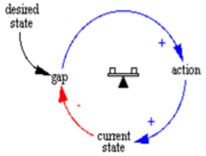
Balancing loop improves government targets to respond to climate science, reaching a maximum target (NZ)

Planners: Policy making and planning



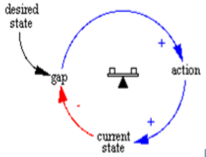
Imperfect choice engine forecasts the potential for mitigation measures and monitors policy outcomes, adjusting policies to meet targets

Industry, households: Measure development and implementation



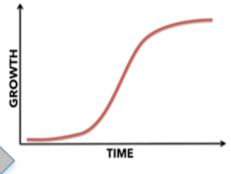
Balancing loop runs until mitigation actions in society meet planners’ goals

Measure development adds new mitigation potential until no more is required



Potential feeds implementation

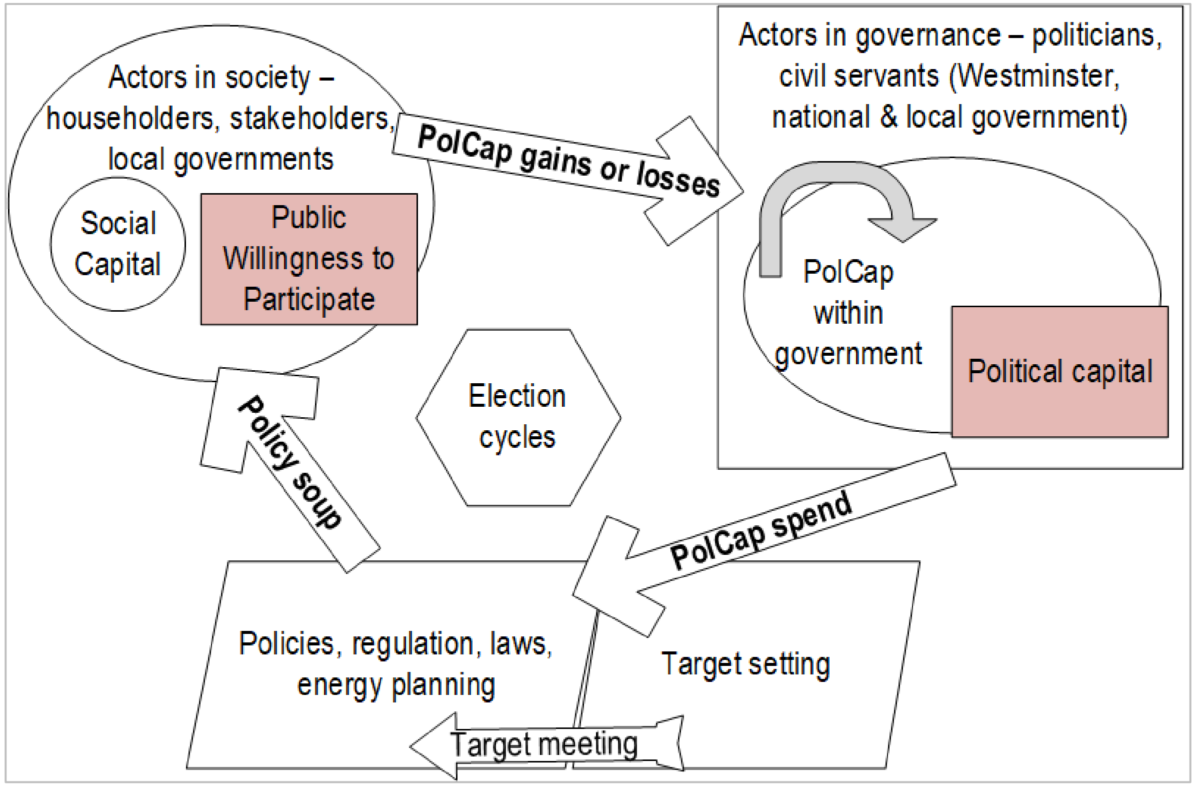
Measure implementation of potential leads to emissions reductions across sectors



Responses from society can increase or decrease policial capital, based on targets, measures, and policies

Political capital and societal responses

- Government can't act directly (except in its own estate); it governs those in society who do act (households, energy industry, public sector, private sector)
- Political capital (PolCap) can be spent on leadership in energy transition
- Social capital ("ability to act") plus an "imperative to act" creates "public willingness to participate" (PWP)



Quantifying values not previously measured in TEMPEST

- Political capital, public willingness to participate, novelty and difficulty of measures, user impacts, not usually quantified
- New ordinal measurement scales set minimum and maximum values as events or trends identified in the historical review as being the most extreme (e.g. the worst or best, the largest or smallest)
- Similar to the Celsius scale based on water: 0°C (freezing) and 100°C (boiling), with units as equal divisions of distance between the extremes
  - Example low PolCap: energy efficiency policies cutbacks in 1987, with policies constrained to those not interfering with the market
  - Example high PolCap: support for building a nuclear power industry, with over Bln£16 government support (1980 to 2005)
  - Example low PWP: political backlash against the full rate of VAT being added to domestic energy bills, change abandoned
  - Example high PWP: FIT scheme had high participation, had to close early due to lack of funds

Social science contributions

- Political economy studies should deepen understanding of the processes of improving environmental protection, so that they can be balanced with other pressing issues such as economic restructuring and changes to welfare systems (Meadowcroft, 2005)
- Empirical and quantitative studies are needed to improve understanding of the coevolution of energy technologies and politics (Schmidt & Sewerin, 2017)
- Social science could provide more insights about how the changes needed within the ‘avoid-shift-improve’ framework (Creutzig et al., 2018) can be achieved at wide scale:
  - avoiding demand for energy services (travel less)
  - shifting to more efficient modes of energy services provision (public transport or active travel)
  - Improving energy services through higher efficiency of technologies (electric vehicles, high efficiency trucks)
- Open question: How much could measures proposed in the planning towards net zero affect energy service provision across society, in terms of: convenience, affordability, safety, health, reliability, trustability, controllability, ownership models, sense of progress, peer status, other social impacts…and are these changes politically feasible?

TEMPEST early results

- Behavioural influences on energy demand in the past (1980 – 2019) have caused negative savings, but we may be reaching peak consumption (e.g. indoor temperature, passenger-km/capita, electrical appliances per household)
  - Efficiency and technology improvements are expected to achieve much higher reductions in emissions in future
- High amounts of political capital will be needed to implement wide-ranging changes to achieve net zero up to 2050
  - Possible that events not endogenous to the energy system may have a deciding impact
  - Societal responses to measures causing disruptions/changes to everyday life are uncertain
- Fast and effective technology development in the UK and internationally will play an important role in the rate of mitigation achieved
  - links to COP26 and other international agreements
- Modelling shows net zero is achievable between 2054-2079, but only if exogenous influences on the energy system are favourable and there are no major shocks to reduce political capital

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By Ross Lydall @Ross

Source: Morningsta

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Mythbusters: eight common objections to LTNs – and why they are wrong

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Taking a U-turn on road measures risks a traffic accident

Posted on November 1, 2020

Some people are taking to the streets in Upper Norwood today to protest against the traffic-calming Low Traffic Neighbourhood initiative.
But as an investigation by environment correspondent PAUL LUSHION has discovered, their campaign is supported and funded by motoring lobbyists and opportunistic Tory careerists

The battle for hearts and minds (and votes) is stepping up over the Low Traffic Neighbourhood in and around the Croydon streets bordered by the A215 South Norwood Hill, A212 Church Road, A214 Anerley Road and the railway line between Norwood Junction and Anerley.

Vandalism of the planters around the LTNs in South Norwood and Upper Norwood still occurs. This was one scene yesterday

Introduced in the summer through funding from the Conservative government and Transport for London, the aim of the LTN was to cut out dangerous rat-running traffic and provide safer, quieter streets to encourage and enable people of all ages to walk and cycle through it.