Accelerating modal shift: evidence on carbon savings and co-benefits

Collated by the Sustainable Transport Alliance, August 2023:

bus users

Campaign for Better Transport

CoMoUK supporting shared transport

Community Rail Network

cta community transport association

LIVING STREETS

we are cycling UK

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In the UK, transport emissions, now our biggest contributor to the climate crisis, are refusing to fall, related to a long-term trend of increasing vehicle mileage and vehicle size weighing against improved engine efficiency,[1] with recent analyses showing greater attention is needed to 'demand side' measures to influence behaviours.[2]

The DfT's Transport Decarbonisation Plan, which has 'accelerating modal shift' as its first objective, states that:

- Total domestic transport emissions[3] = 122.15 MtCO2e[4] (2019)
- 55.4% is from cars (compared to 2.5% from buses, 1.4% from rail), most of the rest from LGVs/HGVs
- This equates to 67.7 MtCO2e from cars annually.[5]

Community Transport Association

Gloucestershire CRP

Provisional emissions data for 2022 suggests territorial transport emissions have dipped slightly, to 112.5MtCo2e, although this is linked to the pandemic causing a steep dip in transport emissions that have not returned to the same levels.[6] The same report states that transport now contributes 34% of territorial emissions, and that changes over the years have been largely attributable to the rate of growth in vehicle kms.

Academics and think tanks have shown that roll-out of EVs is insufficient to get us on course for Net Zero: **we still need to reduce private car use by at least 20-27% by 2030** (more beyond) to meet Net Zero targets, [7] and this is for many reasons more desirable.

Our organisations' experiences tally with research showing that, rather than involving sacrifice, this can bring wide-ranging benefits (summarised below), especially if delivered in an empowering, inclusive and place-based manner, which we believe would be widely well-received.

Evidence collated by the Sustainable Transport Alliance shows how even relatively modest behavioural shifts can achieve major carbon savings, getting us back on track with transport decarbonisation, and deliver strong co-benefits to the economy, levelling up, health and wellbeing, and be achieved in positive, popular ways.

We recommend **a mode share pathway** is developed, scoping and setting out how each mode in the sustainable transport mix (active travel, public transport, community and shared mobility) can take on a greater share of journeys each decade to 2050, across different locality types (urban to rural), bringing the big carbon savings needed, while contributing great benefits and socio-economic value to households and communities.

The below constitutes a largely statistical summary of evidence that our organisations look to and use, but can be read alongside our extensive array of case studies and examples of communities and households getting behind sustainable travel and making changes that benefit them and the climate (see links in section F viii).

Southeast Communities Rail Partnership

A) Carbon savings per journey:

The carbon savings below are taken from a range of sources, some of which compare to an 'average' petrol car, others to a 'large' petrol car, and others looking at typical journeys on a given route. We believe all are useful and valid, albeit not directly comparable, showing scope for major CO2 savings on typical journeys.

i. **Car to rail** - For a 332 mile journey London-Edinburgh, rail produces 12.5kgCO2e per passenger compared to 136.4 by car, 91% less, saving 123.9kgCO2e.[8] For a 30 mile journey, rail produces on average 1.9kgCO2e per passenger compared to 13.0kg in a large petrol car, 86% less, or 11.1kgCO2.[9]

ii. **Car to bus** - For a 30 mile journey, buses produce on average 4.8kgCO2e per passenger compared to 13.0 in a large petrol car, a reduction of 63%, saving 8.2kgCO2.[10] (Far greater savings are made if journeys are switched to fully electric buses, which produce 75% lower emissions.[11])

iii. **Car to cycling** - Cycling produces no emissions, a reduction of 100%, so for a five-mile journey, cycling saves 1.4 kgCO2e compared to the average petrol car. For a 10-mile journey, it saves 2.9kgCO2e.[12]

iv. **Car to walking** - Walking produces no emissions, a reduction of 100%, so for a 0.5 mile journey, it saves 0.14 kgCO2e compared to the average petrol car. For a one-mile journey, it saves 0.3kgCO2e.[13]

v. **Private car to car club** - Emissions from an average car club car are 37% lower,[14] saving 3.2kgCO2e per 30-mile journey compared to the average petrol car (plus reducing overall mileage, as below).[15]

vi. **Domestic flight to rail** - For a 332-mile journey London-Edinburgh, rail produces 12.5kgCO2e per passenger compared to 165.1kg flying, a 92% reduction, saving 152.6 kgCO2e.[16]

B) Cumulative/combined carbon savings:

i. **Car to rail** - If all drivers with access to a car in England[17] switched one 30-mile car journey a month to rail, this would deliver 4.4 MtCO2e savings per year, a 6.5% reduction in total car emissions.[18]

ii. **Car to bus** - If everyone switched one car journey to bus per month by 2030, and two journeys per month by 2050, this would result in 15.8 million tonnes of carbon dioxide savings.[19]

iii. **Car to active travel** - One study found active travel can realistically substitute for 41% of car trips under three miles, equating to 5% of emissions from cars,[20] or 3.4MtCO2e.[21] This is on top of 5% of avoided emissions from existing walking and cycling and does not account for longer cyclable journeys.

iv. **Car to active travel** - Switching one journey per day from driving to walking or cycling reduces each person's CO2e by 0.5 tonnes annually on average.[22]

v. **Car to active travel on the school run** - The UK's primary school run is responsible for 0.5 MtCO2e pa, more than some small countries.[23] Shifting just 20% of these mainly short journeys to walking and cycling would mean 0.1m tonnes CO2e saved pa, and possibly encouraging wider active travel too.

vi. **Car to cycling** - If everyone in England had access to a bicycle (currently 38% have one), it could save 15MtCO2e per annum.[24] People who cycle have 84% lower CO2e from daily travel than non-cyclists.[25]

vii. **Car to e-bikes** - E-bikes have the capability to reduce car emissions by 24.4MtCO2e pa in England, with greatest benefit in rural areas.[26]

viii. **Car to bike share** - 71kgCO2e are reduced on average for every bike share user pa from mode shift.[27]

ix. **Private car to car-club** - Estimates for car club users cutting overall car miles (see below)[28] equate to 48.7 kgCO2e saved per year (on top of the savings from more economical cars).

v. **Domestic flight to rail** – In 2021, there were three million passenger journeys by UK domestic flight, on average 277km.[29] A 10% switch to rail would mean 19,682 tonnes CO2e saved per year.

C) Reductions in traffic volume and congestion:

i. A double-decker bus with all the seats occupied would take on average 48 cars off the roads.[30]

ii. A long-distance train with all the seats occupied take on average 407 cars off the roads.[31]

iii. A car club car on average replaces 22 private cars (29 in London).[32]

iv. 32% of car clubs users report reducing monthly car miles. It's estimated that, on average, each user has reduced their monthly car mileage by 14 miles, 5% less per year based on the average.[33]

v. The average private car is parked 96% of the time, wasting resource and space, particularly so with average size being 32% larger than in the 1960s.[34] Motor vehicles take up 35%-41% of urban spaces.[35]

D) Economic, health and lifestyle benefits:

i. Measures to support modal shift tend to benefit those who already don't have access to a car. This is nearly three in 10 UK adults overall, but nearly half of adults on low-incomes, disabled people and ethnic minority groups, who currently experience transport-related social exclusion disproportionately.[36] Therefore such measures support Levelling Up, and directly fulfil some LU missions.[37]

ii. If everyone switched one car journey per month to bus by 2030, and two journeys a month by 2050, this would bring 15.8 MtCO2e savings, £29.4 billion in reduced congestion and £14.9 billion in cumulative health benefits.[38]

iii. This level of modal shift would also lead to 5,600-ton reduction in NOx and 121-ton reduction in PM10 by 2050, valued at £28 million (enough to pay for 800 nurses).[39]

iv. The cumulative economic value of this modal shift would be £15 billion of positive impacts (£9.3 billion reduction in road crashes and casualties, £5.4 billion with improvements to lifestyle, and £160 million with reduction to noise pollution). This is enough to build 33 new NHS hospitals.[40]

v. The same study concluded that modal shift is not only necessary, but desirable due to these multi-dimensional benefits.[41]

vi. Physical inactivity is associated with one in six UK deaths and is estimated to cost the UK £7.4 billion annually. Our population is around 20% less active than in the 1960s.[42] Increasing levels of active travel has a significant effect in reducing early deaths and the costs of inactivity.[43] The NHS recommends that even a 10-minute brisk walk per day makes a marked difference to health and wellbeing.[44]

South East Lancashire CRP

vii. Many journeys by public transport include active travel, bringing health and wellbeing benefits, hence using public transport instead of private car use is associated with lower BMI.[45]

viii. Walking or cycling to school has marked health benefits for children, especially in deprived areas, and infrastructure development such as safe walking routes increases take-up.[46]

ix. People who walk, cycle and use public transport spend 40% more with local businesses on average, while areas that have been improved for active and sustainable travel access tend to see greatly increased footfall and economic activity.[47]

x. Bike share schemes get people cycling more: 66% cycle more frequently since joining; 53% of bike share users have started cycling again after at least one year's absence, and 7% for the first time.[48]

xi. Car club schemes encourage use of active travel and public transport too: 32% of car club members use a bicycle at least weekly, 76% walk for travel at least weekly, 48% use a bus at least weekly.[49]

xii. In 71% of UK towns and cities, children are breathing unsafe levels of air pollution. Around 1 in 3 babies are growing up in areas of the UK with unsafe levels of particulate matter.[50] See point iii above.

F) Popularity and opportunities for welcome change:

i. Between the Sustainable Transport Alliance partners, we support and represent approaching 3,000 community groups and 20,000 volunteers striving to advance and champion sustainable travel. In our extensive experience, communities are full of enthusiasm and knowledge that can help us achieve modal shift positively, through engaging, enabling and empowering people, and meeting local needs.

ii. A range of academic research shows how shifting towards sustainable lifestyles and sustainable development rests on 'community vitality' and 'social capital',[51] pointing towards an engaging, empowering approach being needed, to break down barriers, nurture local action, and help people to change together, going beyond 'ABC' choice-based and nudging change models.[52] Putting onus on individuals to make different choices may alienate and show a lack of understanding for people's realities,[53] whereas involving communities collectively in transport and its development can bring behavioural and structural/systemic shifts simultaneously.[54] Our organisations' activities align strongly with the academic evidence on this (see point vii below).

iii. Surveys show strong support for climate action, and for sustainable and healthy travel specifically, including improvements to active travel and public transport. In the National Travel Attitudes Survey (NTAS), 76% agreed we should be reducing the amount we drive for the sake of the environment (a figure that increased) while 68% thought congestion in urban areas was a serious problem, and 72% were concerned about the environmental effects of road building.[55]

iv. The NTAS also showed smaller proportions, but still sizeable minorities, willing to switch their short journeys to buses (31%), cycling (37%) or walking (42%).[56] This suggests latent demand for sustainable travel, but also barriers and inhibitors to be addressed.

v. Scope and willingness for behaviour change is also shown in a recent DfT report, with more than four in 10 saying they are willing to use their cars less. This also shows common barriers to be broken down, particularly for public transport to be cheaper and more reliable.[57]

vi. Citizens' assemblies and juries (selected from wide cross-sections of the population) show strong support for measures to enable greater use of sustainable travel, when people come together to hear and discuss the evidence. The UK assembly backed a reduction in the amount we use cars by an average of 2–5% per decade, and had improvements to public transport as a key recommendation, stressing the need for solutions to be accessible and affordable.[58] The Leeds Climate Change Citizens' Jury recommended that private car use should be a 'last resort' in the city.[59]

vii. Our organisations' extensive literature, reports and case studies shows how sustainable travel and modal shift can be achieved positively, with community involvement and support. For example:

a. Community Rail Network's report on **modal shift activities and impacts in community rail**;

b. CoMoUK's reports showing the growth and success of **car clubs** and **bike share**;

c. Living Streets' summary of **impacts of their walk to school activity**, including reduced car use;

d. Bus Users UK's **annual impact report**, including coordinating Catch the Bus Month;

e. Community Transport Association's summary of **community transport impacts**, and their **climate action** programme;

f. Campaign for Better Transport's **wide-ranging reports**, such as on mode shift from plane to train, and local authorities being support to **develop bus networks**;

g. Sustrans' range of **reports on opportunities to improve active travel** and make it inclusive for all;

h. London Cycling Campaign's **impact summary** shows its contribution to bike journeys trebling.

G) Mode share targets and analyses

We recommend that a review of mode share, targets and pathways to 2050 would be invaluable to inform and prioritise decarbonisation and other policy developments and investments across transport. We believe this is not yet available at UK level across transport modes, but we are aware of these key strategies and studies:

i. DfT's Gear Change strategy aims for 50% of journeys in towns and cities to be active travel by 2030;[60]

ii. Transport for the North's (draft) Strategic Plan aims to increase public transport mode share to 10% by 2030 and 15% by 2050 (rail 3%, bus 12%), and active travel to 33% by 2030 and 36% by 2050;[61]

iii. London's Transport Strategy aims for 80% of journeys to be by active/public transport by 2041;[62]

iv. The Scottish Government's route map for achieving a 20% reduction in car kms by 2030;[63]

v. A Bristol-specific academic review recommended a maximum of 20% of journeys by car, 25% by public transport, and 55% by active travel in the city;[64]

vi. CREDS' analysis of general prospects for travel demand change and recommendations for this.[65]

For queries on this paper contact any Sustainable Transport Alliance partner directly as relevant or news@communityrail.org.uk.

Devon and Cornwall Rail Partnership

End notes:

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8 Rail Delivery Group, 2023, https://www.raildeliverygroup.com/?view=article&id=469776947
9 Analysis from Community Rail Network's 2021 report on Modal Shift, https://communityrail.org.uk/wp-content/uploads/2021/07/Modal-shift-report-FINAL-FOR-WEB.pdf, using statistics from https://ourworldindata.org/travel-carbon-footprint#licence.
10 ibid
11 See https://www.sciencedirect.com/science/article/abs/pii/S036054421630319X?via%3Dihub
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25 ibid
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Living Streets

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Front cover image courtesy of Wheels for Wellbeing