Presentation by

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New Technologies: the Key to Making the Right Choices about Future Travel?

Future Travel Choices, Bristol
15 May 2019

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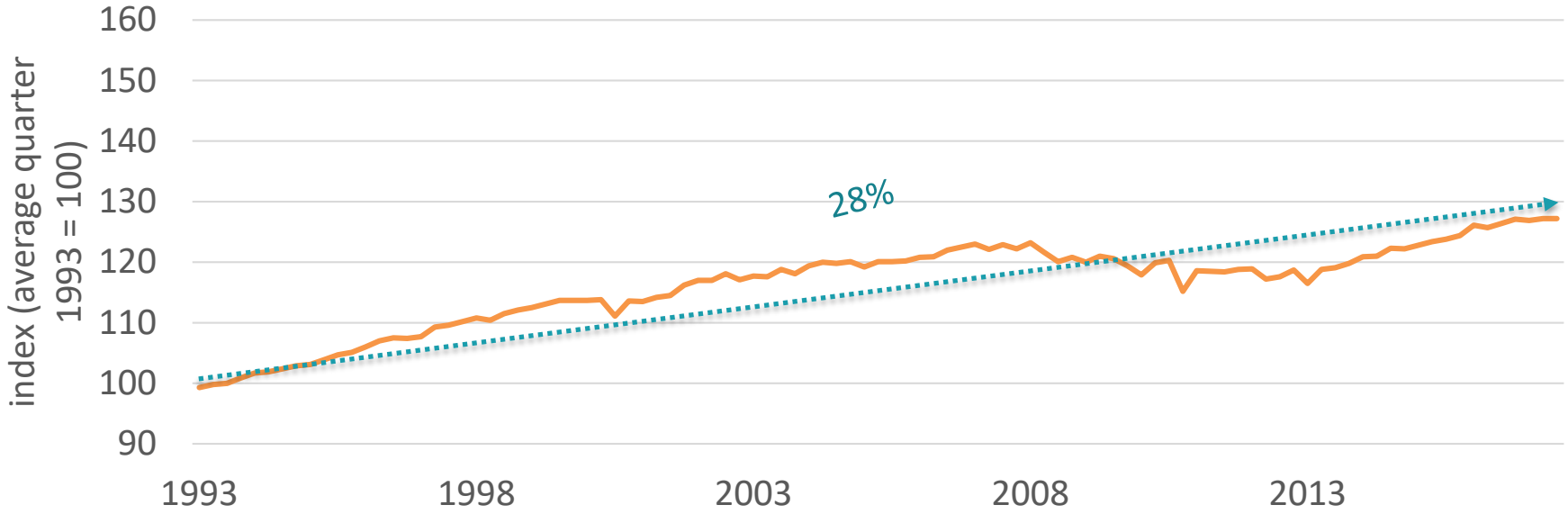
Centre for Transport & Society

Reminder of the Current Transport Policy Problems

Outcome of Transport Policy 1993-2017: 28% traffic growth



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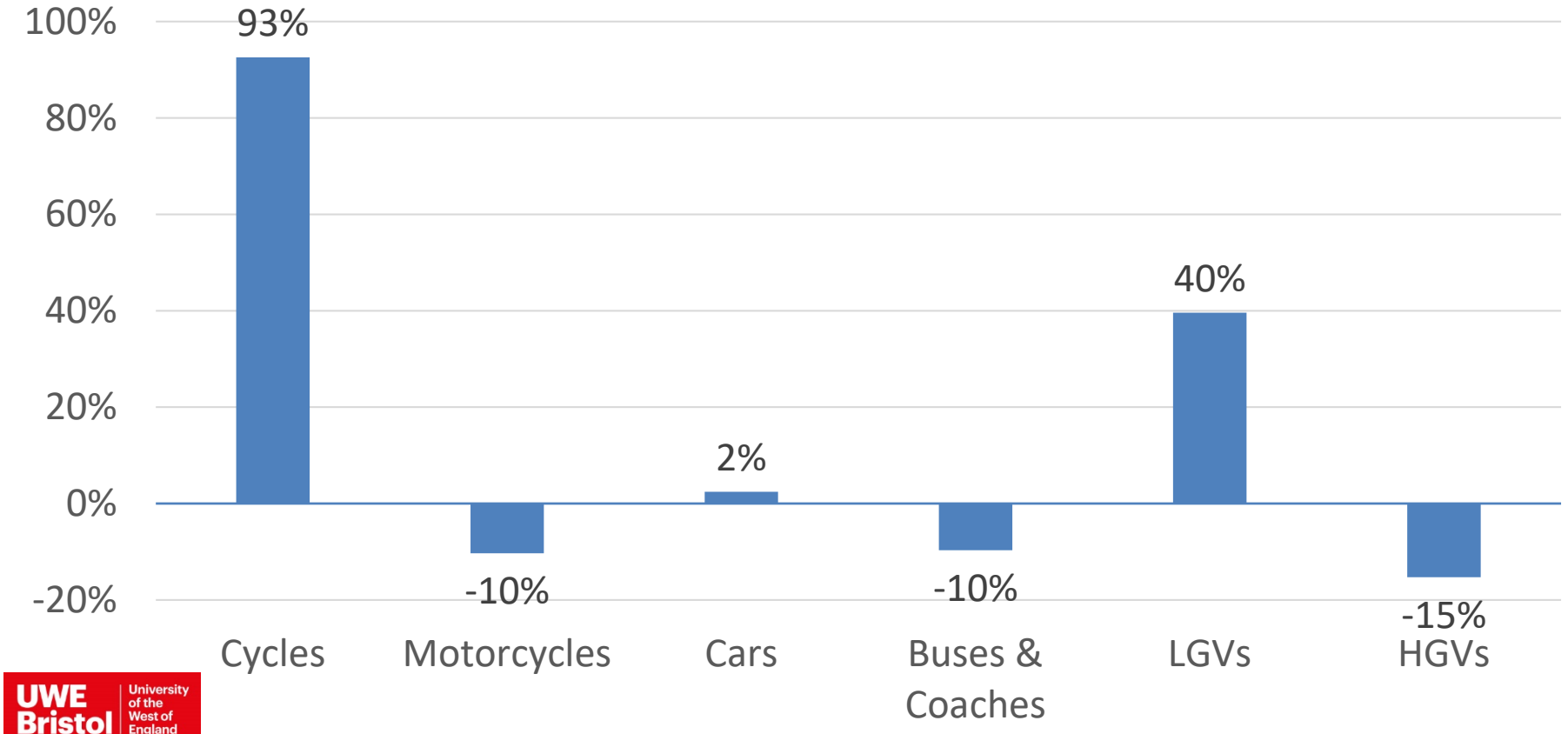
DfT (2017) Road traffic (vehicle miles, seasonally adjusted) in GB (Table TRA2502f)

Bristol City: 2000-14 Traffic Change (%)



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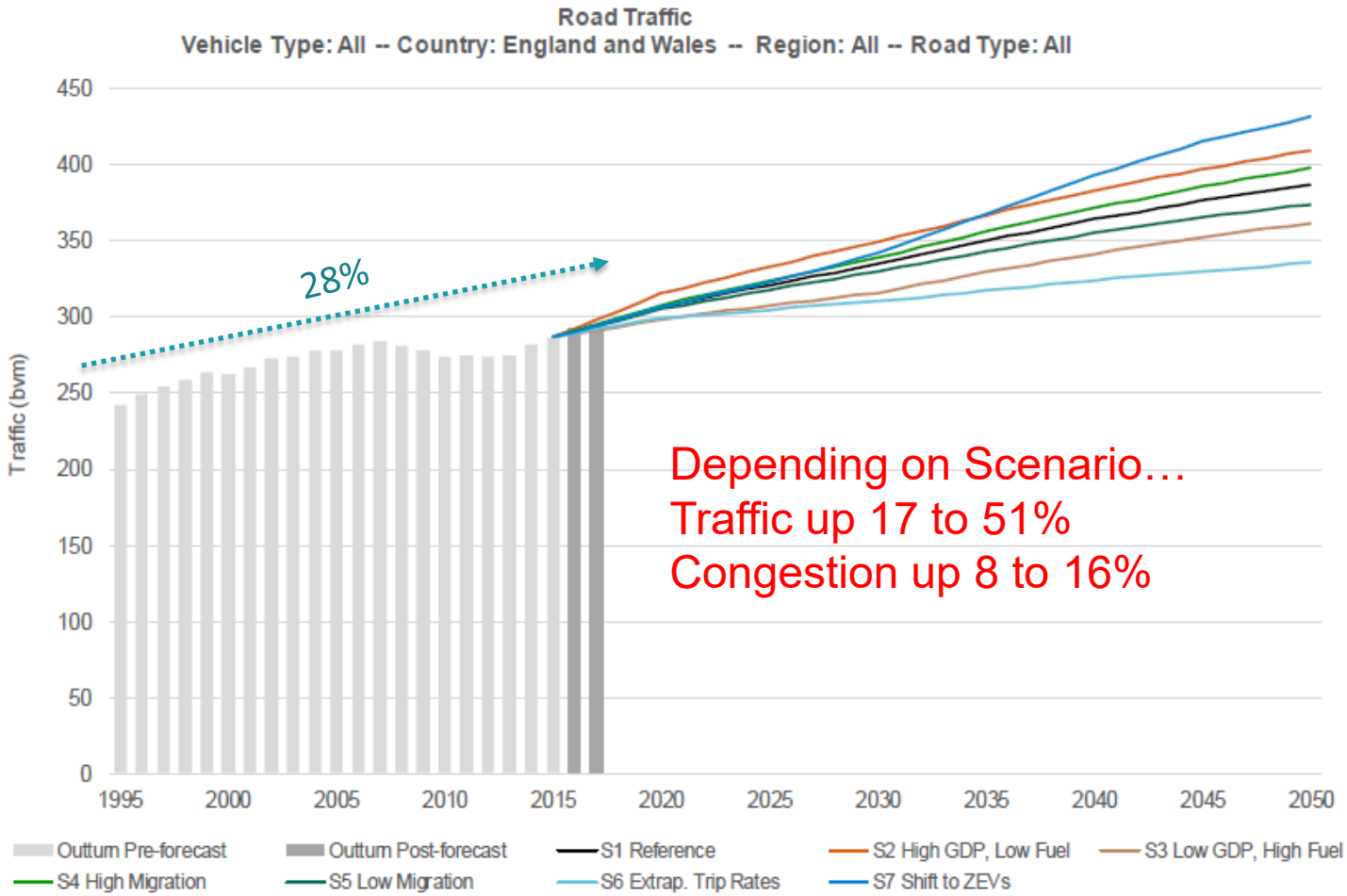
Traffic: the only way is up?



DfT Road Traffic Forecasts (2018) Figure 25

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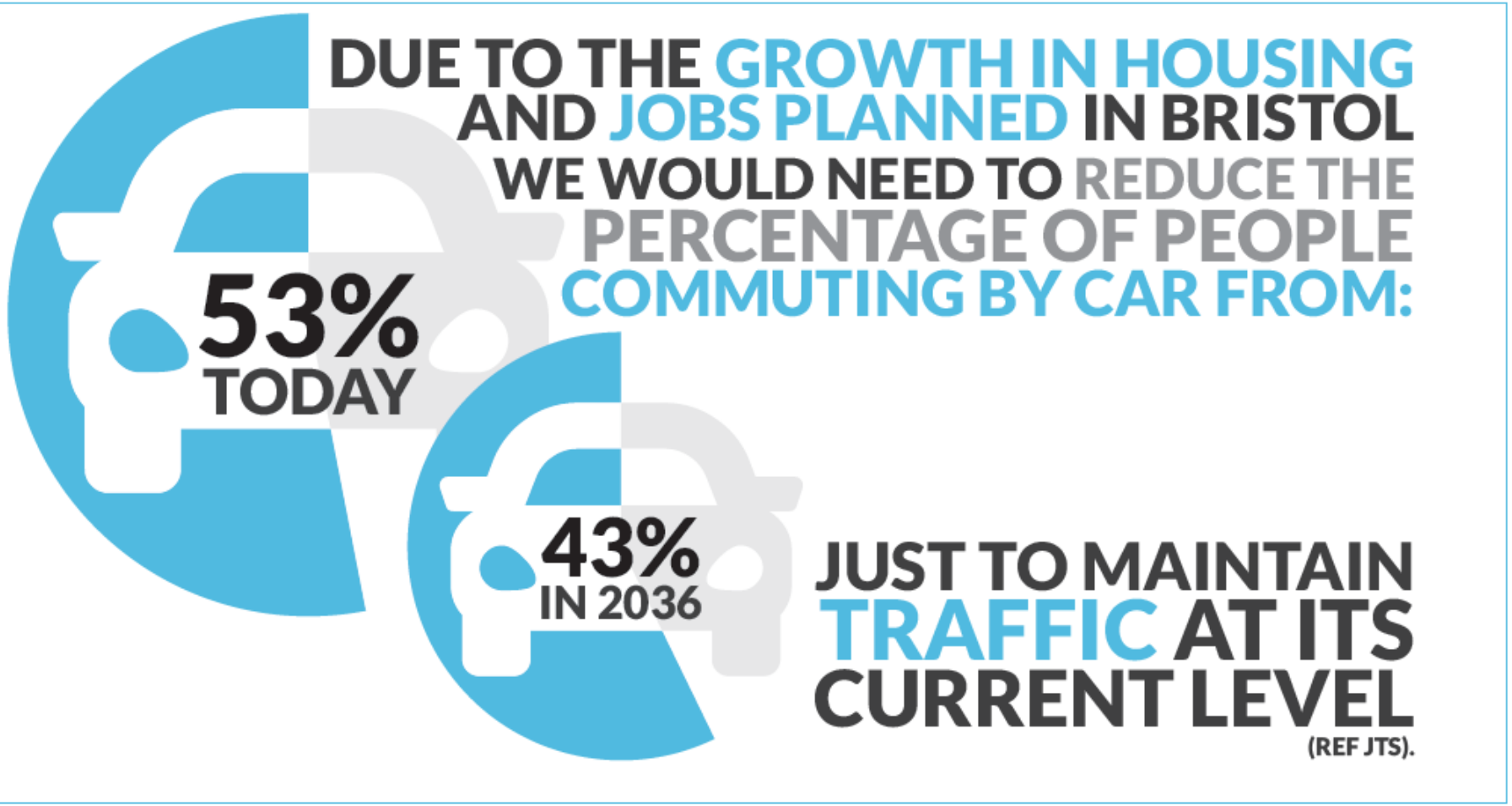

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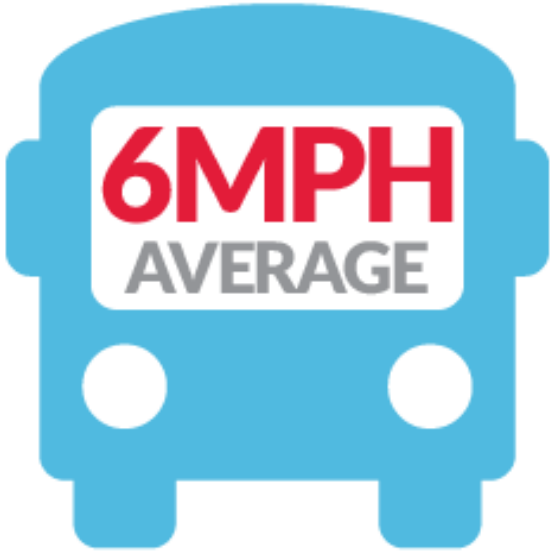
BCC Area: 33k new homes; 22k new jobs Temple Q.



AVERAGE SPEED ON SOME BUS ROUTES IS CURRENTLY AS LOW AS 6MPH IN PEAK PERIODS WITH 80% 'ON TIME' IN 2015/16

AROUND 40% OF JOBSEEKERS SAY THAT LACK OF PERSONAL TRANSPORT, OR POOR PUBLIC TRANSPORT, IS A KEY BARRIER PREVENTING THEM FROM GETTING A JOB

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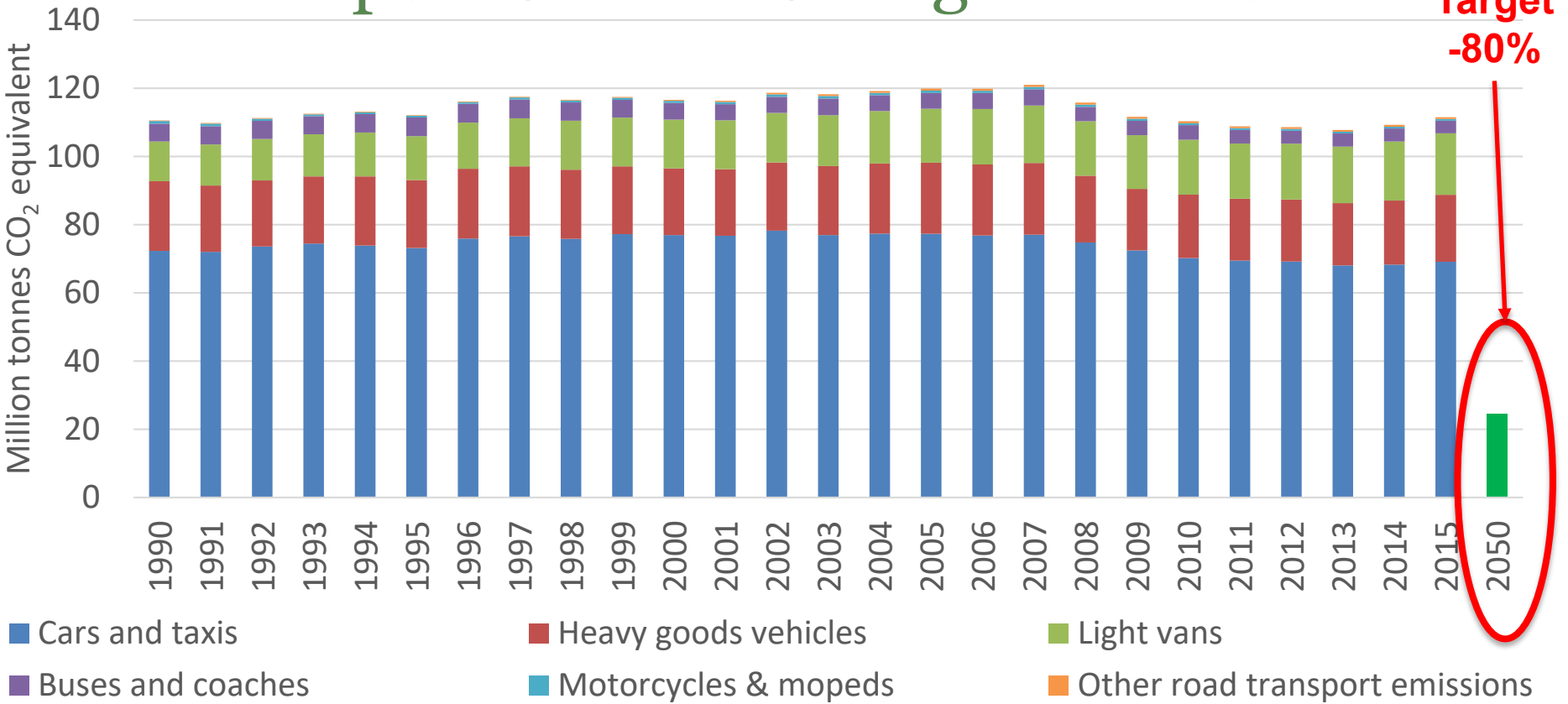
Road Transport Climate Change Emissions



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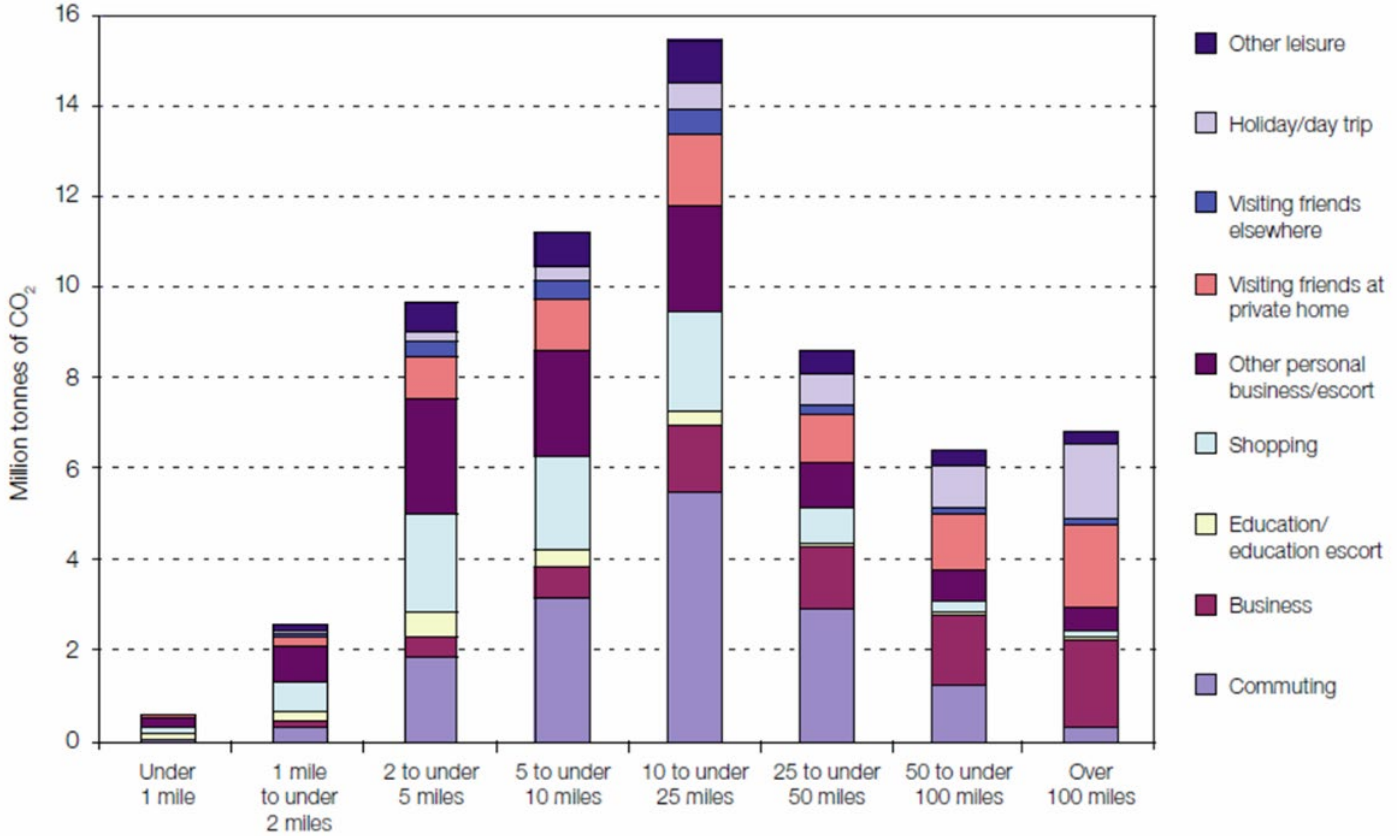
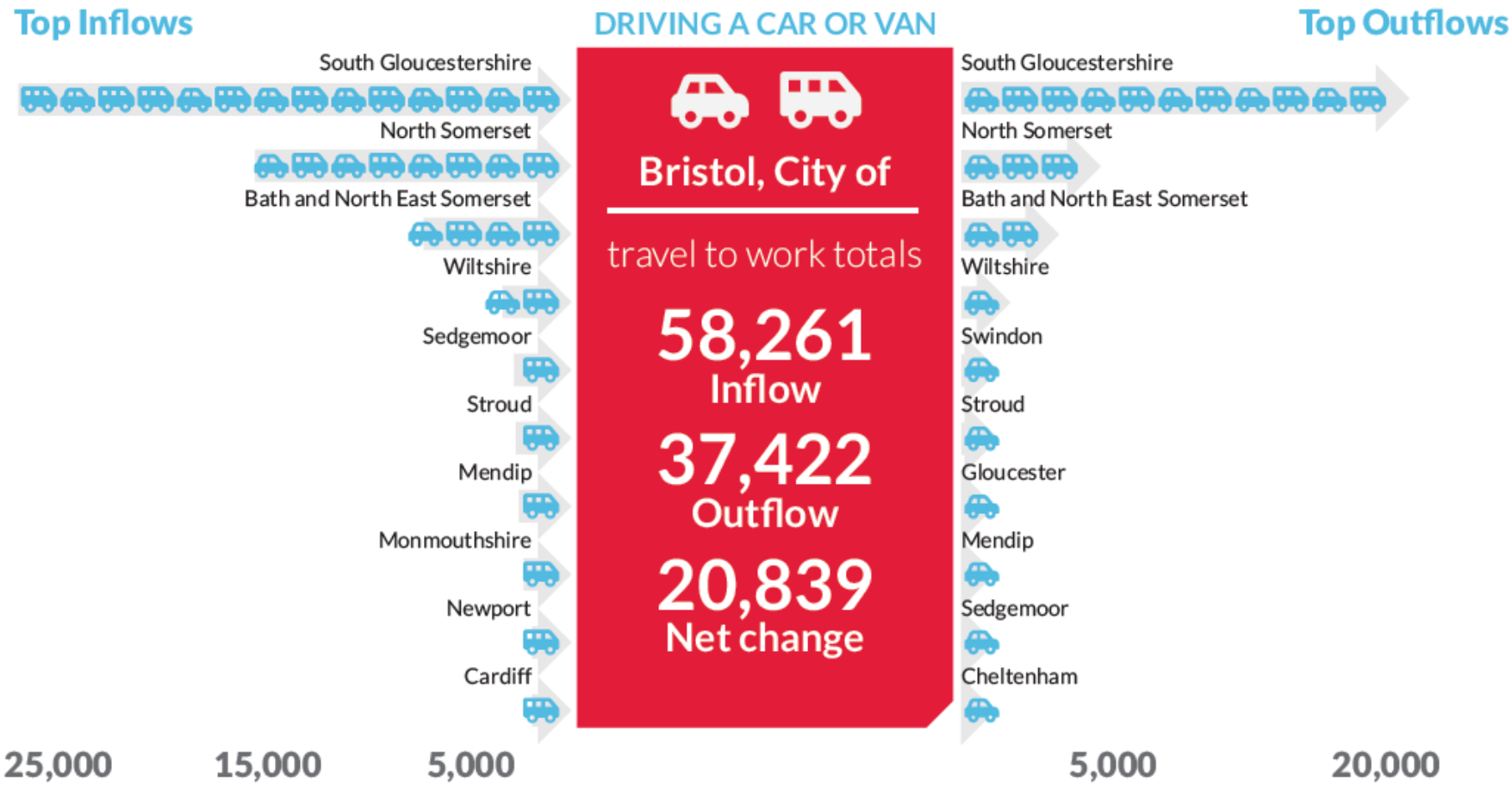
DfT (2017) Greenhouse gas emissions by transport mode: UK 1990-2015. Table ENV0201 (Historic)

Medium-range trips contribute most carbon



UK DfT (2009) Delivering Sustainable Low Carbon Travel. Figure 2.1



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60% Car/Van Commuters from outside BCC Area

1

AROUND

51%

OF BRISTOL RESIDENTS REPORT BEING OBESE OR OVERWEIGHT

2

AROUND

300 DEATHS

(8.5% OF ALL DEATHS) EACH YEAR IN BRISTOL ARE ATTRIBUTABLE TO AIR POLLUTION

3

8 PEOPLE KILLED AND 1,200 PEOPLE INJURED ON BRISTOL'S ROADS IN 2015

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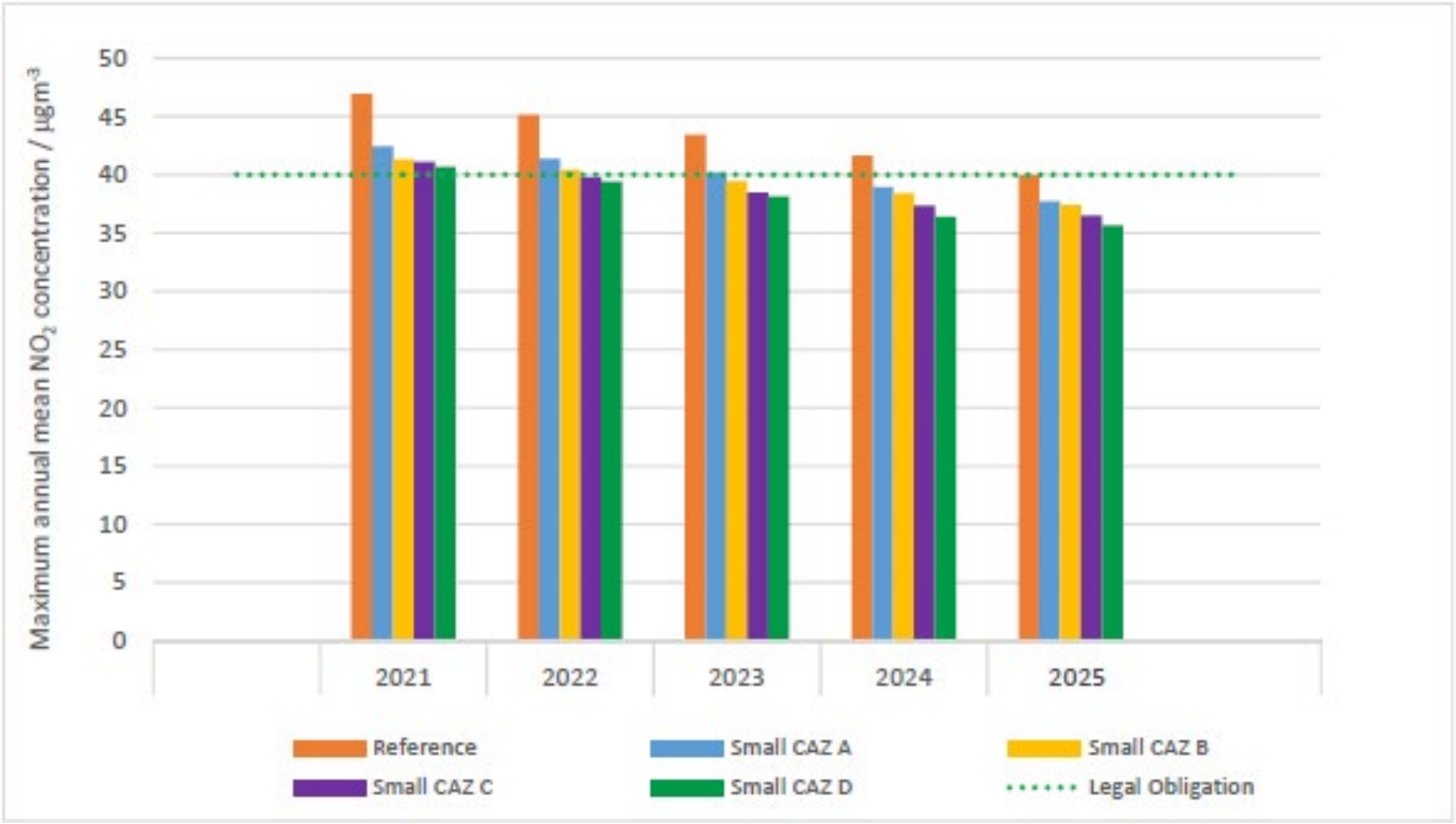
How significant is having a CAZ?



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How Relevant is the 'Legal Obligation'?

"Neither the concentration limits set by government, nor the World Health Organization's air quality guidelines, define levels of exposure that are entirely safe for the whole population." (p.xii)

"With…a lack of evidence of a threshold where no effects exist for many pollutants, further control policies should seek to decrease pollution exposure, even where limits are met." (p.12, emphasis added)

"The Committee on the Medical Effects of Air Pollutants estimates 29,000 'equivalent' deaths annually from exposure to PM2.5 in the UK, with only a small fraction of that figure relating to exposures to concentrations in excess of legal limits". (p.18, emphasis added)

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Source: Royal College of Physicians (2016). Every breath we take: the lifelong impact of air pollution. Report of a working party. London: RCP.

Significance of Current Innovations

EVs, Energy & GHGs

+28-35% higher efficiency than petrol
+13-21% than diesel

+ 20% future efficiency (all pathways)

The other 50% reduction required would need to come from carbon-neutral energy

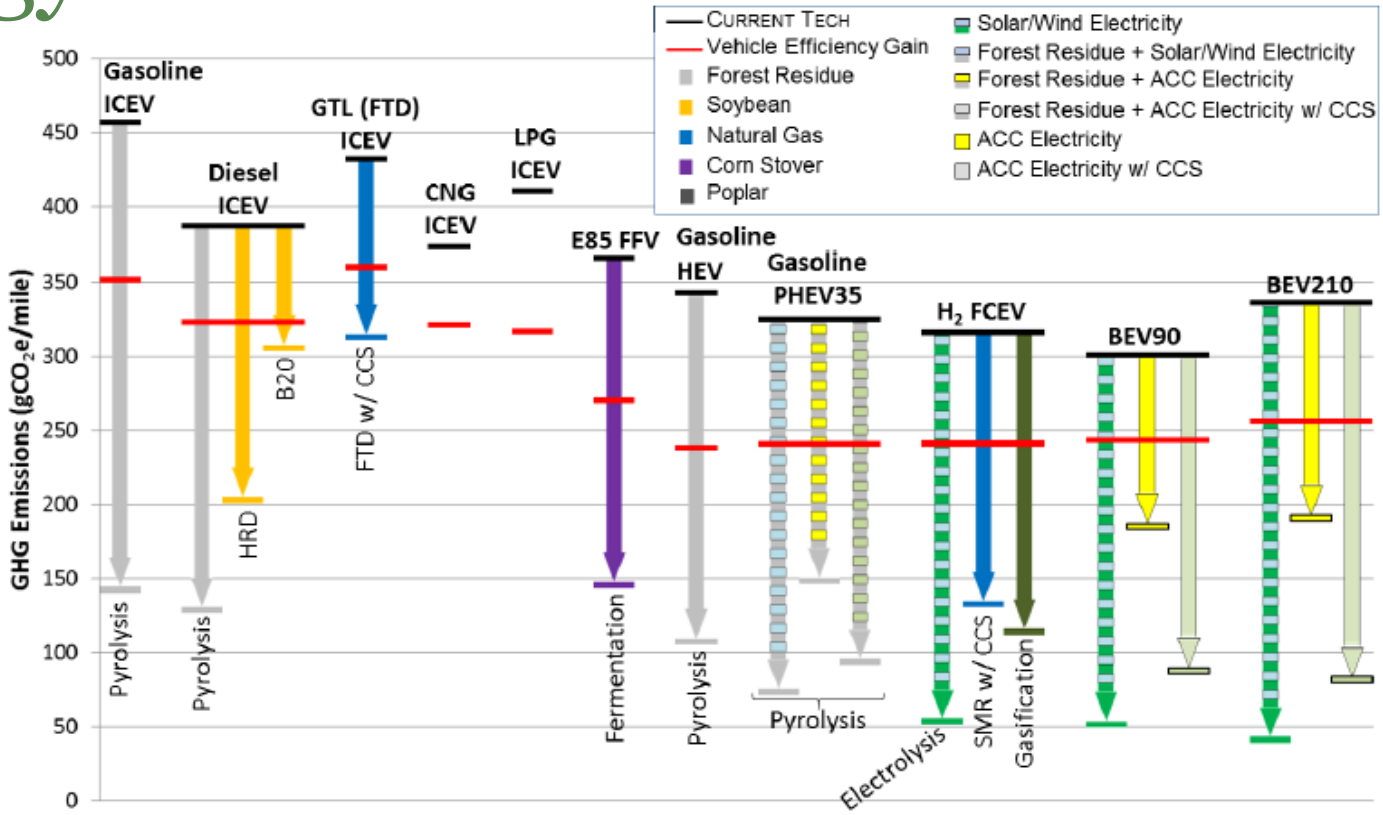

Figure ES-1. C2G GHG emissions of various vehicle-fuel pathways. Analysis was performed using GREET2014, and vehicle and fuel pathways are constrained to those deemed scalable to approximately 10% of the LDV fleet.

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EVs & Air Pollution

- EVs avoid NOx emissions
- But 90% of ICEV PM_{10} and 85% of $PM_{2.5}$ emissions NOT from combustion but from sources like tyres, brakes and 'resuspension'
- EVs are (currently) 24% heavier, but use regenerative braking
- Particulate reduction will require lightweighting and reducing traffic

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Some information from Timmers & Achten (2016) Non-exhaust PM emissions from electric vehicles. *Atmospheric Environment*, 134, 10-17.

Significant practical challenges to roll-out if intention to replace 30 million vehicles…

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Contribution of EVs - Summary

- Light duty EV sales now a growing niche although heavy duty solutions more problematic
  - 20-year transition until 90-95% fleet share?
- Contributes to sustainability but only as part of a wider strategy
  - Need renewable electricity and additional solutions for traffic growth and air quality
- EVs are more expensive to buy but cheaper (and more acceptable?) to use
  - Some threat to the demand for and sustainability credentials of public transport

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The sharing economy mostly concerns asynchronous sharing

Is the transport sector likely to be very different?

Effects of car ‘sharing’ clubs

- Millard-Ball et al. (2005)
  - 1 CSC car substitutes 9-13 private cars
- Martin & Shaheen (2011)
  - mean vkm per year by members decreased 27%.
- Muheim (1998)
  - 10-30% of members reduce car ownership when join
- Ter Schure et al. (2012)
  - members 40% less likely to drive alone for trips than non-members

Millard-Ball, A. et al. (2005). Car-Sharing: Where and How It Succeeds. Transportation Research Board (TCRP Report, 108).

Martin, E., Shaheen, S. (2011). Greenhouse Gas Emissions Impacts of Carsharing in North America. Report 09-1. Mineta Transportation Institute, San Jose State University, Calif., 2010. http://transweb.sjsu. edu/project/0911.html

Muheim, P. Carsharing: The Key to Combined Mobility. Swiss Federal Office of Energy, Bern, Switzerland, 1998.

Ter Schure, J., et al. (2012) Cumulative impacts of carsharing and unbundled parking on vehicle ownership and mode choice. Transportation Research Record: Journal of the Transportation Research Board, 2319(1), 96-101

Uncertainty around effects of 'Transportation Network Companies' to date

- Like Car Clubs, Standard Uber and Lyft services represent asynchronous sharing
- Uber Pool and Lyft Line are synchronously shared but are only offered in the largest metropolitan areas

- Rayle et al. (2016) found a special appeal for a group of (generally) younger, well-educated urban travellers with a high 'value of time'
  - 'special' in the sense that the offer was not replicated by other modes = additional demand?
- Hall et al. (2017) considerable variability on the impact of Uber on transit services in US metropolitan areas
  - on balance they found a complementary effect but variability and uncertainty

Rayle, L., Dai, D., Chan, N., Cervero, R. and Shaheen, S., 2016. Just a better taxi? A survey-based comparison of taxis, transit, and ridesourcing services in San Francisco. *Transport Policy*, **45**, 168-178.

Hall, J.C., Palsson, D., and Price, J., (2017) Is Uber a substitute or complement for public transit? University of Toronto. http://individual.utoronto.ca/jhall/documents/Uber_and_Public_Transit.pdf

If automation does happen, whether sharing has a significant share becomes even more critical

According to scenario modelling, a synchronously-shared CAV fleet would require only 10% of the number of current vehicles to provide for existing mobility.

But an exclusively-used collective fleet would still require 77% of current vehicles!

Overall traffic and peak congestion *still increased* in the 'rideshare max' option (6% and 9% respectively).

Exclusive use would double both measures.

International Transport Forum (2015) summarised by Parkhurst, G. and Lyons, G. (2018) The many assumptions about self-driving cars – Where are we heading and who is in the driving seat? Available from: http://eprints.uwe.ac.uk/36997

"automation might plausibly reduce road transport GHG emissions and energy use by nearly half – or nearly double them – depending on which effects come to dominate"

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Wadud, Z., MacKenzie, D., Leiby, P. (2016) Help or hindrance? The travel, energy and carbon impacts of highly automated vehicles. *Transportation Research A*, 86, 1–18.

Contribution of 'shared mobility' - Summary

- Will shared-ownership car clubs become more than a niche?
- Smart shared taxis currently only viable in largest urban areas
  - AV shared taxis would change costs radically, but barriers to deliverability and acceptance
- Sustainability contribution only with max synchronous sharing and active travel encouraged
  - High risk of social exclusion
- Small, shared vehicles would not be sufficient to meet current levels of peak demand in an efficient way

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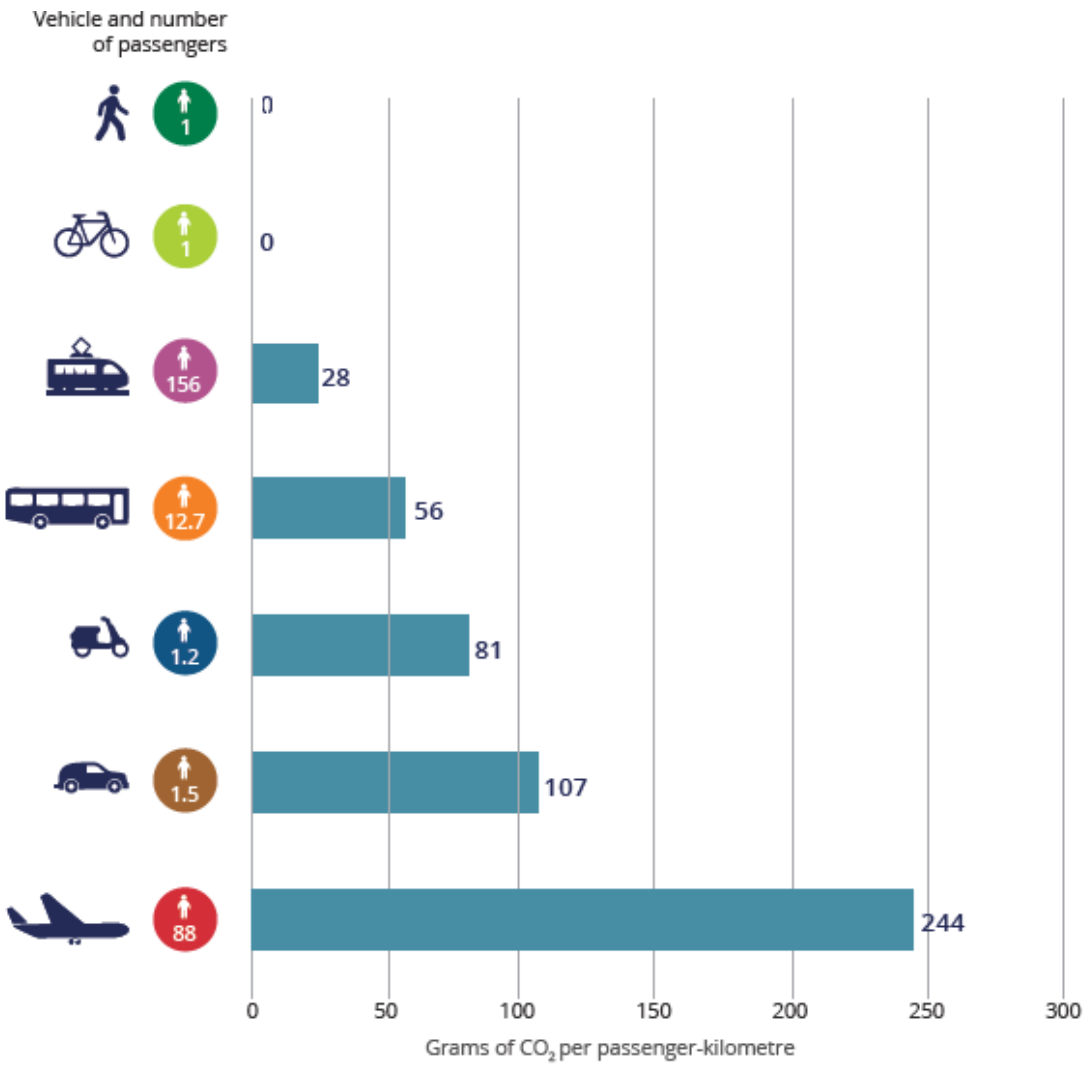
What Else is Needed?

Other modes which can half carbon emissions…

CO_2 emissions at average occupancy for various transport modes, 2014
EEA (2016) Fig 5.2



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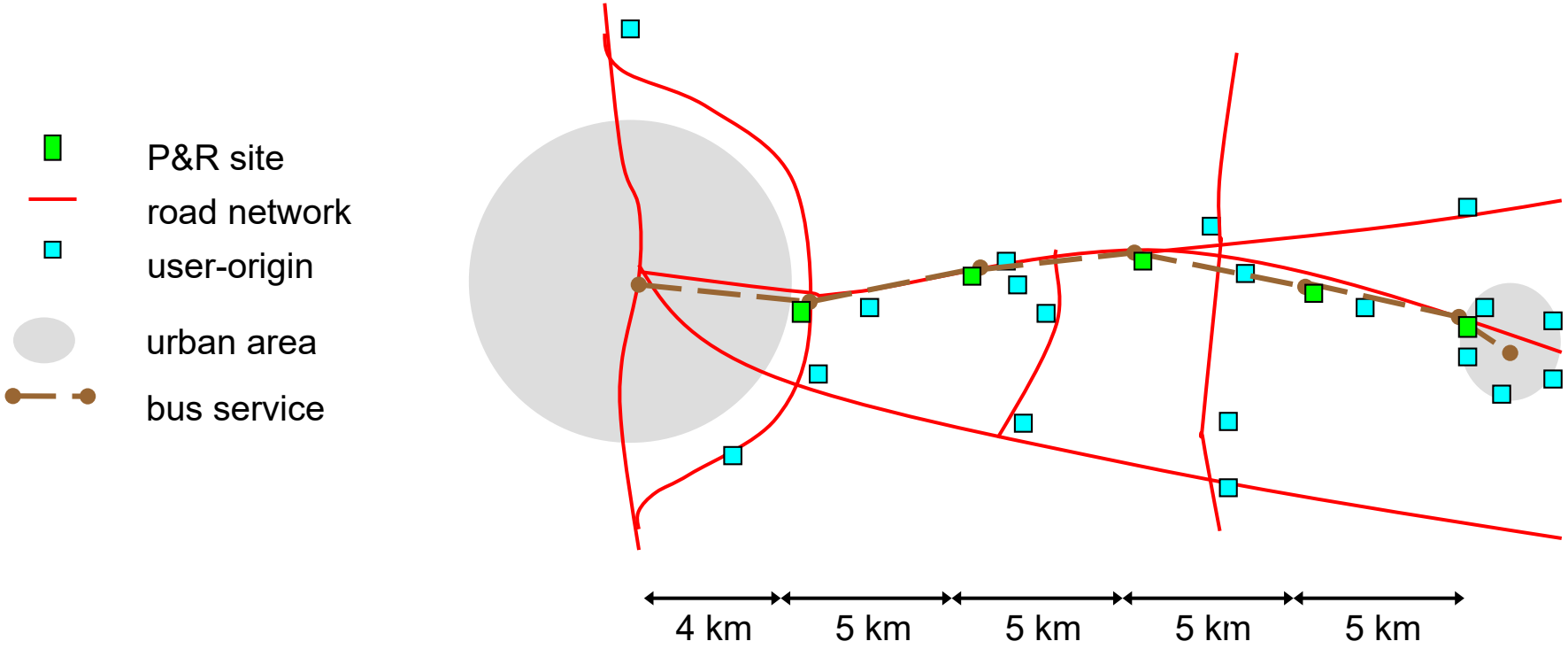
P&R Integrated with Bus Services: ‘Link & Ride’



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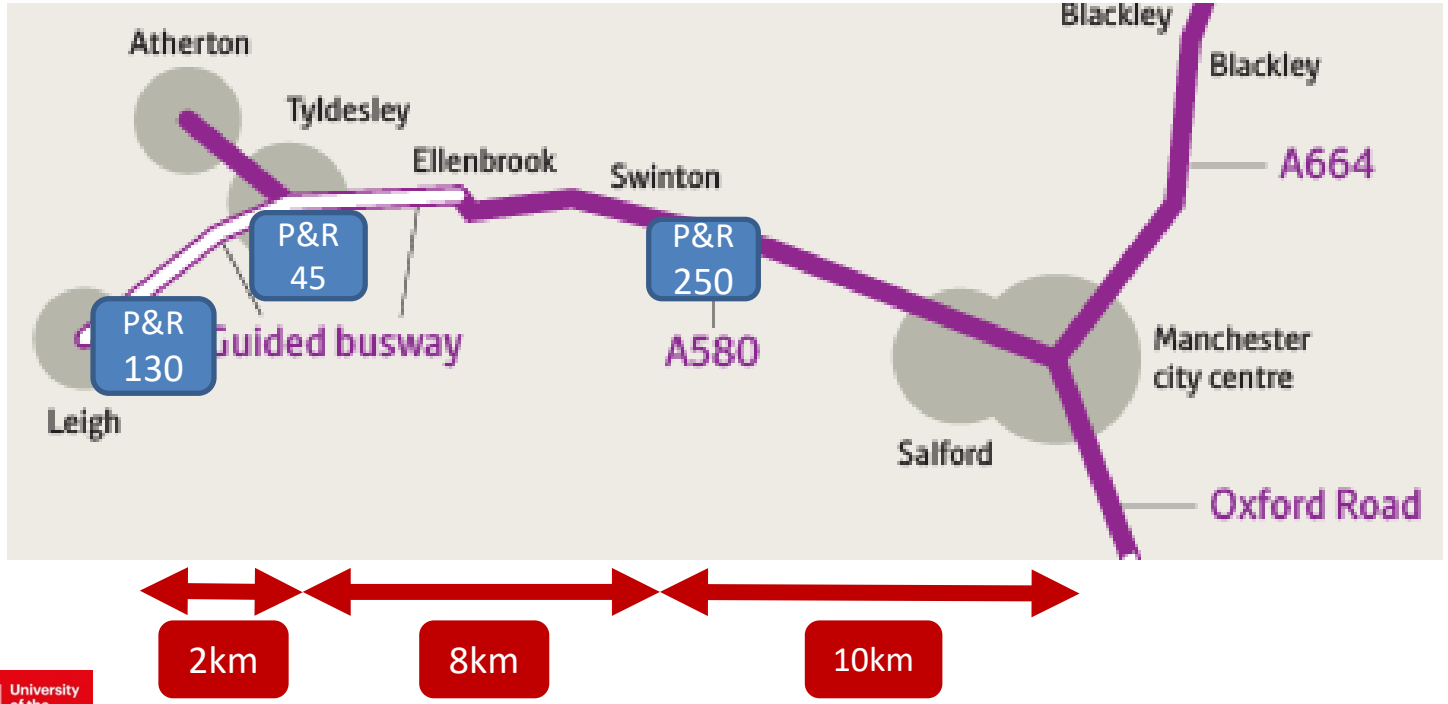
Leigh-Manchester Busway



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Bath: Potential Integrated Transport Corridors

More MetroBus and perhaps other centrepiece public transport schemes…

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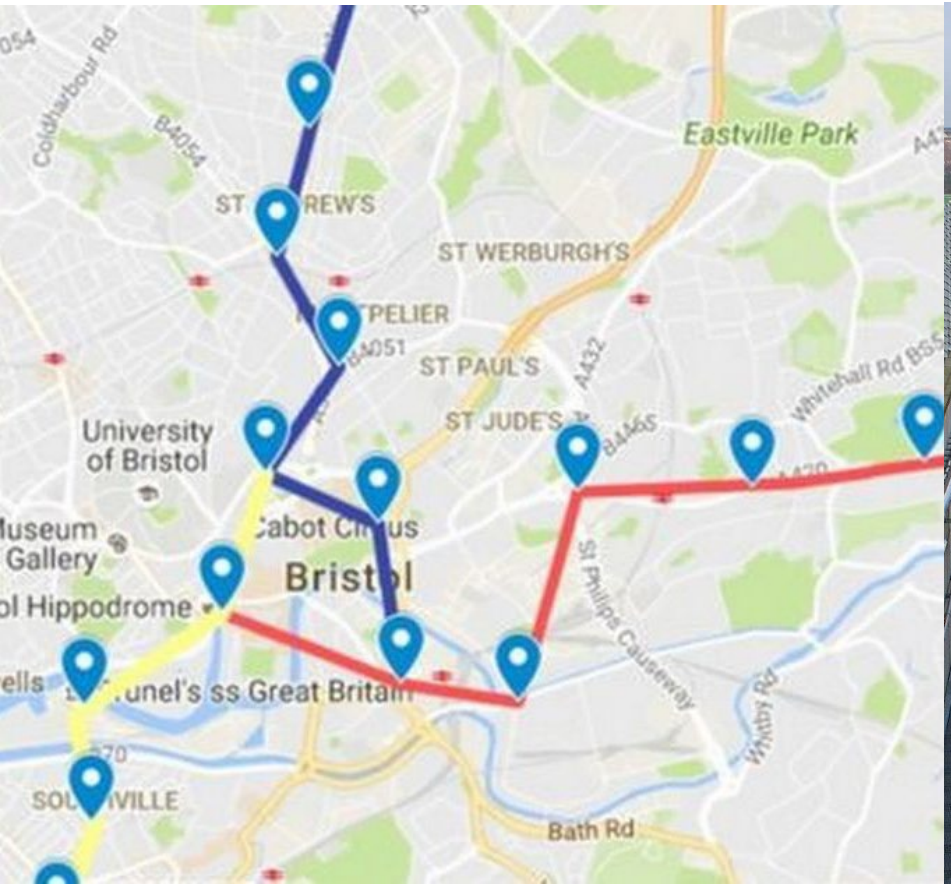
Parkhurst, G., Seedhouse, A. (in press). *Will the 'smart mobility' revolution matter?*

Bristol Underground (£2-4 bn)?

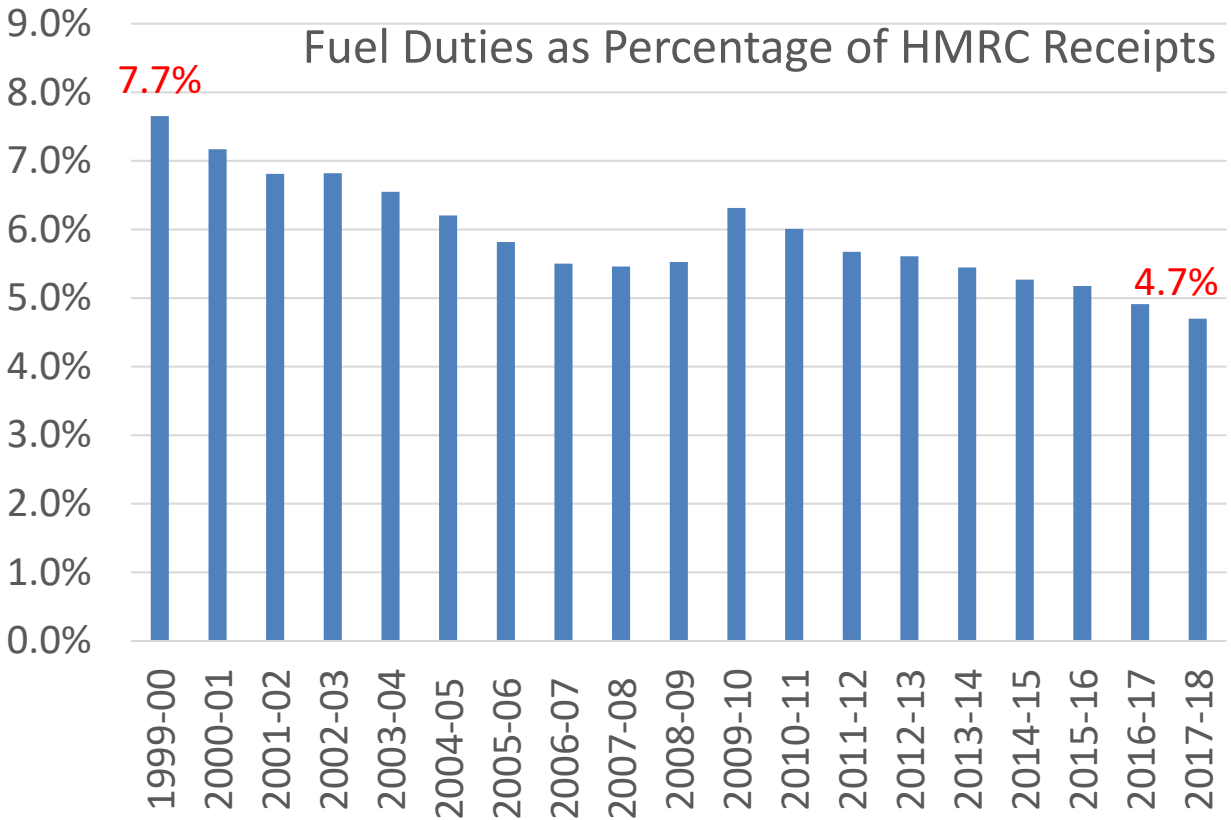


Credit: Movida
https://commons.wikimedia.org/wiki/File:MB_115_Poliambulanza_uscita_20130309.JPG

Future of transport taxes?

4.7% = £28 billion p.a.

Every 1% shift to BEVs will cost the Treasury of the order of £300 million



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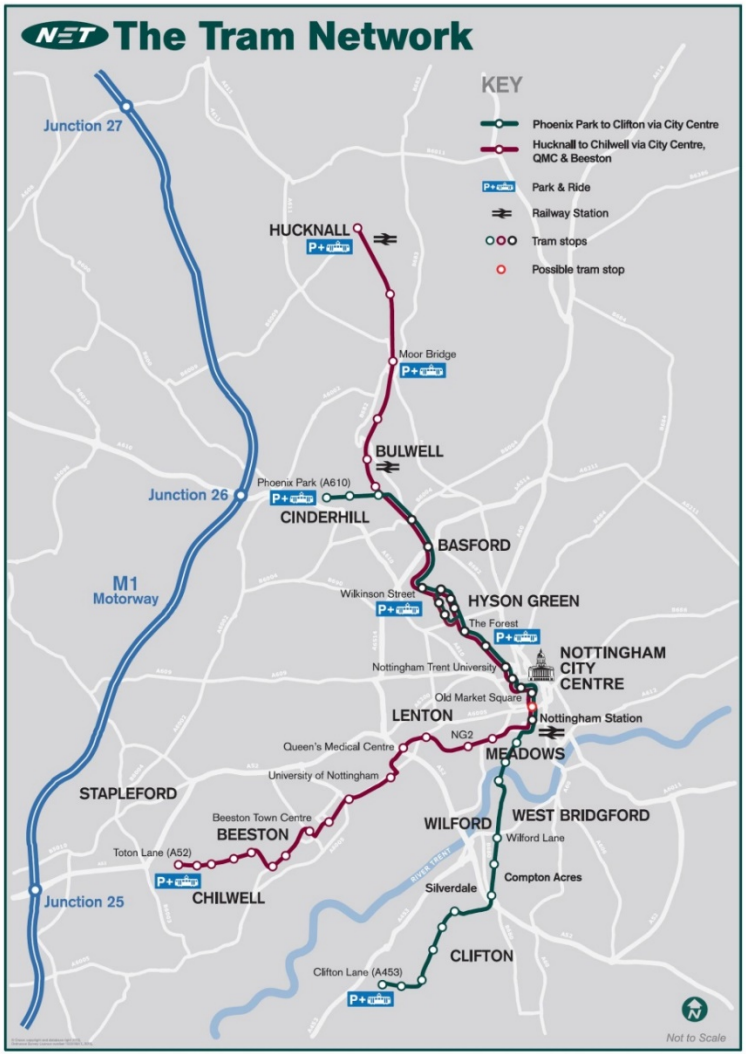
Source: HMRC (2018) https://www.gov.uk/government/statistics/hmrc-tax-and-nics-receipts-for-the-uk

Nottingham


The Tram Network
KEY
Phoenix Park to Clifton via City Centre
Hucknall to Chilwell via City Centre, QMC & Beeston
Park & Ride
Railway Station
Tram stops
Possible tram stop
Junction 27
HUCKNALL
Moor Bridge
BULWELL
Junction 26
Phoenix Park (A610)
CINDERHILL
BASFORD
M1 Motorway
Wilkinson Street
HYSON GREEN
The Forest
NOTTINGHAM CITY CENTRE
Nottingham Trent University
Old Market Square
LENTON
Nottingham Station
NG2
Queen's Medical Centre
MEADOWS
University of Nottingham
STAPLEFORD
Beeston Town Centre
BEESTON
WILFORD
WEST BRIDGFORD
Wilford Lane
Toton Lane (A52)
Compton Acres
Silverdale
Junction 25
CHILWELL
CLIFTON
Clifton Lane (A453)
Not to Scale

Conclusions

- We need to do a lot more to reduce climate change and noxious emissions and avoid traffic/congestion growing
- New technologies can help, but only if they address the fundamental problems:
  - vehicle ridership is too low currently
  - we must promote early interchange onto efficient public transport (and walking and cycling)
- EVs will cause a revolution in transport taxation
  - Major problems ahead if government decides to replace fuel duty with a tax not related to travel demand

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