Forecasting Demand Changes from Cycling Investments: A New Forecasting Tool

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Introduction

There have been large increases in active travel spending in the last few years (especially cycling)

There is a requirement under the Transport Appraisal Framework (TAF) to undertake a Multi-Criteria Analysis for projects over 30 million euros

Modelling will be needed in such cases to assess the impact of schemes/investments (including mode shift)

Need for an ***easy-to-use modelling tool*** – application rather than pure research

Note: Very brief overview today – I'm available to discuss more later

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Challenges

Traditional transport modelling has been focused on road and public transport schemes

Larger investments (Luas, Metro) with bigger impacts than cycle routes

Modelling tools designed for such schemes and have difficulties detecting the impacts of small schemes (5km cycle path etc.)

Smaller projects need proportional modelling: You can’t build bespoke models for every cycle track

Modelling needs to be quick and easy but consistent across projects

Existing Resources/Methods

Existing guidance (TAG Unit A5.1) from the UK provides a few options, we will focus on *disaggregate mode choice models* based on (Wardman, Tight, Page, 2007) - marginal utility change

Key point - the change in the utility of cycling predicts the change in the cycling mode share

$$P_y^f = \frac{P_y^b e^{\Delta U_y}}{P_y^b e^{\Delta U_y} + (1 - P_y^b)}$$

Where:

ΔU_y is the change in utility of the cycling mode, in year *y*

P_y^b is the proportion of those choosing to cycle out of the maximum of those where it is a viable option, without any intervention, in year *y*

P_y^f is the proportion of those choosing to cycle out of the maximum of those where it is a viable option, with intervention, in year *y*.

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Disaggregate Mode Choice Model

Based on a multinomial mode choice model – standard for choice modelling

Relates changes in the cost/utility of cycling to cycling's mode share

It holds all other modes constant – reasonable assumption for a small scheme

TAG provides the methodology but not a tool – requires modellers to have enough knowledge to build their own/do analysis (slow too)

Parameters provided are also UK specific- Irish parameters and sensitivities are need, as is consistency with existing strategic models

Disaggregate Mode Choice Model

In the NTA Regional Models we model cycling improvement using speed increases as a proxy - “generalised speed” as the model needs to operate with a standardised metric

Speed gain equivalent to benefit from safer infrastructure

These increases are sourced from the same study as UK parameters, but in a different format - we use generalised speed not monetary benefits

Table 9.1 Coded Network Speeds

Link Classification	2016 modelled speed (km/h) P1.5
Base network speed	13.6
B1/S2	16.8
S1/C3	18.3
C2	19.2
C1	19.5
G1	19.9

(*) Base network speed is calculated from the NHTS

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Disaggregate Mode Choice Model

A sensitivity parameters is still needed to convert costs/speed into utility – the driver of mode choice

Again, a standard approach in mode choice modelling and tells us how sensitive mode preference is to investment

The NTA models have 33 such parameters, 1 per demand segment

For ease of use, the tool uses a demand weighted average parameter for all people and all trip purposes

~ -0.12 is used (for reference commuters are the least sensitive = -0.07, and primary education is the most sensitive = -0.2)

Worked Example

NTA Cycling Demand Forecasting Tool

Instructions

1	Divide your project into sections based on the Do Nothing cycle infrastructure present (or lack there of)
2	Combine sections with the same infrastructure and calculate length per infrastructure type
3	Insert the combined section lengths and insert the appropriate speed from the Cycle Speeds Lookup table provided
4	Repeat Steps 1-3 for the Do Something
5	Set the proportion of trip makers you think will consider cycling as a viable mode (if unknown set to 50% as per NHTS bicycle ownership data)
6	Insert the Do Nothing cycle flows for your location
7	Insert the Do Nothing cycle mode share for your location
8	Check if the All modes trip check makes sense for your location - this should equal the total trips by all modes at the location
Note	This tool is suitable for cycling investments below 12k and uses values from the Regional Modelling System. Based upon disaggreate models outlined in https://www.gov.uk/government/publications/tag-unit-a5-1-active-mode-appraisal

Cells of this colour require you to input data

Cells of this colour provide outputs

Section Inputs

Do Nothing Infrastructure	Section Length km	Section Speed kph	Travel Time Mins	Utility
Section 1	*0.16*	*16.8*	0.57	-0.070
Section 2	*1.67*	*18.3*	5.48	-0.672
Section 3	*0.12*	*19.2*	0.38	-0.046
Section 4	*1.15*	*13.6*	5.07	-0.622
Section 5			0.00	0.000
Section 6			0.00	0.000
Total/Average Checks	3.1	16.98	11.50	-1.410

Do Something Infrastructure	Section Length	Section Speed	Travel Time Mins	Utility
Section 1	*3.1*	*19.2*	9.69	-1.188
Section 2			0.00	0.000
Section 3			0.00	0.000
Section 4			0.00	0.000
Section 5			0.00	0.000
Section 6			0.00	0.000
Total/Average Checks	3.1	19.2	9.69	-1.188
Same Length Check	Same Length			

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Limitations

This tool has been designed specifically for small schemes that are linear in nature

Doesn't account for changes in destination choice

Doesn't account for junction upgrades

Doesn't account for network effects and changes to perception of cycling – highly unlikely to occur due to a small scheme

Not a greenway assessment tool – Tools available from TII for this

Forecasting Guidance

This tool forms one part of a larger guidance piece on cycling demand forecasting

The guidance covers a wide range of investment types and projects, from small local investments to full scale network upgrades

Tells users when the tool is applicable

Full guidance to be published on the NTA website later this year

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Summary

There is a need to model the impact of smaller active travel schemes

Modelling needs to be proportional to project size – full strategic model runs are not suitable, so an off the shelve tool seems appropriate

Modelling approaches should be consistent across projects

This tool provides an easy-to-use solution to these requirements, while still being consistent (in terms of ***model response mechanisms***) with Irish strategic models

Summary

Thank You – Any Questions?