

Carbon Footprint of Home-Workers Revisited

Commuting vs Home-working

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It's Poll Time – What do you think?



Hybrid Working



Where are we after COVID?

- In February 2023, 40% employed people home- or hybrid-worked¹
- From 6th April 2024, all workers will be able to request hybrid or home-working from day one²
- ~80% those aged 25+ (and can home-work) do
- GHG Protocol Category 7. Commuting

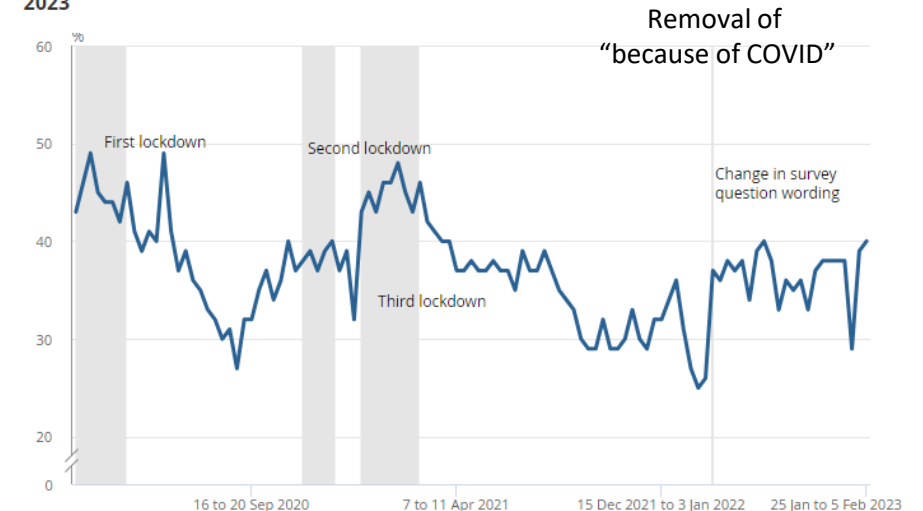
Annoyingly they stopped tracking this ->

% people working
“from home in last week”

Figure 1: Trends in working from home

Proportion of working adults in Great Britain, March 2020 to February

2023



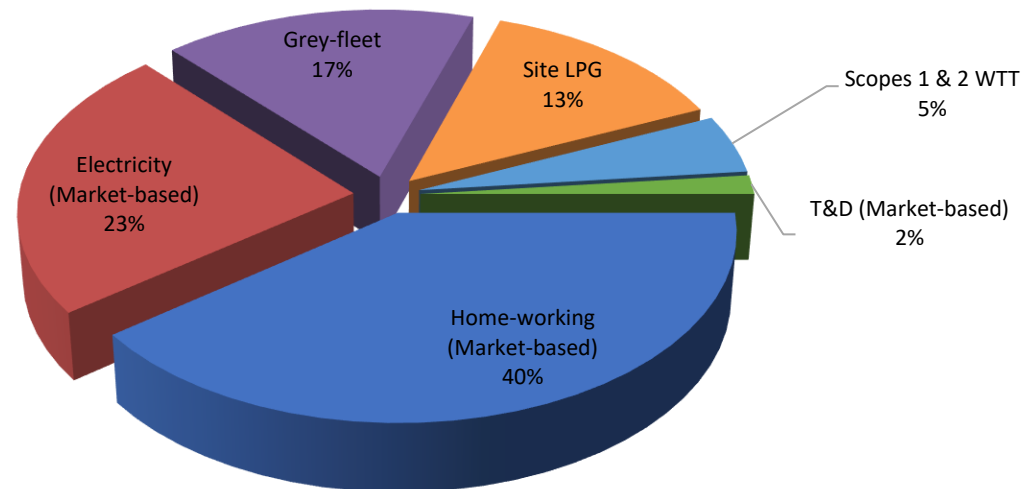
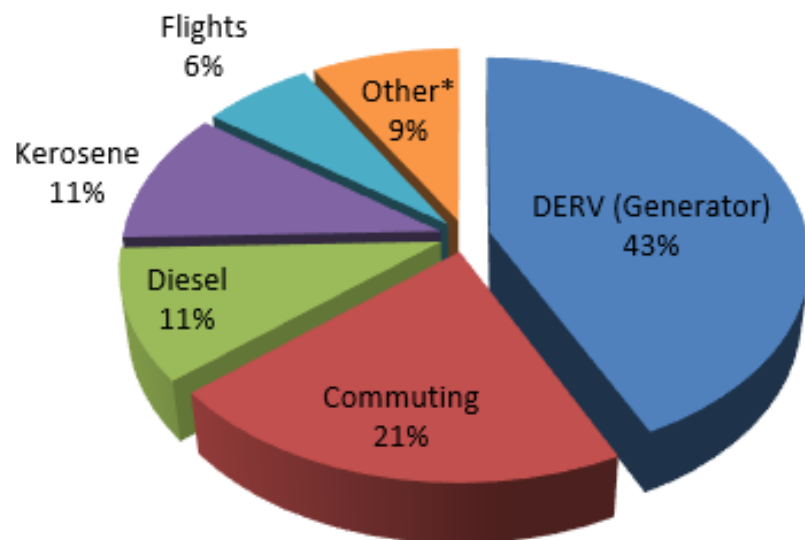
¹Office for National Statistics (ONS), (2023), *Characteristics of Home-workers*

<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/characteristicsofhomeworkersgreatbritain/september2022tojanuary2023>

²UK Government (2024), *Flexible Working*

<https://www.gov.uk/flexible-working>

Why is hybrid working an issue?



Data problems

“Excuse me boss... can I see your energy bills?”



- Need to survey employees, what can you ask for?
 - Ask for home-working and commuting data at the same time
 - Aim for 100% response (50%+ per site is good, we can apportion)

Home-working	Commuting
Working hours/days at home?	Working days at office?
Home alone in office hours?	Transport mode? (car*/motorbike*/bus/taxi/ferry/rail/walk/cycle)
Did you heat your home this Winter?	*Vehicle details?
What country?	*Carpool details?
Are you on a green tariff?	Distance?

UK Census data as backup

Electricity consumption

Unless, of course, you have a 10-mile extension cable.



- Power consumption of appliances used in work time

Home working	V (V)	I (A)	P (W)	Energy (kWh)	Emissions (tCO ₂ e/year)
Laptop	20	2.25	45	81.0	0.022
Screen			20	36.0	0.010
Light			25	45.0	0.012
Kettle				25.1	0.007
Microwave				15.0	0.004
Total				202.1	0.056

Constants	Value	Unit
Hours in a week:	40	hours
Weeks in a year:	45	weeks
Hours in a year:	1800	hours
UK Gen Emissions Factor:	0.20707	kgCO ₂ e/kWh
UK T&D Emissions Factor:	0.01792	kgCO ₂ e/kWh
UK Gen WTT Factor:	0.04590	kgCO ₂ e/kWh
UK T&D WTT Factor:	0.00397	kgCO ₂ e/kWh

Hot drink calc	Value	Unit
Cup capacity	0.3	kg
c	4.182	kJ/kgK
T start	20	deg C
T end	100	deg C
delta T	80	K
Energy per cup	100.368	kJ/cup
kWh/cup	0.02788	kWh/cup
No. Cups per day	4	cups
kWh	25.1	kWh

Microwave lunch	Value	Unit
Power	1,000	W
Time/day	240	Sec
Consumption/day	240	kJ
Consumption/year	54,000	kJ
kWh	15.0	kWh

Heating and cooling

The only thermostat that should be at 30°C is in your lizard tank.

- Heating/Cooling Energy consumption depends on:
 - House size
 - How many people in the house
 - The time of year/weather/location
- So total with electricity...
 - Just you (w/heating) = $\sim 0.7\text{tCO}_2\text{e}$
 - With others (w/heating) = $\sim 0.2\text{tCO}_2\text{e}$
 - With others (excl. heating)* = $\sim 0.06\text{tCO}_2\text{e}$

*In other words, just electricity

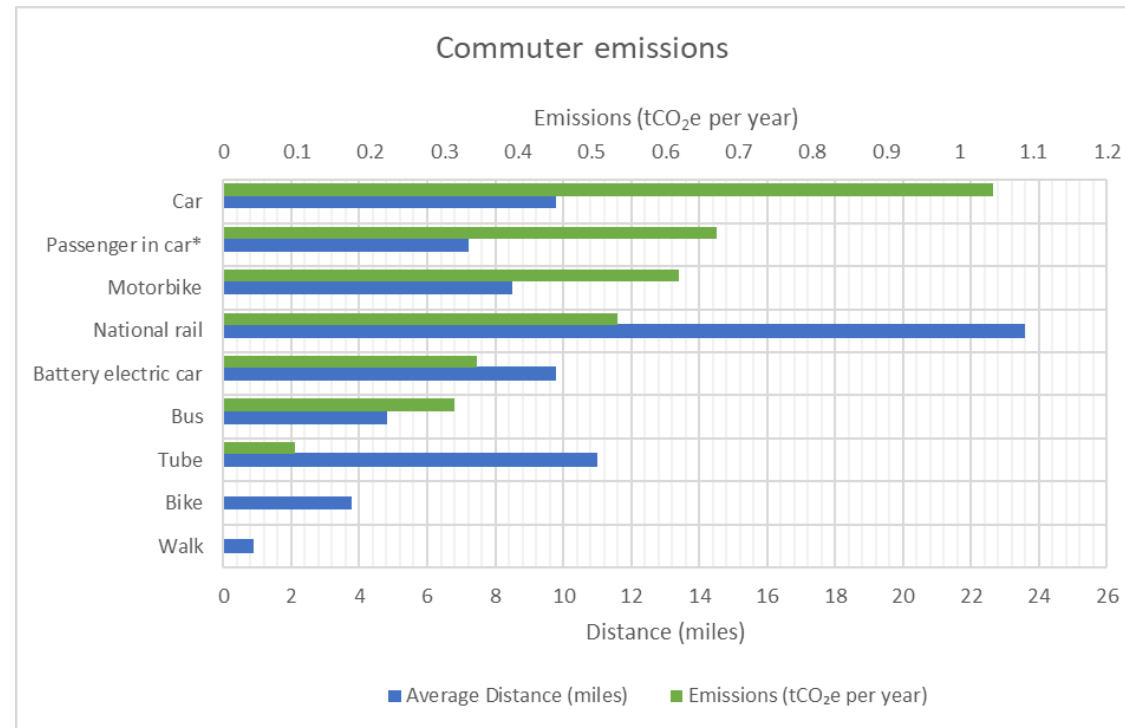
Size	Inhabitants in Working Hours	Average Gas (kWh)	25% extra gas split between inhabitants (kWh)	Gas Emissions (tCO ₂ e)
1-2 bed	1	8000	2000	0.37
1-2 bed	2	8000	1000	0.18
1-2 bed	3	8000	667	0.12
3-4 bed	1	13258	3315	0.61
3-4 bed	2	13258	1657	0.30
3-4 bed	3	13258	1105	0.20
3-4 bed	4	13258	829	0.15
3-4 bed	5	13258	663	0.12
5+ bed	1	17000	4250	0.78
5+ bed	2	17000	2125	0.39
5+ bed	3	17000	1417	0.26
5+ bed	4	17000	1063	0.20
5+ bed	5	17000	850	0.16
5+ bed	6	17000	708	0.13

Commuting

Braking wastes energy; rush hour traffic is terribly inefficient!



- Yes, home emissions may increase, but I'm not driving to work?



*Taxi passenger.km factor used

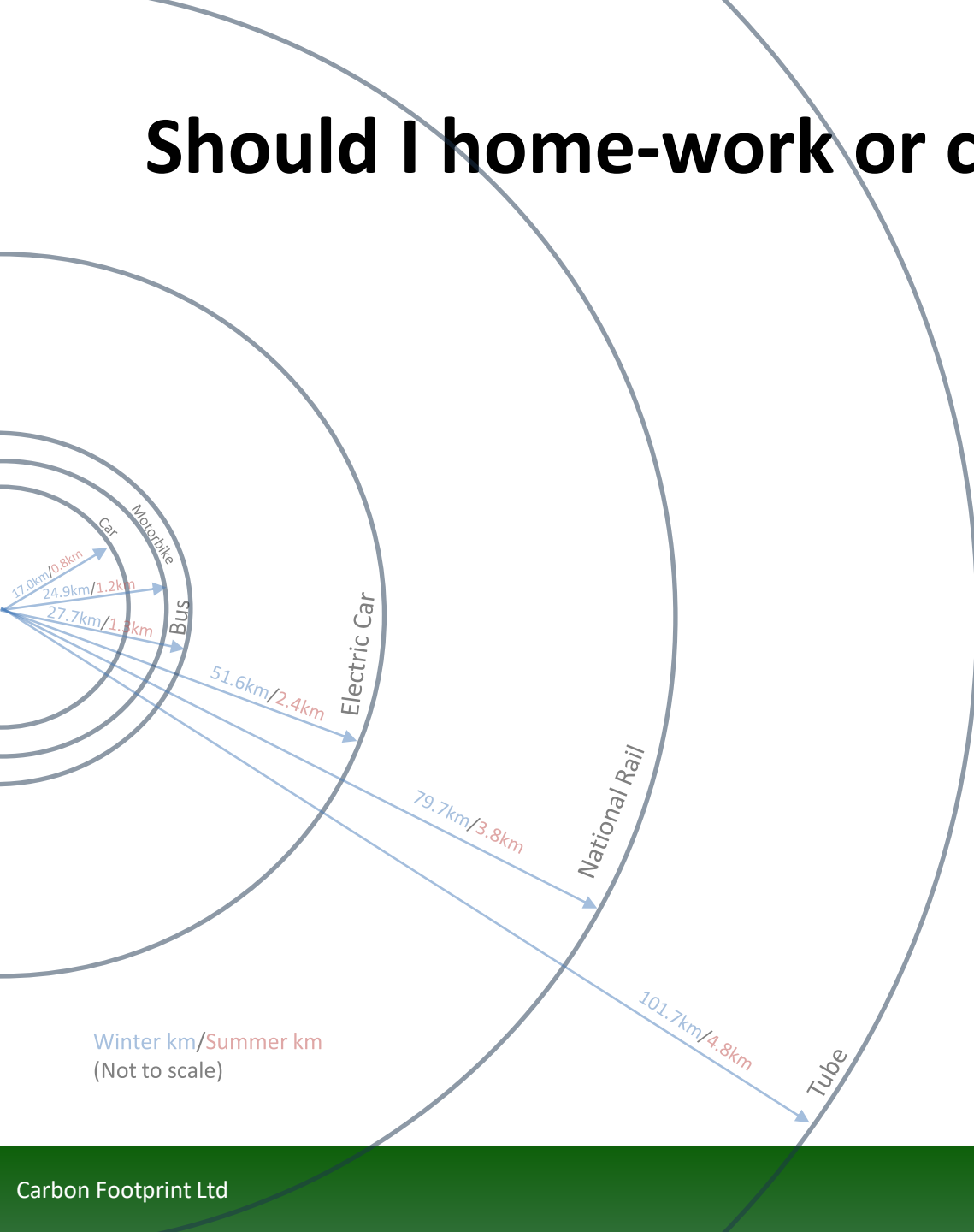
UK Gov Defra/BEIS/DESNZ Greenhouse Gas Reporting Conversion Factors 2023

<https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023>

UK Gov (2022) *Modal comparisons (TSGB01)*. Data from: NTS0409b

<https://www.gov.uk/government/statistical-data-sets/tsgb01-modal-comparisons#travel-to-work>

Should I home-work or commute?



- Would I need heating?
- How far am I travelling?
- How am I travelling?

<- assuming ave. UK gas used for heating over 6 cold months
(multiply by 5/8 for miles)

Conclusion



- Emissions differ:
 - Employee to employee
 - Country to country
 - Season to season
- Calculations depend on the data available
- Work from home less in Winter*
- Work from home more in Summer*
- Check your distance

*In the UK

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