AREAS OF MANCHESTER TO TARGET FOR EMISSIONS REDUCTIONS FROM FOSSIL FUELED VEHICLES

Data Science Capstone Project

AREAS OF MANCHESTER TO TARGET FOR EMISSIONS REDUCTIONS FROM FOSSIL FUELED VEHICLES

Three ways to reduce emissions from fossil fueled vehicles:

- Low emissions zones to restrict/deter polluting vehicles via additional tariffs,
- Public electric vehicle (EV) charging points to encourage transition of low emissions vehicles,
- Incentives/subsidies for electric vehicle car sharing schemes to set up and operate in the area.

We're looking for the areas with the most to gain. The factors that influence the 'level of gain' are:

- Respiratory Disease Deaths – reducing number of fossil fuel powered cars will reduce private vehicle tailpipe emissions, reducing the air pollution that augments respiratory health problems.
- COPD Admissions – reducing number of fossil fuel powered cars will reduce private vehicle tailpipe emissions, reducing the air pollution that augments COPD (Chronic Obstructive Pulmonary Disease).
- Accidents – reducing number of vehicles on the roads can reduce the number of accidents.

Factors that will influence EV (private or car sharing) uptake include:

- Distance to station – an assumption in this project is that the further a ward (i.e. a type of district in Manchester) is from a station the more likely the locals are to use private transport. Therefore these areas can benefit from EV charging and car sharing schemes.

WHO WANTS TO KNOW?

The answer to this question ‘which areas of Manchester should be targeted for emissions reductions from fossil fuelled vehicles’, may be of interest to:

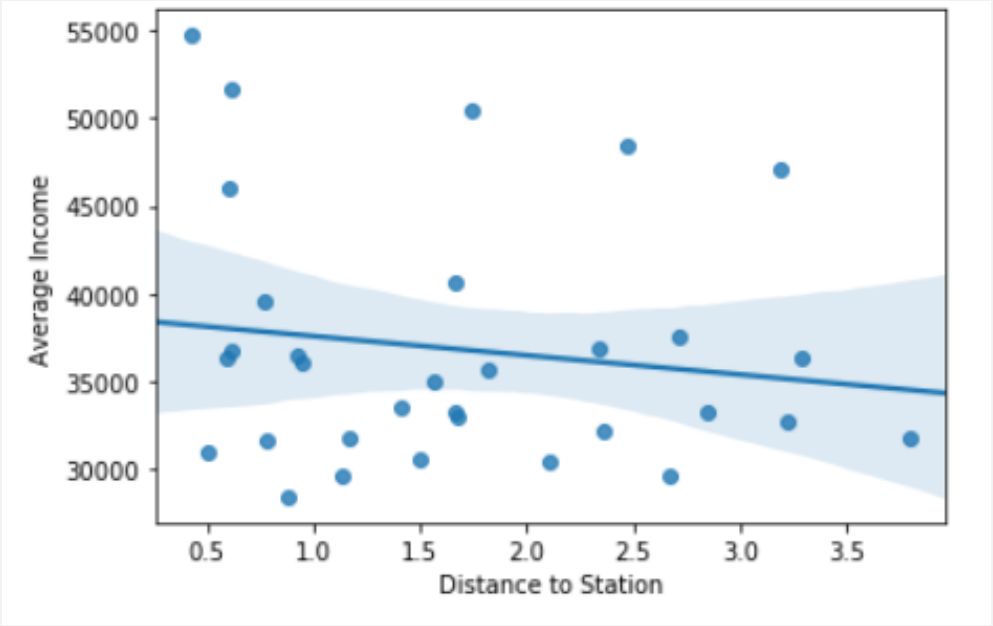
- Policy makers and or Local Authorities - to set targets and incentives for three ideas laid out on the previous slide,
- Community interest groups - to campaign for the rollout of local charging points.

DATA ACQUISITION AND CLEANING

- CSV of Manchester wards by latitude and longitude, Source: https://www.doogal.co.uk/UKPostcodes.php?Search=M (June, 2020)
  - Of the 47 fields available in the CSV the 5 fields were selected for use these were all fully populated
- Accidents, Health and Population data by Manchester ward, Source: https://dashboards.instantatlas.com/viewer/report?appid=962615537fc24dda8a0a29dc86bd4e37 (June, 2020)
- Geojson file of wards of Source: https://martinjc.github.io/UK-GeoJSON/json/eng/wards_by_lad/E08000003.json (June, 2020)
- Foursquare supermarket venue search (June, 2020)
  - Had to clear rows with a mention of Money or Car from the results of the 'supermarket' search
- The solar potential identified for Manchester in Source: Google Environmental Insights Explorer (June, 2020) https://insights.sustainability.google/places/ChIJ2_UmUkxNekgRqmv-BDgUvtk/download

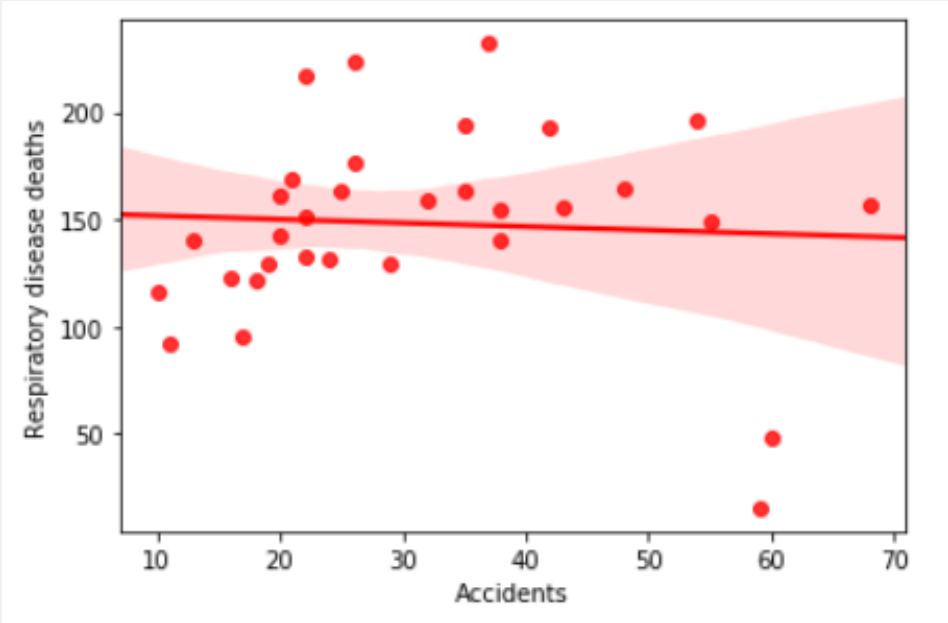
DATA EXPLORATION & VISUALISATION

- Is there a relationship between Distance to Station and Average Income of a ward?
- Scatter plot of Distance to Station and Average Income shows slight negative correlation, -0.149.
- It is thought that houses close to amenities (like a station) cost more so those with higher incomes can better afford these.
- Wards appearing on the top right hand corner of this graph are hypothesised to be the best candidate locations for chargepoint installations.



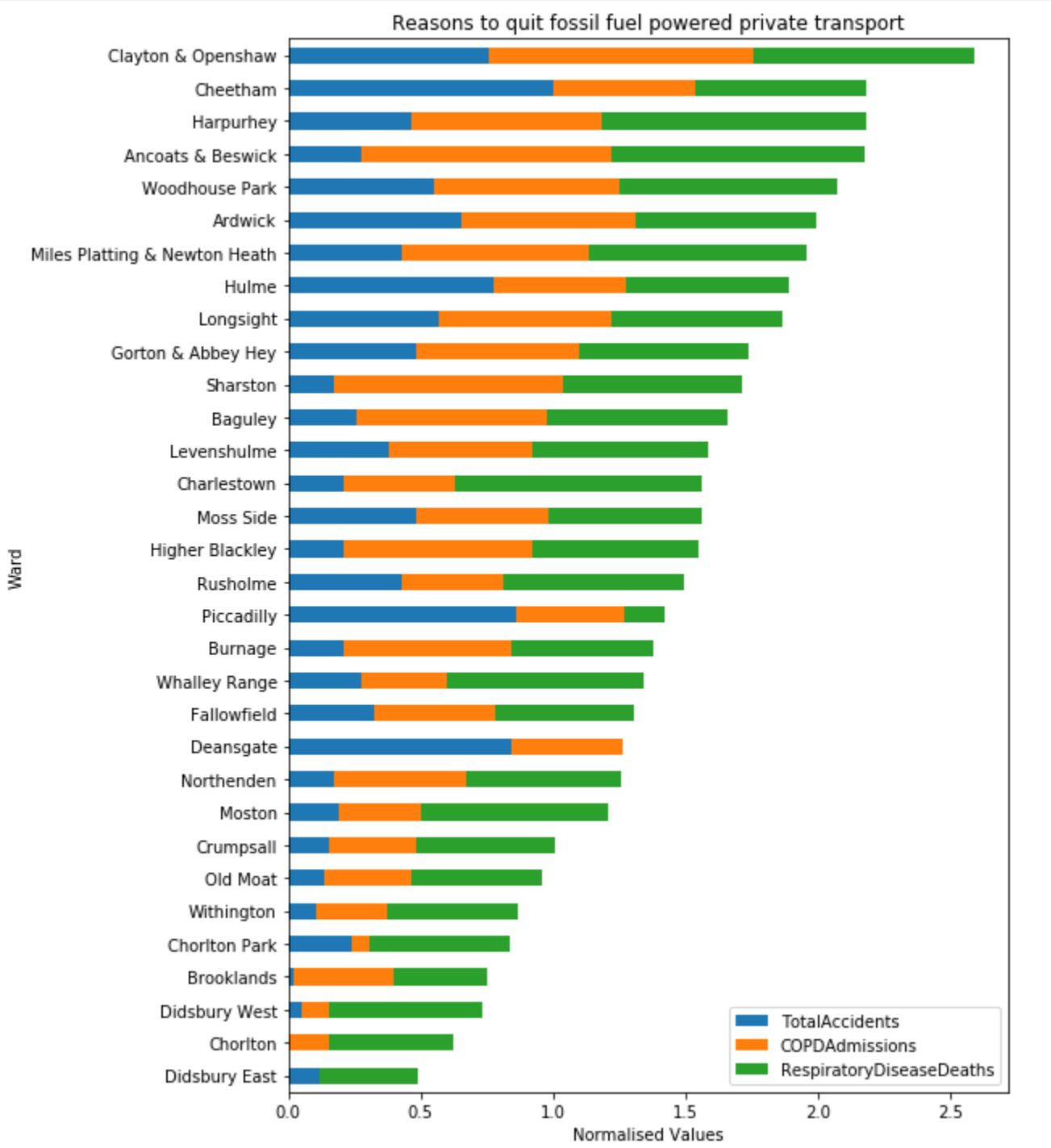
DATA EXPLORATION & VISUALISATION

- Is there a relationship between Respiratory Disease Deaths and Road Accidents in a ward?
- Scatter plot suggests no correlation.
- There are many influencing factors that cause accidents that are not related to the number of vehicles in an area (and respiratory diseases are also caused by factors other than vehicle air pollution).



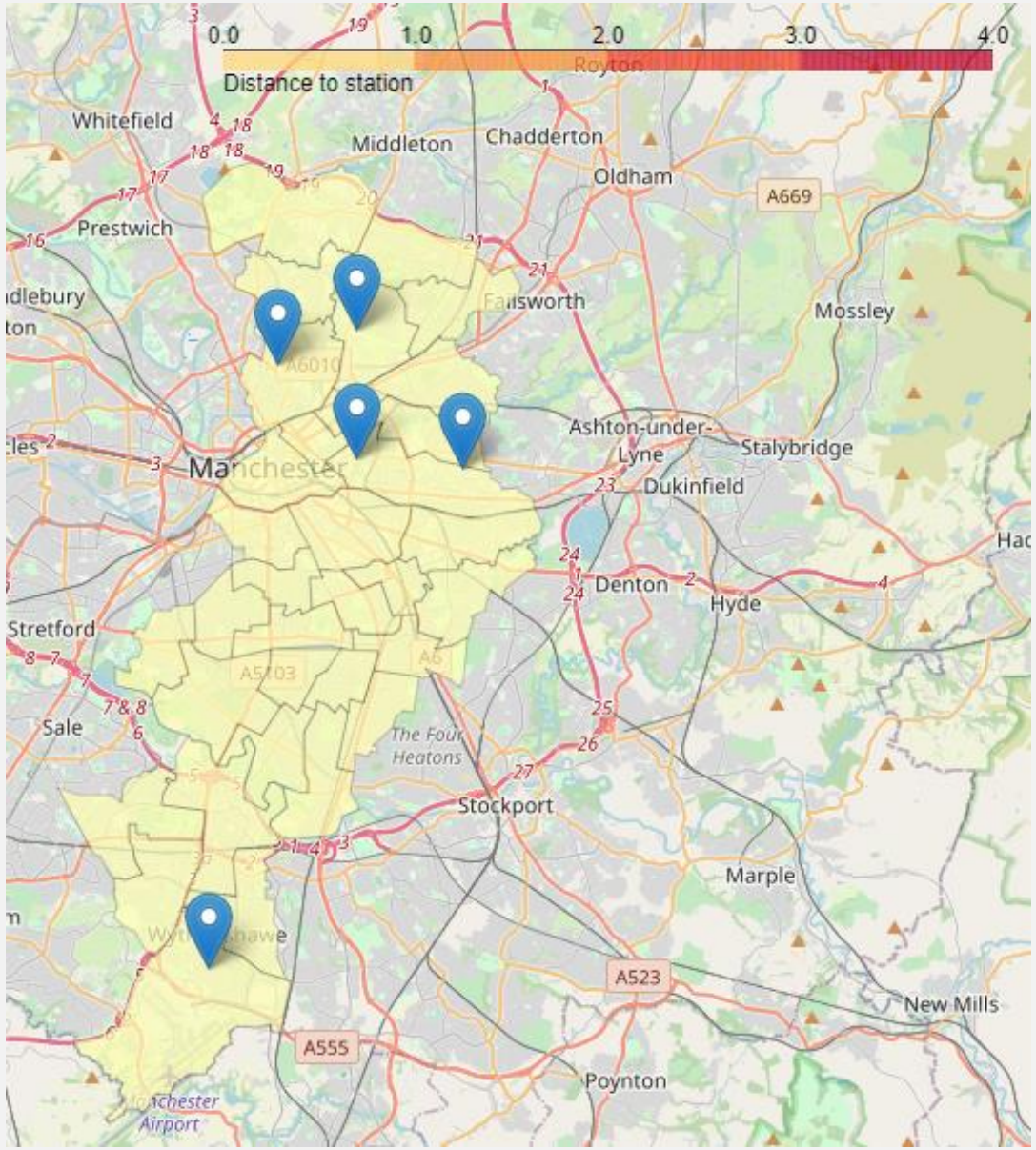
DATA ANALYSIS

- The three key features that would influence the ‘level of gain’ for targeting fossil fuel vehicle reduction are normalised and stacked in this horizontal bar chart which shows the totals in descending order.



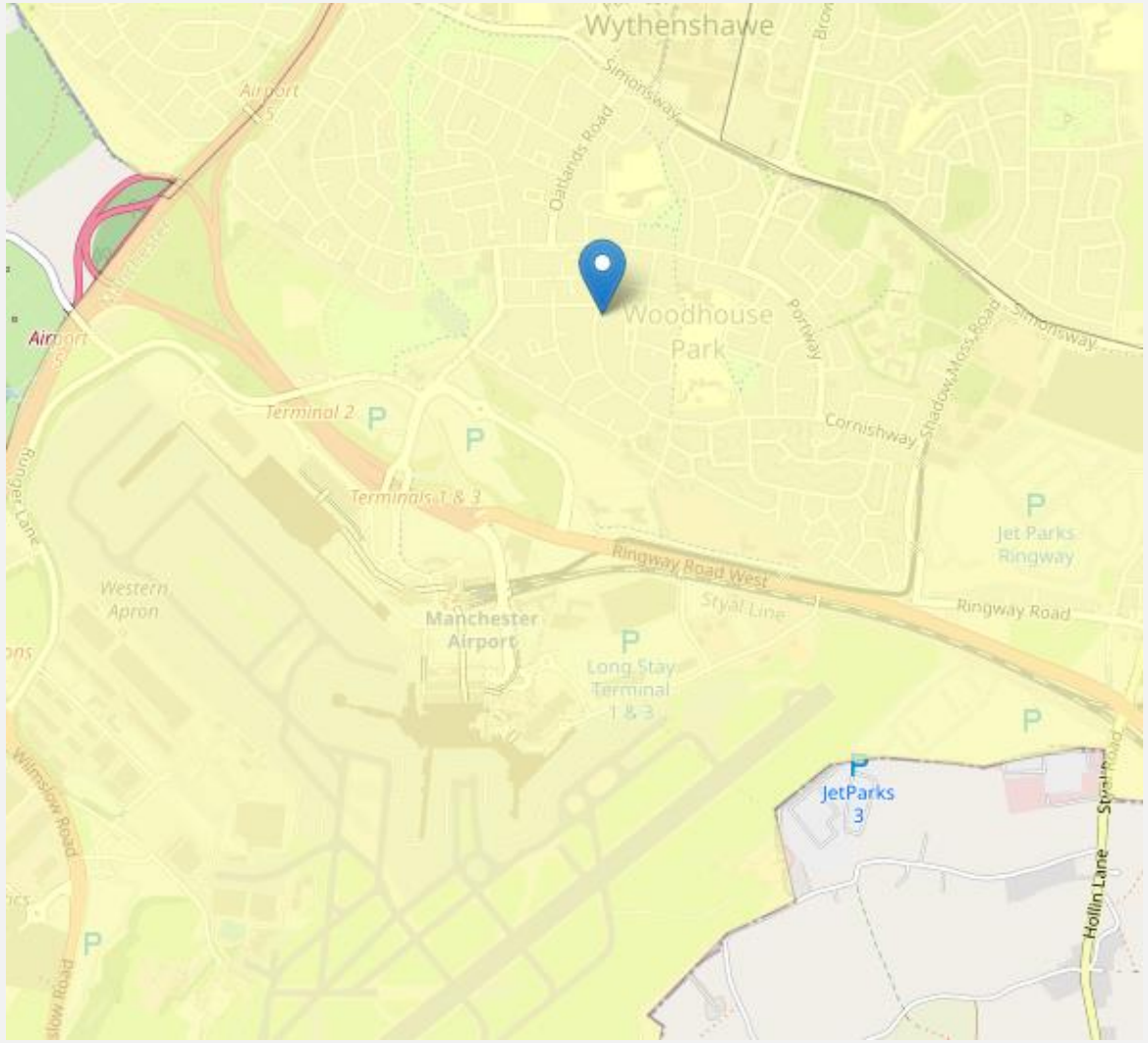
DATA VISUALISATION

- Choropleth map to show the distance to the station.
- Markers show the top 5 wards with the worst total cases of respiratory disease deaths, COPD admissions and accidents.
- They markers contain the ward names in a ‘pop over’.



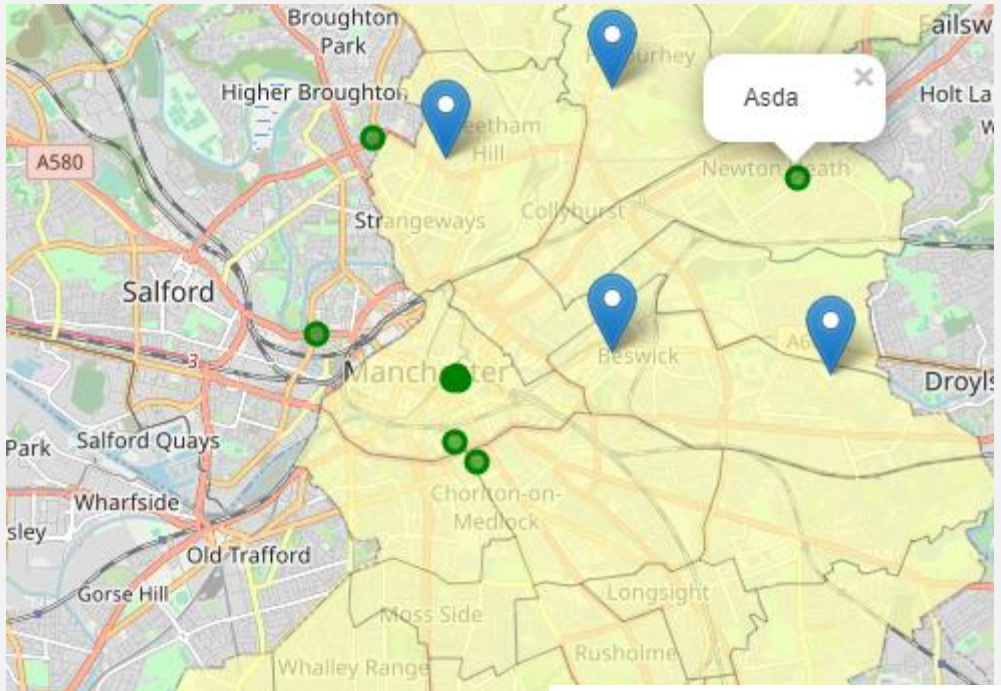
DATA VISUALISATION

- One of the five wards appears to be a long way outside the city centre. Upon zooming in we see that it is close to Manchester International Airport so it seems likely that this is the cause of the air pollution leading to Woodhouse Park being in the top 5 wards.



DATA VISUALISATION

- To make the visualisation more useful. The Foursquare API is used to identify supermarkets within 2km of the centre of the top 5 wards. (Inlay here shows dataframes with the identified supermarkets).
- Supermarkets are frequented by most households on average weekly (even in lockdown). Hence their car parks would make ideal locations for EV chargepoints or car share scheme bases.



name	categories	address	lat	lng
Asda	Supermarket	Old Church St	53.499256	-2.181447
Tai Hing Hong Chinese Supermarket	Grocery Store	Salford M5 4DE	53.483411	-2.263978
Thai supermarket Manchester	None	Charlotte street	53.478597	-2.240601
Woo Sang Supermarket	Convenience Store	19-21 George Street	53.479144	-2.240004
Asda	Supermarket	Great Cheetham Street	53.503383	-2.254168
Wing Fat Supermarket	Grocery Store	49 Faulkner Street	53.478570	-2.239628
Hang Won Hong	Food & Drink Shop	58-60 George Street	53.478794	-2.240575
The Grosvenor Supermarket	Grocery Store	126 A34	53.470312	-2.236458
Lameizi Chinese Supermarket & Restaurant	Food & Drink Shop	Unit 2 The Quadrangle Chester St	53.472240	-2.240310
Asda	Supermarket	214 Hollyhedge Road	53.387961	-2.253292

CONCLUSIONS AND RECOMMENDATIONS

- It is recommended that: Clayton & Openshaw, Cheetham, Harpurhyey, Ancoats & Beswick, Woodhouse Park be targeted for ways to reduce air pollution.
- To reduce pollution from emissions from fossil fuelled private vehicles, the supermarkets identified within the vicinity of the top 5 wards could be explored as places for electric vehicle chargepoints and/or EV car sharing schemes.