

# PLEASEM: a tool to measure PPlace-based Estimated Advantages of Shared Electric Mobility

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## Abstract

Car sharing reduces private vehicle mileage and ownership, particularly if combined with electrification, and can thus reduce carbon emissions from local transport. Various studies have demonstrated this through data from existing car club operations in mainly urban areas, but there is a lack of evidence from other geographies. We argue that emissions reductions and other benefits are place-specific and use open data to demonstrate the benefits that may accrue outside urban areas. We show this in an open-source dashboard that aims to help local policymakers benchmark the potential benefits of an electric car club in their area.

**Key words:** Car clubs; Electric Vehicles; Carbon emissions savings; Place-based policy; UK

## 1. Research Questions

In response to the climate emergency, the transition towards electrification is accelerating globally. Its potential to be sustainable and transformative is augmented if combined with shared mobility (Sprei, 2018). Local policymakers across the United Kingdom have declared climate emergencies, but may have influence over a mere third of their jurisdictions' emissions, with road transport a key action area (CCC, 2020). The levers local policymakers can pull to reduce emissions from transport vary spatially, especially in rural areas, where there is less public transport and higher baseline emissions (Marsden et al., 2020). With public transport in decline outside London (Friends of the Earth, 2023), shared electric mobility or electric 'car clubs' can be a sustainable transport policy alternative (CCC, 2020).

Commercially-run car clubs operate predominantly in denser urban areas (Dill and McNeil, 2021; Shaheen and Cohen, 2013), taking advantage of greater demand, complementary transport options, and more public charging infrastructure (Marsden et al., 2019; Shaheen et al., 2019). There is a lack of research on rural car sharing, and its potential to meet policy objectives such as reducing carbon emissions (De Paepe et al., 2023). Evidence suggesting that car sharing reduces private vehicle mileage and ownership varies by city and business model and is mainly sourced from urban examples (Jochem et al., 2020; Marsden et al., 2019; Mock, 2023; Shaheen et al., 2019). Engagement with policymakers in rural Oxfordshire as part of a pilot of electric car clubs revealed frustration with this lack of evidence of potential impact or rural examples beyond qualitative case studies<sup>1</sup> (TSU, 2025). To start to fill this gap, we developed a basic tool using open data and conservative assumptions that visualises *place-specific* benefits from electric car clubs.

## 2. Data and Methods

Carbon emissions from vehicles, whether private or shared, are dependent upon fuel type and mileage. An Irish study found that private car electrification can have greater environmental benefits outside cities due to higher average mileage per vehicle and lower EV uptake (Charly and Caulfield, 2025). The DfT publishes quarterly statistics on registered vehicles by fuel type for local authorities

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<sup>1</sup> <http://hookycarclub.org.uk/>

(LA) in Britain<sup>2</sup> and annual statistics on vehicle miles travelled (VMT) on county and unitary roads. Conversion factors are published annually (Table 1) to calculate carbon emissions from passenger vehicles based on fuel type per kilometre (mile) and UK electricity production (DESNZ, 2024).

*Table 1: Kg CO<sub>2eq</sub> conversion factors by fuel type / kilometre (mile) for an average-sized car*

Diesel	Petrol	Hybrid	Plug-in hybrid	Battery electric
0.170 (0.273)	0.165 (0.265)	0.126 (0.203)	0.107 (0.174)	0.044 (0.076)

For each LA, total car VMT on the roads is divided by total cars registered then multiplied by the emissions from an ‘average’ car, as derived from the proportion of vehicles of each fuel type in the registered car fleet.<sup>3</sup> PLEASEM shows the reduction in carbon emissions if this average mileage was instead driven in a fully electric or hybrid car. Although shared cars usually record greater annual mileage<sup>4</sup>, they tend to reduce the annual VMT of multiple drivers of private cars, likely resulting in greater carbon savings. However, as we do not account for induced demand or indirect carbon emissions that might result from sharing (Amatuni et al., 2020), the tool assumes a straight switch.

We also use small area statistics from England and Wales to calculate changes in car ownership rates and electric vehicle (EV) uptake by households (DfT, 2024; ONS, 2021). Such statistics have been used convincingly to test policy scenarios for emissions reduction in complex models (Brand et al., 2025). Our simplified version assumes each electric car club vehicle replaces nine private vehicles. This is deemed a conservative estimate based on an amalgamation of data summarised in Table 2.<sup>5</sup>

*Table 2: Data on potential of car clubs to reduce car ownership*

CoMoUK survey: number of cars sold / not replaced (+purchase deferred) <sup>1</sup>			Operators: median (mean) users with at least 6 bookings per year		
England & Wales (ex. London)	Scotland	London	All Co Wheels	Rural Co Wheels	Oxfordshire trial
8 (14)	11	15 (32)	9 (11.7)	9 (12.5)	12.5 (12.9)

<sup>1</sup>Statistics from <https://www.como.org.uk/documents/car-club-annual-report-uk-2023>

Finally, PLEASEM depicts the change in the rate of EV uptake by decile if inclusive of nine frequent car club users. Local clustering of EV early adopters suggests a neighbour effect (Morton et al., 2018), so an electric car club nearby could act as an additional policy lever to accelerate EV uptake.

### 3. Findings

Our tool, [PLEASEM](#), shows that urban LAs are likely to achieve relatively lower direct carbon emissions’ reductions than some suburban and rural authorities, even assuming a switch from private car mileage rather than from public transport or new trips. The LAs with the most potential are not the most remote, but lack populous cities. Furthermore, the average annual mileage on local roads has a greater impact on the variation in emissions reductions between LAs than the cleanliness of that LA’s private fleet. The tool’s users can adjust the annual mileage to estimate more precisely carbon emissions savings, e.g. if they have mileage data from a local electric car club to benchmark.

<sup>2</sup> The most recent data was for Quarter 2, 2024.

<sup>3</sup> See Github repository: <https://github.com/HBudnitz/PLEASEM>

<sup>4</sup> See supplementary information.

<sup>5</sup> See supplementary information for detailed descriptions.

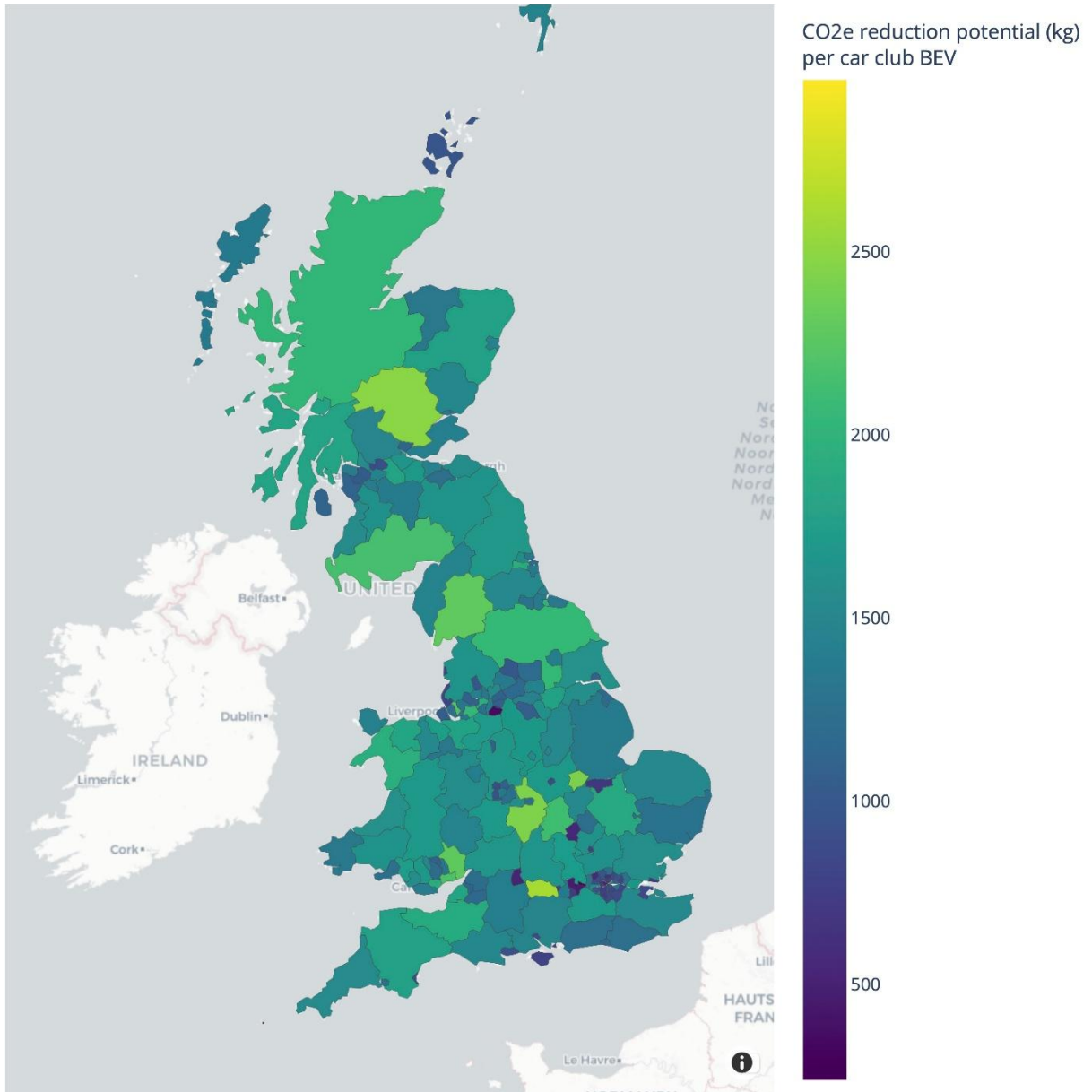


Figure 1: Estimated  $CO_{2eq}$  reductions by LA of BEV replacing one average private car's annual mileage

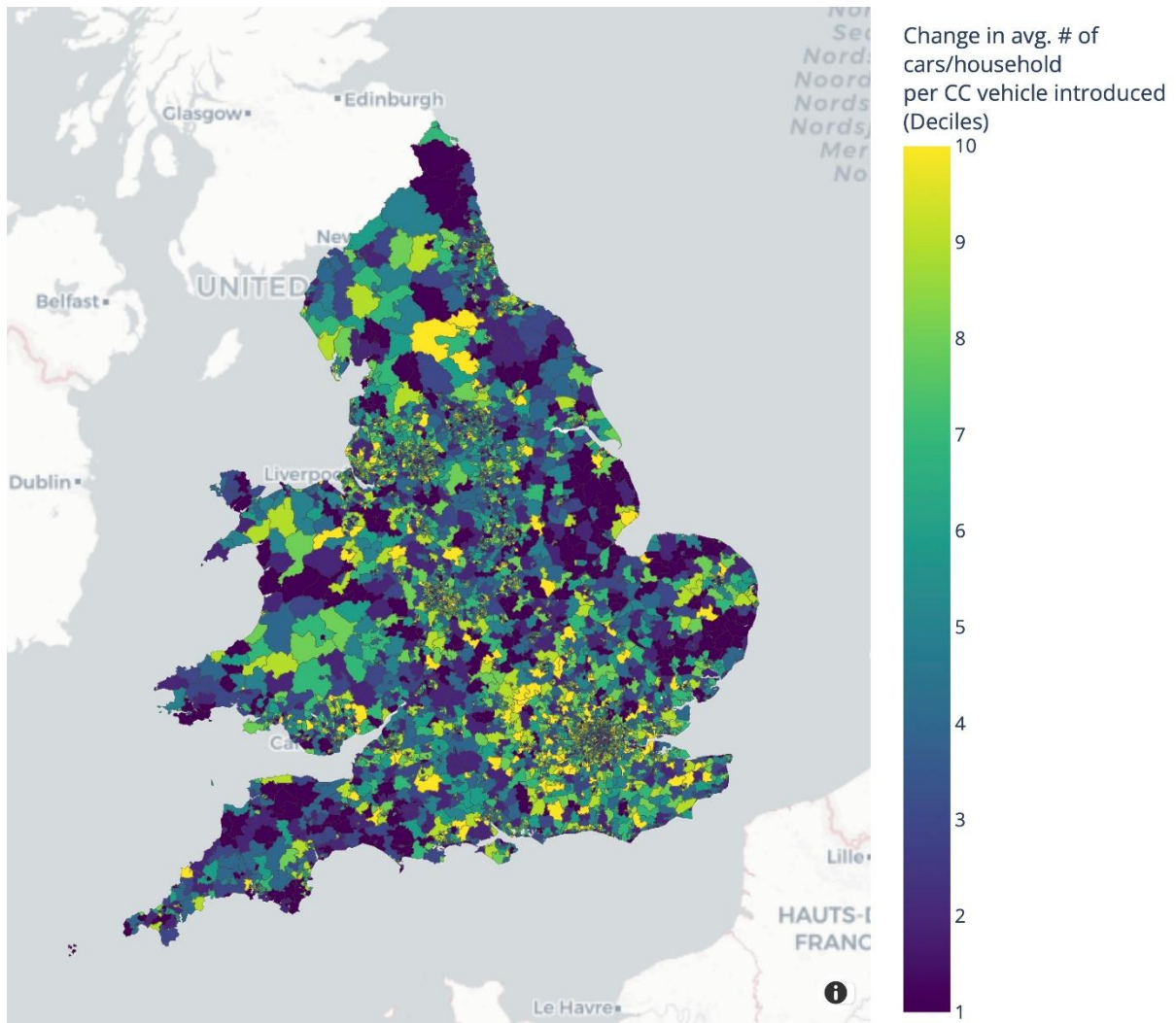


Figure 2: Deciles of reduction in average cars owned per household by MSOA per shared EV

The tool also shows the impact on EV uptake and car ownership at the Middle layer Super Output Area (MSOA) level per shared vehicle.<sup>6</sup> The variation between MSOAs is a product of the total fleet and population, average cars per household and level of EV ownership.

PLEASEM demonstrates that the benefits of electric car clubs vary by location. Initial feedback from local, rural policymakers is that PLEASEM helps them visualise and benchmark these benefits. It provides a base that can be updated and further developed to offer additional place-specific outputs.

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<sup>6</sup> These are statistical areas of 2-6,000 households. The tool also aggregates this to LA level.

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