

TECHNICAL NOTE

HIGH LEVEL CO₂ ANALYSIS AND GRAPHIC COMMUNICATIONS

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| To | Cycling UK | Duncan Dollimore |
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Introduction

Witteveen+Bos UK has been commissioned by Cycling UK to undertake high level CO₂ estimate of the potential impact of moving beyond car dependency for short journeys on UK greenhouse gas (GHG) emissions. Given the recent political debates, attention has also been given to 'value' statements with robust grounding in national data, as these may be more meaningful to the general public than numbers given the current scepticism towards manipulated statistics.

Methodology

The following methodology has been applied to perform this task. The scope of GHG assessment is broken into three levels of footprint: Scope 1 is institutional, Scope 2 is territorial and Scope 3 is consumer-based. This high level assessment is based on Scope 2 as we have robust national UK data for this. The limitation of this is that it underestimates the full carbon impact of car mileage as there are additional GHG burden in the production of the vehicle. The general public is likely not aware of the differences in the GHG scope levels, which can cause confusion when different numbers appear in the media. Scope 3 is the most robust as it relates to the true planetary footprint, but may be more difficult to estimate as it includes many indirect factors.

For each statement the relevant national transport or other data source is stated to provide transparency for the assumptions. Passenger car journeys are not counted to avoid 'double' counting in terms of emissions. (i.e all passenger car journeys also have a driver car journey). There are differences in the numbers cited due to differences in methodologies (e.g. whether net CO₂ emissions vs total GHGs of CO₂ equivalent, or country boundary used).

Definitions

Great Britain (GB) = means England, Scotland and Wales.

United Kingdom (UK) = means England, Scotland, Wales and Northern Ireland.

GHG = greenhouse gases.

CO₂e = carbon dioxide equivalents as a standard unit for measuring carbon footprints.

Mt = million tons or mega tons.

Contribution of Cars to UK emissions

In 2018, UK net emissions of carbon dioxide were provisionally estimated to be 364.1 million tonnes (Mt) of which 121.4 Mt are attributable to transport¹. Taking other GHG into account results in a total of 448.5 Mt of CO₂e. Transport accounts for 27 % of this footprint, at an absolute level (121 Mt) which is largely unchanged since 1990 and substantially larger than all other sectors (which are energy supply, business, transport, public, residential, agriculture, industrial process, land use, land use change and forestry (LULUCF) waste management). Most of this transport footprint is attributable to road transport, with more than half sourced to cars².

A detailed breakdown from 2016 estimated that **70 Mt are attributable to cars, a total of 15% of net GHG emissions in the UK³**, see figure 1 below. This is a substantial amount. By comparison the net contribution of rail is 2 Mt (0 %), domestic aviation 1.5 Mt (0 %) and international aviation 34 Mt (NB: international aviation is not included in UK emissions as there is currently no international standard on how to attribute this). Table 1 shows how the impact of transport on GHG emissions is consistent across countries.

¹ Department for Business, Energy and Industrial Strategy - ONS (2019) UK Greenhouse Gas Emissions, Provisional Figures – Statistical Release (2019). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794557/Consumption_emissions_April19.pdf

² Department for Transport - ONS (2018) Transport Statistics Great Britain 2018 - Moving Britain Ahead. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/787488/tsgb-2018-report-summaries.pdf

³ Department for Transport (2018) Greenhouse gas emissions by transport mode, United Kingdom: 2003 to 2016. Table Table ENV0201 (TSGB0306). Available at: <https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env#greenhouse-gas-emissions-env02>

Figure 1 The majority of transport emissions are from cars (© Department for Transport, 2019)

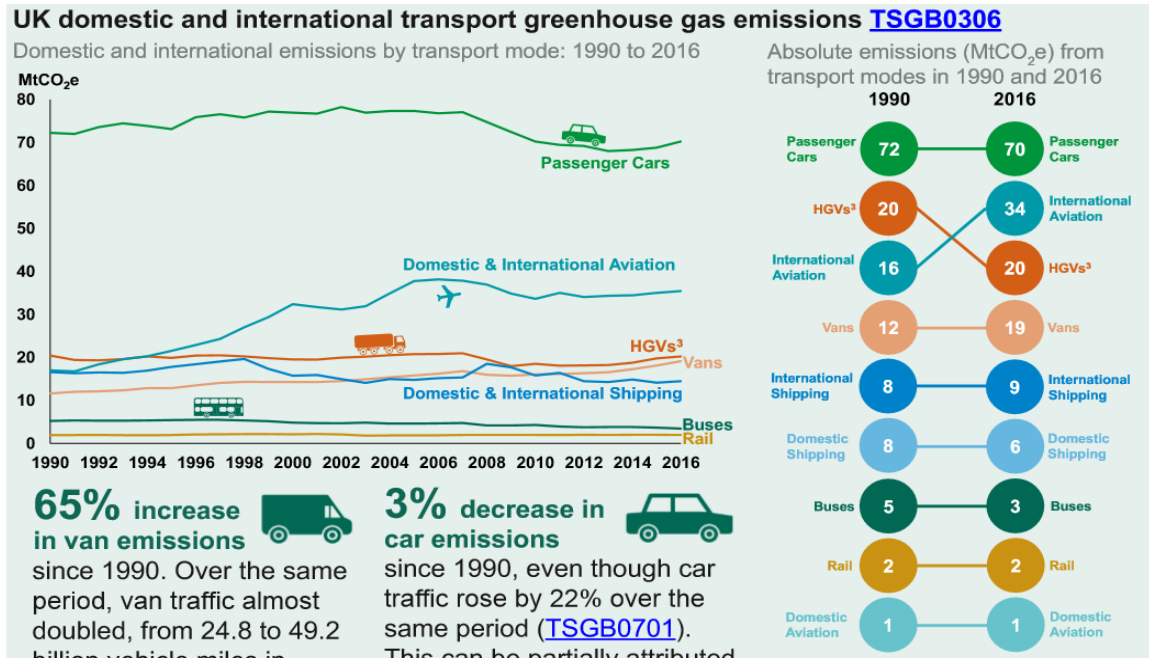


Table 1 Comparison of country specific CO₂ transport emissions 2017 dataset ⁴

| Sector footprint | England | Northern Ireland | Scotland | Wales |
|------------------|---------|------------------|----------|-------|
| Transport | 106 Mt | 3 Mt | 12 Mt | 6 Mt |
| Total | 301 Mt | 13 Mt | 32 Mt | 27 Mt |
| % | 35% | 30% | 38% | 22% |

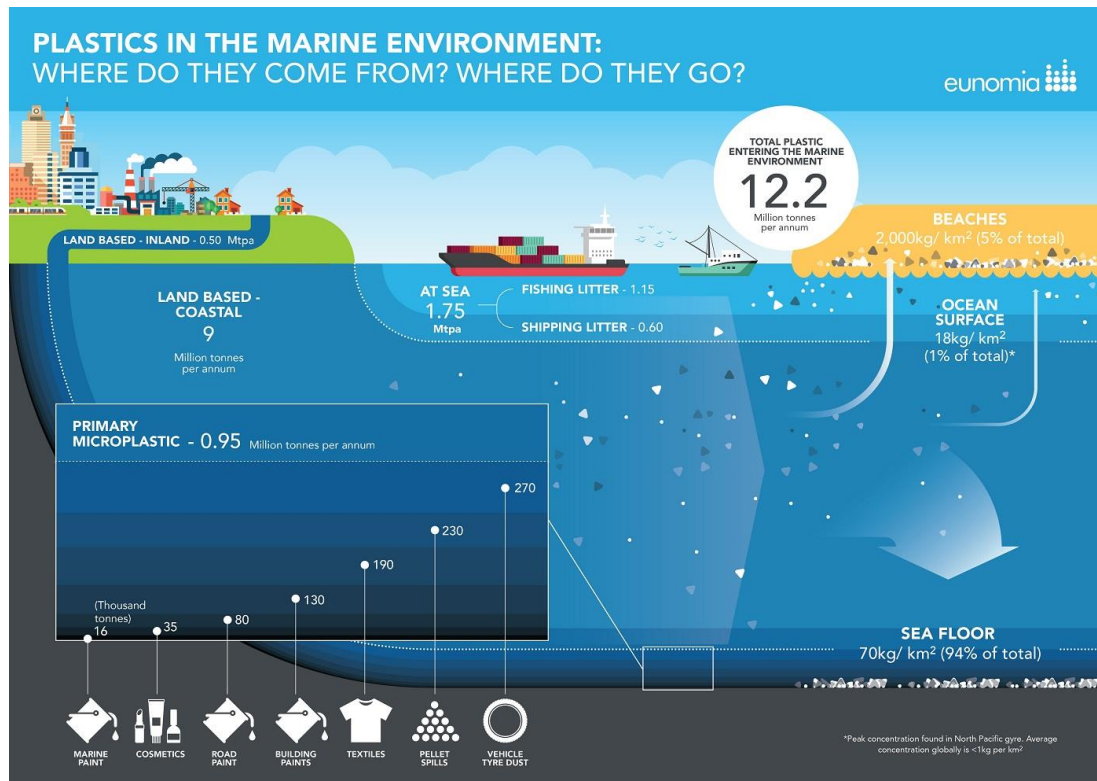
A like-for-like replacement of car journeys with e-car journeys would ignore other major vehicle-related challenges such as congestion, air pollution, severance, health, transport poverty and lack of e-charging infrastructure. As public consensus is currently high around plastics, at this time the issues of microplastics is used as a proxy to represent the wider issues associated with car dependency as car tyre dust is the largest source of microplastics in the ocean⁵, see figure 2 below.

Overall, the concept of a reduction of car mileage as a core approach to delivering a zero carbon Britain is robust and important.

⁴ National Statistics (2019) UK local authority and regional carbon dioxide emissions national statistics: 2005-2017. Available at: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2017>

⁵ Eunomia (2016) Plastics in the Marine Environment. Available at: <https://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/>

Figure 2 Vehicle tyre dust contribution to primary microplastic (© Eunomia, 2019)



Data tables UK

NTS0201 - 33,600,000 estimated driving licence holders in UK

Data tables England

National Travel Survey⁶

NTS9911 - 68 % of all journeys in England are less than 5 miles

NTS0308 - 52 % of all journeys below 5 miles are made by car

NTS0308 - 57 % of all car journeys are less than 5 miles

NTSA19030 - 55 % of all car journeys are below 5 miles

NTSA19030 - 57 % of all journeys below 5 miles are made by car

NTS9911 - 43 % of all journeys in England are below 2 miles

NTSA19030 - 23 % of all car journeys are below 2 miles

NTSA19030 - 39 % of all journeys below 2 miles are made by car

NTS0308b - 479 miles travelled by car for journeys < 5miles per year per person (2018)

Data tables Scotland

Transport and Travel in Scotland Results from the Scottish Household Survey⁷ [only considering driver car]

TD2a-2018 - 42 % of all journeys less than 5 kilometres are made by car

TD4a-2018 - 42 % of all car journeys are below 5 kilometres (3 miles)

Data tables Wales

There is no current national travel survey for Wales, since it was removed from the GB survey in 2012

NTS0308 2012 includes data for Wales -55 % of all car journeys are below 5 miles

Census data shows 30 % of car journeys to work <5km, and 51 % < 10km

A study local to Cardiff found 41 % of car journeys < 5 miles (Neves & Brand)

⁶ <https://www.gov.uk/government/collections/national-travel-survey-statistics>

⁷ <https://www.transport.gov.scot/publication/transport-and-travel-in-scotland-results-from-the-scottish-household-survey-1/table-td2a-main-mode-by-distance-percentage-of-journeys-by-main-mode-by-road-network-distance1-2018/>

Attribution of short journeys which could potentially be walked or cycled

The assumption for modal shift from car to walking or cycling is based on a distance potential that journeys under 5 miles (8 km) could be walked or cycled. The distance of 5 miles equates to approximately 30 to 40 minutes real-life cycling. UK data shows that many shorter journeys including ones that can be walked will fall within this distance potential. A 12mph cycling speed is desirable from both a transport and health perspective, and a valid distance potential given the uptake of e-cycles. It is well established that good infrastructure is a fundamental requirement to enable high levels of walking and cycling modal share which are also safe. As this is not extant in UK, the distance potential for modal shift is hypothetical and contingent on provision of good infrastructure - physical, legal and social. Data sources for car mileages specific to short journeys were not directly comparable or identified for all countries. The data source used for England was the National Travel Survey, and for Scotland is the Scottish Household Survey. These are high quality data sets allowing for informed assumptions to plug specific gaps in data. The National Census (2011) is now currently fairly out of date, but due to its unique national coverage, has been used as a proxy to cross-validate assumptions. As such, data from the National Travel Survey for England was used as a national proxy.

Data from Scotland shows that many short journeys are being driven by car which from distance potential could be walked or cycled. Given that 42 % of all car journeys in Scotland are below 5 kilometres (3 miles), assuming a similar assumption as England data of 57 % of all car journeys are below 5 miles appears reasonable. An additional research study using GPS in the Cardiff Bay area, identified that up to 69 % of journeys under 5 miles could realistically be shifted to walking and cycling⁸. This supports these distance trends and provides a level of confidence in the assumptions made.

57% of all car journeys are below 5 miles (NTS0308a), 479 miles travelled by car under 5 miles per person per year (NTS0308b⁹) * 0.29072 kg CO_{2e} emission/mile from average UK car¹⁰ * 33,600,000 estimated driving licence holders (NTS0201¹¹) = 4,678,964 ton CO_{2e} per year for all car journeys under 5 miles = **4.7Mt CO_{2e} per year for the entire UK.**

This represents around 7 % of the total footprint of cars (70 Mt). Although this seems small, what this may more reveal is the strong association of cars with high mileage and that many regional journeys are currently being carried out by car which could be carried out by rail or bus. This may be part of the rural conundrum, and demonstrates importance of decarbonising A-roads and motorways.

Key Findings

Key findings of this high level estimate of the potential impact of moving beyond car dependency for short journeys on UK greenhouse gas (GHG):

- Cars have a large carbon footprint in the UK, 15 % of total UK GHG emissions.
- A large portion of car journeys are < 5miles (57 % in England and similar trends in Scotland), representing high distance potential for modal shift to walking and cycling.
- In order to unlock this potential, good quality infrastructure is required.
- A large part of the carbon footprint of transport is attributed to A-roads, underlining the importance of decarbonising regional travel.
- The territorial CO_{2e} footprint of short car journeys <5 miles is estimated at 4.7Mt CO_{2e} per year for the entire UK, or 7 % of the total car footprint. Shifting these short, local car journeys to walking and cycling would contribute to achieving UK climate targets in addition to many co-benefits.

⁸ Neves & Brand (May, 2019) Assessing the potential for carbon emissions savings from replacing short car trips with walking and cycling using a mixed GPA-travel diary approach *Transportation Research Part A: Policy and Practice* Vol 123 pp130-146 <https://www.sciencedirect.com/science/article/pii/S0965856417316117?via%3Dihub>

⁹ <https://www.gov.uk/government/statistical-data-sets/nts03-modal-comparisons>

¹⁰ <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018>

¹¹ <https://www.gov.uk/government/statistical-data-sets/nts02-driving-licence-holders>

Based on these analyses, 4 infographics have been produced to communicate key messages to the general public. The purpose of these is not to provide all the answers, but provide data as a context to explore if we are asking the right questions.

APPENDIX: INFOGRAPHICS UK

Transport is the largest contributor to territorial greenhouse gas emissions in the UK.

DID YOU KNOW... most of these emissions are from cars?

CONGESTION
POLLUTION
HEALTH

NO₂
CO₂

JAM M3D

we are cycling UK

Witteveen + Bos

This infographic features a dark blue background with a line-art illustration of a traffic jam on a city street. A blue car in the foreground has a driver with a sad expression and a license plate that reads 'JAM M3D'. Behind it, several other cars are visible, with plumes of smoke or exhaust labeled 'NO₂' and 'CO₂'. To the right, three people with sad faces hold up blue signs that say 'CONGESTION', 'POLLUTION', and 'HEALTH'. A large, light blue thought bubble on the left contains the text 'DID YOU KNOW... most of these emissions are from cars?' with a large white question mark. The 'we are cycling UK' logo is in the bottom right, along with the 'Witteveen + Bos' logo.

Will you stand up for walking and cycling all our short journeys and save millions of tons CO₂ every year?

In the UK, 57% of car journeys are <5 miles.

A RELATIVELY SHORT JOURNEY - CAN WE DO IT!

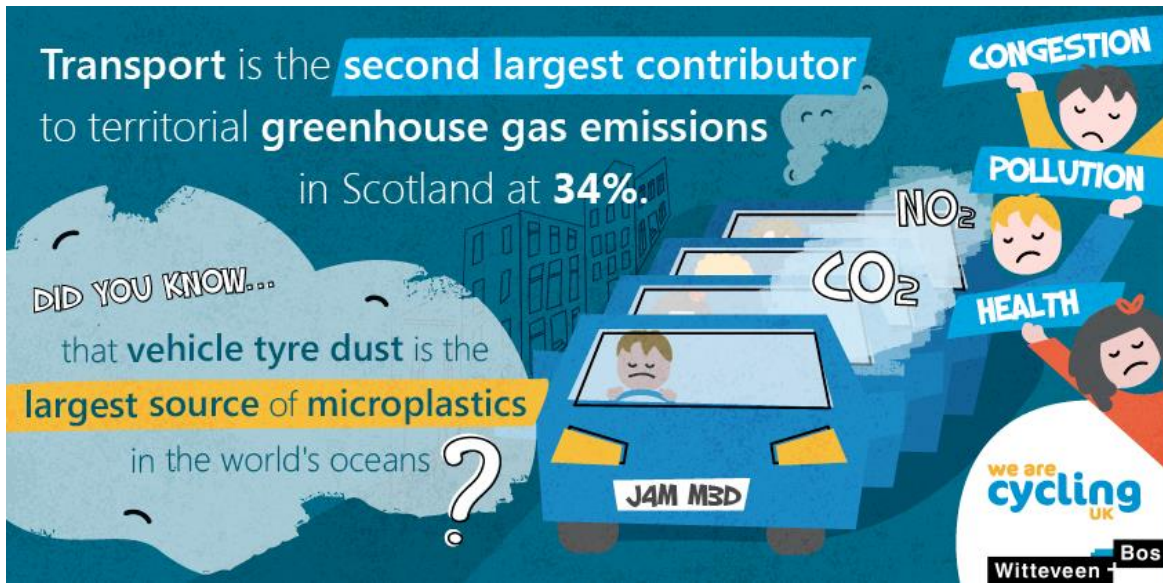
we are cycling UK

Witteveen + Bos

This infographic has a light blue background with a line-art illustration of a city street. A large yellow speech bubble with a question mark contains the text 'Will you stand up for walking and cycling all our short journeys and save millions of tons CO₂ every year?'. Below the speech bubble, a group of diverse people are shown: a woman with a shopping basket, a man with a dog, a woman with a shopping bag, a man with a shopping basket, a woman on a bicycle, and an elderly man with a cane. The 'we are cycling UK' logo is in the bottom right, along with the 'Witteveen + Bos' logo. At the bottom, a blue banner reads 'In the UK, 57% of car journeys are <5 miles.' and a small tagline says 'A RELATIVELY SHORT JOURNEY - CAN WE DO IT!'.



APPENDIX: INFOGRAPHICS SCOTLAND





APPENDIX: INFOGRAPHICS WALES

Transport is the **second largest contributor** to territorial **greenhouse gas emissions** in Wales at **26%**.

DID YOU KNOW...
that **vehicle tyre dust** is the **largest source of microplastics** in the world's oceans?

CONGESTION
POLLUTION
HEALTH

NO₂
CO₂

JAM M3D

we are cycling UK

Witteveen + Bos

Will you **stand up** for **walking and cycling** all our **short journeys** and **save millions of tons CO₂** every year?

In the UK, 57% of car journeys are <5 miles.

we are cycling UK

Witteveen + Bos

A RELATIVELY SHORT JOURNEY - CAN WE DO IT?