PCT Case Study: Hounslow

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Introduction

This short case study explores cycle commuting potential in Hounslow, Greater London. It uses the Propensity to Cycle Tool (PCT: www.pct.bike) to look at area and route-based potential across Hounslow, incorporating on a case study of Heathrow Airport and the impact of increased employment there on car and cycle trips. The case study also includes a brief comparison of the new LSOA (Lower Layer Super Output Area) level route network, a raster layer released in March 2017.

Contents

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 travel to work 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 and route levels. This data is currently at the level of a Middle Layer Super Output Area (MSOA), a unit of population of around 7500 people, with on average 3325 commuters.

Data for the case study was downloaded from the Propensity to Cycle Tool (PCT) as of 1st January 2017. Some of the underlying data may change slightly in future updates to PCT. In particular future builds may overcome a limitation of the current MSOA-level PCT: it does not include cross-regional flows in the route-based data. This means that currently, commutes between (e.g.) Ashford, Surrey, and workplaces/homes in Hounslow will not be shown. This results in the map for the far West of the borough looking artificially sparse.

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:

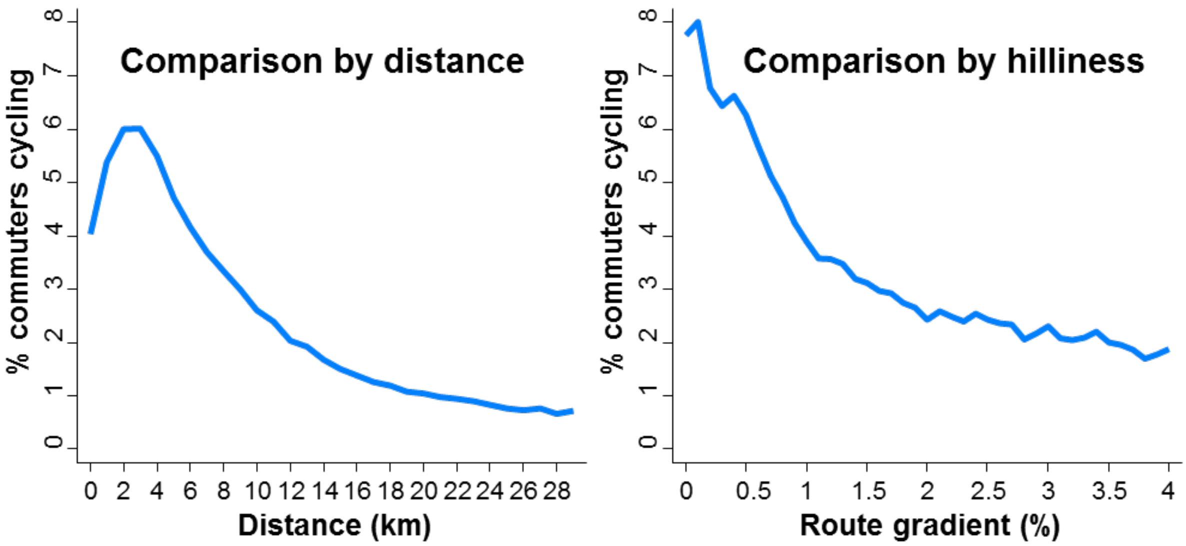

Figure 1: how cycle commuting relates to distance and hilliness (based on Census 2011 Travel to Work data)

There are four core scenarios:

1. Government Target – the target for cycling in England for 2025, involving a doubling of cycling nationally. At the local level this growth is not uniform, in absolute or relative terms. Areas with many short, flat trips and a below-average current rate of cycling are projected to more than double. Conversely, areas with above-average levels of cycling and many long-distance hilly commuter routes will experience less than a doubling.

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.

Achieving "Go Dutch" in England

The PCT helps authorities decide *where* to build, but does not in itself tell us *what* to build. However, achieving Dutch cycling propensities anywhere in England is likely to require substantial change in planning for cycling, including concentrating on the stated and revealed preferences of under-represented groups. The shift required is fundamentally two-fold: including both a greater focus on substantial separation from motor traffic and on creating routes that are as flat and direct as possible (given limitations imposed by local topography).

Scenario Cycling Levels in Hounslow and London

Cycle commuting levels are slightly lower in Hounslow than in Greater London, at 3.5% compared to 4.3%. Under the Government Target scenario – which allocates a doubling in cycling across the country based on trip distance and hilliness – Hounslow is slightly higher than the London average (8.1% vs. 7.9%). This picture is reversed for gender equity; because while cycle commuting is low in Hounslow the current gender gap is not (in London context) particularly large, hence were we only to close the gender gap without growing cycling beyond this, it would make relatively little impact.

The ambitious Go Dutch scenario suggests that Hounslow's unmet potential is substantial. Go Dutch uses Dutch cycling propensities, so represents where cycling in London would be highest if London resident commuters cycled as the Dutch would for trips of the same length and hilliness. While the Greater London average is 20.9%, for Hounslow it is 24.6%. Finally the Ebikes scenario sees Great London closing the gap somewhat, with some longer and hillier trips now becoming cycleable – Hounslow does also benefit, with 30.5% of trips cycled under this scenario.

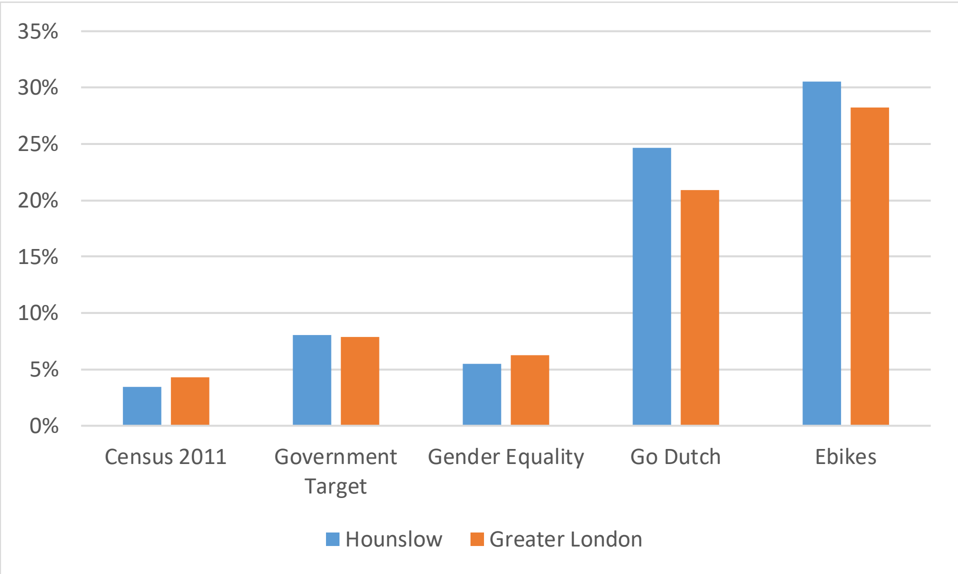

Figure 2: how cycling changes in Hounslow and Greater London, all scenarios

The health and carbon reduction benefits to be gained in Hounslow under each scenario are illustrated below:

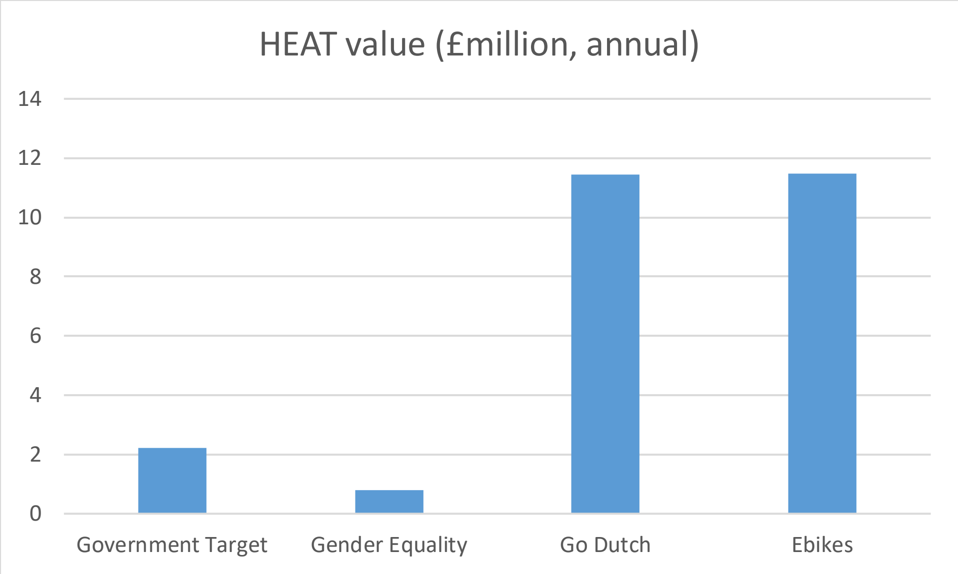

Figure 3: health benefits in Hounslow, by scenario

Substantial health benefits can be gained with the two most ambitious scenarios. Go Dutch and Ebikes are similar because the Ebike scenario assumes a large switch from conventional to e-bikes, so despite a 6% increase in mode share for cycling there is no additional health benefit. However, there is a very large carbon reduction benefit, due to the large number of car trips additionally switched in the Ebike scenario (14,274, compared to 11,360 in the Go Dutch scenario).

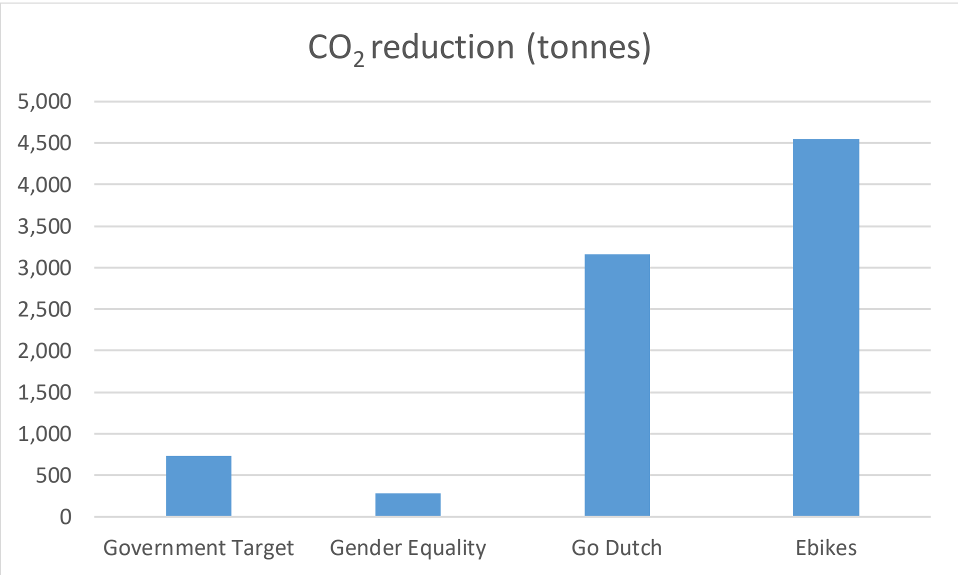

Figure 4: CO_2 benefits in Hounslow, by scenario

About how trips are routed

The PCT uses the Cyclestreets.net routing algorithm. This is used by individual cyclists for journey planning, but it can also be used to route a series of trips. Cyclestreets provides both 'fast' and 'quieter' routes, and comparing these (in terms of distance and hilliness) can help provide information about the quality of a network. Analysis conducted for the PCT project has illustrated how propensity to cycle declines as distance and hilliness rise. As we know that cyclists will preferentially choose quieter routes, this implies that where such routes are longer and/or hillier than busier alternatives, cycling demand will be suppressed.

Analysis conducted for this report

The analysis conducted for this report uses the .csv and .geojson downloads available from pct.bike, downloaded into free QGIS software and into Microsoft Excel.

Commuter Cycling Potential in Hounslow: area level data and co-benefits

The following images explore the cycling potential in Hounslow at MSOA level, highlighting those MSOAs with particularly high potential and with particularly high co-benefits. The area data includes all commuters, unlike the route data where not all commuters can be included (due to within-zone flows, exclusion criteria for longer trips, and the exclusion of cross-regional flows into or out of Surrey or Berkshire).

The figure below illustrates current commuter cycling rates across the borough, mostly these are under 5% but in the East of the borough six MSOAs have between 5 and 10% commuter mode share for cycling.

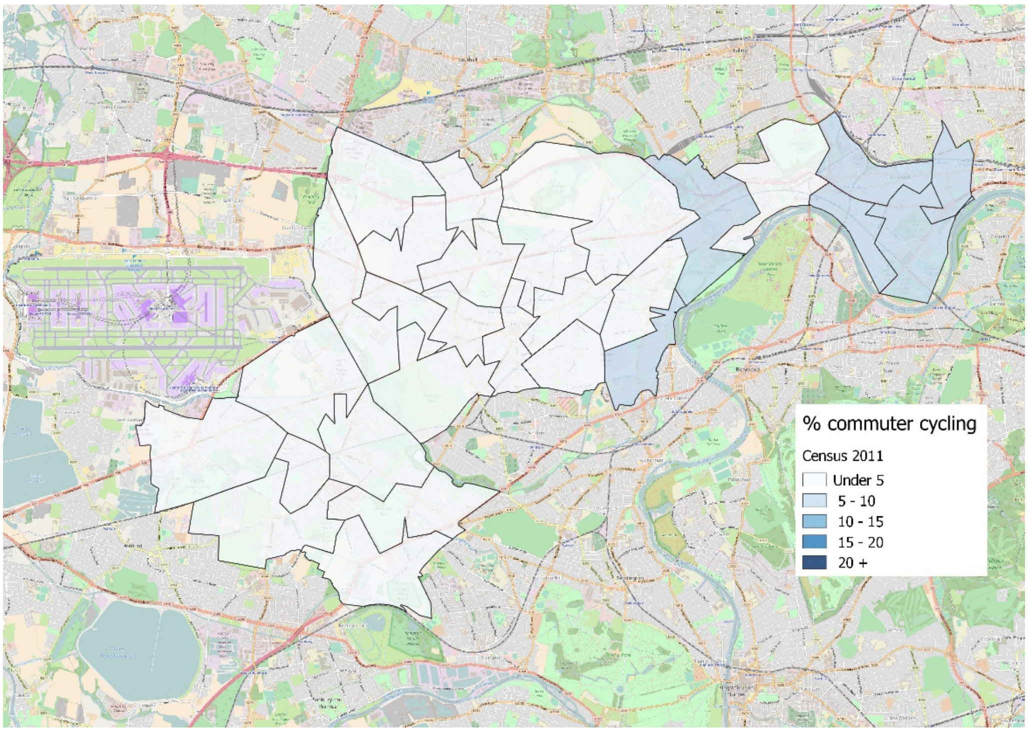

Figure 5: Current commuter cycling rates, by MSOA

Below we see the Gender Equality scenario. This illustrates the impact of women cycling at the same rates as men currently do, for all the various commute origin-destination pairs. Achieving gender equality based on current cycling rates has most impact in the far West of the borough, where several MSOAs move into the 5-10% category, and in the far East of the borough where three MSOAs would now have 10-15% commuter cycling.

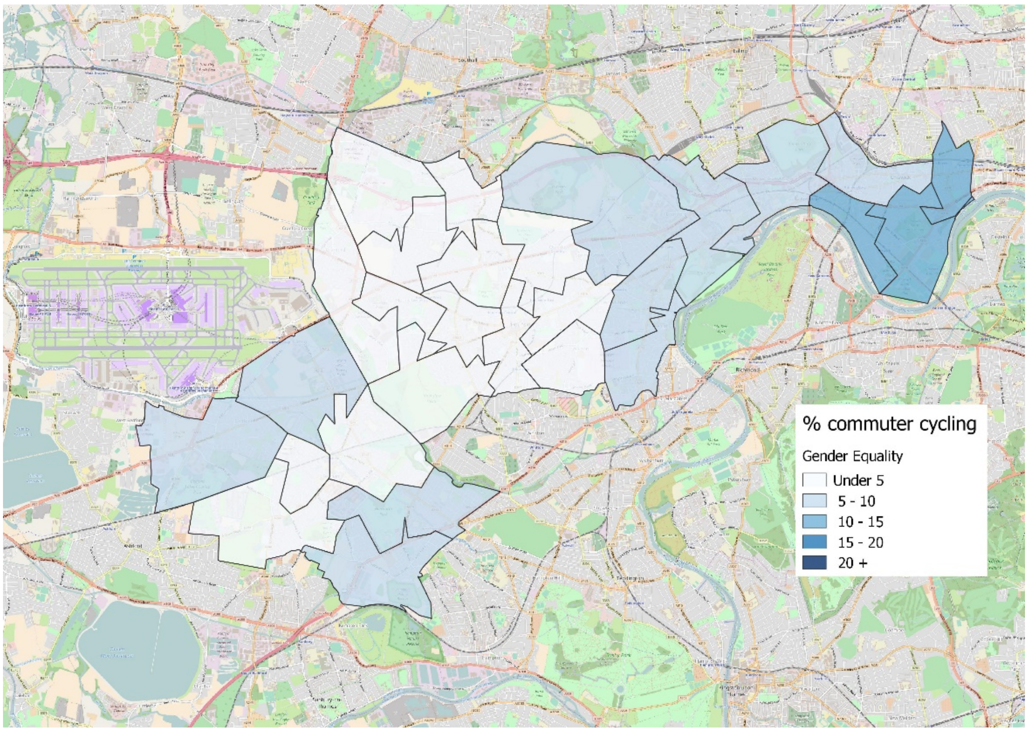

Figure 6: Cycle commuting rates, Gender Equality scenario

By contrast the Government Target results are more homogenous across the borough, highlighting similarities in trip distance and hilliness across the MSOAs. Here all but three far East MSOAs (with 10-15%) sit within 5-10% mode share, also illustrating the borough's relatively high cycling potential in an England and Greater London context.

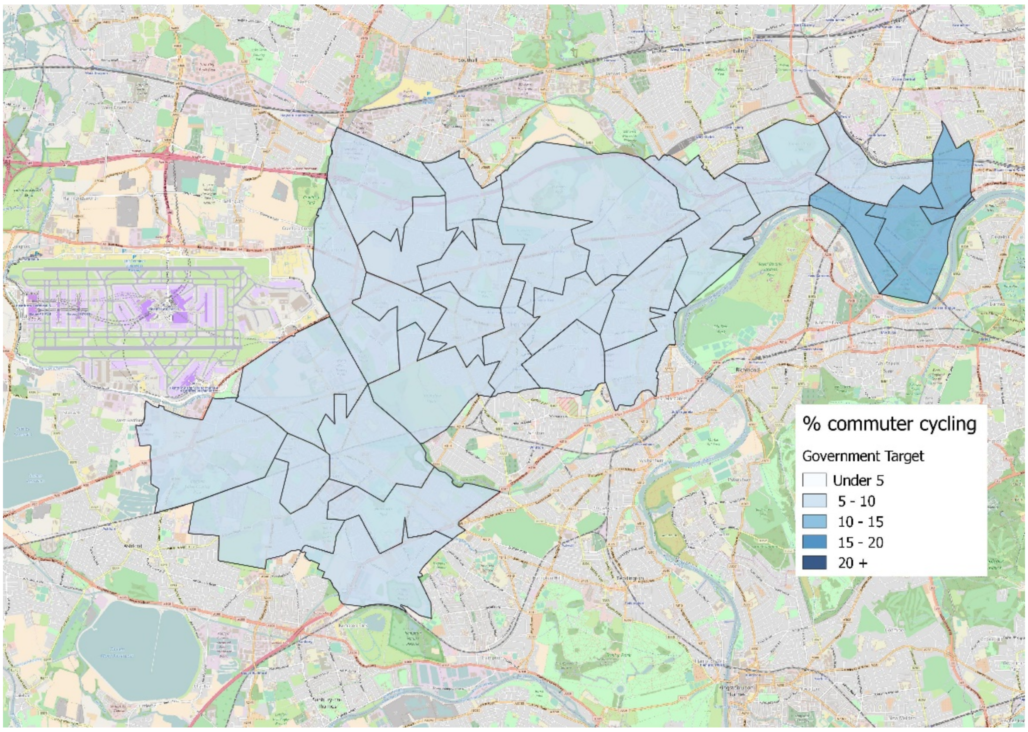

Figure 7: Cycle commuting rates, Government Target scenario

The Go Dutch scenario, however, presents a very different picture. This represents the levels of cycling we would see if Hounslow residents cycled to work at the same rates as the Dutch, based on trip distance and hilliness. Note that it only includes main-mode cycling potential, so we are not measuring potential for people to cycle to rail stations, for instance, as part of a mixed-mode commute. However, every single MSOA has >20% cycling to work.

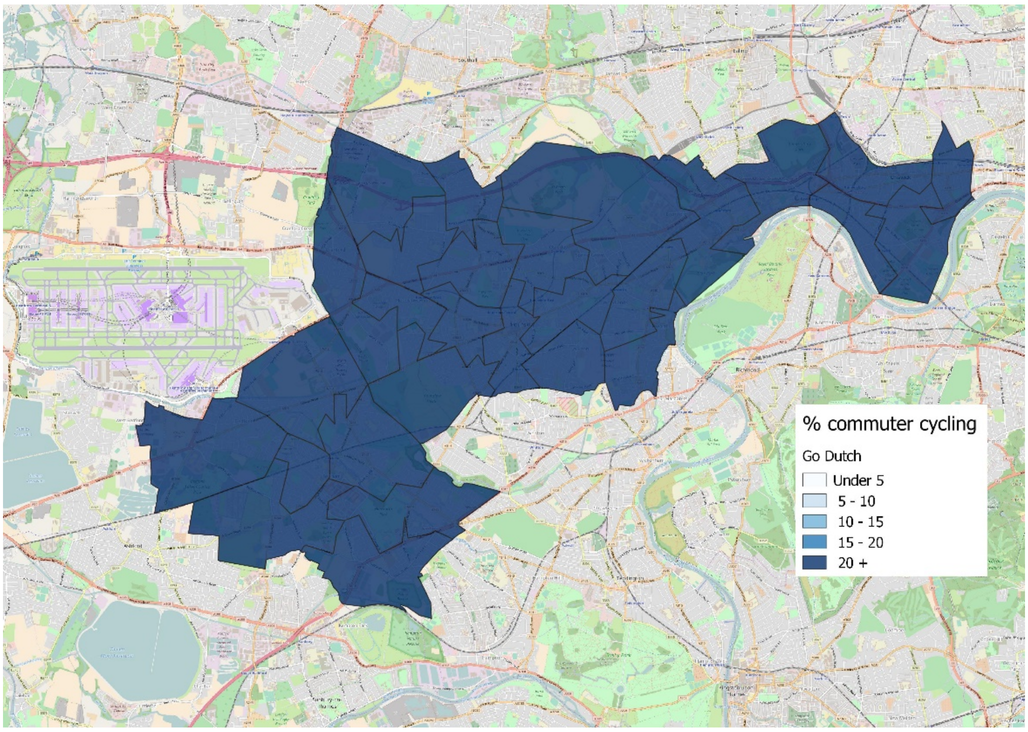

Figure 8: Cycle commuting rates, Go Dutch scenario

The figure below changes the display legend categories, to highlight the parts of Hounslow with highest cycling potential under the Go Dutch scenario. The West of the borough actually here has the highest cycling potential, with most of the Western MSOAs seeing 25-30% cycling rates while most of the East has 20-25%.

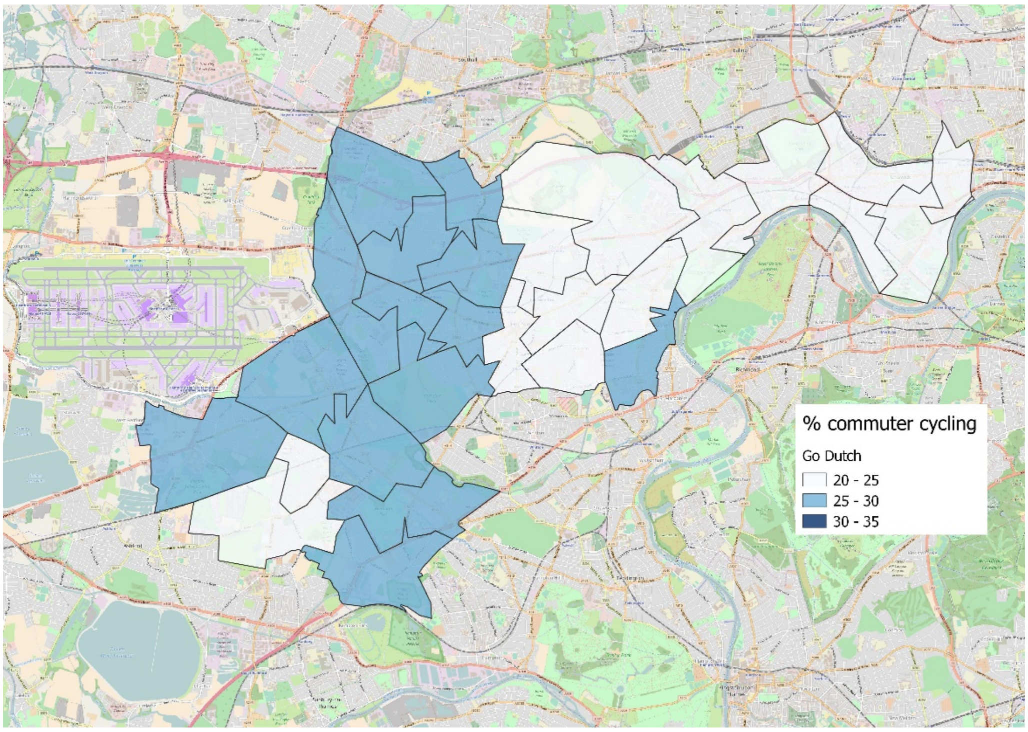

Figure 9: Cycle commuting rates, Go Dutch scenario

The Ebikes scenario increases cycling levels across the borough, but does not fundamentally change their spatial distribution:

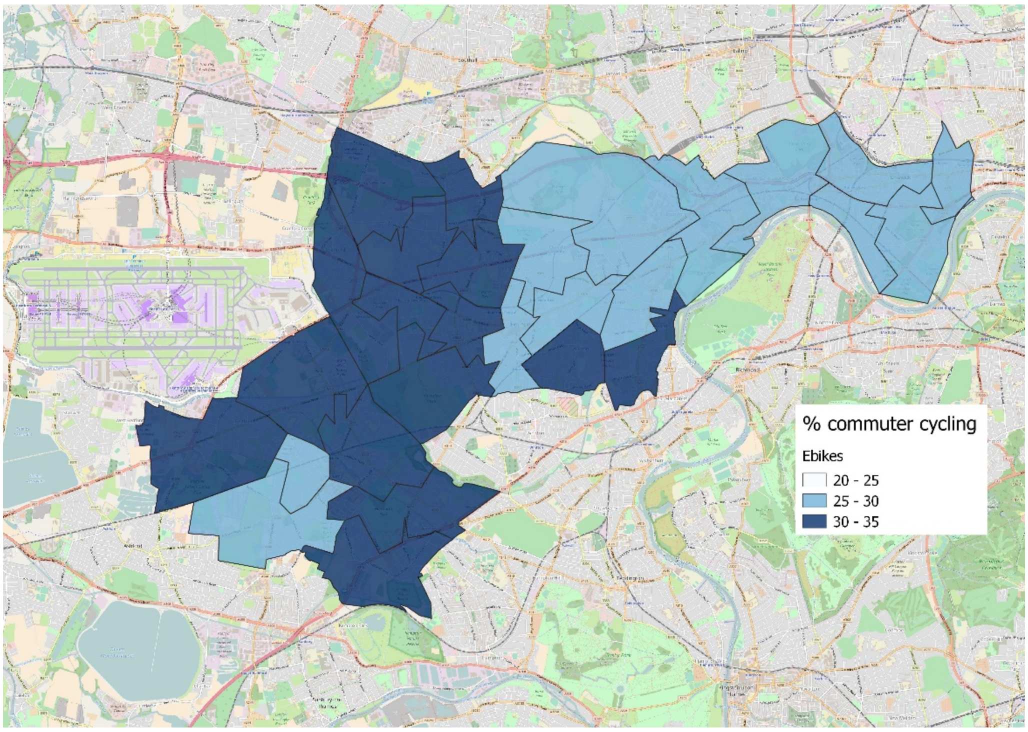

Figure 10: Cycle commuting rates, Ebike scenario

A couple of other graphs highlight two of the co-benefits of achieving the Go Dutch scenario. The greatest reduction in car-driver commutes are in the West of the borough, where it is typical for each MSOA to see over 400 car-driver trips switched to cycling. By contrast in the far East of the borough, numbers are 100-200 car-driver trips per MSOA.

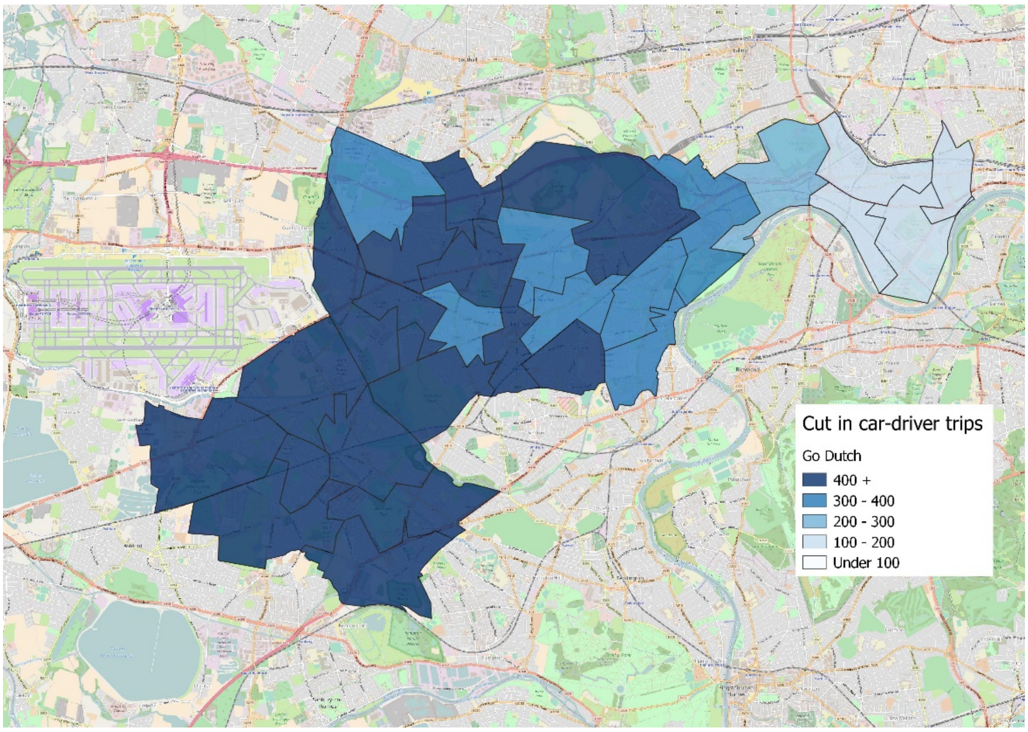

Figure 11: Cut in car-driver trips, Go Dutch scenario

The graph below illustrates the health benefits that could be achieved under Go Dutch, also concentrated in the West (and to a lesser extent) central areas of the borough. However all MSOAs see annual health economic benefits of hundreds of thousands of pounds accruing to their residents.

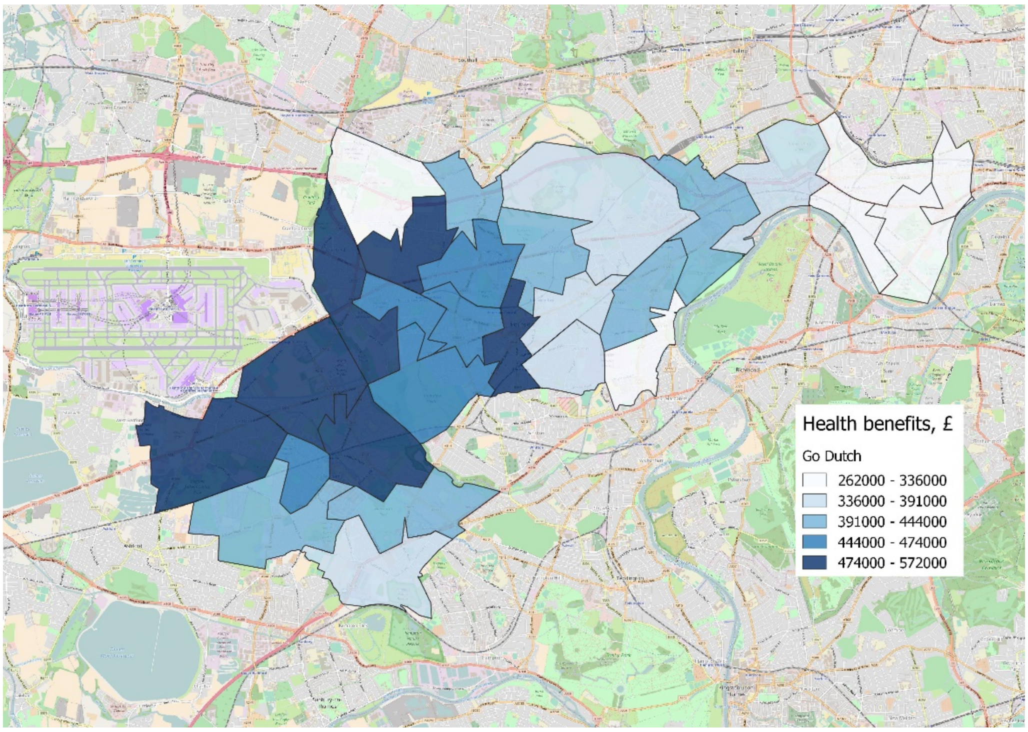

Figure 12: Health benefits, Go Dutch scenario

Commuter Cycling at Route Level, with a focus on Heathrow

The image below highlights the impact of excluding the regional flows – flows in the far South-West of the borough appears artificially sparse. This should be remembered in interpreting the images that follow; potential flows in the West of the borough are likely higher than we can illustrate using MSOA-level data.

Desire Lines

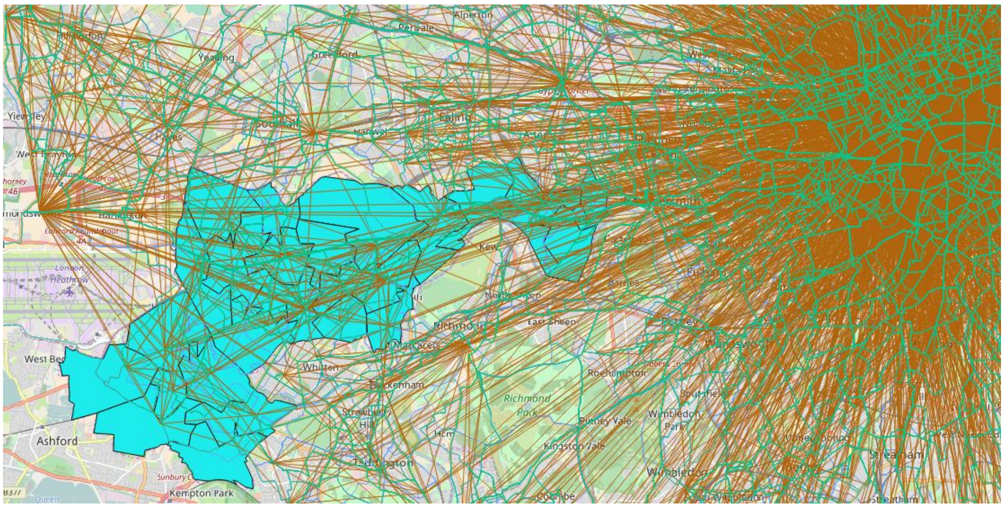

Figure 13: Origin-destination flows within the Greater London boundary, highlighting Hounslow

The following image shows in cutout form the flows that are included in this section, within the Hounslow border.

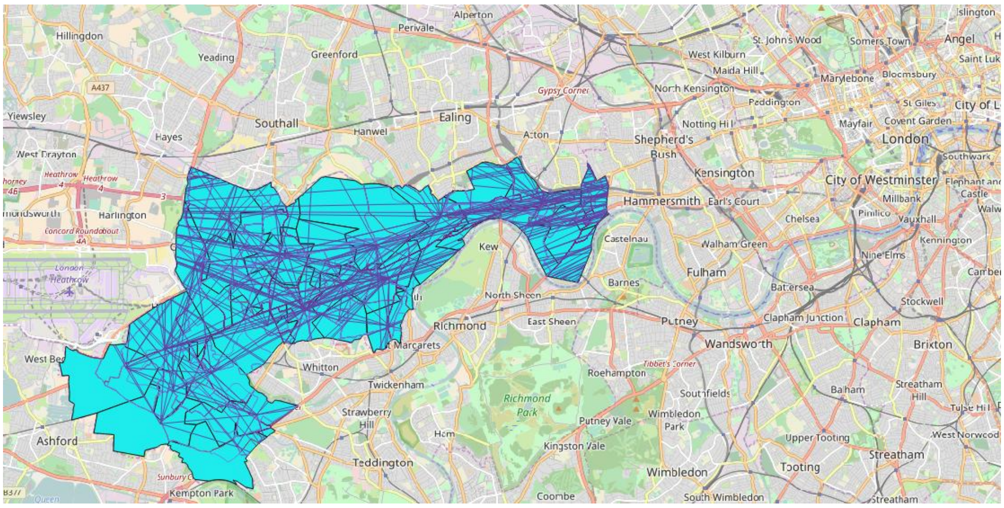

Figure 14: Origin-destination flows within the Greater London boundary, which pass through Hounslow

Next we see cycling desire lines based on the 2011 Census; it can be seen that almost all OD (origin-destination) pairs have under 20 cycling commuters travelling between those locations.

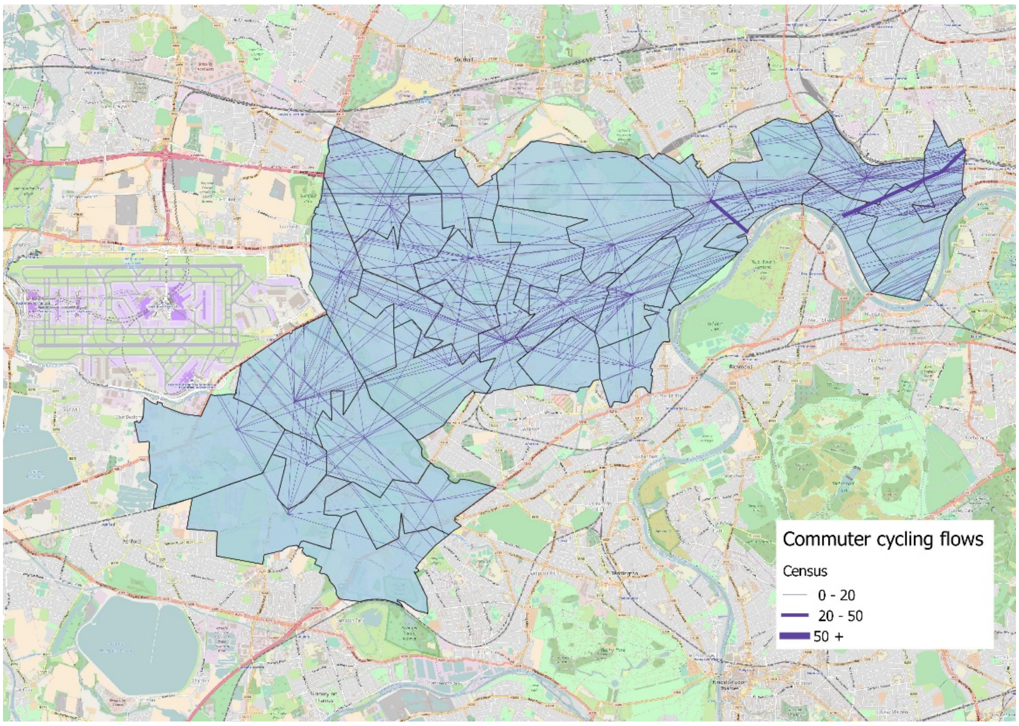

Figure 15: Commuter cycling flows, Census 2011

Next we see the Government Target scenario, in which some lines have between 20 and 50 cyclists.

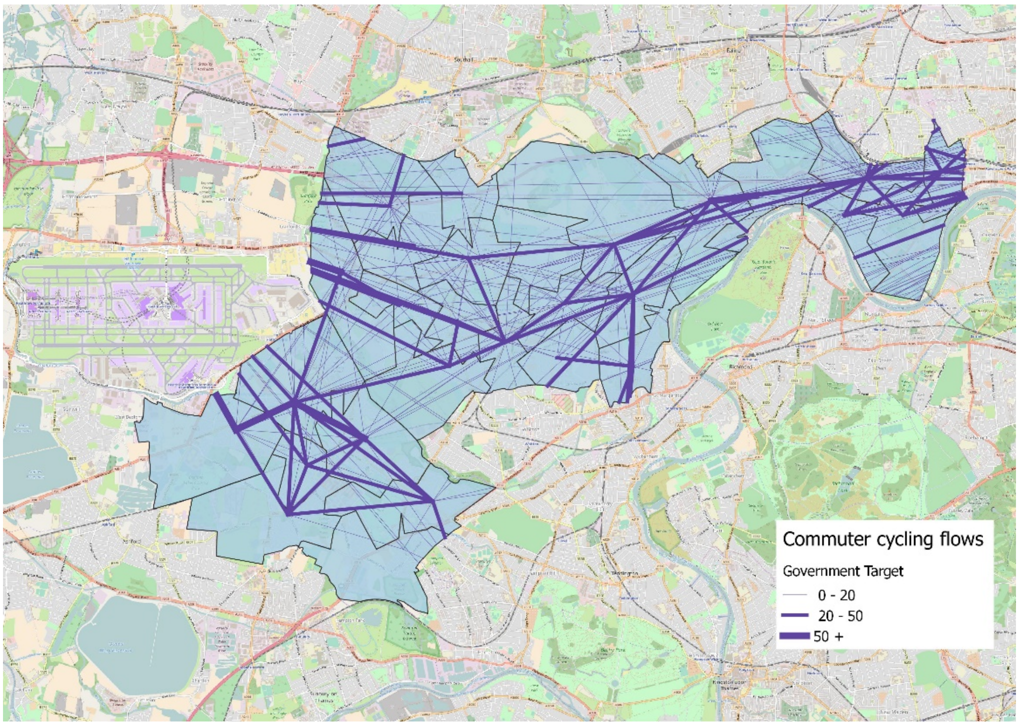

Figure 16: Commuter cycling flows, Government Target scenario

Go Dutch however again shows a step-change, with many flows across the borough now having 50 or more cyclists. In particular, we see the Central-West area of the borough, and the East corner with very high concentrations of such flows.

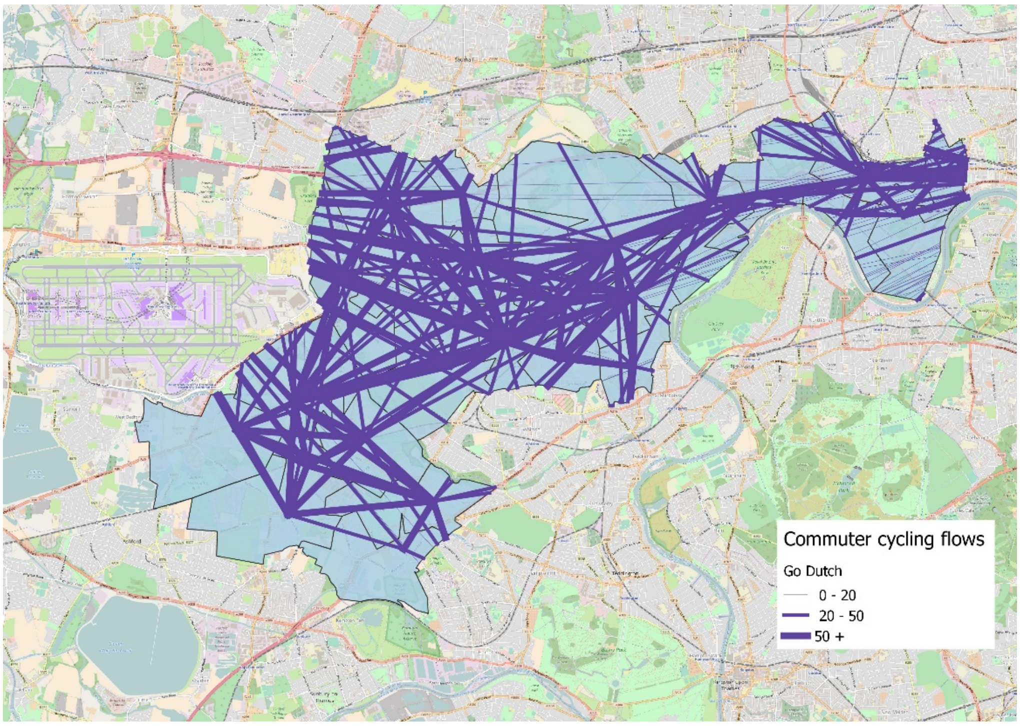

Figure 17: Commuter cycling flows, Go Dutch scenario

Finally (in relation to OD pairs) we highlight the driving trips saved; in the West of the borough there are a number of OD pairs where more than 50 trips would be switched away from car-driver to cycling.

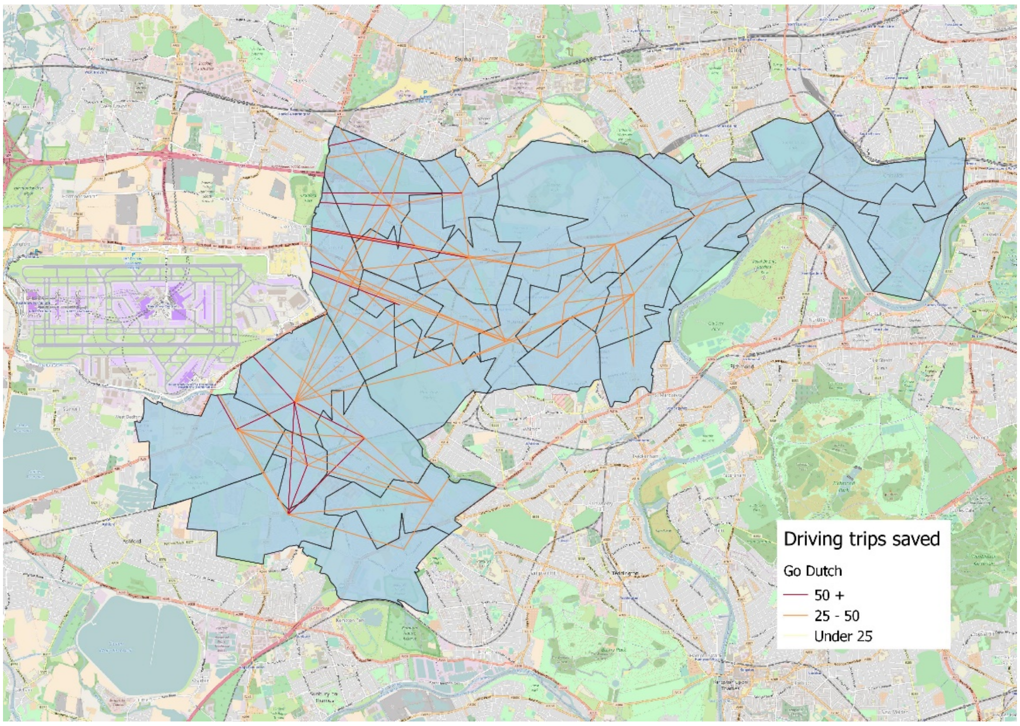

Figure 18: Driving trips saved, Go Dutch scenario

Route Network

Now we use the PCT's Route Network data to examine how these OD pairs might map on to the route network in Hounslow. First we present the Route Network based on Census data; i.e. where people might be cycling, if they took the fastest legally cycleable routes. Few sections of the route network see over 100 commuter cyclists.

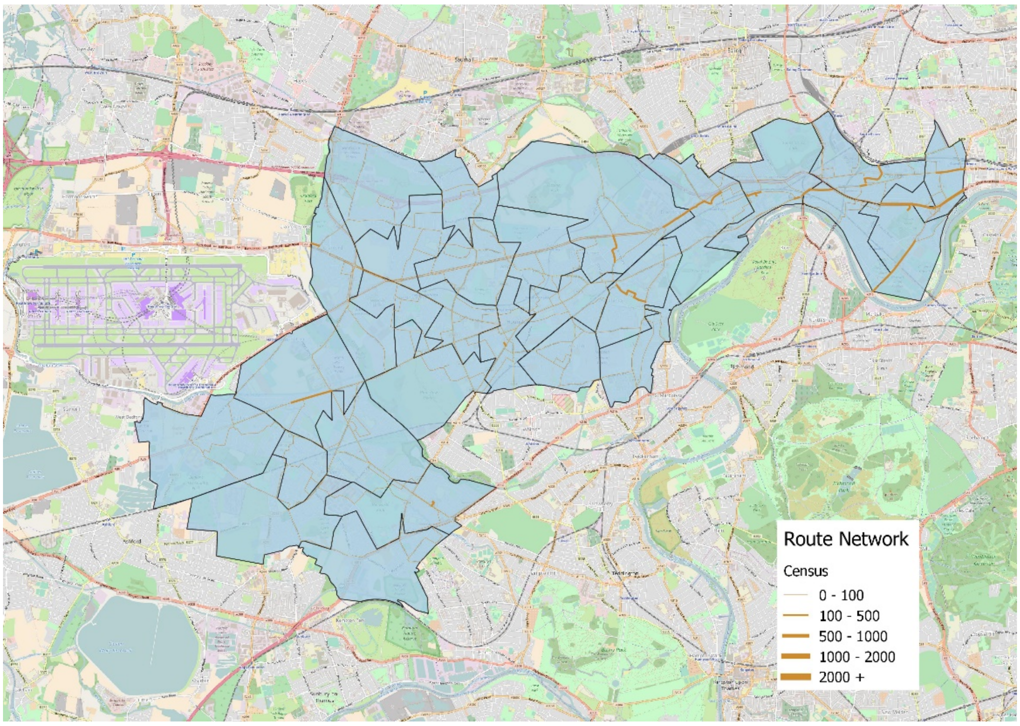

Figure 19: Route Network, census 2011

Secondly, we present the Route Network for the Government Target scenario, with many more route sections with 100-500 commuter cyclists, and a few (in the North-West of the borough) with over 500.

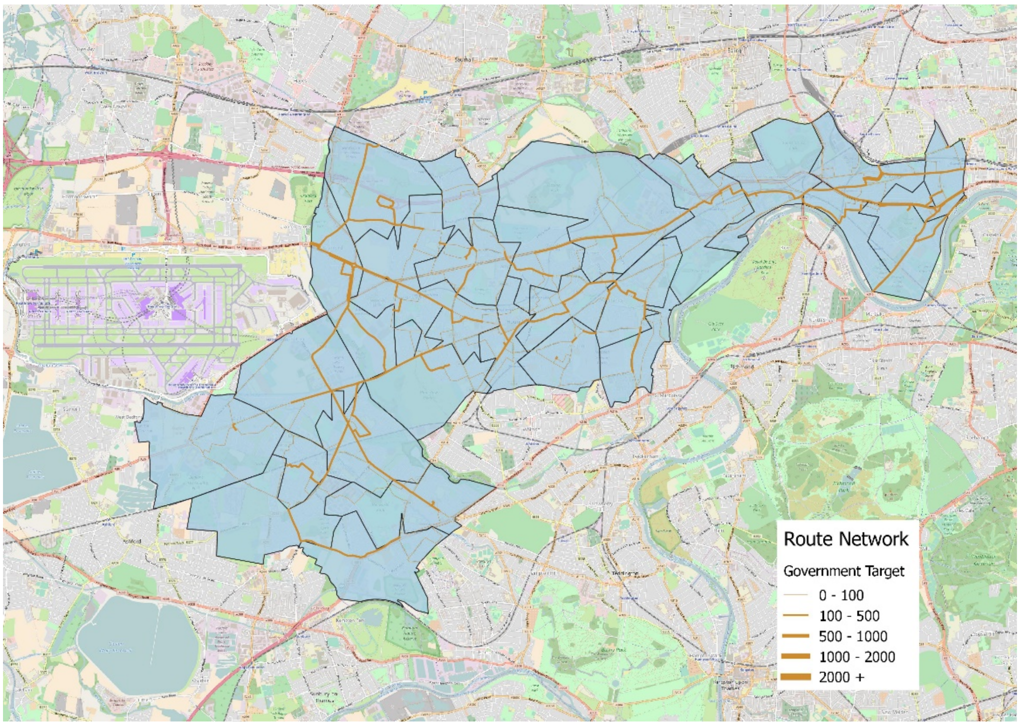

Figure 20: Route network, Government Target scenario

The next image is Go Dutch: a number of route sections have >500 and even >1000 commuter cyclists.

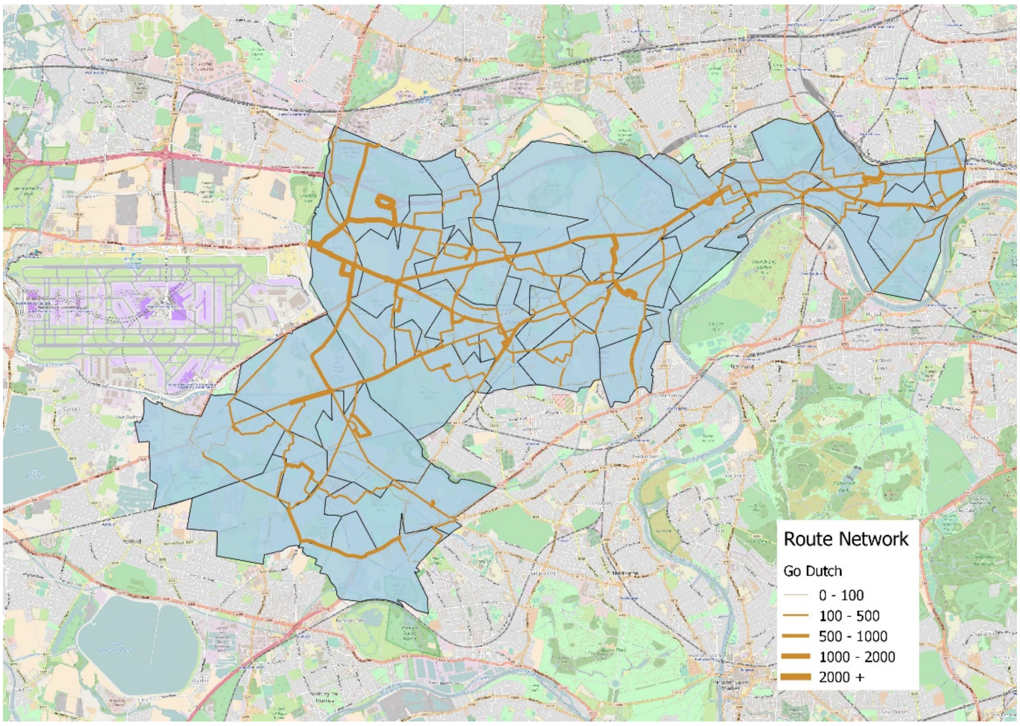

Figure 21: Route Network, Go Dutch scenario

Finally the Ebikes scenario illustrates even higher takeup, with more route sections falling into the 1000+ categories.

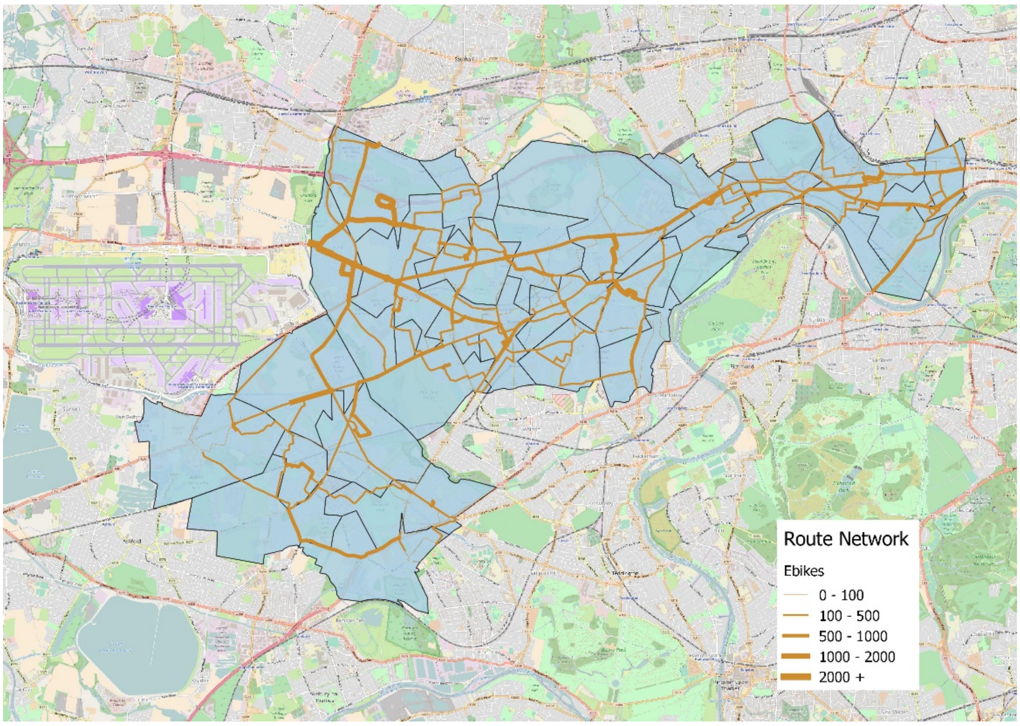

Figure 22: Route Network: Ebikes scenario

LSOA-level Route Network

In March 2017 the LSOA-level route network was released, consisting of a raster layer available via the PCT interface. (Corresponding downloads will be available via the PCT site by early Summer 2017). The LSOA-level route network provides greater granularity, as it routes cyclists to the population-weighted centroids of LSOAs, a smaller geography than MSOAs. We are also able to capture many within-MSOA flows, which cannot be included in the MSOA flow data. Finally, the LSOA layer has been built nationally and does not exclude cross-regional flows. This substantially improves representation of commuter cycling and cycling potential in areas like West Hounslow, which may have many commuters travelling into and out of the Greater London boundary.

The two images below illustrate the difference this makes in West Hounslow for the Go Dutch scenario.

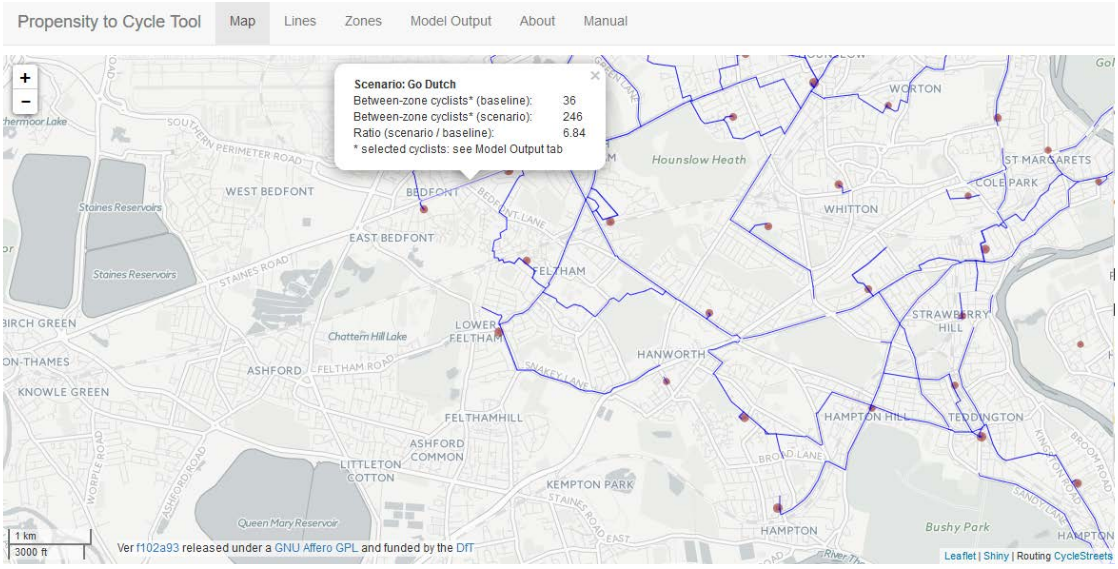

Figure 23: MSOA-level Route Network (from PCT interface), West Hounslow

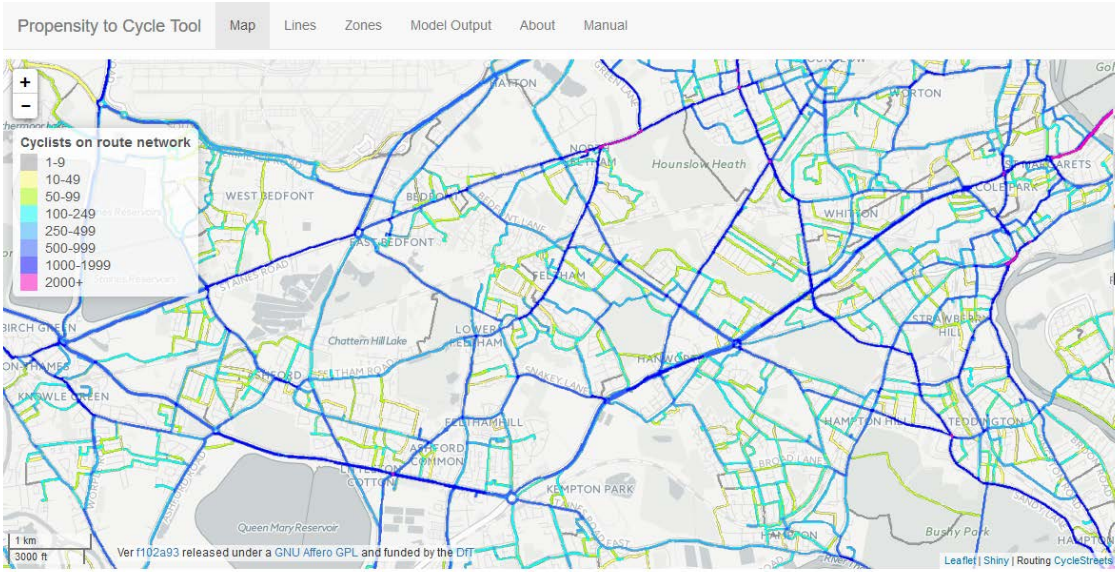

Figure 24: LSOA-level Route Network (from PCT interface), West Hounslow

The LSOA route network layer illustrates the strong cycling potential in the South-West of the borough, which in the MSOA flow data cannot be seen because of cross-regional flows, within-MSOA flows, and the greater inaccuracy in locating Heathrow flows.

Heathrow Case Study

Finally, we examine the potential for cycling to (and from) the Heathrow area, by focusing on that subset of desire lines that start or end at Heathrow, and which are likely to pass through Hounslow. Note that because cyclists are routed to and from MSOA population weighted centroids, the location for Heathrow is not accurate – it lies somewhat North of the airport. Hence route related results are not shown; however, we can highlight the areas where provision may be needed to achieve cycling potential in this area, and the rough desire lines along which cyclists might wish to go.

The image below represents the desire lines that have been included in this analysis; representing 45 origin-destination pairs and a total of 12,309 commuters. The average crow-fly distance per commuter is 6.66km.

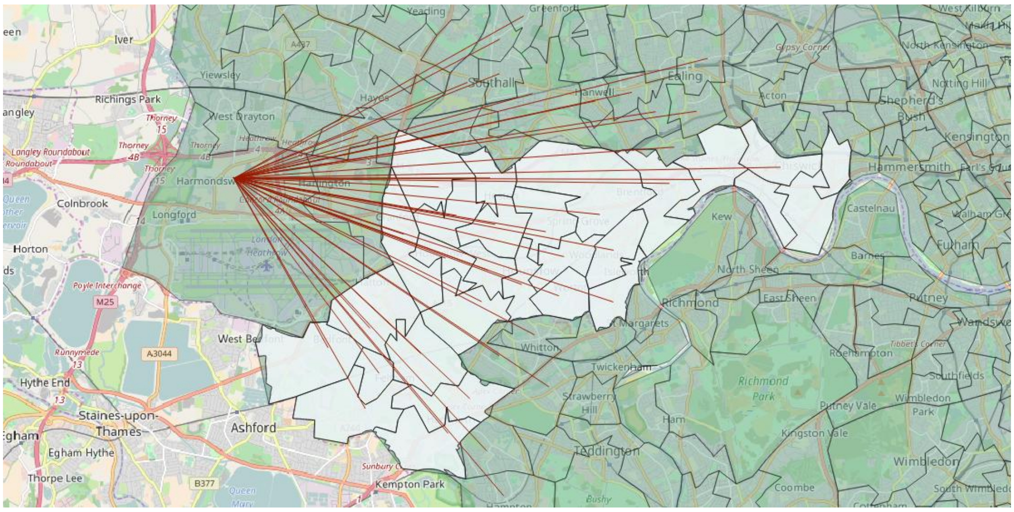

Figure 25: Desire lines to and from Heathrow, potentially routed through Hounslow

The pie chart below shows how these journeys are currently made. 1% are made by bicycle. Around half are car driver trips, followed by bus at 30%.

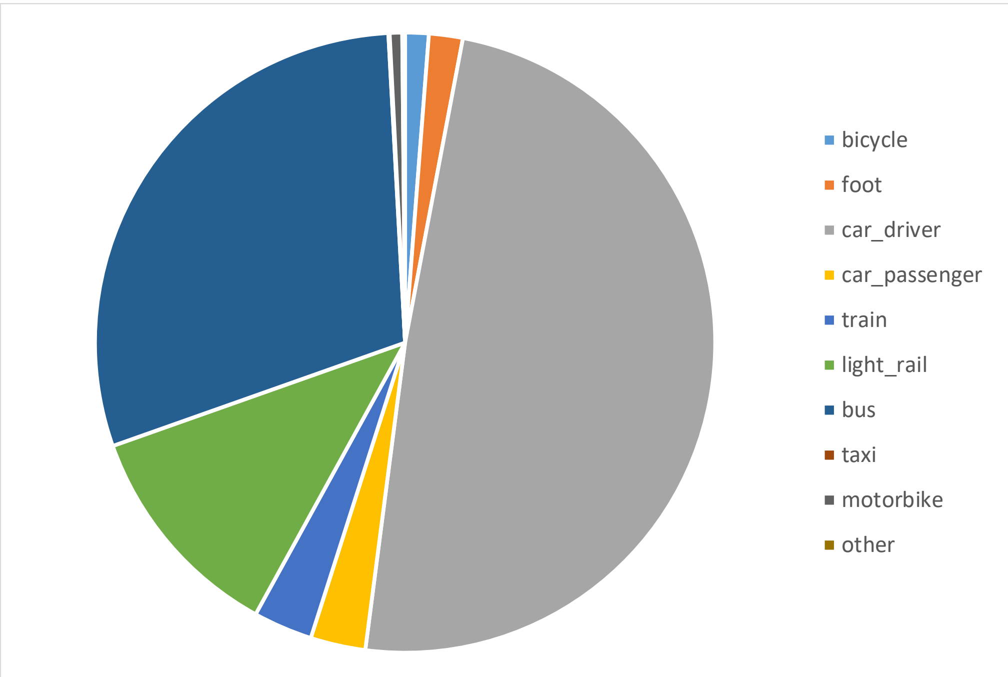

Figure 26: Current mode split of selected commute OD pairs, Census 2011

The image below highlights the OD pairs with the greatest 'Go Dutch' commuter cycling potential; unsurprisingly these tend to be those headed to the West rather than the East of the borough (or beyond).

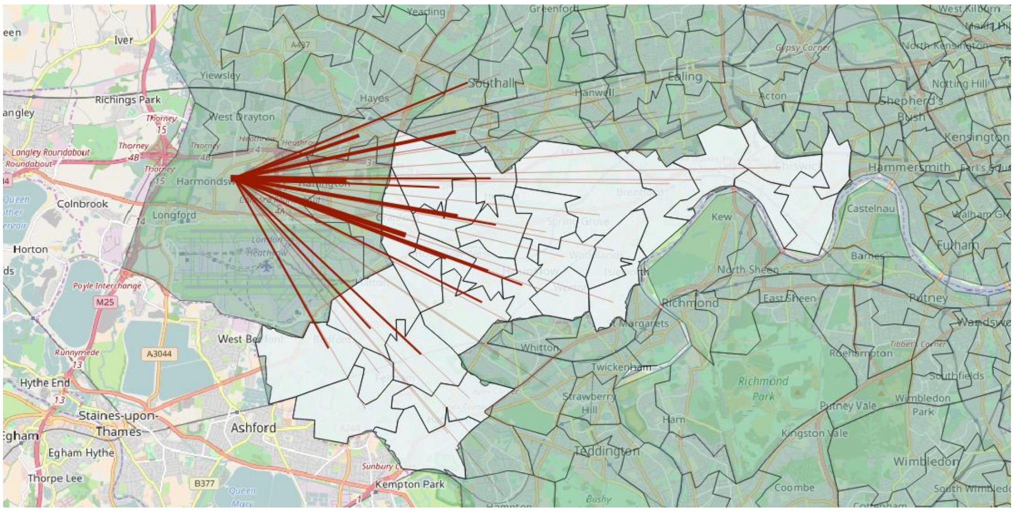

Figure 27: Greatest Go Dutch cycling potential, selected OD commute pairs

Below the image highlights those lines where the greatest numbers of car-driver trips might be replaced under Go Dutch; again the West of the borough is highlighted.

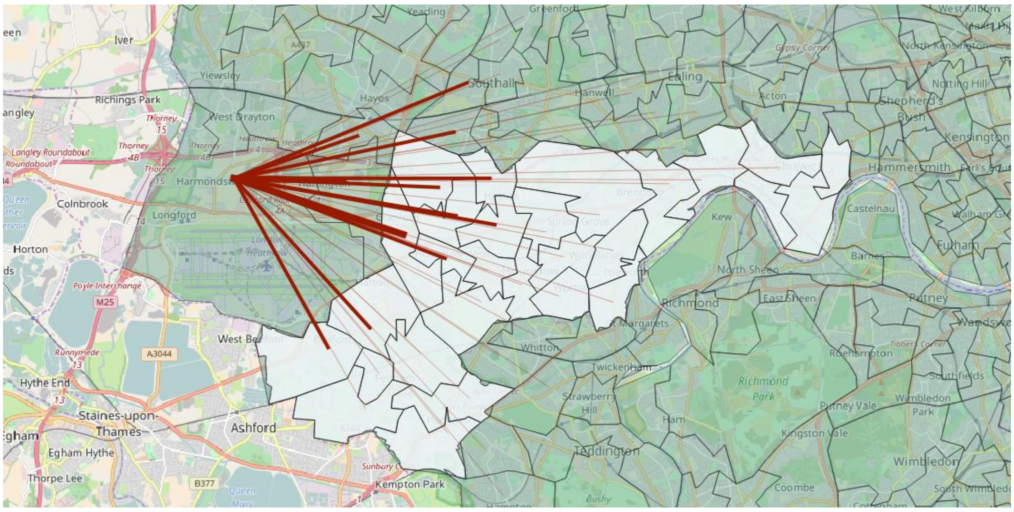

Figure 28: Greatest reduction in car driving under Go Dutch scenario, selected OD commute pairs

Returning to the Go Dutch visualisation, the MSOAs in yellow highlight particularly strong commuter cycling potential to and from the Heathrow area, within Hounslow.

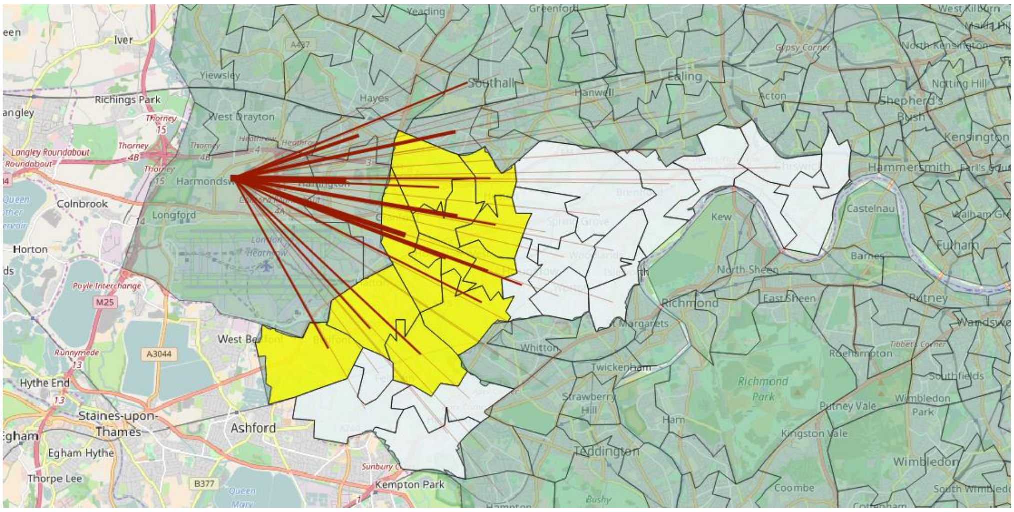

Figure 29: MSOAs with particularly strong Heathrow-related cycling potential, Hounslow

What overall impact might achieving the various scenarios have on cycling and on car driver trips? For all 12,309 commuters considered in this scenario, the percentage cycling and driving are shown below for all scenarios. Government Target shows a five-fold increase in cycling, because currently these commutes are underperforming for cycling considering their distance and hilliness, in relation to the rest of the country (and to Greater London). For Go Dutch and Ebikes we see a complete turnaround – from cycling being a minority mode and driving the norm (which is maintained in Government Target, despite the five-fold increase) to a situation where driving and cycling have relatively similar mode shares. (Such scenarios are unlikely to be realised without substantial investment in infrastructure and other programmes.)

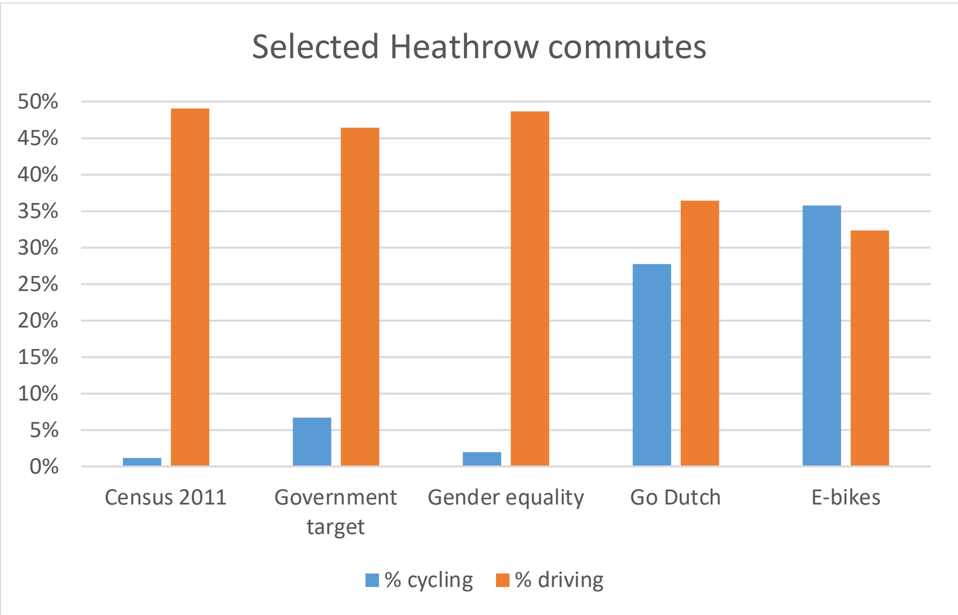

Figure 30: Mode shift for selected commute OD pairs, all scenarios

Finally, planned Heathrow expansion will lead to a substantial increase in employees based at the site. While there are currently around 75,780 employees, another 58,200 may be added on the core site alone. These figures were used to explore how cycling potential might cut the extra car trips that might otherwise be added to Hounslow's roads. It was assumed that the increase in employment would affect our 12,309 commuters proportionately (not absolutely all the 12,309 commuters covered in this analysis might work at

Heathrow itself, but it was considered that adjacent sites might also increase, e.g. businesses offering services to commuters and travellers).

This gave an uplift factor of 1.77. We also assumed that the additional people commuting to Heathrow in this area would have similar home locations to existing commuters on these OD pairs.

The chart below shows the impact of 'business as usual' on the roads in this area, in terms of extra car trips – an additional 4,638 cars on the roads. Under Go Dutch this is instead 1,873 extra car commuters, and under the Ebikes scenario, an extra 991 cars on the roads. The less ambitious scenarios (which might perhaps be hoped for with more limited investment) do less to mitigate the extra vehicle impact, as even with a mode share of 6.7% (as in Government Target) the area still sees an additional 4,000 car-driver commutes.

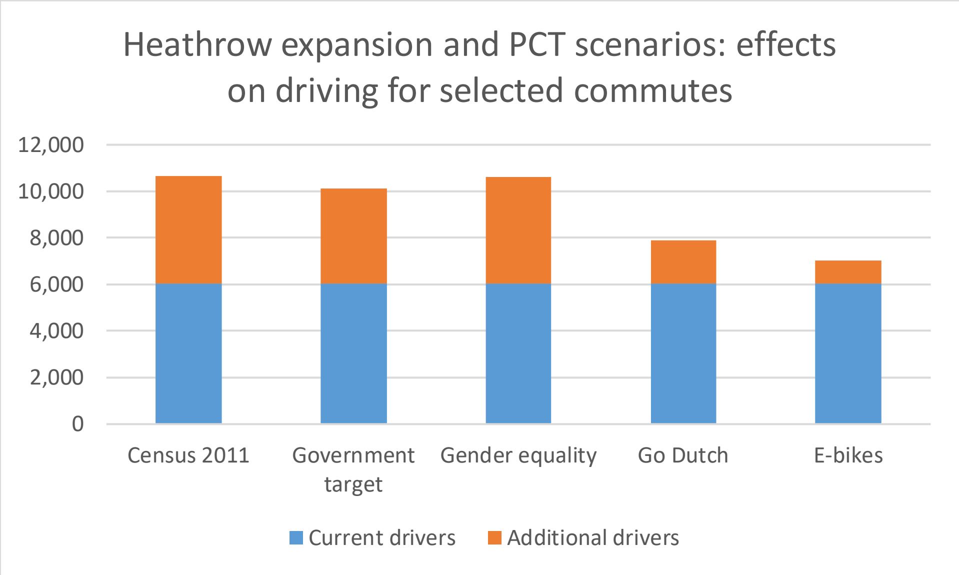

Figure 31: Impact on car driving, all scenarios, selected commutes