Contents

Introduction

This short case study uses the Propensity to Cycle Tool (PCT: www.pct.bike) to explore cycle commuting potential in Greater Manchester. It has been written by Rachel Aldred on behalf of the PCT team. Data was downloaded from the Propensity to Cycle Tool (PCT) as of 1st September 2016. Some of the underlying data may change slightly in future updates to PCT. In particular, an update to be applied in November 2016 will improve our estimates of route hilliness, and so reduce measurement error in modelling propensity to cycle, although we do not expect this significantly to change the model results. QGIS and Excel have been used to analyse the downloaded data.

About the PCT

The PCT is a Department for Transport-funded tool that uses information about current trip lengths and hilliness to identify trips that might be most easily switched to cycling. Currently, the tool uses data from the 2011 Census, which has origins and destinations for almost all commuters in England. The PCT provides a range of scenarios to explore cycling potential at area or route level. It is freely available for everyone to use and the code is open source.

Limitations

Some limitations of the PCT are outlined here; these tend to involve the under-estimation of cycling potential. Firstly the PCT does not take into account new developments (post-2011), and the cycling potential that these might generate. Perhaps most importantly, the PCT currently only covers commuter cycling. Commuting only represents around a sixth of all trips: based on Dutch travel patterns, if we achieved mass cycle commuting we would also have very high (sometimes higher) levels of cycling for other trip purposes. Planners should note that these trips may have different destinations (e.g. hospitals, leisure destinations, schools, etc.) and may also be very important, particularly for some demographic groups such as women and older people for whom the commute makes up a smaller proportion of trips. Finally, we are only including the potential for trips to switch entirely to cycling – whereas based on bespoke work conducted for Tunbridge Wells, there might be very high potential for longer-distance commuters to cycle to the station. Planners need to consider additional trip generators and how this might impact the size and spatial distribution of cycling potential.

Why cycling matters

Increasing cycling can have a range of benefits. Health benefits are substantial and arise primarily from increases in physical activity, particularly where people are currently relatively inactive. Other health benefits stem from declines in air pollution if car trips decline, and – given substantial mode shift – falls in injury levels. Cycling is very efficient, allowing many times more people to be transported in a given space than cars. Additional benefits include the ability to increase mobility among poorer citizens and those with limited access to private motor vehicles, such as children.

However, the benefits of cycling are currently far from being realised in England. Research shows that the major barrier to increasing cycling is fear of motor traffic, with a systematic review conducted for DfT showing women have a particularly strong need for cycling infrastructure away from motor traffic, such as tracks on main roads. Under-represented groups such as women and older people also benefit from such routes being direct, because they are less likely than men and younger people to cycle longer journeys.

Building 'gold standard' infrastructure for cycling is increasingly recognised as necessary to begin achieving our potential. This gold standard comprises three main types of infrastructure, all different but all providing the necessary high level of service for cycling by a range of ages and abilities:

- Cycle tracks, physically protected from motor traffic, on busy roads.

- Greenway routes – cycle paths that run through parks, for example, or along rivers or disused rail lines. If direct, well surfaced and usable after dark (see for instance the Cambridge Busway Cycleway) they can be excellent contributors to a utility cycling network.

- Very quiet residential streets, with only the occasional motor vehicle even at peak. Where streets are currently insufficiently quiet, this will require removal or substantial reduction of through motor traffic.

But where should this infrastructure be built? The Propensity to Cycle Tool (PCT) can help answer this question, examining which trips are most likely to switch to cycling under specific scenarios. For this case study, we have focused on the tool's 'Government Target' and 'Go Dutch' scenarios.

About Greater Manchester

Greater Manchester is a metropolitan county in North West England, with a population of 2.8 million. It encompasses one of the largest metropolitan areas in the United Kingdom and comprises ten metropolitan boroughs: Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford, Wigan, and the cities of Manchester and Salford. Greater Manchester was designated a City Region on 1 April 2011. It spans 493 square miles (1,277 km^2), which roughly covers the territory of the Greater Manchester Built-up Area, the second most populous urban area in the UK. Greater Manchester is a polycentric county with ten metropolitan districts, each of which has at least one major town centre and outlying suburbs[1]. Land use is mostly urban, with a focused central business district.

[1] https://en.wikipedia.org/wiki/Greater_Manchester

The scenarios

The Propensity to Cycle Tool uses scenarios to identify which areas and routes might see greatest cycling uptake under different scenarios of the future. The tool currently uses Census 2011 Travel to Work data at the level of a Middle Layer Super Output Area (MSOA), a unit of population of around 7200 people, usually at least 5000. The basic concept involves using a statistical model to identify journeys that might be most likely to switch to cycle, based on trip distance and hilliness, established as being substantial barriers to cycling. The tool can then also route cyclists using Cyclestreets.net, which we use to provide estimates of scenario cycling potential along different route sections.

The graphs below show how the likelihood of cycling declines, as distance or hilliness grow:

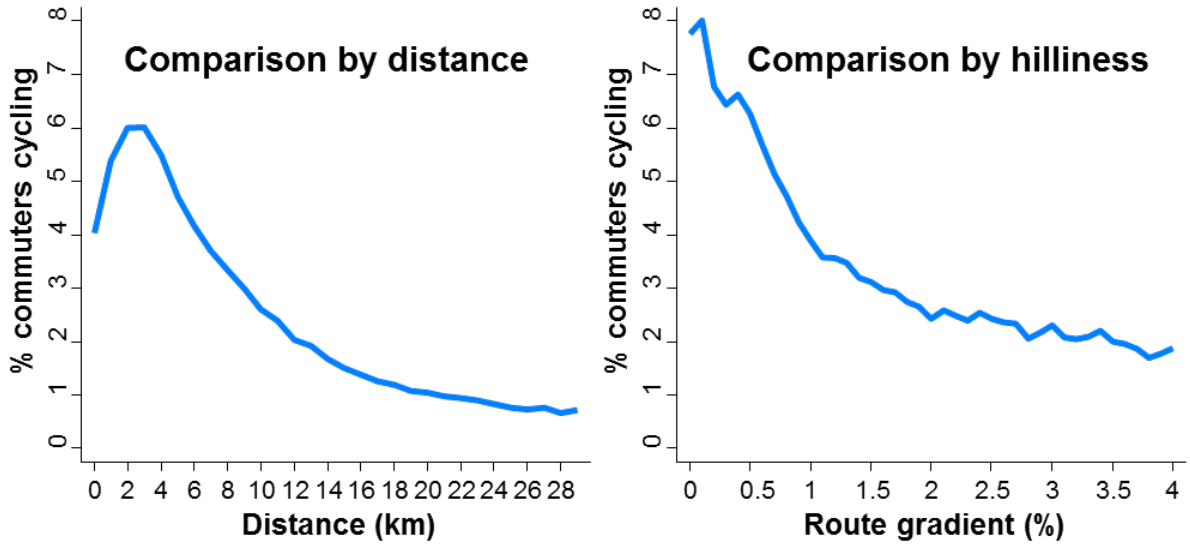

Figure 1: how cycle commuting relates to distance and hilliness (based on Census 2011 Travel to Work data)

There are four core scenarios:

1. Government Target – the target for cycling in England for 2025, involving a doubling of cycling nationally.
2. Gender Equality – women cycle at the same rate as men do now, for each origin-destination pair.
3. Go Dutch – uses the probability that each given trip would be cycled in the Netherlands, based on length and hilliness. In other words, the scenario assumes that England overcomes its infrastructural and cultural barriers to cycling, but hilliness and journey characteristics stay the same.
4. E-bikes – A kind of Go Dutch plus, based on Dutch and Swiss data, assuming that people use e-bikes for longer or hillier journeys as the Dutch and Swiss already do. Literature and data on e-bikes, while still limited, suggests that if cycling takes off, e-bikes will be increasingly popular and should help grow cycling further, particularly in hillier areas.

Headline Figures for Greater Manchester

This section illustrates, using PCT screenshots, how cycle commuting changes in Greater Manchester and in England, for the four scenarios.

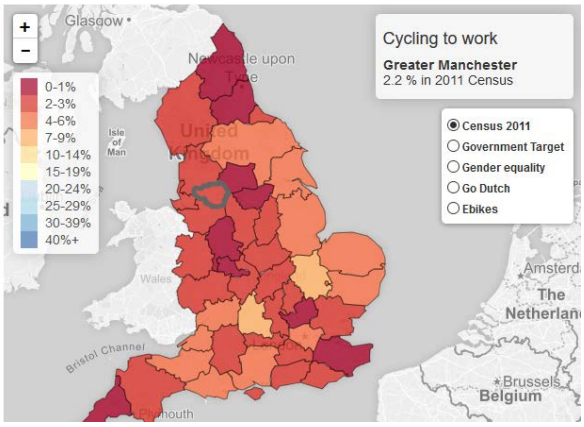

Figure 2: Census 2011 levels of cycle commuting in Greater Manchester and England

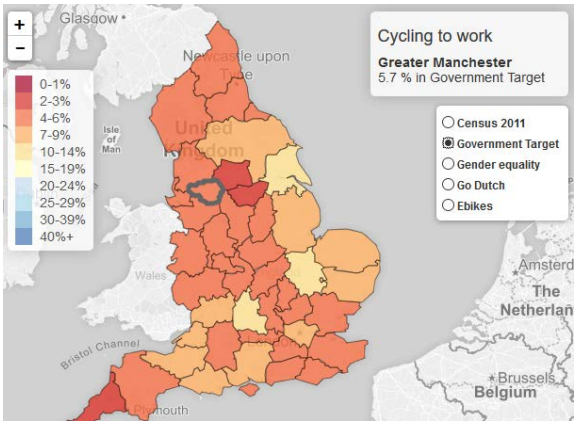

Figure 3: Government Target scenario, Greater Manchester and England

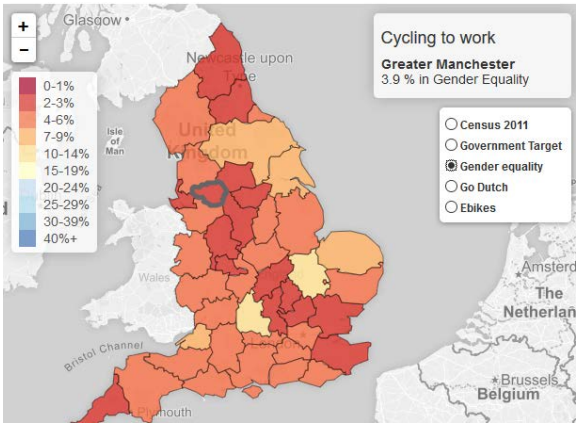

Figure 4: Gender Equality scenario, Greater Manchester and England

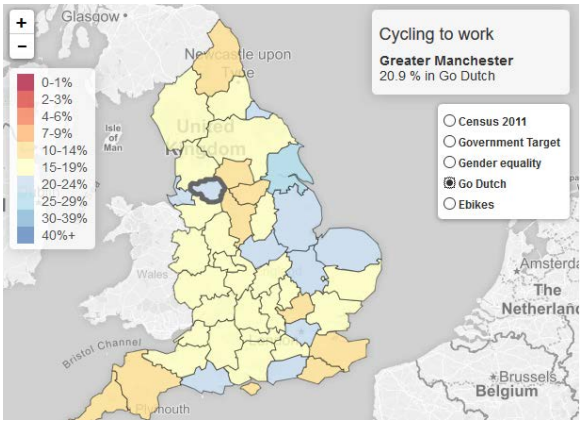

Figure 5: Go Dutch scenario, Greater Manchester and England

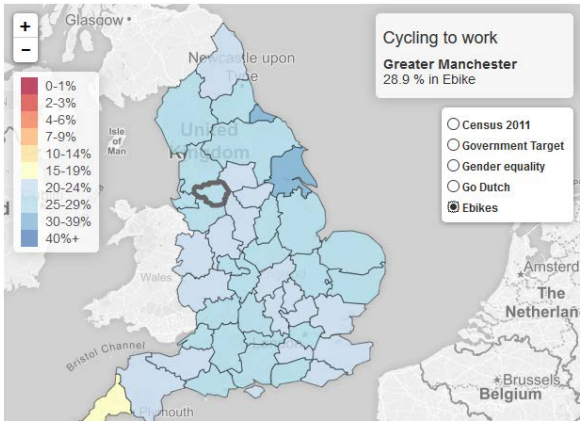

Figure 6: E-bike scenario, Greater Manchester and England

Areas

We now move to consider the Greater Manchester region, scenario levels of cycling and their impacts. Initially the report presents all scenarios, then focusing upon the two selected here: Government Target (less ambitious) and Go Dutch (more ambitious).

For all the legends, areas are divided into quintiles – i.e. the top 20%, the next 20%, and so on. Therefore the category boundaries change, as cycling increases. Therefore while in the higher-cycling scenarios there are clear hotspots (places with lots of short, less hilly trips), even the lower-cycling areas see a substantial increase compared to the Census 2011.

% cycle commuting, all scenarios

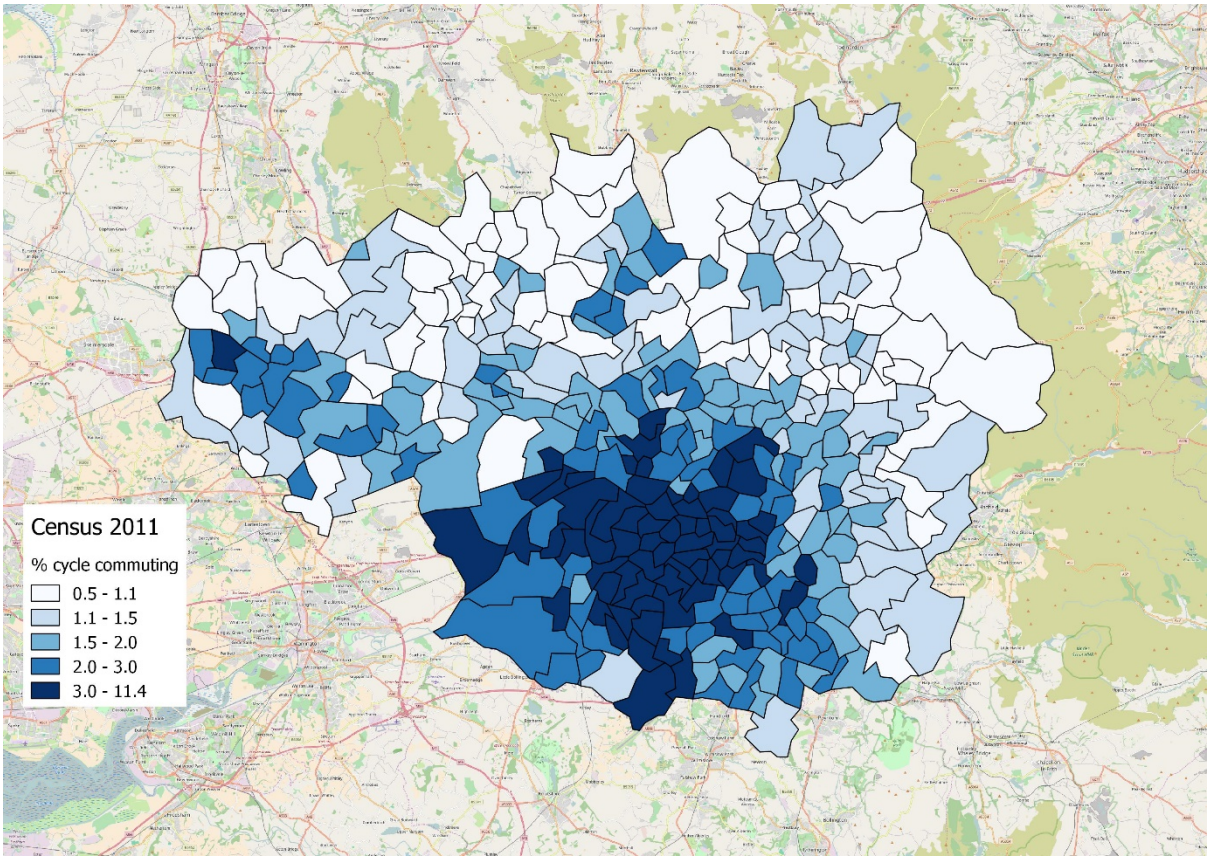

Figure 7: Census 2011 Cycle Commuting, Greater Manchester

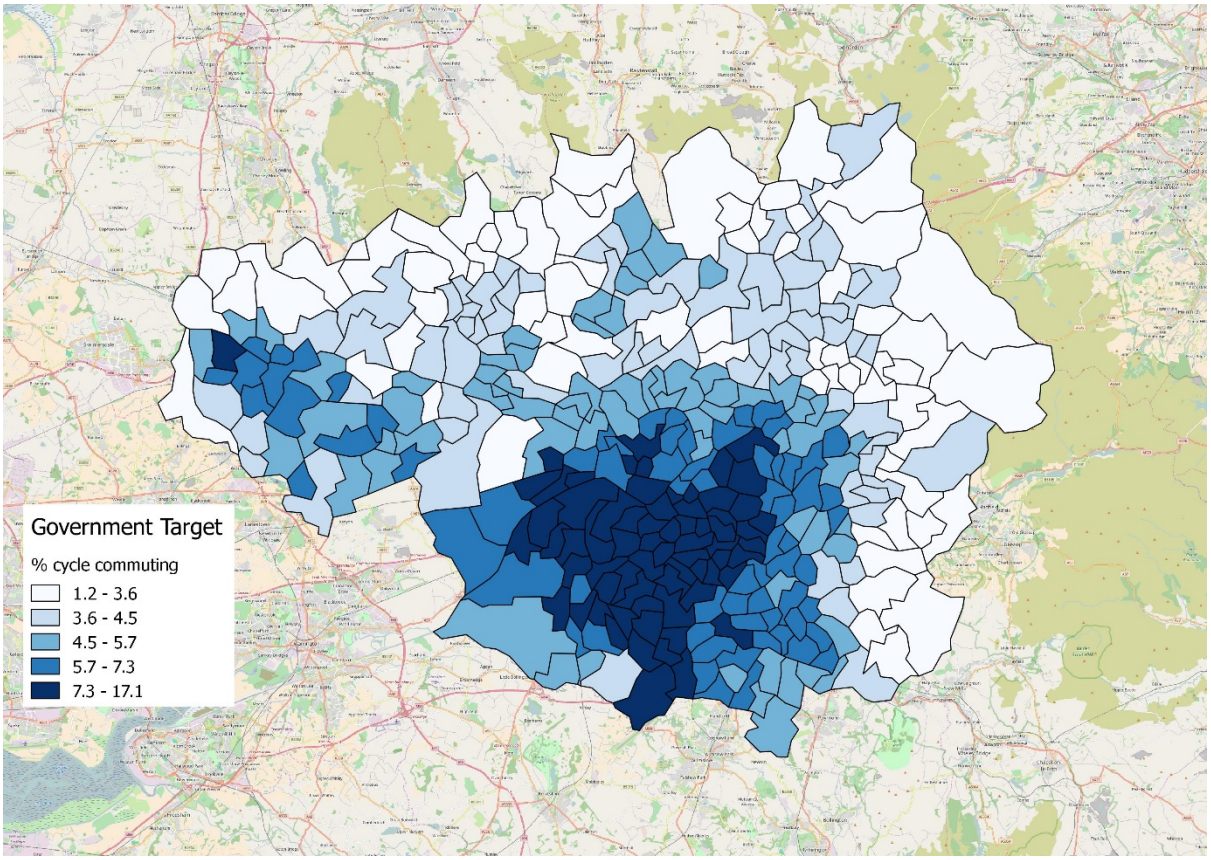

Figure 8: Government Target scenario Cycle Commuting, Greater Manchester

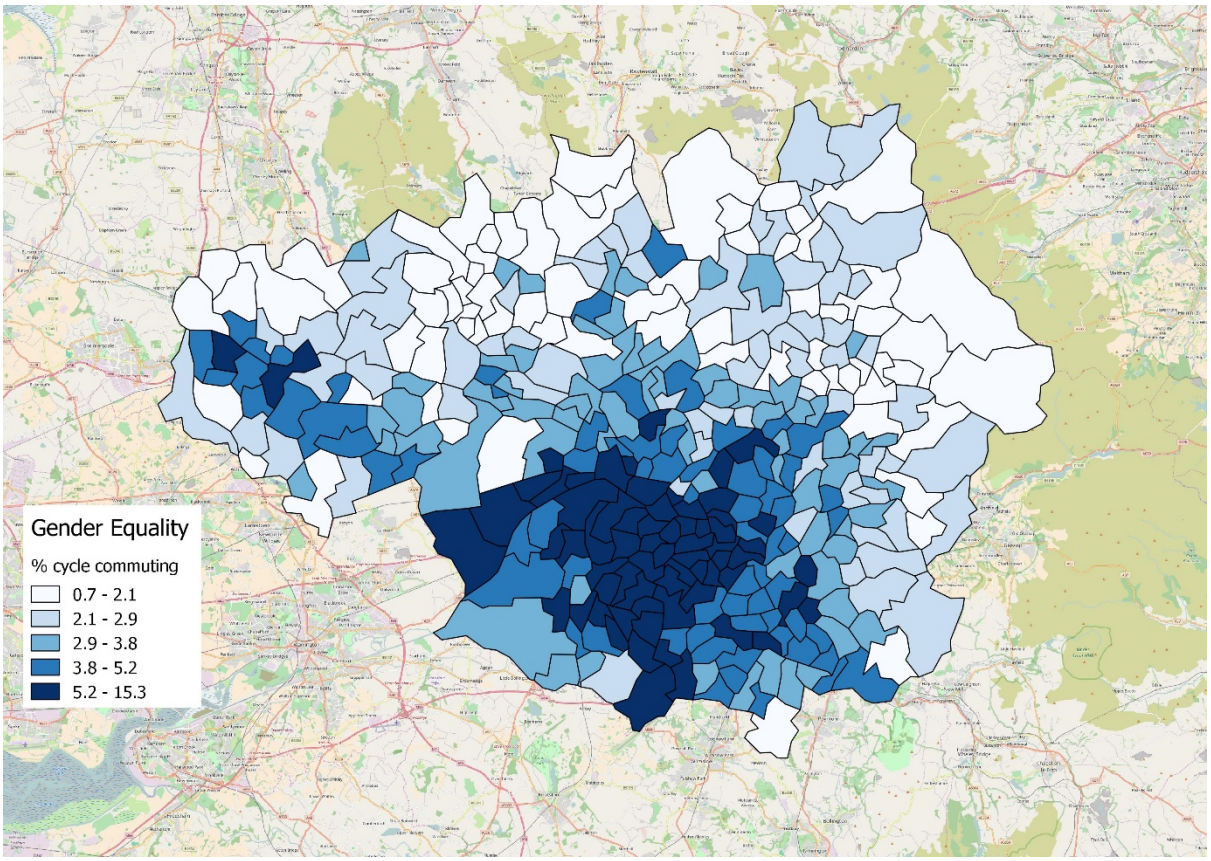

Figure 9: Gender Equality scenario Cycle Commuting, Greater Manchester

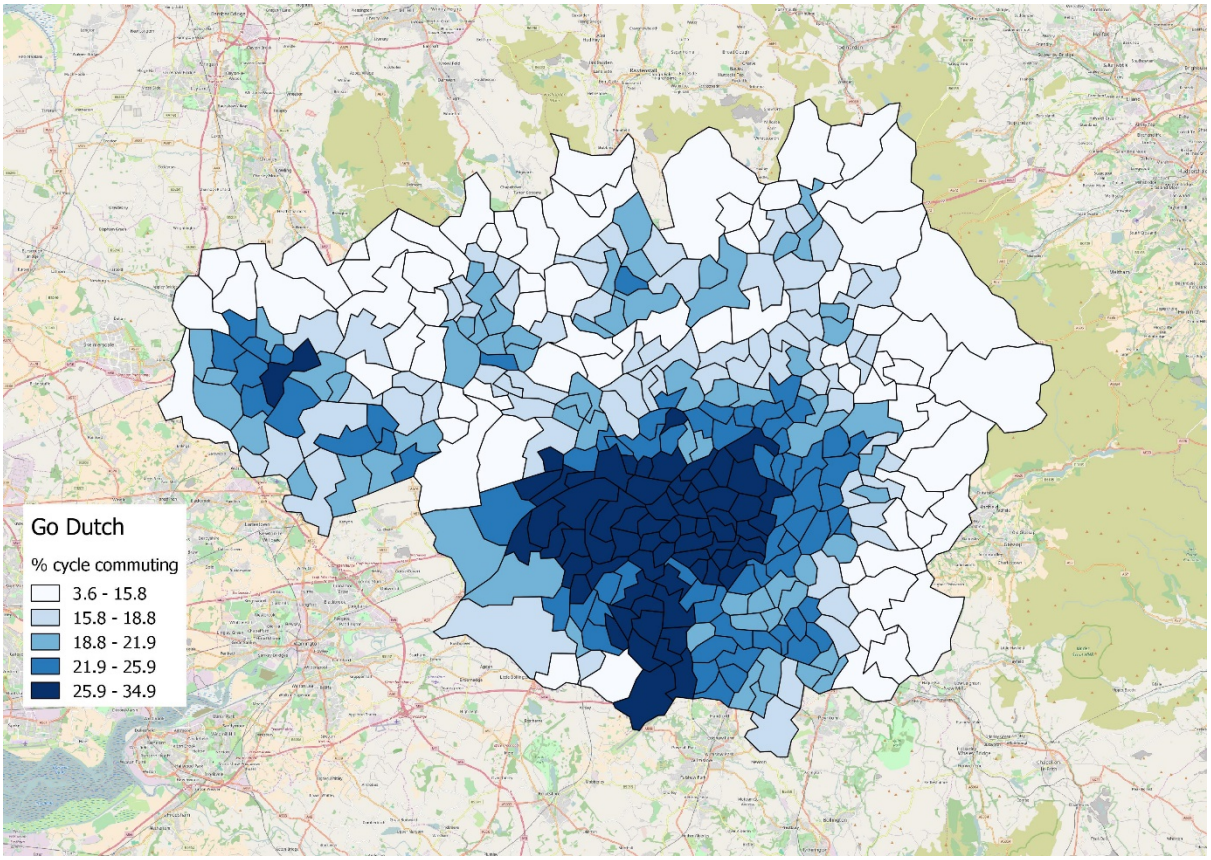

Figure 10: Go Dutch scenario Cycle Commuting, Greater Manchester

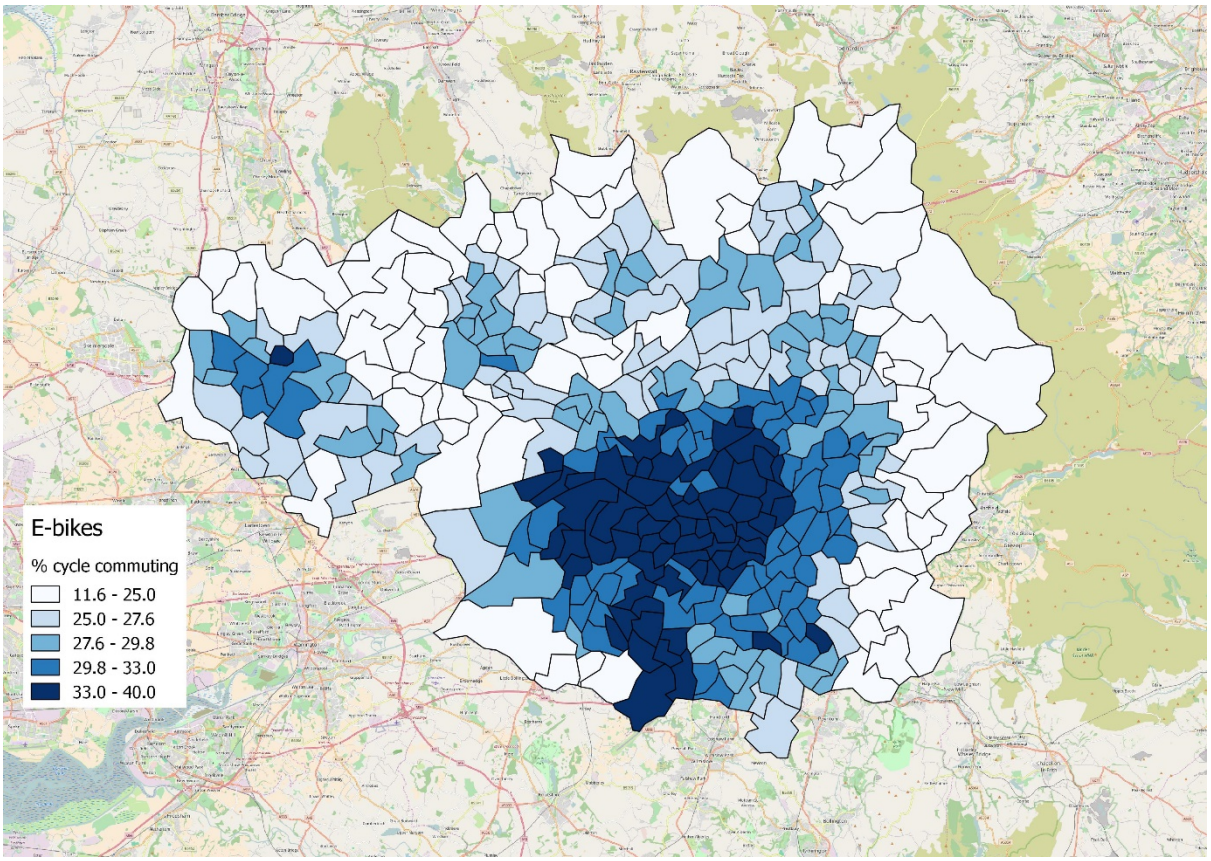

Figure 11: E-bike scenario Cycle Commuting, Greater Manchester

Change in driving, Government Target and Go Dutch

The two maps below illustrate drivers switching to cycling per MSOA, for the two selected scenarios:

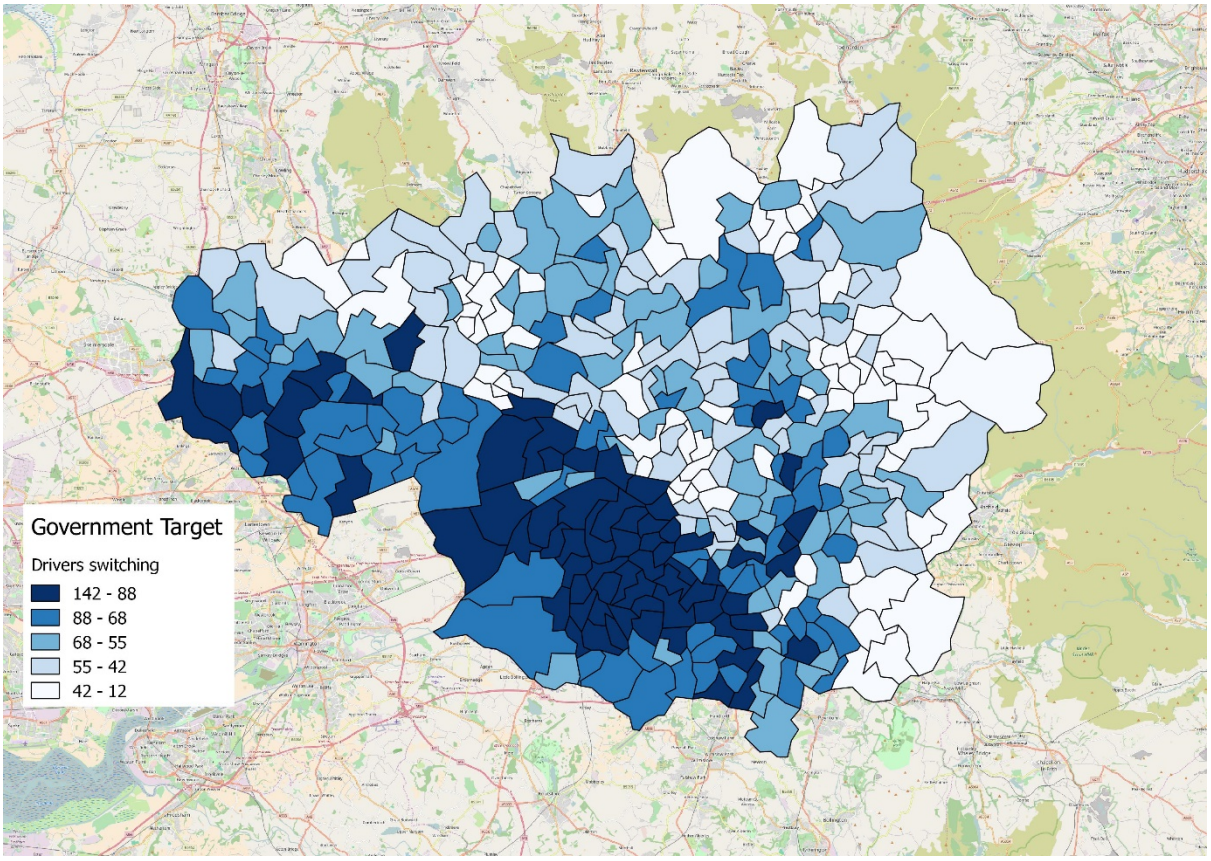

Figure 12: Drivers switching to cycling per MSOA, Government Target scenario

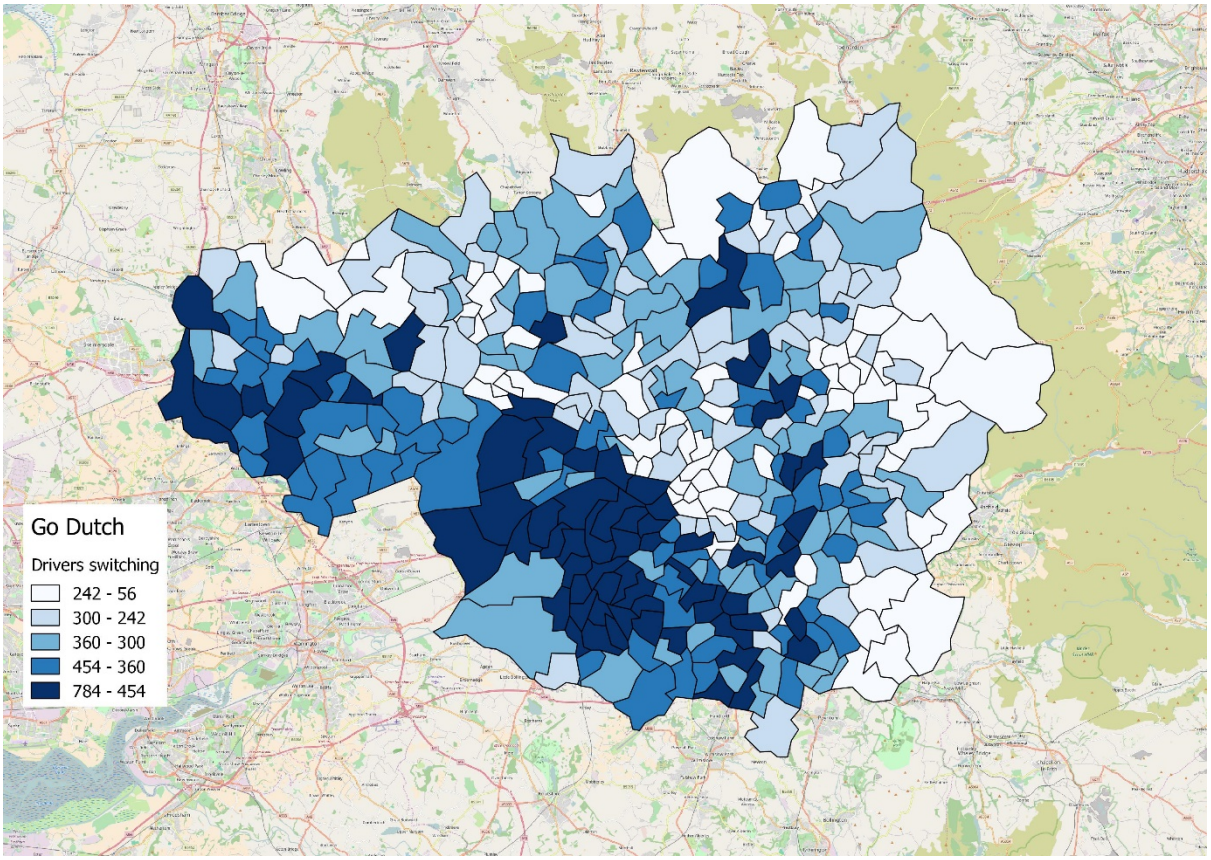

Figure 13: Drivers switching to cycling per MSOA, Go Dutch scenario

Health benefits, Government Target and Go Dutch

Below we illustrate the health economic benefits per MSOA for the same two scenarios. These are calculated using a modified version of the WHO's Health Economic Assessment Tool incorporating local data on population age structure and health status.

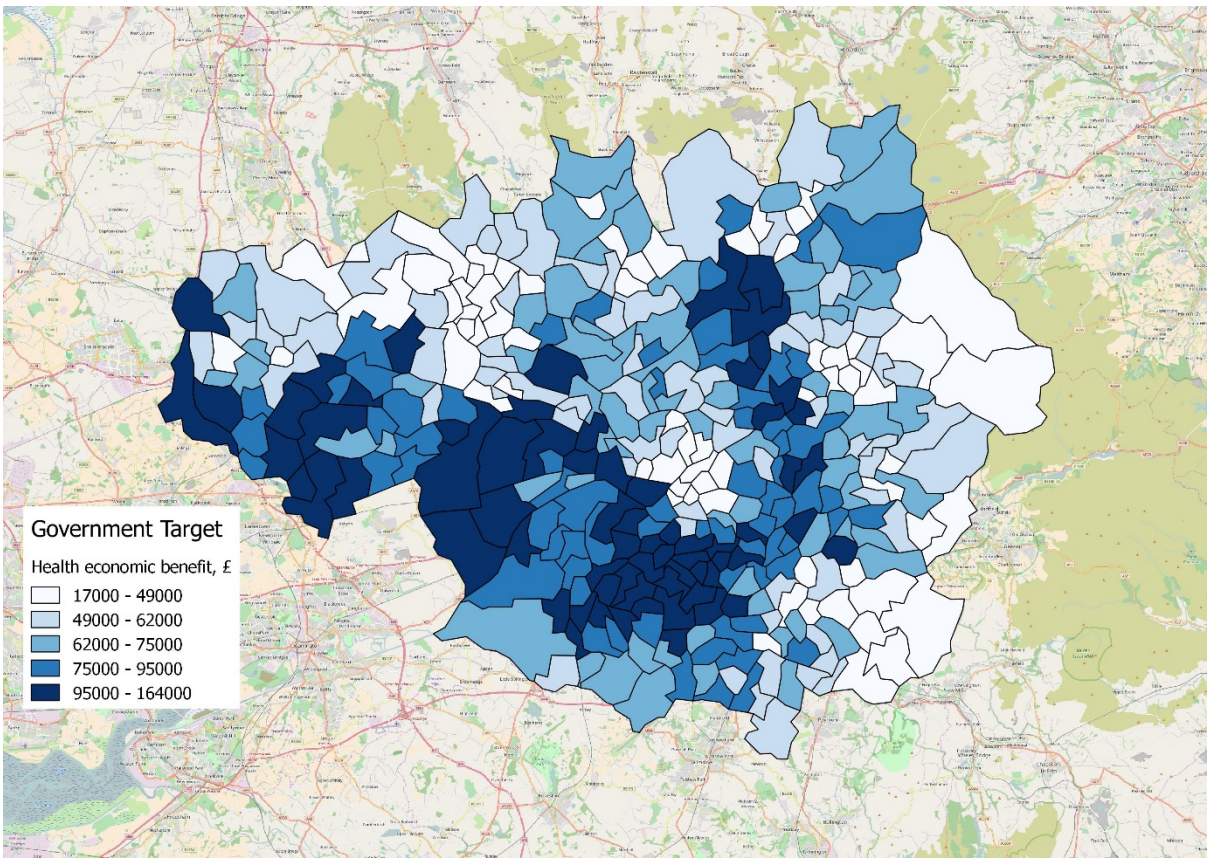

Figure 14: Health Economic Benefits per MSOA, Government Target scenario

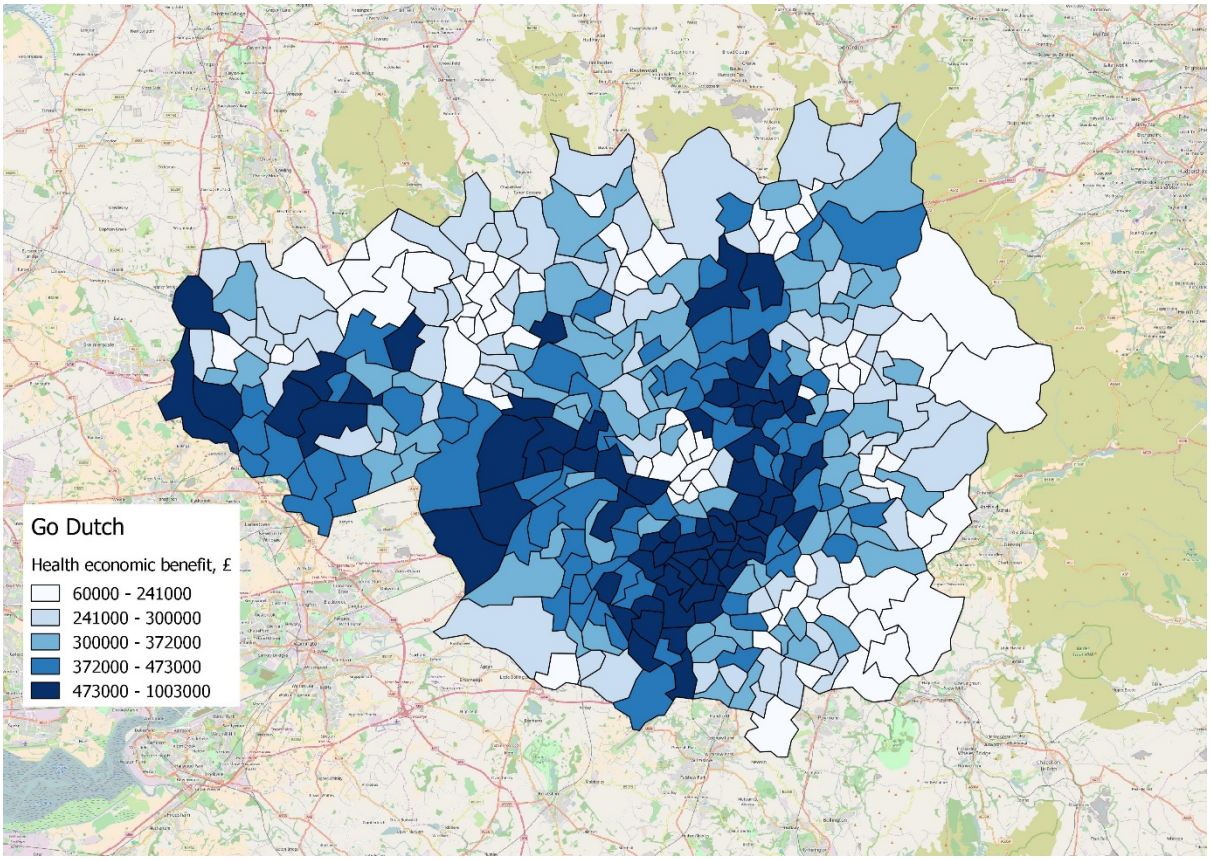

Figure 15: Health Economic Benefits per MSOA, Go Dutch scenario

Carbon savings, Government Target and Go Dutch

Finally in this section we illustrate the carbon savings from the two scenarios. This is derived from drivers switching and the lengths of trips that are switched.

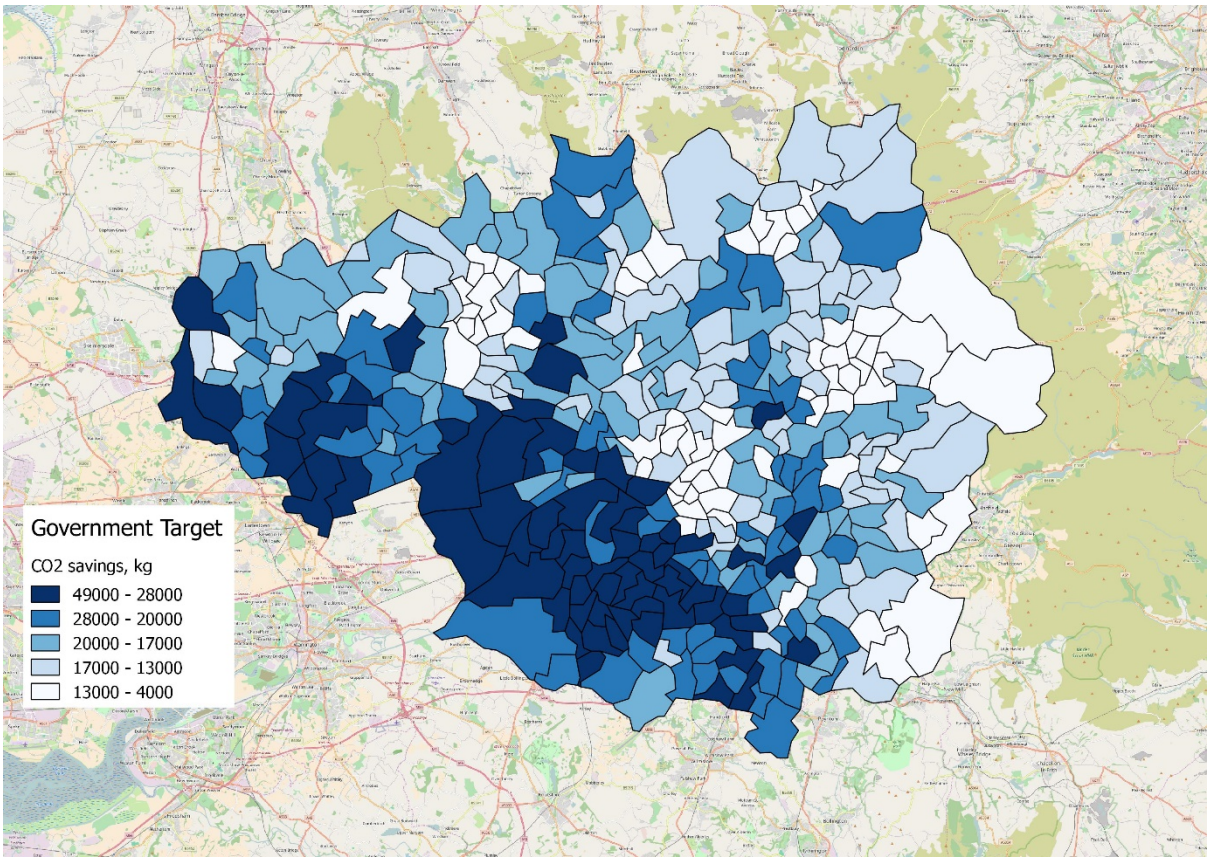

Figure 16: Carbon savings per MSOA, Government Target scenario

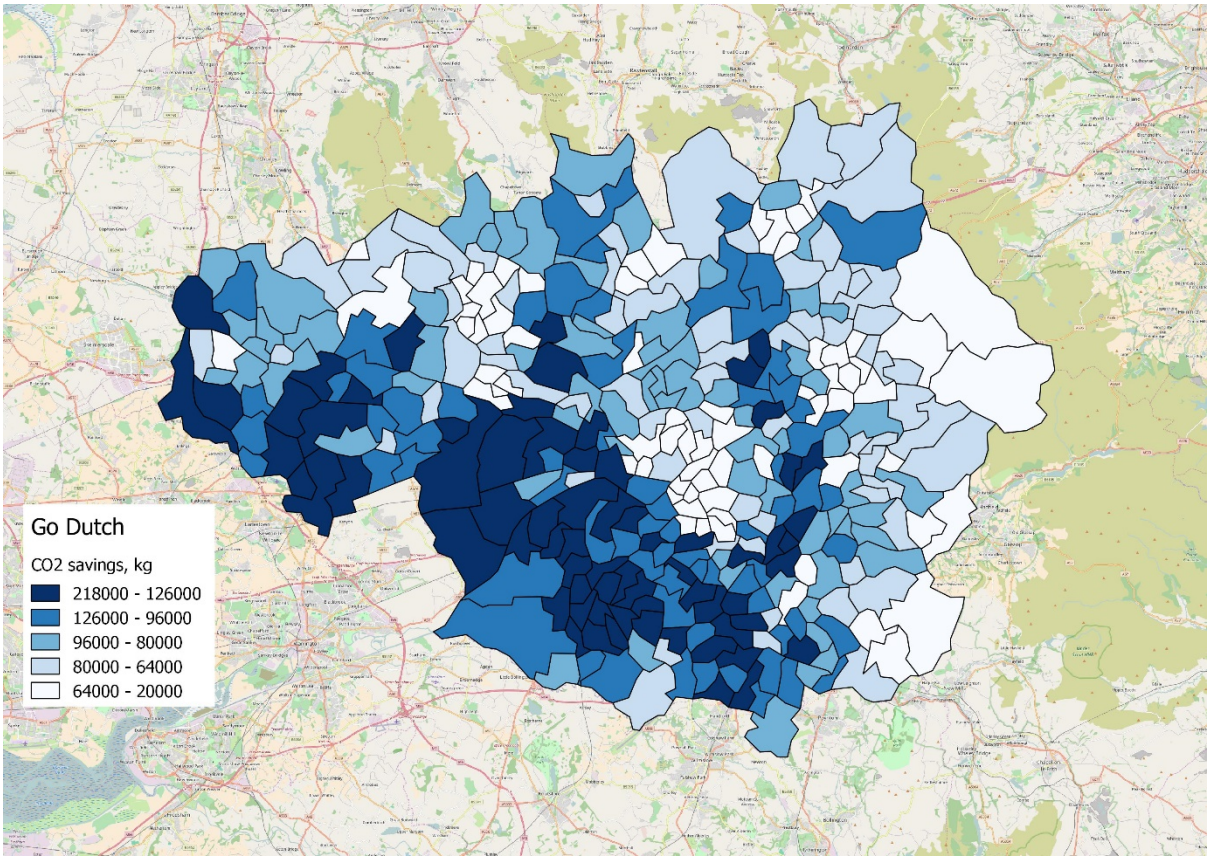

Figure 17: Carbon savings per MSOA, Go Dutch scenario

Desire Lines

We now move to consider desire lines, i.e. the lines connecting commuter origins and destinations. These are mapped for Census 2011, Government Target and Go Dutch, initially focusing on those with at least 25 cyclists.

Census and Government Target

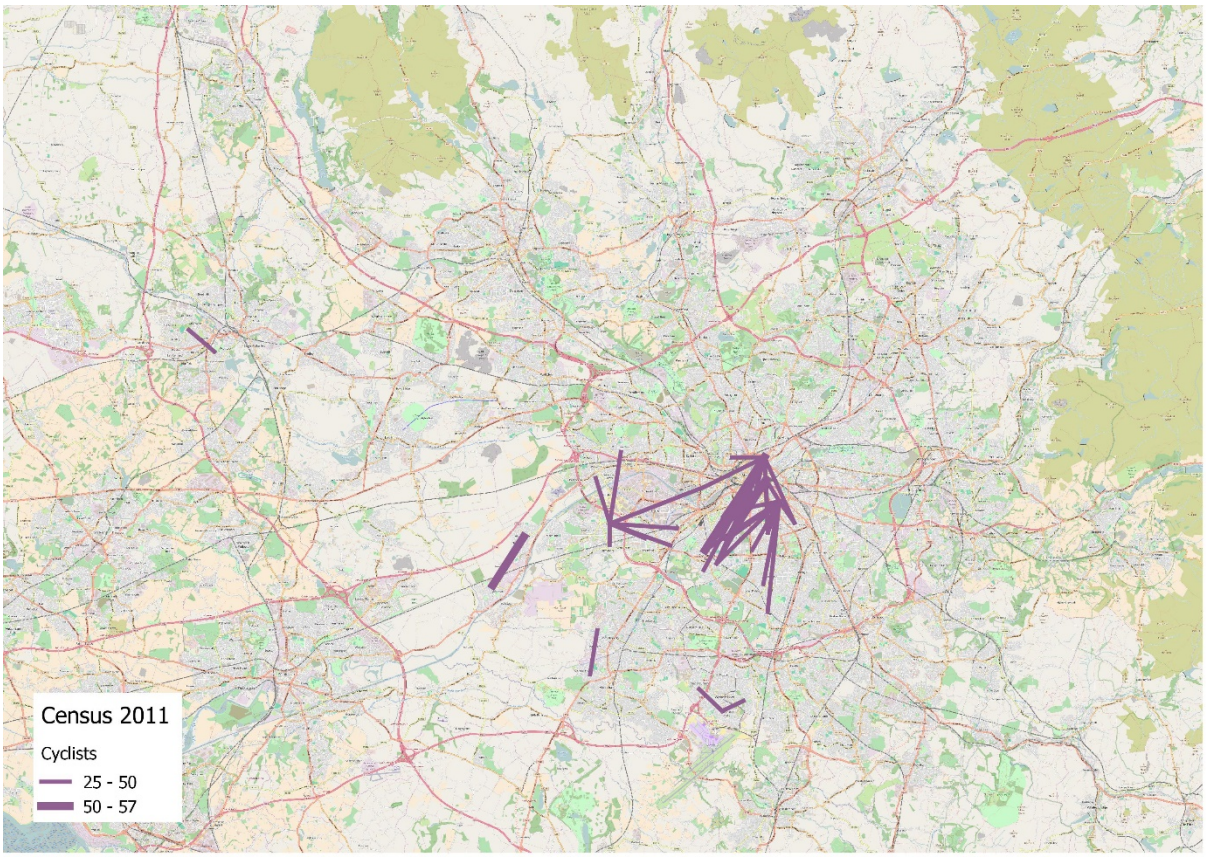

Figure 18: Desire lines with 25+ cycle commuters, Census 2011

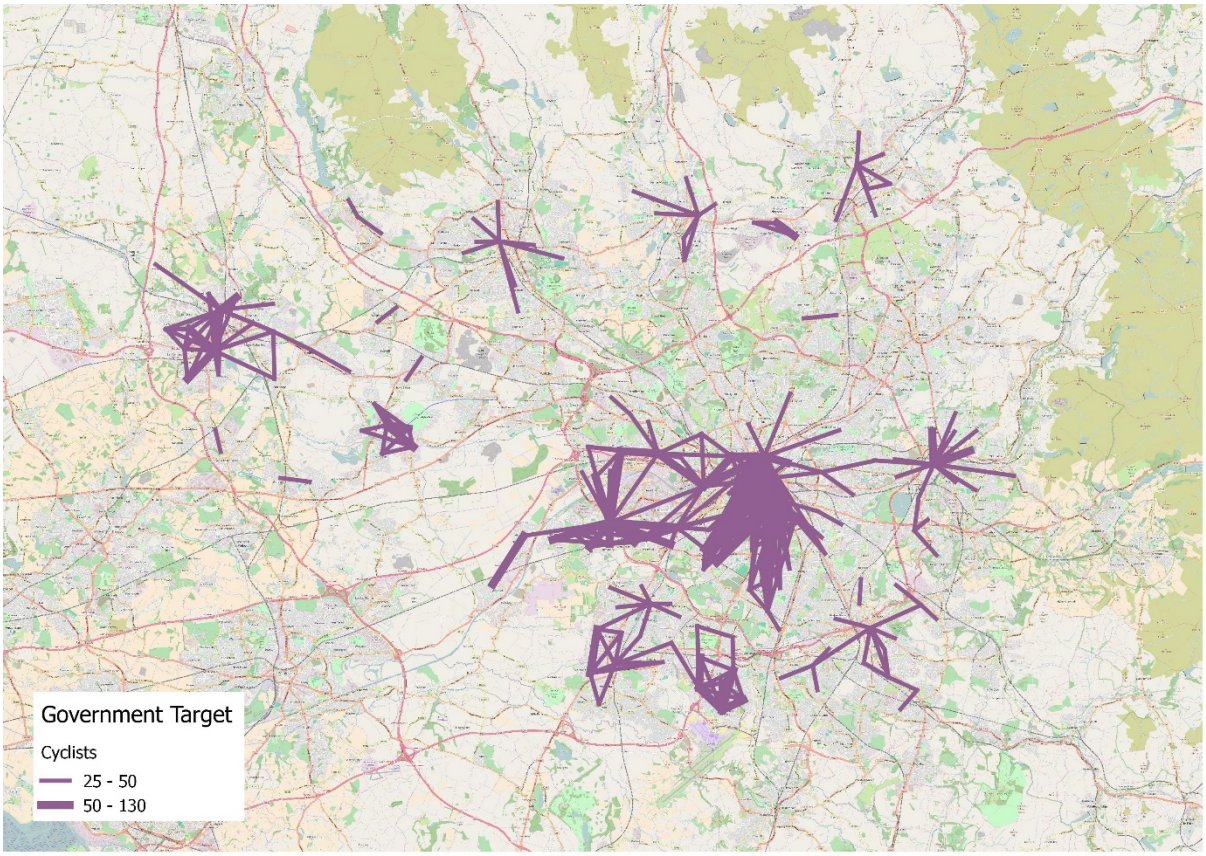

Figure 19: Desire lines with 25+ cycle commuters, Government Target scenario

Go Dutch

Below desire lines are mapped for the 'Go Dutch' scenario, initially all with 25+ cyclists and then only including those with >50 and >100 cyclists.

Figure 20: Desire lines with 25+ cycle commuters, Go Dutch Scenario

Figure 21: Desire lines with 50+ cycle commuters, Go Dutch Scenario

Figure 22: Desire lines with 100+ cycle commuters, Go Dutch Scenario

Network

Finally we present network results where desire lines are mapped to the network (using the fastest legally cycleable routes) for Census cycling, Government Target and Go Dutch. Please note that this only represents commuter cycling and may not represent where people currently cycle (because often the fastest routes are hostile for cycling). However, if we are to achieve substantial uplift in cycling, facilitating cycling along direct routes will be necessary, given the sharp decay in cycling propensity as distances grow, particularly for currently under-represented groups.

It should also be remembered that cycling along some of the more major routes will often involve also cycling along feeder routes not highlighted here, which are likely also to need interventions to facilitate cycling.

Whole Network

The figure below illustrates routes with 100+ commuter cyclists, based on Census 2011 data and mapped to the fastest legally cycleable routes.

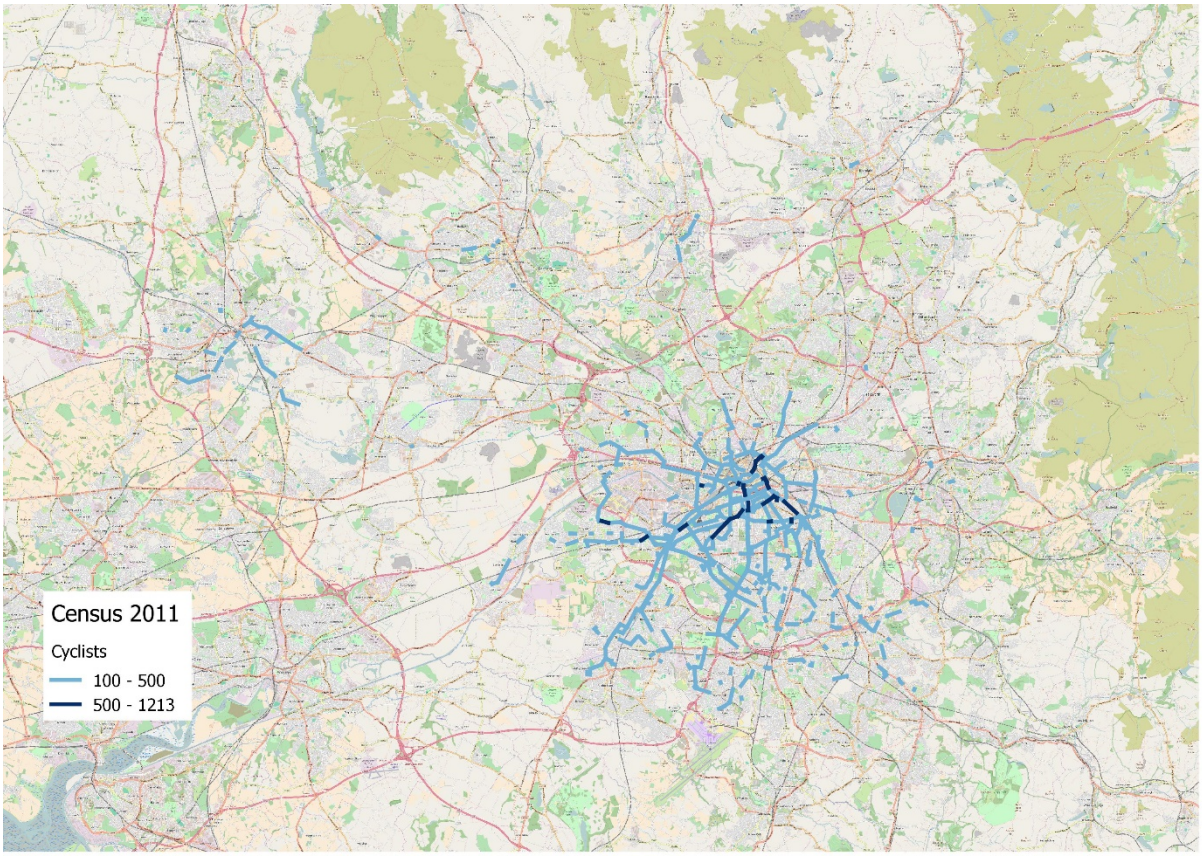

Figure 23: Route network segments with 100+ cycle commuters, Census 2011

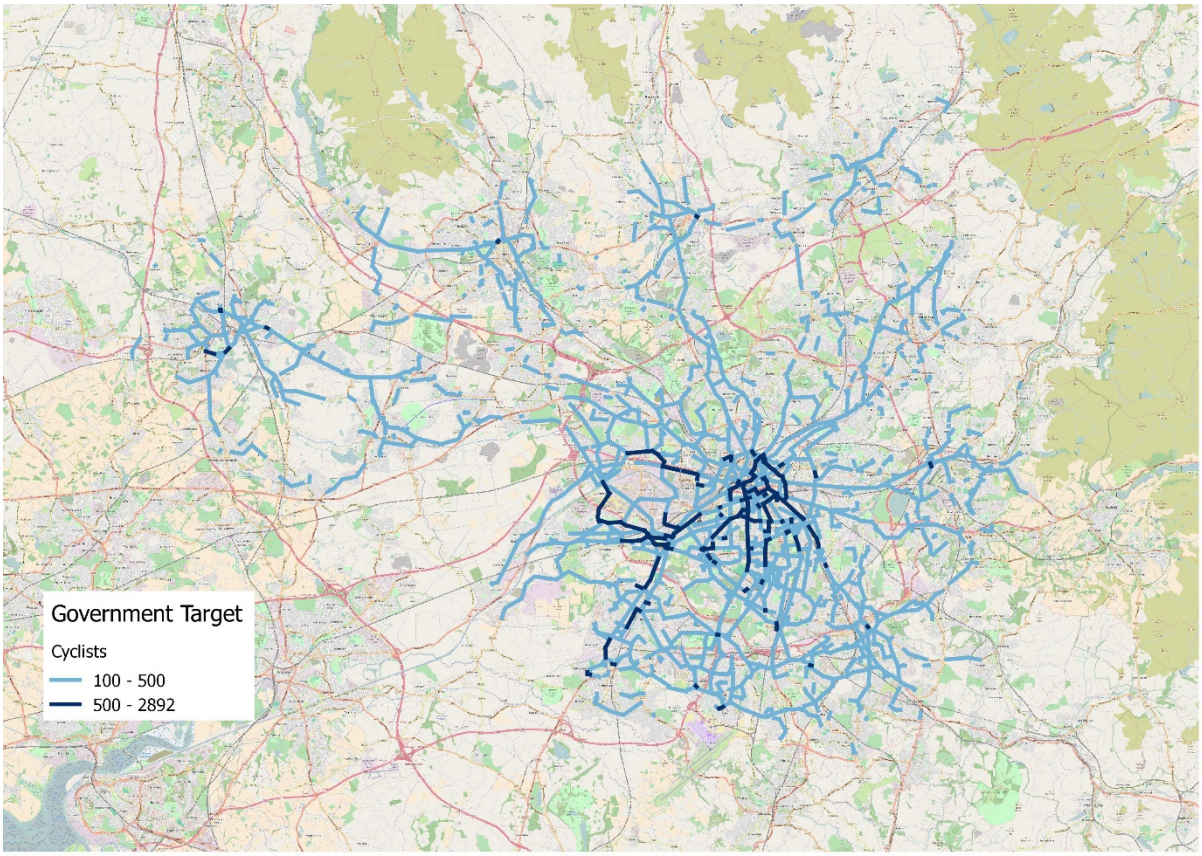

Figure 24: Route network segments with 100+ cycle commuters, Government Target

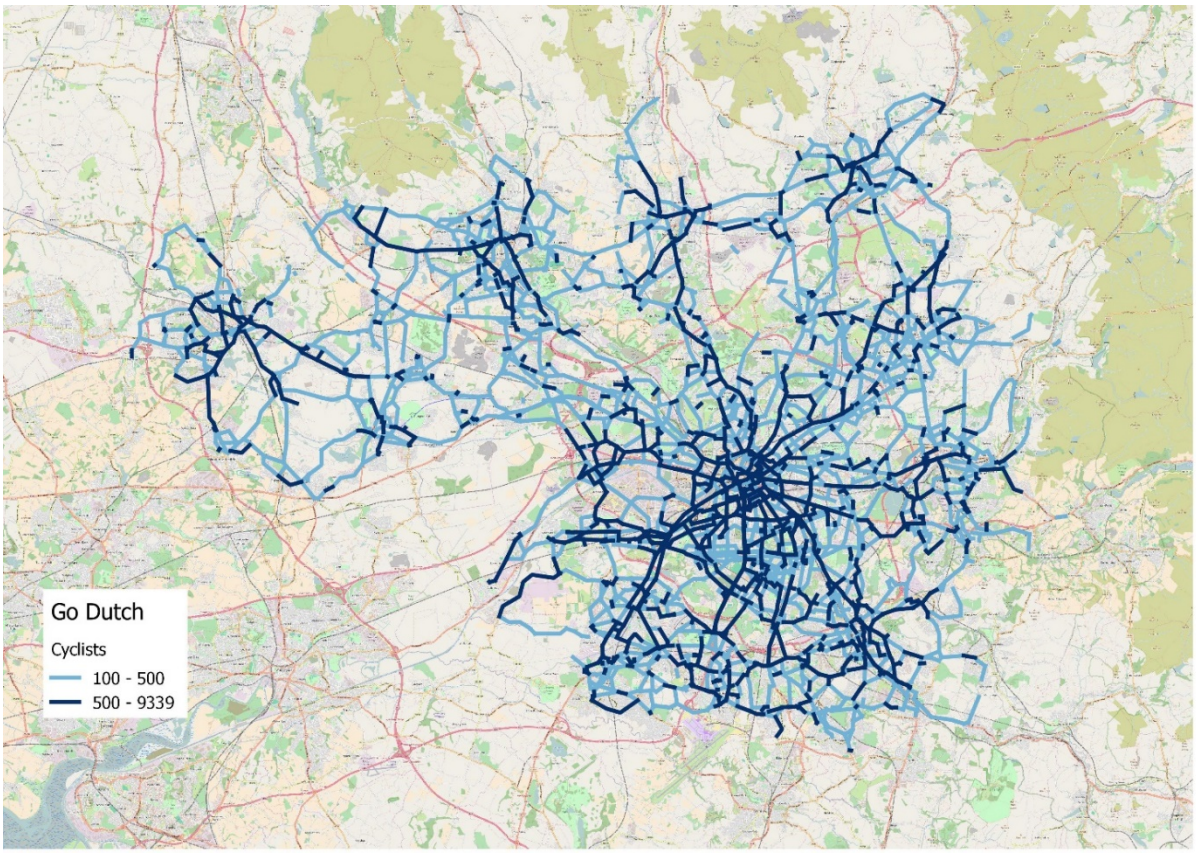

Figure 25: Route network segments with 100+ cycle commuters, Go Dutch

Zooming in on District Centres

Finally the Go Dutch scenario is used to zoom in on district centres and highlight routes sections with >100 (light blue) and >500 (dark blue) commuter cyclists under the Go Dutch scenario.

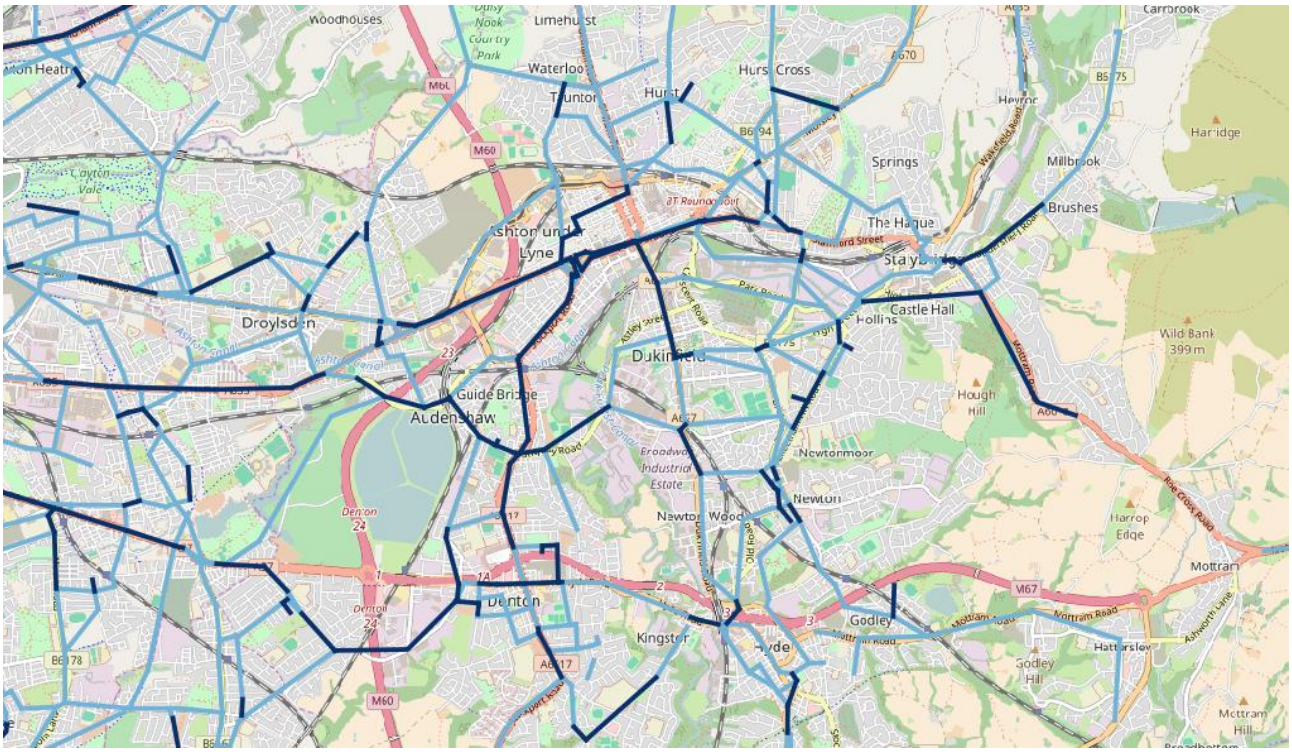

Figure 26: Route network segments with 100+ cycle commuters, Go Dutch – Ashton

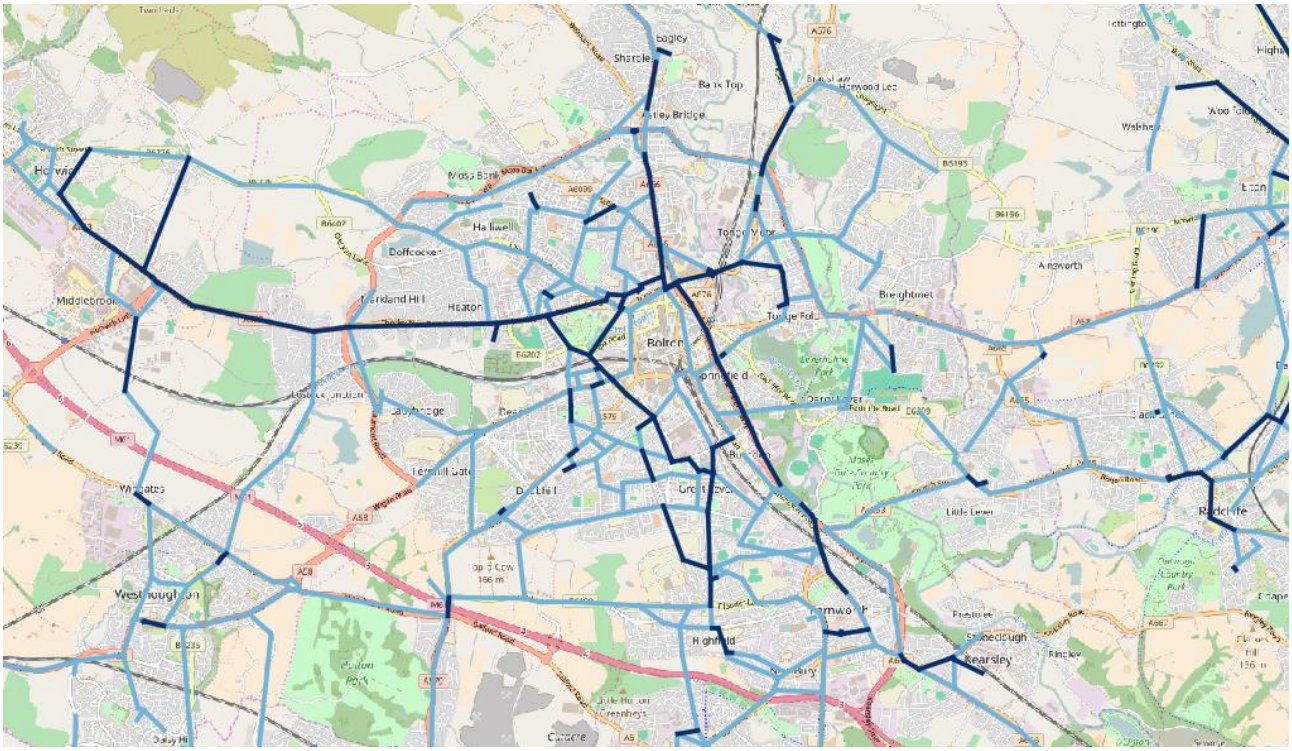

Figure 27: Route network segments with 100+ cycle commuters, Go Dutch – Bolton

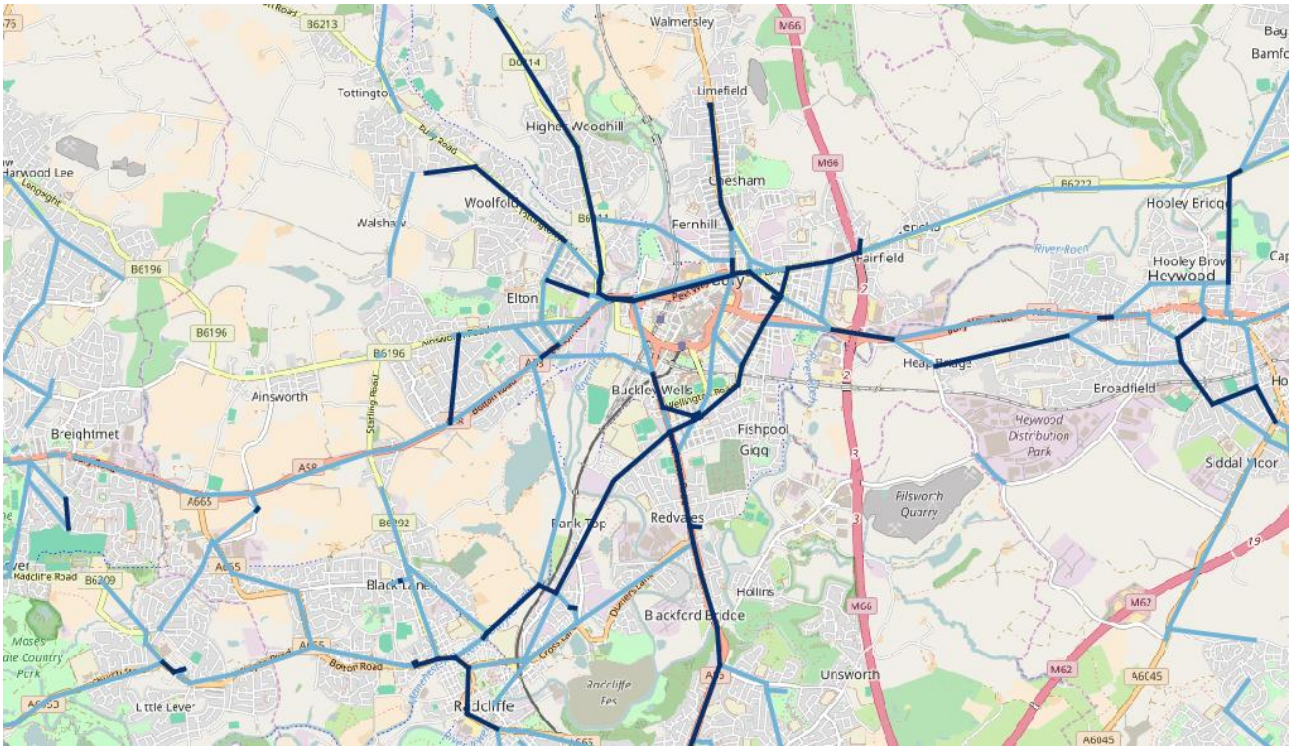

Figure 28: Route network segments with 100+ cycle commuters, Go Dutch – Bury

Figure 29: Route network segments with 100+ cycle commuters, Go Dutch – Manchester

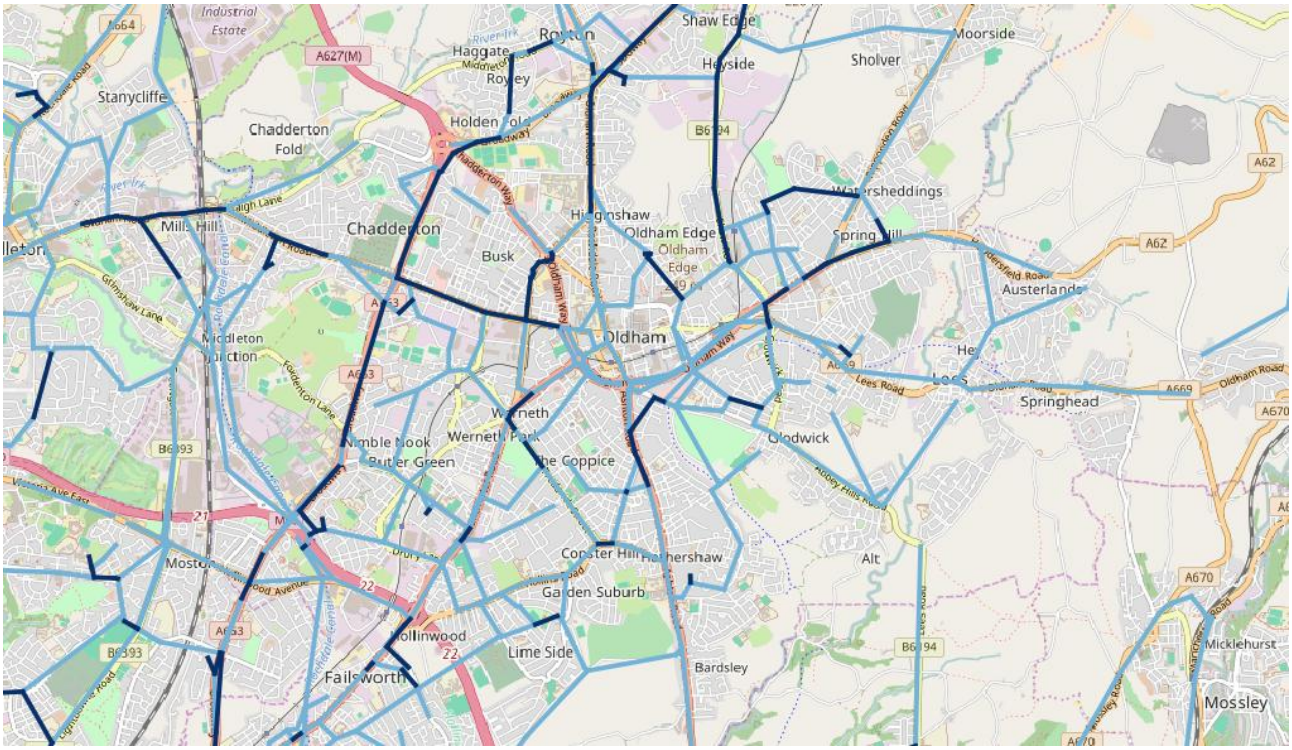

Figure 30: Route network segments with 100+ cycle commuters, Go Dutch – Oldham

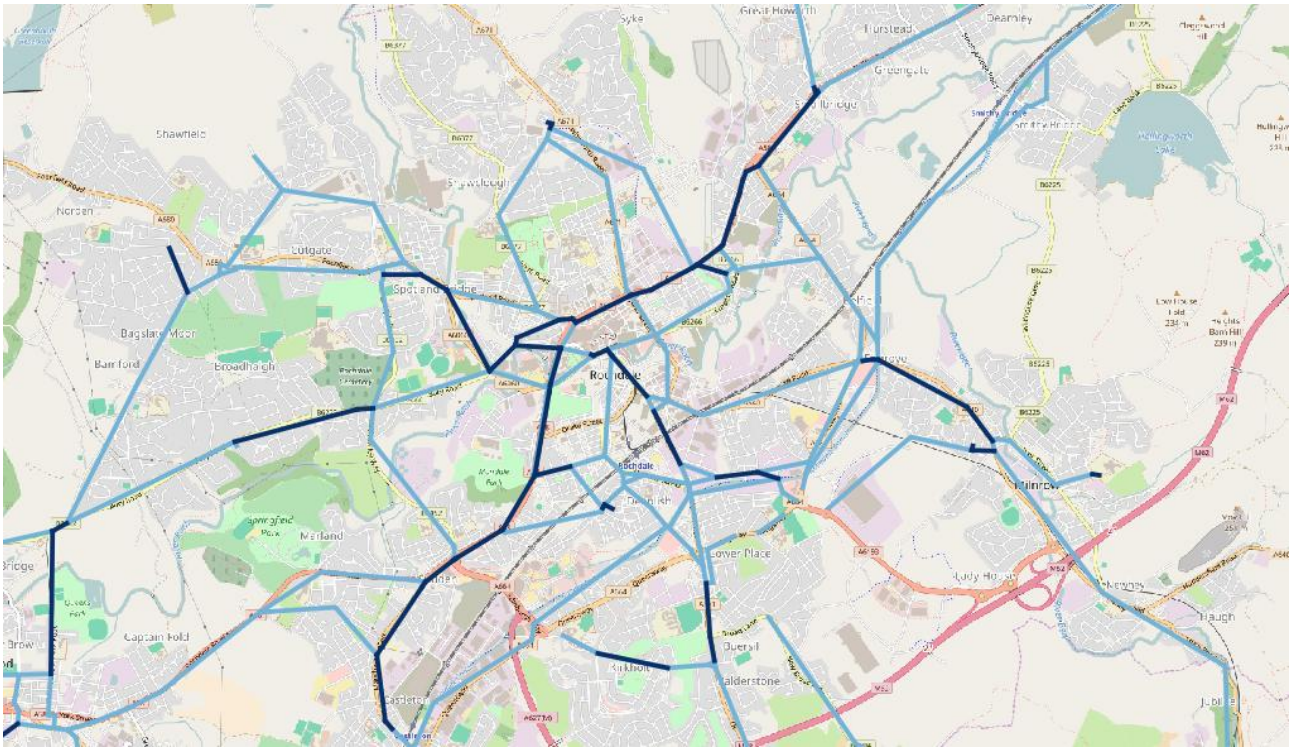

Figure 31: Route network segments with 100+ cycle commuters, Go Dutch – Rochdale

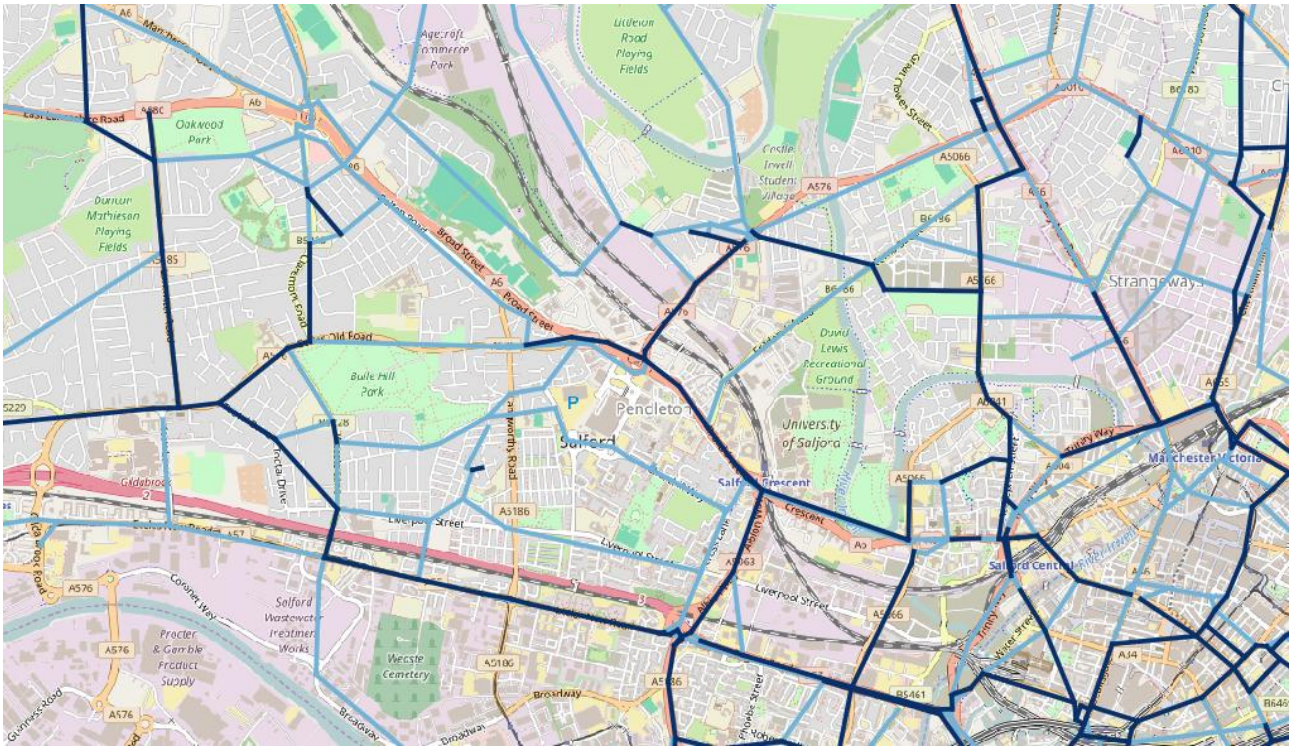

Figure 32: Route network segments with 100+ cycle commuters, Go Dutch – Salford

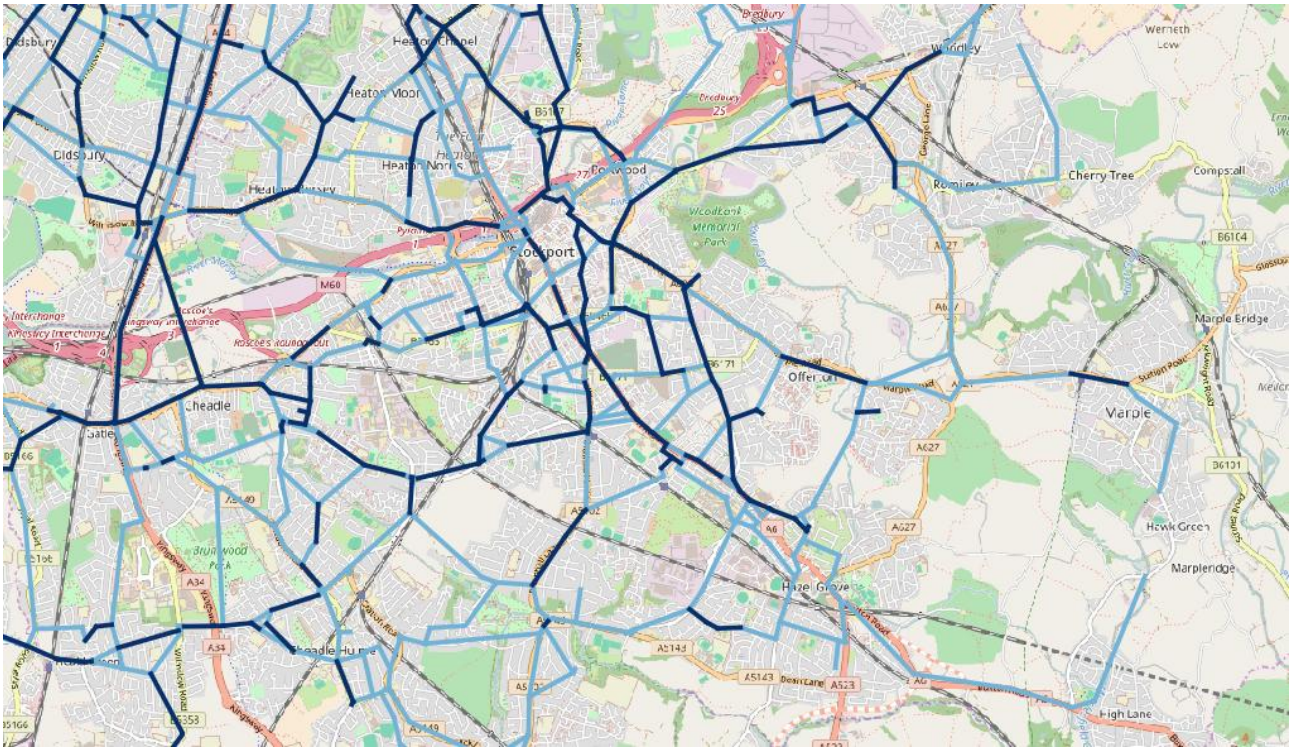

Figure 33: Route network segments with 100+ cycle commuters, Go Dutch – Stockport

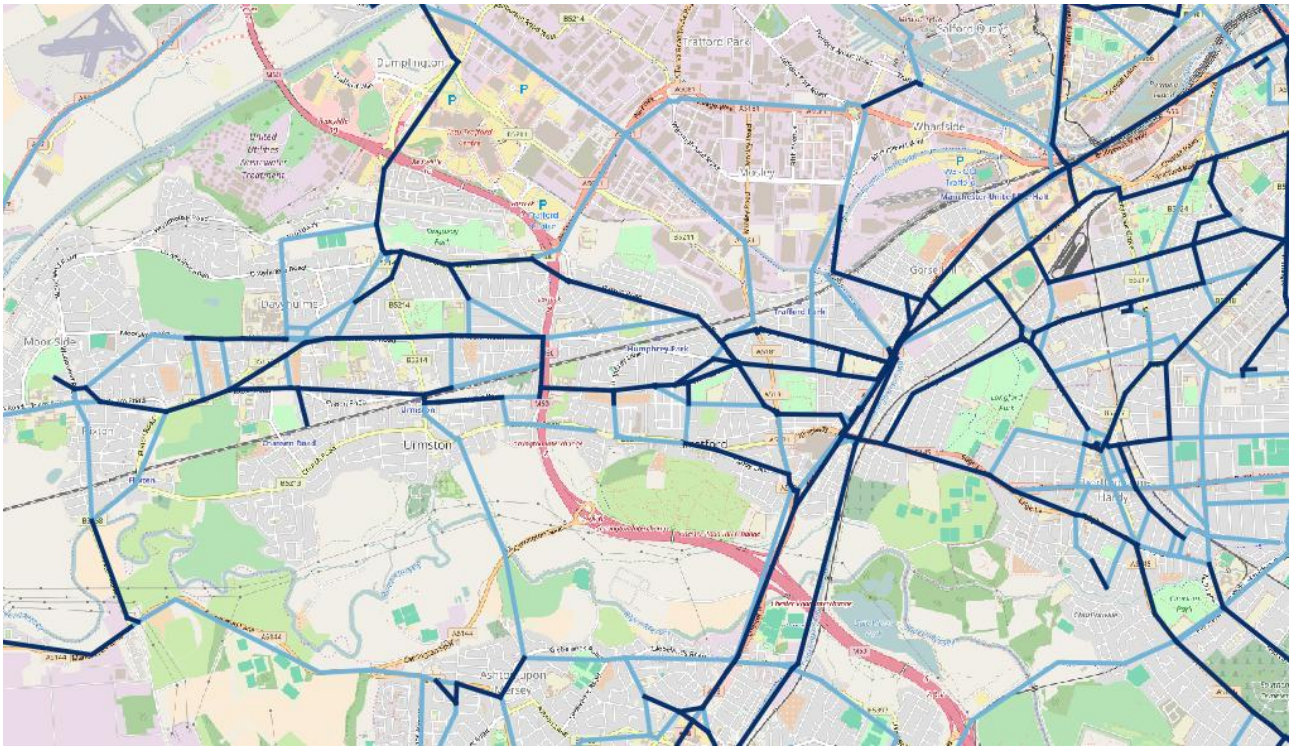

Figure 34: Route network segments with 100+ cycle commuters, Go Dutch – Urmston

Figure 35: Route network segments with 100+ cycle commuters, Go Dutch – Wigan

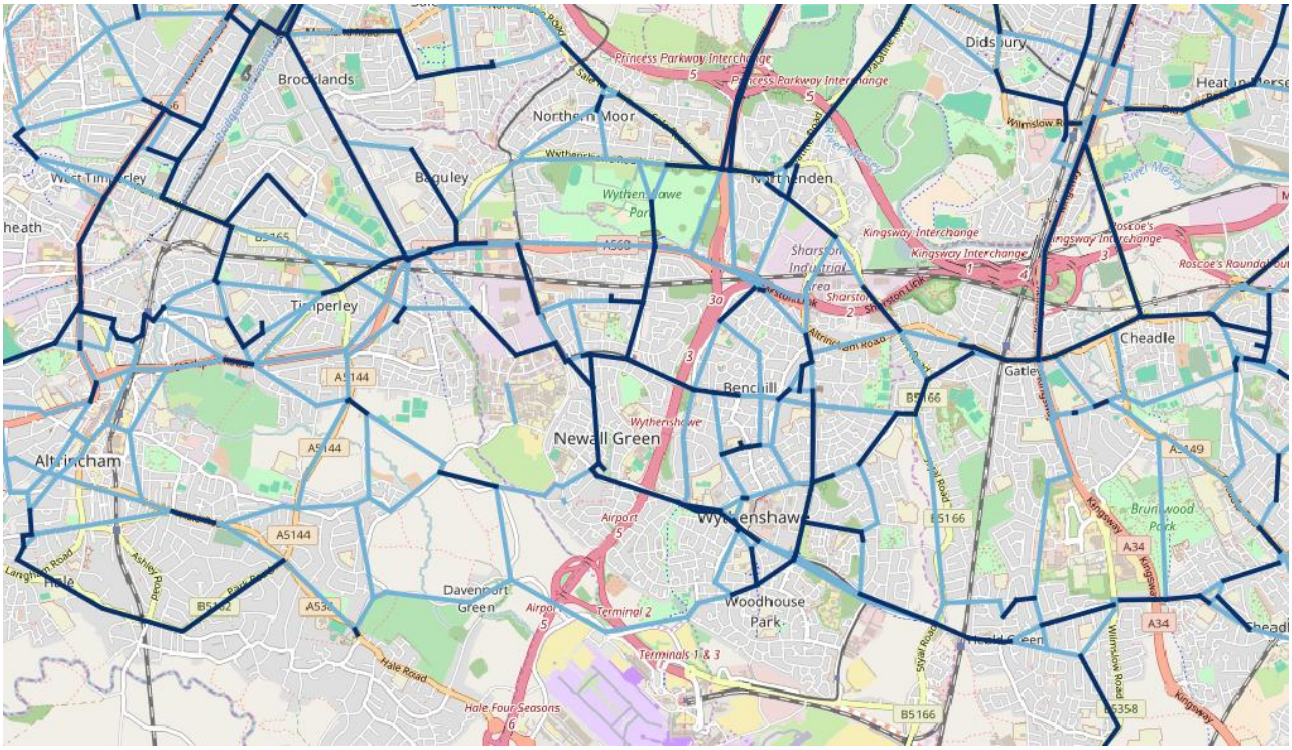

Figure 36: Route network segments with 100+ cycle commuters, Go Dutch – Wythenshawe