Capturing technological disruptions and behavioural change in long-term energy scenarios

Charlie Wilson

3rd International Forum on
Long-Term Scenarios for the Clean Energy Transition

10 June 2021

Tyndall Centre
for Climate Change Research

International Institute for Applied Systems Analysis
IIASA

NAVIGATE
Next generation of advanced integrated assessment modelling to support climate policy making

SILCI
Social Influence and *disruptive* Low Carbon Innovations

erc European Research Council
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1. There is good empirical evidence on behaviour change (which is more than just activity reduction).

Activity =
total amount 'consumed'
e.g., less °C, less meat, fewer p-km

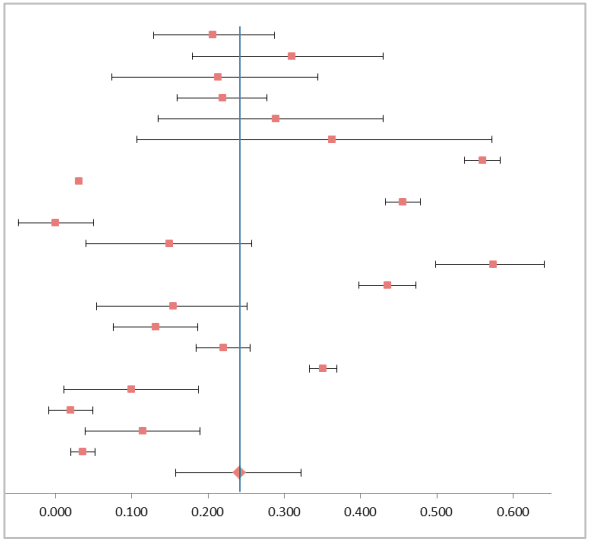
Structure =
mix of different forms of activity
e.g., mixed use buildings, modal shift

Intensity =
efficiency of each form of activity
e.g., heat pumps, line drying, EVs

Ivanova et al. (2020). "Quantifying the potential for climate change mitigation of consumption options." *Environmental Research Letters* 15(9): 093001.

2. Social dynamics explaining behaviour change can be modelled (alongside technology & market dynamics).

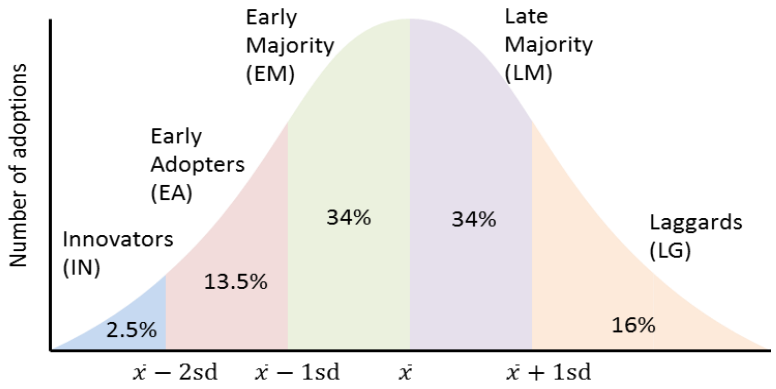
uptake rates?

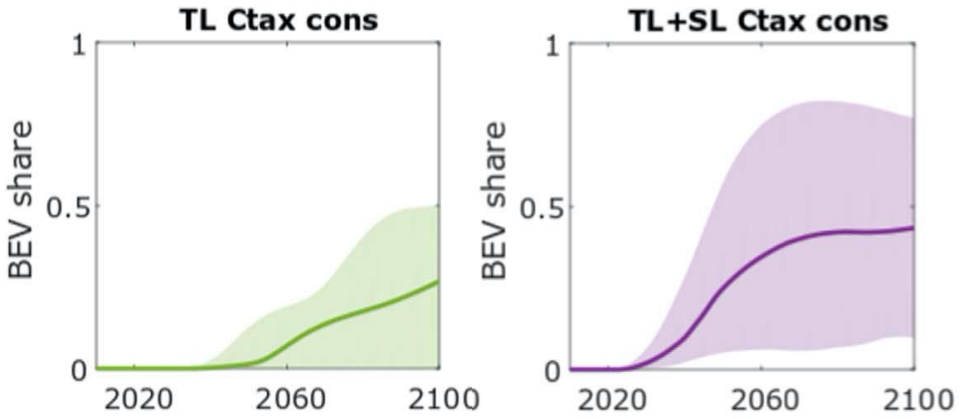


meta-analysis of 20+ empirical studies of **social influence on vehicle choice**

Pettifor et al. (2017). "Social influence in the global diffusion of alternative fuel vehicles – A meta-analysis." *Journal of Transport Geography* 62: 247-261.

diffusion is a social process (Rogers 2003)

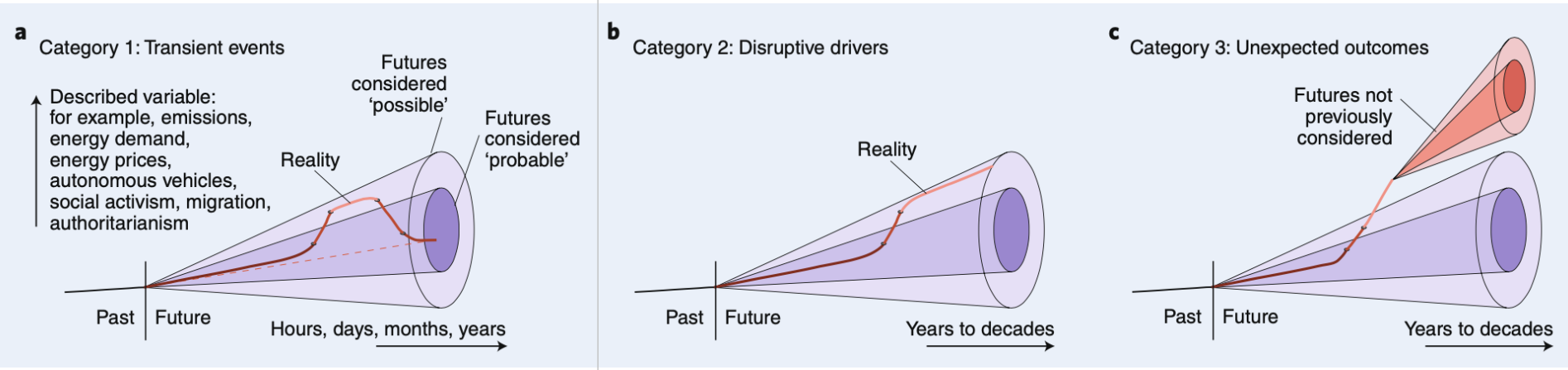




social learning (SL) parameterised alongside technological learning (TL) in global modelling

Edelenbosch et al. (2018). "Interactions between social learning and technological learning in electric vehicle futures." *Environmental Research Letters* 13(12): 124004.

3. More disruptive social dynamics are important for net-zero, but weakly captured in long-term scenarios.



McCollum et al. (2020). "Energy modellers should explore extremes more systematically in scenarios." *Nature Energy* 5(2): 104-107.

social tipping elements =
"*contagious processes of rapidly spreading technologies, behaviors, social norms, and structural reorganization*"

SOCIAL TIPPING ELEMENT	*Example Intervention*	Estimated Time Needed to Trigger Tipping (years) <5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
FINANCIAL MARKETS	*divestment*	■							
INFORMATION FEEDBACK	*GHG disclosure*	■							
DECENTRALISED ENERGY	*community mobilisation*		■						
HUMAN SETTLEMENTS	*net-zero cities*		■	■					
LOW-CARBON ENERGY	*subsidy regimes*			■	■				
EDUCATION SYSTEM	*climate education*			■	■				
NORMS & VALUES	*moral recognition*							■	■

Adapted from Otto et al. (2020). "Social tipping dynamics for stabilizing Earth's climate by 2050." *Proceedings of the National Academy of Sciences* 117(5): 2354.

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