



Institute for Transport Studies (ITS)

Research Report 2017

Research by ITS has added to the body of evidence about the dangerous levels of air pollution emitted from diesel vehicles. Working with Transport for London, **Dr James Tate** investigated the emission performance of a range of new (Euro 6/VI) cars, trucks and buses. The results showed that, despite permissible levels of oxides of nitrogen (NOx) emissions being achieved under laboratory conditions, levels in real driving conditions from diesel cars were significantly higher. Dr Tate's projects are described on pages 23 and 24.



Truck simulator – warning of cyclists approaching in driver's blind spot
[TruckSIM video](#)

This technology is part of a suite of simulators (car, truck and

pedestrian) at the University of Leeds. The facility, led by **Professor Richard Romano**, offers an inclusive simulation service for research. Visit the Simulator website at <https://uolds.leeds.ac.uk/>

Propensity to Cycle Tool (PCT)

Mapping the best locations for cycling infrastructure ([PCT video](#)).

A new online tool developed by **Dr Robin Lovelace** in collaboration with three other UK universities will help policymakers to identify the areas and routes in England that offer the

greatest potential for cycling. The Propensity to Cycle Tool, funded by the Department for Transport, will help prioritise transport investment decisions and is widely seen as representing a step-change in planning strategically to promote cycling. Visit www.pct.bike



INTRODUCTION

2017 marked the 50th anniversary of the establishment of the Centre for Transport Studies at Leeds, as the forerunner of the Institute for Transport Studies (ITS) which was later formed in 1971. Our 50th year began with a visit by the Secretary of State for Transport to officially re-open the ITS building, following completion of a £4m project to extend and fully refurbish our facilities. During his visit, Mr Grayling met with leading researchers who showcased various ITS research impacts including Network Rail's efficiency targets and Euro NCAP's safety ratings of new cars.

"I'm confident that Leeds University students will play a huge part in shaping a modern transport system for the future"

Rt. Hon. Chris Grayling MP, Secretary of State for Transport.

The Institute has enjoyed the benefits of a three-storey modern extension with social space, seminar rooms and PhD study area. The original buildings of 34-40 University road were remodelled to accommodate a range of meeting rooms, plus an upgrade to the wired infrastructure. This has resulted in an improved learning environment, and has greatly enhanced the quality of interactions between our students, staff and industry partners.

A notable achievement this year was the Institute's excellent position in global rankings for transport studies, achieving 4th of 150 institutions in the world, some 17 places above its nearest UK competitor. These [Academic Ranking of World Universities](#) are based on a set of objective indicators and third-party data. At the University level, our optimism was further buoyed by the award of the University of the Year 2017 by The Times and The Sunday Times 'Good University Guide', as well as a Gold rating in the Teaching Excellence Framework.



Staff Changes

In 2017 we celebrated the promotions of **Professor Samantha Jamson** (Chair in Transport and Psychology), **Dr Caroline Mullen**, **Dr Manuel Ojeda-Cabral** and **Dr Phill Wheat**.

Beyond ITS, **Professor Peter Woodward** has been appointed as Chair in High Speed Rail Engineering in the School of Civil Engineering. He will be responsible for developing a new Institute for High Speed Rail Engineering at the University, using his expertise in geotechnical engineering to create a world leading research and innovation hub with an emphasis on train-track interaction and infrastructure systems.

Thanks to a number of large grant awards ITS welcomed eleven new research assistants: **Samuel Bennet**, **Dr Chiara Calastri**, **Madga Cepeda Zorrilla**, **Oscar Giles**, **Dr Gillian Harrison**, **Hrvoje Jukic**, **Dr Tyron Louw**, **Dr Malcolm Morgan**, **Dr David Palma**, **Thomas Redfern**, **Albert Solernou Crusat**, and **Dr Jean-Christophe Thiebaud**. We also welcomed **Dr Fangni Zhang** to the core academic staff. **Kirstie Stewart** and **Emma Tsoneva** joined as research project coordinators.

We bade farewell to Dr Dong Ngoduy, Dr Astrid Guehnemann, Dr James Laird, Dr Luigi Pariota, Dr Louise Reardon, Dr Craig Morton and Dr Ian Jones who left for pastures new.



In memoriam Dr Frank Lai 1969-2017: we are deeply saddened to inform you that our friend, colleague and alumnus Frank Lai passed away after a courageous battle against cancer. Frank graduated from ITS with an MSc (Eng) Transport Planning & Engineering in 1997 and continued his PhD in Transport Studies graduating in 2005.

In his honour, the University lowered its flag on the day of his funeral in commemoration of Frank's dedicated service to the institution. His legacy will be carried forward as we celebrate his life through the newly created annual Frank Lai Student Award for "most impactful dissertation" that was presented for the first time at the Graduation ceremony in December.

Awards and Prizes

The International Choice Modelling Conference (ICMC) has named its new prize in honour of **Emeritus Professor Andrew Daly**. The ICMC award for the most innovative application in choice modelling was set-up to reflect Prof Daly's contributions to the field and his role in setting up the conference series.

Professor Stephane Hess won the award for the most innovative application of choice modelling at the 5th International Choice Modelling Conference (ICMC) in Cape Town for his paper 'Using advanced choice models to study animal behaviour'.

Close to 500 participants convened for the 15th CIVITAS Forum, including **Professor Susan Grant-Muller** in her capacity as leader of the [EMPOWER](#) project funded by Horizon 2020. EMPOWER's Take-Up City, Bologna, won the CIVITAS Award 2017 in the "Bold Measure" category for their Bella Mossa Campaign. This award is given to a city that adopts a daring and innovative approach to sustainable urban mobility.

A research paper by **Professor Karen Lucas, Dr Giulio Mattioli, Alvaro Guzman and Ersilia Verlinghieri** entitled 'Transport poverty and its adverse social consequences' won the ICE Publishing Webb Prize 2017 as the 'best paper on non-road transport engineering'. The prize is awarded to authors who have produced work judged by their peers to be of exceptional quality and benefit to the civil engineering, construction and materials science community.

Emeritus Professor Peter Mackie was awarded the Lifetime Contribution to

Transport in Northern England. Prof Mackie is a leading UK academic figure in transport policy and economics specialising in transport appraisal and the issues of regulation and deregulation. He received the award from Lord Adonis and Professor David Begg.

PhD student **Chiara Calastri** won the Postgraduate Teaching, PGR Student category in the Leeds University Partnership Awards. These awards recognise and celebrate the achievement, commitment and impact of students, staff and the Postgraduate Researcher (PGR) community.

Research student **Fiona Crawford** was awarded the Smeed Prize 2017, which recognises the best student paper and presentation at the Universities' Transport Study Group (UTSG) annual conference. Fiona presented a paper entitled 'A method for clustering road users based on trip regularity using Bluetooth data', and was commended by the judges for the high quality of both her written and oral presentations of the work.

PhD student **Thomas Hancock** was awarded Best Student-led paper for 'Decision field theory: improvements to current methodology and contrasts with standard choice modelling techniques' at the International Choice Modelling Conference.

Influencing Government Policy

Professor Simon Shepherd and **Dr Chandra Balijepalli** have been working with the Greater Jakarta Transport Authority (GJTA) to develop a test-bed for the region using a dynamic land-use transport interaction model (MARS). The model will provide an innovative approach to help the Indonesian Government test its proposals for new major infrastructure investments. It has been used in the initial testing of proposed transport policy options for the city region, such as new mass rapid transit lines and road pricing.

The London Assembly Transport Committee report, [London's Bus](#)

[Network](#), has found that, following a decade of strong growth, bus passenger numbers are now in decline. In the report **Dr Ronghui Liu** called for a redesign of the bus network based on the feeder/trunk model and improvements to the passenger experience with better information and facilities.

Dr Giulio Mattioli, Dr Ian Philips and **Prof Karen Lucas** gave a seminar at the Department for Transport (DfT) where [graphic results of their research on Energy-Related Economic Stress](#) were presented. The research team used anonymised data from the DVLA and MOT vehicle test records to estimate average household expenditure on motor fuels at the level of small local zones and showed the correlation between economic stress and the dependency on cars in deprived areas. The seminar was attended by more than 100 policy makers from DfT and beyond. The seminar was also presented to HM Treasury and the research findings are available in the following publications:

Mattioli G, Lucas K, Marsden G (2017) [Transport poverty and fuel poverty in the UK: From analogy to comparison](#). *Transport Policy*, **59** 93-105.

Mattioli G (2017) ['Forced Car Ownership' in the UK and Germany: Socio-Spatial Patterns and Potential Economic Stress Impacts](#). *Social Inclusion*, **5** 147-160.

Appointments to advisory panels

Professor Richard Batley is a member of the DfT Joint Analytical panel. Profs Batley and Peter Mackie produced a report for the DfT: ['Independent Peer Review of The Economic Impact Of Night Flights Research Study'](#) which is published on the [gov.uk](#) website.

Professor Andrew Smith and **Professor Chris Nash** have been appointed to the Advisory Board of the newly established Italian Transport Regulation Authority. The first meeting was held in June in Turin.

Professor Andrew Smith has been advising Ofwat for several years on technical aspects relating to econometric modelling for the purpose of benchmarking water companies in England and Wales. This analysis is used to set water bills for customers. Professor Smith has led the development of the new 'Totex' benchmarking framework and has taken on a peer review / advisory role for Ofwat. Professor Smith has advised on the modelling approach for the Ofwat 2019 Periodic Review.

Dr Kate Pangbourne has been appointed as academic member to the Scottish Government's National Transport Strategy Strategic Framework Working Group. Kate led a research workshop/knowledge exchange event with the Scottish Environmental Protection Agency at the University of Aberdeen. Kate Pangbourne has also been appointed to the EU-funded MoTiV project Advisory Board, which will run until April 2020. The "Mobility and Time Value" (MoTiV) project addresses emerging needs and perspectives on Value of Travel Time.

Professor Jillian Anable has been invited to Chair the National Transport Strategy for Scotland Research and Evidence Group (2017-2019). She has attended a roundtable discussion on the Scottish Government's Climate Change Plan and Energy Strategy in Edinburgh as well as introducing the topic at HM Treasury's "congestion roundtable".

Professor Natasha Merat attended the London Assembly Transport Committee (automated vehicles) and the DfT Centre for Connected and Automated Vehicles as expert advisor and is an Advisory Board member of Meridian Mobility Technology. Natasha also contributed to a number of roundtable discussions on driverless vehicles, traffic safety and the future of mobility.

Academic visits and presentations

Among the many, here is a flavour of the stimulating activities engaged in

by our academic staff to promote their research expertise around the globe:

Dr Chandra Balijepalli visited Manila, Philippines on a trip sponsored by the British Embassy. As part of his visit, Dr Balijepalli delivered a public lecture entitled 'A tale of two cities: toll setting game with simulation results' at the University of Philippines which was attended by students, staff and representatives of the Ministry of Transport and Local Authorities.

Professor Karen Lucas gave a presentation on Socially Inclusive Transport to audiences in Ottawa, Canada at the National Capital Commission for policymakers from Federal and Local Government and NGOs, and at the British High Commission for the general public. Karen also attended Transport Systems Catapult and Highways England workshops on Community and Environmental Impacts of Future Transport.

Professor Richard Romano visited NASA's Johnson Space Center in Houston to lead a two day workshop with NASA engineers on opportunities for applying current driving simulation technologies to the Mars Rover. During the visit Prof Romano had the opportunity to drive the prototype Mars Rover over a variety of simulated lunar terrain.

In 2017 **Dr James Tate** was invited on multiple occasions to speak to the media and to give evidence to expert panels on air quality. His appearances include: providing evidence to Leeds County Council's air quality scrutiny board; leading an air quality workshop at the Leeds City Council 'State-of-the-City' event with many local politicians; Air pollution & Asthma story on the BBC Inside Out West Yorkshire show; commenting on BBC Look North News on the Leeds Clean Air Zone plans; being an invited panellist for a www.iema.net/ webinar on 'Air Quality in the UK – Trends, Science and Politics'; and being ranked amongst the top ten air quality influencers by BreezoMeter – an international air quality information and technology company:

Dr Craig Morton submitted a report to TfL's public consultation on London's air quality and policy proposals.

Dr Phillip Wheat's work on optimal size of franchises and relative cost of open access was cited by the Transport Select Committee's report on rail franchising.

Following the Secretary of State's visit to ITS, **Professor Andrew Smith** was invited to DfT to give two talks on vertical integration and franchise / competition policy.

Dr Eva Heinen participated as an expert at WHO for a consensus meeting on the Development of the Health Economic Assessment Tools (HEAT) for walking and cycling.

International Visitors

In the spirit of international collaboration, we hosted a number of academic visitors most of whom presented their research to staff, students and the wider community. Seminar presentations are available to view on www.its.leeds.ac.uk/slideshare. Our visitors included: **Dr Laura Garach** from University of Granada, Spain hosted by Professor Natasha Merat. **Dr Robert Hrelja** from Swedish National Road and Transport Research Institute (VTI), Sweden hosted by Dr Caroline Mullen and Dr Zia Wadud. **Dr Tatjana Ibraimovic** from University of Lugano, Switzerland hosted by Professor Stephane Hess. **Professor Guoli Ou** from Beijing Jiaotong, China hosted by Dan Johnson. **Professor Luc Pellecuer** from École de Technologie Supérieure, Canada hosted by Dr James Tate. **Dr Shafiq-Ur Rahman** from Jahangirnagar University, Dhaka, Bangladesh hosted by Dr Paul Timms.

Our Postgraduate Research visitors included: **Malin Aldenius** from Lund University, Sweden who was hosted by Dr Caroline Mullen. **Rafael Goncalves** from Pontifical Catholic University of Rio de Janeiro, Brazil, **Penghui Li** from Tsinghua University, China **Yuki Okafuji** from Kobe University, Japan, and **Xue Qingwan** from Beijing University, China were hosted by Professor

Natasha Merat. **Pernille Holm**, **Markus Rothmueller** and **Aleksandra Vendelbo-Larsen** from University of Aalborg, Denmark were hosted by Dr Ruth Madigan and Professor Natasha Merat. **Matthiu Plourde** from École polytechnique fédérale de Lausanne, Switzerland was hosted by Dr Charisma Choudhury. **Rodrigo Tapia** from Federal University of Rio Grande do Sul, Brazil was hosted by Professor Gerard De Jong. Tian Zhang from Beijing Jiaotong University, China was hosted by Professor Andrew Smith. **Shuo Zhao** from Central South University, China was hosted by Dr Ronghui Liu.

Alumni

In 2017 we welcomed return visits by alumni **Raquel Lopez** (2010) at the ITS summer BBQ and **Leighton Cardwell** (2006) at our induction week networking event. **Chris Allan** (2013), **James Reeves** (1989) and **Noor Zaitun Yahaya** (2011) all hosted seminars at ITS. The [University Big Get Together](#) campaign saw five worldwide events hosted by ITS alumni in Ghana, Uganda, Bangladesh, New Zealand and Australia.

Many of our alumni meet each other around the world at conferences, events and in the workplace, proving that ITS really is the hub of a global transport network. We had the opportunity to catch up with alumni across Indonesia, USA, Argentina, Uruguay, and Leipzig. We currently have 155 career profiles on our website, representing 54 countries. If you would like to post your profile please write to info@its.leeds.ac.uk. For more alumni news, events and profiles visit www.its.leeds.ac.uk/alumni/news/.

Are you interested in recruiting ITS graduates?

Each year we hold Employer Visit Days where employers from the transport sector visit the campus to give presentations to, and/or interview current students. This is a unique opportunity for students to gain direct access to employers, and for employers to gain access to ITS graduates. International students make up 75%

of our full-time cohort and are drawn from 35 countries. International job opportunities would be greatly welcomed. Companies based outside the UK, and interested in employing ITS graduates for their international offices, can register their interest to take part in a Virtual Employer Day. This is a format whereby companies can deliver an on-line presentation, with the possibility to interview potential candidates remotely. We also have an [ITS LinkedIn page](#), onto which employers can upload job advertisements. If you would like to register your interest in our virtual employer days, or the visit days, please contact us. Contact details are shown at the end of this page.

PhDs awarded

Postgraduate research degrees were awarded to five of our students in the past year: **Valerio Benedetto** 'The impacts of regulatory structures on the efficiency of European railway systems'; **Chiara Calastri** 'Capturing and modelling complex decision-making in the context of travel, time use and

social interactions', **Fiona Crawford** 'Methods for analysing emerging data sources to understand variability in traveller behaviour on the road network', **Tyron Louw** (pictured centre) 'The human factors of transitions in highly automated driving'; **Arwa Sayegh** 'Uncertainties and errors in predicting vehicle exhaust emissions using traffic flow models'.

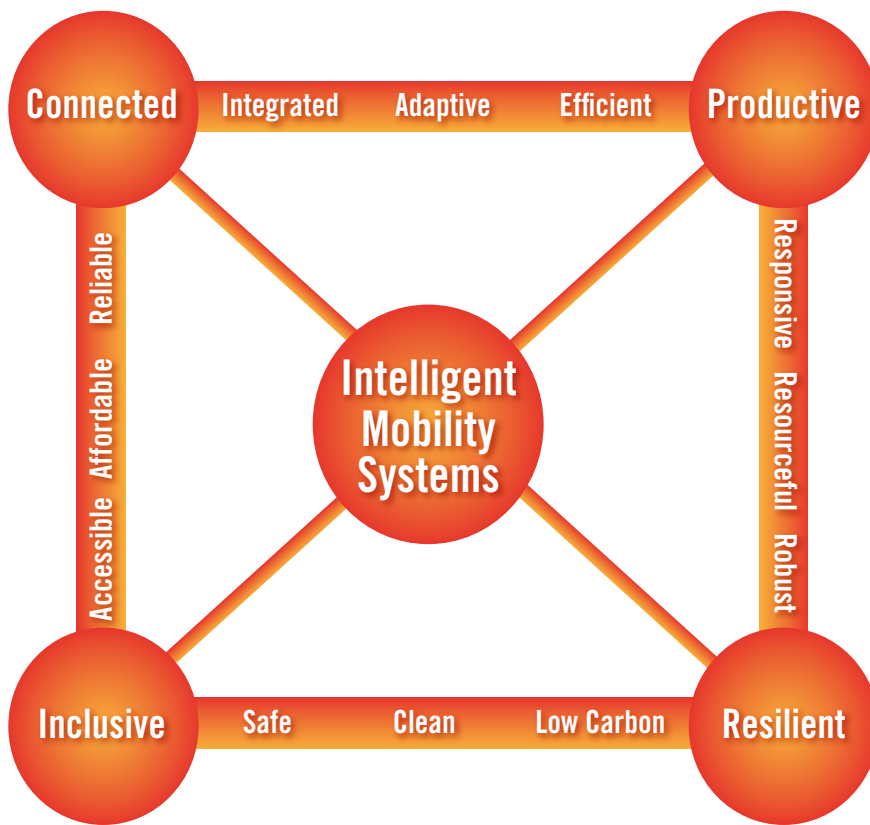
PhD theses are available via [White Rose eTheses Online](#).

Postgraduate Research Students

The Institute has a vibrant research culture and our students participate in seminars, international nights (sharing regional foods), field trips and other events throughout the year. In addition to those who graduated, a further seventy seven students were engaged in research during 2017.

Khaled Abdullah, **Samuel Appiah**, **Ilyas Alhassan**, **Al-Amin Al-Hassan**, **Mahmoud Al-Khazaleh**, **Izza Anwer**, **Peter Atkinson**, **Jeroen Bastiaanssen**,





RESEARCH PROJECTS

The quality of our research delivery is underpinned by [ISO9001:2015 accreditation](#). Organisations commissioning research from ITS may be confident in the quality of our research. The professionalism and ethics of our processes lead to a high degree of customer satisfaction.

The Institute's research landscape is designed to meet the emerging challenges in transport. Multidisciplinary themes are coordinated to ensure we are always engaged in cutting edge research that has impact in the global environment. We welcome [collaboration with Industry](#) and other partners. Further information about our research is available on the [ITS website](#).

Our thematic approach supports the development of intelligent mobility systems which are **Connected** (integrated in terms of modes and systems); **Inclusive** (addressing disadvantage and supporting equity); **Productive** (promoting economic and social wellbeing) and **Resilient** (sustainable, flexible and responsive to external pressures).

The range of research carried out at the Institute is demonstrated in the projects described in the following pages. The projects are grouped under the four 'cornerstone' theme headings shown in the above diagram.

Jawaher Binsuwadan, Martyna Bogacz, Davide Bruscoli, Julian Burkinshaw, Andrew Bwambale, Chiara Calastri, Fanta Camara, Mauro Capurso, Magda Cepeda-Zorrilla, David Chikwendu, Anna Pereira, Edmond Daramy-Williams, Louise de Tremerie, John Dixon, Joel Dodsworth, Rafael Dos-Reis, Lawrence Duncan, Umoh Edemeka, Joanna Elvy, Anderson Etika, Anthony Ezenwa, Cristhian Figueroa-Martinez, Andrew Gillies-Smith, Thiago Guimarães-Rodrigues, Alvaro Guzman-Jaramillo, Thomas Hancock, Stephen Hanley, Md Bashirul Haque, Probo Hardini, Thalia Hernandez-Amezcuca, Sheriff Idriss-Yahya, Rashed Ismaeel, Naphat Ketphat, Haneen Khreis, Alexandros Kontotasios, Narinder Lali, Christopher Leahy, Qiyang Liu, Tahera Mayat, Ioanna Moscholidou, James Musgrave, Tamas Nadudvari, Haruko Nakao, Taufiq Nugroho, Lamprini Papafoti, Evangelos Paschalidis, Alexander Patrick, David Pierce, Vishnu Radhakrishnan, Christopher Rushton,

Ehsan Sadraei, David Simpson, Aswin Siregar, Fangqing Song, Daosadeth Soysouvanh, Panagiotis Spyridakos, Sidi Sun, Tianli Tang, Yvonne Taylor, Jack Thompson, Lap-Kwan Tjong, Nur Ubaidillah, Chinebuli Uzundu, Conor Walsh, Ying Wang, Yao Yao, Jingyan Yu, Weiming Zhao, and Tatjana Zimasa.

With an increasingly multidisciplinary and collaborative approach, ITS staff co-supervised twelve students based in other Schools at the University of Leeds: **Sakarias Bank** (Psychology); **Akshay Dwarakanath** (Medicine); **Gyeonghwa Lee** (Design); **Eusebio Odiari** (Geography); **Kate Palmer** (Doctoral Training Centre); **Pablo Puente Guillen** (Computing); **Richard Riley** (Doctoral Training Centre); **Charlotte Stead** (Engineering); **Daisy Thomas** (Engineering); **Eugeni Vidal Tortosa** (Geography); **Thomas Waddington** (Geography); **David Wyatt** (Doctoral Training Centre in Low Carbon Technologies); **Weiyi Yao** (Engineering).

Connected Transport



AdaptIVe (Automated Driving)

Grant holder: Professor Natasha Merat
Investigators: Professor Richard Romano, Dr Tyron Louw, Dr Ruth Madigan
Funded by: European Commission
Dates: April 2014 – June 2017
Collaborative partners: 28 partners in eight countries (see website for details)
Website: www.adaptive-ip.eu

Abstract: The AdaptIVe project developed various automated functions for daily driving by dynamically adapting the level of automation to different traffic situations and driver status. The focus of ITS Leeds partners was to investigate how the intentions of drivers and their actions should be taken into account in the design of automated systems.

Papers:

- 1) Louw T, Markkula G, Boer E, Madigan R, Carsten O & Merat N (2017) Coming back into the loop: Drivers' perceptual-motor performance in critical events after automated driving. *Accident Analysis & Prevention* **108** 9-18.
- 2) Louw T, & Merat N (2017) Are you in the loop? Using gaze dispersion to understand driver visual attention during vehicle automation. *Transportation Research Part C: Emerging Technologies* **76** 35-50.

Impact: The AdaptIVe project was a multidisciplinary and international collaboration, where the ITS team collaborated with researchers from the German Aerospace Centre, Volvo Cars, Volvo Trucks, Ford, WIVW, and CRF. The Final Event for the AdaptIVe project was held in Aachen in Germany

in June 2017. It received an excellent score from the EU project reviewers, and the Human Factors work which we contributed to was highlighted as particularly impressive and one of the most important outcomes and contributions from the project. This work culminated in a report on the human factors recommendations for the design of automated driving systems. Our work in AdaptIVe has been widely disseminated at various conferences including Driver Assessment, DDI, and ICTTP, where Louw et al. won the Best Paper award for linking driver visual attention and crash potential during the resumption of control from a highly automated driving system.

Human Drive

Grant holder: Professor Natasha Merat
Investigators: Professor Richard Romano, Dr Tyron Louw, Dr Gustav Markkula, Dr Hamish Jamson, Vishnu Radhakrishnan
Funded by: Innovate UK
Collaborating partners: Professor Erwin Boer (independent researcher), Nissan, Hitachi, Cranfield University, HORIBA MIRA, Transport Simulation Systems, Atkins, Highways England, Catapult, SBD (please see website for details)
Dates: September 2017 – February 2020
Website: <http://humandrive.co.uk/>

Abstract: The HumanDrive project will develop a prototype autonomous vehicle with the aim of successfully demonstrating a lengthy end-to-end journey in a variety of settings, including country roads, A-roads and motorways in live traffic and different environmental conditions. Before being introduced to UK roads, the system will be developed and subjected to a robust testing process using a range of facilities, including simulation, hardware in the loop, private test track and small sections of public roads. One of the key innovative aspects of the project will be the development of an advanced vehicle control system, designed to allow the vehicle to emulate a 'natural' human driving style

using machine learning and developing an Artificial Intelligence to enhance the user comfort and experience.

InterACT

Grant holder: Professor Natasha Merat
Investigators: Professor Richard Romano, Dr Gustav Markkula, Dr Charles Fox, Dr Ruth Madigan, Oscar Giles, Fanta Camara
Funded by: EU H2020
Collaborating partners: seven European partners (please see website for details)
Dates: May 2017 – April 2020
Website: www.interact-roadautomation.eu/

Abstract: As Automated Vehicles (AVs) will be deployed in mixed traffic, they need to interact safely and efficiently with other traffic participants. The interACT project will be working towards the safe integration of AVs into mixed traffic environments. After analysing today's human to human interaction strategies we will evaluate solutions for safe, cooperative, and intuitive interactions between AVs and both their on-board driver and other traffic participants.

L3PILOT

Grant holder: Professor Natasha Merat
Investigators: Dr Daryl Hibberd, Dr Tyron Louw, Vishnu Radhakrishnan
Funded by: EU H2020
Collaborating partners: 34 partners from 12 countries (please see website for details)
Dates: September 2017 – August 2021
Website: www.l3pilot.eu/

Abstract: L3Pilot tests the viability of automated driving as a safe and efficient means of transportation. The project focuses on large-scale piloting of Society of Automotive Engineering (SAE) Level 3 functions, with additional assessment of some Level 4 functions. The functionality of the systems used is exposed to variable conditions with 1,000 test drivers

and 100 vehicles in 11 European countries. The tested functions cover a wide range from parking to overtaking, and urban intersection driving. These tests will provide valuable data for evaluation of technical aspects, user acceptance, driving and travel behaviour, and impact on traffic and society. With its large coverage of driving situations, L3Pilot is the first project worldwide demonstrating and testing a comprehensive setup of automated driving functions.

Evaluating Driver Engagement in Automation

Grant holder: Professor Natasha Merat
Investigators: Professor Richard Romano, Dr Tyron Louw, Vishnu Radhakrishnan
Funded by: Seeing Machines
Dates: September 2017 – February 2018

Abstract: This study, in collaboration with Seeing Machines, assesses the use of the PC-Driver Monitoring System in a simulator-based experiment. We will assess novel methods for measuring driver engagement and resumption of control during SAE Levels 2 and 3 automated driving.

AUTOPILOT

Grant holder: Dr Haibo Chen
Investigators: Dr Yvonne Barnard
Funded by: European Union Horizon 2020 (EU H2020)
Dates: January 2017 – December 2019
Coordinating partner: ERTICO
Collaborative partners: 46 partners in industry and academia (see website for details)
Website: autopilot-project.eu/

Abstract: ‘Automated driving Progressed by Internet Of Things’ (AUTOPILOT) brings the Internet of Things (IoT) into the automotive world. The Internet of Things (IoT) enables connections between objects or ‘Things’. The IoT connects

anything, anytime, anyplace, using any service over any network. The project aims to transform connected vehicles (i.e. ‘moving Things’ within the IoT ecosystem) into highly and fully automated vehicles. While using the IoT potential for automated driving, AUTOPILOT also returns data from autonomous cars to the IoT. AUTOPILOT will involve vehicles, road infrastructure and surrounding objects in the IoT ecosystem, with particular attention to the safety-critical aspects of automated driving. The IoT-enabled AUTOPILOT cars are tested in real conditions at six permanent large-scale pilot sites in Finland, France, Italy, the Netherlands, South Korea and Spain. The project aims to bring automated driving towards a new dimension.

CARTRE (Coordination of Automated Road Transport Deployment for Europe)

Grant holder: Dr Yvonne Barnard
Investigators: Dr Haibo Chen, Dr Dongyao Jia, Professor Natasha Merat
Funded by: EU H2020
Dates: October 2016 – September 2018
Coordinating partner: ERTICO – ITS Europe
Collaborative partners: 36 European partners (see website for details)
Website: <http://connectedautomateddriving.eu/about-us/cartre/>

Abstract: CARTRE is a Coordination and Support Action to accelerate development and deployment of automated road transport by increasing market and policy certainties. To achieve this, CARTRE will support the development of clearer and more consistent policies for EU Member States in collaboration with industry players, ensuring that automated road transport systems and services are compatible at EU level and are deployed in a coherent way.

Other objectives include: the creation of a solid knowledgebase of all European activities, to support current activities and structure research outcomes by

enablers and thematic areas; to set up a platform for sharing and re-using data and experiences from different automated road transport systems; to actively support Field Operational Tests (FOTs) and pilots carried out at National and European levels; and to work on future visions, potential impacts and research gaps in the deployment of automated road transport.

The CARTRE project will run for two years and aims to establish a joint stakeholders forum in order to coordinate and harmonise automated road transport approaches at European (e.g. strategic alignment of national action plans for automated driving) and international level (in particular with the US and Japan).

Impact: *As an overall impact, CARTRE supports the development of automation in road transport, in view of optimising its contribution to the ambitious EU policy goals in terms of road safety, reduced congestion, energy efficiency and air quality as well as ensuring the leading role of European industry in the global market to boost sustainable growth and create jobs.*

Cycle Propensity phase 2

Grant holder: Dr Robin Lovelace
Investigators: Dr Malcolm Morgan, Ilan Fridman-Rojas
Funded by: DfT
Coordinating partner: University of Cambridge
Collaborative partners: University of Westminster, London School of Hygiene and Tropical Medicine
Dates: September 2016 – March 2017
Website: www.pct.bike/

Abstract: The Propensity to Cycle Tool (PCT) was commissioned by the Department for Transport to create a strong and accessible evidence base for investment in cycling. It represents a paradigm shift in cycling policy towards a network approach and is now part of central Government Policy as a DfT-endorsed tool in the Cycling and Walking Infrastructure Strategy (CWIS). The PCT is being used by dozens of

LEPs, local and regional authorities, interested citizens and transport consultancies, making the sustainable transport discussion more evidence-based.

Papers:

- 1) Lovelace R, Goodman A, Aldred R, Berkoff N, Abbas A, & Woodcock J. (2017). [The Propensity to Cycle Tool: An open source online system for sustainable transport planning.](#) *Journal of Transport and Land Use*, 10(1).
- 2) Aldred R; Watson T; Lovelace R; Woodcock R (2017) [Barriers to Investing in Cycling: stakeholder views from England.](#) *Transportation Research Part A: Policy and Practice*.

Impact: *The project is already having real-world impacts. The location of many cycle paths, junction treatments and new links are being influenced by this work. The wider impact is a shift towards route networks rather than isolated paths as the main level of analysis for the PCT. This project has been acclaimed by experts on cycling in government, the private sector and in academia. According to Roger Geffen, MBE, "it is the best thing the DfT has ever funded". The project has spawned follow-on projects internationally including projects funded by the World Health Organisation and the CyIPT project (see below) which is aimed at the question of 'what to build'.*

Cycling Infrastructure Prioritisation Toolkit

Grant holder: [Dr Robin Lovelace](#)
Investigator: [Dr Malcolm Morgan](#)
Funded by: DfT
Coordinating partner: University of Leeds
Collaborative partner: [CycleStreets.net](#)
Dates: April 2017 – March 2018
Website: [www.cyipt.bike/](#)

Abstract: This project will tackle the challenge that cycling uptake is often

limited by infrastructural barriers which could be remediated cost-effectively, yet investment is often spent on less cost-effective interventions, based on assessment of only a few options. To meet the Government's target to double cycling by 2025, it makes sense to prioritise interventions that will deliver the greatest benefit for a given budget on the route network. The project will be highly innovative in its use of big data to provide estimates of cost (based on recent evidence) and effectiveness (measured in expected levels of cycling uptake). Cost and effectiveness estimates will be made on a wide range of options, thus allowing decision makers to prioritise the most cost-effective options among hundreds of thousands of possible schemes across England.

ELVITEN

Grant holder: [Dr Haibo Chen](#)
Investigator: [Professor David Watling](#)
Funded by: EU H2020
Dates: November 2017 – October 2020
Collaborative partners: 21 partners in industry and academia (see website for details)
Website: [http://www.elviten-project.eu/](#)

Abstract: 'Electrified L-category Vehicles Integrated into Transport and Electricity Networks' (ELVITEN) aims to boost the usage of all categories of electrified bicycles, scooters, tricycles and quadricycles (EL-Vs) in the urban environment and ultimately to achieve a mind-shift among users by providing them with a better EL-V experience. This will be achieved by designing and offering replicable usage schemes, consisting of support services, ICT tools and policies. EL-Vs of all categories are being tested in Genoa, Rome, Bari, Malaga, Berlin and Trikala. The project has three principal objectives: First, it seeks to make users more familiar and facilitate them to use EL-Vs instead of conventional vehicles for their private transport and for light urban deliveries. Second, it attempts to collect rich information sets made of real usage data, traces from dedicated

ICT tools, and users' opinions after real trips. Third it will generate detailed guidelines and business models for service providers, Planning Authorities and manufacturers in order to make EL-Vs more attractive and more integrated in the transport and electricity networks.

GameCAR

Grant holder: [Professor Samantha Jamson](#)
Funded by: EU H2020
Coordinating partner: University of Patras
Collaborative partners: University of Patras, Brainstorm Multimedia, CTAG, Spark Works, IFSTTAR, Kite
Dates: January 2017 – December 2018
Website: [http://www.gamecar.eu/](#)

Abstract: Road transport is one of the major causes of the environmental pollution. In addition, road traffic injuries are a serious public health problem in the European Region, with huge social and financial adverse effects. A leading cause for both issues is aggressive driving. Driver's style makes a difference in terms of fuel consumption, with a stretch up to 35% between a calm and an aggressive one. Individuals can contribute in the reduction of CO2 emission associated to personal transportation by operating their vehicles more efficiently. To make this change more effective, GameCAR will put in place an innovative strategy building on Gamification. The GameCAR system will unobtrusively sense physiological, behavioural, environmental and vehicle data that compose a novel eco-driving index and will provide the driver with personalized and proactive hints on how to adjust the current driving style. The setting of a multiplayer gaming environment will give the driver the opportunity to set missions and invite other to participate collaboratively or competitively. The evaluation of the developed technologies will be performed via small scale tests campaigns in three different pilot sites in UK, Spain and France.

Impact: *The use of innovative visualization techniques, such as Augmented Reality, will allow the monitoring of ecodriving score evolution and for drivers to receive a personalized plan for improvement of their driving efficiency.*

Hazard Perception

Grant Holder: Dr Ruth Madigan
Investigators: Professor Richard Romano, Anthony Horrobin, Hrvoje Jukic
Funded by: DfT
Dates: March 2017 – March 2018

Abstract: The purpose of this project is to provide novice drivers with increased information of how to effectively scan the risky areas of a driving scene, thus improving their visual search patterns while driving. The study provides an adaptation of the Risk Awareness and Perception Training (RAPT) programme developed at the University of Massachusetts for use in the UK context, while also incorporating new technology to complement the existing techniques. Through a workshop with expert stakeholders, a number of critical driving situations have been identified, and videos of these situations have been recorded by the University's Virtual Learning Environment (VLE) department. These scenarios include a combination of naturally developing and choreographed events. Three different versions of the RAPT-UK training have been developed and will be tested to determine which version is most effective in improving the ability of drivers to perceive hazards in the environment. The first version will present 180° still frames from the RAPT-UK videos on a computer screen and participants will use mouse clicks to indicate the areas they would pay attention to in the scene. For the second version of the training, the same still frames will be presented using a Head Mounted Display (HMD), and in the final version the RAPT-UK videos will be presented using the HMD. Participants' learning will be evaluated using a hazard perception

test, similar to the one used as part of the driver licensing process in the UK.

Impact: *The project will produce a report for the DfT at its conclusion. It is anticipated that the most successful of the training regimes will be incorporated into existing driver training protocols.*

Machine Learning

Grant holder: Dr Robin Lovelace
Investigators: Liam Bolton, Ilan Fridman-Rojas, Rob Long
Funded by: DfT
Dates: February – June 2017
Website: <https://github.com/robinlovelace/mlCars>

Abstract: The aim of this project was to demonstrate the potential of supervised Machine Learning to add value to existing datasets. Using a case-study of car dependency in West Yorkshire, the work augmented official census datasets with open access data from OpenStreetMap. The results were presented by Robin Lovelace and researcher Liam Bolton at a DfT Data Science event in London.

Papers:

- 1) R Lovelace, I Fridman-Rojas & R Long (2017) [New tools of the trade? The potential and pitfalls of 'Machine Learning' and 'DAGs' to model origin-destination data.](#) Computation conference.

Impact: *Practitioners in the DfT and beyond were presented with the methods of machine learning. An understanding of the opportunities and risks associated with applying machine learning methods enables practitioners to make the most of their raw data.*

Next Generation Driving Behaviour Models

Grant holder: Dr Charisma Choudhury
Investigators: Dr Daryl Hibberd, Michael Daly, Evangelos Paschalidis
Funded by: EU-Marie Curie
Dates: May 2015 – January 2019

Abstract: We aim to develop dynamic driving behaviour models that explicitly account for the effects of driver characteristics in driver decisions alongside the effects of path-plan, network topography and traffic conditions. In a novel approach, the project will calibrate our driving behaviour models by combining experimental data collected from the University of Leeds Driving Simulator and actual traffic data collected using video recordings. Particular emphasis of these models are to capture how stress levels impact on driving decisions and vice versa.

Papers:

- 1) Papadimitriou S and Choudhury C. (2017) [Transferability of Car-Following Models between Driving Simulator and Field Traffic,](#) *Transportation Research Record.*
- 2) Paschalidis E, Choudhury C & Hess S. (2017), Investigating the effects of stress on choices, *5th International Choice Modelling Conference, Cape Town.*

Programme for Simulation Innovation (PSI)

Grant holder: Dr Gustav Markkula
Investigators: Professor Richard Romano, Dr Hamish Jamson, Tony Horrobin, Michael Daly, Hrvoje Jukic, Dr Andrew Tomlinson, Oscar Giles, Ehsan Sadraei and Panagiotis Spyridakos
Funded by: Engineering and Physical Sciences Research Council (EPSRC), Jaguar Land Rover (JLR)
Dates: April 2013 – March 2018
Collaborative partners: Dr Erwin Boer (independent researcher); Universities of Loughborough, Warwick, Cambridge, Sheffield and Manchester.

Abstract: PSI is developing capabilities in advanced simulation to support a virtual vehicle design process and to reduce the reliance on physical prototypes. If a vision of zero physical prototypes is ever to be realised, then the process of digital design and verification needs to encompass not just the physical dimensions of component and system functionality, but also the driver's perceptual experience. In a very rare set of experiments, involving engineers and professional test drivers from a number of different groups within JLR, selected vehicle testing tasks have been re-created in the University of Leeds Driving Simulator, scaled to different levels of fidelity. By modelling and comparing driver behaviour and test outcomes obtained in these simulator trials to corresponding results with physical prototypes, it has been clarified how driving simulators can be used for testing of vehicle stability, for example to replace expensive cold-weather field trials, but also testing of vehicle driveability, and vehicle human-machine interfaces.

Impact: The obtained insights on simulator-based vehicle testing and required simulator capabilities are being incorporated in JLR guidelines for simulator use, and are being reported on in scientific papers for wider dissemination and impact.

TRANSITION: Transport safety in automated vehicles

Grant holder: Professor Natasha Merat
Investigators: Dr Gustav Markkula, Professor Richard Romano
Funded by: EPSRC
Dates: September 2017 – June 2020
Coordinating partner: Professor Richard Wilkie (School of Psychology)

Abstract: Automated Vehicles (AVs) hold great promise for improving for example traffic safety, but there are also open questions and concerns relating to for example human capabilities when resuming steering control from AVs. In cross-disciplinary collaboration between Leeds School of Psychology and ITS, project TRANSITION is investigating human perceptual-motor behaviour during vehicle control resumption, and how it is affected by factors such as time spent in automated driving mode as well as visual and cognitive tasks engaged with. The aim is to identify situations where drivers are particularly vulnerable to making steering errors, and to develop computational models of human steering that can help support development of safe AVs.

Inclusive Transport



ADAPT

Grant holder: Dr Kate Pangbourne
Investigators: Dr Alex Baker-Graham, Samuel Bennet
Funded by: EPSRC
Dates: June 2016 – May 2021
Website: <https://adapt.leeds.ac.uk/>

Abstract: ADAPT is leading a new network, Arguments for Behaviour Change (ABC-NET) for researchers

and practitioners interested in developing well-structured arguments for behaviour change. The aim is to establish a collaborative community to further research and practice in this area, with a particular emphasis on sustainability, well-being and resilience, and the use of ICT in delivering tailored, persuasive and ethical arguments for travel behaviour change. We will develop and trial message content that is formulated more scientifically than the marketing led approaches that have been used to date. Preliminary work has been presented in 2017 at the European Conference on Argumentation, the Royal Geographical Society with IBG Annual Conference, Cycling and Society and a Computational Models of Natural Argument Workshop.

Co-Motion (Co-design of the built environment for mobility in later life)

Grant holder: Bryan Matthews
Investigator: Frances Hodgson
Funded by: Research Councils UK (RCUK)
Dates: September 2013 – January 2017
Coordinating partner: University of York
Collaborative partners: University of Newcastle, University of Northumbria
Website: tinyurl.com/y96rajjd

Abstract: The project conducted interviews with older people to explore their mobility and wellbeing over time and life changing events. Participants were involved in the research through a series of workshops and co-design sessions to help develop and test innovations such as crowd sourcing about mobility barriers, mobility apps, adaptations to mobility scooters. The aim was to help overcome conflicts between the needs of different people in the urban space.

Papers:

- 1) Gillroy, R. and Matthews, B. (2017) Mobility experiences of older People with Sight-Loss: Is there a blind spot in our understanding and

Responses? Paper presented at the annual *British Social Gerontology (BSG) conference* in Swansea.

Impact: *The project has co-created practical tools which can complement or act as alternatives to the redesign of the built environment. Please see the [Co-motion project website](#) for details.*

EMPOWER

Grant holder: [Professor Susan Grant-Muller](#)

Investigators: Frances Hodgson, Magda Cepeda-Zorrilla

Funded by: EU H2020

Dates: May 2015 – April 2018

Coordinating partner: ITS

Collaborative partners: 11 European partners (see website for details)

Website: <http://empowerproject.eu/>

Abstract: The main objective of EMPOWER is to substantially reduce the use of conventionally-fuelled vehicles in cities, using positive incentives delivered through pervasive information technology such as smartphone, as part of a behavioural approach to demand management. To achieve this objective, EMPOWER will create a set of tools for industry, policy makers and employers. These will empower them beyond the lifespan of this project to understand, help choose and successfully implement 'positive' evidence-based and cost-effective policy interventions, based on new and innovative mobility services, and in the context of already existing infrastructure, policy and measures. EMPOWER is working with over 40 stakeholders including cities, transport sector suppliers and incentive providers, and will demonstrate large scale implementation in Living Labs: Manchester, Milton Keynes, Scotland, Helsinki, Gothenburg and Enschede - plus a further seven take-up cities across Europe (Milan, Bologna, Budapest, Odense, Antwerp, Reading and Newcastle). The positive incentives being designed, trialled and implemented include: financial incentives, points and digital currencies, tangible rewards (such as

prizes and vouchers), upgraded service offers and social incentives. Early deliverables include design features for the IT architecture and templates for business models in a multi-stakeholder context.

Impact: *The project has been awarded six prizes to date. [These are detailed on the project website](#) and include: Grant-Muller et al who won the **Distinguished Scientific Papers – Europe award** at the 23rd World Congress on Intelligent Transport Systems for their paper 'Evaluating the social network concept within new ICT-enabled mobility schemes'.*

*BetterPoints won the **Healthy Streets Award for modal shift** and the **Business Environment Award** for their work with Reading Borough Council and the **BikeSmart** programme which provided incentives and encouragement through the BetterPoints smartphone app. Participants earned points when they cycled, which they could redeem against vouchers for high street shops or donate to charity. During a trial period of six months more than 600 people actively took part and made 30,000 cycle journeys totalling 331,762 miles. Reportedly, nearly 7,000 of those journeys replaced a car journey, which will have saved around nine tonnes of CO₂ emissions.*

Habits

Grant holder: [Professor Susan Grant-Muller](#)

Investigators: Frances Hodgson, Dr Gillian Harrison, Dr Nick Malleon (School of Geography), Thomas Redfern

Funded by: Economic and Social Research Council (ESRC)

Dates: February 2017 – February 2018

Collaborative partners: Newcastle City Council, Newcastle Urban Observatory

Website: habitsdata.org/

Abstract: The project will consider implications of 'track and trace' data generated from mobile phones in relation to health impacts. Two areas of health impact will be considered:

the health burdens of exposure to air pollution and health related to levels of travel activity. Track and trace data (T&T, the trace of individuals' movements through the city) will be generated as a result of introducing a new travel app in Newcastle, SMART. The app (which has mature tracking algorithms that have been tested for over five years in Europe) is being tailored to Newcastle and implemented on a large scale as part of the H2020 EMPOWER project (described above). In the Habits project we take T&T data and explore the challenges, methodologies and policy implications in reducing individual health burdens. The project researches new methods and tools to investigate the cross-referencing and integration of real-time T&T data with existing and emerging databases such as pollution data. The project also looks into new approaches for modelling the health impacts arising from exposure to pollution and the individual patterns of travel activity.

Papers:

- 1) Grant-Muller S M, Hodgson F & Malleon N (2017) 'Health Equity Outcomes Arising from Transport Scheme Innovation, Utilizing New Generation Mobility Data' presented at hEART, [6th Symposium of the European Association for Research in Transportation](#), Haifa, Israel.
- 2) Malleon N, Grant-Muller S M, Hodgson F & Harrison G (2017) [Quantifying Personal Pollution Impacts to Inform Transport Scheme Innovation through New Generation Mobility Data](#). Presented to *the European Colloquium on Theoretical and Quantitative Geography*, York.
- 3) Grant-Muller S M, Hodgson F, Malleon N and Snowball R (2017) [Enhancing Energy, Health and Security Policy by Extracting, Enriching and Interfacing Next Generation Data in the Transport domain](#). *IEEE International Congress on Big Data*.

Smart Measures

Grant holder: [Dr Thijs Dekker](#)
Investigators: [Dr Caroline Mullen](#),
[Dr Eleonora Morganti](#), [Dr John Nellthorp](#),
[Dr Craig Morton](#), [Dr Giulio Mattioli](#),
[Bryan Matthews](#), [Julian Burkinshaw](#),
[Erik Thomasson](#)
Funded by: DfT
Dates: May 2017 – April 2018

Abstract: The objective is to explore and identify how mid-sized cities use data and technology to monitor, evaluate and improve effectiveness of transport measures in relation to health, mode shift or reliability. We will use city case studies and examples of smart cities' transport-related measures (for instance, cleaner buses, Clean Air Zones, pedestrianisation and cycle facilities) to evaluate how these contribute to improving health and provide economic benefits.

The Smarter Travel Solution

Grant holder: [Dr Jeremy Shires](#)
Investigators: [Dr Haibo Chen](#),
[Dr Astrid Günemann](#), [Professor Simon Shepherd](#),
[Dr Ian Philips](#)
Funded by: Innovate UK
Dates: March 2016 – February 2018
Coordinating partner: Telefónica UK
Collaborative partners: C3UK,
 Firstgroup, West Yorkshire Combined Authority, Leeds City Council, Ove Arup & Partners, City Car Club, Forum for the Future and South Yorkshire Passenger Transport Executive.
Website: its.leeds.ac.uk/research/featured-projects/sts/

Abstract: The aim of the project is to develop a new travel app for smart phones that allows users to plan their journey. It's an online, map-based, multi-modal journey planner that incorporates real-time travel and disruption information. It will also provide the option to book and pay for tickets, hire cars, use car club and provide feedback on the journey. The ITS input to this collaborative project is to look at the impact of the travel

app in terms of carbon mitigation and what changes it will have on travel decisions in particular for vulnerable user groups.

Transport Equity Assessment (TEA COST)

Grant holder: [Professor Karen Lucas](#)
Funded by: EU COST Action
Dates: April 2013 – April 2017
Collaborative partners: 15 partner countries of the TEA COST consortium
Website: www.cost.eu/COST_Actions/tud/TU1209

Abstract: Understanding the equity implications of transport policies and investments is becoming increasingly important, as underscored by social movements around the world. A major challenge in the assessment and appraisal of transport projects and policies is that equity issues are currently hardly addressed. The TEA COST Action develops new approaches that incorporate equity consideration in transport project evaluation and decision making. This includes the measurement of accessibility combined with the literature on social justice, travel behaviour models and socio-economic impact analysis in line with mainstream welfare economics. TEA COST has three main purposes: i) to develop innovative and comprehensive transport evaluation criteria that account for distributional effects and accessibility; ii) to include social and spatial factors in social welfare assessment; iii) to devise a common European methodology that links equity indicators and social welfare maximization in order to promote equity considerations in transport decision making. It will achieve this by promoting a series of knowledge exchange workshops between academics and policymakers in the 15 partner countries that form the TEA COST Consortium.

Papers: in preparation

Transport and Mobilities in Low Income Countries

Grant holder: [Professor Karen Lucas](#)
Funded by: ESRC Global Challenges Research Fund (GCRF)
Dates: January 2017 – June 2018
Website: <http://intalinc.leeds.ac.uk/>

Abstract: This International Network for Transport and Accessibility Low in Communities (INTALInC) brings together partners from eleven academic and stakeholder institution in the UK, Africa and East Asia with a focus on finding innovative ways to address the mobility needs of low income populations in Low and Middle Income Countries. Our mission is to promote research that can provide the evidence-based for the delivery of socially sustainable and inclusive urban mobilities in the developing world context.

Papers: see website for workshop reports and other published resources.

Impact: Between January 2017 and December 2018 INTALInC will convene eight 'research into practice' workshop events in the UK, Africa and East Asia bringing researchers into direct contact with policy makers, operators and communities to design more inclusive transport systems.

UDRIVE

Grant holder: [Professor Oliver Carsten](#)
Investigators: [Dr Daryl Hibberd](#),
[Dr Frank Lai](#)
Funded by: European Commission
Dates: October 2012 – June 2017
Collaborative partners: 19 partners across 11 countries (see website for details)
Website: www.udrive.eu

Abstract: UDRIVE was the first large-scale European Naturalistic Driving Study – observing drivers in their everyday driving routines and behaviours within a fleet of 200 vehicles (cars, trucks and powered-two wheelers). It aimed at enhancing in-depth understanding of actual

road user behaviour by means of field observations. The objectives were to identify measures that improve road safety and to identify ways for reducing vehicle emissions and fuel consumption. At Leeds we were involved in all stages of the project, including study design, field trials, data analysis and dissemination. Leeds led the work on everyday driving, which examined such factors as drivers' choice of speed and following distance as evidence of their safety-related performance. We also led the work on involvement in secondary tasks, which examined in particular how driver self-regulated their engagement in such activities as mobile phone use.

Papers: were presented at the Naturalistic Driving Research Symposium 2017.

Impact: *The many insights from the project help policy-makers to identify practical solutions to address real-world safety problems.*

XCYCLE

Grant holder: Professor Oliver Carsten
Investigators: Dr Daryl Hibberd, Professor Richard Romano, Michael Daly, Dr Charles Fox
Funded by: EU H2020
Dates: June 2015 - November 2018
Coordinating partner: University of Bologna
Collaborative partners: Nine European industry and academic partners (see [website for details](#))
Website: www.xcycle-h2020.eu/

Abstract: This project aims to find the means to equalise the treatment of cyclists in traffic and thus both encourage cycling and make cycling safer. The project will contribute to innovative and efficient advanced safety measures to reduce the number of accidents involving cyclists in interaction with motorised vehicles. The project will develop technologies aimed at improving active and passive detection of cyclists, systems informing both drivers and cyclists of hazards at junctions, effective methods of

presenting information in vehicles and on-site and cooperation systems aimed at reducing collisions with cyclists. To this end, the University of Leeds has developed an in-vehicle HMI to warn truck drivers of imminent collision risk. The work is being carried out on a new truck simulator, developed with University funding and with a cab donated by Volvo Trucks. The recommended HMI design will be incorporated in a Volvo test vehicle.

Impact: *There will be large impacts on cycling safety by addressing some of the most severe collision scenarios.*

Productive Transport



CQC Efficiency Network

Grant holder: Dr Phill Wheat
Investigator: Alex Stead
Coordinating partner: Measure 2 Improve
Funded by: Local Authorities
Dates: April 2015 - December 2018
Website: nhtnetwork.org/cqc-efficiency-network/home/

Abstract: The CQC Efficiency Network (Cost, Quality, Customer) is an offering to local authorities throughout Britain to enable them to quantify the scope for cost savings in the delivery of highway services and to identify better practices. Importantly the analysis recognises the interplay between the **C**ost of work done, the **Q**uality of the work and the **C**ustomer perception of the highway service. The CQC Efficiency Network is a joint venture between the National Highways & Transport Network (NHT) and the University of Leeds. Both partners worked successfully together in two pilot studies of this approach funded by HMEP.

Impact: *The network is helping local authorities improve their cost performance, whilst at the same time maintaining the quality of their offering. The work has identified substantial opportunities for savings. The CQC network provides evidence to support enhanced central government funding as a reward to local authorities who adopt efficient practices.*

DITTO

Grant holder: Dr Ronghui Liu
Investigators: Dr Anthony Whiteing, Dr Hongbo Ye
Funded by: Railway Safety & Standards Board
Dates: September 2014 – August 2017
Coordinating partner: University of Southampton

Abstract: DITTO (Developing Integrated Tools to Optimise Railway Systems) is a multi-disciplinary project bringing together University-based traffic engineers and transport operations researchers (from Leeds and Southampton) and computer scientists (from Swansea). The project contributes to the Future Traffic Regulation Optimisation (FuTRO) programme by establishing relevant basic principles and proofs of concept for the optimisation of rail operations. Our objective is to develop the formulations, algorithms and processes that will deliver a step-change in rail system performance and meet future customer needs. This is done by taking into account developments in human and automatic control on trains and in control centres and by making better use of data, particularly with respect to the time and position of trains. The Leeds team is developing network simulation models to design and test real-time operations of FuTRO systems, in particular train control algorithms for the new ERTMS (European Rail Traffic Management System) Levels 2 and 3.

Webpage: www.its.leeds.ac.uk/research/featured-projects/ditto/
Outputs: Are listed in full on the webpage and include:

- 1) Li F, Gao Z, Wang D Z W, Liu R, Tang T, Wu J, Yang L. (2017) [A subjective capacity for single-track railway system with \$\delta\$ -balanced traffic and \$\lambda\$ -tolerance level](#). *Transportation Research Part B*, **105**, 43-66.
- 2) Ye H and Liu R (2017) [Nonlinear programming methods based on closed-form expressions for optimal train control](#). *Transportation Research Part C*, **82**, 102-123.

Energy-Efficient Automatic Train Control

Grant holder: [Dr Ronghui Liu](#)
Investigator: [Dr Hongbo Ye](#)
Funded by: Royal Academy of Engineering
Dates: April 2017 – April 2019
Coordinating partner: Beijing Jiaotong University
Collaborative partners: TCT Ltd Beijing, Network Rail, First Group

Abstract: The widespread development of urban railway systems in China and the rapid rise in train mileages has led to a huge increase in energy consumption and carbon emissions. Beijing Metro is the city's biggest consumer of electricity. Most of the energy usage is taken by the train traction forces. The proposed research tackles this problem by developing and testing energy-efficient Automatic Train Operation (ATO) systems based on sound optimal control theory, software verification and real-life test results.

The project combines the complimentary skills of two leading research groups from China and the UK on train optimal speed controls and, together with industry enablers, will develop energy-efficient train control methods and software that can be embedded in the train-borne ATO systems to automatically generate individual train speed profiles in real time, according to the practical train operating situation and track conditions.

Impact: *Reducing train traction energy will bring significant economic and environmental benefits.*

OPTIYARD (Optimised Real-time Yard and Network Management)

Grant holder: [Dr Ronghui Liu](#)
Investigators: [Dr Hongbo Ye](#), [Professor Andrew Smith](#), [Dr Anthony Whiteing](#)
Funded by: EU H2020
Dates: October 2017 – September 2019
Coordinating partner: UIC

Abstract: The European Commission's 2011 White Paper states that, by 2050, rail should substantially expand its modal share over medium and long distances. This is consistent with the policy goals of expanding rail capacity, cited in both the Horizon 2020 and Shift2Rail calls. Considering the ambitious Horizon 2020 Key Performance Indicator calling for a surge in the utilisation of rail capacity within a range of 70-90%, rail yards, hubs and terminals play a key role in facilitating this step-change by contributing to a competitive, reliable and safe freight transport, thus making rail the preferred modal choice. As rail yards are the first and last points of customer experience for the physical journey, they must be easily accessible and fully adapted to efficient operations. OptiYard will provide decision support tools to infrastructure managers that will ensure a smooth transfer and optimised marshalling essential to the general efficiency of the transport chain.

OptiYard will design optimised processes for managing marshalling yards and terminals, considering their interaction with the network. The processes considered are those that have to be performed in real-time. With real-time interaction between yard and relevant network IT systems, OptiYard's software based planning and optimisation of processes will address critical operational points

of the transport chain (both rail marshalling yards or as transfer points to other modes) to improve capacity and reliability. Most importantly, these improvements will enhance competitiveness whilst increasing service reliability and customer satisfaction by providing accurate and updated information.

RAPPORT (Real-time Accurate Positioning and Protection of Rail Transport)

Grant holder: [Dr Ronghui Liu](#)
Investigators: [Dr Hongbo Ye](#), [Dr Fangni Zhang](#), [Erik Thomasson](#)
Funded by: Innovate UK
Dates: August 2017 – February 2018
Coordinating partner: Incremental Solutions Ltd
Collaborative partners: Network Rail, Arriva Rail North, Icomera UK

Abstract: RAPPORT is an industrial research project developing technology solutions to reduce disruption and delays in UK rail. The project will develop and help bring to market a suite of innovative and revolutionary technology tools that will transform operational awareness of train locations and movements. Through the exploitation of enhanced location information and interactive mapping, RAPPORT will deliver useable tools with practical operational benefits. These include accelerating accident and emergency response times to rail incidents; providing supplementary information to signallers at User-Worked Crossings to enable more accurate train location awareness and better decision making; improving service recovery procedures by presenting deeper insights into real-time delays caused by incidents. By introducing innovative technology to existing systems provided by the collaborating partners, the project will deliver a live trial of high value, low cost, state-of-the-art products with immediate use and benefit to the rail network, its users and moreover to the UK economy as a whole.

NeTIRail

Grant holder: Professor Andrew Smith

Investigators: Dr Manuel Ojeda-Cabral, Dr Phill Wheat, Dan Johnson, Dr Fangni Zhang, Bryan Matthews, Professor Chris Nash, Dr Thijs Dekker
Funded by: EU H2020

Dates: June 2015 – May 2018

Collaborative partners: University of Sheffield (coordinator), University of Leeds, VTI, UIC, ADS Electronic, AFER, TU Delft, IFSTTAR, TCCD, ALU-FR, Intader, SZ, RCCF
Website: netirail.eu

Abstract: The main purpose is to develop and demonstrate technologies and best practice tailored to the needs of different categories of rail systems - including busy capacity-limited passenger lines, under-utilised rural or secondary “low density” lines and routes dominated by freight. The consortium will deliver innovative concepts of new technologies for railway operation and analyse current best practice to identify optimal solutions to be applied to different line categories across Europe. Moreover, it will also assess the societal impact of railway and the business case for each alternative asset management strategy and the applications of the technologies developed, including consideration of the incentives and regulatory/ financial frameworks across the EU member states. Our contribution to this large project involves establishing the business case and associated cost, demand modelling and undertaking research on incentives and regulatory aspects.

Reducing Energy Demand (TransEnergy)

Grant holder: Professor Andrew Smith

Investigators: Dr Jean-Christophe Thiebaud, Dr Romain Crastes dit Sourd, Alex Stead, Jeremy Shires, Dr Manuel Ojeda Cabral

Funded by: EPSRC

Dates: July 2017 – July 2019

Collaborative partner: Mark Wardman (SYSTRA)

Website: www.sheffield.ac.uk/creesa/projects/transenergy

Abstract: The TransEnergy Road to Rail Energy Exchange project is an innovative technical and socio-economic research collaboration to provide energy buffering services to rail transport systems and electric vehicles. It will enable a step-change reduction in road and rail energy demand with attractive options to support adoption. The output relating to the University of Leeds is a major socio-economic study providing financial models and frameworks to support adoption and implementation.

PDFH V6 UPDATE

Grant holder: Professor Richard Batley

Investigator: Professor Gerard de Jong
Funded by: RDG

Coordinating partner: SYSTRA

Dates: December 2016 – January 2018

Abstract: We are working with SYSTRA to deliver the sixth update to the Passenger Demand Forecasting Handbook (PDFH). The objectives are to ensure that the new version of PDFH: reflects the needs of different stakeholders on a more consistent basis; includes recent evidence since the previous update based upon the most accurate and robust research available; considers constructive criticism of PDFH from other parties; identifies gaps in the evidence base to provide recommendations for future research; has an improved presentation style and is delivered online.

SMaRTE

Grant holder: Dan Johnson

Investigators: Dr Fangni Zhang, Dr Kate Pangbourne, Professor Andrew Smith, Jeremy Shires

Funded by: EU H2020/ S2R

Coordinating partner: ITS

Collaborative partners: University of Huddersfield, FIT Consulting, IST Lisbon, Fertagus, UNIFE, Luleå University of Technology, Ergoproject, UITP, London Underground Limited, Luleå Flygteknik

Dates: September 2017 – August 2019

Abstract: The project, **Smart Maintenance and the Rail Traveller Experience**, brings together two related but distinct areas of research. Smart maintenance and human factors are concerned with digitisation and the use of information to enhance decision making, either by industry players in respect of maintenance decisions, or by rail users in employing smart applications to navigate the rail system and its interaction with other modes.

The challenge of the smart maintenance stream of this work is to improve current rail maintenance systems, through the integration of predictive data analysis algorithms and online optimization tools within an improved Condition Based Maintenance strategy.

The challenge of the human factors stream of this work is to understand the current and future needs of passengers from the railway and other transport systems. These needs are characterised by rapid advances in technology and demographic change. We will consider human centred design in identifying aspects of the customer experience which could be improved and simplified through information and mobility support.

SNCF Strategic Partnership

Grant holder: Professor Andrew Smith
Investigators: Professor Richard Batley, Dr John Nellthorp, Dr Phill Wheat, Dr Jean-Christophe Thiebaud
Funded by: SNCF
Dates: August 2017 – July 2020
Collaborative partner: SNCF Reseau

Abstract: This is a three year strategic partnership between ITS and SCNF Reseau focused around methodological and empirical advances in transport economics research. As part of the partnership a new researcher has been joint funded (50% match funded) and additionally ITS experts will work with SNCF, developing and applying economics tools and capability to address key policy challenges. The areas identified to date include: (1) Cost benchmarking of SNCF RESEAU regional data; (2) comparison between economic and engineering model estimates of marginal cost for setting track access charges; (3) advances in marginal cost modelling techniques; (4) demand modelling – drawing on existing evidence from Great Britain; (5) drawing on best practice in respect of Social Cost Benefit Analysis (SCBA) – towards developing a French handbook; and (6) drawing on ITS experience and expertise in assessing the economic / business case for technical innovations. This partnership provides strong opportunities to bring together rail economics and engineering to considerably strengthen the value of rail research and assist the development of technically and economically viable innovations that can then be implemented.

Impact: As a forerunner to this partnership, our research, working with consultants ECOPLAN, has already been used to determine track access charges in France (2017).

ITF Capital Bias

Grant holder: Professor Andrew Smith
Investigators: Dr Phill Wheat, Alex Stead
Funded by: International Transport Forum (ITF) and SNCF Reseau
Dates: September 2017 – March 2018

Abstract: The background to the project derives from discussions held as part of the ITF working group on private investment in transport infrastructure.

A key issue in economic regulation (at least in theory) is the problem of capital bias. Totex benchmarking is seen as a potential solution at least to the latter problem. The overall objective of the research is to answer the following question: can benchmarking work in transport? If benchmarking can work then the regulated model can be seen as a good alternative to Public-Private Partnerships (which in many respects are seen to have been unsuccessful in transport in general). The output of the research will be a position paper setting out the issues and challenges in benchmarking, focusing on rail, roads and the utilities. The note will set out the issues, how they have been resolved to date, together with weaknesses of existing approaches. It will also point the way to new approaches that could be developed to address the problems noted.

Steel Composition and Track Degradation

Grant holder: Professor Andrew Smith
Investigators: Professor Richard Batley, Dr Phill Wheat, Professor Chris Nash, Bryan Matthews, Dr Manuel Ojeda-Cabral
Funded by: EPSRC
Dates: July 2015 – June 2017
Collaborative partners: University of Huddersfield (coordinator), University of Cambridge, Cranfield University, Tata Steel, involvement also from Network Rail and RSSB.

Abstract: To reduce costs of the railway system and improve

performance it is important to select the optimum materials for railway components. There are many conflicting requirements when selecting the materials for wheels and rails including a range of failure mechanisms; operating and loading conditions and the associated financial implications. This research to establish a comprehensive understanding of the metallurgical characteristics of rail and wheel steels to enable scientifically-informed choices combined the skills of an interdisciplinary team from four Universities. Our contribution at Leeds was the business case and associated cost and demand modelling, including incentives and regulatory aspects. We conducted new research on econometric and engineering based cost modelling.

Papers:

- 1) Smith A; Iwnicki S; Kaushal A; Odolinski K; Wheat P (2017) Estimating the relative cost of track damage mechanisms: combining economic and engineering approaches, Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit, **231** 620-636.

What Works Centre for Local Economic Growth: Transport

Grant holder: Professor Karen Lucas
Funded by: ESRC, London School of Economics
Dates: September 2013 – February 2017
Website: www.whatworksgrowth.org/

Abstract: The What Works Centre for Local Economic Growth was set up to provide solutions for local and national policymakers through the systematic review of the evidence base on policies for local economic growth, as well as to improve that evidence base. Transport can have a positive impact on the local economy, although the role of transport in stimulating growth is not as clear-cut as assumed by many decision makers. The impact of transport investment on employment is

mixed (for road) or unknown (for rail, bus, tram, and cycling). However, there are good reasons to invest in transport infrastructure beyond the impact on local growth. Many of the findings depend on a small number of studies. They are, however, consistent with other research on the economic impact of transport improvements.

Impact: A report of the initial evidence review can be found at www.whatworksgrowth.org/policy-reviews/transport/.

The next stage of the study will be to develop a toolkit of interventions that will help to guide local transport authorities and other investors on what works for economic growth in the local transport sector.

Resilient Transport



ADVANCE:LGV Carbon Reduction

Grant holder: Dr Anthony Whiteing
Investigators: Dr Eleonora Morganti,
Professor Jillian Anable, Dr Ian Philips
Funded by: UK ERC
Collaborative partner: Oxford University
Dates: October 2016 – June 2018

Abstract: LGV (van) traffic has been the fastest-growing segment of road traffic in recent years, yet we know little about the reasons for this. The advANce project is investigating trends in van use, the energy implications of such use and the opportunities for carbon and pollution reduction from the van sector particularly in urban areas, through case study work and analysis of vehicle MoT data. Insights into future use of vans in industries such as retail and food will be used as inputs into

carbon modelling, to test the potential effects of various policies to reduce emissions in this key transport sector.

ClimateXChange

Grant holder: Professor Jillian Anable
Investigator: Dr Craig Morton
Funded by: Scottish Government
Dates: May 2016 – October 2017
Website: www.climateexchange.org.uk/

Abstract: This project delivers timely evidence and recommendations to the Scottish Government concerning its climate change mitigation policies across two principle areas of investigation. Firstly, by charting and understanding the factors that underpin the adoption of low-carbon technologies such as hybrid and electric vehicles. Second, by considering the motivations of citizens to make use of more sustainable modes of transport. In the past 12 months, focus has widened to include analysis of the composition of vehicle fleets at small areas of geography to contribute to impact analysis of potential low emissions zones in urban areas. Data has also been collected on vehicle ownership, travel patterns and attitudes to restrictions to certain categories of vehicle usage.

Papers:

- 1) Morton C, Lovelace R, & Anable J. (2017). [Exploring the effect of local transport policies on the adoption of low emission vehicles: Evidence from the London Congestion Charge and Hybrid Electric Vehicles.](#) *Transport Policy*, **60** 34–46.

Impact: Research associated with this project has been presented to the Scottish Government at a number of conferences, meetings and workshops. In addition, a series of policy notes have been produced and disseminated by the [ClimateXChange centre](#) which summarise the key policy relevant findings of the project.

Electricity Sat Nav

Grant holder: Professor Jillian Anable
Funded by: EPSRC (via UKERC)
Dates: September 2017 – August 2019
Coordinating partner: Aston University, Birmingham
Collaborative partner: University of Southampton

Abstract: The overall aim of this project is to design a real-time system to enable flexible electric vehicle charging/discharging from/to individual household or commercial renewable electricity resources in low-voltage distribution networks, in an open electricity market context. ITS is responsible for designing and executing fieldwork with householders and electric vehicle owners to assess the acceptability of various business models, interfaces and tariffs related to this proposition.

MOT (Motoring and vehicle Ownership Trends)

Grant holder: Professor Jillian Anable
Funded by: EPSRC
Dates: October 2013 – March 2017
Collaborative partners: Department for Transport, University of Aberdeen, University of Bristol, University of the West of England and the Transport Research Laboratory
Website: www.motproject.net

Abstract: Efforts to reduce emissions from car travel have so far been hampered by a lack of specific information on car ownership and use. The MOT project seeks to address this by bringing together new sources of data to give a spatially disaggregated diagnosis of car ownership and use in Great Britain and the associated emissions and energy demands. Data from annual car roadworthiness tests ('MOT tests' in the UK), made available by the Department for Transport, together with additional details of all vehicles registered from the UK Driver Vehicle Licencing Agency is used as a platform upon which to undertake a set of inter-linked modelling and analysis tasks.

Papers:

- 1) Chatterton T, Anable J, Cairns S & Wilson E. (2017) Financial Implications of Car Ownership and Use: a distributional analysis based on observed spatial variance considering income and domestic energy costs. *Transport Policy*.

Impact: *The project has developed the capability to understand spatial differences in car ownership and use and has the potential to transform the way in which energy and emissions are quantified, understood and monitored. The project's work on the relationship between who/where local air pollution is generated and who is exposed to these emissions has stimulated policy interest in assessing the social justice issues and targeted interventions related to air quality from passenger vehicles. Altogether the project will help refine future research and policy agendas and inform transport and energy infrastructure planning.*

RACER (Rapid Acceleration of Car Emissions Reductions)

Grant holder: Professor Jillian Anable
Investigators: Dr Giulio Mattioli,
Dr Caroline Mullen
Funded by: EPSRC (via UKERC)
Dates: October 2016 – September 2018
Coordinating partner: Tyndall Centre, University of Manchester

Abstract: With specific emphasis on the UK car fleet, this project tackles head-on the unprecedented mitigation challenge outlined in the Paris Agreement. With particular focus on deep and near-term mitigation, it examines the potential for the rapid penetration of highly efficient petrol and diesel models to deliver quantitative fleet wide reductions of around 50% within a single decade. Such levels of mitigation are beyond those yet countenanced, but are necessary if the UK is to play its fair role in delivering on the Paris commitments. It will proceed to develop a set of scenarios including

narratives, policy mechanisms and regulatory regimes designed to equip decision makers with the wherewithal to consider seriously accelerating mitigation. Finally, it will offer a taxonomy and concise evaluation of more interventionist prospects to extend mitigation beyond existing technical and social norms.

RAC Foundation Almanac

Grant holder: Professor Jillian Anable
Investigator: Dr Craig Morton
Funded by: RAC Foundation
Dates: July 2017 – November 2017
Coordinating partner: ITS
Collaborative partners: University of the West of England; Dr Sally Cairns

Abstract: This report was commissioned in order to present highlighted results from the MOT Project in a series of self-contained maps and subsidiary data and outline findings. Topics covered include: private car ownership in GB; understanding car mileage; how mileage varies with age; fuel type and mileage driven; motoring costs; air pollution; the relationship between poverty and emissions; drive collision involvement and light goods vehicles.

Papers:

- 1) Cairns S, Anable J, Chatterton T, Wilson RE, Morton C (2017) MOToring along: The lives of cars seen through licensing and test data. Report for the RAC Foundation.

Impact: *The report was launched at a high profile event at the Royal Automobile Club to a set of stakeholders from industry and government. This has led to a number of requests, particularly from local authorities, to understand how the dataset can help in the analysis of local policy design targeted at reducing emissions from the vehicle fleet.*

UK ERC3 (UK Energy Research Centre Phase 3)

Grant holder: Professor Jillian Anable
Funded by: EPSRC
Dates: January 2016 – April 2019
Coordinating partner: Imperial College London
Collaborative partner: University of Oxford
Website: www.ukerc.ac.uk

Abstract: UKERC is a cross-research council funded 'virtual' research centre comprising a focal point for UK research on sustainable energy. It takes an independent, whole systems approach, drawing on engineering, economics and the physical, environmental and social sciences. The primary objective is to explore the UK energy transition in an uncertain world, and the synergies and trade-offs between the key drivers for this transition. Professor Anable works primarily within Theme 5 'Key challenges in energy system decision-making' with the work centring on the analysis of policy scenarios for carbon mitigation of the UK transport sector using the UK Transport Carbon Model (UKTCM).

Papers:

- 1) Brand C, Cluzel C & Anable J. (2017) Modeling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach. *Transportation Research A: Policy and Practice*, **97** 121-136.

Impact: *Project 5.6 (Energy/transport systemic change) has redesigned and developed the transport demand module of UKTCM (UK Transport Carbon Model) into a Scottish version of the Transport Energy and Air Pollution Model (STEAM) to better reflect decision making jurisdictions in energy/transport system. This has involved working with Transport Scotland on application of STEAM in informing the next Climate Change Plan for Scotland by running relevant policy scenarios.*

Crossmodal

Grant holder: Dr Jeremy Toner

Funded by: Norwegian Research Council

Dates: October 2015 – June 2018

Coordinating partner: The Institute of Transport Economics, Norway (TØI)

Collaborative partner: Mark Wardman (SYSTRA)

Abstract: Mode shift is at the core of sustainable transport planning in all world cities; yet we know comparatively little about it. The Crossmodal project seeks to improve our understanding of demand effects across different transport modes: How and to what extent policies which change demand for one transport mode (e.g. bus) also affect demand for other modes (e.g. car). Crossmodal develops new and policy-relevant understanding of passengers' mode-switching behaviour through improved theoretical understanding, better methodological approaches and new empirical evidence.

DECISIONS

Grant holder: Professor Stephane Hess

Investigators: Dr Romain Crastes dit Sourd, Dr Charisma Choudhury, Dr Thijs Dekker, Dr David Palma, Dr Chiara Calastri, Thomas Hancock, Martyna Bogacz

Funded by: ERC

Dates: July 2014 – June 2020

Abstract: Mathematical models of choice are used to understand and forecast behaviour, or value intangibles such as time. These outputs are key in many decision making contexts. Yet, while current modelling techniques are faithful to economic theory, their behavioural and psychological soundness have been questioned. This project aims to further develop choice models by: (i) better representing human choice making process, and (ii) considering the context of real-life choices more accurately.

The first objective requires introducing behavioural and psychological elements in mathematical choice models. This implies moving away from the *homo economicus* framework to a more complex representation, where 'soft' factors such as social influence affect decisions.

The second objective seeks to better consider context and temporality (long term vs short term) when modelling choices. Choices are generally not made in isolation. For example, the decision to commute by car is affected by the decision to live in a given area, which in turn is influenced by longer term decisions such as having a large family or not. Moreover, many choices are not restricted to a simple selection, but to a choice of 'what' and 'how much', for example what to buy at the supermarket, and how much of each product. We also seek to better understand such joint choices.

Papers:

- 1) Hess S & Börjesson M. (in press) Understanding attitudes towards congestion pricing: a latent variable investigation with data from four cities, *Transportation Letters*.
- 2) Hess S, Daly A, Dekker T, Ojeda Cabral M & Batley RP (2017) A framework for capturing heterogeneity, heteroskedasticity, non-linearity, reference dependence and design artefacts in value of time research, *Transportation Research Part B*, **96** 126–149.
- 3) Beck MJ, Hess S, Ojeda Cabral M & Dubernet I. (2017) Valuing travel time changes: a case of short-term or long-term choices?, *Transportation Research Part E*, **100** 133-143.
- 4) Hess S, Murphy P, Le H & Leong WY (in press) Estimation of new monetary valuations of travel time, quality of travel and safety for Singapore, *Transportation Research Record*.
- 5) Hess S & Train KE (2017) Correlation and scale in mixed logit models, *Journal of Choice Modelling*, **23** 1-8.
- 6) Giergiczny M, Dekker T, Hess S & Chintakayala P. (2017) Testing the stability of utility parameters in repeated best, repeated best-worst and one-off best-worst studies, *European Journal of Transport and Infrastructure Research*, **17(4)** 457-476.
- 7) Calastri C, Hess S, Daly AJ & Carrasco JA (2017) Does the social context help with understanding and predicting the choice of activity type and duration? An application of the Multiple Discrete-Continuous Nested Extreme Value model to activity diary data, *Transportation Research Part A*.
- 8) Bwambale A, Choudhury CF & Hess S (2017) Modelling trip generation using mobile phone data: a latent demographics approach, *Journal of Transport Geography*.
- 9) Hancock TO, Hess S & Choudhury CF (2017) Decision field theory: improvements to current methodology and comparisons with standard choice modelling techniques, *Transportation Research Part B*.

Impact: *This project will make choice modelling more flexible and capable of reproducing real world behaviour, while still providing easily interpretable results. Our theoretical developments will be tested on a new database collected as part of the project. This data will mix travel behaviour with energy consumption to better understand how our daily choices impact our carbon footprint. Specialized software will be developed for the analysis, and will later be made openly available.*

DEMAND Centre

Grant holder: Professor Greg Marsden
Investigators: Dr Caroline Mullen, Dr Anthony Whiteing, Dr Giulio Mattioli, Professor Jillian Anable
Funded by: Research Councils UK (RCUK) Energy Programme
Dates: May 2013 - May 2018
Collaborative partners: University of Lancaster, University of Reading, University of Aberdeen, University of Birmingham, University College London, University of Southampton, EDF Research, Transport for London
Website: demand.ac.uk

Abstract: At ITS we lead the majority of the mobility-facing research of the Demand Centre's programme. We have completed a study examining the extent to which technology is reconfiguring business practices. To understand need and justice in future mobility transitions we have conducted in-depth qualitative investigations in parallel with a quantitative exploration of economic stress across housing and transport in the (t)ERES study. In 2017 the emphasis of the work switched to a study on the future of retail and on-line shopping (described below). A national Commission on Travel Demand is reviewing how travel demand is understood, how it is changing and the key uncertainties in demand futures.

Papers:

- 1) Marsden G and McDonald M (2017) [Institutional Issues in Planning for Uncertainty, Transportation](#).
- 2) Mattioli G, Lucas K and Marsden G (2017) [Transport Poverty in the UK: From analogy to comparison, Transport Policy](#), 59 93-105.

Impact: *The Commission on Travel Demand has attracted evidence from the DfT, Committee on Climate Change, Civil Aviation Authority and several core cities as well as from consultant practitioners and academics. Over 50 practitioners have been involved in six evidence sessions along with academics and practitioners from eight countries. Dr Caroline Mullen met with*

Graham Pendlebury (DfT's Director of Local Transport) to talk about the findings of the Demand project and about walking as a mode of transport in particular. The Commission on Travel Demand will report in early 2018.

Infrastructures for online shopping: integrating supply and demand

Grant holder: Professor Greg Marsden
Investigators: Dr Anthony Whiteing, Dr Ian Jones
Funded by: Research Councils UK, EDF R&D, Transport for London
Dates: September 2015 – August 2017

Abstract: The trend towards online shopping is resulting in changes to transport demand, for both personal travel and freight movement, with potentially important implications for energy demand. Data has been collected from consumer focus groups and household surveys and is being analysed to gain insights into how households expect to shop in the future - particularly for non-grocery items - and how logistics systems will respond to such changes. The analysis will inform how energy use both in households and industry will change as a result of online shopping.

Local Sustainable Transport Fund Evaluation

Grant holder: Professor Richard Batley
Investigator: Professor Chris Nash
Funded by: DfT
Coordinating partner: Ipsos-MORI
Dates: September 2016 – February 2017

Abstract: The DfT commissioned Ipsos-MORI and ITS to undertake peer reviews of three impact evaluation case studies delivered by private contractors on behalf of the DfT. These case studies assessed the impacts of a small number of Local Sustainable Transport Fund (LSTF) projects.

The relevant case studies were: 1) The Carbon Case Study, prepared by The University of Southampton; 2) Strategic Employment Sites & Business Parks Case Study, prepared by Hertfordshire County Council, The University of West of England, The University of Hertfordshire and Atkins; 3) Town Centres Case Study, prepared by Atkins.

Our reviews provided constructive feedback: (a) to enhance the quality and rigour of the case studies; (b) an independent discussion of the strengths and limitations of each case study so that lessons could be learnt for future evaluations; and (c) an overall assessment of the contribution that these case studies provided to the evidence base.

MARS Jakarta

Grant holder: Professor Simon Shepherd
Investigator: Dr Chandra Balijepalli
Funded by: Greater Jakarta Transport Authority
Dates: August 2016 – November 2017

Abstract: The Jakarta region of the republic of Indonesia has a rapidly increasing population. Transportation in Greater Jakarta relies heavily on the road network and the surge in motorized vehicle traffic is tremendous. The worsening congestion is causing huge economic loss. The aims of this project were to develop the MARS model for the Greater Jakarta Transport Authority (GJTA) and to facilitate the development of a Transportation Master Plan for the metropolitan area. We tested transport policies involving infrastructure expansion such as Metro Rail, Light Rail Transit, Jakarta Outer Ring Road and also the demand management policy involving road pricing.

Impact: *We have trained the officers of GJTA initially in Leeds where they learnt how to develop system dynamic models and how to use the MARS model. Subsequently, in a*



visit to Jakarta, Dr Balijepalli trained the officers of GJTA (see photo – Dr Balijepalli is wearing a dark suit) in developing alternative test scenarios and interpreting the results. Dr Balijepalli presented the preliminary policy test results not only at GJTA but also to a wider audience at various universities including University of Indonesia, Institute of Technology Sumatra, Institute of Technology Bandung, University of Gadjah Mada and School of Land Transport Bekasi. We are collaborating with the Jakarta Ministry of Planning to apply the MARS model for their Transportation Master Plan.

OptiTruck

Grant holder: Dr Haibo Chen
Investigators: Dr Yvonne Barnard, Dr Dongyao Jia, Dr Richard Connors, Professor David Watling
Funded by: EU H2020
Dates: September 2016 – August 2019
Coordinating partner: ERTICO
Collaborative partners: Ten partners in industry and academia (see website for details)
Website: optitruck.eu/

Abstract: The automotive industry has developed powertrain technologies to improve the fuel efficiency of Heavy-Duty Vehicles (HDVs). However, due to increasing road freight, total HDV energy use and CO₂ emissions are expected to remain undiminished if no policy action is taken. The goal of optiTruck is to combine the most advanced technologies from powertrain control with intelligent transport systems in order to achieve a 20% global reduction of energy

consumption, while achieving Euro VI emission standards, for heavy duty road haulage.

Pathways to diesel free mobility

Grant holder: Dr Caroline Mullen
Investigators: Dr Eleonora Morganti, Dr Craig Morton
Funded by: Friends of the Earth
Dates: May 2017 – July 2017

Abstract: We were commissioned to produce a report on what would need to happen to achieve a diesel free mobility system that was economically, socially and environmentally sustainable. The diesel free objective is motivated by recognition of the huge public health burden associated with pollution for which diesel vehicles are a major contributor. Our challenge was to develop methods of meeting the objective without unintended environmental consequences in Britain or overseas whilst sustaining and improving safe, affordable and accessible mobility.

Papers: The report drew on a number of papers including several written by the project leader, for example: Mullen, C.A. and Marsden, G. (forthcoming) 'The car as a safety-net: narrative accounts of the role of energy intensive transport in conditions of housing and employment uncertainty' in *Demanding energy* (eds.) Alison Hui, Gordon Walker and Rosie Day, Palgrave Macmillan: Hampshire.

Impact: The report is intended to provide a valuable tool for Friends of the Earth work on clean air.

TRACE

Grant holder: Dr Paul Timms
Investigator: Professor David Watling
Funded by: EU H2020
Coordinating partner: Cyprus Ministry of Transport of Communications and Works (MTCW)
Collaborative partners: Institute of Transportation Systems (DLR) (Berlin-Germany), University of Cyprus, Cyprus International Institute of Management (CIIM)
Dates: September 2017 – August 2018
Website: www.kios.ucy.ac.cy/trace/

Abstract: The TRACE project aims to establish a Centre of Excellence in Transport Research in Cyprus. In (the current) phase one, funding is provided for the development of a business plan to establish the Centre of Excellence. The business plan will be used to make a proposal for phase two for the creation and operation of the new centre. If successful, match funding would be expected from the Cypriot government. TRACE aims to promote research, innovation and entrepreneurship in transport planning and related policies, sustainable mobility, intelligent transport systems, green and sustainable transport, maritime transport and the blue economy. These areas directly affect key aspects of Cypriot society such as the economy, the environment, tourism and citizens' quality of life. It is therefore expected that TRACE will make a significant positive contribution.

VENI

Grant holder: Dr Eva Heinen
Funded by: Dutch Research Council
Dates: January 2014 – December 2017

Abstract: Reducing car use and encouraging people to walk, cycle or use public transport seems almost impossible to achieve despite extensive academic and policy attention. Change may be effected, but calls for a different methodological approach to the complexity of behaviour, and

a focus that goes beyond the current emphasis on theories concerning rational choice. This project aims to tackle the problem using a novel methodological approach and focussing on differences in behaviour from journey to journey within individuals. It is recognised that identities could prevent behavioural change, as a threat to one's identity causes resistance to change. This research will make a major contribution towards effective strategies to achieve more sustainable transport.

Papers:

- 1) Heinen E; Mattioli G (2017) [Does a high level of multimodality mean less car use? An exploration of multimodality trends in England, Transportation.](#)

Conox Vehicle Emissions

Grant holder: [Dr James Tate](#)

Funded by: Federal Office for the Environment, USA

Coordinating partner: Swedish Environmental Research Institute (IVL)
Collaborative partners: IIASA, Technical University of Graz (TUG), Technet (TNET), Zurich City (ZRH), University of York

Dates: December 2016 – December 2017

Abstract: The aim is to improve knowledge of the real driving emissions of NOX from late-model (i.e. Euro 5 and Euro 6) light-duty diesel passenger cars and vans by pooling, sharing and analysing remote sensing data from those countries which have put a lot of effort into remote sensing measurements over recent years, i.e. Switzerland, UK, Spain, France, Sweden and - above all - the USA. The project has unlocked new understanding of the deterioration of diesel vehicle emission controls and the impact of ambient temperature on emission rates. At lower temperatures during winter emission rates of air quality pollutants are often higher, which can unfortunately often coincide with the time when atmospheric dispersion conditions are weakest,

contributing to a worsening of air quality during pollution episodes.

Papers:

- 1) Sjödin, A., Carslaw, D., Tate, J., J. de la Fuente, Alt, G.-M., Borken-Kleefeld, J., Gentala, R., McClintock, P., Vescio, N., Hausberger, S., Bernard, Y., Jenk, H. (2017) Pan-European study on real-driving NOX emissions from late model diesel cars as measured by remote sensing. *Transport and Air Pollution Conference*, Zurich.

Leeds Air Quality

Grant holder: [Dr James Tate](#)

Funded by: DEFRA

Collaborative partner: Leeds City Council

Dates: March 2017 – January 2018

Picture: see front cover

Abstract: High resolution, high quality telematics data is now routinely collected from a growing proportion of passenger cars and commercial vehicles. Telematics providers are not only collecting data for vehicle logistics and security services, but also support the motor insurance industry to develop products tailored to a customer's use of a vehicle. Telematics data is therefore moving away from being biased by a limited sample of commercial fleets with professional drivers, towards pervasively surveying the real traffic movements and driving behaviour of a growing share of the general passenger car fleet. Second-by-second speed trajectory data is needed so instantaneous emission models can supplement the observed traffic movement data with reliable predictions of tail-pipe CO2 and air pollutant emissions. Telematics data also offers the opportunity to study the impact of the real-life variations in traffic flow and congestion due to incidents, special events, changes in weather conditions and fluctuations in traffic demand.

Since its inception, the Leeds Air Quality study was designed to make

best use of emerging vehicle telematics data. The study area 1km west of Leeds City centre was identified as the only urban area in the north of England failing to achieve the EU nitrogen dioxide (NO2) annual average directive in 2020. The links of most concern were the A58 and A58M (two and three-lane urban motorway). The road network incorporates several multi-lane and multi-level intersections which are frequently heavily congested.

Anonymised telematics data for the study area was sourced from [www.theflow.com](#) between April 2015 – May 2016. The dataset includes over 56,000 kms of quality checked second-by-second vehicle trajectory records. The records cover: vehicle location (GPS), speed (GPS and road-speed), bearing, a short road segment ID (5 – 50 m in length) supplemented with the road gradient. An automatic number plate recognition survey was also conducted during the week commencing 16th April on the A58(M). The vehicle number plates were cross-referenced with the UK registration database so the local vehicle fleet mix at different time periods was known. The raw vehicle activity data was supplemented with predictions of tail-pipe emissions from the European instantaneous emission model scaled according to the local fleet mix and total traffic flow (measured by in-situ automatic traffic counters). The results were analysed and visualised to understand the impact of real driving conditions and onset of traffic congestion in the study area.

Impact: *The impact of the 'dieselisation' of the UK passenger car fleet from a diesel share of 12.9% in 2000 to 52.3% in 2017 was also examined. A 2017 UK passenger car fleet (Euro standard distributions) but with a year 2000 mix of fuel type/ powertrains (petrol, diesel and EV) was predicted to emit 36.6% less NOX and 54.2% less primary NO2.*

Papers:

- 1) Tate J, Pellecuer L, Chapman S (2017). Assessing the vehicle emissions impact of a Clean Air

Zone in Leeds using high resolution big telematics data. *Transport and Air Pollution Conference, Zurich.*

NO2 Local Evaluation Plans

Grant holder: Dr James Tate
Investigators: Professor Jillian Anable,
Dr Karl Ropkins
Funded by: DfT / DEFRA
Coordinating partner: Ipsos-MORI
Dates: September – December 2017

Abstract: The Department for Transport commissioned Ipsos MORI, with our assistance to scope options for measuring the impact of local plans to reduce nitrogen dioxide (NO2) concentrations at the roadside. A £255m implementation fund is supporting all immediate work required to finalise plans to the timeline directed by the Secretary of State. The aim is to bring about compliance with EU limit values for NO2 concentrations in the shortest time possible. The project is developing a guidance note for local authorities to collect base line data and the expected analysis of future impacts. It draws on consultations with stakeholders representing the Joint Air Quality Unit (DfT and Defra), Transport for London and Highways England. The consultations were used to understand the likely nature of local plan activity and anticipated outcomes, and to identify data, metrics and analytical approaches which can be used to assess the impact of local plans.

Impact: *Department for Transport guidance note: 'Evaluation of local NO2 plans'. This guidance will be followed by the implementation of Air Quality Management plans and Clean Air Zones by Local Authorities.*

RESEARCH PUBLICATIONS

The majority of our research publications are now Open Access so that the outcomes of publicly-funded research are more widely and freely available.

JOURNAL ARTICLES

Batley R, Bates J, Bliemer M, Börjesson M, Bourdon J, **Cabral MO,** **Chintakayala PK,** **Choudhury C,** **Daly A,** **Dekker T,** Drivyla E, **Fowkes T,** **Hess S,** Heywood C, **Johnson D,** **Laird J,** **Mackie P,** Parkin J, Sanders S, Sheldon R, **Wardman M,** **Worsley T** (2017) New appraisal values of travel time saving and reliability in Great Britain, *Transportation*, 1-39.

Batool Z, **Carsten O** (2017) Self-reported dimensions of aberrant behaviours among drivers in Pakistan, *Transportation Research Part F: Traffic Psychology and Behaviour*, **47** 176-186.

Beck MJ, **Hess S,** **Cabral MO,** Dubernet I (2017) Valuing travel time savings: A case of short-term or long term choices?, *Transportation Research Part E: Logistics and Transportation Review*, **100** 133-143.

Benedetto V, **Smith ASJ,** **Nash CA** (2017) Evaluating the roles and powers of rail regulatory bodies in Europe: A survey-based approach, *Transport Policy*, **59** 116-123.

Binch A, **Fox CW** (2017) Controlled comparison of machine vision algorithms for Rumex and Urtica detection in grassland, *Computers and Electronics in Agriculture*, **140** 123-138.

Brand C, Cluzel C, **Anable J** (2017) Modeling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach, *Transportation Research Part A: Policy and Practice*, **97** 121-136.

Bwambale A, **Choudhury CF,** **Hess S** (2017) Modelling trip generation

using mobile phone data: A latent demographics approach, *Journal of Transport Geography*.

Calastri C, **Hess S,** **Choudhury C,** **Daly A,** Gabrielli L (2017) Mode choice with latent availability and consideration: Theory and a case study, *Transportation Research Part B: Methodological*.

Calastri C, **Hess S,** **Daly A,** Carrasco JA (2017) Does the social context help with understanding and predicting the choice of activity type and duration? An application of the Multiple Discrete-Continuous Nested Extreme Value model to activity diary data, *Transportation Research Part A: Policy and Practice*, **104** 1-20.

Calastri C, **Hess S,** **Daly A,** Maness M, Kowald M, Axhausen K (2017) Modelling contact mode and frequency of interactions with social network members using the multiple discrete-continuous extreme value model, *Transportation Research Part C: Emerging Technologies*, **76** 16-34.

Calastri C, **Hess S,** Sivakumar A (2017) Editorial: Triggers of behavioural change in an evolving world, *European Journal of Transport and Infrastructure Research*, **17** 304-305.

Choudhury CF, Yang L, de Abreu e Silva J, Ben-Akiva M (2017) Modelling preferences for smart modes and services: A case study in Lisbon, *Transportation Research Part A: Policy and Practice*.

Cottrill C, Gault P, Yeboah G, Nelson JD, **Anable J,** Budd T (2017) Tweeting Transit: An examination of social media strategies for transport information management during a large event, *Transportation Research Part C: Emerging Technologies*, **77** 421-432.

Crawford F, **Watling DP,** **Connors RD** (2017) A statistical method for estimating predictable differences between daily traffic flow profiles, *Transportation Research Part B: Methodological*, **95** 196-213.

De Jong GC, **Tanner R,** Rich J, Thorhauge M, Nielsen OA, Bates

J (2017) Modelling production-consumption flows of goods in Europe: the trade model within Transtools3, *Journal of Shipping and Trade*, **2**.

De Luca S, Di Pace R, Memoli S, **Pariota L** (2017) Comparing signal setting design methods through emission and fuel consumption performance indicators, *Advances in Intelligent Systems and Computing*, Vol **539** 200-209.

Docherty I, **Marsden G, Anable J** (2017) The governance of smart mobility, *Transportation Research Part A: Policy and Practice*.

Engström J, Bårgman J, Nilsson D, Seppelt B, **Markkula G**, Piccinini GB, Victor T (2017) Great expectations: a predictive processing account of automobile driving, *Theoretical Issues in Ergonomics Science*, 1-39.

Engström J, **Markkula G**, Victor T, **Merat N** (2017) Effects of Cognitive Load on Driving Performance: The Cognitive Control Hypothesis, *Human Factors*, **59** 734-764.

Fearnley N, Flügel S, Killi M, Gregersen FA, **Wardman M**, Caspersen E, **Toner JP** (2017) Triggers of Urban Passenger Mode Shift - State of the Art and Model Evidence, *Transportation Research Procedia*, **26** 62-80.

Fyhri A, **Heinen E**, Fearnley N, Sundfør HB (2017) A push to cycling—exploring the e-bike's role in overcoming barriers to bicycle use with a survey and an intervention study, *International Journal of Sustainable Transportation*, **11** 681-695.

Giergiczny M, **Dekker T, Hess S, Chintakayala PK** (2017) Testing the stability of utility parameters in repeated best, repeated best-worst and one-off best-worst studies, *European Journal of Transport and Infrastructure Research*, **17** 457-476.

Gladman J, Buckell J, Young J, **Smith A**, Hulme C, Saggi S, Godfrey M, Enderby P, Teale E, Longo R, Gannon B, Holditch C, Eardley H, Tucker H (2017) Understanding the Models of

Community Hospital rehabilitation Activity (MoCHA): A mixed-methods study, *BMJ Open*, **7** 2.

Gyarmati-Szabó J, Bogachev LV, **Chen H** (2017) Nonstationary POT modelling of air pollution concentrations: Statistical analysis of the traffic and meteorological impact, *Environmetrics*, **28** 5.

Hamersma M, **Heinen E**, Tillema T, Arts J (2017) New highway development in the Netherlands: A residents' perspective, *Transportation Research Part D: Transport and Environment*, **51** 326-339.

Hamersma M, **Heinen E**, Tillema T, Arts J (2017) The development of highway nuisance perception: Experiences of residents along the Southern Ring Road in Groningen, The Netherlands, *Land Use Policy*, **61** 553-563.

Hamersma M, **Heinen E**, Tillema T, Arts J (2017) Understanding resident satisfaction with involvement in highway planning: in-depth interviews during a highway planning process in the Netherlands, *Journal of Environmental Planning and Management*, 1-26.

Harrison G, Thiel C (2017) An exploratory policy analysis of electric vehicle sales competition and sensitivity to infrastructure in Europe, *Technological Forecasting and Social Change*, **114** 165-178.

Harrison G, Thiel C (2017) Policy insights and modelling challenges: The case of passenger car powertrain technology transition in the European Union, *European Transport Research Review*, **9**.

Heinen E, Harshfield A, Panter J, Mackett R, Ogilvie D (2017) Does exposure to new transport infrastructure result in modal shifts? Patterns of change in commute mode choices in a four-year quasi-experimental cohort study, *Journal of Transport and Health*, **6** 396-410.

Heinen E, Mattioli G (2017) Does a high level of multimodality mean

less car use? An exploration of multimodality trends in England, *Transportation*, 1-34.

Hess S, Daly A, Dekker T, Cabral MO, Batley R (2017) A framework for capturing heterogeneity, heteroskedasticity, non-linearity, reference dependence and design artefacts in value of time research, *Transportation Research Part B: Methodological*, **96** 126-149.

Hess S, Train K (2017) Correlation and scale in mixed logit models, *Journal of Choice Modelling*, **23** 1-8.

Ibraimovic T, Hess S (2017) A latent class model of residential choice behaviour and ethnic segregation preferences, *Housing Studies*, 1-21.

Ibraimovic T, Hess S (2017) Changes in the ethnic composition of neighbourhoods: Analysis of household's response and asymmetric preference structures, *Papers in Regional Science*, **96** 759-784.

Jamson S, Mrozek M (2017) Is three the magic number? The role of ergonomic principles in cross country comprehension of road traffic signs, *Ergonomics*, **60** 1024-1031.

Johnson D, Ercolani M, **Mackie P** (2017) Econometric analysis of the link between public transport accessibility and employment, *Transport Policy*, **60** 1-9.

Khreis H, Kelly C, Tate J, Parslow R, **Lucas K**, Nieuwenhuijsen M (2017) Exposure to traffic-related air pollution and risk of development of childhood asthma: A systematic review and meta-analysis, *Environment International*, **100** 1-31.

Khreis H, May AD, Nieuwenhuijsen MJ (2017) Health impacts of urban transport policy measures: A guidance note for practice, *Journal of Transport and Health*, **6** 209-227.

Kuflik T, Minkov E, Nocera S, **Grant-Muller S**, Gal-Tzur A, Shoor I (2017) Automating a framework to extract and analyse transport related social

media content: The potential and the challenges, *Transportation Research Part C: Emerging Technologies*, **77** 275-291.

Li F, Gao Z, Wang D, Liu R, Tang T, Wu J, Yang L (2017) A subjective capacity evaluation model for single-track railway system with δ -balanced traffic and λ -tolerance level, *Transportation Research Part B: Methodological*, **105** 43-66.

Li P, Merat N, Zheng Z, Markkula G, Li Y, Wang Y (2017) Does cognitive distraction improve or degrade lane keeping performance? Analysis of time-to-line crossing safety margins, *Transportation Research Part F: Traffic Psychology and Behaviour*.

Li W, Yang L, Wang L, Zhou X, Liu R, Gao Z (2017) Eco-reliable path finding in time-variant and stochastic networks, *Energy*, **121** 372-387.

Liu B, Jia D, Lu K, Chen H, Yang R, Wang J, Barnard Y, Wu L (2017) Infrastructure-Assisted Message Dissemination for Supporting Heterogeneous Driving Patterns, *IEEE Transactions on Intelligent Transportation Systems*, **18** 2865-2876.

Liu B, Jia D, Lu K, Ngoduy D, Wang J, Wu L (2017) A joint control-communication design for reliable vehicle platooning in hybrid traffic, *IEEE Transactions on Vehicular Technology*, **66** 9394-9409.

Liu J, Wan J, Jia D, Zeng B, Li D, Hsu CH, Chen H (2017) High-Efficiency Urban Traffic Management in Context-Aware Computing and 5G Communication, *IEEE Communications Magazine*, **55** 34-40.

Liu W, Li X, Zhang F, Yang H (2017) Interactive travel choices and traffic forecast in a doubly dynamical system with user inertia and information provision, *Transportation Research Part C: Emerging Technologies*, **85** 711-731.

Liu W, Zhang F, Yang H (2017) Modeling and managing morning

commute with both household and individual travels, *Transportation Research Part B: Methodological*, **103** 227-247.

Louw T, Madigan R, Carsten O, Merat N (2017) Were they in the loop during automated driving? Links between visual attention and crash potential, *Injury Prevention*, **23** 281-286.

Louw T, Markkula G, Boer E, Madigan R, Carsten O, Merat N (2017) Coming back into the loop: Drivers' perceptual-motor performance in critical events after automated driving, *Accident Analysis and Prevention*, **108** 9-18.

Louw TL, Merat N (2017) Are you in the loop? Using gaze dispersion to understand driver visual attention during vehicle automation, *Transportation Research Part C: Emerging Technologies*, 35-50.

Lovelace R (2017) Forecasting urban travel: Past, present and future, *Environment and Planning B-Urban Analytics and City Science*, **44** 184-186.

Lovelace R, Goodman A, Aldred R, Berkoff N, Abbas A, Woodcock J (2017) The Propensity to Cycle Tool: An open source online system for sustainable transport planning, *Journal of Transport and Land Use*, **10**.

Lu H, Hess S, Daly A, Rohr C (2017) Measuring the impact of alcohol multi-buy promotions on consumers' purchase behaviour, *Journal of Choice Modelling*, **24** 75-95.

Lucas K, Hamilton J, Mayne R (2017) Building capacity through action research: reflections on working with low-carbon communities in the UK, *Local Environment*, **22** 725-745.

Madigan R, Louw T, Wilbrink M, Schieben A, Merat N (2017) What influences the decision to use automated public transport? Using UTAUT to understand public acceptance of automated road transport systems, *Transportation Research Part F: Traffic Psychology and Behaviour*, **50** 55-64.

Marsden G, Reardon L (2017) Questions of governance: Rethinking the study of transportation policy, *Transportation Research Part A: Policy and Practice*, **101** 238-251.

Marti J, Hulme C, Ferreira Z, Nikolova S, Lall R, Kaye C, Smyth M, Kelly C, Quinn T, Gates S, Deakin CD, Perkins GD (2017) The cost-effectiveness of a mechanical compression device in out-of-hospital cardiac arrest, *Resuscitation*, **117** 1-7.

Martínez CF, Hodgson F, Mullen C, Timms P (2017) Creating inequality in accessibility: The relationships between public transport and social housing policy in deprived areas of Santiago de Chile, *Journal of Transport Geography*.

Mattioli G (2017) 'Forced Car Ownership' in the UK and Germany: Socio-Spatial Patterns and Potential Economic Stress Impacts, *Social Inclusion*, **5** 147-160.

Mattioli G, Anable J (2017) Gross polluters for food shopping travel: An activity-based typology, *Travel Behaviour and Society*, **6** 19-31.

Mattioli G, Lucas K, Marsden G (2017) Transport poverty and fuel poverty in the UK: From analogy to comparison, *Transport Policy*, **59** 93-105.

Mattioli G, Nicolas JP, Gertz C (2017) Household transport costs, economic stress and energy vulnerability, *Transport Policy*.

Mccay L, Abassi A, Abu-Lebdeh G, Adam Z, Audrey S, Barnett A, Carrasco-Turigas G, Cerin E, Elias W, Hand G, Kelly CE, Loder N, Luke M, MacLeod KE, Moutou C, Puig-Ribera A, Rykala E, Schwartz S, Sener IN, Shaw C, Vert C, Witten K, Woodcock A, Zapata-Diome (2017) Scoping assessment of transport design targets to improve public mental health, *Journal of Urban Design and Mental Health*, **3** 8.

Minton J, Murray CC, Meads D, Hess S, Vargas-Palacios A, Mitchell E, Wright J, Hulme C, Raynor DK, Gregson A, Stanley P, McLintock K, Vincent R, Twiddy M (2017) The Community

IntraVenous Antibiotic Study (CIVAS): a mixed-methods evaluation of patient preferences for and cost-effectiveness of different service models for delivering outpatient parenteral antimicrobial therapy, *Health Services and Delivery Research*, **5** 6.

Moody A, **Tate J** (2017) In Service CO₂ and NO_x Emissions of Euro 6/VI Cars, Light- and Heavy- dutygoods Vehicles in Real London driving: Taking the Road into the Laboratory, *Journal of Earth Sciences and Geotechnical Engineering*, **7** 51-62.

Moreno-Monroy AI, **Lovelace R**, Ramos FR (2017) Public transport and school location impacts on educational inequalities: Insights from São Paulo, *Journal of Transport Geography*.

Morgan M, Fenner R (2017) Spatial evaluation of the multiple benefits of sustainable drainage systems, *Proceedings of the Institution of Civil Engineers - Water Management*, 1-14.

Morton C, **Anable J**, Nelson JD (2017) Consumer structure in the emerging market for electric vehicles: Identifying market segments using cluster analysis, *International Journal of Sustainable Transportation*, **11** 443-459.

Morton C, Budd TM, **Harrison G**, **Mattioli G** (2017) Exploring the expectations of transport professionals concerning the future automobility system: Visions, challenges, and transitions, *International Journal of Sustainable Transportation*, **11** 493-506.

Morton C, **Lovelace R**, **Anable J** (2017) Exploring the effect of local transport policies on the adoption of low emission vehicles: Evidence from the London Congestion Charge and Hybrid Electric Vehicles, *Transport Policy*, **60** 34-46.

Motte-Baumvol B, Belton-Chevallier L, Dabanc L, **Morganti E**, Belin-Munier C (2017) Spatial Dimensions of E-Shopping in France, *Asian Transport Studies*, **4** 585-600.

Ngoduy D, **Jia D** (2017) Multi anticipative bidirectional macroscopic traffic model considering cooperative driving strategy, *Transportmetrica B*, **5** 100-114.

Pampel SM, **Jamson SL**, **Hibberd D**, **Barnard Y** (2017) The activation of eco-driving mental models: Can text messages prime drivers to use their existing knowledge and skills?, *Cognition, Technology and Work*, **19** 743-758.

Pettifor H, Wilson C, Axsen J, Abrahamse W, **Anable J** (2017) Social influence in the global diffusion of alternative fuel vehicles - A meta-analysis, *Journal of Transport Geography*, **62** 247-261.

Philips I, Clarke G, **Watling D** (2017) A fine grained hybrid spatial microsimulation technique for generating detailed synthetic individuals from multiple data sources: An application to walking and cycling, *International Journal of Microsimulation*, **10** 167-200.

Rasmussen TK, Nielsen OA, **Watling DP**, Prato CG (2017) The restricted stochastic user equilibrium with threshold model: Large-scale application and parameter testing, *European Journal of Transport and Infrastructure Research*, **17** 1-24.

Ropkins K, DeFries TH, Pope F, Green DC, Kemper J, Kishan S, Fuller GW, Li H, Sidebottom J, Crilley LR, Kramer L, Bloss WJ, Stewart Hager J (2017) Evaluation of EDAR vehicle emissions remote sensing technology, *Science of the Total Environment*, **609** 1464-1474.

Rushton CE, **Tate JE**, **Shepherd SP**, Carslaw DC (2017) Inter-Instrument Comparison of Remote Sensing Devices and a New Method For Calculating On Road NO_x Emissions and Validation of Vehicle Specific Power, *Journal of the Air & Waste Management Association*.

Sakai K, **Liu R**, Kusakabe T, Asakura Y (2017) Pareto-Improving Social Optimal Pricing Schemes Based on

Bottleneck Permits for Managing Congestion at a Merging Section, *International Journal of Sustainable Transportation*, **11** 737-748.

Siddique MAB, **Choudhury CF** (2017) Modelling the Behavioural Response to Congestion Pricing in Dhaka, Bangladesh, *Transportation in Developing Economies*, **3**.

Smith A, Iwnicki S, Kaushal A, Odolinski K, **Wheat P** (2017) Estimating the relative cost of track damage mechanisms: combining economic and engineering approaches, *Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit*, **231** 620-636.

Smith AP, **Lovelace R**, Birkin M (2017) Population synthesis with quasirandom integer sampling, *Journal of Artificial Societies and Social Simulation*, **20** 14.

Tirachini A, Hurtubia R, **Dekker T**, Daziano RA (2017) Estimation of crowding discomfort in public transport: Results from Santiago de Chile, *Transportation Research Part A: Policy and Practice*, **103** 311-326.

Vanderhaegen F, **Carsten O** (2017) Can dissonance engineering improve risk analysis of human-machine systems?, *Cognition, Technology and Work*, **19**.

Wadud Z (2017) Asymmetry in transport fuel demand: Evidence from household level data, *Transportation Research Part D-Transport and Environment*, **57** 277-286.

Wadud Z (2017) Fully automated vehicles: A cost of ownership analysis to inform early adoption, *Transportation Research Part A: Policy and Practice*, **101** 163-176.

Wadud Z, Baierl M (2017) Explaining "peak car" with economic variables: A comment, *Transportation Research Part A: Policy and Practice*, **95** 381-385.

Wadud Z, Huda FY (2017) Fire Safety in the Readymade Garment Sector in Bangladesh: Structural Inadequacy

Versus Management Deficiency, *Fire Technology*, **53** 793-814.

Wang WW, Wang DZW, **Zhang F**, Sun H, Zhang W, Wu J (2017) Overcoming the Downs-Thomson Paradox by transit subsidy policies, *Transportation Research Part A: Policy and Practice*, **95** 126-147.

Wheat P (2017) Scale, quality and efficiency in road maintenance: Evidence for English local authorities, *Transport Policy*, **59** 46-53.

Wheat P, Wardman M (2017) Effects of timetable related service quality of rail demand, *Transportation Research Part A: Policy and Practice*, **95** 96-108.

Wu W, **Liu R**, Jin W (2017) Modelling bus bunching and holding control with vehicle overtaking and distributed passenger boarding behaviour, *Transportation Research Part B: Methodological*, **104** 175-197.

Xu M, **Grant-Muller S** (2017) Tradable Credits Scheme on Urban Travel Demand: A Linear Expenditure System Approach and Simulation in Beijing, *Transportation Research Procedia*, **25** 2938-2952.

Xu M, **Grant-Muller S**, Gao Z (2017) Implementation effects and integration evaluation of a selection of transport management measures in Beijing, *Case Studies on Transport Policy*, **5** 604-614.

Xu M, Wang G, **Grant-Muller S**, Gao Z (2017) Joint road toll pricing and capacity development in discrete transport network design problem, *Transportation*, **44** 731-752.

Ye H, Liu R (2017) Nonlinear programming methods based on closed-form expressions for optimal train control, *Transportation Research Part C: Emerging Technologies*, **82** 102-123.

Ye H, Xiao F, Yang H (2017) Exploration of day-to-day route choice models by a virtual experiment, *Transportation Research Part C: Emerging Technologies*.

Ye H, Yang H (2017) Rational behavior adjustment process with boundedly rational user equilibrium, *Transportation Science*, **51** 968-980.

Yokomi M, **Wheat P**, Mizutani J (2017) The Impact of Low Cost Carriers on Non-Aeronautical Revenues in Airport: An Empirical Study of UK Airports, *Journal of Air Transport Management*, **64** 77-85.

Zhang F, Liu W, Wang X, Yang H (2017) A new look at the morning commute with household shared-ride: How does school location play a role?, *Transportation Research Part E: Logistics and Transportation Review*, **103** 198-217.

Zimasa T, Jamson S, Henson B (2017) Are happy drivers safer drivers? Evidence from hazard response times and eye tracking data, *Transportation Research Part F: Traffic Psychology and Behaviour*, **46** 14-23.

CONFERENCE PAPERS

Clement SJ, McKee DW, **Romano R**, Xu J, Lopez JM, Battersby D (2017) The Internet of Simulation: Enabling agile model based systems engineering for cyber-physical systems, *IEEE 12th System of Systems Engineering Conference*.

De Lima J, Maia ML, **Lucas K** (2017) Income vs. travel time: Why do the poorest and the rich, *World Conference on Transport Research (WCTR) In: Transportation Research Procedia*, Vol 25.

Killip G, Owen A, Topouzi M, **Morgan M** (2017) Governance of Low-carbon Innovation in Domestic Energy Retrofits in the UK, *The International Refurbishment Symposium*.

Lovelace R, Fridman-Rojas I, Long R (2017) New tools of the trade? The potential and pitfalls of 'Machine Learning' and 'DAGs' to model origin-destination data, *International Conference on GeoComputation*.

McKee DW, Clement SJ, Ouyang X, Xu J, **Romano R**, Davies J (2017) The Internet of Simulation, a Specialisation of the Internet of Things with Simulation and Workflow as a Service (SIM/WFaaS), *11th IEEE International Symposium on Service-Oriented System Engineering*.

Pariota L, Bifulco GN, **Markkula G, Romano R** (2017) Validation of driving behaviour as a step towards the investigation of Connected and Automated Vehicles by means of driving simulators, *5th IEEE International Conference on Models and technologies for intelligent transportation systems*.

Philips I, Anable J, Cairns S, Emmerson P, Chatterton T (2017) A Spatial Typology of Car Usage and its Local Determinants in England, *49th Annual Universities Transport Studies Group Conference*.

Romano R, Sadraei E, Markkula G (2017) Rapid Tuning of the Classical Motion Cueing Algorithm, *In: Proceedings of Driving Simulation Conference 2017*.

Svärd M, **Markkula G**, Engström J, Granum F, Bärghman J (2017) A quantitative driver model of pre-crash brake onset and control, *In Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, Vol 61.

Thomas D, Li H, Wang X, Song B, Ge Y, Yu W, **Ropkins K** (2017) A Comparison of Tailpipe Gaseous Emissions for RDE and WLTC Using SI Passenger Cars, *International Powertrain, Fuels and Lubricants Meeting*.

Xu M, **Grant-Muller S**, Mussone L, Liang L (2017) Characteristics of household mobility for Milan: A statistical investigation of underlying determinants, *IEEE International Conference on Environment and Electrical Engineering and 2017 IEEE Industrial and Commercial Power Systems Europe (EEEIC / I&CPS Europe)*.

Xu SX, **Liu R**, Liu TL, Huang HJ (2017) Pareto-improving policies for an

idealized two-zone city served by two congestible modes, *22nd International Symposium on Transportation and Traffic Theory, In: Transportation Research Procedia, Vol 23.*

Ye H, Xiao F, Yang H (2017) Exploration of day-to-day route choice models by a virtual experiment, *22nd International Symposium on Transportation and Traffic Theory, In: Transportation Research Procedia, Vol 23.*

BOOKS AND BOOK CHAPTERS

Hodgson F (2017) Structures of disadvantage and acts of resistance: Remembering, skilling, history and gender, *In: Divall C, Hine J eds. Transport Policy: Learning Lessons from History, Routledge, 31-46.*

Jones I, Faulconbridge J, Marsden G, Anable J (2017) Demanding business travel: the evolution of the timespaces of business practice, *In: Hui A, Day R, Walker G eds. Demanding Energy: space, time and change, Palgrave Macmillan, 257-277.*

REPORTS

Cairns S, Anable JL, Chatterton T, Wilson RE, Morton C (2017) MOToring along: The lives of cars seen through licensing and test data, RAC Foundation.

Hall S, Shepherd S, Wadud Z (2017) The Innovation Interface: Business model innovation for electric vehicle futures.

Cornerstones of the ITS Research Landscape and Related Projects

Connected Transport

AdaptIVe	7
AUTOPILOT	8
CARTRE	8
Cycle Propensity phase 2	8
Cycling Infrastructure	
Prioritisation Toolkit	9
ELVITEN	9
Evaluating Driver Engagement	
in Automation	8
GameECAR	9
Hazard Perception	10
Human Drive	7
InterACT	7
L3PILOT	7
Machine Learning	10
Next Generation Driving	
Behaviour Models	10
Programme for Simulation Innovation	11
TRANSITION	11

Inclusive Transport

ADAPT	11
Co-Motion	11
EMPOWER	12
Habits	12
Smart Measures	13
The Smarter Travel Solution	13
Transport and Mobilities in	
Low Income Countries	13
Transport Equity Assessment	13
UDRIVE	13
XCYCLE	14

Productive Transport

CQC Efficiency Network	14
DITTO	14
Energy-Efficient Automatic	
Train Control	15
ITF Capital Bias	17
NeTIRail	16
OPTIYARD	15
PDFH V6 UPDATE	16
RAPPORT	15
Reducing Energy Demand	16
SMaRTE	16
SNCF Strategic Partnership	17
Steel Composition and	
Track Degradation	17
What Works Centre for	
Local Economic Growth	17

Resilient Transport

ADVANCE	18
ClimateXChange	18
Conox Vehicle Emissions	23
Crossmodal	20
DECISIONS	20
DEMAND Centre	21
Electricity Sat Nav	18
Infrastructures for online shopping	21
Leeds Air Quality	23
Local Sustainable Transport	
Fund Evaluation	21
MARS Jakarta	21
MOT	18
NO2 Local Evaluation Plans	24
OptiTruck	22
Pathways to diesel free mobility	22
RACER	19
RAC Foundation Almanac	19
TRACE	22
UK_ERC3	19
VENI	22

Index of Featured Projects

ADAPT	11
AdaptIVe	7
ADVANCE	18
AUTOPILOT	8
CARTRE	8
ClimateXChange	18
Co-Motion	11
Conox Vehicle Emissions	23
CQC Efficiency Network	14
Crossmodal	20
Cycle Propensity phase 2	8
Cycling Infrastructure	
Prioritisation Toolkit	9
DECISIONS	20
DEMAND Centre	21
DITTO	14
Electricity Sat Nav	18
ELVITEN	9
EMPOWER	12
Energy-Efficient Automatic	
Train Control	15
Evaluating Driver Engagement	
in Automation	8
GameECAR	9
Habits	12
Hazard Perception	10
Human Drive	7
Infrastructures for online shopping	21
InterACT	7
ITF Capital Bias	17
L3PILOT	7

Leeds Air Quality.....	23	Pathways to diesel free mobility.....	22	The Smarter Travel Solution.....	13
Local Sustainable Transport		PDFH V6 UPDATE.....	16	TRACE.....	22
Fund Evaluation.....	21	Programme for Simulation Innovation	11	TRANSITION.....	11
Machine Learning.....	10	RACER.....	19	Transport and Mobilities in	
MARS Jakarta.....	21	RAC Foundation Almanac.....	19	Low Income Countries.....	13
MOT.....	18	RAPPORT.....	15	Transport Equity Assessment.....	13
NeTIRail.....	16	Reducing Energy Demand.....	16	UDRIVE.....	13
Next Generation Driving		SMaRTE.....	16	UK_ERC3.....	19
Behaviour Models.....	10	Smart Measures.....	13	VENI.....	22
NO2 Local Evaluation Plans.....	24	SNCF Strategic Partnership.....	17	What Works Centre for	
OptiTruck.....	22	Steel Composition and		Local Economic Growth.....	17
OPTIYARD.....	15	Track Degradation.....	17	XCYCLE.....	14

Index of Researchers and their projects

Anable, Prof Jillian	AdVANCE, CXC, MOT, RACER. Electricity Sat Nav
Baker-Graham, Dr Alex	ADAPT
Balijepalli, Dr Chandra	MARS Jakarta
Barnard, Dr Yvonne	CARTRE, AUTOPILOT, OptiTRUCK
Bennet, Samuel	ADAPT
Batley, Prof Richard	LSTF Evaluation, PDFH, Steel Composition, SNCF
Calastri, Dr Chiara	Decisions
Carsten, Prof Oliver	UDrive, XCycle
Cepeda-Zorilla, Magda	EMPOWER
Chen, Dr Haibo	AUTOPILOT, CARTRE, ELVITEN, OptiTRUCK, STS
Choudhury, Dr Charisma	Decisions, NGDBM
Connors, Dr Richard	OptiTRUCK
Crastes, Dr Romain	Decisions
Daly, Michael	NGDBM, XCycle, PSI
De Jong, Prof Gerard	PDFH
Dekker, Dr Thijs	Decisions, Smart Measures, NeTIRail
Fox, Dr Charles	InterACT, XCycle
Giles, Oscar	InterACT, PSI
Grant-Muller, Prof Susan	EMPOWER, Habits
Harrison, Dr Gillian	Habits
Heinen, Dr Eva	VENI
Hess, Prof Stephane	Decisions
Hibberd, Dr Daryl	L3PILOT, XCycle
Hodgson, Dr Frances	EMPOWER, Habits
Horrobin, Anthony	PSI, Hazard Perception
Jamson, Dr Andrew	Human Drive, PSI
Jamson, Prof Samantha	GameCAR
Jia, Dr Dongyao	CARTRE, OptiTRUCK
Johnson, Dan	NeTIRail, SMaRTE
Jones, Dr Ian	DEMAND Centre
Jukic, Hrvoje	PSI, Hazard Perception, Human Drive
Liu, Dr Ronghui	DITTO, Energy Efficient ATO, OptiYard, RAPPORT
Louw, Dr Tyron	AdaptIVe, Human Drive, L3PILOT
Lovelace, Dr Robin	Cycle Propensity, Cycling Infrastructure, Machine Learning
Lucas, Prof Karen	TEA Cost, Transport & Mobilities, What Works
Madigan, Dr Ruth	AdaptIVe, Hazard Perception, InterACT
Markkula, Dr Gustav	Human Drive, InterACT, PSI, Transition
Marsden, Prof Greg	DEMAND Centre, Infrastructures for online shopping
Matthews, Bryan	Co-Motion, NeTIRail, Steel
Mattioli, Dr Giulio	DEMAND centre, RACER
Merat, Prof Natasha	AdaptIVe, Human Drive, InterACT, L3PILOT
Morgan, Dr Malcolm	Cycle Propensity, Cycling Infrastructure
Morganti, Dr Eleonora	AdVANCE, Smart Measures, Pathways

Morton, Dr Craig	Climate X Change, Pathways
Mullen, Dr Caroline	DEMAND Centre, Pathways, RACER, Smart Measures
Nash, Prof Chris	LSTF Evaluation, NeTIRail, Steel
Nellthorpe, Dr John	Smart Measures, SNCF
Ojeda-Cabral, Dr Manuel	NeTIRail, Reducing Energy Demand, Steel
Palma, Dr David	Decisions
Pangbourne, Dr Kate	ADAPT, SMaRTE
Phillips, Dr Ian	AdvANce, STS
Redfern, Thomas	Habits
Romano, Prof Richard	AdaptIVe, Hazard Perception, InterACT, PSI, Transition, XCycle
Ropkins, Dr Karl	NO2 Local Evaluation Plans
Shepherd, Prof Simon	MARS Jakarta, STS
Shires, Jeremy	Reducing Energy Demand, SMaRTE, STS
Smith, Prof Andrew SJ	ITF, OptiYard, NeTIRail, Reducing Energy Demand, SMaRTE, SNCF, Steel
Solernou-Crusat, Dr Albert	Human Drive
Stead, Alex	CQC, Reducing Energy Demand, ITF Capital Bias
Tate, Dr James	Conox Vehicle Emission, Leeds Air Quality, NO2 Local Evaluation Plans
Thiebaud, Dr Jean-Christophe	Reducing Energy Demand, SNCF
Thomasson, Erik	Smart Measures, RAPPORT
Timms, Dr Paul	TRACE
Tomlinson, Dr Andrew	Programme for Simulation Innovation
Toner, Dr Jeremy	Crossmodal
Wadud, Dr Zia	DEMAND Centre
Watling, Prof David	ELVITEN
Wheat, Dr Phill	CQC, NeTIRail, ITF Capital Bias
Whiteing, Dr Anthony	AdvANce, DEMAND Centre, DITTO
Ye, Dr Hongbo	DITTO, Energy Efficient ATO, OptiYard, RAPPORT
Zhang, Dr Fangni	NeTIRail, RAPPORT, SMaRTE

