Reaching Net Zero: The role of active travel

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Summary

Our modelling work suggests that swapping 40% of car journeys under 5km to active travel (walking, wheeling or cycling) would have reduced 2019 carbon emissions from cars[1] by 9-11%. If every journey under 5km was made by active travel[2], this would save 23-28% of carbon emissions from car journeys.

If 10% of trips over 5km were swapped to more sustainable travel (i.e., a combination of active travel and public transport), a further 7% of car emissions would be saved. This leads to total carbon savings of 16-18% (if 40% of journeys under 5km and 10% of journeys over 5km were shifted to sustainable travel), or 30-35% if all journeys under 5km were made by active travel. These are conservative estimates. Integration of active travel with, and use of, public transport is likely to be key to reducing transport emissions.

Introduction

We outline here the potential for active travel to contribute to Net Zero. This summary highlights the main findings from the accompanying Excel document “Reducing carbon emissions through active travel”. The savings we present are based on Transport Scotland figures for what mode people travelled by in 2019 (e.g., whether by walking, cycling, bus, car, etc.)[3], and represent the changes to carbon emissions that would have occurred if people had changed what mode of transport they chose

[1] Tailpipe emissions only (i.e., only the gases and particles emitted by a car when it is running). It does not include lifecycle emissions (accounting for the emissions required to produce the car, to extract, produce and distribute the fuel before it reaches the car, etc.)

[2] Excluding certain categories such as emergency services and disabled driver vehicles.

[3] Transport Scotland (2019). Transport and Travel in Scotland 2019: Results from the Scottish Household Survey. Available at: https://www.transport.gov.scot/publication/transport-and-travel-in-scotland-2019-results-from-the-scottish-household-survey/

for various trips. To calculate emissions, we have used a low, middle, and high value for each distance category of the Transport Scotland figures[4]. In some cases, this will give a range of values rather than a precise figure.

What impact can active travel have?

- 40% of trips under 5km in Scotland in 2019 were made by a driver of a car/van[5]. Reducing this to 22% of trips under 5km (i.e., a 40% reduction) would result in carbon reductions of 9-11% of all car emissions[6].
    - Previous research based in Wales suggested that 41% of short car journeys can feasibly be swapped to active travel, and this would mitigate 4.5% of carbon emissions from cars[7].
- If 100% of all trips under 5km in 2019 were made by active travel, car travel carbon emissions would have reduced by 23-28%. If 10% of car trips over 5km were also shifted to a combination of public transport and active travel, this would rise to 30-35%[8].

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[4] Transport Scotland group trips by distance (e.g., 5-10km). Within these categories we have no way of knowing how long trips are and have hence gone with a proxy of choosing the lower (5km), midpoint (7.5km) and highpoint (9.9km) end of each category.

[5] Calculated from Table TD 2a in Transport and Travel In Scotland 2019 Travel Diary Tables. Available at: https://www.transport.gov.scot/publication/transport-and-travel-in-scotland-2019-results-from-the-scottish-household-survey/

[6] Notably, these figures are for swapping personal journeys and exclude several trip types and purposes that would be more difficult to swap to active travel such as emergency vehicles, disabled driver vehicles and disabled passenger carrying vehicles (i.e., the category of “Crown and Exempt vehicles”).

[7] Neves, A. and Brand, C. (2019). Assessing the potential for carbon emissions savings from replacing short car trips with walking and cycling using a mixed GPS-travel diary approach. *Transportation Research Part A: Policy and Practice*, *123*, pp.130-146. Available at: https://www.sciencedirect.com/science/article/pii/S0965856417316117?via%3Dihub

[8] While a 100% shift to active travel for trips under 5km is unlikely, strategies such as enhanced public transport and car sharing using electric vehicles mean it is feasible to move towards no trips under 5km being made by combustion engine cars.

- Per kilometre, shorter journeys are more carbon intensive than longer journeys due to the extra initial tailpipe emissions that result from combustion in a cold engine (known as cold start emissions).
- However, car trips over 40km (as a driver) represent a higher amount of carbon emissions and distance travelled; they make up just 8% of all car trips[9], but account for 34-37% of all kilometres travelled by car, and 18-24% of car CO_2e[10] emissions[11]. Conversely, car trips under 5km make up 43% of all car journeys but only 7-8% of car km and 23-28% of car CO_2e emissions (see Table 1 below).

Table 1: Percentage of trips, mileage, and emissions for various journey distances. AT= Active Travel. PT= Public Transport. Figures taken from accompanying Excel file "Reducing carbon emissions through active travel".

Car Journey distance	% of all journeys, all modes	% of overall journey km, all modes	% of car journeys	% of car journey km	% of car CO_2e emissions	% decrease in CO_2e emissions for every 10% mode shift to AT (<5km) or PT + AT (>5km)
Under 5km	22	5	43	7-8	23-28	2-3
5-40km	26	38-39	47	56-59	53	5
40+km	4	22-24	8	34-37	18-24	2

- Integrating public transport with active travel is essential for achieving net zero. Longer car journeys cannot be directly replaced by active travel, despite making up a higher proportion of emissions and kilometres travelled. However, some of these

[9] See Table P1, "Tatis Tables (2021)" tab in accompanying Excel document.
[10] CO_2e stands for 'carbon dioxide equivalent'. This is a method by which the seven main greenhouse gases are weighted based on their potential to cause global warming, allowing them to be more readily compared.
[11] See Table ii in "Dashboard Calculations" tab of accompanying Excel Document.

journeys can be shifted to public transport plus sustainable travel connections.

    - Independent active travel journeys (i.e., shorter trips), and active travel journeys as part of a longer public transport trip have similar requirements (in terms of accessibility, infrastructure, ease of use, etc.). Therefore, investment in active travel must be integrated into investment in public transport[12].

- CO_2e emissions from cars decrease by 7% for every 10% shift to active travel and public transport in journeys over 5km.

Assumptions

- The model assumes that the only change is to mode of transport. However, modal shift to active travel is likely to bring about other changes which may further influence carbon emissions. For example, more active travel is likely to bring about a healthier population, requiring fewer hospital visits.
- Our figures are a conservative estimate of the impact active travel could have on reducing carbon emissions in the transport sector; the actual savings are likely to be higher than the percentages given here:
    - Assumptions and exclusions that are likely to lead to ***more*** carbon savings in real life:
        - Figures do not account for (a) reductions in average trip length or (b) reductions in the total number of trips (e.g., lowered levels of commuting thanks to homeworking, or policies such as 20-minute neighbourhoods, etc.).

[12] Lauder, J. (2023). Sustainable Travel to Stations: A strategy helping make it easy, convenient, and safe for most passengers to get to and from our stations without a car. Scotland's Railway. Available at: https://scotlandsrailway.com/assets/site/Sustainable-Travel-to-Stations-FINAL.pdf

        - This analysis only looks at tailpipe emissions. Including more sources of emissions such as well-to-tank or lifecycle emissions would result in larger savings of carbon emissions from modal shift to active travel.
        - Electrification of buses/coaches/trains is not included.
    - Assumptions and exclusions that are likely to lead to ***less*** carbon savings in real life:
        - Reductions in commuting following the pandemic might not lead to less car usage overall. Some people work from home more but have moved to rural areas. This lifestyle might lead to more non-commuting trips by car. (Quinio, 2021; Santos & Azhari, 2022).
        - Lifecycle emissions for push cycles are not included. However, they are much lower than lifecycle emissions for cars (Stott, 2021).
        - Coach and rail emissions were used to calculate emission reductions for trips over 5km. However, for trips within cities, bus services would mainly be used instead, which have higher emission rates than coaches.
- Cold start emissions have been double counted. Currently, cold start emissions are included in conversion factors for calculating emissions on a per kilometre basis. However, cold start emissions disproportionately impact shorter trips. With this in mind, we have added in a cold start value on a per trip basis. While this will overestimate absolute values, it will mean emissions values are more accurate proportionally- hence why we have reported percentages rather than absolute CO_2e values. Further information surrounding why we have done this can be found on the Main Dashboard tab in the supporting Excel File “Reducing carbon emissions through active travel”.

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