Quantifying the carbon impact of the household

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BACKGROUND AND MOTIVATION

Meeting net zero greenhouse gas emission targets will require a fundamental shift in the way that people live, work and travel. In the UK, housing accounts for 21% of all greenhouse gas emissions, with 29 million homes in the UK needing to become low-carbon and resilient to climate change to meet the governments net-zero by 2050 target.

The "carbon impact" of the household extends further than most typically consider. Lifestyle, transport and consumption all factor into the overall carbon impact of a household.

This project used data from CACI and the UK Government to quantify the carbon impact of every household in Leeds, and defined a reproducible, easy to follow method that could be rolled out for the whole country.

DATA

CACI's address level Address Spine and Ocean datasets were the core datasets used in this project. Address Spine contains property level variables such as property type, number of rooms, tenure, house price and energy consumption. Ocean, CACI's consumer database, contains demographic, digital, lifestyle and attitudinal characteristics for individuals within UK households. Additional publicly available data were used including EPC data, IMD and shapefiles.

METHODS

The relevant variables were identified using literature and an estimated carbon total was calculated for each of the three domains of carbon emissions (property, transport and consumption). For domains where there were no pre-existing carbon emission totals available, estimates were made using government predicted emissions and propensity scores from the Ocean dataset. Total carbon emissions were calculated by adding together the totals from the sub scores.

An additional investigation was performed into the relationship between the Index of Multiple Deprivation and household carbon emissions at LSOA level. Standard regression and Geographically Weighted Regression were used for this, and it was found that Education, Skills and Training Deprivation and Health Deprivation were significant negative predictors of carbon emissions.

KEY FINDINGS

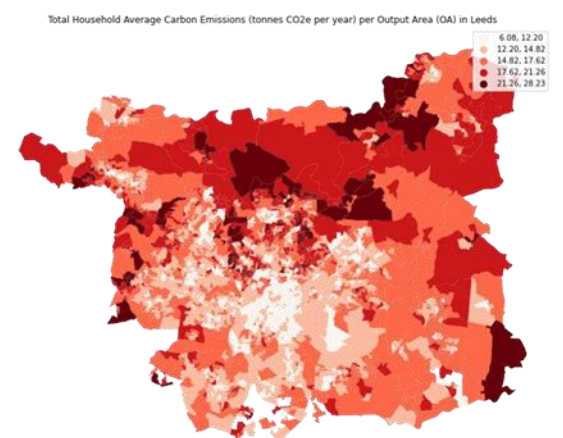Results were mapped for each domain of carbon production (Figure 1)

Total Household Average Carbon Emissions (tonnes CO2e per year) per Output Area (OA) in Leeds

Figure 1: Total Household Average Carbon Emissions (tonnes CO2e per year) per Output Area (OA) in Leeds

KEY FINDINGS

Maps were also created for each domain, and slight variations were observed in the distribution of high and low carbon scores. Broadly, however, the patterns were the same. Generally household carbon emissions were higher outside of central Leeds, with the highest estimates found in the north of the city. There are some areas of high emissions to the east of the city.

In Leeds, there is a wide variation in carbon emissions, with results ranging from 1 tonne per year to 65 tonnes per year for each household.