D. Using the PCT to make a business case

Contents

Executive Summary

This section of the Manual offers some examples in how to use the PCT in business case preparation. It is the most provisional section; as more authorities start using the PCT, it may well be used in ways that we did not foresee. Hence we anticipate updating it with 'real life' examples in due course. However, we hope that the examples below provide users with a starting point for using the PCT in a range of ways, within business cases.

We cover:

1. Using the PCT as part of a qualitative narrative supporting business cases, for instance, to justify the selection of areas and routes within an area as candidates for investment.
2. Using the PCT to estimate the impact of (i) new infrastructure that might cause severance of cycle desire lines, and (ii) new infrastructure that might overcome severance
3. Using the PCT to directly generate quantitative inputs to business cases; these being health economic benefits (via HEAT) and carbon reduction benefits
4. Using the PCT to estimate other benefits that are not currently directly generated by the tool, for instance decongestion and absenteeism benefits.

The PCT is not of course intended to predict uptake in cycling, given an infrastructure investment. However, we believe that it can contribute to estimating uptake. The Rotherhithe case study used the Government Target scenario – which corresponds well with London's current targets and recent cycling growth – and sense checked it against cycling flows on other London bridges. Similarly, the frequently used traditional 'case study' method of estimating cycling uptake can be used to sense check PCT scenario results. Where they differ, practitioners can take into account the extent to which the case in question might (or might not) differ from existing case studies (for instance in the cycling potential, or in the type of intervention).

We would note that while figures are quoted here to a high level of precision (e.g. pounds of benefit estimated) these must in practice be treated as rough indicators of the magnitude of different types of benefits under particular scenarios.

For further information on case studies discussed here, please see the case studies available via the Manual page of the PCT website.

1. Introduction

The first five case studies (Cornwall, Rotherhithe, Preston, Tunbridge Wells, West Sussex) available on the PCT website give examples of how the PCT can be used more broadly to understand and plan for cycling investment. This section of the manual draws on the case studies to discuss ways of using the PCT to make a business case, at both a strategic level and in relation to specific schemes.

Insights from the case studies include the following:

- Preston suggests that while the 'Guild Wheel' (an orbital route around the city) may be a great leisure facility, it is unlikely to match more radial commuting desire lines in and around the city. The A6 South of Broughton for example has very high cycling potential.
- The West Sussex case study shows that a quieter route linking Crawley and Horsham adds around a third to cycle journey times compared with the most direct route along the A264, thus supporting the case for building tracks alongside this road.
- Cornwall supports the selection of Bodmin and Truro as priority locations for cycling investment, and also illustrates the substantial difference that ebikes can make to cycling potential in hilly areas
- Tunbridge Wells includes a bespoke study of rail-cycle potential, showing that this can substantially add to cycling numbers in commuter belt areas
- The Rotherhithe case study provides an estimate of additional commuter cycling potential that could be unlocked by building a bridge where only a ferry currently exists

Note that all these case studies were created using the version of the PCT that existed in September 2016. It is possible that some of the underlying data may change slightly in future updates to PCT, but the principles for how to use the PCT to create a business case study will remain unchanged.

2. Data Downloads

The case studies have been produced by downloading data from the online tool. Using data downloads rather than the interactive map alone allows the user a number of advantages. These include bespoke aggregation of uptake/benefits calculations (e.g. for a district, or for those lines passing through a particular point), combination with other datasets (e.g. on childhood obesity levels), and the ability to create bespoke visualisations (e.g. displaying the route network above a certain threshold level of cycling).

We anticipate that in many cases those using the PCT in business cases will benefit from using the downloads. Section B of this manual contains more information about how to download the data.

Additionally, authorities may wish to combine PCT data with their own datasets. For instance, where there is a new housing development leading to a likely increase in the potential number of cyclists these additional residents could be added manually to the data downloaded from the PCT. Where for example this produces a 50% uplift in commuters in a specific MSOA, the assumption could be made that these commuters will travel to workplaces in similar locations to the existing commuters, and the baseline and scenario flows calculated accordingly.

Another reason for using data downloads is that bespoke, and potentially more attractive, images can be produced (see below) for use in reports.

A range of software, including freely available and open source software, can be used to analyse the data downloaded from the PCT. One option we have used for spatial analysis is QGIS. This is free and there is extensive training material available online.

3. Business Cases

Authorities may wish to produce business cases for different reasons. Business cases are essential to securing funding within competitive bidding processes led by the DfT. Authorities with greater devolved powers, such as Transport for London, produce business cases to evidence investment plans (such as for the Mayor's Vision for Cycling as a whole, as well as individual schemes). Business cases may be developed before schemes are submitted to sub-national funders, e.g. Local Enterprise Partnerships, for consideration in funding competitions.

WebTAG and the PCT

WebTAG is the Department for Transport's guidance on transport modelling and appraisal approaches which meet the department's requirements for business cases. Business cases can include a range of evidence, in five domains, both qualitative and quantitative. The PCT can help support business cases in the following ways:

1. *Qualitatively,* it can justify the spatial (area and route-based) focus of investment. For example:
    A. If a high proportion of a county's cycling potential lies within a few towns, this is a good reason to prioritise these for investment.
    B. Similarly, the route network feature can be used as a basis for illustrating the routes with the highest commuter cycling potential.
    C. Where health benefits are concentrated in particular areas, this can be used in informing Active Travel Strategies and prioritising public health investment. The same can be done for carbon reduction benefits or reductions in car trips, where these are priority outcomes.
2. *Quantitatively,* it can provide specific inputs to business cases, at different levels. For example:
    A. At a regional or local authority level, to provide a high-level estimate of benefits that could be realised by achieving some or all of a specific scenario potential - similar to the Mayor's Vision in London, which calculated benefits from achieving 5% cycling mode share.
    B. At a more localised level, to estimate benefits from achieving some or all of the scenario cycling potential attached to a particular route and/or small area. Which scenario to use will be up to the authority, and might be informed by higher-level targets and/or by uplifts in cycling seen in other contexts.

4. Qualitative Inputs to Business Cases

Here we draw on the Preston case study to propose the basis for a hypothetical investment strategy for commuter cycling in Preston.

Example: Planning for Commuter Cycling Potential in Preston

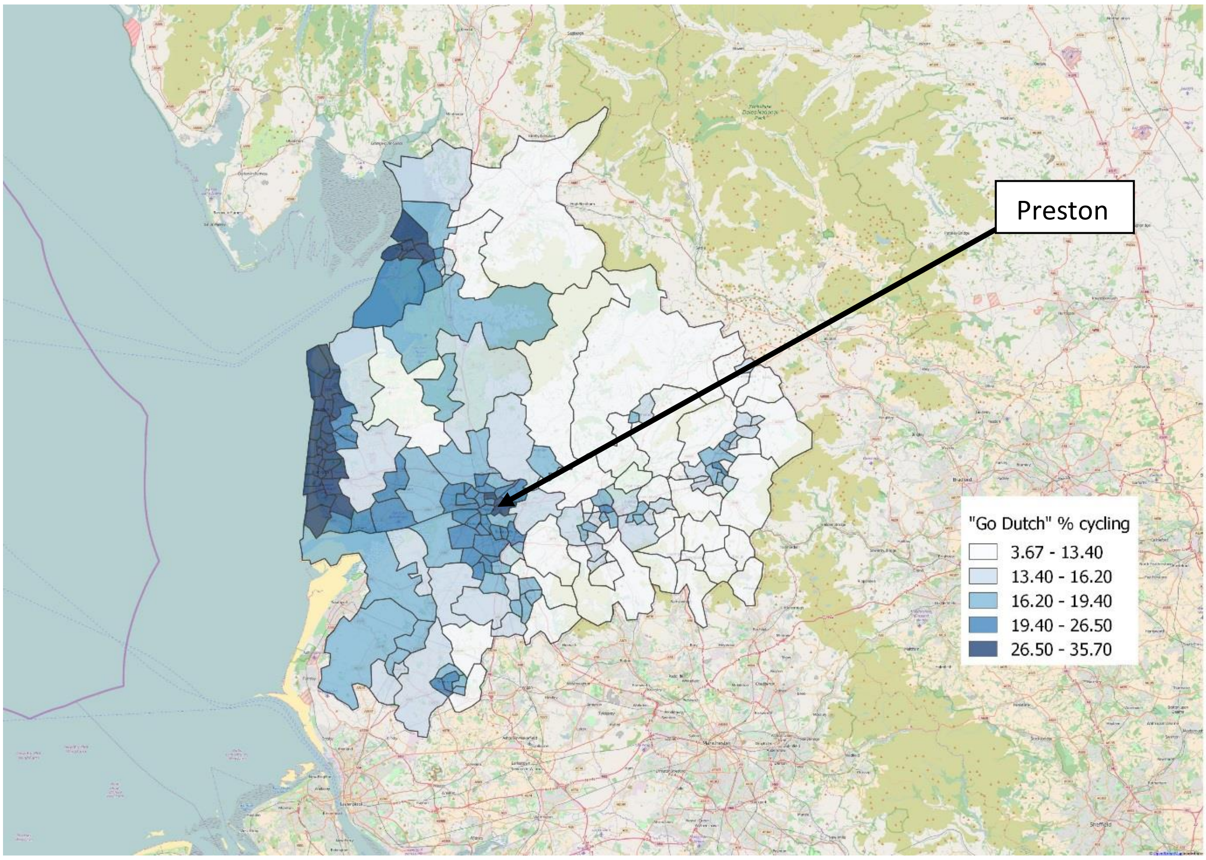

Figure 1: Commuter cycling potential in Lancashire, Go Dutch scenario

Within the county of Lancashire, the figure above illustrates that Preston, along with the Fylde towns and the Lancaster/Morecambe area, has particularly high cycling potential. These areas, under the 'Go Dutch' scenario, have cycling potential of between 20-35% in many MSOAs, compared to rates of a third this or less in the hillier and more rural areas (although note under the more ambitious 'ebike' scenario some of this disparity is reduced).

In making a business case for a commuter cycle network in Preston, then, the first step could be to highlight, as above, that Preston, with other local urban centres, has substantial cycling potential. The next step might be to produce a route network map aggregating cycling potential within the Preston area. The figure below illustrates an example of this: some of the neighbouring South Ribble MSOAs have been included in the image as they are very close to Preston and thus would need to be considered as part of this network (despite administrative boundaries).

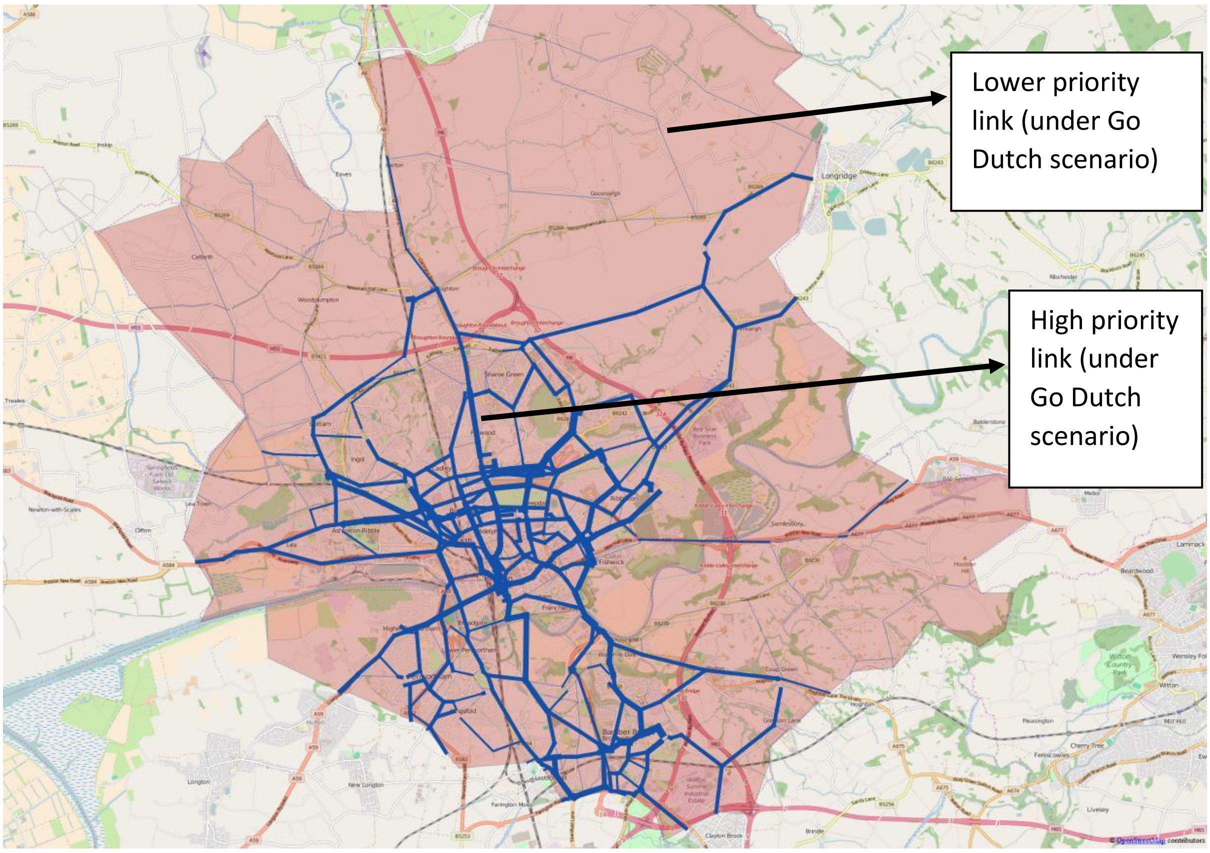

Figure 2: route-based commuter cycling potential, Preston and neighbouring South Ribble areas

The map above could therefore be used as a first attempt to lay out an integrated commuter cycling network for Preston and the area immediately South of the district. The thick blue lines represent potentially higher flows, and the thinner blue lines (for example in the north-east of the district) represent desire lines with lower potential under this scenario. The thick blue lines could be used as the basis for an initial grid of prioritised routes: for instance, one might choose to start with a North-South and an East-West link and build up from there.

The PCT estimates cycling potential, it does not directly estimate how many more cyclists an intervention would lead to. However, methods to accurately predict cycling uptake are not currently available and typically authorities use a case study approach. Potentially the PCT can help here by 'calibrating' results applied from elsewhere. For example if a scheme in one area was estimated to lead to 100 more peak time cyclists then when calculating how many new cyclists a similar scheme might bring about in another location the relative unmet cycling potential in each area or along each desired line could be compared and the numbers adjusted accordingly.

5. Blocking or Unblocking Desire Lines

Bespoke PCT analysis can be used to explore the possible implications of infrastructure that can block or unblock key cycle desire lines. Two pieces of analysis using the PCT have explored this issue.

(a) Firstly, our Rotherhithe case study examined the extent to which providing a bridge between Canary Wharf and Rotherhithe could unblock potential for cycling. Currently, cyclists must pay to use a slow ferry across the river, or detour substantially out of their way. PCT analysis identified substantial additional potential that could be unlocked by building the bridge. The first step was to identify desire lines plausibly served by this infrastructure. We then used the PCT scenario equations to calculate the extent to which the lengthening of those routes,

resulting from a lack of suitable river crossings, was likely to be suppressing cycling demand (both current and potential).
The Government Target scenario was used (approximating London's cycling targets) alongside a measure of projected population growth to estimate potential cycle commuting levels for 2021, with the bridge having been built. The conclusion was as follows:

> *… a 'ballpark figure' for 2020-1 – when a bridge might open – might be perhaps around 3,000 cyclists in the morning peak. This is based on the commuter figures calculated here [i.e. using the Government Target scenario] with a further modest uplift of a little over a quarter, given that our calculated figure commuters travelling from outside London (who might combine rail with cycling) as well as those with OD pairs not included in our model due to length or commuter numbers, neither of which can be shown in the graph above.*

The figure of 3,000 cyclists in the morning peak was then sense checked against figures for other London bridges – both current cycling levels and growth trends. It was found to be consistent with these.

(b) Secondly, a piece of work examining the potential impact of a new rail line between Lewes and Uckfield carried out related analysis, similarly subsetting commute desire lines likely to be affected by this infrastructure. The first category of desire lines subsetted were those perpendicular to the proposed line, allowing a calculation of current and potential commuter cyclists whose journeys might be obstructed by the rail line. The second category of lines subsetted were those parallel to the proposed rail line, of interest for policy-makers considering building cycle infrastructure alongside the new line.
This kind of analysis can help policy-makers identify where crossing points might be most needed, and the level of benefit that might be obtained from building new cycle routes parallel to new major infrastructure.

6. Quantitative inputs to business cases

At present, the PCT only quantifies some of the benefits of cycling, although we plan to add more over time. Historically the appraisal process has under-estimated benefits of active travel, given the history of car-dominated transport planning (see Gössling and Choi 2015, for example). It remains challenging to quantify some benefits of active travel, meaning that qualitative inputs and the broader strategic case remain important. However, quantitative measures of costs and benefits related to active travel are also important and methods for assessing these continue to improve.

This section discusses how the PCT can help in quantifying benefits of cycling schemes, using examples from our case studies. It includes both benefits directly generated by the tool (health and carbon benefits) and a discussion of how other benefits (decongestion, absenteeism, time savings, journey quality) might also be calculated, although not as yet incorporated within the tool itself.

A. Benefits directly generated by the tool

As mentioned above, the tool directly generates scenario estimates of health and carbon reduction benefits, at both area and flow levels. In the case of health benefits, we provide an estimate of change in premature deaths due to cycling uptake, and the corresponding economic value. For each scenario, the data downloads give both the difference compared with zero cycling, and compared with current levels of cycling (see data download codebook). For a business case the latter would likely be required.

We are using a modified version of the World Health Organization's HEAT tool, which incorporates local data on current age structure of cyclists, and the age structure and mortality rate of local populations. (Please see the Manual section C.4.xi for further details.) This means that the tool takes account of areas with relatively poor and relatively good existing health, and can incorporate the higher benefits that will be realised where commuters are older. Health benefits also depend on the modes from which new cyclists transfer. Transfers from inactive modes generate health benefits, but transfers from walking result in a negative health benefit, because, mile for mile, walking provides more physical activity than cycling.

The PCT provides a figure for annual health economic benefits representing the impact of scenario levels of cycling on premature mortality. Please note these benefits are estimated based on how much society values reducing the risk of death, they are not primarily financial benefits or health care cost savings. The value presented would represent the benefit in a single year if the scenario level of cycling had already been achieved. This annual figure may be included as part of economic calculations using WebTAG.

The corresponding Net Present Value over the period of years used in the business case should be calculated as per guidance.

1) Assign a year by which the scenario level of cycling is realised. We recommend assuming a linear increase up to that year.
2) Assuming a social discount rate of 1.5%.

Currently WebTAG recommends assuming that health benefits build up over the first five years before first reaching the calculated annual benefit. However, there is limited evidence to support this and it is being considered for revision for a May 2017 WebTAG update.

WebTAG also currently suggests assuming that the impact of walking and cycling schemes decline over the long term (10% per year). We would advise that this is not necessary for infrastructure schemes that will remain in place. A similar assumption is not made for road or public transport infrastructure and at the time of writing, this is also being considered for revision in the May 2017 WebTAG update. However, it may be a more realistic assumption in relation to short-term promotional/behavioural interventions. WebTAG also recommends an appraisal period of 20 years for cycling, while for most road or rail infrastructure it is 50 years.

This annual figure may be included as part of economic calculations using WebTAG. However it should be noted that the health benefits estimated by the PCT for a given increase in cycling are smaller than those produced by the current version of WebTAG. This is because the estimates that we use of the health impacts of active travel are those that have most recently been recommended by the World Health Organisation, and these more recent estimates generate somewhat smaller benefits than the older estimates that are still used by WebTAG. It is expected that the more up-to-date estimates used by the PCT will feature in the next version of WebTAG, although there will also be other changes to how economic impacts are calculated.

1. *Example: health benefits of cycling uptake in West Sussex*

Using the example of the West Sussex case study, the PCT allows us to calculate that realising ebike scenario cycling potential across the whole county would bring a health economic benefit of nearly £25 million per year (£24,775,295), compared with current levels of cycling. If it was assumed that the ebike scenario would be achieved in 2040, the calculation would give a Net Present Value of £179,993,303.

How should such a Net Present Value be used in practice? It is a starting point for the local authority in question, and the use made of this calculation will depend on the level of changes being made and their geographical scale. The ebike scenario is in one respect very ambitious; however, in another respect it underestimates potential benefits, since commuting only accounts for around a sixth of trips. Were we to achieve the commuter cycling rates indicated in the ebike scenario, total cycling and numbers of cyclists on specific routes would on average be several times higher. In the Netherlands, cycling propensity for non-commute trips are similar to those for commute trips.

Because the tool calculates the spatial distribution of health benefits at area and route level, more localised benefits can be estimated for business cases. For example, if a specific town (e.g. Bognor Regis) were implementing ambitious cycle network improvements, and considered this could realise a certain proportion of scenario cycling potential, the health benefits just from the Bognor Regis area could be calculated. This can be done relatively simply in Excel, by downloading the area-level data and selecting the Bognor Regis MSOAs.

Another option would be to use the route level data to examine the benefits of achieving scenario cycling levels along specific corridors. For example, in the West Sussex case study we extracted data on fast routes that might use the A264 corridor between Crawley and Horsham. The health benefits from realising a given scenario potential along those desire lines can then be summed. An NPV derived from that analysis could be used within a business case focusing on upgrading the A264 for cycling and making improvements to areas indicated by the PCT as located at the start or end of origin-destination pairs.

2. *Example: CO_2 benefits of cycling*

The PCT calculates the kilogrammes of CO_2 saved on an annual basis, due to scenario cycling uptake. This is based directly on the scenario reduction in distance driven. In the PCT we do not currently monetise this benefit; however this can be done by the user, based on WebTAG values and again as part of a calculation of Net Present Value to include within the Cost-Benefit Analysis.

For instance, for the London Borough of Hounslow, the ebike scenario generates a reduction in CO_2 equivalent emissions of 4548 tonnes per annum. The NPV calculation here is slightly different and based on the WebTAG values per tonne of CO_2, which change year-on-year, as well as the previously mentioned 1.5% discount rate. The twenty-year discounted NPV, using the central forecasts for Non Traded Values, £ per Tonne of CO_2e (2010 prices) is then £2,706,826.

NB that we would expect emissions from new cars to reduce over the next 20 years, with a knock-on impact on the fleet as whole, but this is not incorporated within the above calculation.

B. Benefits not (yet) directly generated by the tool

The following benefits may be calculated using information generated by the tool, but are not as yet directly calculated by the tool itself.

- Decongestion benefits
- Absenteeism benefits
- Journey quality benefits
- Time savings benefits

These are discussed below, with specific examples given for absenteeism and journey quality benefits.

1. Decongestion benefits

Using WebTAG, a simple calculation can be made which ascribes a decongestion benefit to each car taken off the road. The reduction in car commutes (for an area or series of routes) provided by the PCT downloads can then be multiplied up to give an annual figure for decongestion benefits.

NB: WebTAG recommends the use of the simple calculation where full traffic modelling is not being undertaken. Where a traffic model is being used, instead of this calculation, the modellers should be asked to factor in the scenario-derived reduction in driving that has been agreed for use in the business case. This will ensure that route-specific decongestion benefits are incorporated within assessments of changes to journey times that might result from infrastructure construction.

2. Absenteeism benefits

WebTAG suggests that each cyclist or pedestrian takes 0.4 fewer sick days per annum than those using non-active modes. To calculate this, the scenario decrease in walking needs to be subtracted from the scenario increase in cycling (as there will be no benefit from switching from walking to cycling). WebTAG values for the market value of time can then be applied and the resulting value converted to a Net Present Value for inclusion in the cost-benefit analysis.

As of the Spring 2016 TAG data book, the average market price per hour for employees is £19.27 (at 2010 prices). We have used here the 'all modes' average as it is reasonable to assume that (for example) car drivers who switch to cycling do not experience a large fall in their hourly income.

Example: reduced absenteeism in the Preston area

Returning to the Preston area (which includes neighbouring MSOAs in South Ribble), there are 85,878 commuters within the selected MSOAs. Under the 'Go Dutch' scenario, 22.7% of them (19,527) cycle to work, of whom the majority, 17,231, are new cycle commuters. However, not all are new *active commuters,* so we need to subtract the number of commuters who stopped walking from the number of new cycle commuters. In this case, the number of commuters who stopped walking was 3181.

In total, therefore, there are 14,050 new *active commuters*, who previously used an inactive mode of travel, for this scenario and area. We then multiply this by 0.4 to get the reduction in days lost to absenteeism, and by 7 (assuming a day is 7 hours). This equates to 5,620 fewer absence days annually, or an annual benefit of £758.082. Using the same Net Present Value assumptions as employed earlier (that the scenario is realised by 2040) this equates to a twenty-year NPV appraisal figure of £5,507.488.

3. Journey Quality Benefits

Journey quality benefits are frequently important for the appraisal of cycling schemes (see the figure below which illustrates the balance of benefits in WebTAG). However, this depends on the balance of existing and new users, due to the 'rule of half' which assumes new users only realise 50% of the journey time and quality benefits that existing users experience.

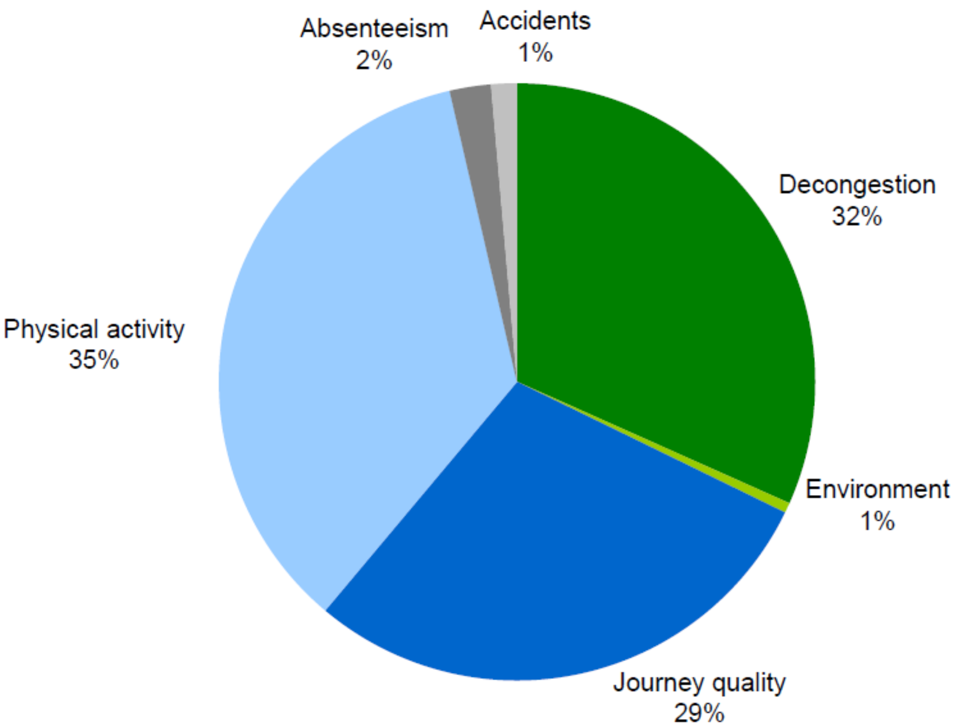

Figure B2 Proportion of benefits attributable to each main impact

Figure 3: WebTAG case study of new cycling and walking infrastructure: balance of benefits

The PCT cannot incorporate these benefits directly because our scenarios are based around changes in cycling propensity, rather than specifying the infrastructural change required. However, it is possible to use the PCT to estimate journey quality changes, where specific schemes are planned or hypothesised. It might be assumed that Dutch quality infrastructure is necessary to achieve the Go Dutch scenario although it cannot be assumed that Dutch quality infrastructure would be sufficient.

Example: journey quality and the hypothetical 'A264 corridor improvement scheme'

Assumptions

1. That the full 'ebike scenario cycling potential' gains will be achieved for 75 origin-destination pairs, which could currently use the A264 corridor (highly ambitious).
2. That no other cycling uptake occurs along this corridor (highly conservative, but to some extent acting to balance assumption (1). Overall one could consider that it is as if a relatively modest scenario increase in overall cycling is assumed – although of course non-commute trips may have different destinations – but we do not have data as yet in the PCT for these non-commute trips).
3. That all existing cycle commuters are using the A264 (unlikely, but a simplifying assumption, and one that will not make much difference in practice as existing cycle commuters make up only 5% of all scenario commuters – demand for cycle commuting along this corridor seems suppressed to an exceptional degree).

4. That cycle commuters will use the track for approximately a third of their commute trips – a more accurate figure could be calculated using GIS software, however, this simplifying assumption has been used here.
5. That the journey quality value of having a high-quality cycle track alongside the A264 is 7.03 pence per minute in 2010 prices (derived from WebTAG). To simplify matters it has been assumed that there are no monetary benefits stemming from the improvements that would need to be made to feeder routes.
6. The 'rule of a half' has been used, i.e. that existing commuters receive the full benefits (58 commuters) while the 1069 new commuters only receive half of the benefits.

Methods

1. For each of the 75 OD pairs, we used the Cyclestreets figure for time taken per fast-route return commute. This is provided in seconds, so needs to be divided by 60 to give minutes.
2. We then used the 'Census' and 'ebike' commuter numbers for each OD pair to derive (i) new and (ii) existing commuters. In this case, with an ambitious scenario on a route with currently low cycling, the vast majority of commuters (1069/1127) new.
3. We multiply (1) and (2), so that for each of the 75 OD pairs, we now have the daily minutes spent commuting for (i) new and (ii) existing cycle commuters. All these figures are then divided by 1/3, as we are assuming the cycle commuters will use the new track for approximately a third of their commute trips. As the benefits for new commuters are halved, we then divide those figures by 2.
4. We then add the new and existing commuter 'daily minutes of benefit' together, to provide a single figure for each OD pair.
5. For each OD pair, we multiply the 'daily minutes of benefit' by 7.03, and divide by 100 to provide the benefit in pounds.

The daily commuter benefit, following steps 1-5, is £1,321.37 for the 1127 commuters, comprised of £1,189 of benefits for new and £133 of benefits for existing cyclists. Assuming on average cycle commuters make 136.5 return commutes annually (based on an average of 5.24 cycle commute trips per commuter cyclist in an average week) this would equate to an annual benefit of £180,367

Using the NPV assumptions used previously, this becomes a twenty-year appraisal NPV of £1,310,372.

4. Time savings benefits

The 'fast' and 'quieter' route data downloads include estimated journey times, using the journey time calculated by cycling journey planner Cyclestreets. This potentially allows for the estimation of time savings benefits for the individuals that switch that stem from building, for example, higher quality infrastructure along an A road that would currently be off-putting to all but the hardiest of .riders. The West Sussex example allows the comparison of routes involving the currently recommended 'quieter' routes with the more direct routes that would use the A264 between Crawley and Horsham. The median increase in journey time is around 40% for the quieter routes, due to the A264 being flat and alternatives often being hillier as well as longer.

An alternative would be to focus on changes in distance as provided by Cyclestreets. While their time estimate is based on assumptions about how fast cyclists might travel on routes as they are, changes in distance are independent of this. In flat areas, therefore, one might want to focus on distance, particularly as potentially quieter routes might be made faster, by for instance changing priorities at junctions along the route.

It might be assumed that people switching from other modes to cycling might take longer than for their previous journey, but this is not necessarily the case. The complementary Impacts of Cycling Tool (ICT; www.pct.bike/ict) uses National Travel Survey data to examine how trip switching might impact journey time (and health and carbon emissions). The ICT shows that for nearly half of all trips switched to cycling, journeys are slower while for the other half they are faster. Most of those that are faster by bike are walk trips while slower trips are mainly car trips. These estimates of journey time savings may be underestimates given that the ICT does not eliminate between journey purposes. Car trips are likely to be slower at peak times when most commute trips are made; however, a lower than average proportion of commuting trips are by walking.

7. References

Gössling, S. and Choi, A.S. (2015) Transport transitions in Copenhagen: Comparing the cost of cars and bicycles, Ecological Economics 113: 106-113