Transport for Humans

How can we electrify social change?

Pete Dyson

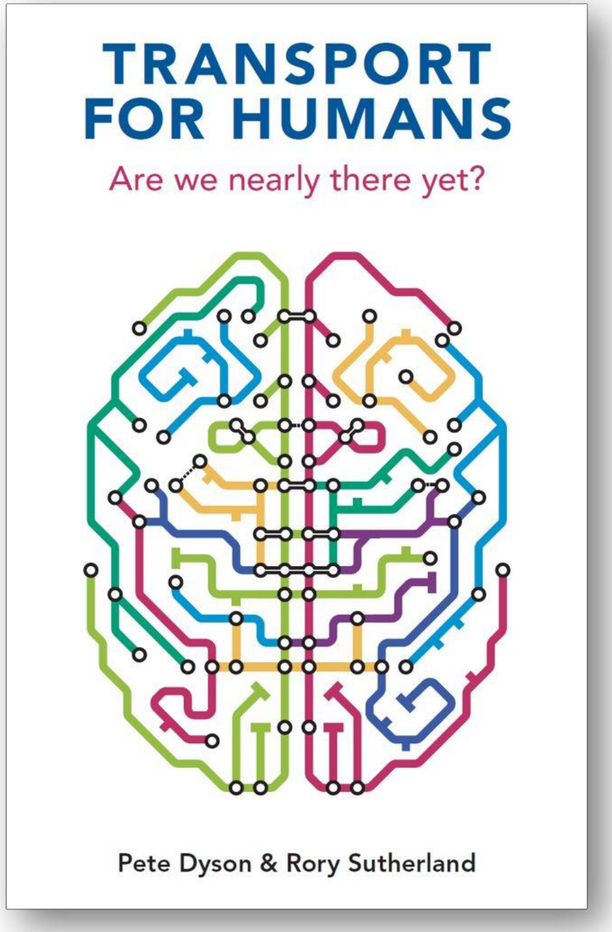
University of Bath

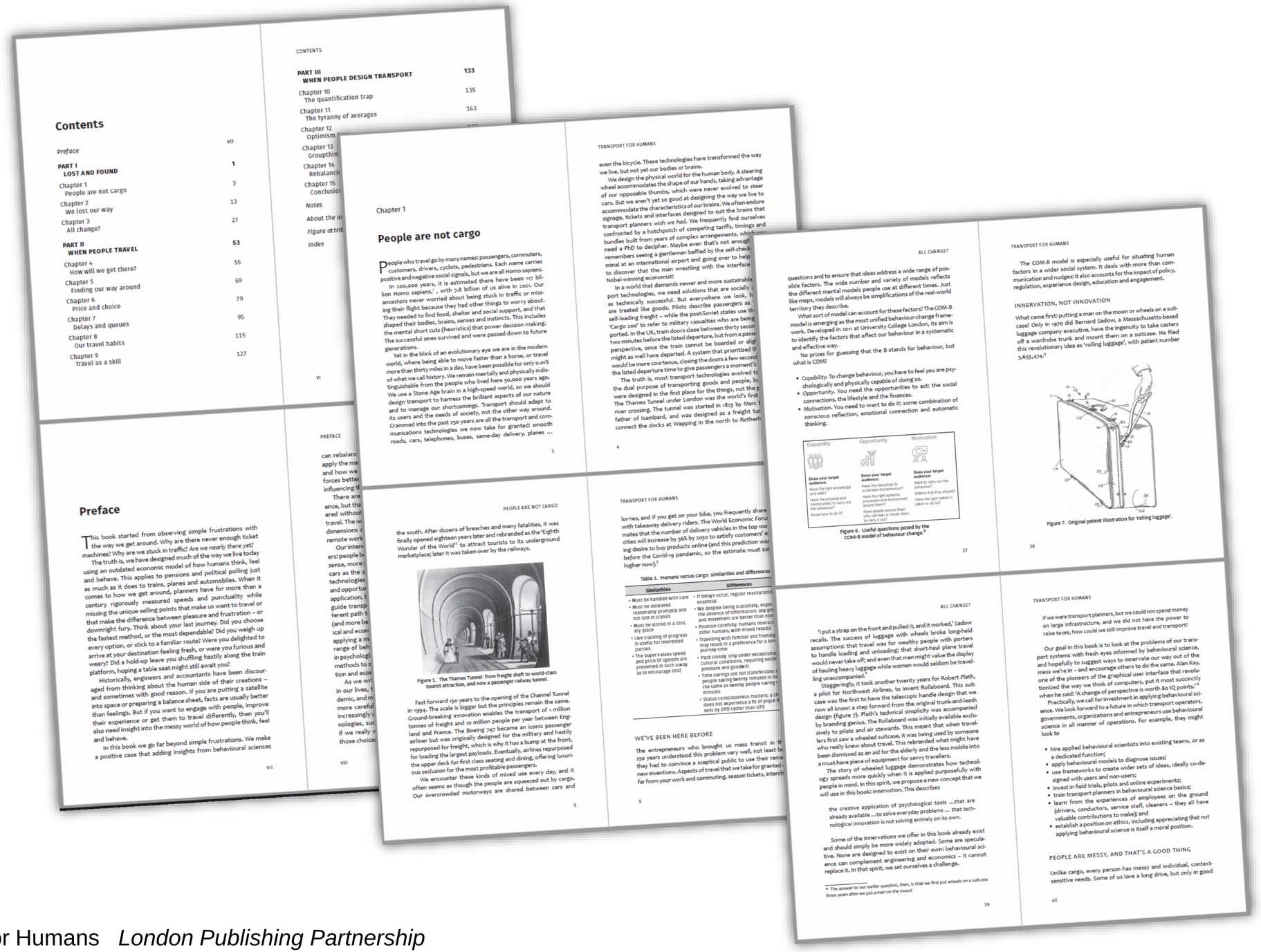
FPC2025
Future Propulsion Conference

AAPS CENTRE FOR DOCTORAL TRAINING

UNIVERSITY OF BATH

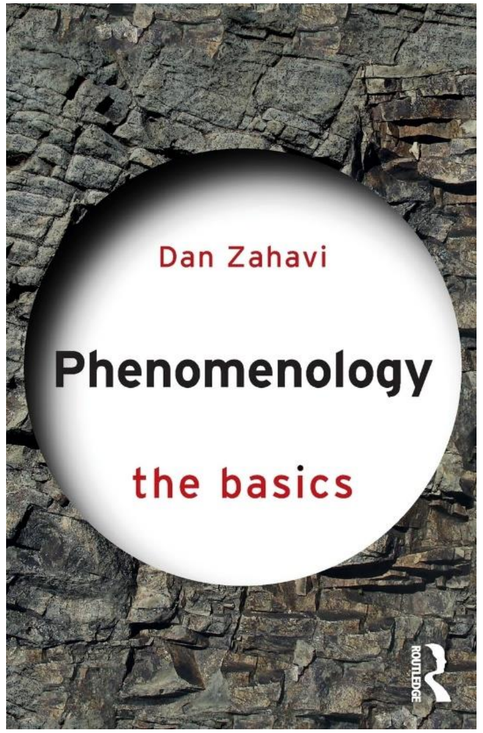
UKRI Engineering and Physical Sciences Research Council





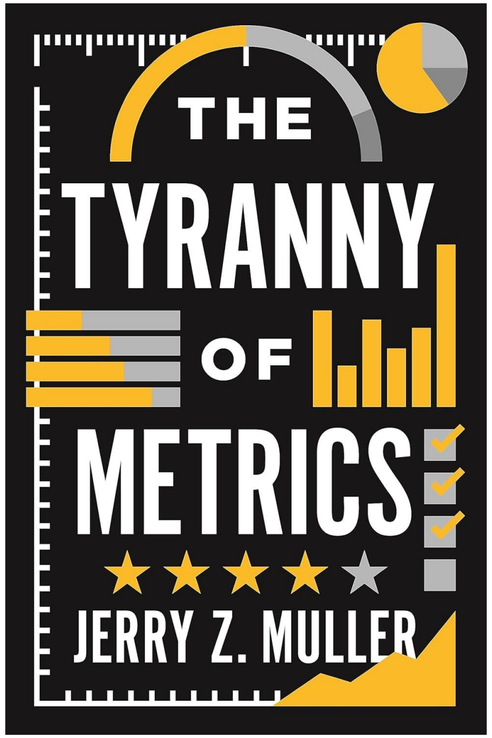
Dyson, P. & Sutherland, R. (2021) Transport for Humans *London Publishing Partnership*

Psychology & philosophy



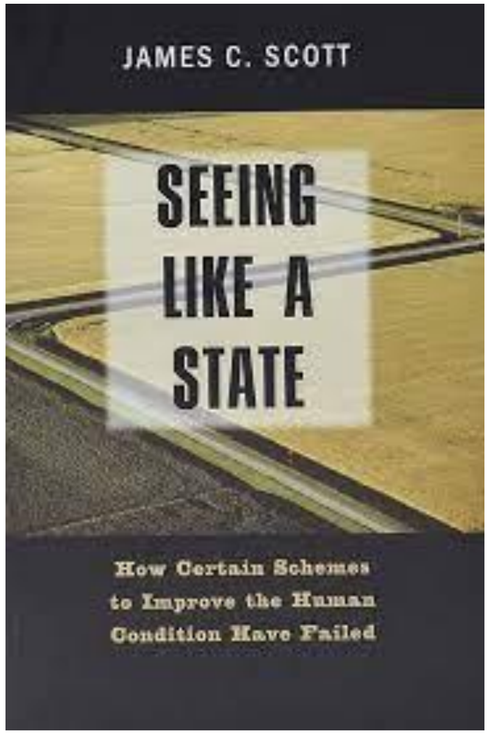
Zahavi, D. (2018). *Phenomenology: the basics*.

Business & metrics



Muller, J. (2018). *The tyranny of metrics*.

Government & society

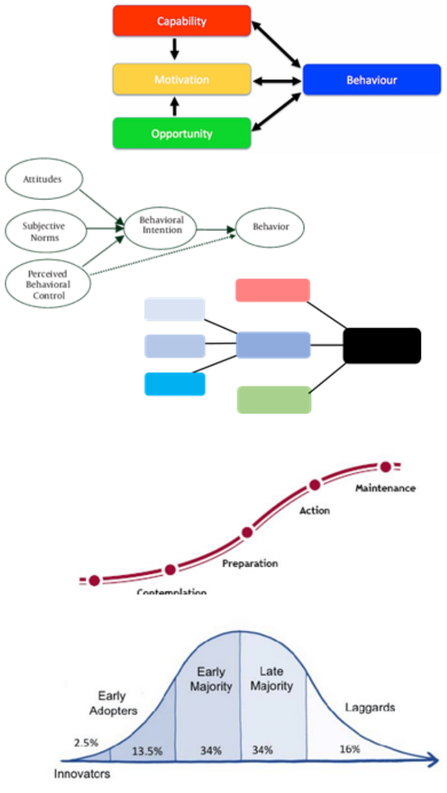


Scott, J. C. (1998). *Seeing like a state: How certain schemes to improve the human condition have failed*.

Technology & society

Centola, D., (2021) Change: How to make big things happen

PUTTING HUMANS INTO EQUATION: THEORY, MODELS AND EVIDENCE



Models of behaviour at the individual level

COM-B / TPB / Self-Determination / Triandis / Health Belief

Models of behaviour at higher levels of scale

ISM / Determinants of Health / NOA / Hofstede Culture

We choose the best fit for the situation

Theories of change over time

TTM (stages of change) / Rogers Innovation Curve / Systems Thinking

Applied models and frameworks

MINDSPACE / EAST / Defra 4Es / INCASE

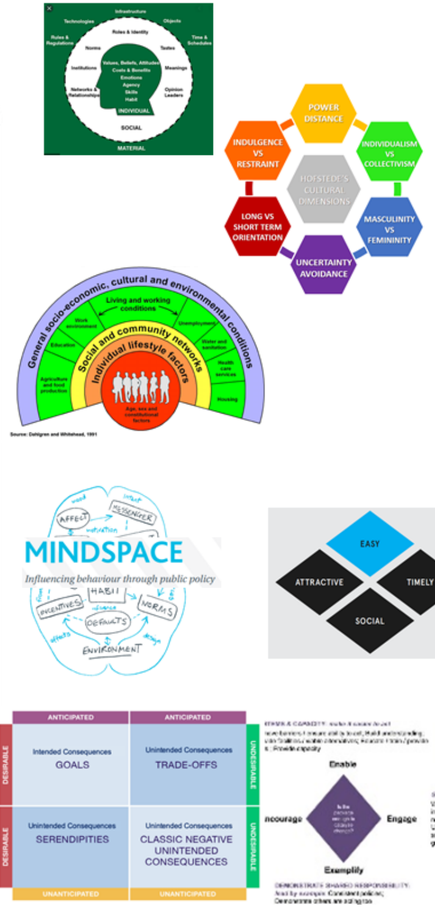


Chart illustrated, adapted and updated from GSR Behaviour Change Knowledge Review (2008)

TODAY WE'LL COVER

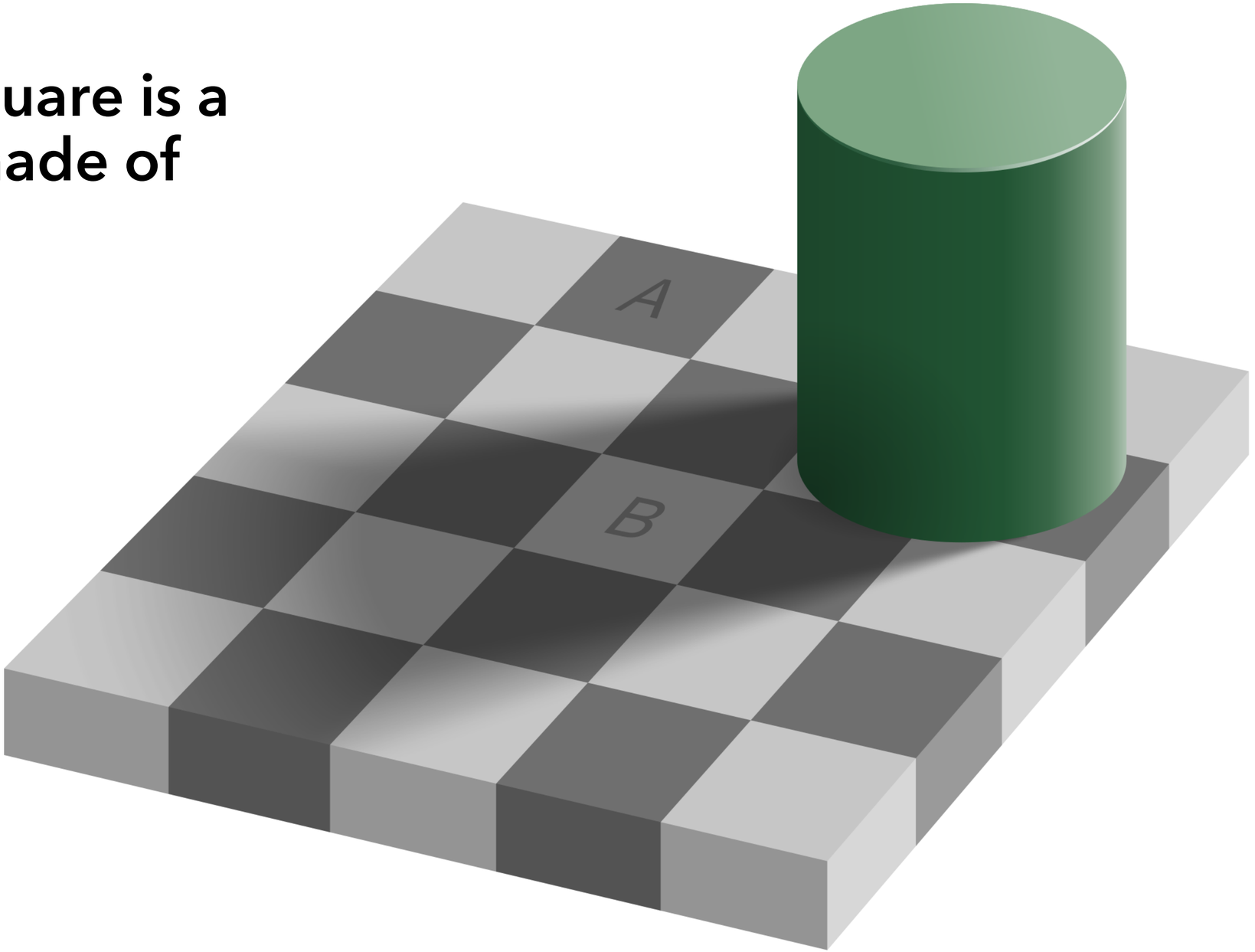
1.
PEOPLE &
PERCEPTION

2.
SOCIETY &
TRANSITIONS

Question 1.

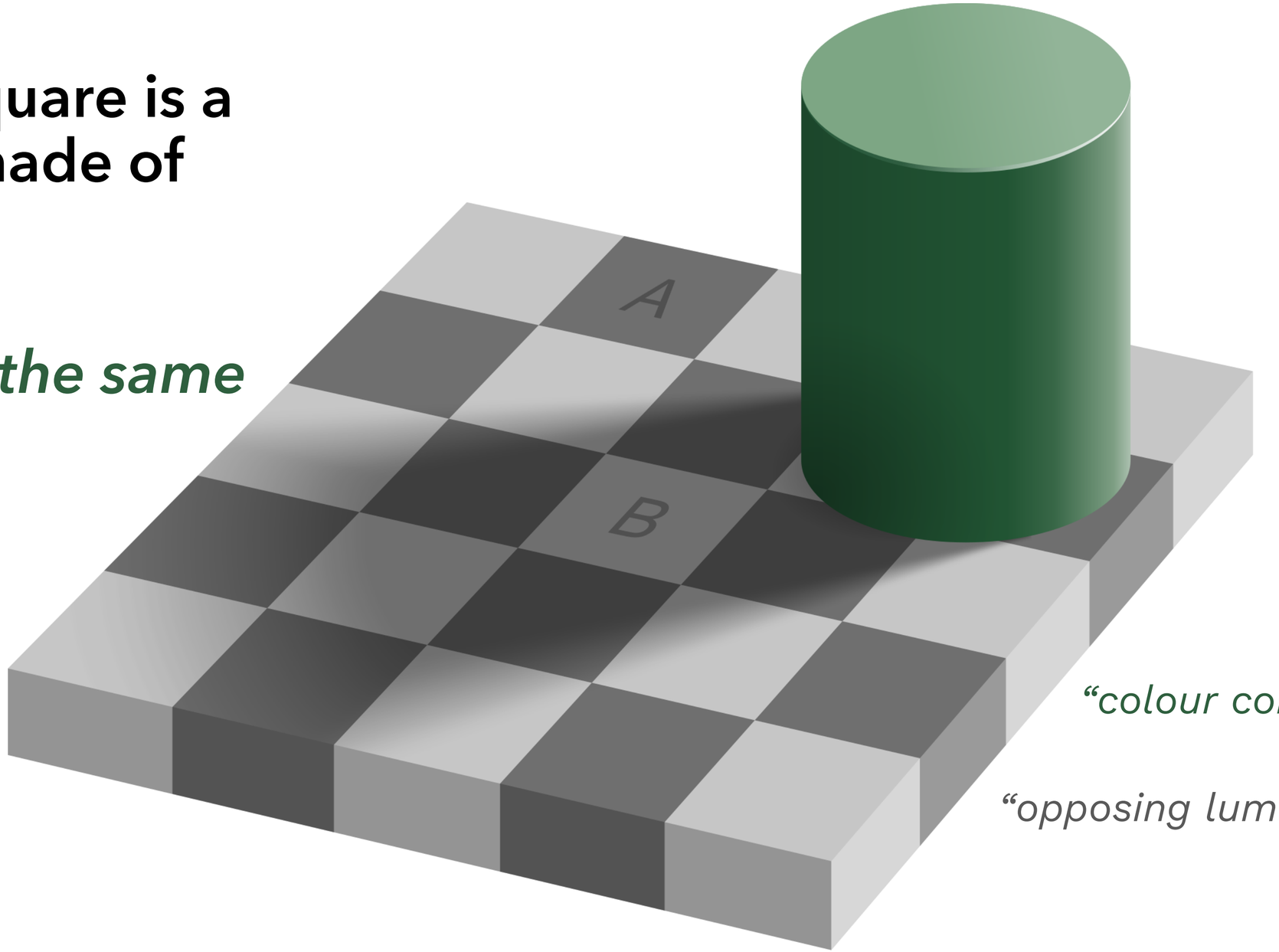
Which square is a lighter shade of grey….

A or B?



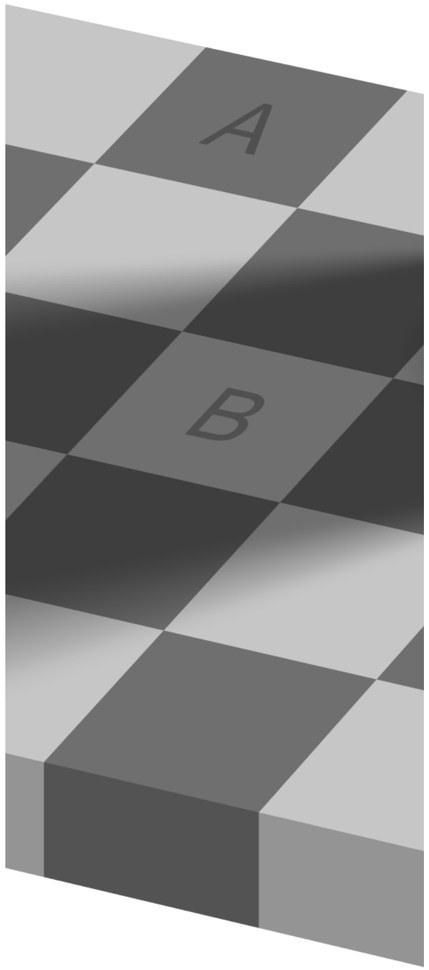
Which square is a lighter shade of grey….

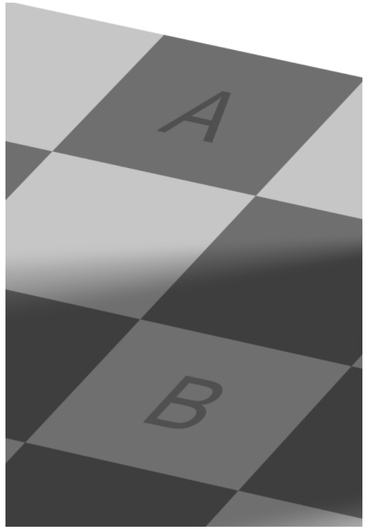
They are the same

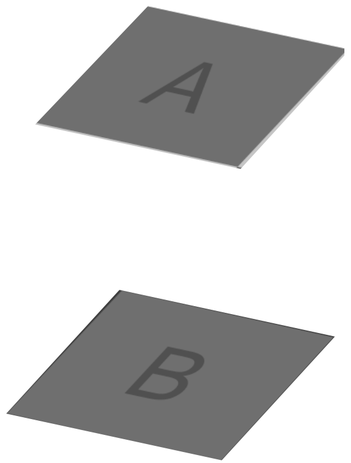


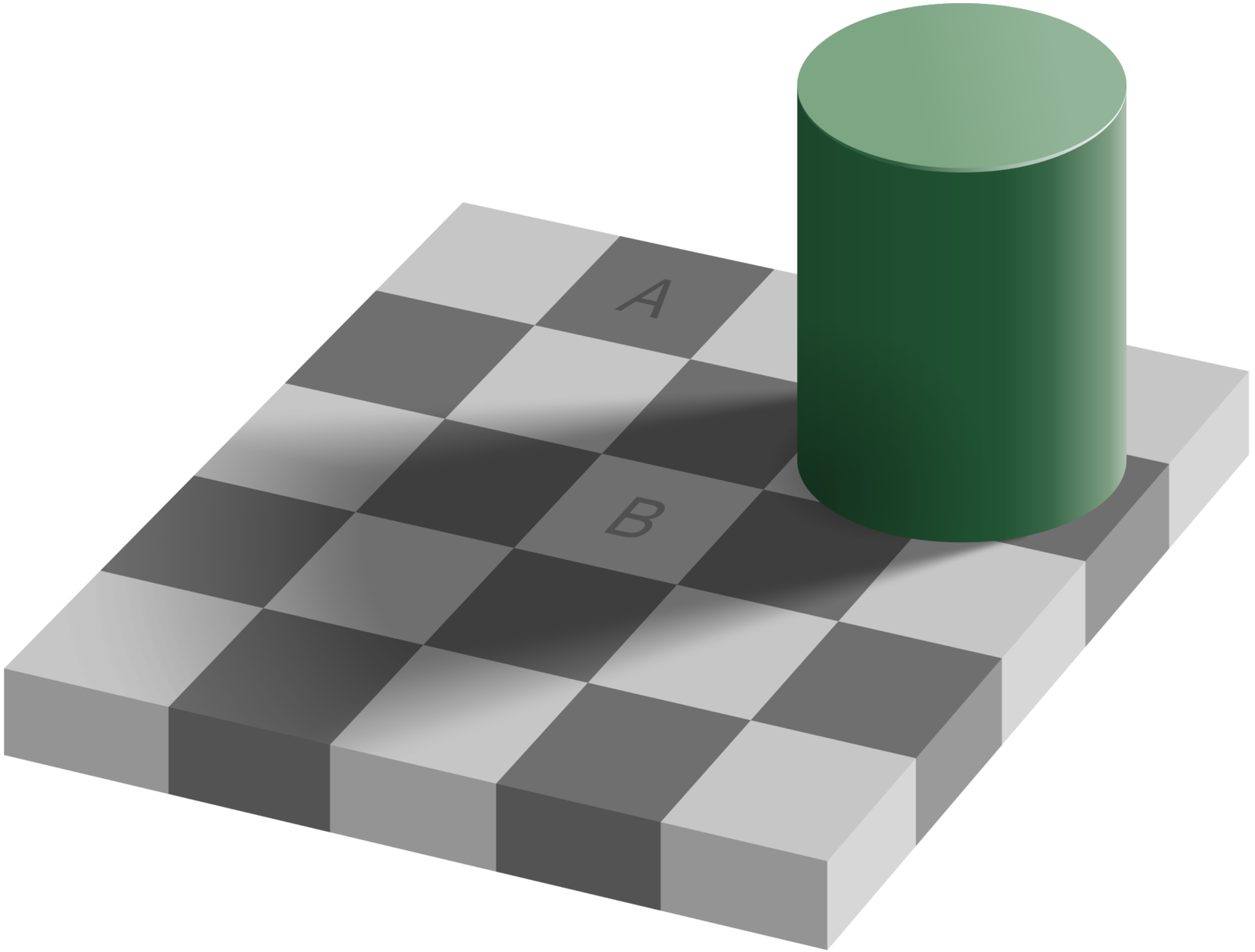
“colour constancy effect”

“opposing luminance gradient”


A
B


A
B


A
B



Adelson, Edward H. (2005). "Checkershadow Illusion". Perceptual Science Group. MIT. Retrieved 2007-04-21.

Question 2.

What is this person saying?

Question 2.

The ‘McGurk Effect’ - an example of our brain’s cross modal processing

McGurk H., MacDonald J. (1976). "Hearing lips and seeing voices". Nature. 264 (5588): 746–748.

Question 3.

Which road would you choose?

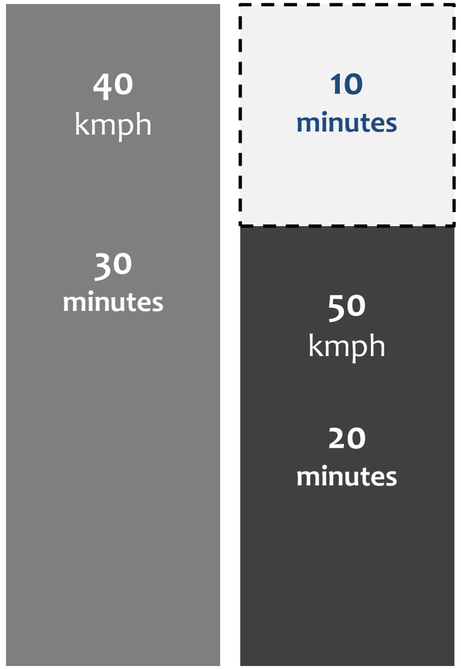
"Imagine a situation in which two road improvement plans are available but where there is only the budget to build one. Both of the proposed roads are the same length – 20 kilometres – and they are being evaluated for their potential to reduce journey times by as much as possible:

- **Road A increases the average speed from 40kmph to 50kmph per hour**

OR

- **Road B increases the average speed from 80kmph to 130kmph per hour**

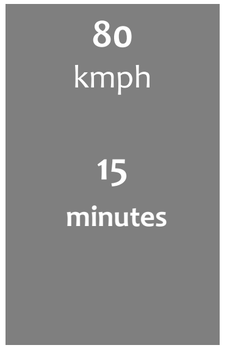
Which would you choose?

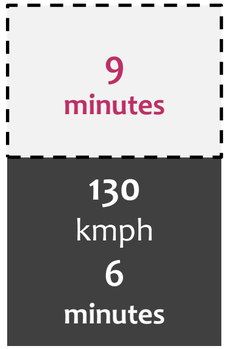


Road A

- 10 minutes

+ 50% *more energy in aerodynamic drag*





Road B

- 9 minutes

+200% *more energy in aerodynamic drag*

Research finds 80% of people choose Road B.

Road A increases speed by just 25%
Road B increases speed by 60%.

But it is Road A that saves more overall time.

We're tend to Road B because of the '**proportion heuristic**': the rule of thumb that time saved is the proportion of the speed increase from the initial speed.

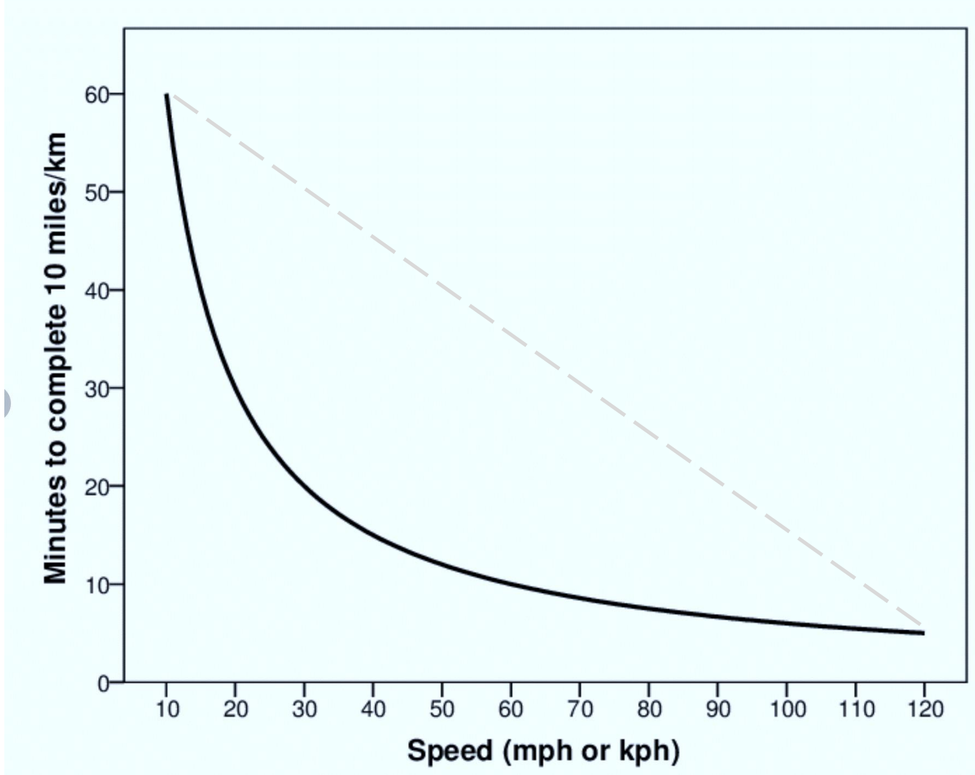
Note: In practice, road capacity (vehicles per minute) remains roughly constant because cars leave bigger gaps at higher speeds and are constrained by bottlenecks formed at entry and exit junctions.

O. Svenson. 2008. **Decisions among time saving options: when intuition is strong and wrong**. Acta Psycholgica **127**, 501–509.

BEHAVIOURAL INSIGHT :

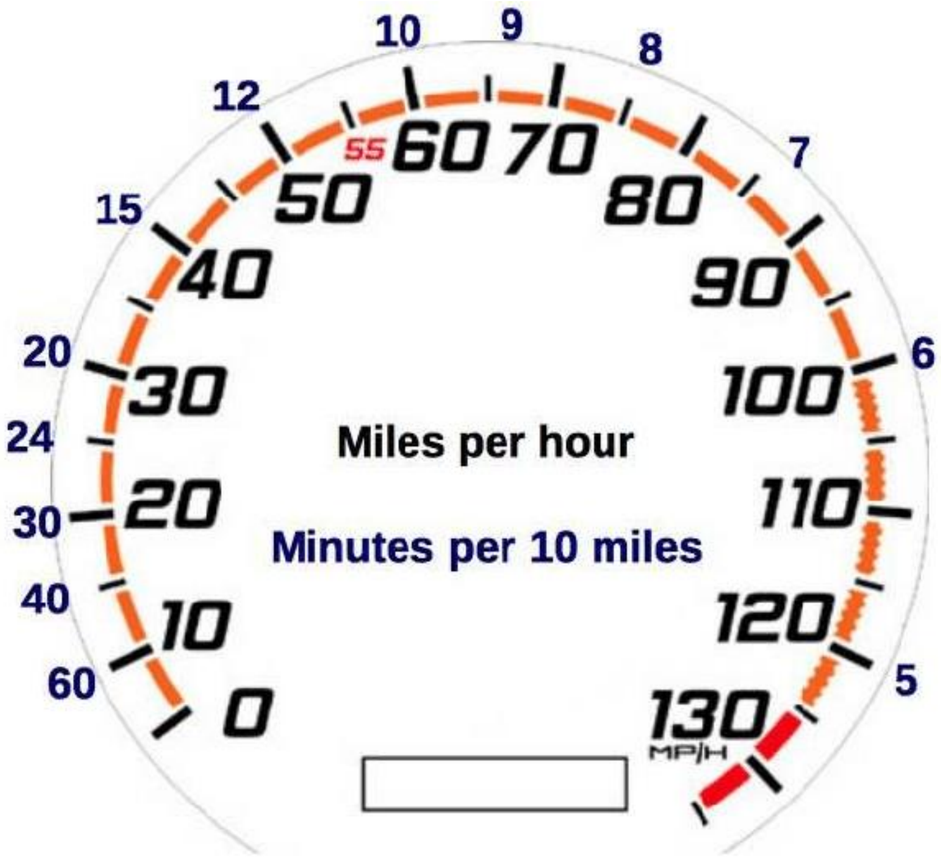
The Proportion Heuristic

Our intuition = linear
Our reality = curvilinear



IDEA :

The PACEOMETER



Courtesy of Eyal Peer and Eyal Gamliel, 2012.

E. Peer and L. Solomon. 2012. Professionally biased: misestimations of driving speed, journey time and time-savings among taxi and car drivers. *Judgment and Decision Making* **7**(2), 165.

WE ARE

HOMO SAPIENS

NOT

HOMO TRANSPORTICUS

Speed / Velocity / Pace

Fuel economy
MPG vs GPM
m/kWh vs kWh/m

Braking distances
Increase non-linearly

Fatality and KSIs per capita / time / distance travelled

METRICS INFLUENCE OUR THINKING AND BEHAVIOUR

Cost/Benefit Ratios

Reaction times

Disability criteria

Discount rates

Blood alcohol volumes

Light levels
lux vs lumens

Sound and noise
Db on a Log scale

Demographics
Population growth

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American psychologist*, *39*(4), 341.

Speed / Velocity / Pace

Fuel economy
MPG vs GPM
m/kWh vs kWh/m

Braking distances
Increase non-linearly

Fatality and KSIs per capita / time / distance travelled

NEW TECHNOLOGY MEANS NEW LANGUAGE

Cost/Benefit Ratios

Reaction times

Disability criteria

Blood alcohol volumes

Discount rates

Light levels
lux vs lumens

Sound and noise
Db on a Log scale

Demographics
Population growth

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American psychologist*, *39*(4), 341.

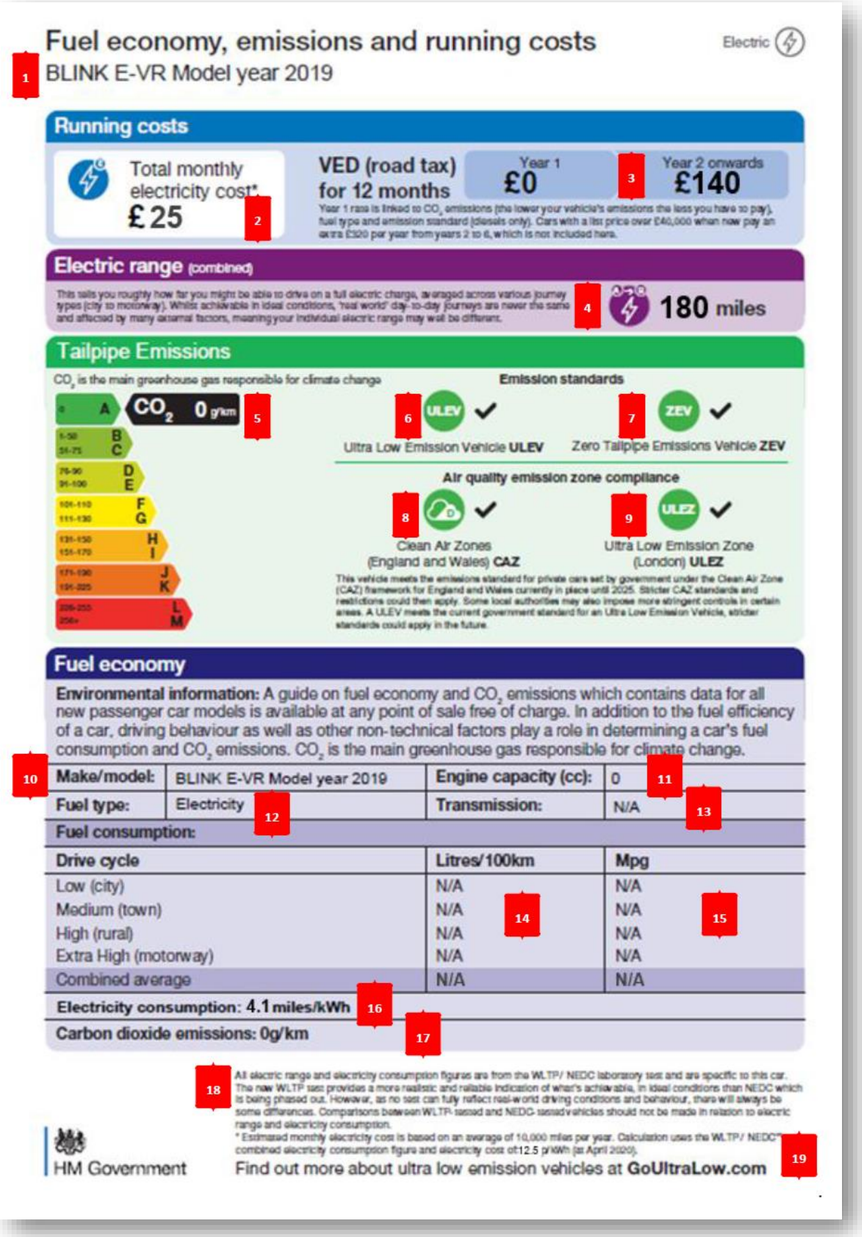
An example solution: New Car Labelling

Vehicle Certification Agency

Providing guidance to car dealerships on how to present clear, coherent and comparable information to prospective buyers.

How we like to think: *"I'll weigh up the pros and cons of my new car and get the best one for me"*

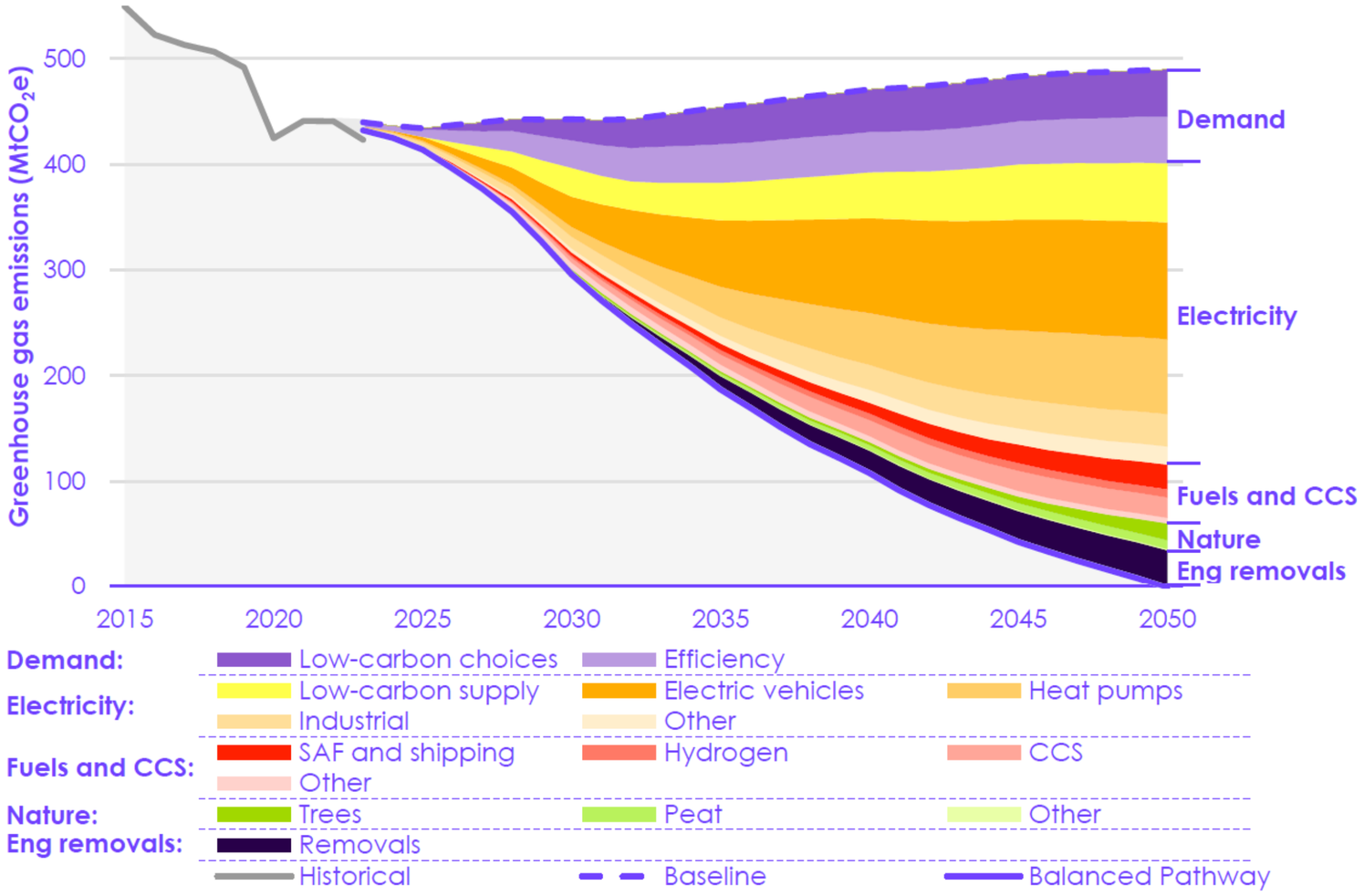
How we really think: *"I've seen this brand around. That new battery sounds clean, green and might save me money"*



DVSA (March 2023) The Passenger Car (Fuel Consumption and CO2 Emissions Information) Regulations
https://www.vehicle-certification-agency.gov.uk/publication/vca061-3/

2. SOCIETY & TRANSITIONS

Putting electrification in context



"Electric cars and vans (53% and 19% respectively of surface transport emissions reduction in 2040", p. 149)

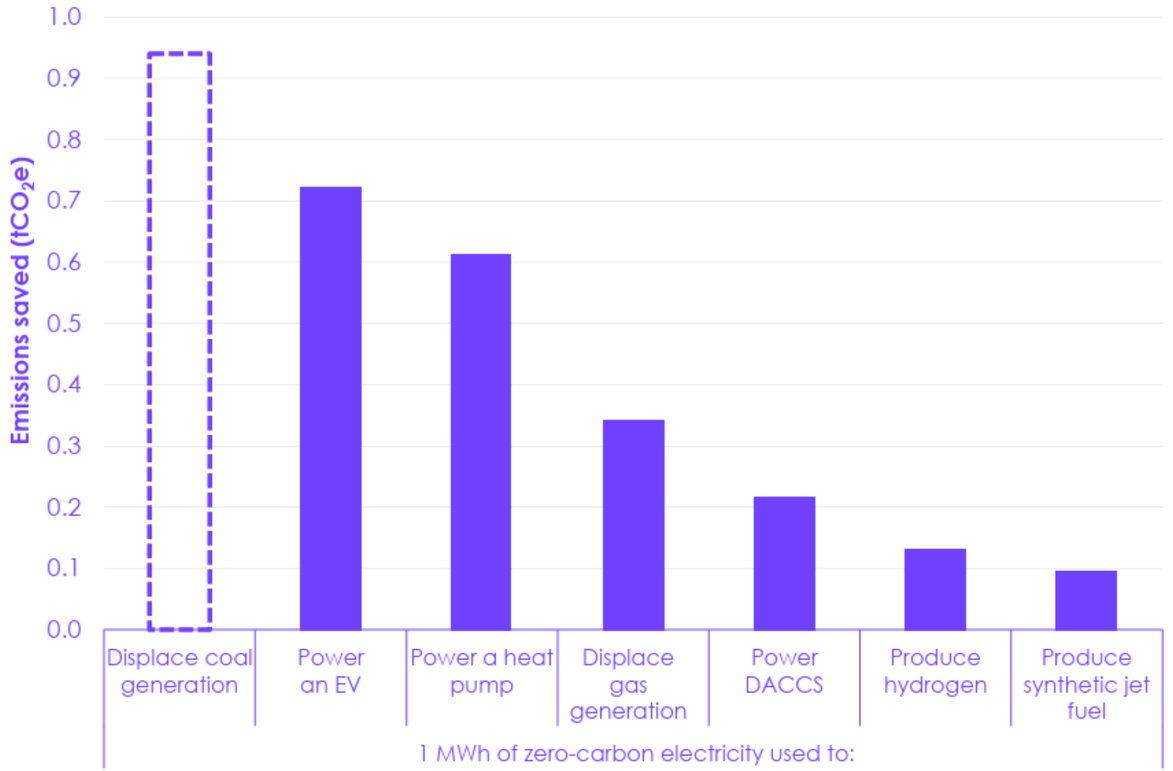
Climate Change Committee

Climate Change Committee (2025) The Seventh Carbon Budget

https://www.theccc.org.uk/publication/the-seventh-carbon-budget/

Priorities to electrify

Figure 10.8 Best uses for zero-carbon electricity



Description: Chart shows emission savings from using 1 MWh of zero-carbon electricity, with the highest savings coming from direct electrification uses (for example, in electric vehicles and heat pumps) and the lowest savings for indirect uses (such as converting to hydrogen).
Source: CCC analysis.

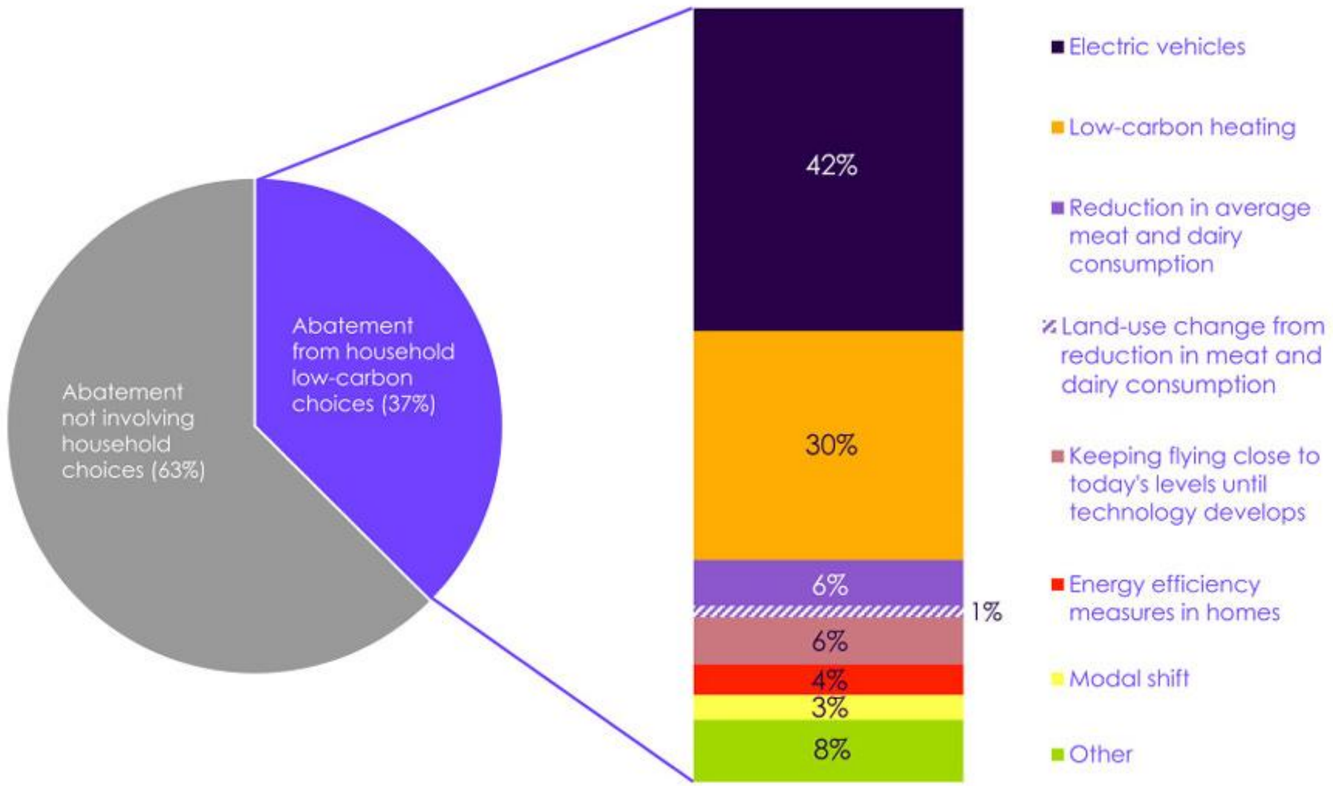
Climate Change Committee

Climate Change Committee (2025) The Seventh Carbon Budget

https://www.theccc.org.uk/publication/the-seventh-carbon-budget/

Household choices and behaviours

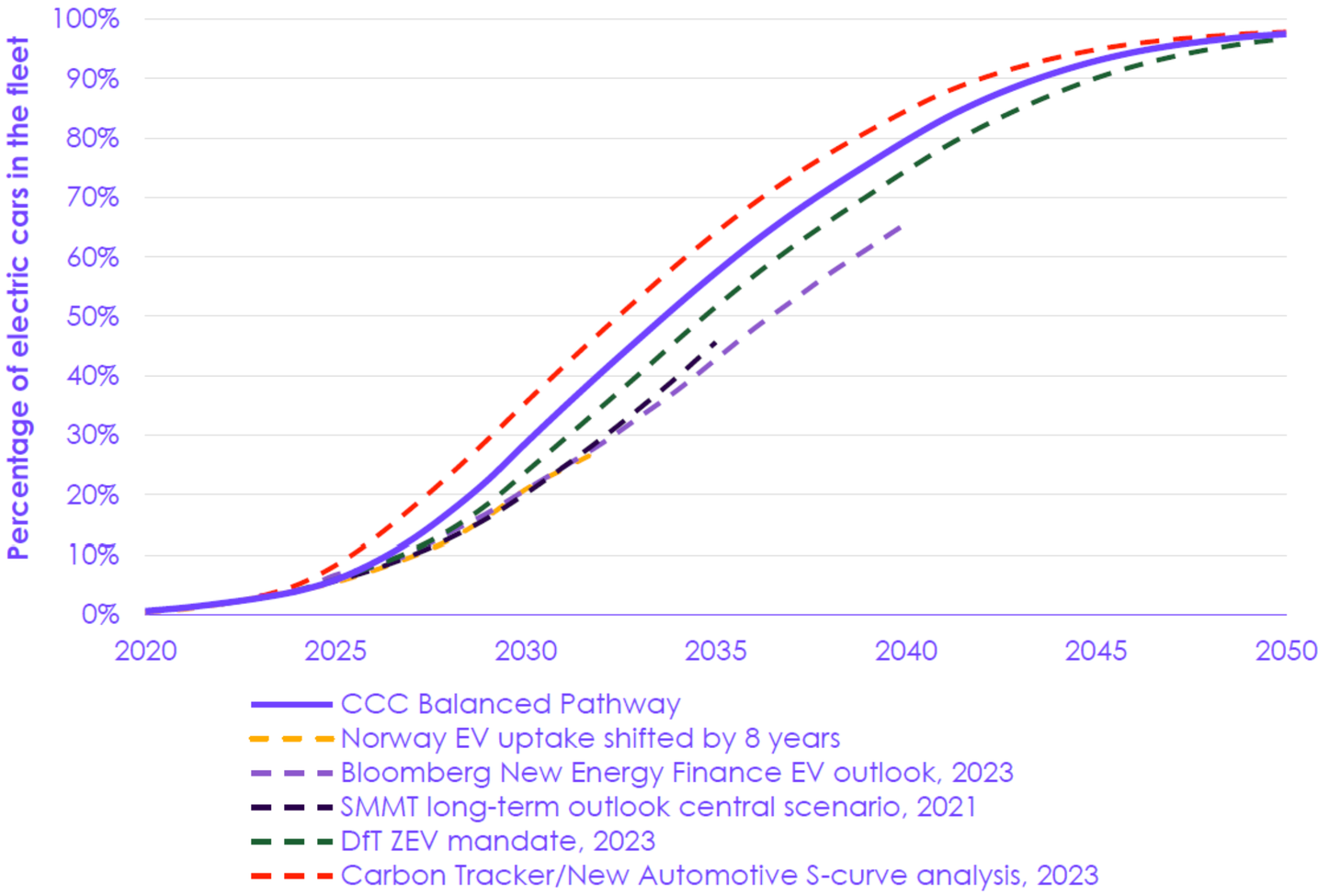
Figure 8.1 Emissions reduction in 2040 that relies on household low-carbon choices



Climate Change Committee (2025) The Seventh Carbon Budget

https://www.theccc.org.uk/publication/the-seventh-carbon-budget/

Figure 7.1.3 EV uptake in the Balanced Pathway compared to the ZEV mandate and forecasts from other sources



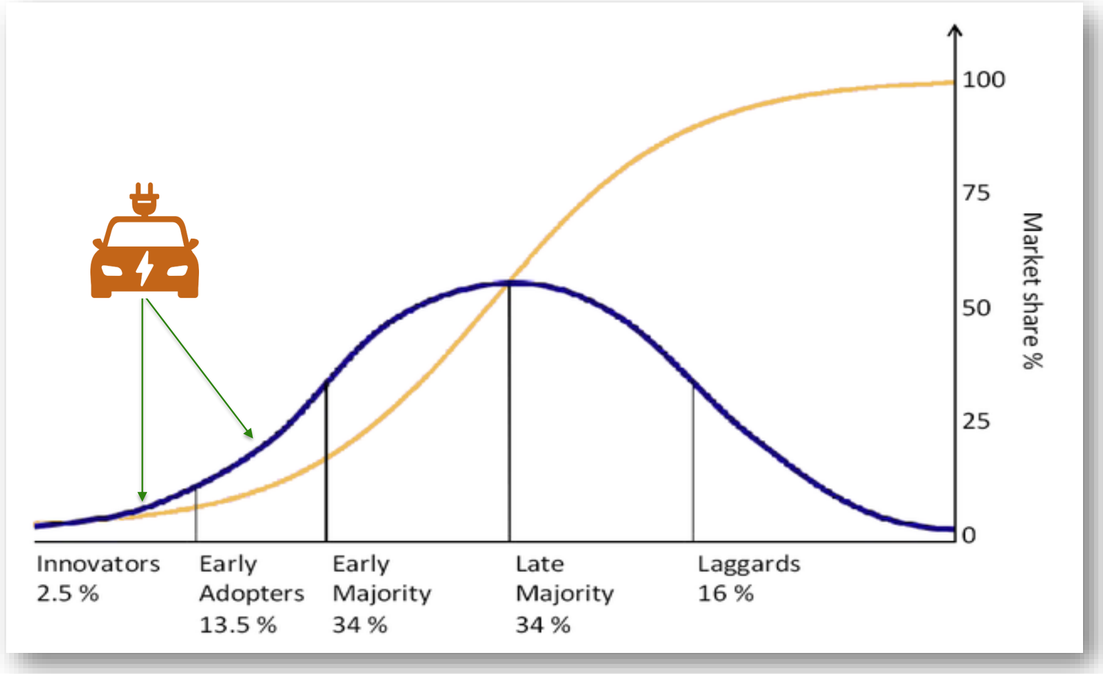
Climate Change Committee (2025) The Seventh Carbon Budget

https://www.theccc.org.uk/publication/the-seventh-carbon-budget/

THEORY IS ALREADY AVAILABLE ON NEW TECHNOLOGY ADOPTION

Innovators or early adopters?

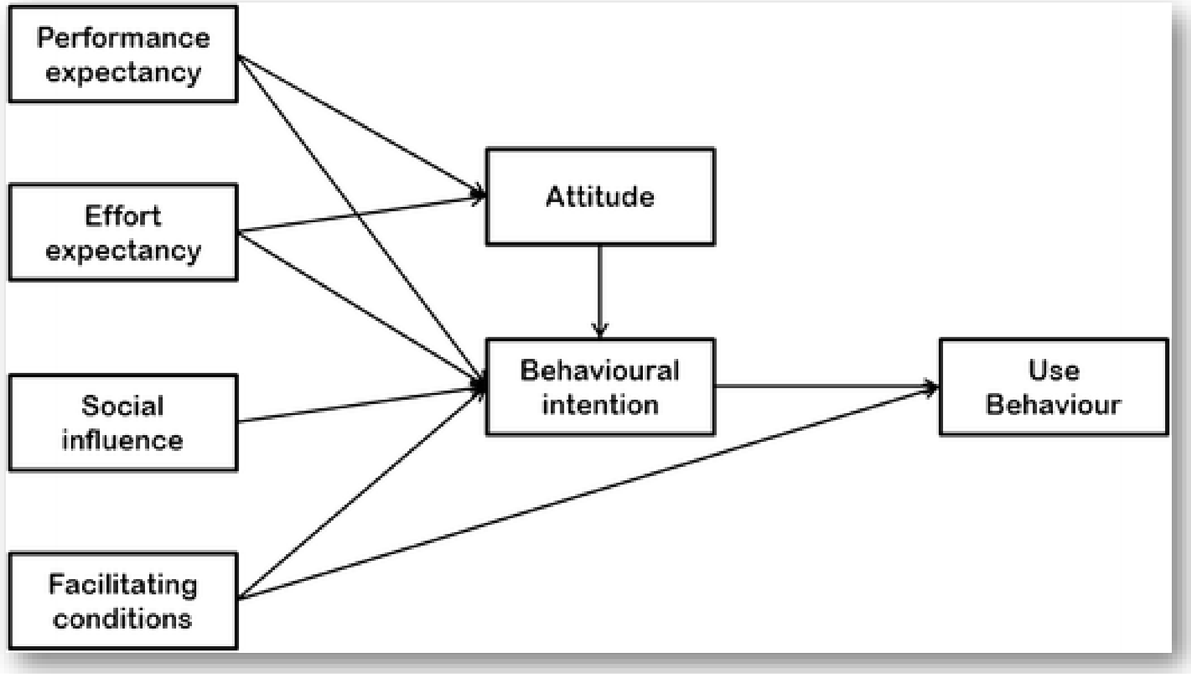
Re-frame objective to reach 'tipping point' faster?"



Rogers' Diffusion of Innovation Theory (1962, 1995)

Going beyond 'technology acceptance'

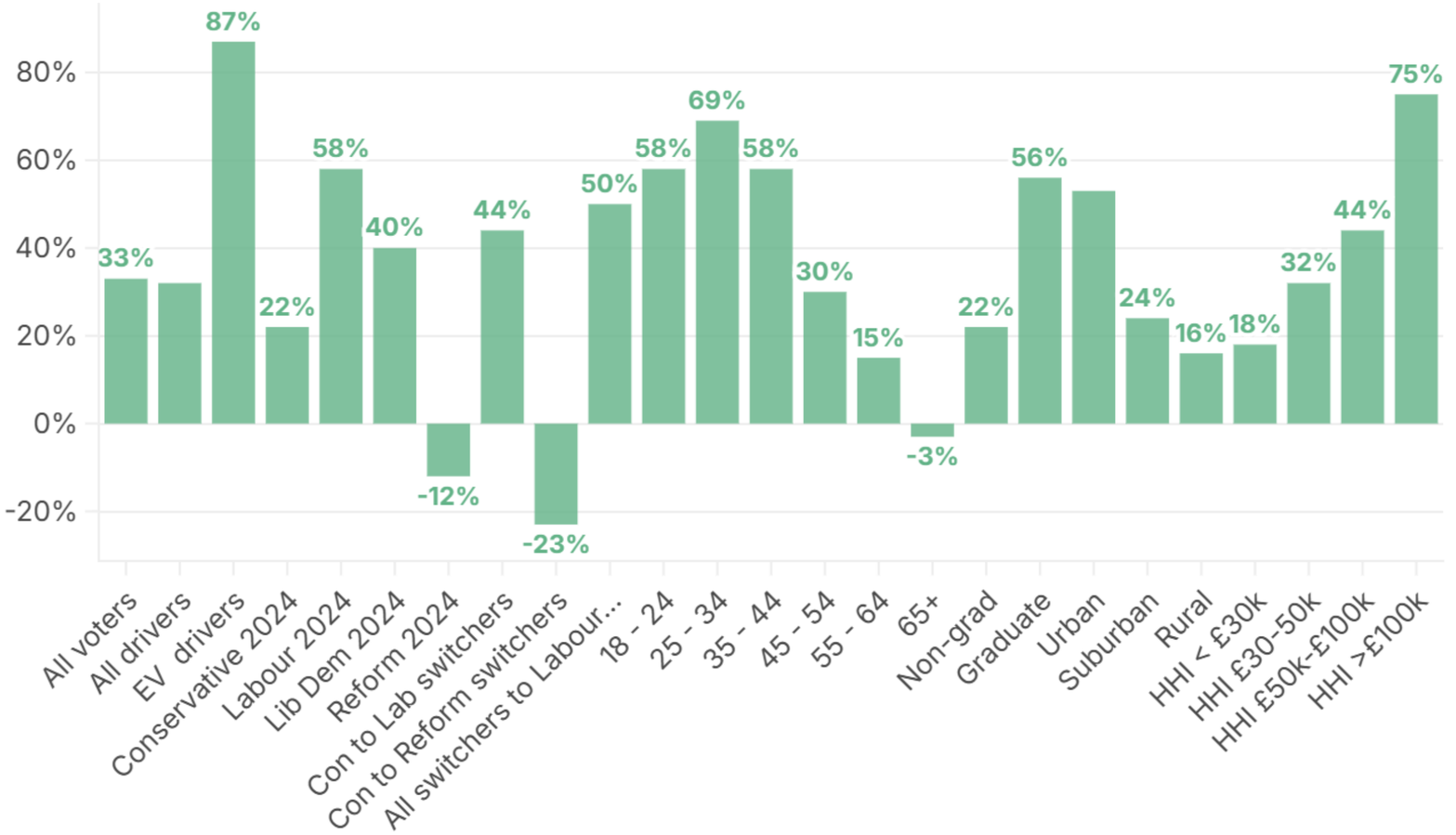
Validated frameworks are more robust



Unified Theory of Acceptance and Use of Technology
UTAUT (Source: Adapted from Venkatesh et al. 2003)

Figure 1: Most voters - and drivers - are positive towards electric vehicles

NET positivity to EVs (all those with a positive view minus all those with a negative view)



Source: FocalData for Persuasion UK/IPPR, 4,000 UK adults, w/c 24th October 2024

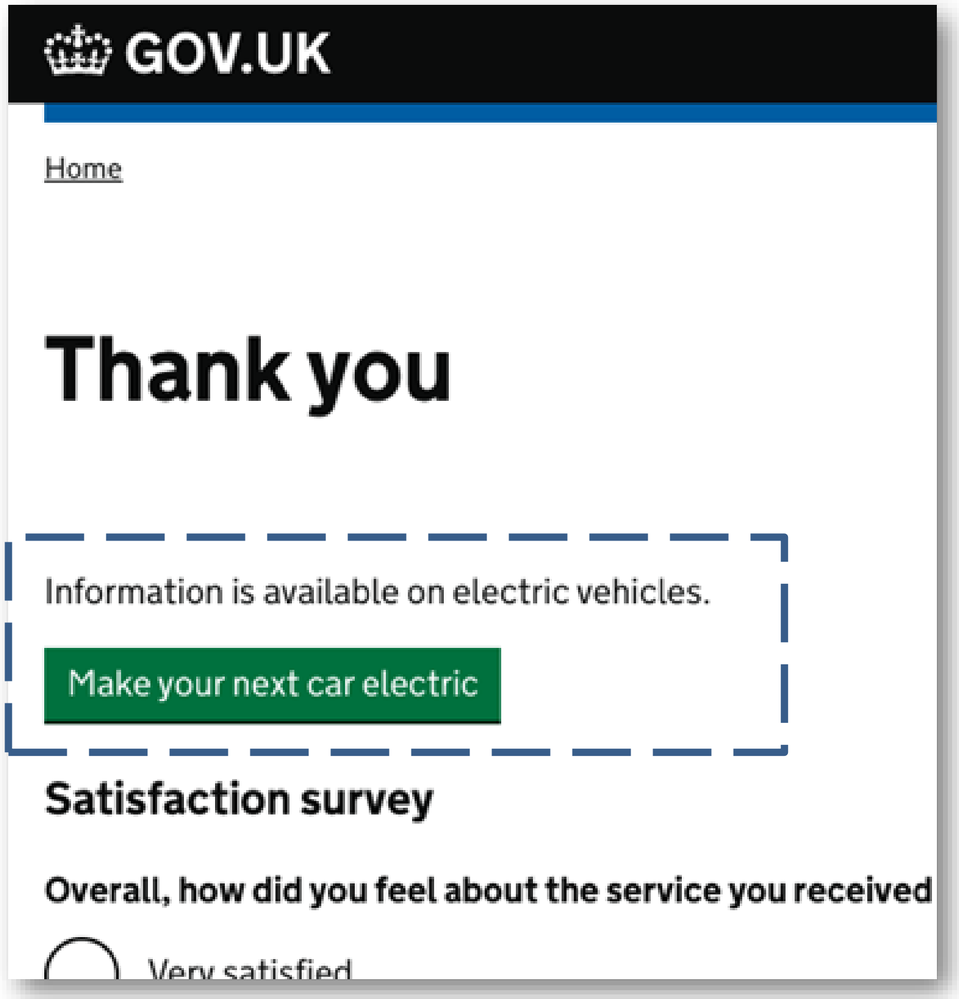
IPPR (2025) All to play for: attitudes to the EV transition

Question 4.

When people have renewed their annual **vehicle tax online,** they are presented with a **‘thank you’** page.

To understand **what motivated people to find out more about electric vehicles,** behavioural scientists at DfT conducted a **3 month online experiment** (a randomized controlled trial) with **4 million people** to test different messages.

Which of the following 8 messages got the most clicks on the green button?



Question 4.

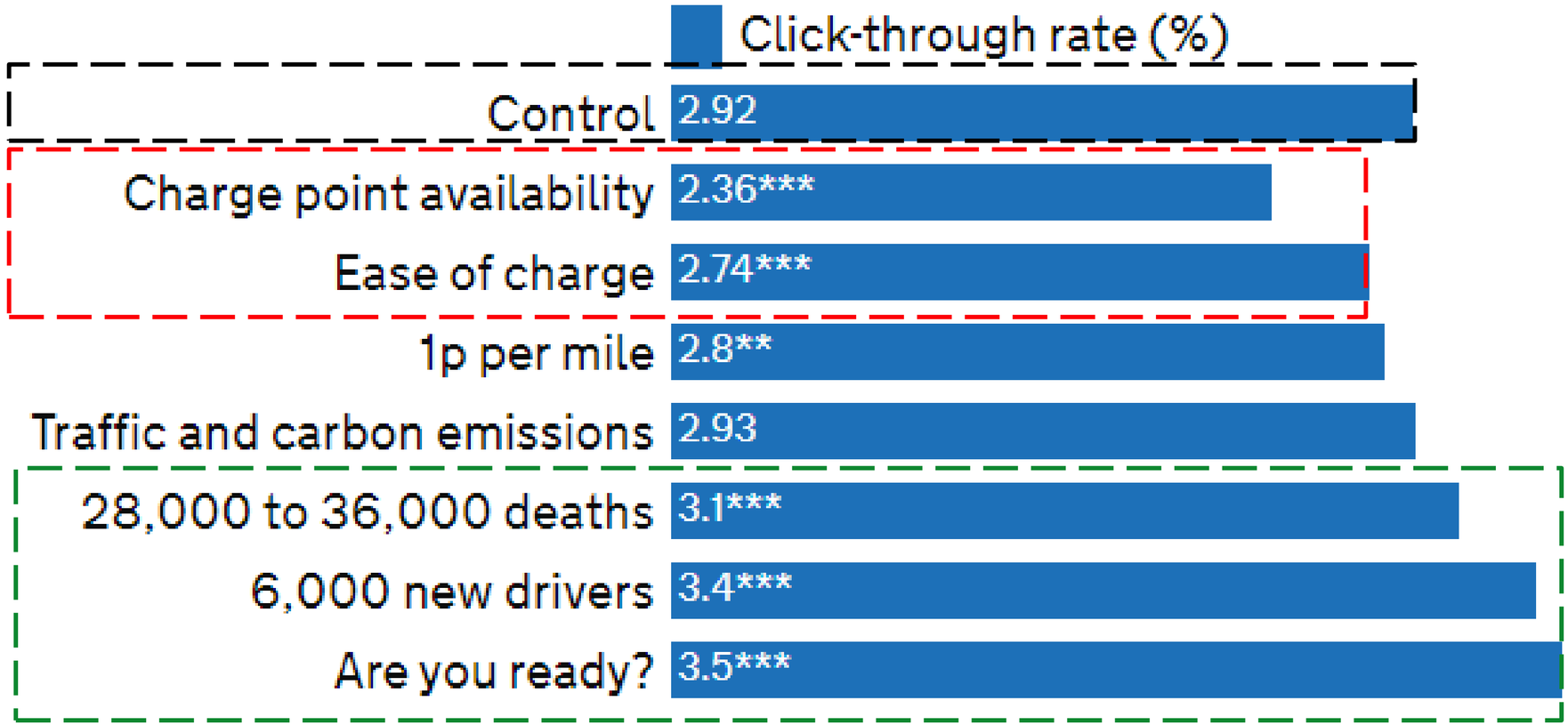
1.	“**Information** is available on electric vehicles.”
2.	“Fully electric vehicles could **cost from as little as 1p per mile** to run – less than a quarter of the cost of the most fuel-efficient petrol or diesel vehicles”
3.	“**Join the 6,000 new drivers** every month who make the switch to an electric vehicle.”
4.	“Road traffic is the biggest single **contributor to carbon emissions** in the UK. What you drive makes a difference.”
5.	“Between **28,000 and 36,000 people die** every year as a result of air pollution. What you drive makes a difference.”
6.	“The **Government are consulting** on ending the sale of new petrol, diesel and hybrid cars and vans by 2035 or earlier. Are you ready?”
7.	“Charging your electric vehicle at home can be **as easy as charging** your phone overnight.”
8.	“**Rapid charge points** for electric vehicles are **available** at almost all motorway service stations in the UK.”

Research and analysis

Make your next car electric: a behavioural science messaging trial

Published 1 February 2021

Department for Transport



https://www.gov.uk/government/publications/behavioural-science-messaging-trial-make-your-next-car-electric/make-your-next-car-electric-a-behavioural-science-messaging-trial

Finding broadly replicated in a message testing experiment in January 2025

Change in attitude	Anti message only	Pro: Climate	Pro: Energy independence	Pro: Consumer benefit	Pro: Social norming	Pro: Pollution	Pro: Jobs/China
Change in positivitiy to EVs (net)	−8.0%	+5.5%	−3.7%	−6.2%	+6.0%	−0.7%	−1.6%
Change in support for 2030 phase out policy (net)	−6.7%	+9.2%	+11.0%	+2.5%	+13.5%	+7.4%	+3.7%
Change in belief that 'EVs good for enviroment' vs bad (net)	−6.2%	+5.9%	−4.0%	+0.4%	+8.6%	+5.4%	−0.6%
Change in belief that 'EVs are affordable' vs unaffordable (net)	+3.1%	+3.4%	+3.9%	+8.3%	+5.3%	+3.4%	+5.9%
Change in belief that 'Evs are practical for people like me' vs impractical (net)	−1.2%	+5.9%	+2.6%	+5.4%	+5.8%	−0.6%	+2.1%
Change in belief that 'EVs are for everyone' vs just the elite (net)	−8.7%	±0.0%	+2.9%	+2.4%	+7.2%	−5.4%	−5.2%
Increase in willingness to buy an EV (>5/10 willing) (just drivers in market for new car)	−2.1%	+2.5%	+3.5%	−1.2%	+2.1%	+0.4%	−2.3%

Persuasion UK/IPPR, via YouGov December 2024/January 2025. Split over two experiments, 8,900 UK adults, c. 1,100 people per condition weighted on age, gender,

Institute for Public Policy Research (2025) Public Support Electric Vehicles – Messaging Experiment
https://www.ippr.org/articles/public-support-electric-vehicles

REVIEW ARTICLE
https://doi.org/10.1038/s41560-019-0541-9
nature energy

Peer influence on household energy behaviours

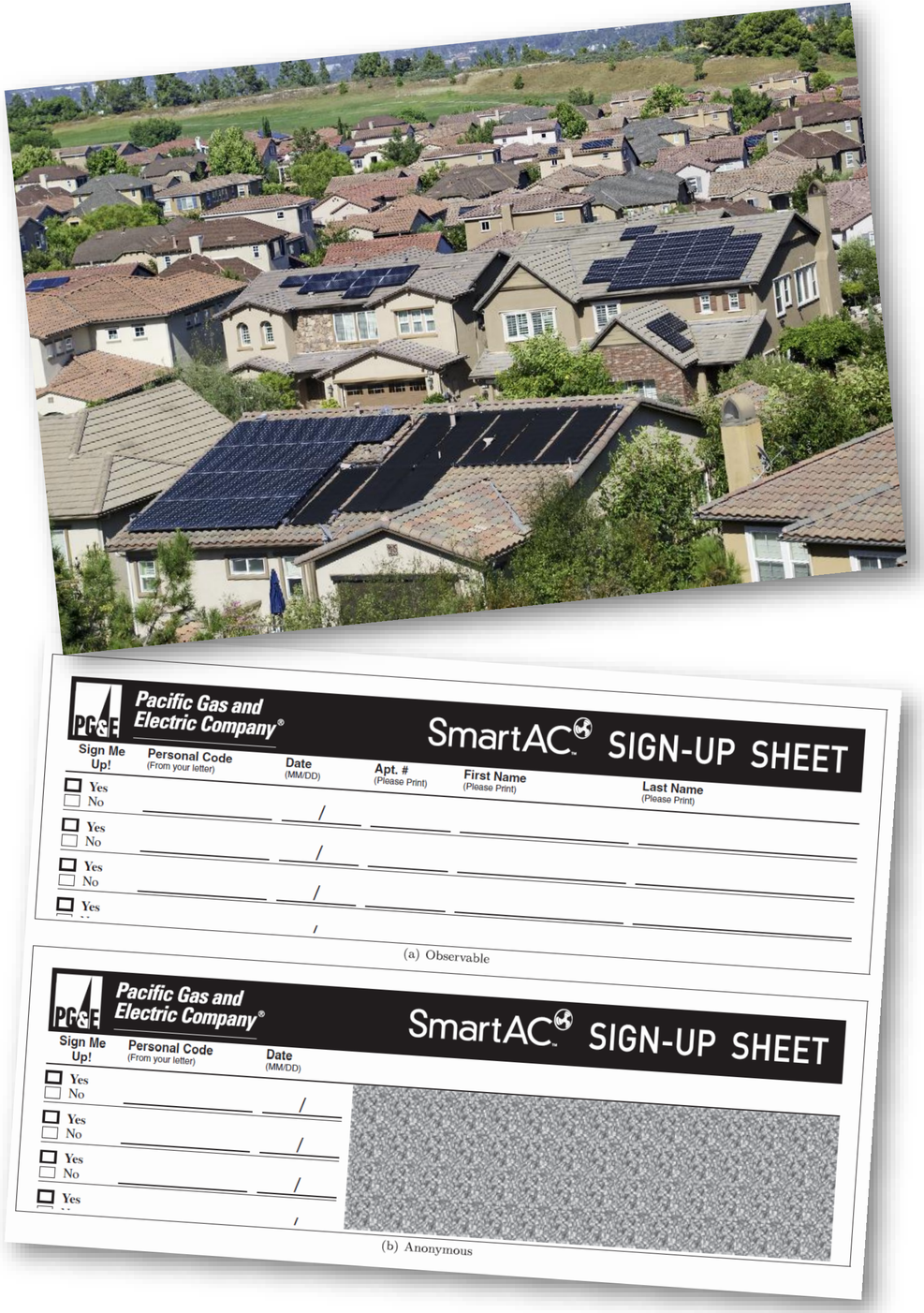
Kimberly S. Wolske[1], Kenneth T. Gillingham[2*] and P. Wesley Schultz[3]

Studies across multiple disciplines demonstrate the importance of peers in shaping energy-related behaviours. Research on this process is wide ranging, from documenting spatial peer effects in the adoption of rooftop solar—when an individual's behaviour is influenced by the behaviours of neighbours—to showing how neighbour comparisons can be used to reduce household electricity consumption. However, gaps exist in our understanding of how and why these peer effects occur. In this Review, we examine recent findings on social influence in energy behaviour and discuss pathways through which social influence can result in peer effects. We propose a conceptual framework for predicting which social influence processes will most often result in peer effects, depending on the targeted energy behaviour. We also review the limitations of social influence as well as evidence for when it is expected to be the strongest.

In developed countries, households are significant energy consumers, accounting for approximately 40% of country-level greenhouse gas emissions through their home energy use and transportation behaviours[1]. A growing focus in energy research is on understanding consumer choices around energy and in developing intervention strategies to promote shifts toward a more sustainable energy future[2,3]. Examples of these desired changes include buying more energy efficient technologies, such as for lighting or transportation[4]; purchasing or generating energy from renewable energy sources, such as wind power or solar photovoltaics (PV)[5]; reducing consumption, either overall or at selected time periods when demand for energy is high[6,7]; and shifting patterns of consumption to match time periods when energy can be generated

Peer effects

'Peer effects', as it is widely known in the economics, marketing and diffusion of innovations literatures, is an umbrella term that refers to when the attitudes, values or behaviours of an individual are influenced by the behaviours of members within a peer group[13]. In the energy context, nearly all of the peer effects research examines how peer behaviour affects individual behaviour, and accordingly, we focus on behaviour in this review. Peer effects are useful to study because they can imply a contagion effect, whereby prosocial decisions by members of a group exert an influence on the subsequent behaviours of others, thereby amplifying the positive effects (although negative peer effects that slow down diffusion could be possible, too[14]). A key distinction between peer effects and



From ‘range anxiety’ to ‘charge-point anxiety’

Keeping perception in line with reality.
Making the unfamiliar feel normal or special?


Electric High


NISSAN
0Z70 ZEV


TFR 327J
GZ67 NGT

Summing up…

> **Think psychologically** when measuring and communicating new technologies

>Where needed, **adapt and create new metrics**. And help people use them.

> Research how technology is **understood by industry, government and people**

> **Create and support** social/public polices to improve technology adoption

> **Contribute to regulation and legislation** that supports conditions for innovation and socially sustainable technology standards

> Never forget, those **two squares** really are the same shade of grey

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Transport for Humans

Electrifying societal change?

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