ITS Annual Research Report 2023

SPECIAL FEATURE:

ART in TRANSPORT

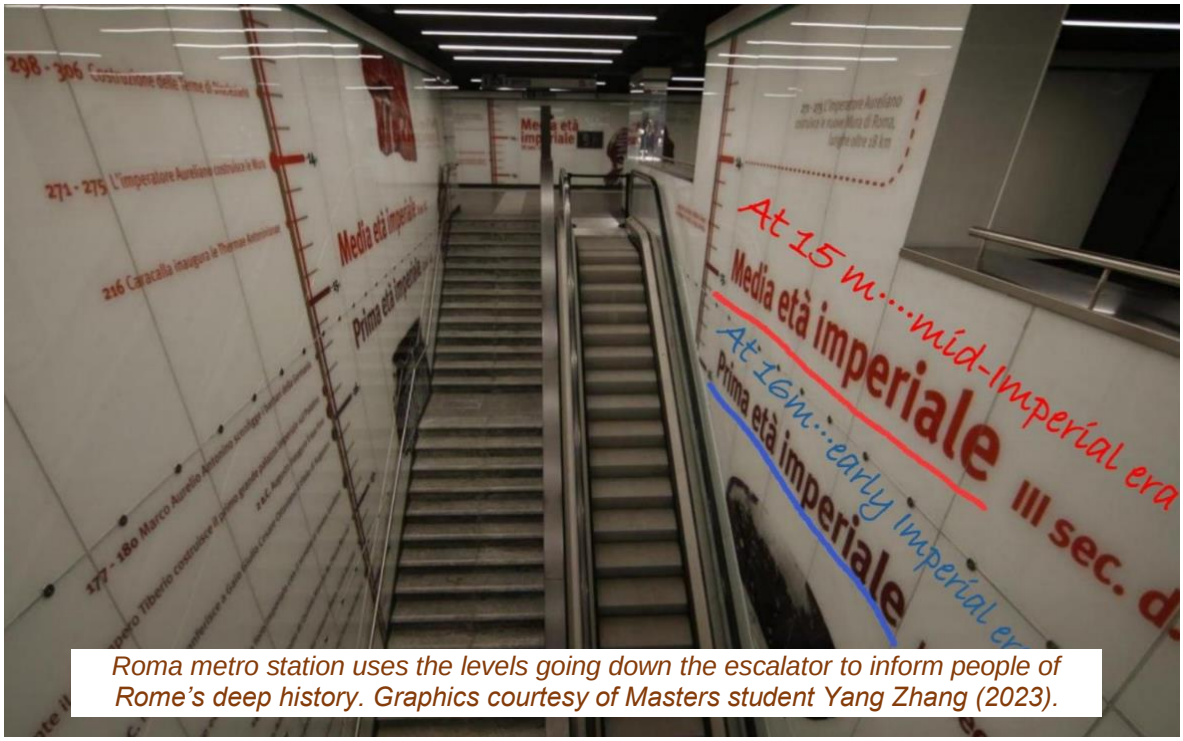
Bus seat design in Los Angeles - from the Masters dissertation by Minghao Huang (2019).

Dr Yvonne Barnard, Dr Paul Timms and **Dr Dave Milne** are supervising Masters dissertations on the topic of Art in Transport. From an initial single student in 2016 to 10 students this year, the topic has attracted growing research interest since 'People are not Parcels'. In total, 25 students have taken on this dissertation topic.

Guangzhou metro station. Photo courtesy of Masters student Junao Lu (2023).

Studying the impact of art in metro stations, bus stops, airports, in public transport vehicles and on city streets opens a wide range of interesting discussions. Students bring examples from their own home and travel experiences and choose an art form to investigate, be it murals, poetry, music, paintings, sculpture, museum displays, infographics, interactive media or public engagement initiatives.

ART in ***TRANSPORT*** has proved to be a legitimate topic for scientific research, leading to the offer of Art in Transport as a PhD topic for the first time in 2024. The research reveals how elements of local culture, local history and tourist attractions are used creatively to enhance the traveller experience. Transport studies are given another, exciting dimension by the study topic of Art in Transport. Interdisciplinary research and international co-operation can lead to practical implementations which improve the experience of sustainable transport modes, thus encouraging more people to choose such modes.



Roma metro station uses the levels going down the escalator to inform people of Rome's deep history. Graphics courtesy of Masters student Yang Zhang (2023).

Masters student Fengyi Mou says: "*Art and transport seem to be two distinct fields, but they influence each other. In transport design, artistic elements can not only improve the aesthetics of traffic facilities and inject more vitality into urban space, but also enhance their functionality and improve people's willingness to use public transport. Transportation, in turn, provides themes and sources of inspiration for artistic creation*."

Masters student Kristina Shanidze receiving her prize is flanked by Dr Tony Whiteing and Prof Richard Batley.

Academic colleagues were initially sceptical about Art in Transport as a study topic until Kristina Shanidze won an award for 'best dissertation of the year' in 2017. Shown on the last page of this report is a diagram extracted from Kristina's dissertation and her dissertation poster demonstrating how Kristina's prize was won on academic and scientific merit rather than by a 'dissertation full of pretty pictures'.

Further examples of Masters students' *ART* in ***TRANSPORT*** work can be found among the list of research outputs at the end of this report.

ITS research influencing government policy

Road Safety

Speeding “Isn’t worth it”

Alumnus **Dr Ian Greenwood’s** PhD thesis ‘The Politics of Road Death’ was inspired by the observation that road user deaths and serious injuries in Britain, after declining for years, had plateaued. His research gathered interview data from road safety policy participants and politicians, used thirty-four years of data from House of Commons debates and policy documents to examine how and why road safety policy was made, not made or did not get onto the policy agenda at all. Ian’s thesis identified two distinct time periods: prior to 2003 where road safety was seen as a policy problem, policies were debated but largely accepted, and the political discourse was conducive, resulting in open windows, policy action and a reduction in road user deaths and serious injuries. After 2003, road safety was largely not seen as a policy problem, policies were contested as controversial, unpopular, or expensive, political discourse was reduced and less constructive, which resulted in policy stability or only incremental change as policy windows remained closed. Whilst the number of deaths and serious injuries continued to decline until 2012, the numbers plateaued thereafter.
Ian now campaigns to stop road death and is particularly interested in young driver safety, rural road safety and how policymaking contributes to making Britain’s roads safe.

Alice Greenwood

Ian’s research was motivated by the tragic death of his 12-year-old daughter, Alice, killed by speeding drivers on a country road returning from a weekend away with her mother, Juliette and little sister, Clara. The young male driver and passenger in the speeding car also lost their lives that day. Families were devastated, Ian’s wife and younger daughter were taken to intensive care. Several young people were later given custodial sentences for their part in the crash.

After the loss of his 'beautiful and amazing' daughter, Ian’s plea is to all drivers, but particularly young and novice drivers to travel on our roads safely. The crash resulted from the choices made by a convoy of five speeding drivers. ‘Think about the consequences of speeding and dangerous driving, it’s not worth it!’ It is hoped this article will highlight the risks of travelling on Britain’s roads.

Dr İbrahim Öztürk wrote a policy brief titled Bridging the Gap in Road Safety Inequality. There is an urgent need for an integrated policy to reduce inequalities concerning safety on roads and transport. Governmental and non-governmental actions for a more equitable, accessible, and sustainable transportation can greatly impact achieving many of the Sustainable Development Goals (SDGs) of the 2030 Agenda. With this policy paper, it is argued that by taking a targeted and data-driven approach to road safety, we can reduce the number of crashes and fatalities among disadvantaged groups and create safer and more equitable streets for all by achieving a positive traffic safety culture.

İbrahim Öztürk

Oliver Carsten

Professor Oliver Carsten delivered the first Herman De Croo Road Safety Lecture in Brussels organized by the European Transport Safety Council (ETSC) in honour of the former Belgian Minister of Transport. Prof Carsten's insights and powerful reasoning are evident in his presentation. An extract is shown below. The PowerPoint merits viewing in full here on the ETSC website.
To read more about Prof Carsten's research on the safety of automated vehicles see page 18 of this report.

Some of the proposed external messages for interaction of automated vehicles with pedestrians. This is an extract from Prof Carsten's Herman de Croo lecture.

Virtuocity

The University of Leeds Driving Simulator is in greater demand than ever but needs refurbishment. It was decommissioned in Dec 2023 and will re-launch in Spring/Summer 2024 with a new car in the simulator. The facility attracts high interest from visitors including international and industrial stakeholders. In 2024 we'll be celebrating the 30th anniversary of driving simulation at Leeds.

Visitors to Virtuocity in 2023 included: National Highways; University of Chemnitz; University of Ulm; Ronald Schroeter (QUT, Australia); Sofie Ehrhardt (KIT); Leeds University Executive Group members; JLR colleagues from the Human-Machine Interface (HMI) group; Professor T Wada (Tokyo University) and Tobii. Possible collaborations were discussed with visitors. Tobii kindly donated their latest eye tracker system which is currently used for research by the Virtuocity group.

Rethinking rail investment to reduce transport emissions

Professor Greg Marsden is referenced in this New Civil Engineer article. The Steer report has argued that the UK needs a fundamental shift in its rail investment priorities to help slash carbon emissions in the transport sector, by encouraging people onto the rail network and by modernising the network itself.

Professor Andrew Smith gave evidence at the Committee on Transport and Tourism (TRAN) of the European Parliament public hearing on 'Future challenges for the rail infrastructure: Single European Track Access charges and investments needed towards decarbonisation'. The hearing examined both the future of track access charges, building on the lessons learnt from the ad-hoc measures taken during the pandemic, and the rail infrastructure investments needed for the sector to contribute to decarbonisation.

Andrew Smith

Professor Gerard de Jong was invited to the French Ministry of Transport to give a presentation on the value of time in freight transport.

Professor Susan Grant-Muller is a Co-Investigator on **TRACK (Transport Risk Assessment for Covid Knowledge).** The Department for Transport found the project's data invaluable. The project informed government policy on virus transmission in public transport during the 're-opening' after Covid 19. See full report was published by UKRI in January 2023. An extract relating to TRACK is reproduced in the following 3 paragraphs:

Susan Grant-Muller

'The TRACK project analysed the relative importance of factors that affect the transmission of COVID-19 on public transport and the impact of mitigations. The project first developed virus transmission risk models simulating transmission for hand contact, close-range exposure and aerosol contact in London Underground. Models included mitigation measures. After modelling transmission in underground tubes, researchers conducted similar modelling for bus travel. Researchers also completed data collection on passenger demographics by conducting passenger surveys, analysis of ticketing data and CCTV analysis. The research provides insights into which surfaces are most likely to test positive for the virus, the impact of ventilation and other parameters. Behavioural insights showed variations in travel preferences and attitudes towards hand hygiene. All factors fed into the transport transmission risk model.

The Department for Transport (DfT) received research findings and information from the TRACK project through the pandemic and routinely used it to inform their strategic thinking and guidance on COVID-19. For example, the research fed into the government Plan B, its suggested measures, and the roadmap for re-opening in 2021. The DfT took the information from the project and used it to formulate internal papers that then fed into the decisions described above. Importantly, the research and the process through which research was shared in the regular meetings allowed the DfT and the transport operators to understand the complexity of virus transmission in public transport. The meeting format allowed the stakeholders to ask questions and receive immediate answers to their concerns. The TRACK project's risk factor modelling has shaped guidance relating to public transport, such as encouraging good ventilation and maintaining mask-wearing. Research ensured that the DfT guidance is underpinned by a specific understanding of virus transmission in the public transport environment. For example, at the beginning of the pandemic, there was a lot of focus on cleaning the surfaces in public transport. However, due to the TRACK and VIRAL projects, transport operators slowed the emphasis on cleaning and put more effort into ventilation and face coverings because of the new evidence on airborne transmission routes. The two projects also helped bring about the realisation that there is a lack of knowledge about ventilation on trains. The public transport standards are more about energy savings than air quality. The transport operators are now revisiting their strategies to address this.

According to the DfT representative, the **TRACK project was a game-changer** in terms of transport-specific advice. TRACK project provided evidence in a fast-moving pandemic context and was a trusted source of understanding about how transmission can happen in public transport. The evidence helped the DfT persuade transport operators who, because of commercial motivations, were hesitant to run the risk of being excessively cautious. Since September 2020, when the TRACK project started, the DfT consulted the research findings daily. Transport policy makers' understanding of the virus and virus transmission in public transport was minimal. They needed a trusted source of evidence to inform everyday work, decisions, and guidance the department provides to the sector. TRACK project outcomes and impact cannot be quantitatively measured. However, it is probably the most impactful award covered in this case study: **its findings were the most significant evidence the Department for Transport used to inform its overall departmental COVID-19 strategy.** The research improved understanding, clarified misperceptions, and provided recommendations for various potential actions to mitigate [virus] transmission in public transport. It also fed into key government decisions beyond transport: government Plan B and re-opening roadmap in 2021.'

Bus renaissance is essential for fair transition to a zero-carbon economy

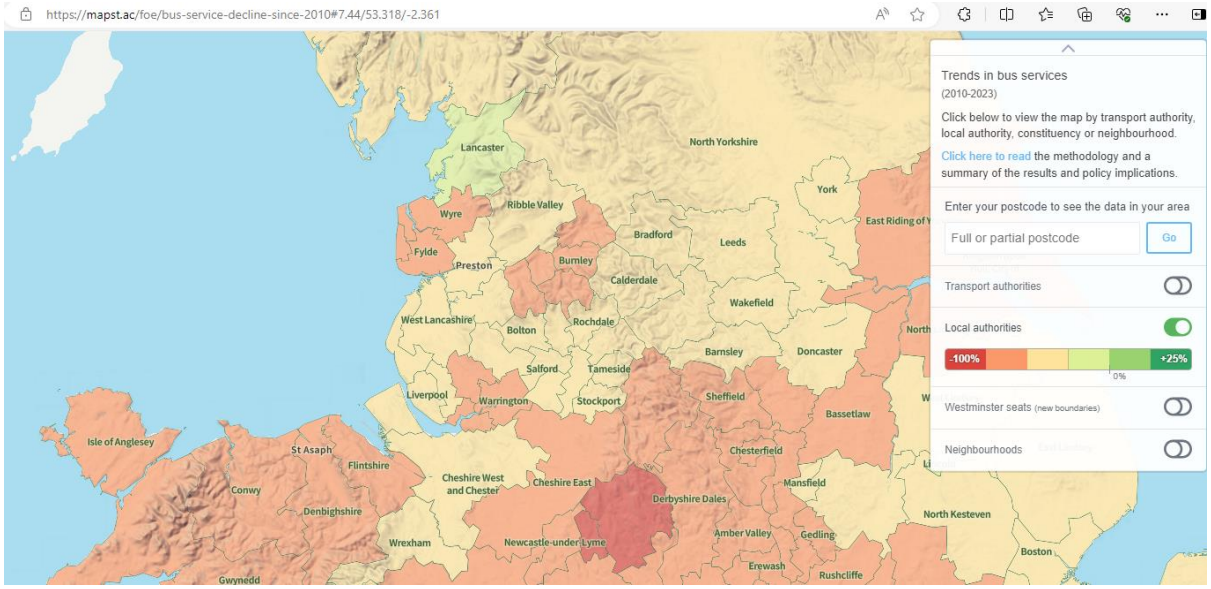
Buses in Leeds with Kirkgate Market in the background.

Malcom Morgan

Dr Malcom Morgan worked alongside Friends of the Earth to complete an analysis of all local and national bus timetables in England, Scotland and Wales over the last 15 years. Bus services outside of London have seen a staggering decline over the past 15 years, with provision plummeting by more than 60% in 80 local authority areas. Good quality, regular bus services are essential for the 22% of households that don't have access to a car, which disproportionately affects people living on low incomes. They are also vital for helping people reduce their car use to cut harmful carbon emissions and ease congestion in urban areas.

A new interactive map **created by Dr Malcolm Morgan** shows the fall in bus services at the constituency level and a breakdown of the data by local authority area and region. The data shows the constituencies that have fared worse since 2010 are Northeast Hampshire, which has seen an 82% fall in services, Bridgwater in Somerset (81%), Staffordshire Moorland (78%) and Stoke-on-Trent North (78%). The research finds that evening and night-time services are particularly poor outside of London, which impacts shift workers without cars, such as NHS staff and those who want to enjoy local nightlife such as theatres and cinemas. While bus services in London have remained at similar levels over the past 15 years, the analysis highlights a stark contrast with urban areas outside the capital which have an average of 14 buses per hour, compared to up to 120 buses per hour in parts of London.

Friends of the Earth is calling on all political parties to include a manifesto pledge for a 'public transport renaissance' and for the next government to commit to return bus services to 2010 levels within five years. Mike Childs, head of Science, Policy and Research at Friends of the Earth, said: "*There has been a silent war on bus users for over a decade. This is not only disproportionately impacting those living on low incomes, people of colour and disabled people who are less likely to own a car, but also people who have had to give up their car as they've got older or due to poor health. A bus renaissance is essential both for the millions of people who do not own a car in the UK and as part of a fair green transition to a zero-carbon economy. To reduce pollution and cut emissions, we need the government to invest in our crumbling public transport system to make it far easier for people to use their car less and switch to greener ways to travel like buses, trains and cycling*."



Malcolm Morgan's interactive map of bus service levels by region.

Staff News

Promotions

Dr Mahdi Rezaei was promoted to Associate Professor in Computer Vision and Machine Learning. Dr Rezaei won an EPSRC Doctoral Training Partnership grant and full scholarship for his PhD students. Dr Rezaei is a member of the Academic Advisory Group in the Leeds Institute for Data Analytics development programme (LIPAG). Keynote Speaker at InCabin International Conference and at the International Conference on Artificial Intelligence and Smart Vehicles (ICAISV), and a panel member of the ICAISV Scientific Committee.


Mahdi Rezaei

Dr Manuel Ojeda-Cabral was promoted to Associate Professor
Dr Phill Wheat was promoted to Professor and became Deputy Director of ITS in 2022.

Post doctoral researchers **Dr Like Jiang and Dr Thomas Hancock** were also promoted. Thomas was featured in the 2021 Annual Research Report and is also featured this year for another award – see below under the Awards heading.

New Staff and Leavers

In 2023 we welcomed **Dr Steve O'Hern** who became deputy leader of the Social and Political Sciences research group, **Research Fellows Dr Jingyuan Di, Dr Zhao Wang, Dr Eeshan Bhaduri, Dr Nadia Naqvi, Dr Panagiotis Tsoleridis, Dr Vishnu Radhakrishnan, Dr Alice de Sejournet**, and **Ms Khatun Zannat** (Research Assistant), and several of whom are ITS alumni. We were also glad to meet our new reception team: **Panna Asher, Liam Naar** and **Stephanie Siviter**.

We bade farewell to Dr Richard Connors, Dr Gillian Harrison, Dr Eleonora Morganti and postdoctoral researchers Tanveer Hussain, Kathryn Logan, Said Munir, Yi-Shin Lin, Yue Yang, Kieran Suchak, Amir Kalantari and Morgan Campbell. We wish them all success in their continuing careers.

Postgraduate Research Visitors

Shaojie Jin from Chang'an University was hosted by Dr Zhiyuan Lin.
Yaqi Yang from Tongji University was hosted by Prof Greg Marsden

Awards

Masters student **Jamie Ward** won the 2023 Voorhees-Large Prize for his dissertation ‘A route-level analysis of the relationship between bike sharing and public transport integration, complementation and substitution.’

Jamie Ward

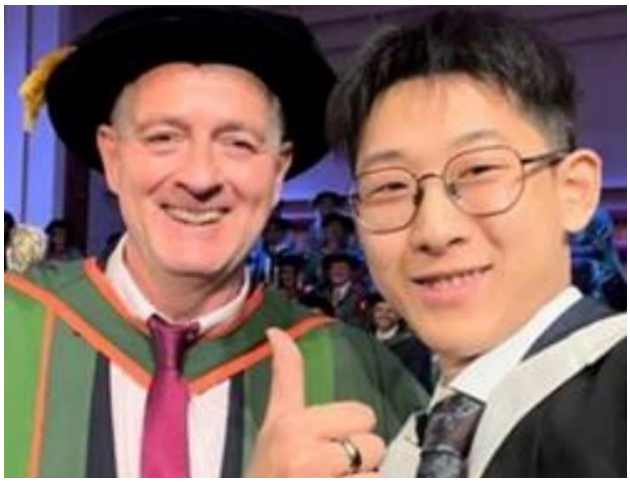
Our postgraduate researchers won the first prize and runner up in this year's Smeed Prize competition. The Smeed Prize recognises the best student paper and presentation at each Annual Conference of the Universities’ Transport Studies Group (UTSG). First prize: **Philip Churchman** supervised by Dr Thijs Dekker and Dr Kate Pangbourne. Runner-up: **Khatun Zannat** supervised by Prof Stephane Hess and Prof Charisma Choudhury.

Dr Thomas Hancock was awarded a Michael Beverley Innovation Fellowship. Funded by a large donation from Michael Beverley, a Leeds alumnus and Yorkshire business leader, the Fellowship is designed to develop the next generation of entrepreneurs and encourages cross-disciplinary collaboration, the development of external partnerships and networking. It has also proved a useful mechanism for career development and advancement. Fellows accelerate their ideas through disrupting traditional ways of thinking, building knowledge and confidence around enterprise, business engagement and commercialisation. Thomas joined the 2023-24 cohort of the University-wide scheme. Thomas' project 'Enhancing Models of Behavioural and Attitudinal Relative Changes' aims to understand and model the travel and health behavioural changes of new students at the University of Leeds over the course of the academic year.

Thomas Hancock

Professor Natasha Merat was awarded an International Excellence Fellowship from the Karlsruhe Institute of Technology (KIT). An experimental psychologist and research group leader of the Human Factors and Safety Group, Prof Merat studies factors such as driver distraction and driver impairment, and is an internationally recognised expert in studying the human factor implications of highly automated vehicles. Prof Merat said: “*As part of our strategic relationship, I have been working with two PhD students from KIT, who have conducted studies at Leeds, using our simulators. My fellowship will take our relationship to the next level, creating new exchange and collaboration opportunities between Leeds, KIT and its partner universities. During my visit I will provide some talks, and organise a series of workshops between KIT, its partners, and my own collaborators from industry and universities in Germany*.” In 2023 Prof Merat was invited to give talks at: Hi-Drive project first general assembly and first technical review; SP leaders’ meeting Lapland; Nordic traffic safety summer school; EUCAR annual conference; Veoneer/Magna advisory board; BSI meeting on Connected Automated Vehicles; DLR VRU workshop and SP meeting, Germany. Prof Merat also visited Australia where she gave talks to: Seeing Machines; UNSW Canberra; UNSW Sydney; QUT and NSW Road Safety group.

Natasha Merat



Master’s student Jingkai Wang celebrates his graduation with his supervisor ITS Director Prof Simon Shepherd.

A Guinness World Record

Transport researchers **Dr Andrew Tomlinson and Dan Johnson** raced from Land's End to John O'Groats using only public transport. The journey was completed in 23 hours and 59 minutes. After an uneventful 23 hours in which all connections arrived on time, they almost failed just 8 miles from their destination when the final bus was held up by escaped cows. Luckily the driver regained a few minutes for the intrepid travellers. The former Guinness World Record for this challenge, was set in 2016. Andrew and Dan beat it by 5 minutes! Their route was as follows:

- 29/08/2023 18:43 Bus service LAND (First Kernow) from Land's End to Penzance Bus Terminal, arrive 19:44 (last service of the day)
- 29/08/2023 21:45 GWR Night Riviera Service from Penzance to London Paddington, arrive 05:04 (30/08) (last departure from Penzance)
- 30/08/2023 05:20 Hammersmith and City Tube from London Paddington to London Kings Cross, arrive 05:31 (first service of the day)
- 30/08/2023 05:48 Lumo Open Access Service from London Kings Cross to Edinburgh Waverley, arrive 10:08 (first departure to Edinburgh of the day)
- 30/08/2023 10:33 ScotRail from Edinburgh Waverley to Inverness, 10 minutes late departing, arrive on time 14:15
- 30/08/2023 14:20 Stagecoach Highlands Service X99 from Inverness Bus Station to Castletown, near Thurso, arrive 17:41
- 30/08/2023 17:54 Aarons of Wick Service 915 from Castletown to John o'Groats, arrive 18:42. (last bus service of the day)

The 2 hours spent in Penzance allowed Andrew and Dan to have fish and chips on the sea front. After that it was all go until they arrived in John o'Groats (pictured below). Previous attempts used Cross Country services to connect with the Caledonian Sleeper to Inverness at Crewe, but the new Lumo Open Access Service meant that the route via London provided the fastest connection.

Dan Johnson and Andrew Tomlinson arrive in time to beat the Guinness world record for a public transport journey from Land's End to John O'Groats.

ITS alumni scoop top awards:

An MBE, CBE and Indian award for alumni achievements and contributions for transport. Tom van Vuren, MBE, Rachel Skinner, Dr Nalin Shinghal were recipients of the awards:

Tom van Vuren, MBE

Tom van Vuren

Alumnus Tom van Vuren was awarded an honorary MBE for services to transport. Tom joined ITS in 1986 as a Research Assistant, working with Dirck Van Vliet on the interaction between signal settings and traffic assignment, which Tom also used for a part-time PhD, completed in 1991. The work used SATURN software extensively, and some of the modules in SATURN are direct descendants of that work. Dirck and Tom wrote the book 'Route Choice and Signal Control' based on this research. Tom has been a steady contributor to the success of the Institute, being appointed as Visiting Professor in 2004, and serving on our External Advisory Board. Some of the other alumni may remember Tom as a supervisor of MSc dissertations, and more recently as a mentor of Integrated Transport Projects. Tom is a member of DfT's Joint Analysis Development Panel, an editor of the journal Transportation, director of policy at the Transport Planning Society and he chairs the annual Modelling World conference.

Rachel Skinner, 'Outstanding Contribution to Transport

Rachel Skinner studied a Master's degree (Transportation Planning & Engineering) at ITS and graduated in 2001. She is now the winner of the Outstanding Contribution to Transport award at the National Transport Awards (NTA). Rachel has also been a leader in driving forward the decarbonisation agenda, choosing net zero carbon as her theme when she was elected as the youngest ever, and second female, President of the Institution of Civil Engineers. At the awards, President and NTA judge Jo Field honoured Rachel's work: "*As a founding Board Member and early President of Women in Transport, and now a Patron of the organisation, Rachel's commitment to improving the sector's diversity has been long-standing. This resulted in her being asked by Government to lead the Transport Employment and Skills Taskforce to improve diversity and promote transport careers*." Rachel was also featured in our 2020 Annual Research Report.

Nalin Shinghal

Dr Nalin Shinghal, 'Distinguished Alumni award'

Dr Nalin Shinghal studied a PhD at ITS in 1999. His thesis was titled 'An application of stated preference methods to the study of intermodal freight transport services in India'. He received the 'Distinguished Alumni Award 2023' award at the 54th convocation ceremony of the Indian Institute of Technology, in New Delhi. The award was conferred in recognition of Dr Shinghal's 36 years of service spanning various assignments in the private, public and government sectors. He has also worked with the Long Range Decision Support group of the Ministry of Railways and with over 16 years of board/ CEO level experience, Dr. Shinghal is recognised as a turnaround expert.

Postgraduate Researcher Awards

Six ITS students were awarded their PhDs in 2023: **Rafael Cirino-Goncalves** 'Allocation of visual attention during transition from vehicle automation'; **Ian Greenwood** 'The politics of road death: critical discourse analysis of road safety policy in Britain 1987-2021'; **Amir Kalantari** 'Modelling vehicle-pedestrian interactions at unsignalised locations employing game-theoretic models'; **Rizal Kamaruddin** 'How exogenous factors and approaches affect the performance measurement of urban rail services'; **Mohammad Sarker** 'Improving Pedestrian Safety in Bangladesh: Insights from Behaviour Change Models and Co-Design Interventions' and **Kai Tian** 'Psychological mechanisms in pedestrian road crossing behaviour: Observations and models'.

Faculty of Environment Partnership Awards

Congratulations to ITS staff and students nominated by colleagues for the Faculty of Environment Partnership Awards. Winners include ITS student reps, **Onyebuchi Agbo-Anike** and **Tirtha Patil** who along with staff, **Dr Zahara Batool** and **Frances Hodgson** jointly won the school community partnership award. Director of Student Education, **Frances Hodgson** was also recognized for her inspirational teaching & mentoring.

RESEARCH PROJECTS

In 2023 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 up to five years and may have already been featured in previous annual reports which can be viewed in the following link: environment.leeds.ac.uk/downloads/download/53/annual_research_reports.

Further research projects are catalogued in the following link: 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.

In the following pages a selection of our research projects are grouped under five thematic headings. Hyperlinks to project websites are shown in **blue.**

ISO9001 certification

Studying public opinion on shared micromobility schemes

Caroline Mullen

COCOMO

Micromobility includes light vehicles that are powered by humans or electricity, such as bikes, electric bikes and e-scooters. Shared micromobility means these are made accessible to multiple people for short trips, such as the new Leeds CityBike scheme. **Dr Zihao An and Dr Caroline Mullen** together with colleagues from other institutions published their findings in the paper: Stereotypes and the public acceptability of shared micromobility. The **COCOMO** researchers surveyed the public from Greater Manchester, Utrecht and Malmö; three regions with very different levels of shared micromobility and surrounding regulations. Although many people see shared micromobility as positive in terms of being environmentally friendly, there are also negative opinions about the schemes causing additional road hazards, clutter and conflicts. Understanding the public's views is not only helpful feedback in terms of improving services but it also highlights the communication needs and objectives of any introduction or promotion of the services. Dr Mullen said "*If shared micro-mobility – bikes and e-scooters – are to be parts of our cities and towns then it is important that they are acceptable to users and non-users alike*."

Are e-bikes a realistic alternative for car journeys?

ELEVATE (innovative light ELEctric Vehicles for Active and digital TravEl)

Compared to other countries, the UK is not advanced in its uptake of a range of innovative light vehicles and related digital technologies for both passenger and freight applications. Theoretically, if these vehicles are used to switch from car and van use, there is significant potential for reducing mobility-related energy demand and carbon emissions, and many might also generate health benefits for users. However, there is uncertainty about how people in different types of places would use light vehicles and how these modes would affect overall travel behaviour, physical activity and energy demand in practice. **Dr Ian Philips,** Principal Investigator and **Professor Jillian Anable,** Co-Investigator along with external colleagues are researching public opinion of e-bikes as a step in overcoming any barriers in the use of innovative light vehicles. The **ELEVATE** project, funded by UK Research & Innovation, involved commissioning a YouGov survey of 2,000 adults. The survey showed that 9% of English households already own an e-bike; 16% of people have ridden an e-bike at least once; 25% of those who had not ridden an e-bike in the last month somewhat or strongly agreed with the statement 'I see myself as the kind of person who might regularly ride an e-bike'; 47% of people were somewhat, fairly or very interested in the free loan of an e-bike for a month; 53% of

people somewhat or strongly agreed that 'the Government should do more to support e-bike use' (with only 15% somewhat or strongly disagreeing); 69% of people somewhat or strongly agreed that 'e-bikes can be a realistic alternative for some car journeys' (with only 13% somewhat or strongly disagreeing).

Launch of the Leeds E-Bike Scheme.

Leeds E-Bike Scheme Launched
New e-bikes for hire arrived in Leeds city centre in September 2023 with more than 1,200 users in the first week. Celebrating the launch **Dr Robin Lovelace** (in the photo above - far right) said "*Investment in active travel is a win-win-win for health, air quality and the local economy. The new bike hire scheme will let people in the University of Leeds and city communities try out cycling on a secure, well-maintained electric-assisted bike. Combined with investment in active travel and public transport measures, this will enable more trips to be made without the costs of cars. The scheme aligns with the University of Leeds Climate Plan and will enable more students to get around on their own steam at a pivotal moment in their lives. E-bikes are a quietly revolutionary technology that can increase transport equality*."

Improving air quality through innovations to transport

Born in Bradford Health and Air Quality Study
The impact of air pollution on the city's health is being measured before and after the introduction of the Bradford Clean Air Zone in September 2022. The study claims that almost half of all visits to A&E for breathing difficulties in Bradford are linked to air pollution. **Dr James Tate** co-investigator on this project, who is measuring air quality said "*We'll see improvement at the most polluted hot-spots, but also right across Bradford and we have actually seen that in other cities."*
Dr Tate was on the scientific committee for 'Transport and Air Pollution conference 2023' in Gothenburg.


James Tate

Evaluation of Local NO_2 Plans – now in phase 2, this 10- year study measures the impact of local air quality plans across the UK. DEFRA have invested over £1 billion into Clean Air Zones in 32 Local Authorities. **Dr James Tate** is leading a large team for the and analysis of data collected from a network of roadside monitoring stations, coupled with case study research, to understand if and how the local NO_2 plans have affected air quality, traffic, travel behaviours and attitudes.

Evaluation of Local NO2 Plans is conducted by the Institute for Transport Studies and IPSOS, on behalf of the Joint Air Quality Unit. The research will provide evidence to support adaptive and future policymaking.

Charisma Choudhury, Chiara Calastri, Fanqing Song

Prof Charisma Choudhury, Dr Chiara Calastri and Dr Fanqing Song are contributing consumer choice modelling expertise on the EPSRC funded project **Towards Zero Carbon Aviation (TOZCA)**. With over 20 collaborators, including universities, government departments and stakeholders in the aviation industry, the project aims to simulate the most cost-effective transition towards a net zero-carbon aviation system by 2050. There are many factors to consider – technology, fuel, operations, competing modes and consumer behaviour – yet this could have an incredible impact on climate change and air pollution across the globe.

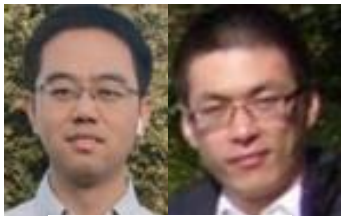
Ian Philips

Dr Ian Philips is studying the use of e-cargo bikes in rural areas where cars are often heavily relied upon. This study seeks to understand people's opinions about replacing cars with electric bikes. It will then directly address those concerns by lending appropriate electric vehicles to families and training them to use and upkeep them safely. The researchers will then be able to visualise the positive effects and the challenges that come with using electric bikes instead of cars. So far, in this part of the **ELEVATE** project families have given positive feedback stating that children enjoy riding on the bikes and that they've been able to carry much more weight than participants had assumed.

Could the electric cargo bike help reduce the use of cars in rural areas? In this photo, courtesy of Dr Ian Philips, an e-cargo bike stands in front of a mural on Leeds University Campus. The mural by James McKay depicts Leeds as a Zero Carbon society in 2050.

Prof Haibo Chen and his team of postdoctoral researchers are studying **nanoParticle Emissions from the Transport Sector (nPETS).** At present there are no existing methods for measuring these sub 100 nm particle emissions from various individual sources. This Horizon Europe funded project assesses the emission of nanoparticles from all transport modes. nPETS aims to study the life of the sub 100 nm emissions from its creation to its potential path to human beings and animals thereby contributing to better public health policies. nPETS will develop innovative methods for quantification of toxicity in the field for all transport modes and aims for a 50% reduction in nanoparticle pollution due to better understanding of the emission sources per transport mode.

Haibo Chen



Ye Liu and Li-Ke Jiang

Related to nPETS is the work of **Dr Ye Liu** and **Dr Like Jiang** - Optimising Control of Diesel Particulate Filter. This collaboration with industrial stakeholders is funded by a UK Research & Innovation Impact Acceleration Account. The researchers are testing and validating an innovative method to optimise the control strategy of diesel particulate filter regeneration.

Karl Ropkins

Dr Karl Ropkins was a co-investigator on **The TRANSITION Clean Air Network** - a collaboration funded as part of NERC's UK Research & Innovation Strategic Priorities Fund (SPF) Clean Air Programme which closed in 2023. The Programme brought together the UK's world-class research base and supported high-quality, interdisciplinary research and innovation to develop practical solutions for today's air quality issues and equip the UK to proactively tackle future air quality. The TRANSITION Clean Air Network focused on air quality and health impacts associated with the transport sector.

Read more about research towards **Clean Air** at the University of Leeds in this article: https://environment.leeds.ac.uk/transport/news/article/5652/supporting-clean-air-at-leeds

Equitable energy demand reduction

On Car Free day in September 2023, **Professor Jillian Anable** commented on a report about Scotland's energy demand reduction target in the National: "*This is a great opportunity to address some current inequalities whereby some people must rely on inadequate and expensive public transport, others are forced to spend money on car travel that they struggle to afford and others travel very high mileages in increasingly large cars. A just transition would involve redirecting resources into the supply of better public transport, walking and cycling facilities and planning housing and other facilities that are well connected by this infrastructure.*"

In February 2023 **Professor Jillian Anable** was interviewed about the impact of the Welsh government's decision to scrap all of its planned road-building projects*. "The whole point of this review is to try and look at the transport system as a whole. We can't have it all, we can't have new roads and new public transport, we can't afford to do that. And its actually anti-car to NOT invest in public transport because we need to get people out of their cars as one way of alleviating congestion."*

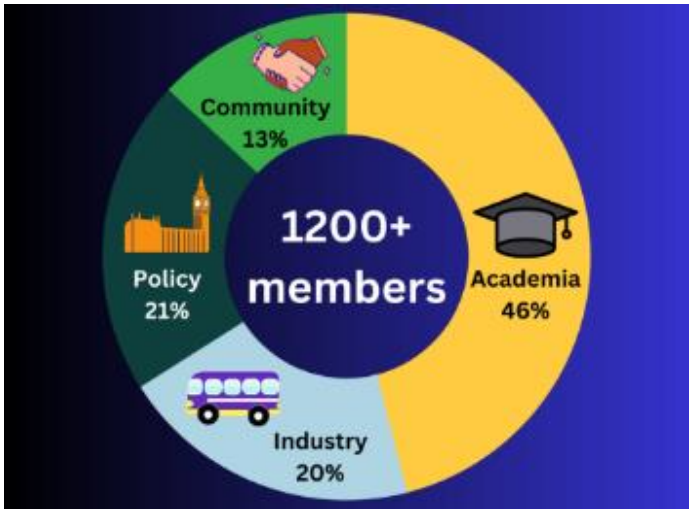
In March 2023 researchers highlighted the impact of Premier League teams such as Manchester United, taking domestic flights between matches in the UK. The vogue for Premier league teams to hire private jets - even for short haul flights - is reaching crisis levels, according to a story in the Daily Mirror which cited research at the University of Leeds. The piece identified 'player welfare considerations often trumping the financial cost and environmental impact' as well as issues with rail reliability, fixture changes and the effect of Brexit on domestic flights, as influencing the shift to VIP travel. Speaking about the damage to the climate **Dr Sally Cairns** (researcher formerly at ITS) said, *"The use of a private plane is usually one of the most polluting ways to travel, and organisations that are serious about their climate commitments should find other ways of travelling where possible."*

Looking globally, **Dr Noel Cass, Dr Caroline Mullen** and collaborators investigated how energy demand reduction can be made equitable. Their paper in Nature, titled 'Emissions savings from equitable energy demand reduction,' was published in July 2023. The authors assessed the emissions reductions needed across 27 European countries to stay under carbon budgets, taking into account high and low energy users. They recommend reducing 'luxury energy use' to cut carbon emissions to a safe level for the planet, while being able to support those in fuel poverty who must increase their current energy use to meet their basic needs. The positive environmental impacts were predicted in previous research, published in the paper '' which calculated that e-bikes could reduce carbon emissions from cars by over 24 million tonnes each year in England.

A paper by Dr Noel Cass and colleagues titled 'How are high-carbon lifestyles justified? Exploring the discursive strategies of excess energy consumers in the United Kingdom' was published. The thought- provoking image below is taken from that paper.

How are high-carbon-lifestyles justified? Extract from a paper by Dr Noel Cass and colleagues.

The **Decarbon8** network was funded by EPSRC for 5 years. Eight research intensive Universities collaborated with industry, government and community. Led by **Professor Greg Marsden,** the network funded 15 seedcorn projects. Seven policy papers were published including the final report titled 'Bridging the Gap'. Outcomes of the research suggest that improved public transport and environments created to be friendly towards active travel are the most likely pathways to reach net zero in transport.



The Decarbon8 network demonstrating collaboration of multiple stakeholders.

There needs to be a systemic shift in the way we travel if the UK is to achieve its net zero mobility targets. Car use in the UK needs to be reduced by at least 20 per cent by 2030. There also needs to be more emphasis on creating places in which active travel, public transport or shared mobility systems help replace cars, particularly for journeys between 5 and 30 kilometres. There also needs to be a focus on creating more attractive places to live, work and play, where there is less need to travel, with convenient alternatives made available. Not only will this support the changes in travel behaviour we need to meet net zero mobility targets, but it will also create healthier places to live. A switch to

electric vehicles alone will not be enough to meet transport decarbonisation targets. People and places need to play a much bigger role. It is often assumed that society is not ready for such change, or that the need to change is not understood by communities, Bridging the Gap takes an alternative view that it is the change itself that is not ready for society.

Greg Marsden and Danielle Densley-Tingley (University of Sheffield) take to their bikes in a drive to reduce their carbon footprints.

Professor Marsden said: "*There is so much that needs to be done to change the practice of transport planning to confront the challenge of keeping to 1.5^{O}C and to face the increasingly evident tragic consequences of the changes that this level of ambition implies. 1.5^{O}C seems increasingly difficult to achieve in the face of populist culture wars and a wavering commitment to the tough decisions that the Climate Change Committee state will define our progress."*

Kate Pangbourne

The new **Energy Demand Research Centre (EDRC)** aims to inform and inspire energy demand reductions that support an affordable, comfortable and secure Net Zero society. Collaborating with partners across policy, industry, civil society and academia, EDRC will deliver a world-leading transformative and interdisciplinary research programme that identifies and shapes evidence-based energy demand solutions for a sustainable and more equitable future. EDRC is funded the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC). There are six themes in this 5-year project: The **Place theme**, led by **Professor Greg Marsden** seeks to build a new approach to place-based approaches and policy making which provides actionable insights, tools and processes which enable an acceleration of the Net Zero transition. The **Governance theme**, led by **Dr Kate Pangbourne** examines how new governance systems can be co-created and implemented to support top down and bottom-up uptake of energy demand solutions across policy, citizen and industrial spheres. With their impressive track records in research, both Prof Marsden and Dr Pangbourne were invited to lead these EDRC themes.

Autonomous Vehicles

Findings from the European CityMobil2 project highlight a quirk of autonomous vehicles maximized for safety that became apparent during the trial. Thanks to virtual reality (VR) systems, algorithms can be fine-tuned safely without putting human participants at risk. To further develop game theory for autonomous vehicles, the Vituocity group led by **Professor Natasha Merat** simulated a range of pedestrian crossing environments and different self-driving vehicle types.

How can we keep roads safe with automated driving assistance?

Samantha Jamson

More research is needed to ensure that drivers won't over-rely on advanced driver assistance systems (ADAS) to drive them safely. **Professor Oliver Carsten, PhD graduate Mickaël J. R. Perrier and Professor Samantha Jamson** examined existing research about driving automation and its effect on driver attentiveness. The **ADAS User Attentiveness** project led by Prof Carsten and funded by AECOM concluded with a report which can be downloaded by clicking here.

International regulations are currently being developed for hands-on technologies, where drivers are still required to keep their hands on the steering wheel, even though the vehicle can control lateral and longitudinal motion for sustained periods of time. Soon, regulations may consider extending the system to allow hands-off driving, where the driver supervises vehicle motion without having to hold onto the steering wheel. This evaluation, which understands the existing evidence about road safety with driver assistance, is intended to influence the outcome of those regulations.

Our researchers sought to understand how the new technologies affect driver attentiveness and drivers' propensity to do non-driving related activities such as using their mobile phones. The report compares hands-on and hands-off driver assistance and how often each leads drivers to lose concentration on the road. As well as drivers' attention, the researchers investigated the methods that the technologies used to keep driver engagement, monitor driver attention, and give visual, auditory and haptic warnings when dangers or issues occur while travelling. They found that there is a lack of research about the ability of automated systems to check the physical and visual attention of drivers. The authors suggest that 'haptic shared control', where the vehicle still requires active participation by the driver in steering, would be a better approach than giving warnings to the driver. Haptic shared control is shown to reduce the likelihood of doing other non-driving tasks. The researchers offer suggestions about the research gaps that should be filled before the technology and related regulations are released. Their recommendations include understanding UK drivers more specifically, including the difference in risk-taking for people of various demographics.

Gustav Markkula

Professor Gustav Markkula has added that the lack of simulations is hampering the driverless vehicle revolution. He warns that algorithms that accurately reflect the behaviour of road users - vital for the safe roll out of driverless vehicles - are still not available. There is formidable complexity in developing software that can predict the way people behave and interact on the roads, be they pedestrians, motorists, or bike riders.

In his **Commotions** project (Computational Models of Local Traffic Interactions for Testing of Automated Vehicles) funded by EPSRC, Prof Markkula has developed the first-ever simulation of how people behave on the roads based on key cognitive theories. Those separate theories were integrated into a larger, single psychological model that would describe behaviour in more complex, real-world tasks. During computer tests, the model accurately reproduced various well-known but not previously understood behaviours of pedestrians and drivers in common road scenarios. The model also predicted how real-life human subjects would behave when facing interactive situations in a virtual reality simulator.

Professor Markkula said: "*These findings suggest that everyday road user behaviour relies on a number of complex underlying cognitive mechanisms, which may be part of the reason why it has been more difficult than expected to create self-driving vehicles. Our research shows that it is possible to integrate separate theories from psychology into combined theories for applications such as simulating the way people behave in traffic, which is something which has been called for but rarely achieved*."

The researchers' findings - Explaining human interactions on the road by large-scale integration of computational psychological theory - has been published in the scientific journal PNAS Nexus.

Software developer Jorge Garcia de Pedro is the subject in this demonstration at HIKER, the pedestrian simulator used in Prof Markkula's research.

The development of automated vehicles could have a major impact on the UK economy. In a vision statement, the Government has said driverless vehicles will launch a £42 billion industry and create 38,000 new jobs. The aim is to see the start of the safe roll out of driverless vehicles by 2025. But the researchers argue that work towards driverless vehicles has been hampered by a lack of models of how human road users interact. Accurate models are needed to run simulations necessary in both development and testing of driverless vehicles and their control systems, for example to demonstrate that the vehicles remain safe when confronted with a range of human behaviour on the road. Up to now, most computer models of road user behaviour have been statistically based, with predictions of how people might behave based on analysis of large datasets, but typically without analysing those models at a detailed behavioural level. The research by Professor Markkula and his team has instead focused specifically on the details of human behaviour and key concepts in human psychology.

RESEARCH OUTPUTS with more examples of ART in TRANSPORT

Names of researchers affiliated with ITS are highlighted in **bold.**

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Artwork on the London Tube: Baker Street station platform with silhouette of Sherlock Holmes. Photo courtesy of Masters student Dingye Han (2022)

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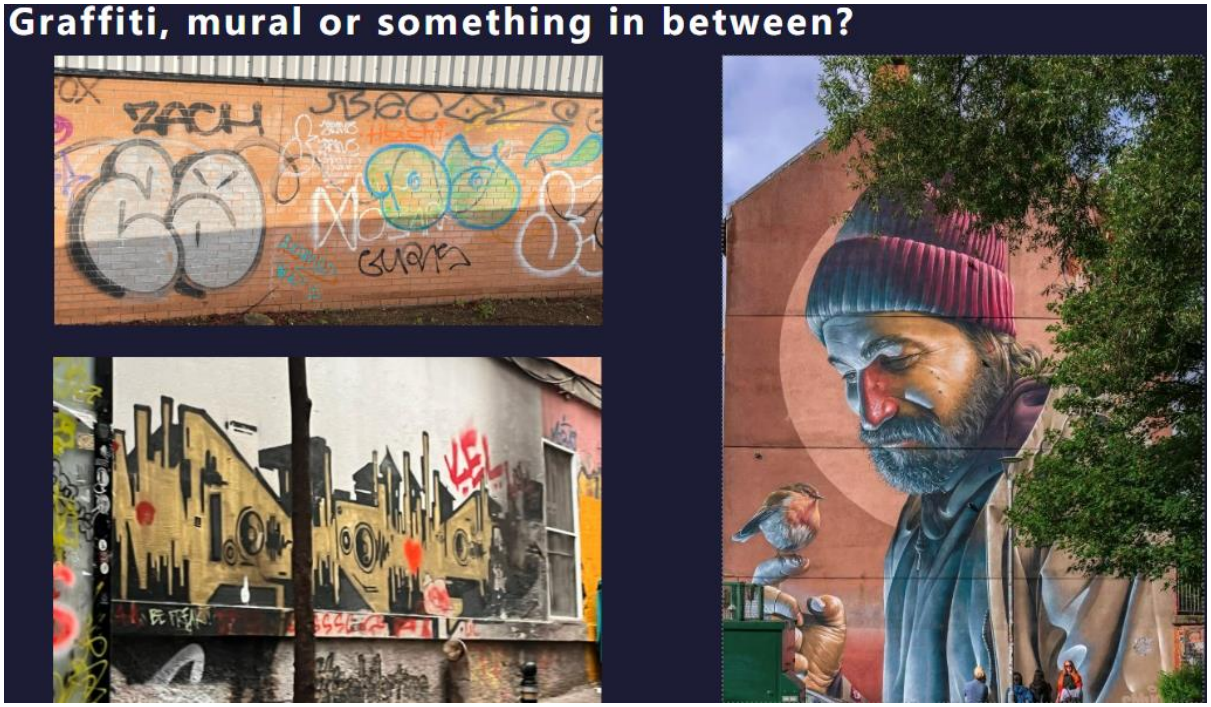

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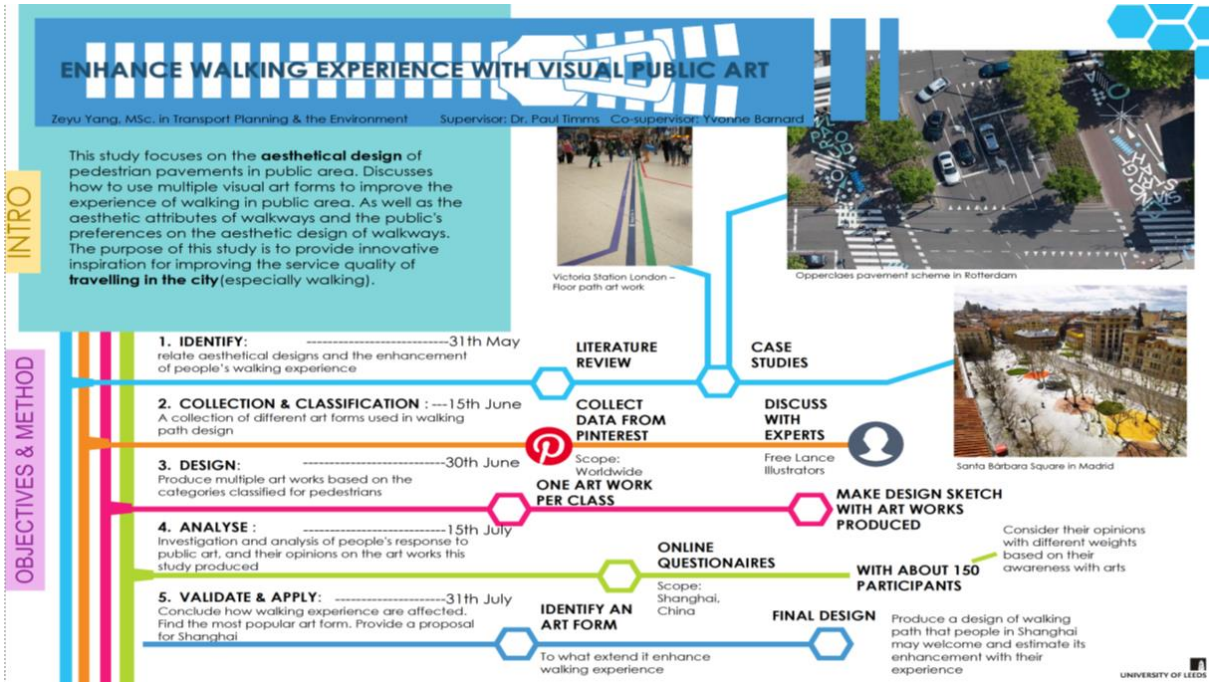

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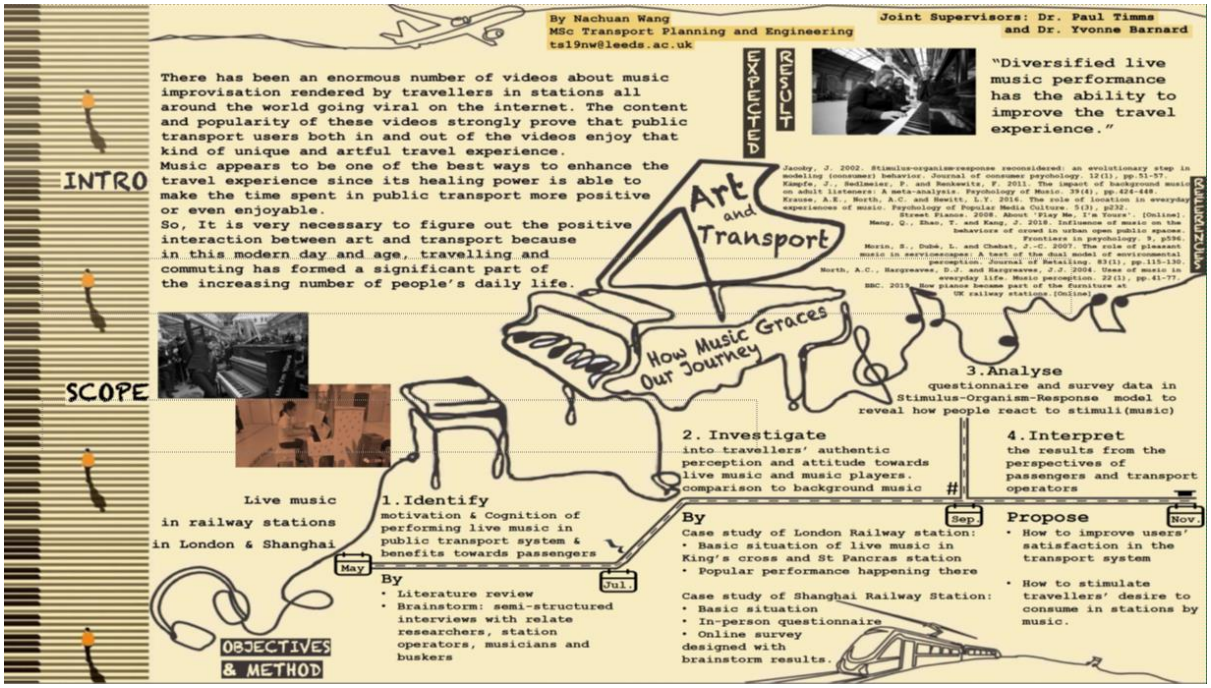

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