Using the Propensity to Cycle Tool to plan strategic cycle networks

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1. Abstract

Robustly evidencing potential demand for, and existing use of, cycle routes is one of the trickiest challenges for transport planners. At a time when cycling as a mode of travel for everyday journeys is becoming more prevalent in UK towns and cities, but limited funding exists to support the design and construction of dedicated route networks, it is more important than ever to target investments in locations that maximise delivery benefits.

Accurately estimating the number of people travelling by bike is central to building an investment case, but remains challenging. Counting people using bikes along principal routes can be resource-intensive and time-consuming. It also typically only provides a partial sample, given many people travelling by bike seek out quiet or traffic-free routes for their journeys. Data such as that collected by physical activity apps – like Strava's Metro dataset - can be used to illustrate behavioural patterns (directional flows and routes used), but the partial sample of users means it is seldom reliable as a source of cycle trip volumes along specific routes.

In this context the recently-launched Propensity to Cycle Tool (PCT), developed by a group of Universities with support from the Department for Transport, offers a fresh approach. It combines the Origin-Destination commuter trip patterns found in 2011 Census data (aggregated to Middle Super Output Area) with routes derived from Cycle Streets' journey planning tool to infer the likely movements and volumetric flows of cycle trips along urban and rural roads and cycle paths.

This paper shares ITP's practical experience of using the PCT to help local authorities define their future cycle network visions. It shows how we have used the tool to extract evidence of potential changes in cycling levels resulting from proposed investment to inform WebTAG compliant economic cases to support successful funding bids.

Keywords: Cycling, Evidence, Planning, Network, Propensity, WebTAG, Demand

Summary: Robustly evidencing potential demand for/existing use of cycle routes is one of the trickiest challenges for transport planners, but is central to building an investment case. The recently-launched Propensity to Cycle Tool (PCT) combines Origin-Destination commuter trip patterns found in 2011 Census data (aggregated to Middle Super Output Area) with routes derived from Cycle Streets' journey planning tool to infer the likely movements and volumetric flows of cycle trips along urban and rural roads and cycle paths. This paper shares ITP's practical experience of using the PCT to help local authorities define and seek investment for their future cycle network visions.

2. Introduction

2.1 - What is the PCT?

The Propensity to Cycle tool, or PCT for short, is an online strategic planning tool which aims to help transport planners and policy makers to develop cycle networks and prioritise investments which are designed to encourage people to cycle.

The PCT has been developed by a team from four UK universities:

- Centre for Diet and Activity Research (CEDAR) - University of Cambridge
- University of Leeds;
- University of Westminster; and
- London School of Hygiene & Tropical Medicine.

The initial development of the PCT was carried out with funding from the Department for Transport (DfT), with subsequent, additional funding coming through Engineering and Physical Sciences Research Council (EPSRC) and Economic and Social Research Council (ESRC).

2.2 - How does it work?

The PCT uses 2011 Census data to indicate Origin-Destination travel to work flows between Lower and Middle Super Output Areas (LSOAs and MSOAs), a geospatial area at which Census data are aggregated. MSOAs are geographical areas which have between 5,000 and 15,000 people within them, while LSOAs are smaller in size and typically contain around 1,500 residents (up to 3,000).

Straight-line O-D flows can be visualised to show the numbers of people that commute by bicycle along each route linking the population-weighted centroids of LSOAs and MSOAs. The baseline data can also be used to estimate the impact, in terms of trip numbers along existing O-D flows, of:

- Achieving the government's Cycling and Walking Investment Strategy target (doubling cycling levels by 2025);
- Achieving a Gender Equality position – in which as many females cycle as men.
- Achieving typical Dutch levels of cycling mode share for each flow; and
- Widespread E-bike usage, which would make longer trips by bike a possibility.

3. How we made use of the PCT

The ITP team has used the PCT to assist in delivering projects in two very different ways, in two different parts of the country. The first project, and the main focus of this paper, used the PCT to identify potential strategic cycle networks in the district of Bath and North East Somerset. The second project which we have used the PCT to deliver was an economic assessment of cycling and walking infrastructure measures in Nottingham. The PCT was used to help estimate the economic benefits associated with delivering these improvements.

4. Project 1 – strategic cycle network prioritisation

3.1 Project outline

In 2016 ITP was commissioned by Bath & North East Somerset Council to assist with the development of a comprehensive joint delivery plan for walking and cycling interventions, both infrastructure projects as well as softer measures, across the District.

The primary purpose of the plan was to inform future funding applications by identifying projects which meet the Council's priorities. Fundamental to the delivery plan was the development of a scoring matrix to provide a framework for Council officers to use to prioritise funding for cycling and walking initiatives.

3.2 Development of a scoring tool

ITP worked with Bath and North East Somerset Council to develop a scoring tool which drew on an evidence base of likely impacts and was designed to align with the government's Cycling and Walking Investment Strategy. The tool was tested at a workshop with Council Officers from the joint Active Travel, Environment and Design Group on 28th November 2016. The pilot involved testing four different schemes (in different locations, and of differing natures) to determine the tool's appropriateness and effectiveness as a mechanism for evaluating the potential Active Travel investments.

After a number of iterations the final scoring tool to prioritise interventions consisted of 9 criteria:

1) Connectivity;
2) Ease of delivery;
3) Impact on demand;
4) Journey types;
5) Funding gap;
6) Maintenance;
7) Supporting measures;
8) Stakeholder support; and
9) Growth contribution.

Each of the nine criteria were scored using the best available evidence. A simple scoring scale was used for each criterion: Low, Medium or High. The scores used were: Low = 1, Medium = 3 and High = 5; with these scores being reversed for the funding gap criterion. Where applied, the scoring mechanism provided a score out of 50 for each cycling intervention, whilst walking interventions achieved a score out of 45 as it omits criterion 3 (impact on demand) owing to the fact there is no Propensity to Walk tool we can use to forecast such impacts.

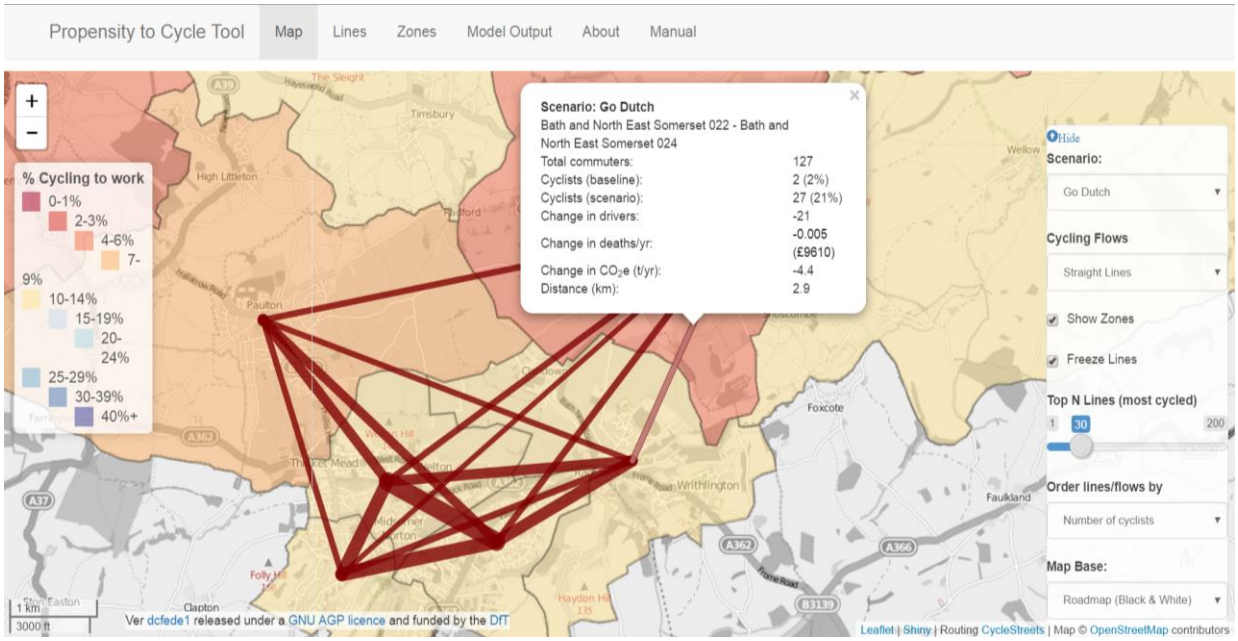
The Bath and North East Somerset district was subdivided into four subsections:

1. Bath;
2. Midsomer Norton and Radstock;
3. Keynsham and Saltford; and
4. Chew Valley.

This helped to ensure to ensure that schemes in the most populated areas of the district, namely those in Bath, would not always be selected at the expense of those in less populated areas. The PCT was used to identify the top 30 cycle flows in each area. **Error! Reference source not found.** shows the top 30 cycle flows in Midsomer Norton and Radstock visualised as straight lines between O-D

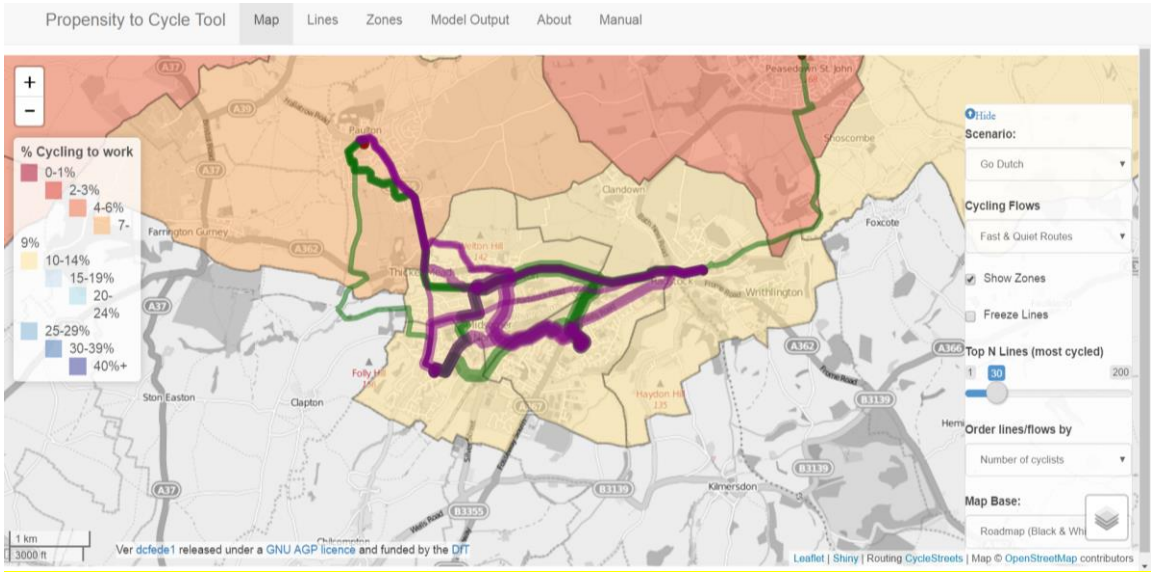
pairs. For each flow the PCT details the total number of commuters, along with estimates for the change in cyclist numbers and reduction in number of drivers for the particular scenario.

Figure 1 - Top 30 commuter flows in Midsomer Norton and Radstock



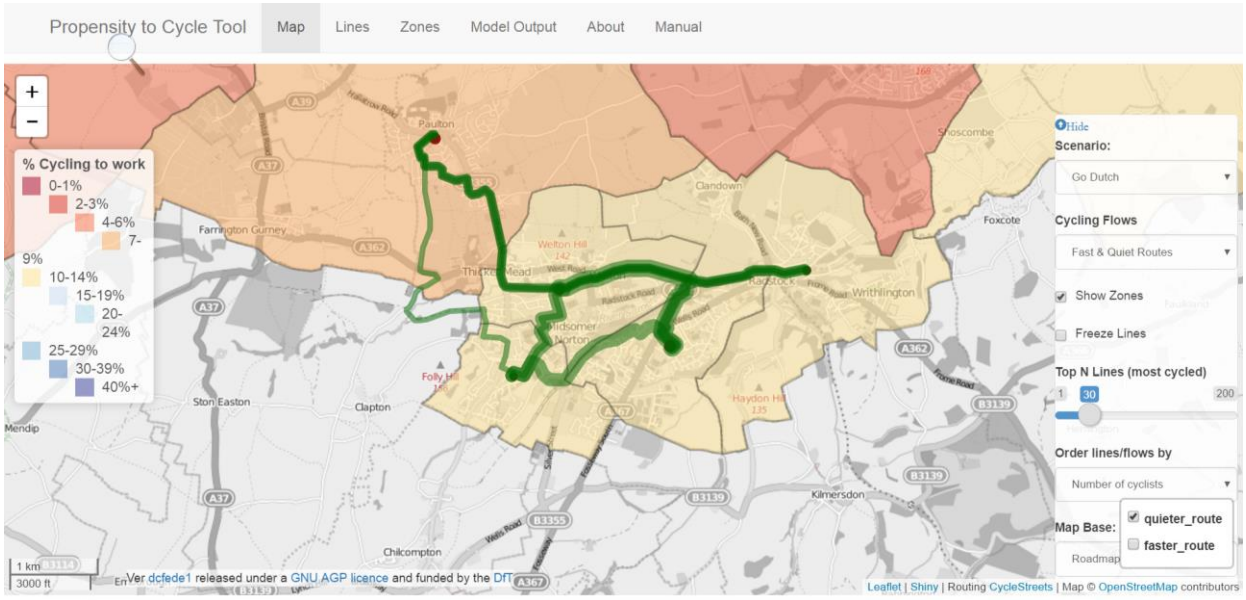
These O-D flows can also be mapped to the local road network using the Cycle Streets journey planning engine. This infers both the faster and quieter routes that people may use when completing journeys between these locations by bike, based primarily on OpenStreetMap data. **Error! Reference source not found.** visualises these faster and quieter routes in the Midsomer Norton and Radstock area of the district. In doing so it effectively estimates the routes along which most local cycle trips are likely to made by both more-experienced (faster routes) and less-experienced (quieter routes) cyclists.

Figure 2 - Top 30 fast/quiet cycle routes in Midsomer Norton & Radstock



The top 30 quieter routes for each of the four subsections of the district were used to inform the scoring for criterion three of the matrix (Impact on demand). For each area we compared the top 30 quieter routes visualised in the PCT with those considered in previous cycle network prioritisation work. We used the quieter routes because we felt that these were the routes which would be best suited to less-experienced cyclists and would therefore encourage the greatest uptake in cycling across the area. These routes could be considered as the highest priority for investment for safer cycle routes, as the available evidence of cycle usage suggests they will be well-used and might require a lower level of infrastructure investment (a local concern) to improve than faster routes.

Figure 3 - Top 30 quieter cycle routes for Midsomer Norton and Radstock



5. Project 2 – cycle route investment appraisal

5.1 Project outline

The second project which we have utilised the PCT to assist in delivering was in the preparation of an economic appraisal of proposed cycling and walking infrastructure improvements to connect a designated Enterprise Zone in the east of Nottingham, on behalf of Nottingham City Council. Our work helped the Council to prepare the economic case component of its successful Local Growth Fund application to the D2N2 Local Economic Partnership for cycling and walking infrastructure improvements around the Boots Enterprise Zone site. The proposed pedestrian and cycle bridge, and upgraded surrounding cycle paths, will reduce segregation caused by the main Nottingham – London railway line, and provide a more-direct walking route to the University of Nottingham tram stop for employees based at the Enterprise Zone (and the existing Boots site).

We carried out the economic appraisal in line with WebTAG guidance and the English Partnerships Additionality Calculation Guide to estimate the benefits associated with providing the proposed cycling and walking improvements. We used the PCT to determine an estimate of the number of cycle trips that pass/originate from/are destined for the Boots Enterprise Zone site. This enabled us to forecast future year flows 'with' and 'without' the proposed walking and cycling improvements based on evidence of impact from other similar investments. It also provided us with a basis from which the scheme benefits could be calculated and monetised.

Based in part on the robust economic appraisal, which returned a Benefit:Cost ratio of between 3.26 and 6.52 (depending on the level of cycling growth achieved), Nottingham City Council's application to the Local Growth Fund was successful and resulted in the Council being awarded £6.1m by the D2N2 LEP to deliver the scheme.

6. Recent and future improvements to the PCT

Since we used the PCT to inform the two projects outlined in this paper, the team behind its development has made a number of improvements to the tool. One of these has been the inclusion of 2011 Census data at the Lower Super Output Area, or LSOAs, level. As noted previously, LSOAs typically contain between 1,000 and 3,000 people and, being smaller in size, provide a much higher level of detail than is available using the much larger MSOAs. The greater granularity they offer is particularly evident when comparing cycle flows in urban areas, because of the improved relevance of commuting O-D data for what are typically shorter cycling trips.

Going forward, ITP intends to continue using the PCT on projects like these, and can see a clear role for the tool in the context of impending local authority work to develop Local Cycling and Walking Infrastructure Plans (LCWIPs). We will continue to provide feedback to the team developing the PCT which we envisage could expand to include walking and other more sustainable modes of travel (bus, tram, rail, car share) in order to highlight scope for a wider range of transport investments based on a wider range of datasets (e.g. beyond the travel to work questions posed in the 2011 Census).

7. Acknowledgements

We would like thank Dr Robin Lovelace of the University of Leeds, who is the Co-investigator and Lead Developer for the PCT development team for his assistance. Robin was kind enough to answer our queries on the tool when we first looked at using it for the projects above. Hopefully the constructive feedback we were able to provide based on our experience of using the PCT went some way towards repaying his generous assistance.