

B. Using the PCT interface and data

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This section introduces the user to the PCT interface and to the data that can be downloaded from it. Screenshots are used to demonstrate the PCT features, but please remember that minor improvements may be made to the interface during the coming months. Where data downloads are shown, the software used is Microsoft Excel and QGIS (these are not the only programs that could be used).

Please see the Manual Part C for description of the methods, for instance how the scenarios are defined.

1. Introduction to the interface features

The PCT front page is distinct from the tool itself. The front page shows a national map where the user can view results for all areas for Census 2011 data and for all five commuting scenarios and both schools scenarios. Hover over a region to see the relevant cycling levels.

The screenshot shows the PCT front page. At the top left is a logo of a bicycle and the text 'WWW.PCT.BIKE PROPENSITY TO CYCLE TOOL'. On the right are links for 'Blog', 'Manual', and 'About'. Below the header is a map of England with a color-coded legend for cycling propensity to work. The legend ranges from 0-1% (dark red) to 40%+ (dark blue). A tooltip is visible over a region, showing 'Cycling to work' and 'Hover over a region'. Below the map are radio buttons for 'Commutate' and 'School', and a list of scenarios: 'Census 2011', 'Government Target (equity)', 'Government Target (near market)', 'Gender Equality', 'Go Dutch', and 'Ebikes'. To the right of the map is a video player with a play button and the title 'Propensity to Cycle Tool'. Below the video player is a welcome message: 'Welcome to the Propensity to Cycle Tool (PCT) for England, which provides an evidence base to inform cycling investment. To run the PCT, first hover over a region on the map on the left to see the regional potential, then click on the region. For an introduction to the tool, its use, and the scenarios, please watch the video above. What's new : New Features coming in the New Year'.

Figure 1: The PCT Front Page

You will also find here a short introductory video about the PCT project.

To access the PCT itself, you need to click on a region. Here we will be using Lancashire as an example.

2. The map tab

On clicking upon Lancashire, you will first of all be taken to the map tab, which is the main PCT page for that area. The URL for the PCT Lancashire area is <http://pct.bike/m/?r=lancashire>.

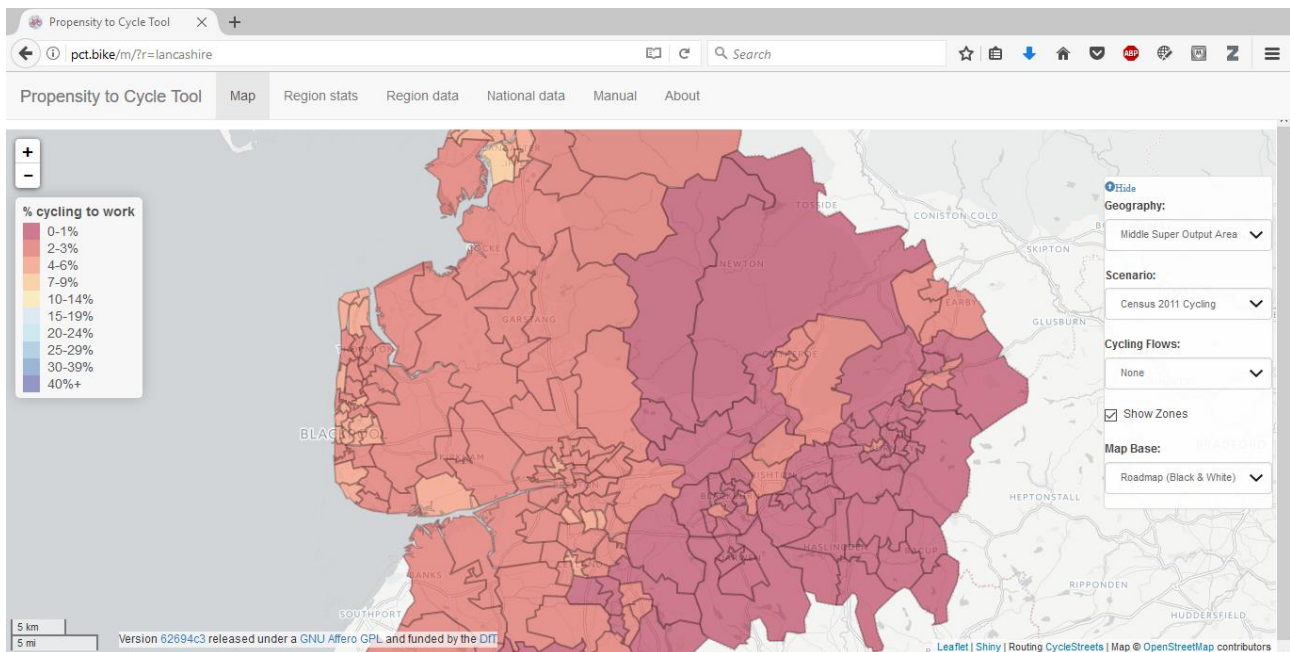


Figure 2: The main PCT page for Lancashire

A. Finding your way around the map tab

To the left you will see a legend, which relates to the area-level information and categorises levels of cycling in each MSOA (Middle Level Super Output Area, average population around 7500 individuals, 3325 commuters). To the right, you will see an options menu, the options in which change depending on whether you are viewing flows, and whether you are viewing scenarios or the Census data. There is also the option to entirely hide the options menu by clicking 'Hide'; click again on 'Show' to get it back.



Figure 3: the legend on the left (only displayed when 'Show Zones' is checked), and the options menu on the right

You can also click on areas or lines, as described below, to get more information about them.

B. Choosing geography and scenarios

By default, the map will show Census 2011 data for the selected area. To change this, click on the 'Scenario' dropdown in the options menu and choose your scenario. Below we show the 'Go Dutch' scenario results for Lancashire, at MSOA level.

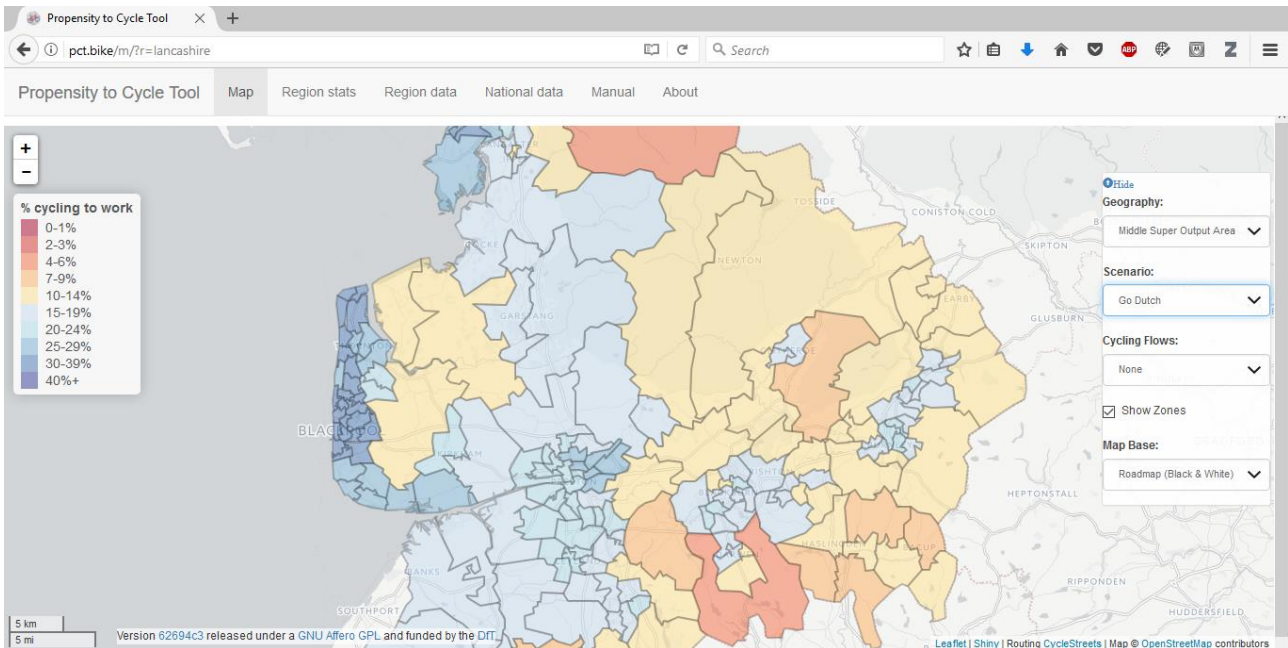


Figure 4: Lancashire, 'Go Dutch' scenario, MSOA level

You can also change 'Geography' to LSOA level (Lower Level Super Output Area, average population around 1560 individuals, 690 commuters). This will result in the cycling potential being shown per LSOA, rather than per MSOA. Note that this may slow the tool down for larger regions.

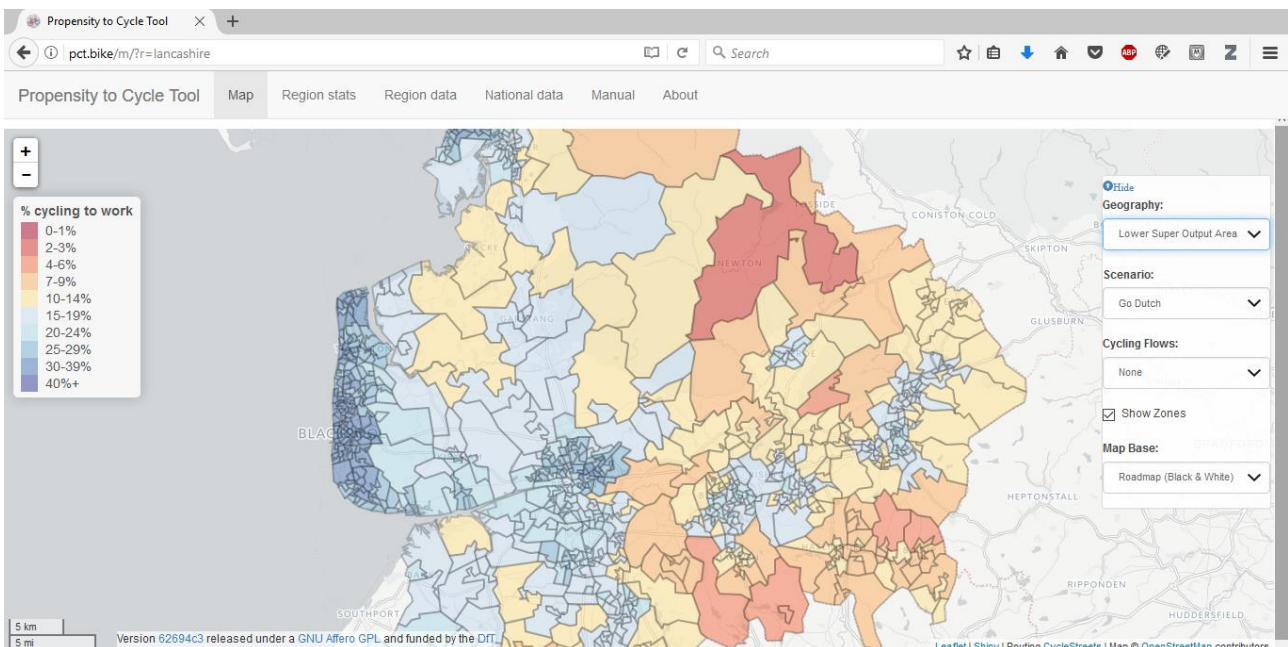


Figure 5: Lancashire, 'Go Dutch' scenario, LSOA level

Different basemap layers are available, including showing OpenCycleMap routes or showing levels of deprivation. These can be selected at the bottom of the options menu.

C. Area popups

Clicking on an area will produce information about that MSOA or LSOA. The Census 2011 popup provides number of commuters, number of cyclists and number of drivers. Scenarios provide commuter numbers, baseline cyclist numbers, and scenario cyclist numbers. As can be seen by comparing Figure 6 and Figure 7, the scenario information also provides further information about the scenario changes:

- Data on the change in the number of car-driver trips under this scenario
- Data on the health impact – change in Years of Life Lost per year (a negative number is a health benefit), secondly the health economic value of this change
- Data on the change in CO₂ emitted per year

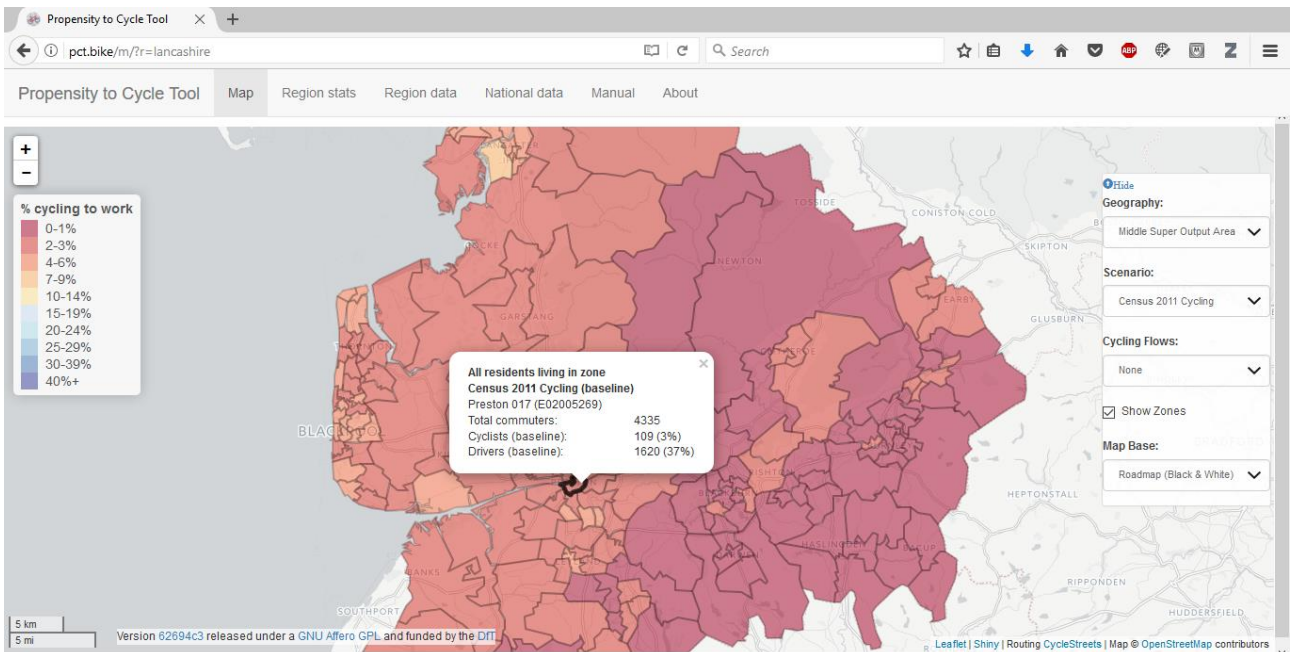


Figure 6: popup zone information for Preston 017, Census data

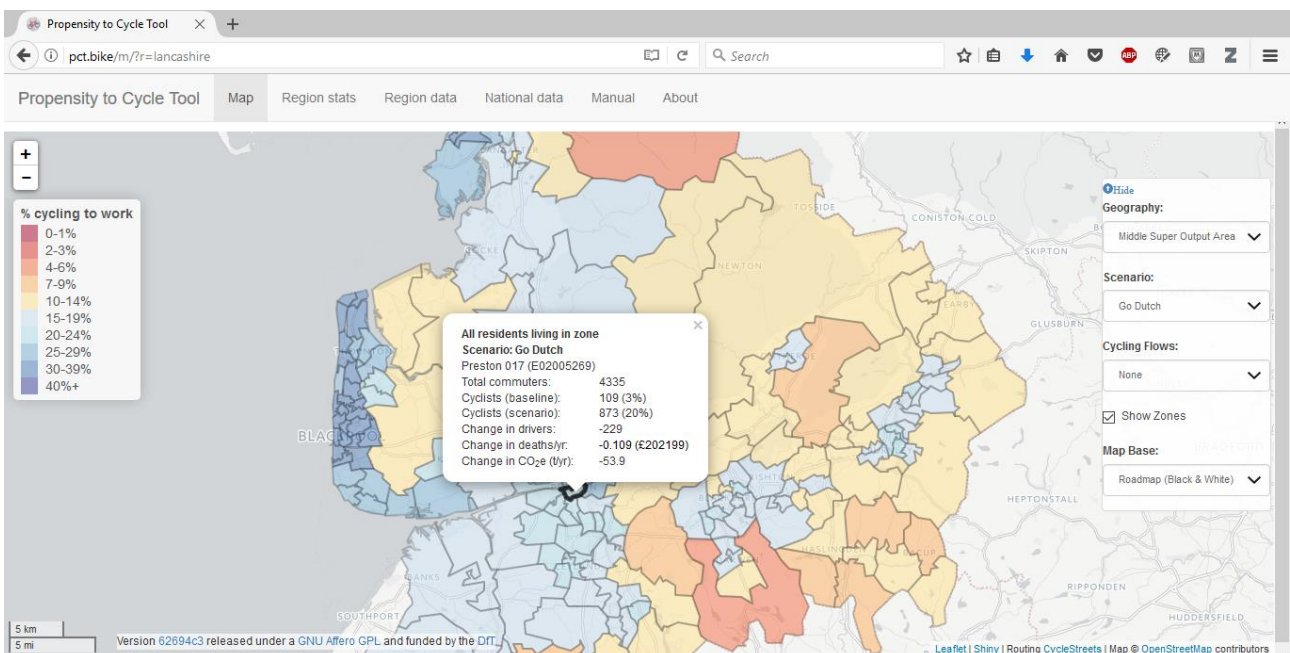


Figure 7: Preston 017 zone popup, Go Dutch scenario

D. Showing the cycling flows

Straight Lines

As well as the area data, the PCT allows you to look at where cycling flows go, and which parts of the route network might be busiest. Please note: these lines data cannot visualise all the commuter cyclists – for instance, those with no fixed workplace. More information about the exclusion criteria can be found in the Region Stats tab.

To show the cycling flows, click on the dropdown 'Cycling Flows' box, and you will find a series of options. The first option is 'Straight Lines'. You will notice that on selecting this, lines appear and an expanded set of options is available on the option menu.

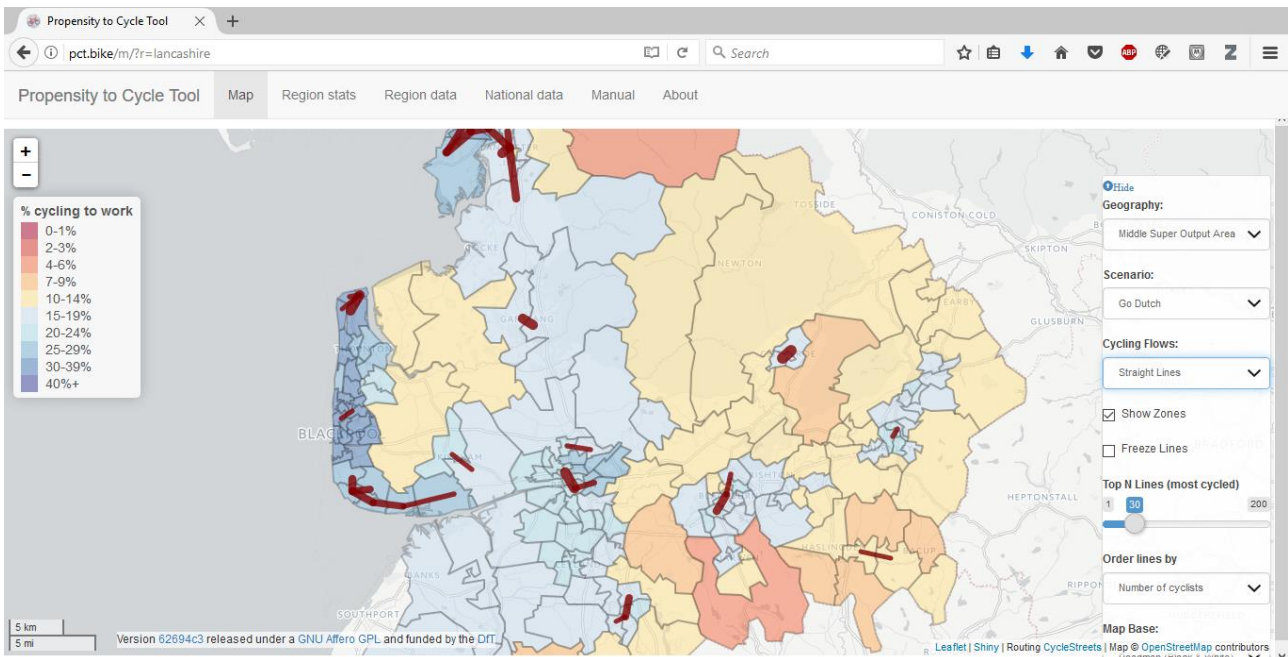


Figure 8: 'Straight line' flows, Lancashire

Some points to note about expanded options menu:

- 'N. Lines' refers to the number of lines shown. The default is to show the top 30, but you can show any number up to 200.
- 'Order lines/flows by' allows you to choose the criteria used to select the top N. of lines. The default is level of cycling, but you can also choose the increase in cycling, the health economic benefit (impact on Years of Life Lost (YLLs) plus impact on sickness absence¹), or the CO₂ reduction.
- If you wish to remove the zone information, you can untick the 'Show Zones' button.
- The 'Freeze Lines' button means that if you navigate around the area, the originally selected lines will remain visible. If you untick the 'Freeze lines' button, then as you move the map, the top N. of line will be recalculated for the new visible area (NB this includes the part of the screen behind the legend and options menu, if present).

The two images below illustrate examples of these combinations, zooming in on the Preston area:

¹ Note that although combined for the purposes of sorting, the health economic benefit from YLLs is a welfare economic calculation while the sickness absence should be an economic benefit to employers

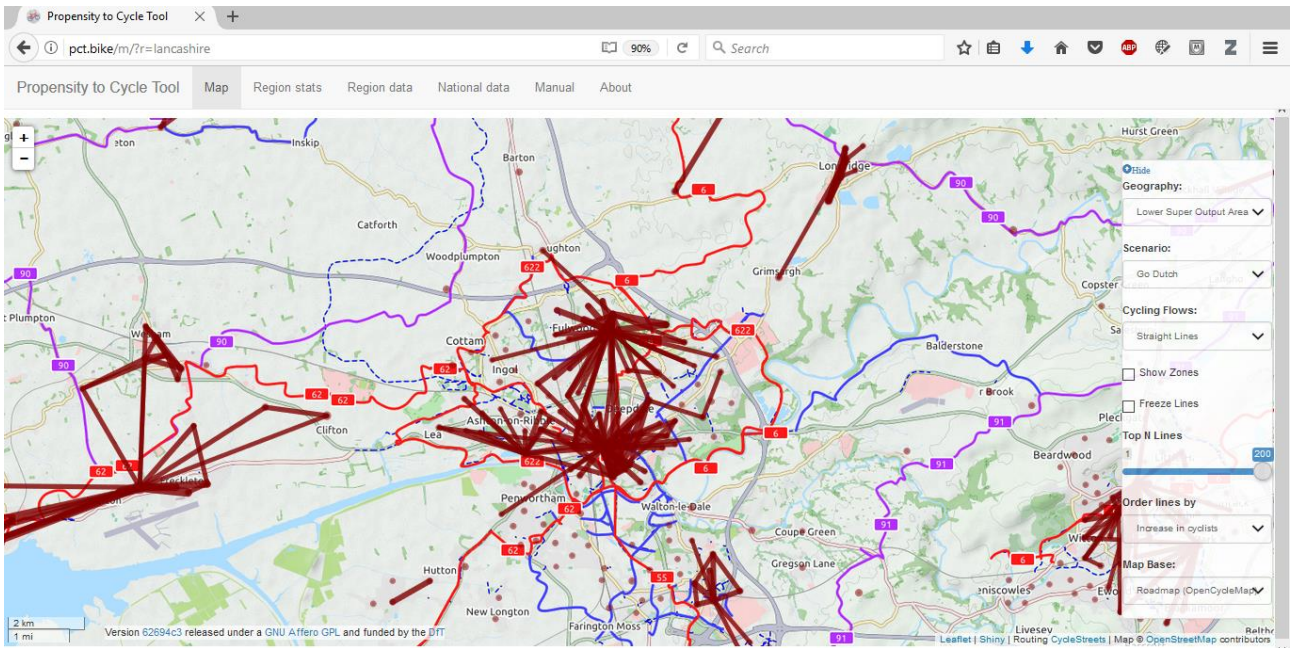


Figure 9: Central Lancashire 'Go Dutch' scenario, top 200 LSOA-level lines against cycle network, ordered by increase in cycling

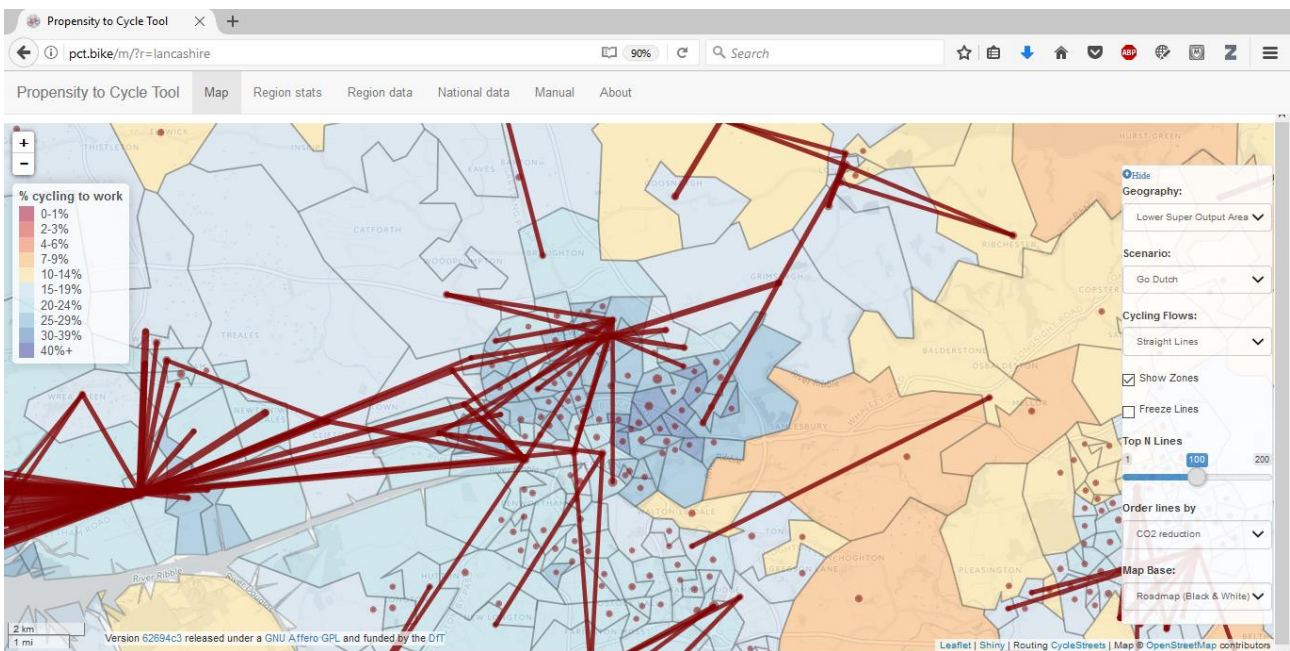


Figure 10: Central Lancashire 'Go Dutch' scenario, top 100 lines shown against zones and OpenStreetMap base, ordered by CO₂ savings

Lines, like areas, have popups associated with them. The image below illustrates the data available for one such line. (If clicking on popups, it's useful to have 'Freeze lines' selected, as otherwise your newly selected line might disappear as the map moves to fit in the popup information).

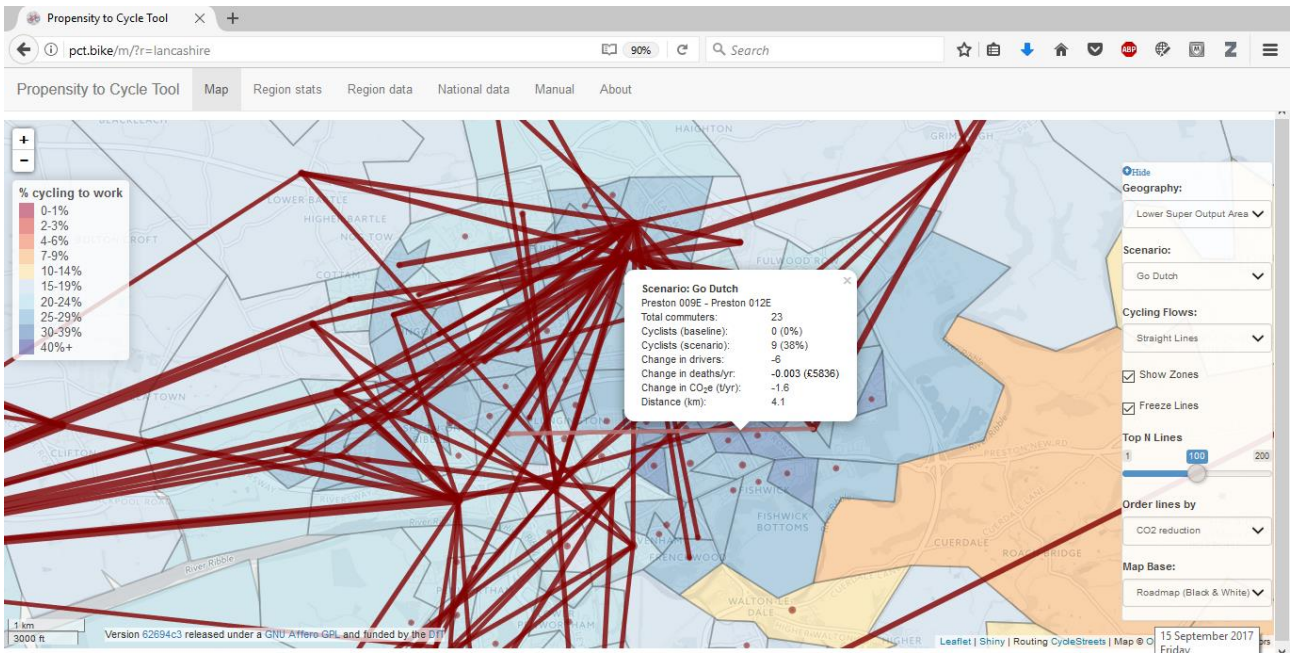


Figure 11: Preston 'Go Dutch' scenario, lines popup

In the figure above, the lines popup tells us that for the Origin-Destination pair comprising Preston 009E and Preston 012E there are 23 commuters in total. The distance between the two points is 4.1km. None of the commuters currently cycle, but under the scenario 38% would cycle. This would lead to four fewer driving trips, and a health economic benefit of £5,836 per year. The CO₂ saving per annum is 1.6 tonnes.

Within-Zone Flows

As you will see in the Region Stats tab, not all cyclists can be shown in the flow data. One group that can't be shown are those travelling entirely within an MSOA or LSOA – as we cannot show them as desire lines or allocate them to the route network. With the cycling flows shown, the circles that you will see at the centre of the MSOAs or LSOAs give you information about this within-zone travel. See the image below, for Clitheroe to the North-East of Preston:

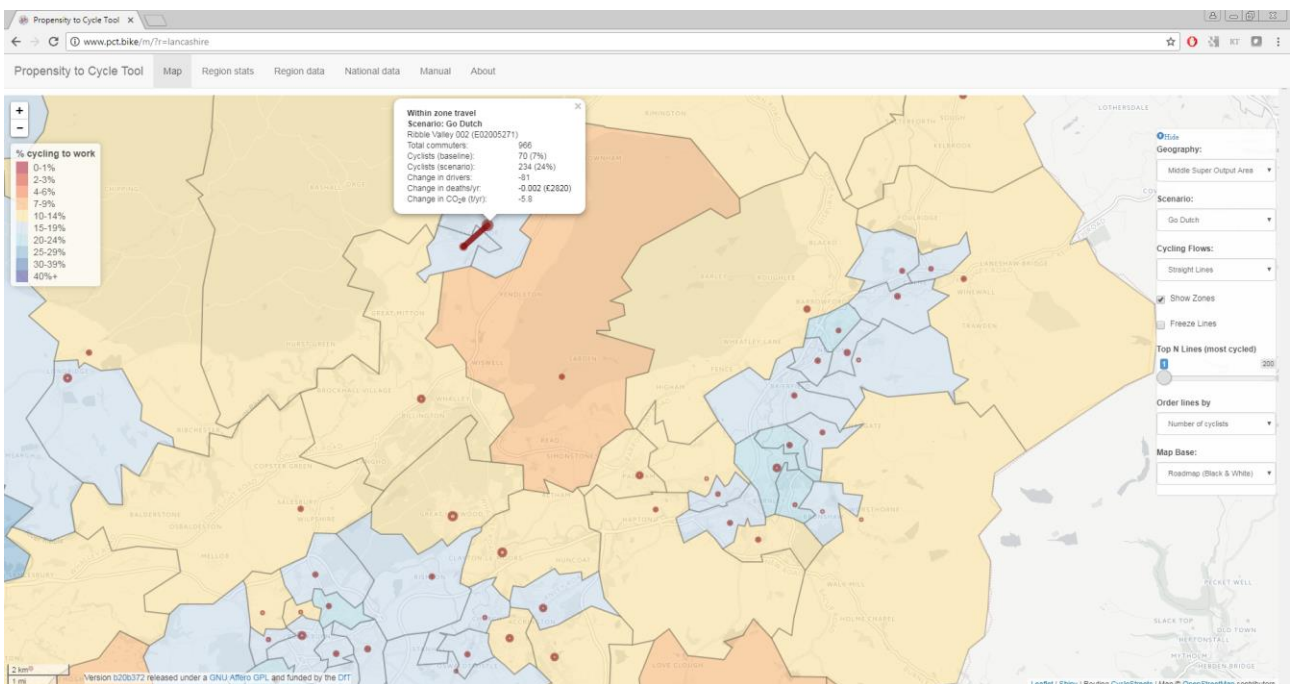


Figure 12: Within-zones travel, 'Go Dutch' scenario, Ribble Valley 002

These within-zone flows can sometimes be quite substantial. There are 966 people who commute entirely within the Ribble Valley 002 MSOA. Currently 7% of them cycle, and under the Go Dutch scenario this would rise to 24%, taking 81 cars off the road.

Fast and Quiet routes

In the 'Cycling Flows' drop-down menu, the options after 'Straight lines' show either the fastest legally cycleable routes, or alternative quieter routes recommended by the Cyclestreets journey planner. Choosing 'Fast routes' shows only the fastest routes, while choosing 'Fast and quieter routes' will also show the recommended 'quieter' routes that Cyclestreets offers for those origin-destination pairs. A couple of caveats should be noted:

- 'Quieter' routes may differ in the extent to which they are truly quiet. Many will still include what Cyclestreets describes as 'very busy sections', so it should not be assumed that a 'quieter' route is necessarily a high-quality cycle route.
- In some cases, there is no reasonable quieter alternative to the fast route. In those cases, the 'quieter' route shown will simply be the same as the direct route.

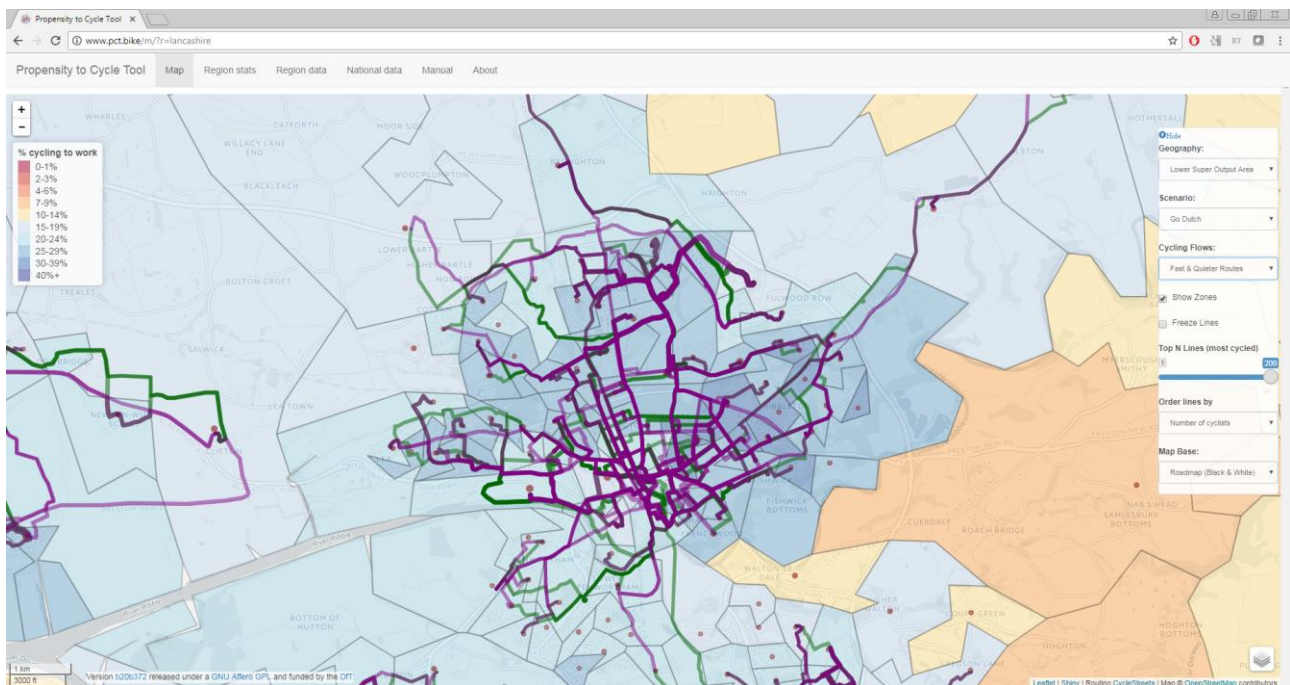


Figure 13: Preston 'fast routes', 'Go Dutch' scenario, Top 100 lines

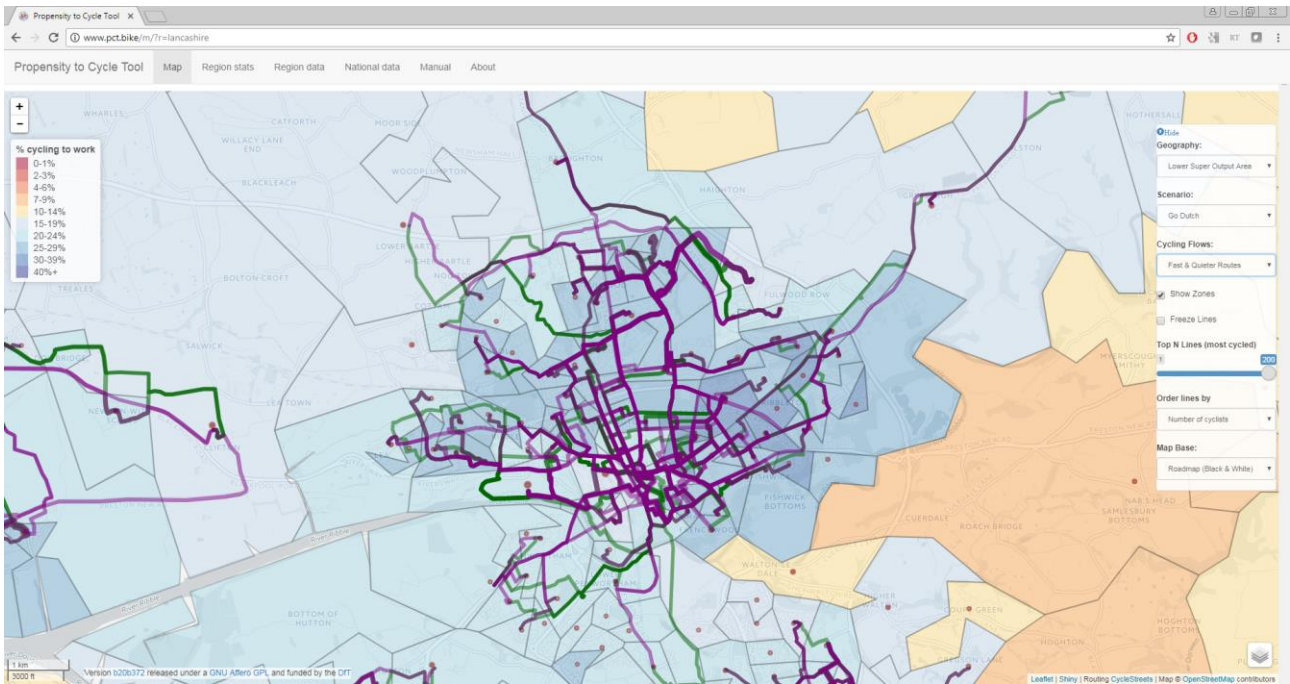


Figure 14: Preston 'fast' and 'quieter' routes, 'Go Dutch' scenario, Top 100 lines

Again, additional information for each route type can be seen by clicking on the line in question:

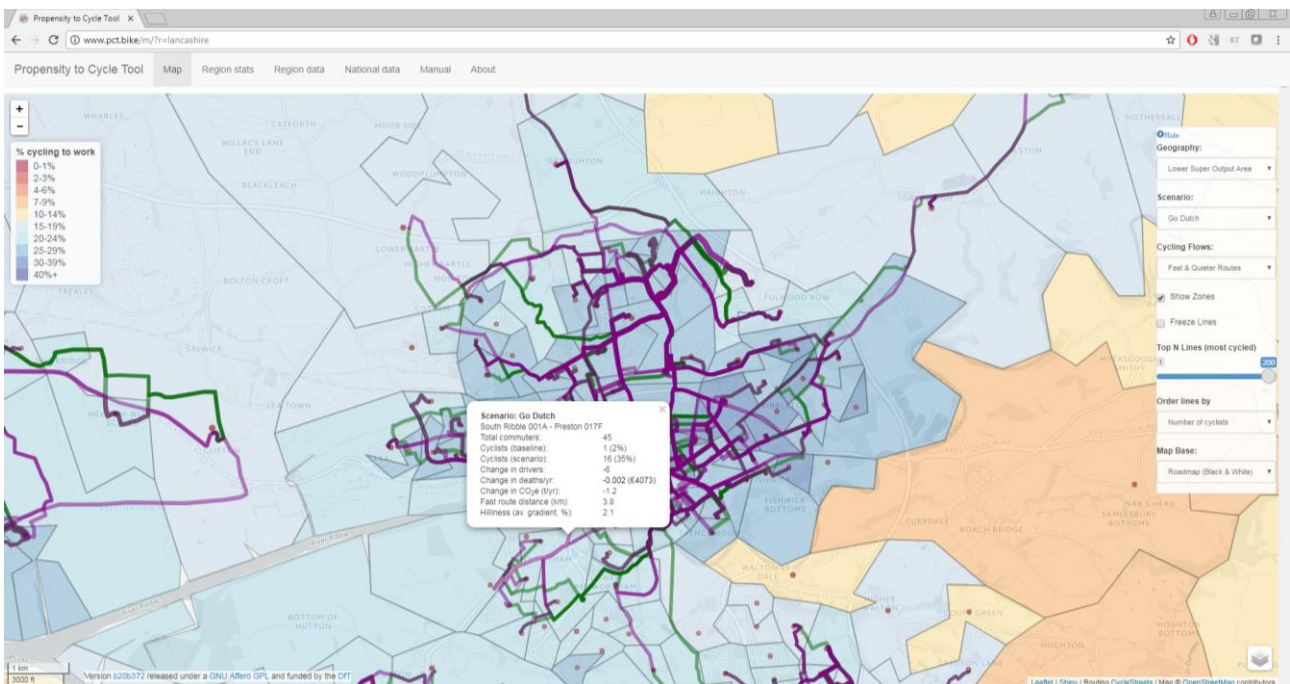


Figure 15: Preston 'fast route' popup example, 'Go Dutch' scenario

In the image above, information is given for the 'fast route' between Preston 001A and Preston 017F, based on the 'Go Dutch' scenario. The popup gives details about the route (distance, hilliness), the cyclists (baseline and scenario), the health economic and carbon benefits.

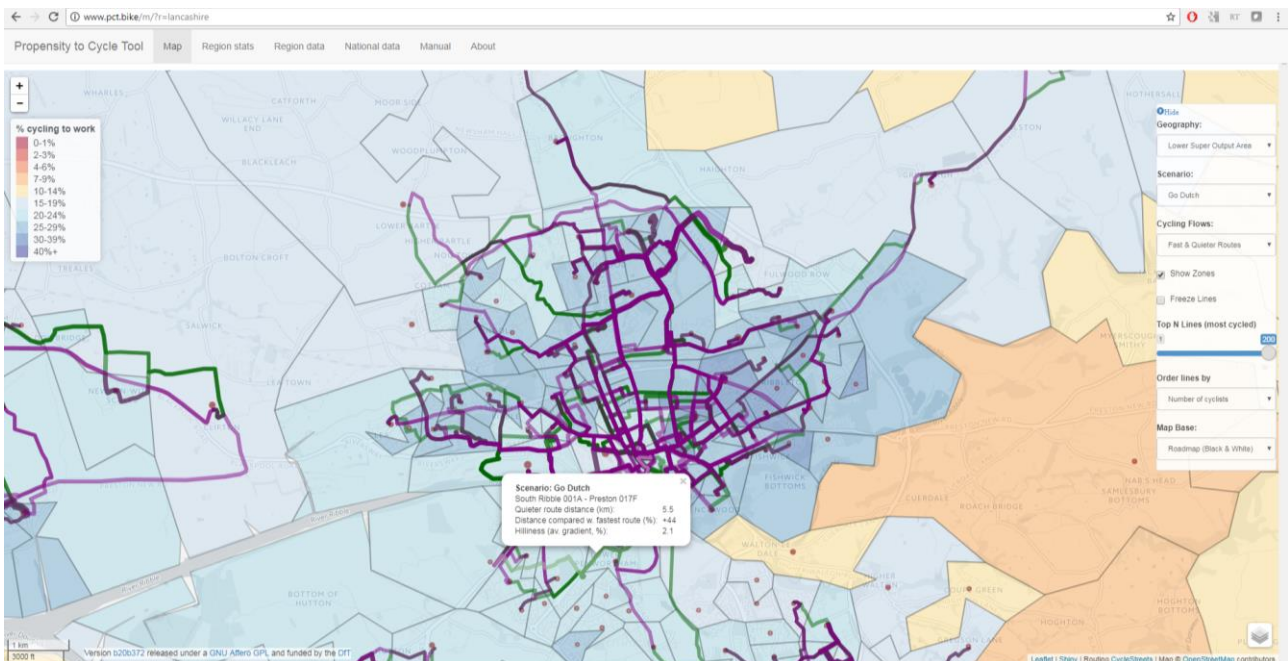


Figure 16: Preston 'quieter route' popup example, 'Go Dutch' scenario

For the quieter route popups, information about the hilliness and the additional distance (compared to the faster route) is given. For instance, the quieter route shown here is 44% longer than the equivalent fastest route.

Route Network – MSOA level

The final two options within the 'Cycling Flows' dropdown provide the Route Network layer. This aggregates all the cycling flows, using the fastest legally cycleable routes. We prioritise these fast routes as it is likely that to achieve cycling potential, direct routes which minimise unnecessary distance decay should be prioritised: however, local knowledge is helpful in interpreting the resultant map, especially as we are using population-weighted centroids rather than actual origins and destinations.

When using the MSOA Route Network the user can choose to display up to a maximum 90% of the network.

Note that the MSOA Route Network, unlike other flow data, does not contain flows that start or end outside the boundary of the PCT area (as defined in the URL, e.g. in this case Lancashire). Hence flows near the area boundary will be suppressed as the Route Network will not include people travelling to or from an MSOA outside the area boundary.

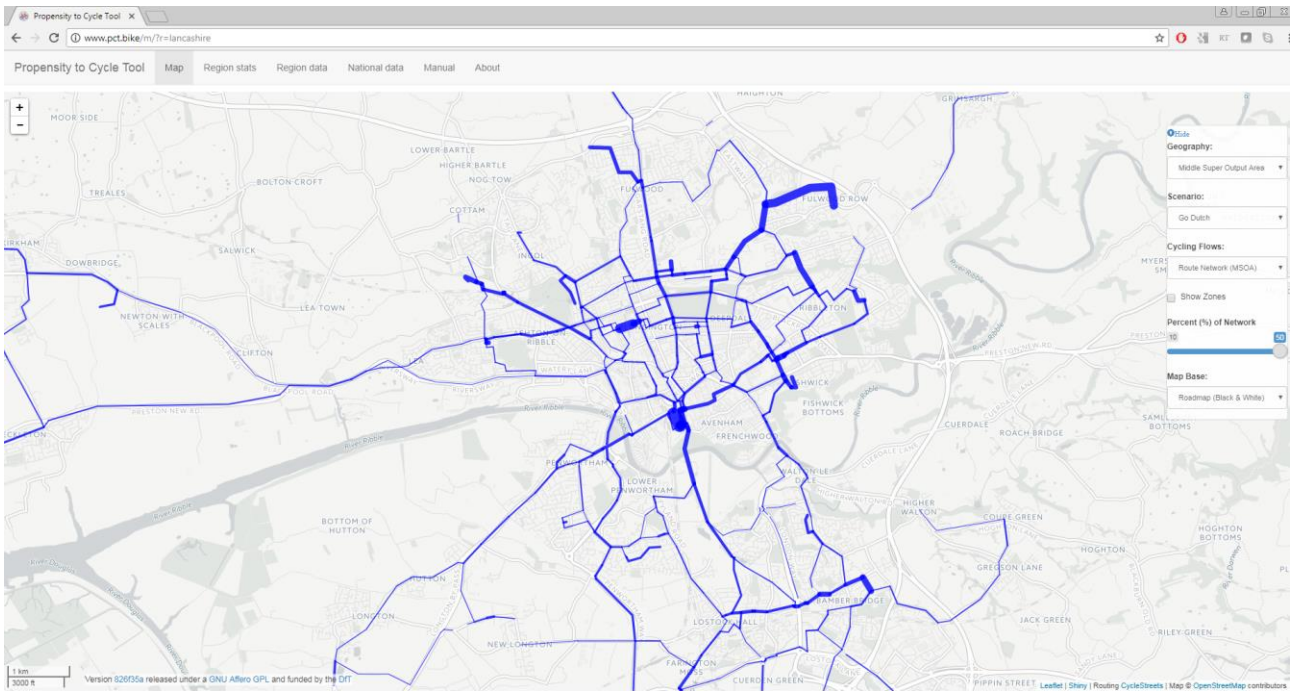


Figure 17: MSOA Route Network, Preston, 'Go Dutch' scenario

It is also possible to click on a Route Network section and see the impact the scenario makes in this case, compared with baseline (the baseline assumes that current Census cyclists are also taking the most direct cycleable route). The popup highlights the relative increase in cycling on that route section under the given scenario.

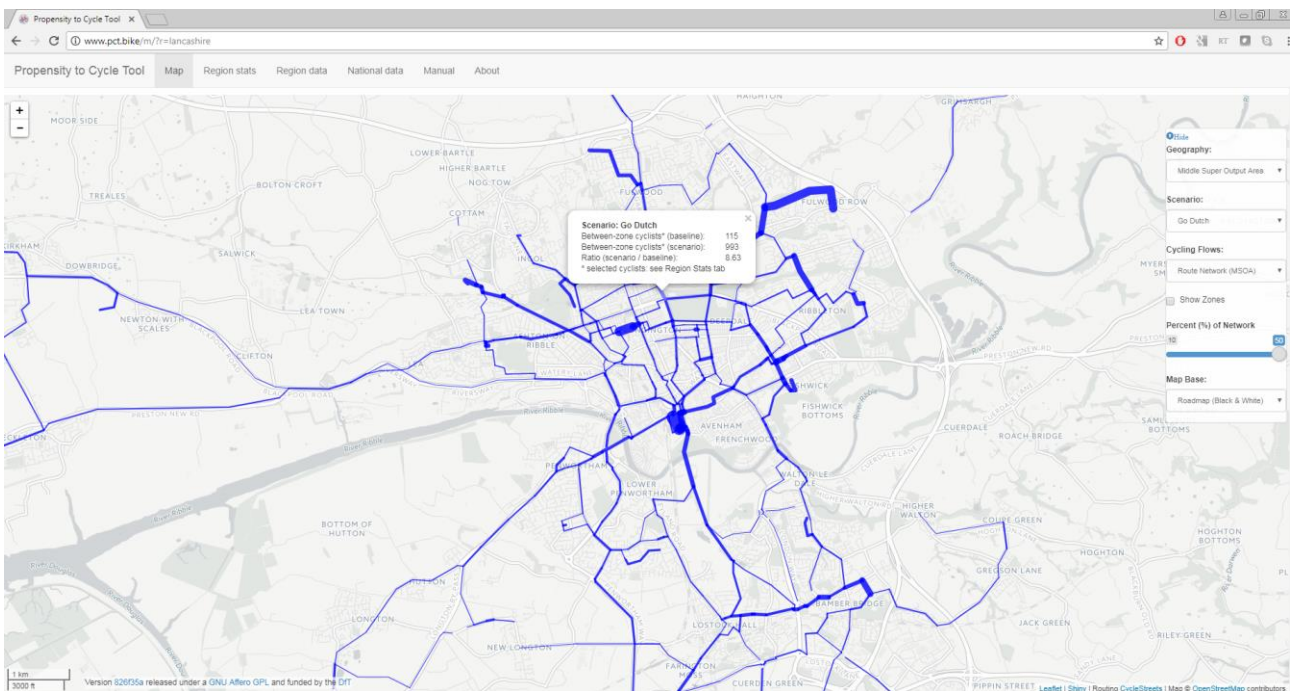


Figure 18: MSOA Route Network, Preston, 'Go Dutch' scenario: with popup

Route Network – LSOA level

The PCT now offers a LSOA Route Network. This provides more granular detail, because we route cyclists from LSOA rather than MSOA centroids. LSOAs are around a quarter the size of MSOAs. While still approximate – particularly for workplaces, because the centroids are weighted to resident population – the LSOA layer allows greater accuracy in routing cycling to and from origins and destinations.

Like the 'lines', 'fast' and 'quieter' routes data, the LSOA Route Network includes flows that cross regional boundaries. This leads to an increase in accuracy towards the edge of a region, rather than removing flows from (for instance) Lancashire into Yorkshire.

Because of this and the greater granularity, we are able to capture more flows, and represent a greater proportion of current and potential cycling in the LSOA Route Network, compared to the MSOA Route Network.

The LSOA layer's additional accuracy necessitates a substantial amount of additional data, and so it is rendered differently from the MSOA layers. The MSOA layers are vector data, while the LSOA layer is a raster. It is not clickable in the online interface in the same way that the MSOA layer is, and there is a legend illustrating different categories of flow, from under 10 to over 2,000.

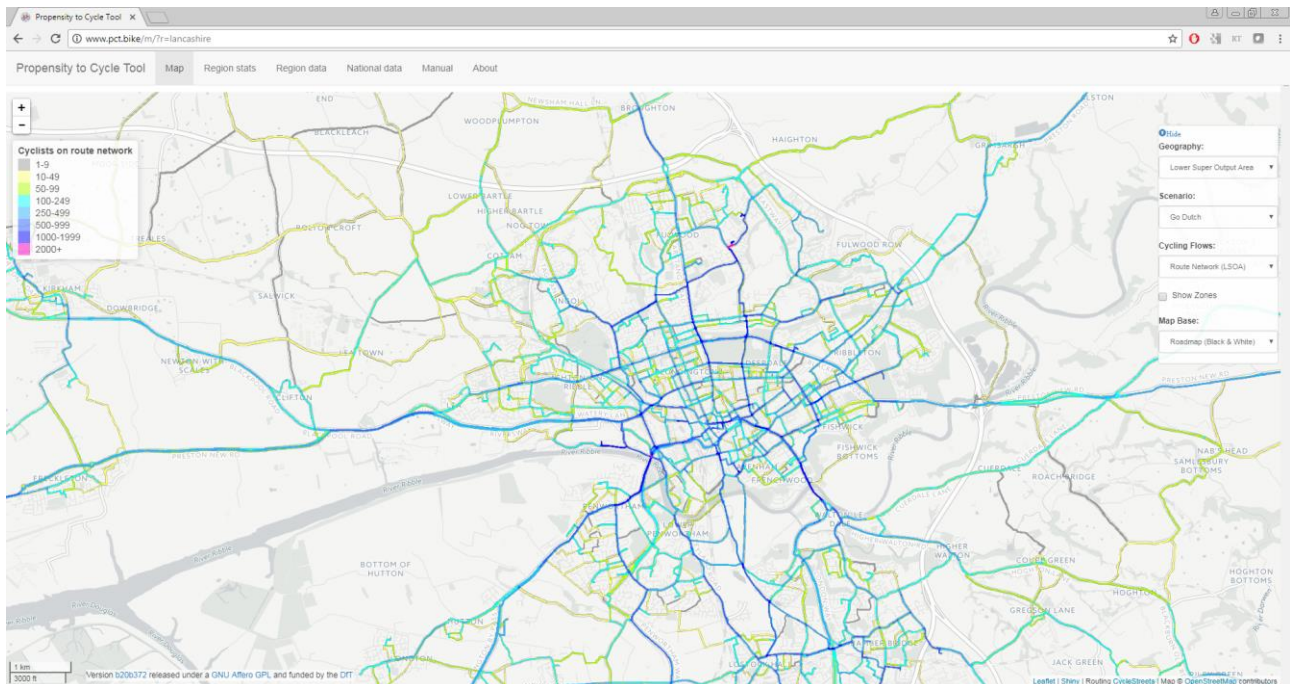


Figure 19: South Lancashire 'Go Dutch' LSOA Route Network

3. Downloading the data for bespoke analysis

While the user will gain much valuable information from the online tool, advanced use is likely to involve the need to download the underlying data. For example, bespoke analysis could aggregate particular areas, such as Preston district, in order to calculate health benefits of achieving the scenario cycling levels just in that area. More advanced analysis might involve selecting specific origin-destination pairs, and comparing the fastest and quieter route times for those journeys (for instance, in considering the potential impact on cycling journeys of building a cycle path along an A road). Or you may wish to merge other local datasets with the information provided by the PCT.

See Manual D for some examples of more advanced use for business case purposes.

To download the data, navigate to the 'Region Data' and 'National Data' tabs. The National Data tab allows you to download data for the whole of England and Wales. Note that some of these files are large. The Region Data will allow you to download data for the current region, here Lancashire. For each type of data there is a corresponding .csv codebook that explains the different variables.

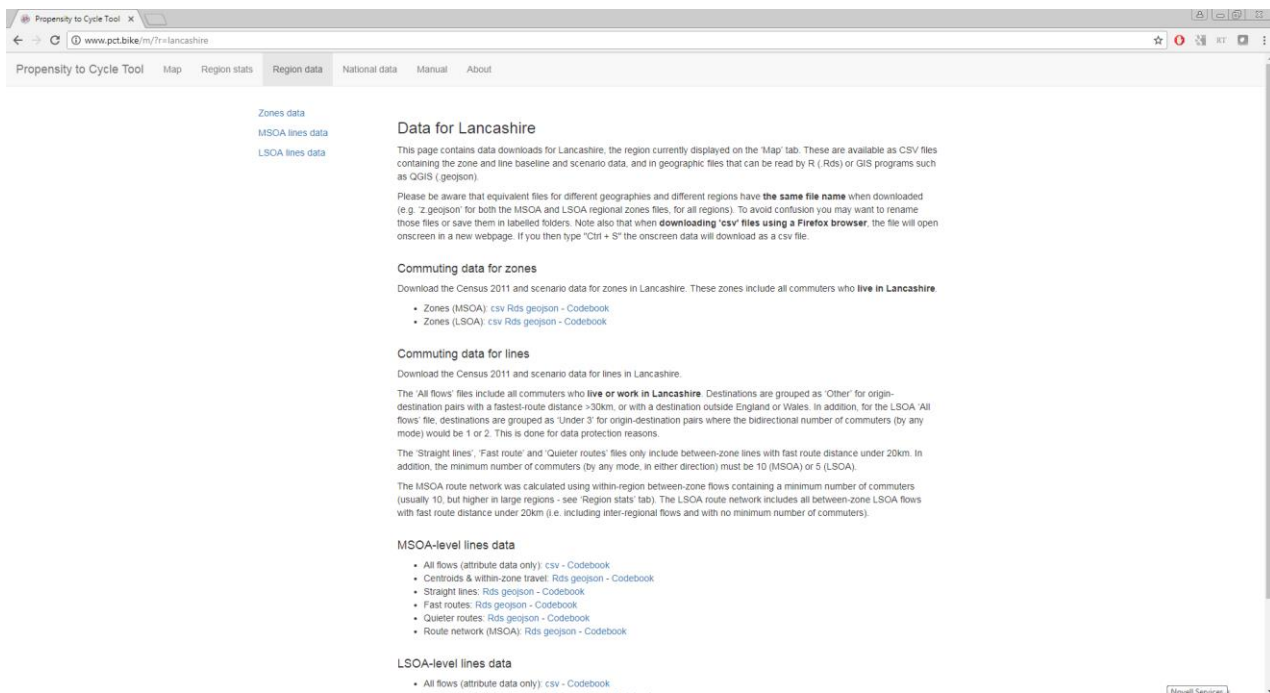


Figure 20: Data for Lancashire: 'Region data' downloads page

Three categories of data are available (at both regional and national levels). Firstly, the zones data (at MSOA and LSOA level); secondly, the MSOA level lines data, and finally, the LSOA level lines data.

Zones Data

The area data can be downloaded in three formats. The CSV file can be opened in commonly used software such as Excel or OpenOffice, and you can for example conduct analysis comparing the impact of the different scenarios. The Rds file can be opened in the free, open source software R. Finally, the geojson file can be opened in GIS software such as QGIS (also free and open source).

If you wish to conduct analysis using other GIS programs, such as Mapinfo, this software may not be able to open a geojson file directly. In this case we recommend that you open the geojson file or files in QGIS (which can be freely downloaded) and then export them in the appropriate format for your program. For more information, see

https://docs.qgis.org/2.2/en/docs/user_manual/working_with_vector/supported_data.html

MSOA and LSOA level Lines Data

Lines data (Straight lines, Fast and quieter routes, Route Network) can also be downloaded. The formats are the same as the zones data, with the addition of LSOA-level raster tifs, which can be opened in R or in GIS software such as QGIS.

The MSOA-level data contains the following:

- Attribute data for all flows (e.g. cycling numbers for each scenario) – in csv format, this can then be linked to geographical files if desired
- Centroids & within-zone travel, Straight lines, Fast and quieter routes, Route Network –in Rds or (except for very large files) geojson format

The LSOA-level data contains the following:

- Attribute data for all flows (e.g. cycling numbers for each scenario) – in csv format, this can then be linked to geographical files if desired
- Centroids & within-zone travel, Straight lines, Fast and quieter routes – all in Rds or (except for very large files) geojson format

- Route Network as tif files (rasters)

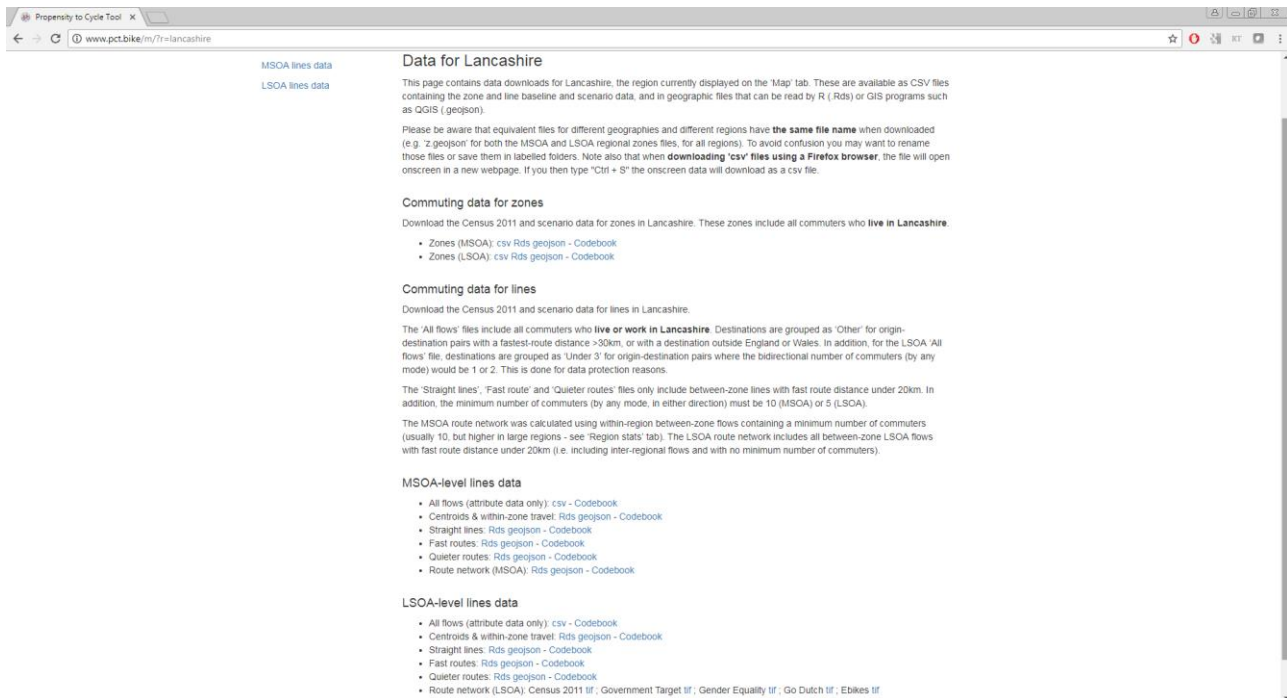


Figure 21: PCT data for Lancashire: Region data downloads page

4. The Region Stats tab

The Region Stats tab provides background information on the area (in this case Lancashire), including details of what proportion of commuters are included within the LSOA-level flow data.

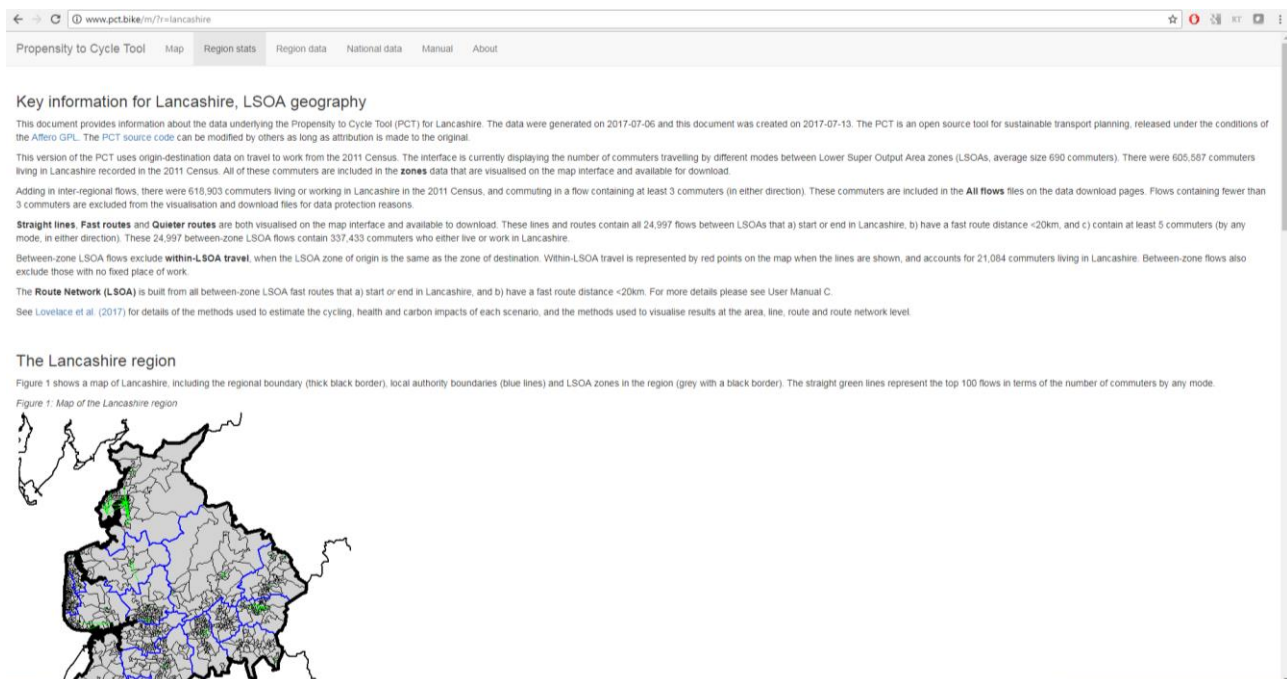


Figure 22: Region Stats page for Lancashire (top section)

5. Creating custom scenarios

More advanced users, going beyond the bespoke analysis of PCT data, may want to create custom scenarios. To do this, you need to ‘build’ new input data for the PCT and have a version of the tool running on your computer (not on a remote server). The steps to install working versions of the PCT and the build scripts on your computer are described in the README files associated with the `pct-load` and `pct-shiny` GitHub repositories. These can be seen from the PCT team’s GitHub page: github.com/npct.

To create custom scenarios, the key dataset to modify is ‘`l.Rds`’, a `SpatialLinesDataFrame` that exists in each region. This could be loaded for Kent, for example, with the following commands, resulting in the following plot:

```
library(sp)           # load spatial library
l = readRDS("../pct-outputs-regional-R/kent/l.Rds")
# Load the straight lines for Kent
plot(l)               # plot the result
```

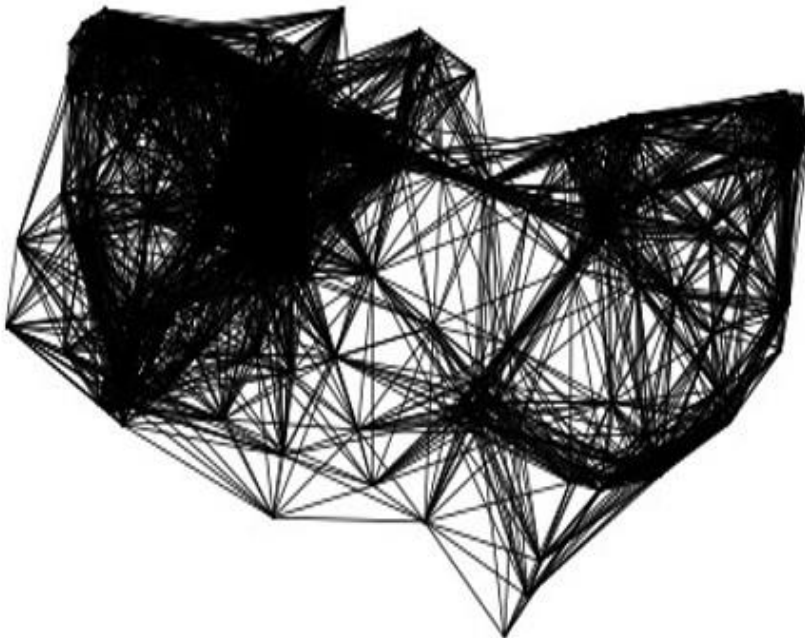


Figure 23: Kent data, plotted using `Rds` file

By modifying the values of the variables associated with each line (e.g. `l$Bicycle`, representing the current level of cycling) in this dataset, new scenarios can be created. Let’s make a new scenario so that the level of cycling is proportional to the inverse of distance, minus the average hilliness of the fastest route. This contrived example could be achieved with the following command:

```
l$newsenario_slc = # Create ‘scenario level of cycling’ (slc) for a new
                   # scenario
0.5 / l$dist_fast - # set proportional to the inverse of distance
l$avslope / 100    # minus the average gradient (percent)
```