ITS RESEARCH REPORT 2022

Celebrating our 50th Anniversary

Emeritus Professor Coleman O'Flaherty, the Founding Director of ITS pictured with the current Director, Prof Simon Shepherd.

To celebrate the 50th Anniversary our founder visited ITS for the first time since 1974

Emeritus Professor Coleman O'Flaherty was the first Director of the Institute in 1972 and one of the founders. Coleman left Leeds in 1974 and later became Deputy Vice-Chancellor at the University of Tasmania. A celebratory dinner was held for current, former and new staff, alumni and students. The 50 years of ITS are recorded here: 50 years of the Institute for Transport Studies - please add your contribution to this timeline (padlet.org)

REF outcomes

The work of ITS has been recognised in the Research Excellence Framework (REF) 2021. REF is the system for assessing the quality and impact of research in UK higher education institutions, along with the environment that supports this research, broken down by disciplines called Units of Assessment (UoA). The Institute for Transport Studies contributed to both Engineering (UoA12) and Geography (UoA14). In Engineering, 97% of the research outputs submitted were assessed as "world leading" or "internationally excellent". The School's work on transport economics, modelling and simulation, automation and rail engineering produced many of the outstanding research outputs that contributed to our success in this UoA. In Geography, 93% of the research outputs were assessed as "world leading" or "internationally excellent". Our work on decarbonisation, active travel and governance contributed to these outstanding outputs.

In both the Geography and Engineering UoAs the case studies submitted by ITS were graded at the highest quality. The research that has positively impacted people in the UK and across the globe was evidenced in the following case studies from ITS:

1. Updating official UK valuations of travel time savings – with implications for the benefit-cost ratio of major transport schemes including HS2 (led by Professor Richard Batley)
2. Intelligent Speed Assistance required as a mandatory safety feature on all new vehicles sold across Europe (led by Professor Oliver Carsten)
3. Toolkits to prioritise investments in cycling (led by Dr Robin Lovelace)

Director Professor Simon Shepherd said:

Our research is truly impactful. The REF result is a great endorsement of our strategy to promote intensive research careers within the Institute which addresses the key transport challenges facing society in the 21st century. Everyone in ITS and their collaborators work at the cutting edge of their discipline and this has been recognised by the REF panel of experts. A great result during our 50th anniversary year!

CONTENTS

Influencing Transport Policy

Dr Karl Ropkins and colleagues in the TRANSITION Clean Air Network wrote a response to the COP26 Declaration on Accelerating the Transition to 100% Zero Emission Cars and Vans: https://transition-air.org.uk/news/letter-re-cop26-declaration-cars/

Karl Ropkins' project https://transition-air.org.uk/ seeks to deliver air quality and health benefits associated with the UK transition to a low-emission transport economy.

New rules have been introduced in the DVLA Handbook for Motorists as a result of **Dr Jo-Ann Pattinson's** work with the law firm Addleshaw Goddard; the insurance of automated vehicles will cover drivers viewing inbuilt screens but not drivers using mobile phones in the event of a collision. Data collected from automated vehicles will be used in evidence.

Swapping Cars for Walking

People are now routinely using their cars less and walking more since the first COVID-19 lockdown, according to research concluded by **Professor Greg Marsden, Professor Jillian Anable** and **Dr Llinos Brown**. Weekday car traffic has remained 10% lower than pre-pandemic levels, as large numbers of people reorganised their lives to travel less over the past two years. The study also found that car ownership has fallen: since the pandemic began, 14% of households that had two cars now have only one. But bus use was 80% of pre-pandemic levels at the end of January 2022, with rail use at 60%. The research team analysed national datasets and insights from a survey in 10 areas of the UK to explore how the new travel behaviours can support net-zero carbon ambitions.

Professor Greg Marsden said:
Some of our findings upend the thinking about transport policy. Society's capacity to innovate suggests we can use the learning from the pandemic to plan for less traffic. We need to do that anyway to meet our climate goals. In the light of the war in Ukraine, increased fuel prices and energy security concerns, we need to double our efforts on enabling better access to the things people need without requiring more travel to get them.

The research team found that more people were walking more often than before the pandemic, and not just for leisure. This means we should be spending more on improving our local areas for walking and cycling. For those who can, working from home has played a critical part in reducing traffic levels. Even if people who have worked from home go back to travelling for half of their working week, there will still be a reduction of 16% in car commute miles.

The report recommended active management of the return to office working, to kickstart sustainable commuting with public transport, cycling and walking. 'Less is more: Changing travel in a post-pandemic society', highlights that the accessibility of key services locally, easily reached by foot or on bike, is essential for a more sustainable future.

Dr Kate Pangbourne: Expert Panel member for New Frontiers in Research Fund Transformation 2022 competition of the Canada Research Coordinating Committee (CRCC) and Canada's three research granting agencies: Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC) and Social Sciences and Humanities Research Council (SSHRC).

New evidence from the DecarboN8 Network (led by Professor Greg Marsden) can help provide clarity around the hidden carbon costs of transport infrastructure and will be of interest to those involved in early-stage decision making, to ensure new schemes do not undermine national and local climate ambitions. Decarbon8.org.uk/EmbodiedEmissions/ features a policy briefing and two technical reports focussed on quantifying the embodied emissions involved in building and maintaining transport infrastructure. The reports also look at the effects of more sustainable alternative materials and processes and a steadily decarbonising electrical grid.

Rapidly rises fuel prices have led to calls to cut fuel duty. In the Conversation https://theconversation.com/petrol-prices-are-rising-but-fuel-duty-cuts-arent-the-answer-185188 **Dr Caroline Mullen** and **Professor Greg Marsden** argue that cutting fuel duty not only undermines efforts to decarbonise transport, it also damages rather than improves social inclusion and equity.

Dr Caroline Mullen participated in EU-level Task Force exploring a fair energy transition as part of the 'Fair Energy Transition for All' European Policy Centre (EPC)

Dr Ian Philips and **Professor Jillian Anable** received a request from Waverley Council to use the results from their paper in the Council's Local Cycling and Walking Infrastructure Plans. The paper is: Philips I, Anable J, Chatterton T. (2022). E-bikes and their capability to reduce car CO2 emissions. Transport Policy https://doi.org/10.1016/j.tranpol.2021.11.019

Dr Malcolm Morgan presented his **Place-Based Carbon Calculator** www.carbon.place at an online event to Friends of the Earth. In the Carbon Calculator's first year 50,000 visitors downloaded over 200 GB of data. In light of the UK's cost-of-living crisis, particularly from rapidly rising energy prices. Dr Morgan has added two new sets of data as well extending the data to cover Scotland and Wales: Postcode level domestic gas and electricity consumption and Energy Performance Certificates. This may help policymakers, local authorities, charities and community groups target help based on people's needs, and that help would be proportional to both the households' income and energy demand. Dr Morgan has also updated the base maps to facilitate the new data layers. This update allows you to zoom in much closer than previously possible and adds individual buildings to the map with a 3D effect which works especially well with the EPC data. The base map also gains hill shading to give a clearer sense of the terrain.

Transport Infrastructure Efficiency Strategy

The **Transport Infrastructure Efficiency Strategy (TIES)** Living Lab continues – but **Professor Phill Wheat** says the team are facing challenges. TIES Living Lab is a joint venture by Dr Wheat and his partners at the University of Dundee, the University of the West of England, Whole Life Consultants Ltd and Accelar. Funded by InnovateUK, as part of the £650 billion investment by the UK over the next decade on infrastructure investment, the TIES Living Lab programme wants to reshape the public sphere by exploring a key issue of this generation: What do environmentally and socially responsive infrastructure projects look like? The project is making headway in establishing protocols for data collection and centralised data storage, but the process is not without obstacles. Major projects across

industries are difficult to compare, especially without a reliable translator. Important lessons can be learned by comparing major projects, but they are written in different, mutually unintelligible languages. Dr Wheat and his colleagues have been brainstorming ways to overcome this challenge. TIES Living Lab is also working with the Department for Transport, HS2, Transport for London, Network Rail and National Highways. Dr Wheat calls for a commitment from industry to join in and work collaboratively to make a lasting impact. Doing so can help achieve the goals that have become a priority for the public and policy makers alike, such as improving environmental performance, reducing carbon emissions, addressing climate resilience, productivity and social value. transporttimes.co.uk/news.php/Making-data-work-to-help-deliver-transport-infrastructure-651/

Staff Awards

Dr Crusat was awarded IET's **Most Innovative Solution in Future Mobility** for his multi-collaborative work on interoperable simulators. Dr Solernou and the Virtuocity team created a link to Ford's CAM testbed network enabling co-simulation between a pedestrian participant in the HIKER lab at Leeds and a driver in the UTAC Millbrook test facility in Leyland.

Dr Albert Solernou-Crusat and his team demonstrated the capabilities of the Interoperable Simulator at The Savoy in London: CAM Innovation Event. Two videos on the project were made public on Youtube: https://www.youtube.com/watch?v=C72Q_p33XNo

https://www.youtube.com/watch?v=7eVKzOtRrMY

Albert also wrote a chapter on the Report of the Interoperable Simulator project: https://zenzic.io/content/uploads/2022/04/Simulation_Report_-_Final_Version.pdf

Professor Chris Nash was awarded an Honorary Doctorate by Masaryk University, Brno.

Professor Jillian Anable was awarded 2022 Transport Planner of the Year.

Prof Anable continues to make multiple media appearances as expert transport scientist including: Radio Leeds answering transport questions from the public; Radio 5 Live speaking about the impact of SUVs on the environment, BBC Radio Ulster on rising fuel prices due to global supply constraints and the need to reach net zero carbon targets with travellers more inclined to use other modes of transport as well as driving at lower speeds; with **Dr Ian Philips** in anthropocenemagazine.org/2022/06/how-much-can-e-bikes-reduce-carbon-emissions/ and youtube.com/watch?v=1OJkD-jFBYA on delivering zero emissions transport and mobility solutions.

The University of Leeds' Partnership Awards cover a range of categories relating to good collegiality. **Professor Charisma Choudhury** won the Academic Personal Tutor/Supervisor award.

Rafael Cirino Gonçalves was awarded a fellowship by transport safety company Seeing Machines. The 18-month postdoctoral fellowship will support Rafael's investigation of safety in self-driving cars. Dr Mike Lenné, Chief Science and Innovation Officer at Seeing Machines said: "The Leeds team is a world-leading research group in the field of road safety and autonomous driving. Continuing our research partnership through this fellowship program will accelerate our ability to continue delivering technology that solves real-world problems and saves lives."

Yanis Boussad has been awarded an enrichment award by the Alan Turing Institute. He will be researching and carrying out activities around the ethical use of pervasive signal data.

Dr Robin Lovelace, lead developer of the Propensity to Cycle Tool, has been appointed Active Travel England's Interim Director of Data and Analysis, as part of his No.10 Data Science Fellowship to support data science across central government, funded by the Economic and Social Research Council and in collaboration with the Office for National Statistics. The focus will be on building tools, systems and datasets that make walking, wheeling and cycling an obvious choice for helping communities to unlock the government's growth agenda and help support its net zero strategy, approached with an open source and collaborative mindset, creating safer, easier and greener local trips. Dr Lovelace was invited to give guidance to the DfT on appraisal of active travel schemes, this will likely influence how some of the £2b for walking and cycling will be spent over the next 5 years.

Contraflow cycling does not increase crash rate.

Allowing cycling in both directions on one-way streets does not pose a safety risk and should be made mandatory in all but exceptional cases, according to a new study. In the first large-scale research of its kind, crashes were examined on more than 500 streets over 22 years in London, both before and after contraflow cycling was introduced, and it was found that contraflows did not increase cyclist crash or casualty rates. The introduction of cycling against the flow of traffic has often proved controversial because it was perceived to be unsafe, but the study shows it to be a safe, low-cost intervention which can improve the cycling experience and increase participation. European studies show that contraflow cycling encourages more cycling and improves the pedestrian experience by discouraging cyclists from using pavements. Reference: Tait C, Beecham R, Lovelace R, Barber S. Contraflows and cycling safety: Evidence from 22 years of data involving 508 one-way streets. *Accident Analysis and Prevention*, 179 doi.org10.1016/j.aap.2022.106895.

Dr Lovelace said:
This research adds to the growing evidence base around the interventions needed to enable active modes to become the natural choice for everyday trips. The government's objective is for at least 50% of short urban trips to be made by active modes by 2030.

PhD Awards

In 2022 PhD certificates were awarded to eleven ITS students: Congratulations to **Fanta Camara** for her thesis on 'Inferring and operating pedestrian behaviour models on autonomous vehicles'; **Naphat Ketphat** 'Train movement under the virtual coupling system: the VCS applications used to increase route capacity and to reduce delay'; **Edward Lambert** 'Optimization and mathematical modelling for path planning of co-operative intra-logistics automated vehicles'; **Davide Maggi** 'Safe and seamless transfer of control authority exploring haptic shared control during handovers; **Tahera Mayat** 'The role of governance in assessing satisfaction with local highways in England'; **Ioanna Moscholidou** 'What shapes smart mobility? A comparison of smart mobility governance in Seattle, Greater Manchester and Stockholm'; **Mickael Perrier** 'The usability of graphical symbols and visual aids designed for driving automation systems'; **Vishnu Radhakrishnan** 'A psychophysiological insight into driver state during highly automated driving'; **Jack Thompson** 'Why has the UK spending on rail increased? A discourse analysis'; **Panagiotis Tsoleridis** 'Leveraging GPS-based trip diaries for modelling individual mobility behaviour'; **Zhuoqian Yang** 'Real-driving emission performance and potential reduction from vans.'

Post Graduate Researcher **Ian Greenwood**, supervised by Professors Samantha Jamson and Greg Marsden, was awarded the Smeed Prize at UTSG for best student paper and presentation titled "The politics of road death: is Britain complacent?"

Alexandra-Eleni Vitel received the Faculty of Environment Partnership Award for her significant impact on our learning/research community as a Postgraduate Researcher.

Vishnu Radhakrishnan (now a member of ITS staff) celebrated his graduation with supervisors Professor Natasha Merat and Dr Tyron Louw.

Staff changes

During 2022 we welcomed **Dr Courtney Goodridge, Peter Woodthorpe, Dr Katie Logan, Dr Christian Bretter, Dr Tanveer Hussain, Dr Jin Liu** and **Dr Eugeni Vidal-Tortosa.**

Dr Caroline Mullen was promoted to Associate Professor. **Dr Gillian Harrison** and **Dr Malcolm Morgan** were also promoted. Promotion panels were very impressed with the quality of their submissions covering both research and teaching criteria. **Dr Mahdi Rezaei** became the new Executive Member of The Universities' Transport Study Group (UTSG).

We bade farewell and good luck in their onward careers to Professor Eva Heinen, and Early Career Researchers: Dr Tyron Louw, Dr Tom Haines-Doran, Dr Kristofer Odolinski, Dr Evangelos Paschalidis, Amir Kalantari, Arash Kalatian, Dr Ehsan Sadraei and Dr David Palma.

It is with great sadness that we learnt of the passing of **Howard Kirby** who was at ITS from 1978 to 1997. Howard was our first director of research. He championed the early use of neural networks in transport applications and pushed others to go for creative research ideas. He was instrumental in getting ITS involved in European research way ahead of any other department in the University. This legacy carries on today. He was interested in everyone's research and was the glue which pulled staff together. Howard was involved in the appointment of Oliver Carsten and Miles Tight via his bid to the AA Road Safety Foundation which sowed the seeds of our highly successful Human Factors research group. He also appointed Susan Grant-Muller and Mark Dougherty and so began the research into intelligent transport systems and neural networks. Howard worked on ANPR and speech recognition and was always looking at how technology and new algorithms could be used in transportation. Howard was kind, supportive, imaginative and always there to help others. A true gentleman who will be sorely missed.

Alumni Awards

Best Paper Award of the TRF Conference went to Alumnus **Dr Cesar Rivera Trujillo** who presented "Establishing the First Economic Regulation of the Mexican Rail Concessions". Cesar graduated with an MSc in Transport Economics in 1998 followed by a PhD in 2004. Cesar is now Director of Economic Regulation for Mexican Railways.

Alumna **Ejiro Ikoko** won the Eric Sampson Award for Early Careers Professional of the year. The award is named in honour of Intelligent Transport Systems (UK) Ambassador Eric Sampson who, throughout his career, has continued to support the next generation of transport professionals. Ejiro graduated from ITS in 2020 with an MSc in Transport Planning. She returned to study for a PhD on how an inclusive multimodal Mobility-as-a-Service scheme could be designed as a solution to the challenges faced by low income women in Lagos, Nigeria.

Alumnus **Oliver Pickles** (MSc in Sustainability in Transport, 2022) wrote an opinion piece for the May 2022 edition of the CILT Focus Magazine. The article focuses on the impacts of transport poverty and how active travel and micro mobility can alleviate the issue. Oliver is a Graduate Transport Planner at Jacobs & Yorkshire & NE Young Rail Professional Secretary.

Alumna **Clare Linton** gave a presentation to the Scottish Parliament's Cross Party Group on Sustainable Transport. Clare, who talked about decarbonising freight and logistics, graduated from ITS in 2017 with Integrated MSc / PhD in Low Carbon Technologies and her PhD thesis is entitled "Excess capacity in urban transport – how much is there and how could it be used to reduce CO2 emissions?"

Recordings of alumni seminars are available online. These can be used as teaching materials, for recruitment and add value to the student experience: environment.leeds.ac.uk/transport-alumni/doc/alumni-international-seminars.

Alumnus **Jeroen Bastiaanssen** won the 2022 NECTAR PhD Award. Jeroen's paper 'Does transport help people to gain employment? A systematic review and meta-analysis of the empirical evidence' (co-authored by PhD supervisors Dr Daniel Johnson and Prof Karen Lucas) was also awarded best paper of the year in Transport Reviews in the previous year. The findings are important for policymakers in that they imply that job seekers may benefit from public policies targeted at improving their access to public transport, in particular for people without access to cars and in areas with fewer job opportunities. This study has systematically reviewed 93 existing studies, synthesised it through meta-analysis, and clearly demonstrated that car ownership significantly increases individual employment probabilities, especially among welfare recipients.

Jeroen said:
"It is a real honour to receive this prize and particularly nice because it is the first paper of my PhD-thesis. I believe that the multidisciplinary research approach, in which we combined the social and economic perspectives on transport, is what truly made it become a good quality paper. That is what makes research at ITS a unique opportunity for any PGR. I currently work as a transport researcher at the Netherlands Environmental Assessment Agency (PBL), where I'm conducting follow-up research into the role of new public transport infrastructure on individual labour market outcomes. Our review paper identified only a few empirical studies that have examined this before, while various Dutch cities want to invest in new (light)rail connections, so this research comes in a very timely moment. I would encourage other PGR's to leverage on the knowledge and experience of the multidisciplinary research group at ITS and disseminate their work in the wider research community."

Part time Master's student **Oliver Craig** is working on the Redevelopment of Euston Conventional Station, a project that will transform Euston into a world leading transport hub. He gave a speech at the CILT Railway Study Forum's Annual Dinner in front of 180 leaders in the industry. On the success of this he was nominated for a Rising Star in Transport Award by Passenger Transport magazine. We are proud that Oliver progresses with his studies at ITS and continues to develop his early career path.

Oliver Craig said: *"It is an absolute pleasure to be recognised by the Transport Rising Star judging panel for my work on creating a better future for passenger transport – something that I'm truly passionate about. Both of my grandfathers served on the UK's railway and I know they would be proud of this achievement. Studying the part-time Railway Operations, Management and Policy MSc at ITS has helped me broaden my understanding of not only the complexity of railway systems, but also how these systems fit into broader transport issues. This has been invaluable whilst working on projects for Network Rail, such as the Transpennine Route Upgrade in Yorkshire and the Redevelopment of Euston Conventional Station in London."*

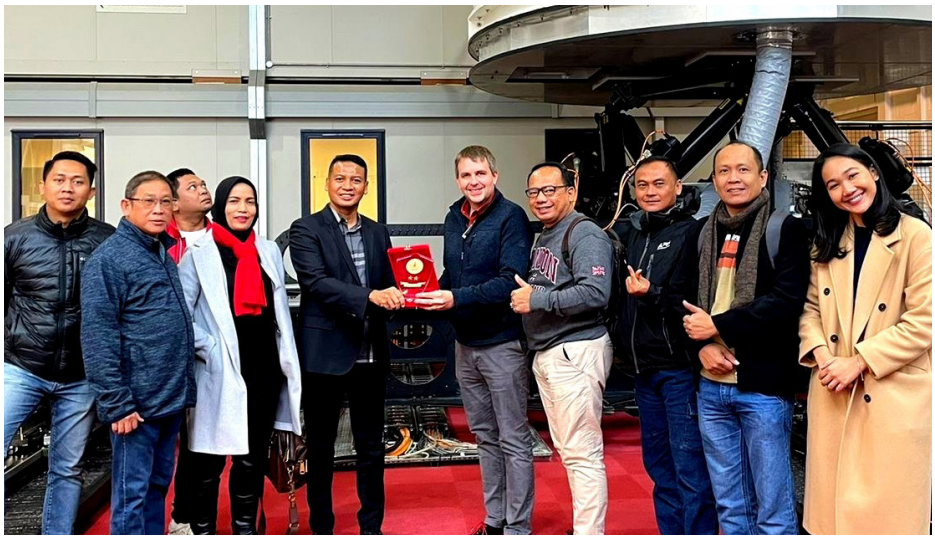
Online international seminars and the ITS professional mentor program keep going from strength to strength, thanks to our global network of alumni.

Alumna **Rachel Skinner** CBE has been awarded an honorary degree at Leeds (Doctor of Laws, honoris causa), for her services to transport engineering and for inspiring women in the industry. Rachel admits that she fell into engineering entirely by chance when, as a geography graduate, she took a job as a transport planner, initially only intending to be in the role for a few months. Rachel subsequently completed a Masters degree in Transport Planning and Engineering at ITS, graduating with a Distinction in 2001. Rachel has forged an outstanding career, both as a senior figure in private practice and as a valued member of numerous national bodies. Rachel has held key roles in several engineering firms. She is currently an executive director and head of transport for Canadian consultancy and design firm WSP Global, leading around 600 staff delivering projects for public and private sector clients. An excellent communicator, Rachel stands out for her enthusiasm and ability to connect with people. A long-time advocate for girls studying STEM subjects, she was instrumental in establishing the Women in Transport Network, a body dedicated to empowering women to fulfil their potential in an industry where they remain significantly under-represented. She is equally passionate about the role which transport and infrastructure engineers must take in tackling climate change. In 2016, she was named among the Daily Telegraph's Top 50 Influential Women in Engineering and the following year named as Best Woman Civil Engineer at the European Women in Construction and Engineering Awards. Rachel has authored and scripted publications and films on topics including net zero carbon infrastructure, driverless vehicles, and on future mobility. She is regularly invited to give keynote conference presentations and to chair national and international industry events. Rachel has served as an Infrastructure Commissioner for Scotland. In 2020 she became the youngest ever president of the Institution of Civil Engineers (featured in the ITS research report 2020). In 2022 Rachel was awarded a CBE for services to infrastructure.

Visitors

Visiting Fellow **Cenk Ozan** was hosted by Prof David Watling. **Professor Hiroki Sakai** from Kobe University was hosted by Professor Andrew Smith. **Dr Liwen Liu** (Jiangxi Normal University, China) was hosted by Professor Richard Batley. **Fei Han** from the School of Transportation Engineering, Chang'an University, was hosted by Dr Zhiyuan Lin and Professor Ronghui Liu. **Eeshan Bhaduri and Manoj BS T** - PhD research scholars from the Indian Institute of Technology, Kharagpur were hosted by Professor Charisma Choudhury and Dr Zia Wadud.

Visitors from the Indonesian Police Higher Education College who have links with ITS via PhD studentships were given a tour of the facility along with a demonstration of the Truck Simulator and the HIKER Pedestrian Cave simulator. On behalf of the Virtuocity team, Manager Pete Woodthorpe (centre) received a token of thanks and appreciation from the delegation and PhD student Yeni Sagala (first on the right) assisted the tour with translations.



On behalf of the Virtuocity team, Manager Pete Woodthorpe (centre) received a token of thanks from the Indonesian Police Higher Education College and student Yeni Sagala (right) assisted with translations. Visitors were given a tour of the facility along with a demonstration of the Truck Simulator and the HIKER Pedestrian Cave simulator.

International Night

International Night at ITS. Over 25 nationalities attended International Night at ITS. Students shared traditional dishes from their home country, wore their national attire, sang and rapped in their dialects, danced to different cultural and universal songs including Jerusalem, wakaka, Arabic Luthuli, poco poco and Macarena. The ITS house-band 'Supertram' led by Lecturer Bryan Matthews, performed transport-related songs.

International Night at ITS.

International Night at ITS.

Dr Dan Johnson, Dr Paul Timms, Jeff Turner and Dr Andrew Tomlinson delivered a training programme aimed at improving transport issues as part of the Ghana Urban Mobility and Accessibility Project.

RESEARCH PROJECTS

In 2022 ITS academics and postgraduates worked on over 90 research projects. A small selection of these is described in the following pages. Many projects are funded for a span of 3 to 5 years and these featured in our 2021 Research Report: environment.leeds.ac.uk/downloads/download/53/annual_research_reports

Further research projects are catalogued here: tinyurl.com/3j26bayz

ITS has held ISO9001 certification continuously since 1995. We ensure high quality research and consultancy is delivered to the satisfaction of clients and sponsors.

Framework for coordination of Automated Mobility in Europe (FAME)

Grant holder: **Dr Yvonne Barnard**
Investigators: **Dr Gillian Harrison, Dr Jo-Ann Pattinson**
Coordinator: **ERTICO**
Funder: **Horizon Europe**
Dates: **July 2022 to June 2025**
Website: connectedautomateddriving.eu/about/fame/

Abstract: A framework for Cooperative, Connected and Automated Mobility (CCAM) is being established in Europe. Our part in this consortium is the development of a common evaluation methodology and data sharing. We will develop and validate the common methodologies and tools to facilitate the sharing of best practices and lessons learned. For example self-driving taxis operate in California ferrying students at night, but large scale CCAM is not so simple. We will support collaboration within the community of CCAM stakeholders across the complex cross-sectoral value chain. FAME follows previous projects (CARTRE, ARCADE, FOTNET) which have built up a wide knowledge database.

SYNERGY

Grant holder: **Professor Stephane Hess**
Funder: European Research Council
Dates: February 2022 to January 2027
Website:

Abstract: SYNERGY (Developing new behavioural models at the intersection of psychology, econometrics and machine learning) will unify three key paradigms for the mathematical modelling of human behaviour, namely: i) process models in psychology and cognate disciplines that seek to explain how decisions are made; ii) econometric and behavioural models that explain which factors influence the decision process and to what extent; and iii) data-driven (machine learning) methods that focus on the outcome of the decision process. The different aims and assumptions of these paradigms have resulted in very distinct strengths and weaknesses for each discipline. Only the synergy of the three will fulfil the promise of producing models that are behaviourally consistent, applicable to real-world problems, computationally tractable, and balance *a priori* assumptions with data-driven insights.

Integrating the three approaches into new Data-Driven Behavioural Models (DDBMs) is a novel, ambitious and highly complex undertaking, but one that is timely given the rapidly changing world, increasing use of models and big data for prediction, and growing interaction between humans and 'intelligent machines' that require the latter to accurately predict human behaviour to enable safe and efficient use of AI.

Impact: The work will result in a paradigm shift for behavioural modelling, with impact in many application domains. SYNERGY will provide analysts with a powerful new toolkit that will allow efficient large-scale behavioural modelling on increasingly rich data while providing interpretable outputs and retaining

important foundations in behavioural science. Alongside major methodological contributions, the research includes large-scale empirical work, applying the new DDBMs to real-world problems with implications for national policy. This includes case studies to understand and predict travel and other behaviour in a COVID-19 environment, and to establish the benefits that more behaviourally consistent AI routines for autonomous vehicles can have for road traffic safety.

DRYVER

Investigator: **Dr Thijs Dekker**
Funder: **EU H2020**
Consortium Lead: **INRAE**
Dates: **September 2020 to August 2024**
Website: www.dryver.eu/

Abstract: Climate change and increasing water demand are causing river networks around the world to dry up. The project is looking at the effects on biodiversity, the river networks' ecological integrity and the ecosystem services that rivers provide. Dr Dekker's contribution to this project is assessing the socio-economic impacts of drying rivers.

Quantification of Wider Economic Impacts in the Developing World

Investigator: **Dr Dan Johnson**
Funder: **World Bank**
Dates: **August 2022 to April 2023**

Abstract: The wider impacts of transport networks have formerly not been considered beyond standard cost benefit analyses. Wider impacts from better transport links include getting people into employment and productivity and better connectivity between firms, suppliers, workers and customers. In this scoping phase of the project Dr Johnson is setting out current theory and evidence for improved appraisals of World Bank projects. To illustrate how wider impacts may play out he will assess what data would be needed from case studies.

Improving walking to school, part of the OptiWaSP Project.

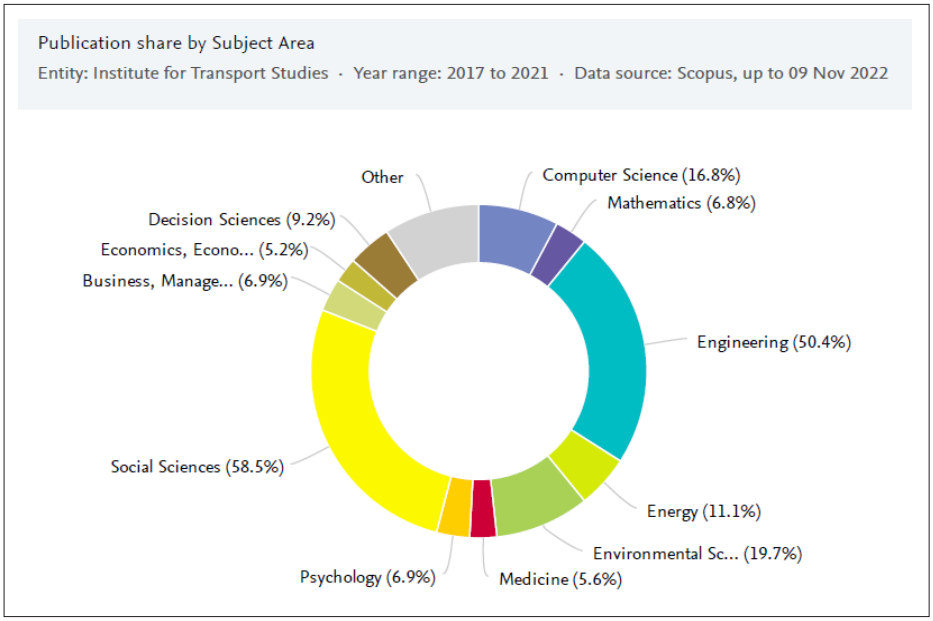
Optimised Walking School Bus Planning (OptiWaSP)

Investigator: **Professor David Watling**
Coordinator: **Lancaster University**
Funder: **EPSRC grant ref: EP/W010232/1**
Dates: **October 2022 to September 2025**

Abstract: In the past four decades there has been a considerable modal shift from walking to school to going by car for primary school children in England. This has led to increased congestion and air pollution and decreased traffic safety. Meanwhile, many studies have shown the health benefits to children of active travel to school. The UK Government set a target to increase the percentage of children aged 5 to 10 that usually walk to school in England from 49% in 2014 to 55% in 2025. However, despite recent initiatives, such as the national Walk to School Outreach programme, the National Travel Survey in 2019 recorded the lowest ever percentage of primary school children walking to school at 46%. Time constraints are often cited as the main barrier to parents accompanying children in walking to school with concerns about safety deterring parents from allowing children to travel independently. A walking school bus (WSB) involves a group of children walking to school with one or more adults and following a set route but the UK has not widely adopted WSBs.

This project will develop an Optimisation Model that identifies walking routes to school and meeting points, while addressing multiple objectives (travel time, safety and air pollution exposure). Prof Watling has extensive experience in multi-objective problem solutions for public transport scheduling and other transport and healthcare applications. The Optimisation Model will work in conjunction with a Modal Choice Model, which will include a novel element recognising that decisions by parents on how their children get to school are based not only on individual considerations, such as minimising travel time, but on the opinions and choices made by other parents.

A Road Network Model will allow assessments to be made of traffic management measures that can be combined with WSBs to increase confidence in walking to school. These models will be combined in a tool that can be used repeatedly as circumstances change. The tool will support the work of organisations such as Living Streets delivering the Government's Walk to School Outreach programme. A Stakeholder Advisory Group is helping steer the project. The academic team is partnered with Living Streets to ensure the tool is well-grounded. OptiWaSP will be demonstrated in Bradford where the local authority and schools have agreed to collaborate in designing and applying the tool.



ITS publications by subject area 2017-2021. Courtesy University of Leeds Library and SciVal

PUBLICATIONS

Seventy percent of our research outputs are openly accessible. The list below is derived from Scopus. Authors, including PhD students affiliated with the Institute for Transport Studies, are highlighted in bold.

Signatory of DORA

The University of Leeds is committed to responsible research metrics and has signed the San Francisco Declaration on Research Assessment (DORA).

Peer Reviewed Journal Articles

Aldenius M, **Mullen C,** Pettersson-Löfstedt F. Electric buses in England and Sweden – Overcoming barriers to introduction. *Transportation Research Part D: Transport and Environment, 104* doi.org/10.1016/j.trd.2022.103204

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Opposite page: Train in downtown Hanoi as seen by Lindsay Stringer during her overland journey back to the UK from Vietnam - read her blog here: Reduce carbon emissions while making the most out of your work-related travel | lindsaystringer (wordpress.com)

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