Institution: University of the West of England, Bristol

Unit of Assessment: 13

Title of case study: Promoting better designed cycle infrastructure

Period when the underpinning research was undertaken: 2013 – 2018

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Dr Caroline Bartle	Research Fellow	Sep 2013 – present
Dr Kiron Chatterjee	Associate Professor in Travel Behaviour	Sep 2003 – present
Dr Ben Clark	Senior Lecturer in Transport Planning and Engineering	Sep 2011 – present
Dr Juliet Jain	Senior Research Fellow	Dec 2003 – present
Professor John Parkin	Professor of Transport Engineering	Oct 2013 – present

Period when the claimed impact occurred: 2014 – 2020

Is this case study continued from a case study submitted in 2014? No

1. Summary of the impact

Research conducted by the Centre for Transport and Society (CTS) at UWE Bristol has produced a significant body of evidence relating to cycling, road-user interactions with cyclists, the effectiveness of different forms of cycle infrastructure provision, and its impacts on travel behaviour. This has had wide-ranging impacts in terms of policy, cycle planning guidance, infrastructure provision, tools and design standards at a local and national level in the UK and internationally across Europe. CTS research has helped ensure that investment in cycling is well-directed, and it has helped maximise the renaissance in cycling, and the benefits of cycling, both across the UK and internationally. CTS has also developed and promoted good planning and design practice and professional practitioner capacity, to help create effective interventions through research-informed training and development programmes.

2. Underpinning research

Research into travel behaviour and road user interactions conducted by the Centre for Transport and Society (CTS) at UWE has produced a body of evidence relating to the effectiveness of, and required specifications for, networks of cycle infrastructure. The findings demonstrate the need for the speed of cycling to determine geometric design of routes for cycle traffic, and the need for cyclists to be provided with attractive and comfortable networks that keep them separated from motor traffic (**R1**).

Travel behaviour research

Between 2009 and 2013, CTS undertook original research investigating the underlying reasons people start, stop or significantly change their amount of cycling. Interviews were conducted with residents of 12 towns and cities in England that were experiencing an unprecedented scale of investment in cycling, via the Cycling City and Towns programme (2008-11). The research found that life events usually prompted people to consider cycling, but that new and improved cycle routes were key to giving people the confidence needed to actually start cycling (**R2**, **G1**).

To understand whether interventions to promote cycling produced changes in long-term travel behaviour in the Bristol travel-to-work area, CTS tracked commuters' travel choices during a 15-month period (2014-15), when investment was being made into cycling infrastructure (**R3**, **G2**,

and linked with **G3**). The panel study dispelled the notion that commuters have one fixed way of travelling to work, and showed that many commuters who drive to work also cycle one or more days a week. The researchers found that 10% of commuters who drove to work increased their use of alternatives to driving, especially cycling, during the investment period; this change was more likely among commuters who were aware of local sustainable transport measures. CTS concluded that the investment programme had succeeded in increasing cycling levels. This finding for a specific region of Bristol was corroborated by CTS research that evaluated the impact of the Cycling City and Towns (CCT) programme (which included 11 towns and Greater Bristol and ran 2008-11) and the Cycling Demonstration Towns (CDT) programme (six towns, running 2005-11). The evaluation found that the annual rate of growth in cycling for the programmes overall was 5.3% and 8.0% respectively, which are comparable to rates of growth seen in international cities with long-term commitments to cycling (**R4**).

In 2014-15, CTS collaborated with three other universities to consider cycling behaviour in older adults – the Cycle BOOM project. Unlike other parts of Northern Europe, such as Denmark and the Netherlands, older adults are severely under-represented amongst those that cycle in the UK. Yet, cycling has the potential to improve physical and mental health for the over fifties population in England (**R5**, **G4**). CTS led the Cycle BOOM project team in conducting in-depth biographical interviews of 236 participants in four different locations in England, which gave a deep understanding of factors that can encourage people to continue cycling or re-start cycling in later years. The project's recommendations on what is needed to move towards 'age-friendly cycling mobility' included: reducing the fear of cycling by providing more cycle routes that are separate from motor traffic; and low-speed traffic zones, to create safer, more pleasant cycling conditions for all.

Road user interactions

CTS has been an innovator in undertaking empirical research relating to car driver, cyclist and pedestrian behaviour. We found that drivers overtake more slowly in the presence of narrower lanes, lower speed limits, and the absence of centre-line markings (**R6**). Drivers also overtake further away from cyclists on roads with more than one lane in the direction of travel. With respect to pedestrian and cyclist interactions, CTS research has discovered varied and conflicting views about how these two groups should interact on shared routes; we concluded that different routes are needed for each type of user (**R1**).

In a systematic review, we identified that: cycle lanes do not reduce the rate of cycle collisions; 20mph speed limits may reduce cyclist collisions; cycle lanes marked on the carriageway of a roundabout increase cycle collisions; but cycle tracks around them may reduce collisions (**G5**).

The conclusions from this research were that, for the benefit of all users, cycle traffic interactions with other road users should be limited, but where interactions are unavoidable, speeds and volumes of motor traffic should be low.

3. References to the research

R1 Parkin, J. (2018) *Designing for cycle traffic: international principles and practice*. ICE Publishing, London. https://doi.org/10.1680/dfct.63495
R2 Chatterjee, K., Sherwin, H. and Jain, J. (2013) Triggers for changes in cycling: The role of life events and modifications to the physical environment. *Journal of Transport Geography*, 30, 183-193. https://doi.org/10.1016/j.jtrangeo.2013.02.007
R3 Chatterjee, K., Clark, B. and Bartle, C. (2016) Commute mode choice dynamics: Accounting for day-to-day variability in longer term change. *European Journal of Transport and Infrastructure Research*, 16 (4). pp. 713-734. https://doi.org/10.18757/ejtir.2016.16.4.3167
R4 Sloman, L., Cope, A., Kennedy, A., Crawford, F., Cavill, N. and Parkin, J. (2017) Summary of outcomes of the Cycling Demonstration Towns and Cycling City and Towns programmes.

Report to the Department for Transport. https://www.sustrans.org.uk/media/2964/2964.pdf
R5 Jones, T., Chatterjee, K., Spinney, J., Street, E., Van Reekum, C., Spencer, B., Jones, H., Leyland, L.A., Mann, C., Williams, S. and Beale, N. (2016). *cycle BOOM. Design for Lifelong Health and Wellbeing. Summary of Key Findings and Recommendations*. Oxford Brookes University, UK. https://www.cycleboom.org/wp-content/uploads/2016/09/cB_Summary_Report_Sept2016_Digital.pdf
R6 Shackel, S. and Parkin, J. (2014) Measuring the influence of on-road features and driver behaviour on proximity and speed of vehicles overtaking cyclists. *Accident Analysis and Prevention*, 73 pp100-108. http://dx.doi.org/10.1016/j.aap.2014.08.015

Evidence of the quality of the underpinning research

G1 Chatterjee, K. *Evaluation of Investment in Cycling*, Department for Transport, 2009 – 2013, £175,075.
G2 Chatterjee, K. *Local Sustainable Transport Fund Evaluation Framework: Case Study theme 'Strategic Employment Sites and Business Parks'*, Department for Transport, 2013 – 2018, £85,100.
G3 Parkin, J. *Local Sustainable Transport Fund, Evaluating LSTF,* funded by Department for Transport via Bristol City Council, 2012 – 2017, £219,725.
G4 Chatterjee, K. *cycle BOOM: Design for Lifelong Health and Wellbeing,* EPSRC, 2013 – 2016, £194,349.
G5 Parkin, J. *Cochrane review: Cycling infrastructure for reducing cycling injuries in cyclists*, National Institute for Health Research, 2014 – 2016, £7,528.

4. Details of the impact

CTS research has helped ensure that investment in cycling is well-directed; maximizing the renaissance in cycling and therefore maximizing the benefits of cycling across the UK and beyond. We define the impact of CTS research under two headings: implementation of cycling infrastructure programmes of work; and cycle planning guidance, design standards and tools.

Implementation of cycling infrastructure

CTS research has influenced government provision of cycling infrastructure at regional, national and international scales. Research has contributed to programme designs in six European cities, through the EU Horizon 2020 FLOW project (2015-2018). This aimed to address urban congestion by creating more opportunities for walking and cycling, using modelling techniques to assess the effectiveness of cycling (and walking) measures. In particular, CTS research had an impact on the design of the public bike share scheme in Budapest, design solutions for College Green in Dublin, the museum quarter in Munich and street re-designs in Lisbon (**R1**, **R5**, **R6**). The Project Manager at FLOW confirms the impact on the schemes developed in the project as a result of the '*responsible and informed use of transport modelling tools'* which came from CTS *'insights of … research to the infrastructure design*' (**S1**). Building on the work, CTS research was also *'instrumental in shaping the FLOW project's final recommendations*' for congestion reduction (**S1**), now being implemented in Budapest, Dublin, Gdynia, Lisbon, Munich and Sofia.

CTS research has demonstrated, in a UK context, the effectiveness of well-designed cycle investment programmes for increasing confidence of people to cycle (**R2**) and the numbers of people cycling (**R3**, **R4**). It also identified factors which reduced levels of cycling among older adults compared with mainland Europe (**R5**, **G4**). This evidence has helped local councils in the Bristol city-region (combined population 1,100,000) justify continued and expanding investment in cycling (**S2**). The lead authority, Bristol City Council, reports that CTS research on cycling infrastructure and behaviours has been:

> *'a material factor in our continued success in winning extension funding, and latterly the £8 million of Access Funding (2017/18 to 2020/21) for continued*

investment in promotion and behaviour change measures linked with cycling' (**S3**).

Findings also supported decisions on cycle infrastructure in Wales. In 2018, CTS reviewed 22 active travel network investment plans produced by Welsh authorities to help the Welsh Government decide which to fund. The Head of Active Travel and Road Safety at the Welsh Government noted the value of UWE research into '*factors which make cycling networks attractive and comfortable for cycle users*', and which help minimise '*interactions between cycle users and pedestrians and motor traffic*' (**R4**, **R5**, **R6**, **S4**). As a result of the review by CTS, a number of local authorities were directed to undertake further work on their network plans. The same source commented that:

'the review by the Centre for Transport and Society therefore helped us target limited resources to the areas and schemes which would have maximum impact on uplifting cycling (and walking) levels' (**S4**).

Cycle planning guidance, design standards and tools

Guidance and design standards have been an important influence on policy change, investment decisions and the provision of cycling infrastructure. CTS co-authored cycle planning guidance published in 2014 by the Chartered Institution of Highways and Transportation (CIHT) – a body of transportation professionals from around the world (**S5**). The guidance, accessible to CIHT's 13,000 members, draws on CTS research, suggesting the need for attractive and comfortable networks for cycling separated from motor traffic and pedestrians (**R6**).

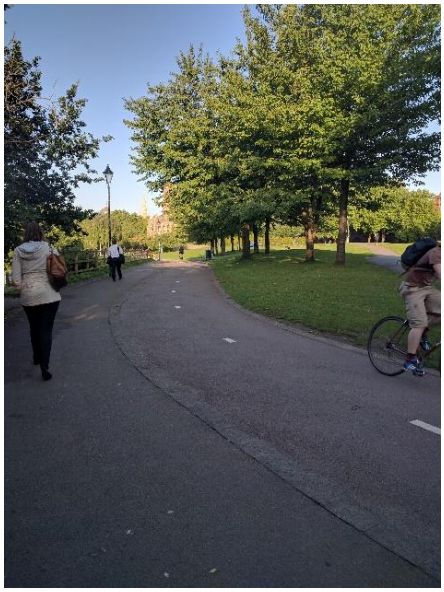
At a national level, CTS research has informed tools and guidance developed by the UK's Department for Transport (DfT). Research underpinned advice to the DfT on infrastructure provision included in the web-based Cycle Infrastructure Prioritisation Toolkit (CyIPT) developed in 2018. This tool allows scheme planners to identify where cycle infrastructure is needed, and CTS research (e.g. **R1**, **R6**) informed the specification for cycle infrastructure to be provided (e.g. cycle tracks, stepped cycle tracks, and different levels of separation) (**S6**). CTS also contributed to the development of DfT's *Local Cycling and Walking Infrastructure Plans* guidance and tools, through work commissioned by DfT (**S7**). All 343 English local authorities are required to comply with these methods for planning and designing cycle networks.

CTS was a principal author of the standard for designing for cycle traffic on major A-roads (**S8**). This was developed over the period 2014-16 as part of the Design Manual for Roads and Bridges, a suite of documents containing requirements and advice relating to the strategic road network operated by, or on behalf of, the devolved nation governments of the UK. It is also used by highway authorities as a reference source for local roads. CTS contributions drew on research about driver and cyclist interactions, and helped shape design standards, including, for example, separation needed between cycle and motor traffic (as summarised in **R1**). The Head of Road Safety at Highways England commented that:

'*CTS research made a particularly important contribution to determining the specifications of horizontal and vertical geometry and stopping sight distances for the design of cycle tracks'* (**S9**).

CTS contributed to Transport for London's international cycling infrastructure best practice study (**S10**) which in turn was influential in the comprehensive revision and update of the London Cycle Design Standards, used to implement cycle infrastructure schemes in London. At UK-wide level, and as part of a DfT commissioned team, UWE researchers influenced the selection and writing of 10 case studies for developing innovative cycling infrastructure, used to stimulate improvements in design (**S11**).

UWE's Professor John Parkin is a member of DfT's Cycle and Walking Infrastructure Group which provides advice on cycling to the UK government and local authorities (**S2**). That group commissioned the recently published and substantially revised and updated Local Transport Note (LTN) 1/20 *Cycle infrastructure design*. Parkin was also a member of a consultancy team that re-drafted the LTN. As an example of the contribution of CTS research, specific reference is made in the Note (p104) to design parameters for traffic signal control design developed by Parkin in his monograph (**R1**).



Finally, CTS has made significant contributions to planning and design practice through extensive provision of training and development activities for professional practitioners. This has included pedagogical and content development for the e-learning package on designing for cycle traffic published by Highways England (**S12**, see also **S8**). This package was used by 3,000 designers in its first two years (to September 2018) (**S9**). CTS also delivers MSc's in Transport Engineering and Planning, and Transport Planning, underpinned by CTS research including work on transport behaviour, cycling and infrastructure provision and its application in practice.

5. Sources to corroborate the impact

S1 Testimonial from the Project Manager at EU FLOW project
S2 Testimonial from the Head of Cycling and Walking Investment Strategy and Policy, Department for Transport
S3 Testimonial from the Head of Local and Sustainable Transport, Bristol City Council
S4 Testimonial from the Head of Active Travel and Road Safety Policy, Welsh Government
S5 Gallagher, R. and Parkin, J. and (2014) *Planning for cycling*. London: Chartered Institution of Highways and Transportation
S6 Department for Transport (2018) Cycling Infrastructure Prioritisation toolkit https://www.cyipt.bike/
S7 Department for Transport (2017) *Local Cycling and walking infrastructure plans. Technical guidance for local authorities* https://www.gov.uk/government/publications/local-cycling-and-walking-infrastructure-plans-technical-guidance-and-tools
S8 Highways England (2019) CD 195 *Designing for cycle traffic* (formerly IAN 195/16 published in 2016) https://www.standardsforhighways.co.uk/dmrb/search/5bb8f60c-737b-49f8-8c40-522a49038eff
S9 Testimonial from the Head of Road Safety, Highways England
S10 Transport for London (2014) *International cycling infrastructure best practice.*
S11 Department for Transport (2016) *Ten case studies developing new cycling infrastructure*
S12 Highways England (2016) E-learning package linked with Interim Advice Note 195/16 Cycle traffic and the strategic road network https://cycletraffic-elearning.com/