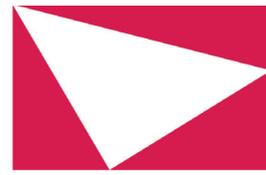


**Transport  
Research Institute**  
Edinburgh Napier University  
Annual Report 2017



**Transport  
Research  
Institute**

*Informing decisions.  
Shaping policy.*

# Welcome

## Transport Research Institute Annual Report 2017

### Our vision

“To be internationally recognised by academics, public policy makers, the transport industry and investors for the relevance, quality and rigour of our research in areas that contribute to a growing economy and more sustainable and healthy mobility.”

In 2017, TRI continued its work as a centre of excellence in transport planning research in Scotland and the wider world. We welcomed several new members of staff as researchers, including Lucy Downey, Monika Grigorova and Dr Nazan Kocak, all of whom are working on road safety and streetscape related projects. Shelly-Ann Julien, Joseph Appiah and Aisling Doyle all successfully defended their PhD theses on, respectively Caribbean Ports, Car Following Models, and Electric Vehicles – we congratulate them and wish them every success in their future careers.

Our consultancy portfolio grew, with new work for Transport Scotland on junction standards which as well as breaking new ground in terms of our knowledge of driver sightlines at junctions is also highly likely to have an impact on actual design standards for trunk roads. Consultancy at the City of Edinburgh Council was also design-related, focusing on the finalisation of their new Street Design Guidance and rolling it out within the Council – although we also won a small project on their Local Transport Strategy. In addition we carried out work for Bikeplus, the Bike Sharing provider, on the scheme in Glasgow, and a review of public transport governance and financing in Scandinavia, for the Urban Transport Group.

On the research side, Achille Fonzone was particularly active with the start of a new Horizon 2020 project, SUNRISE, on sustainable transport in city neighbourhoods, for which he is PI, assisted by Damian Stantchev; and at the same time publishing 5 3\* and 4\* journal articles, and winning two university funded research projects. Tom Rye and Nazan Kocak continued work on the PROSPERITY

Horizon 2020 projects on sustainable urban mobility planning and Wafaa Saleh and Lucy Downey on a project on pedestrian safety in Qatar, funded by the Qatar Foundation. Meanwhile our activity in the area of sustainable freight was increased as, led by Jonathan Cowie, we started a new INTERREG project, SURFLOGH, in the area of business models for sustainable urban logistics.

We maintained TRI's profile with a large number of media appearances in the newspapers, on radio and television, but also with several successful events on topics such as public transport, showcasing our public transport research to an invited group of professionals and researchers; and of course our now regular Electric Vehicle Event which attracted record numbers of participants. Recognition of our work also came in the form of two further awards to Richard Llewellyn for his work on intelligent road studs.

All this activity is of course critical for TRI's research reputation, but it also feeds into keeping our key teaching offer, our highly successful MSc Transport Planning and Engineering programme (led by Jonathan Cowie, and one of the few in the world to be offered in distance learning format) up to date and industry relevant, and we were pleased to reap the rewards of this with 2017 seeing one of our largest student cohorts of recent years. TRI is about research and teaching and the two activities support each other closely.

We very much look forward to continuing on our success and working with you in 2018!

## 2017 HIGHLIGHTS



**Richard Llewellyn** was appointed Chair of The Chartered Institution of Highways & Transportation (CIHT) Scotland Region for 2017/2018. In this role he has undertaken a number of high profile activities. In October 2017, Richard hosted the current president of the CIHT, Andreas Markides, on his annual visit to Scotland. The pair visited the recently opened Queensferry Crossing followed by a tour of the Scottish Trunk Road Traffic Control Centre.



In October, **Richard** also hosted the CIHT Scotland Annual Dinner held at the Grand Central hotel in Glasgow. The event was attended by over 200 guests from national and local government, consultants, contractors and other bodies associated with the transport profession. At the dinner, Richard highlighted his theme for the year which was "Inspiring the next generation of transport practitioners", a subject which tied in well with his activities at the University.

**Prof Tom Rye** was invited to speak at the STEPPing into the Transport Future event in June which was jointly organised by Transport Scotland and SEPA. He spoke on Managing Air Pollution from Transport: some Experience from other Countries, where he looked at what other countries have managed to do nationally and locally to cut especially particulate and nitrogen oxides emissions from traffic. The purpose of the event was to provide updates and insights on some of the key trends that might impact on transport emissions and the implications these might have for transport users (both people and logistics) in the next 15 years. The event will add value to the multi stranded work that Transport Scotland are taking forward in delivering the Cleaner Air for Scotland Strategy (CAFS).



**Clare McTigue** won the Scottish Transport and Applications conference prize for "Best Paper by a Young Professional". Clare is in the final year of her PhD research and her paper "Identifying barriers to implementation of bus policies by local authorities in the UK" was selected for the award by the conference programme committee against stiff competition. Clare presented her work at the STAR2017 conference in May at the Technology Innovation Centre in Glasgow, where the paper generated considerable discussion and interest. Clare's PhD is supervised by Prof. Tom Rye and Dr. Jason Monios of TRI.

**Dr Andrew MacIver**, Head of Civil and Transportation Engineering launched a civil engineering degree programme in Myanmar, in partnership with California Unitech College, Yangon.

**Andrew Maciver** had an article on 'Designing Sustainable Transport in New Developments' in Business Comment, the Edinburgh Chamber of Commerce magazine.

**Emine Akgun** attended a doctorate workshop in Poland in June and was awarded the best presentation prize.

**Dr Yuhong Wang** and PhD student **Ke Du** from TRI attended the final ENRICH project workshop - "Evolution, Integration and Optimization of Supply Chains" held in Dalian in July. Miss Ke Du delivered a presentation named 'Intermodal Transport in Green Port Strategy - An Empirical Application on Ningbo-Zhoushan Port'. The focus of her presentation was on the comparison of green port strategy applications between developed countries and China.

**Prof Wafaa Saleh** was invited as the highest honoured guest at the 8th International Symposium on Travel Demand Management in Taiwan (TDM 2017) that was held in Taipei in September. Innovative concepts, rigorous research, and proactive practices have instilled unprecedented energy and momentum into Travel Demand Management (TDM) around the world in recent years for fostering greener and healthier mobility. The 8th International Symposium on Travel Demand Management provided more than two days of intellectual exchange, best practice sharing and networking with leading TDM researchers and professionals.

Edinburgh Napier University has been selected to host and organise the 2019 TDM Symposium in Edinburgh.

[blogs.napier.ac.uk/tdm2019](https://blogs.napier.ac.uk/tdm2019)

**Prof Tom Rye** and **Dr Jason Monios** gave evidence at a hearing of the Scottish Parliament Rural Economy and Connectivity Committee in February 2017. The aim of the hearing was to assess the transport policy aims contained in the Scottish Government's third Draft Climate Change Plan and provide input to the committee's response to the government on the feasibility and likely outcomes of the proposals contained in the plan towards meeting the Scottish Government's emission reduction targets.

**Prof Tom Rye** was invited to become a member of the Research and Evidence Group for the review of the National Transport Strategy for Scotland. The review of the National Transport Strategy (NTS) was announced by the Minister for Transport and the Islands, Humza Yousaf, in August 2016 and aims to set out a new 20 year vision for transport, one which encapsulates the priorities for transport in Scotland and provides a framework against which questions of transport investment, priorities and policies can be judged.

The review of the NTS will be a wide collaborative endeavour, involving Transport Scotland, Scottish Government and a range of key stakeholders supplying advice, guidance and challenge on the conduct of the review, through various means of engagement throughout the 2-3 year lifespan of the project. As part of this collaborative process, a 'Research and Evidence' Working Group was established to ensure the review is informed by the best available evidence.

**Prof Tom Rye** was invited by the Luxembourg Public Transport Authority to give a presentation on parking management as a key element in sustainable urban mobility policy at their annual conference in September in Luxembourg. He presented on the importance of parking and highlighted many inspiring examples of innovative parking policy from cities around Europe.



**Dr Achille Fonzone** was appointed Associate Editor of the Journal of International Transportation Systems (JITS). The Journal aims to contribute to the scientific understanding of the impacts that intelligent transportation systems can have on accessibility, congestion, pollution, safety, security, noise, and energy and resource consumption.

In January, the Transport Research Institute hosted a seminar on public transport, featuring Nigel Wilson - Professor at MIT, George Lowder - CEO of Transport for Edinburgh, and Tom Rye, Jonathan Cowie and Achille Fonzone from Napier.



## STAFF NEWS

**Dr Jason Monios** left in September to take up a post as an Associate Professor in Maritime Logistics at Kedge Business School, Marseille, France.

**Dr Yuhong Wang** left in October 2017 and joined Ningbo University in China as a Professor in Maritime Transport.

## ACADEMIC VISITORS

Academic visitors who spent time at TRI during 2017 included: Francesco Forlani (from Università di Bologna, to work on his dissertation on urban consolidation centre modelling under Achille Fonzone's supervision).

**Arkadiusz Drabicki (Arek)** carried out a Short Term Scientific Mission, funded by the COST Action TU1305, to design a survey on real time information on crowdedness for public transport users (Achille Fonzone).

**Pierre Médard-Colliard** from ENTPE, France to study Spatial and temporal analysis of traffic behaviour during traffic incidents using traffic sensors and traffic flow theories (Wafaa Saleh).

**Nina Plevnik** from University of Ljubljana under Tom Rye's supervision. Green mobility projects - cycling, walking, air quality, noise, mobility management, soft measures, urban mobility strategies.

**Noemi Noci** from the Politecnico di Bari, Italy to study Urban planning and transformation with particular regard to the role of population in these processes (Achille Fonzone).

**Giuseppe Degennaro** from the Politecnico di Bari, Italy to study Transport Planning (Achille Fonzone).

**Aurore Bauer** from EIVP, France to study Environmental policies and strategies at ports (Jason Monios).

**Mr Qiwen Du** from Beijing Jiaotong University - Government Subsidies for CR express (Yuhong Wang).

**Tuğçe Özer** from Hacettepe University, Turkey to study Energy & the environment (Tariq Muneer).

**Akito Higatani**, Traffic Research & Survey Group, Japan to study the impact of autonomous cars on traffic flow (Wafaa Saleh).



Professor Tom Rye

## STAFF ACTIVITIES 2017

**Professor Tom Rye** is a member of the following: STAR Steering Group; Cross Party Group Cycling Walking and Buses; Invited Chair, OECD Workshop on Measuring Accessibility in Transport; Chair, Universities Transport Studies Group; Member K2 International Advisory Board; Chair of Jury, European Mobility Week Award, 2009; and member of jury for 2010 award. He chaired a session at Thredbo 15 in Stockholm 2017.

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**Dr Andrew MacIver** is a Senior Lecturer in Transportation Engineering and the Subject Group Leader for Civil & Transportation Engineering. He is also a visiting lecturer at Shanghai Normal University. He is a former director of ITS Canada and currently serves on the Edinburgh Urban Design Panel, City of Edinburgh Council and on the Institution of Civil Engineers Municipal Group (Scotland) committee. Andrew MacIver is the External Examiner for Civil Engineering at Caledonian College of Engineering (CCE) in the Sultanate of Oman.

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**Dr Jason Monios** published several journal papers and book chapters, in addition to publishing a co-edited textbook on Intermodal Freight Transport and Logistics. He reviewed for several journals and presented at a number of conferences, including chairing a session on freight and logistics at the UTSG conference in Dublin in January 2017. He was an invited keynote speaker at the Northern Lead in Gothenburg in April, Ningbo University, China in May, and the Institute of International Economics, University Jaume I in Castellon, Spain in September. He gave evidence to the Scottish Parliament Rural Economy and Connectivity Committee on the Scottish Government's third Draft Climate Change Plan 2017, and was a member of the Strategic Framework Working Group for the review of the National Transport Strategy for Scotland. He was successful in a bid for European funding for the SURFLOGH project on smart and sustainable urban freight transport, with a value for Napier of £83,000. He continued to sit on the Edinburgh Urban Design Panel, and continued as Chartered Member of the Chartered Institute of Logistics and Transport, fellow of the Royal Geographical Society, member of the International Association of Maritime Economists and committee member of the Scottish Transport Studies Group. In September he was



Dr Achille Fonzone

external examiner for a PhD thesis at the University of Antwerp. Jason also continued as visiting researcher at the University of Gothenburg and the University of Manitoba.

**Dr Achille Fonzone** became Associate Professor on 1st August 2017. He took part in ISTTT21 in Kobe in August and presented his paper there. In September he was invited by Transport for London (TfL) to give a talk at their First Research Forum. His topic was "RTPI – Does it make any difference?" He was invited to be a member of a PhD examination committee at KTH, Stockholm, for a dissertation on "New opportunities in urban transport data". Achille was invited to give a talk in a seminar on "Real-time Travel Information: Prediction Challenges and Behavioral Implications". Achille gave an invited webinar for the TRB Traffic Flow Theory committee on "A model of bus bunching under reliability-based passenger arrival patterns" in December. Achille was involved in the workshop on Smart Urban Mobility, and with Tom and Wafaa, he is coordinating the editing of the related special issue of Transportation Research part A.

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**Professor Wafaa Saleh** continued chairing the committee of the International Symposium on Travel Demand Management at the 8th meeting held in Taipei, Taiwan in September 2017, being a member of the scientific committee of the International Symposium on Transportation Network Reliability (INSTR). She was invited at the Graduate Institute of Injury Prevention and Control at Taipei Medical University in Taiwan to give a presentation on EEG analysis, HGV and safety. In March, Wafaa visited King Saud University (KSU) in Riyadh and gave three presentations on transport research and safety systems at the department of Geography at the University. She was also invited to Qatar University and presented on pedestrian safety. Wafaa is continuing as principal investigator on a project funded by the Qatar Research Foundation on modelling pedestrian walking and crossing behaviour. Wafaa has founded the TRI Transport Engineering Academy at ENU. The aim of the academy is to set engaging and creative training facilities and capabilities to contribute to enhancing and empowering international students experience in transport engineering. The academy encourages engineering efforts and developments in applied and basic research in different engineering and science disciplines (<http://www.tri.napier.ac.uk/c/news/newsid/13076>). Wafaa is continuing, to successful completion, PhD supervision at Edinburgh Napier and being an examiner at a number of universities in the area of transport modelling and travel demand management. Wafaa is continuing to be active in terms

of publications, a peer reviewer and a member of the editorial board at a number of international journals.

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**Professor Tariq Muneer** currently chairs an active group engaged in research on 'Sustainable Energy' that includes 'Sustainable Transport'. Professor Muneer is an international authority on the subject of solar energy and its use in buildings with over 35 years' experience. He is the author of over 215 technical articles, most of which have been distilled in his research monographs.

Professor Muneer is also a visiting professor for the period of 2013-2020 for the following two universities: University of Granada, Granada, Spain and University of Maribor, Celje campus, Slovenia

Professor Muneer is the co-ordinator of Chartered Institution of Building Services Engineers' Solar Data Task Group and in this capacity he has been involved in the production of the CIBSE Guides A& J for Weather and Solar Data. Professor Muneer has also been employed both by the government and industry as a consultant on a large number of engineering projects. Professor Muneer has been awarded several prestigious awards including the Royal Academy of Engineering Industrial Fellowship (2000-02), the Royal Academy of Engineering Engineers Secondment Overseas (1995), the Leverhulme Trust (1989) and the University College, Oxford/General Electric Company (1989) Research Fellowships. He is also the recipient of the Osmania University's Karamat Jung Gold Medal (1974), CIBSE Carter Bronze Medal (1990), CIBSE Napier Shaw Bronze Medal (1999), Millennium Commission's Fellowship Award (1999), Walsh-Weston (Society of Light & Lighting, London) Award (2002), Services to Industry Group's Proof of Concept award (2003) and the Scottish Green Energy, Highly Recommended Best Renewable Award (2006).

Under Professor Muneer's supervision, 3 MPhil and 28 PhD candidates have successfully gained their awards. A further five doctoral programmes are currently underway.

Professor Muneer has been a PI for one EPSRC grant that dealt with solar radiation and daylight modelling and a co-investigator for two further EPSRC grants that dealt with the subject areas of 'climate change' and 'decentralised grids'.

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### Professor Christiane Bielefeldt

Christiane Bielefeldt retired from Edinburgh Napier University in early 2017 from the post of Professor for Strategic Transport Management. She is now a Professor Emeritus, but has since been re-employed part-time by Napier as an adviser for the evaluation in the H2020 project SUNRISE, which deals with mobility planning and implementation at urban district level through "neighbourhood mobility labs".

Key research interests: sustainable transport; co-modal and intermodal transport; ICT in transport; urban and motorway traffic control.

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**Richard Llewellyn's** research work has focussed on his current PhD topic, "The Influence of Illuminated Road Studs on Safe Driving Behaviour". He undertook a major user survey through distribution of 11,000 postal questionnaires to residents of the Scottish Borders. The survey was designed to look at perception of safety on the road as a result of implementation of led powered road studs at nine junctions on the route.

Another research project Richard is leading is a review of Driver Eye Height as part of an update of the Design Manual for Roads and Bridges. In this project, TRI is working as technical advisor to CH2M, in providing advice to their clients Transport Scotland and Highways England. Later in the year Richard will be undertaking on-road measurements which will be used to inform the update of this important technical standard.

Richard has continued to be an active member of the transportation teaching team at the university. In August 2017, he taught his module on Railway Engineering to the first cohort of students through the new Edinburgh Napier University / California Unitech Civil Engineering programme in Yangon, Myanmar.

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### Dr Jonathan Cowie

Jonathan Cowie is a lecturer in Transport Economics and programme leader of the MSc in Transport Planning and Engineering. He teaches modules on transport policy, freight transport, public transport and transport economics, and has considerable experience of teaching research methods. Jonathan's main research interests are in public transport supply side economics (regulation, competition, production economics), freight transport and research methodologies. He is author of the book 'The Economics of Transport' published by Routledge and joint editor of the Routledge Handbook of the Principles of Transport Economics published in August 2017.

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**Dr Yuhong Wang** was a senior research fellow of maritime economics and management until he left TRI in October 2017. His research is mainly focussed on economic and spatial analysis of liner shipping network and its implication to inter-port competition.

### Dr Damian Stantchev

Dr Damian Stantchev continued in his role as external examiner and Member of the Complaints Commission for the 'Industrial Buying Behaviour' module at the University of Agder, Norway.

Damian continued to be a member of the International Editorial Board of the Yearbook of the University of National and World Economy (UNWE) in Bulgaria, a peer-reviewed compendium of selected publications. The UNWE is a leader among the higher educational institutions in Southeastern Europe in the fields of economics, management and administration, law and politics. Damian supervised a PhD student in the Business School who is conducting research in humanitarian logistics, jointly with Dr Miles Weaver and Prof Grant MacKerron from the Business School. Since November 2017 he started supervising another PhD student in the Business School whose preliminary research topic is "Scalable framework creation for sustainable supply chain management and digital marketing within the context of future trends in retail".

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**Lucy Downey**

Lucy has been working with Qatar University as part of a project funded by the Qatar National Research Fund. The research involves investigating pedestrian crossing behaviour at junctions and mid-block locations. The study design includes a literature review, video recording and data extraction, statistical analysis and simulation modelling. It is anticipated that the findings will provide guidelines to improve existing simulation models. In addition, recommendations will be made towards improving the crossing environment and reducing pedestrian casualty rates.

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**Dr Nazan Kocak**

Nazan is a research fellow at TRI. Naz is a town planner with a PhD in road user charging; MSc in traffic planning and implementation; and a PGDip in Urban Design. Having worked in academia, consultancy and local government, Naz has 360 degree experience in development and execution of transport policies and strategies; transport and traffic modelling; scheme appraisal; public transport schemes; active travel (walking and cycling) planning and scheme design; and urban and street design in the light of the Scottish Government's Designing Streets policy.

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**Monika Grigorova**

Monika Grigorova joined the TRI as a Research Assistant in June 2017. She has been working with Professor Wafaa Saleh on a project investigating pedestrian crossing behaviour at midblock un-signalised locations in Edinburgh. So far, the project output includes literature review, video recordings, data extraction and reduction, and statistical modelling. This research project will provide more insight into the role of refuge islands in crossing behaviour as well as assess the contribution of various demographic and traffic variables to pedestrians' decision-making.

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**Dr Mark Taylor**

Mark continues working on the dataBike project and is now working with Glasgow City Council to help them with developing their cycling infrastructure asset management processes. Mark is also developing new geospatial mapping techniques to assist in the collation and analysis of cycling infrastructure condition data.

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**Dr Zuansi Cai**

Zuansi Cai is an Environmental Modeller with over ten years' research experience. He joined Edinburgh Napier University as a lecturer in 2016, after working as a Research Associate/Fellow for three multi-million pound RCUK and EU research projects at University of Sheffield and Queens' University Belfast. His research interests include Groundwater Risk Assessment of Fracking for Shale gas, Water Resources and Climate Change.

Currently, Zuansi is collaborating with research Prof Tariq Muneer in Renewable Energy and Electric Vehicles. His earlier research experience included solid waste technology, soil and groundwater remediation, flow and transport modelling as well as uncertainty quantification.

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**Professor Keith Dickinson**

Prof Keith Dickinson continues to serve on the TRI Advisory Board and takes an active role as Emeritus Professor of Transportation at TRI. He is currently supervising Faqhrul Islam, a PhD student studying the Impact of Ubiquitous Real-time Passenger Information (URTPI) on travellers' choice. Faqhrul is planning to complete his PhD studies in early 2018.

**Professor Mike Maher**

Professor Mike Maher is a Professor Emeritus. He continues to be on the Editorial Advisory Board for Accident Analysis and Prevention. He is involved in two Aecom/Atkins projects for the DfT on (i) the impact of 20 mph speed limits and (ii) the effect on accidents of the recent increases in HGV speed limits, advising on statistical methodology. He is an honorary professor at University College London.

**David Hunter**

David Hunter has been an Associate Research Fellow of TRI since June 2015 and is active in a number of voluntary, professional and statutory bodies including the Mobility and Access Committee for Scotland. During the year David has been pursuing a number of interests on accessible and inclusive travel, including forthcoming papers on the changing patterns of travel by disabled people and further work on trends in the use of dial-a-ride services in the UK. He helped facilitate TRI's seminar on 'Shared Spaces' in April 2017.

**David Scotney**

David Scotney (Associate Research Fellow) is a continuing board member of the Tayside and Central Scotland Regional Transport Partnership (Tactran) and a programme committee member for the STAR conference. He is undertaking research on mainly historical aspects of transport development and their potential lessons: during 2017 he both continued work with colleagues in TRI on the differing specifications and costs of transport provision in various countries, as well as collaborating with specialists from Russia on the development and utilisation of the formerly extensive narrow gauge networks in Russia and the USSR.

**Yvonne Lawrie**

Yvonne continues to provide administrative support to TRI's Director, staff, PhD students and visiting students. Yvonne organised the 3rd Annual Electric Vehicle Event in October and is organising the 4th event on Wednesday 10th October 2018. She is assisting in the organisation of an Autonomous Vehicle seminar in September 2018 and the TDM Symposium on 19th-21st June 2019. She co-ordinates the Advisory Board meetings and other seminars. She compiles TRI's and ISC's Annual Reports and deals with stakeholder engagement, marketing material and general enquiries.

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**PROJECTS ACTIVE IN 2017**

Projects that TRI researchers participated in during 2017 are listed below, with details of funding bodies and collaborating partners.

**SUSTAINABLE ENERGY AND TRANSPORT**

Tom Rye: **PUSH&PULL: Parking management and incentives as successful and proven strategies for energy-efficient urban transport** (EU Framework Programmes funded by Intelligent Energy Europe) [ends 28/02/2017]

The project aims to improve urban mobility in European cities by means of parking space management combined with mobility management measures. By introducing paid parking, increasing parking fees, reducing or restraining parking supply or implementing comparable measures, car drivers will be pushed to use more sustainable transport. At the same time, the income generated from parking space management can be used for incentives to promote alternatives, thus pulling or attracting users towards public transport, walking, cycling and other sustainable modes.

Richard Llewellyn (Project Lead), **City of Edinburgh Street Design Guidance**, Prof Tom Rye, Dr Nazan Kocak. [1 Mar 2017 - 31 Dec 2018]

Provision consultancy services and technical support to the City of Edinburgh Council in preparation of new Street Design Guidance for Edinburgh.

Dr Mark Taylor: **Intellibike: A novel approach to engineering condition assessment of cycling infrastructure.**

The UK National Cycle Network comprises 23,660 km of cycling and walking paths of which a significant percentage is dedicated off-road infrastructure. This represents a significant civil engineering infrastructure asset that currently contributes to the provision of a sustainable transport mode option nationwide. Commuting and recreational cyclists have observed the often hazardous conditions on these paths. There are various simple measures that could be taken to improve the maintenance of such off-road paths. Reliance on walk-over surveys (direct visual inspection) and path users notifying the local authority may not be tackling maintenance in a resource efficient manner. The proposed inspection method includes the use of an instrumented bicycle to examine cycle path condition through user perception of satisfaction and quality. A questionnaire was conducted to identify the attributes of off-road cycling infrastructure people find most important in relation to their personal satisfaction. An exploratory factor analysis was undertaken on perception study data to elucidate the determination of the variables associated with perceived user satisfaction. The study has shown that people find maintenance issues to be of high importance, especially surface issues. The results were used to assist the creation of dedicated user perception based surface condition rating-scales. The Intellibike will be used to assist local authorities in the collection of cycling infrastructure asset management condition data and ensure more efficient use of maintenance resources.



Dr Mark Taylor

## PROJECTS ACTIVE IN 2017 continued

Tom Rye: **PROSPERITY** (EU Framework Programmes)  
[September 2016 - 31/08/2019]

PROSPERITY is an Horizon 2020 project in the CIVITAS family of projects on sustainable urban mobility. It aims to enable and create a culture shift in government agencies and local authorities to support Sustainable Urban Mobility Plans (SUMP). The project focuses on promoting and supporting a broad take-up of SUMP especially in countries / regions and cities where the take up is so far so low. It aims to achieve this by providing mechanisms and tools for national / regional agencies to take a leading role in the development of SUMP; and building professional capacity through peer-to-peer exchange programmes and tailor made training programmes on various aspects of SUMP and/or innovative approaches in sustainable urban mobility. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690636.

Bike Share for All project funded by European Social Fund, Social Innovation Fund. In May, TRI started a 6-month collaboration on a project with Bikeplus and Glasgow Bike Station, the delivery partner of bike share operator Nextbike.

Low-income households suffer higher level of social exclusion than others and will be more likely to be in transport poverty. This programme seeks to replicate the success achieved by The Better Bike Share Programme in the USA by testing the same interventions in the poorest neighbourhoods of Glasgow served by their bike share scheme. Within the context of improving cycling infrastructure and encourage cycling through bike sharing scheme, the project offers a cost convenient alternative for lower income and ethnic minority residents. Napier plays a key role in evaluation of the project.

For further information about Nextbike refer to <https://www.nextbike.co.uk/en/glasgow/>.

Tariq Muneer: **Enerwater** [1 Oct 2014 - 31 Oct 2018]

This project involves the research and development of novel systems to recover and re-distribute energy in food processing and manufacturing premises, especially where there are demands for refrigeration and heating on-site and localised. The project also aims to optimise the production of heated water as a process requirement for heating, cleaning or sterilisation, by re-cycling both the waste heat and treating the waste water stream, so that it may be recoverable and re-cycleable. The user industry attraction will be local energy recovery for useful purposes, including water supply streams. Treatment of water itself for recycling is an additional attraction reducing external energy, resource treatments and requirements. The proposed developments may be applied within an industrial complex that can provide source and "sink" needs, or interbusiness or community to other industrial or domestic premises. This approach therefore minimises the industrial consumption of energy and diverts it to other localised energy users, which could be a range of uses, such as aligned similar site or other local heat consuming processes or domestic or office localised heating needs.

## MOBILITY MANAGEMENT AND TRAVEL PLANNING

Wafaa Saleh: **Qatar Pedestrian Research (Research - Other Sources funded by Qatar National Research Fund)**  
[ends 31/03/2018]

Investigating pedestrian crossing behaviour to improve pedestrian accident rates and severities in the State of Qatar. The study aim is to investigate pedestrian crossing behaviour at high accident rate locations in urban areas in Doha by developing an in-depth understanding of pedestrian's interaction with each other and with motorised traffic. The investigation will model pedestrian crossing behaviour at 24 junctions and mid-block locations with different characteristics (e.g. road speeds, pedestrian volumes and traffic control measures). The study design includes a literature review, video recording and data extraction, statistical analysis and simulation modelling using VISWALK PTV software. It is anticipated that the findings will provide guidelines to improve existing simulation models. In addition, recommendations will be made towards policies to improved pedestrian safety and reduce accidents as well as improving the crossing environment for pedestrians.

Dr Achille Fonzone (Project Lead), **SUNRISE** - Prof Christiane Bielefeldt, Dr Damian Stantchev [1 May 2017 - 30 Apr 2021]  
SUNRISE will develop, implement, assess and facilitate learning about new, collaborative ways to address common mobility challenges at the neighbourhood level. Towards this aim, 6 cities will foster collaborative processes in specific neighbourhoods as "Neighbourhood Mobility Labs" with the explicit mandate to implement innovative solutions for and with their residents, businesses etc.

SUNRISE rests on several pillars: A) Utilisation of neighbourhood-specific opportunities. B) Co-creation of solutions, i.e. through strategic civic-public alliances C) Socio-technical nature of solutions as combinations of services, social arrangements, rules, technologies or small infrastructures etc. D) New forms of synergies between bottom-up and top-down. All SUNRISE activities are structured along the following phases of the innovation chain: 1) Co-identification of mobility problems; 2) Co-planning / co-selection of solutions; 3) Co-implementation of solutions; 4) Co-evaluation; 5) Co-learning and uptake. The SUNRISE action neighbourhoods will use a blend of proven state-of-the-art online and face-to-face participation techniques and will establish longer-term collaborative forums. These will systematically involve citizens, businesses, NGOs, local authorities, academics etc. – always with a view to also involve under-empowered sections of the population like migrants, women, older and young people. Alongside the mobility benefits for the action neighbourhoods, the project will result in a suite of products – most prominently the SUNRISE Neighbourhood Mobility Pathfinder – which will be provided to European cities, their stakeholders and citizens through a powerful exchange process to inspire and inform change across Europe. This will include a group of 20 Take-Up neighbourhoods and various city networks in cooperation with CIVITAS.

## PROJECTS ACTIVE IN 2017 continued

### MARITIME TRANSPORT & LOGISTICS ENRICH

(EU FP7 Marie Curie Action, from October 2013 to September 2017) Dr Yuhong Wang and Dr Jason Monios

ENRICH (EC-ChiNa Research Network on Integrated Container Supply Chains) is a research staff exchange project to set up long-term research cooperation with four European and two Chinese universities. This project specifically aims to address long-lasting changes in operational, environmental, economic, technical and managerial practices in different segments of the rail, road, air and sea transport industries from an overall container supply chain perspective.

**Norwegian Research Council**, November 2015 to October 2019  
Dr Yuhong Wang

The SeaConAZ project represents a holistic perspective on the supply chains of consumables produced in China destined for European retailers. The focus of the project is on exploring the potential of a system changing approach, where the point of cross-docking and consolidation of less-than full container consignments (LCL) into full container loads (FCL) for a single, or cluster of, retailing points is moved from Europe to China. The academic consortium for the SeaConAZ project comprises

universities and research centres in Norway, Sweden, UK, The Netherlands and China.

Jason Monios: **Report on grant opportunities for coastal shipping of Scottish timber**  
[1 Jul 2017 - 30 Sep 2017]

Jason produced a report on opportunities for modal shift freight grants for setting up coastal shipping services on the west coast of Scotland for timber transport

#### Smart Urban Freight Logistics Hubs

Dr Jonathan Cowie  
[1 Jun 2017 - 31 Oct 2020]

The focus of the project is the optimization of the interaction between the hub and the urban logistics system, promoting both efficient and sustainable logistics in urban areas in smaller and medium-sized cities and city networks.



## PHD STUDENT RESEARCH TOPICS IN 2017

### PhD Student: Augustus Ababio-Donkor

Research Topic:

*Applying behavioural economics in modelling and analysing the demand for public transport using MINDSPACE and Structural Equation Modelling*

The demand for travel is derived from people's need for social and economic activity participation because this is necessary for human existence, the level of this activity participation measures the economic vibrancy and success of a city and mostly correlate the level of road traffic congestion. Meanwhile it is conventionally accepted that the most efficient and sustainable way of addressing the travel demand for activity participation is through the use of public transport. This has led to several transport related research and subsequently, schemes to promote public transport patronage. Notwithstanding, traffic in major UK cities maintain an upward trend whilst public transport ridership is recording a decline. It still remains uncertain as to which factors are most important in influencing mode choice decisions.

Traditional travel demand models explained, travel choices based on the attributes of the travel modes available and the socio-economic characteristics of the decision maker. This method has been widely criticised for not taking into account for attitudinal, social and psychological factors which have been found to influence travel choices. This has led to the development of latent/hybrid choice models that account for the heterogeneity of decision makers by incorporating elements like comfort, safety, risk etc in the decision making process. However, recent studies in the field of cognitive psychology, behavioural economics and consumer behaviour suggest that consumer decision is largely influenced by a framework called "MINDSPACE" (mnemonic for Messenger, Incentive, Norm, Default, Salience, Priming, Affects, Commitment and Ego). It is therefore suggested that individual transport behaviour could be modelled and better explained using MINDSPACE.

This research aims to investigate the effect of MINDSPACE in travel decision making and build upon the extant travel choice models by incorporating elements of MINDSPACE as latent factors in calibrating a latent travel mode choice model using structural equation modelling.

### PhD Student: Benjamin Afuye

Research Topic:

*Investigation of operational and perceived characteristics of buses in Edinburgh.*

Improved urban bus operational performance characteristics provide significant opportunities to generate a number of positive outcomes such as increased public transport modal shift, reduction of road traffic congestion and the emissions of greenhouse gases and local pollutants. Vehicle Speed-time profile factors are often complex, changes over time and some occurs in so many directions. This study is aimed at investigating the performance of buses in Edinburgh, utilising some readily available advanced technology. The driving cycle of typical buses in Edinburgh will be measured, analysed and assessed.

The characteristics of the driving cycles of the different types of buses will be used to assess the operational performance of each type of studied bus. Then the perceived performance of each of these buses measured by the emotional and reported reaction of the users will also be analysed and compared. Finally, a detailed comparison and analysis of the two results will be performed to assess the operational and perceived quality of Edinburgh buses. The work is novel in a number of areas: a) the investigation and comparison of the driving cycle of different types of buses in Edinburgh b) the use of advanced technology to monitor and analysis passengers' responses to bus operations, and c) comparing operational characteristics of buses with perceived performances obtained and drawing conclusions on any links if applicable.

### PhD Student: Emine Zehra Akgun

Research Topic:

*Investigating how consolidation centres can reduce emissions and congestion caused by freight transport in urban areas.*

Emine started at the Transport Research Institute in September 2015. Her main research interest includes sustainable urban freight transportation, consolidation centres and urban freight policies. Cities are the centres for various economic and social activities, such as living, working, leisure, production, travelling as well as shopping. Therefore, freight transportation to and from the urban areas becomes crucial to keep the cities alive. Freight is transported by motorized vehicles which causes much air pollution, noise nuisance, congestion and traffic accidents. Local authorities work for developing strategies in order to mitigate negative economic, societal and environmental impacts of urban freight transportation. Among various mitigation strategies Emine is interested in understanding how freight consolidation platforms can reduce the negative impacts caused by freight transport in urban areas and which local policies can contribute to the consolidation efforts for performing more sustainable operations in the urban freight.

### PhD Student: Joseph Appiah

Research Topic:

*Modelling and Simulation of traffic/driver behaviour.*

This research aims to investigate driving behaviour and car following models and techniques as well as enhancing the collection of traffic flow and driver behaviour data. This area of research has attracted the attention of many leading transport researchers and continues to be a promising and motivating area of study with the current advancement of technology. The continuous urge by researchers to improve driver behaviour models and driver safety in car-following situations has led to different methods of data collection being adapted for different studies such as aerial observation of traffic flow by helicopter. For this study, a novel driver behaviour data collection systems called instrumented vehicle was introduced. A private vehicle was equipped with different elements of modern traffic measuring devices (i.e. long rangefinder radar sensors, video-audio monitoring systems (i.e. GPS based video VBOX), speed measuring systems (i.e. GPS based performance box and laptop) to collect real time sequence traffic data in Scotland, more

## PHD STUDENT RESEARCH TOPICS IN 2017 continued

especially the City of Edinburgh and the surrounding areas. The study focuses on using traffic data to develop a new car following model that replicates real driving behaviour and also to improve the calibration parameters of the existing car-following models that replicate real individual driving behaviour.

### PhD Student: Aisling Doyle

Research Topic:

*An investigation into the thermal characteristics in an electric car.*

Aisling's research involves the development of a computer model to predict indoor cabin temperature of the automobile. This research focuses on the electric vehicle (EV) predominantly. Conventional internal combustion engine vehicles (ICEV) use waste heat from the engine to heat their cabin space, however, the EV does not have this luxury. The EV battery uses a significant amount of energy to heat and cool the cabin resulting in another limitation or factor that adds to 'range anxiety'. This model can help the industry, policy makers and academics to understand the thermal demand of the EV. The project also looks at implanting solar panels on the roof and bonnet of the vehicle to operate an auxiliary power unit to optimise the thermal performance of the EV.

Aisling attended a conference in Celje, Slovenia in May of 2015 where she presented a paper ('An experimental review of the electric vehicle'). Also a paper was published at an SAE conference in Chennai, India August 2015 ('A review of the Thermal performance of Electric Vehicles'. Technical Paper. 2015-28-0052. Aisling Doyle, Tariq Muneer, Ian Smith).

### PhD Student: Sayed Mohammed Faruque

Research Topic:

*Residential location choice in the era of Shared Autonomous (SAV) vehicles with socio-economic perspectives: A Stated choice Analysis.*

Over the last few decades the concept of Urban Mobility has changed in a multifaceted way. The introduction of Autonomous vehicle has a relatively new feature that have a lot of potential in the near future. According to Department of Transport Autonomous Vehicle will give benefit to a wide range of people with significant environmental, economic and social benefit including improved social inclusion.

Sayed is at the first year of his PhD at TRI. His research is concerned about the usefulness and motivation of Autonomous Cars for journey experiences. While the theme, the objective of this research is to measure the value of travel time savings for different journey aspects by Autonomous Vehicle. When automated driving will be fully implemented, people's perception about time and space can be greatly modified which will further enhance the location and travel choice behaviour of people. This choice variation will be guided by the time dependent travel theory. Theoretically, Autonomous or Driverless cars are the new generation of cars where driving functions are fully or partially controlled without human contact. So these cars are computer controlled rather than human interaction but serving people with greater benefits to mobility.

Vehicle Automation is the spectrum of driver assistance technologies as specified by Society of Automation Engineers (SEA) where the highest level refers to the complete hands/feet/drain off driving and can interact with the surroundings by seamless data sharing and intelligent decision making.

### PhD Student: Faqhrul Islam

Research Topic:

*Smarter Urban Mobility.*

Faqhrul joined TRI as a research student in March 2015. Since then he has been working on the impact of real time passenger information. His study is focused on understanding the impact of real time passenger information on travel choice behaviour. The study will also address the factors that encourage or hinder passengers to use real time information.

Faqhrul attended CILT-13 Young professional Conference 2015 in Edinburgh, STAR conference 2015 in Glasgow, RTPI conference 2015 in London, and Scottish Passenger Transport Excellence 2016 in Edinburgh. He also presented his research work in UTSG annual conference, Bristol 2016.

### PhD Student: Shelly-Ann Julien

Research Topic:

*International Trade Economics, firm/industry level evolutionary technical efficiency and productivity*

This research investigates evolutionary technical efficiency and productivity of Small Island Developing States (SIDS) ports from, 2001-2011. The sample covers 69 worldwide ports of which major top ports, are included as a benchmark for which we compare the performances of the Caribbean and Pacific SIDS. A non-parametric DEA-Malmquist Productivity Index (MPI) model is introduced to measure the changes in efficiency and productivities, as a result of progressive port development over the years, impacting scale, pure and technological improvements. The time series analysis results reveal a 72% average technical efficiency for Top ports, compared to 60% for the SIDS group. Moreover, productivity growths of SIDS increased by 3.1%, with scale improvements being the main contributor in the Caribbean, and pure efficiency in the case of Pacific ports. This heterogeneity within the SIDS group, tells that regional port strategy, may actually play an integral part in possibly impacting port productivity and efficiency. This research seeks to contribute to existing literature on port efficiency and productivity, by focusing on Small Island Developing States, and the factors that impact their performances. It also brings a practical contribution to the future development of these ports, as is the agenda of local, regional (CARICOM), and international organizations (United Nations).

**PhD Student: Clare McTigue**

Research Topic:

*Implementation of Transport Policies at a local level.*

The first stage of this project looks at the theoretical approaches to policy implementation and focuses on top-down, bottom-up and hybrid theories and frameworks to help understand the barriers and enablers that have an impact on policy implementation. A new hybrid theory is developed which is a 10-point framework on what is needed for successful implementation.

The second stage of this project includes the data collection. Mixed data collection methods are used to identify the keys barriers associated with developing and implementing sustainable transport policies. These methods include online surveys with 56% of public transport officers in the UK and follow-up telephone interviews with 10 of those officers. It also includes four case studies with particular emphasis on cities that had previous involvement in bus projects or schemes. These case studies include face-to-face interviews with experts who can give their opinions and perceptions and comment on how bus policies are implemented in their area, and the challenges faced in the implementation process.

The final stage of this project includes triangulation of the data collection methods and incorporation of the McTigue et al. (2016) hybrid theory. This project particularly focuses on bus policy because it is an under-researched area and evidence of this gap means that there is an opportunity to understand what factors can help or hinder successful implementation and how this can in turn improve bus services and infrastructure. The findings from this research will inform policy makers, local authority staff, regional transport partnerships, bus operating companies and other practitioners working within the field of transport.

**PhD Student: Suzanne Meade**

Research Topic:

*Vulnerable Road Users Safety Performance in Scotland*

Vulnerable Road User (VRU) road safety performance has lagged behind the improvements achieved for motorised users despite having the same road safety targets for reduction across EU and UK. Scottish policy aspirations aim to increased mobility alongside commitments to improve road safety, which poses the question: Why has VRU road safety performance not improved in tandem with motorised modes over the past decade in Scotland?

The aim of the research is to investigate whether there is a VRU SiN effect in Scotland due to increased mobility and examine if there are wider spatial, demographic and policy differences affecting VRU safety performance.

Equity within the transport system for VRU is essential for those who do not have the choice or access to a private car due to deprivation, age, gender, disability, and location. The current method for gauging performance is the use of global number of fatalities per population and to a lesser extent fatalities expressed by kilometres travelled. It is hoped that this research will develop safety performance indicators at a local level, based on risk equity rather than aggregate global numbers of fatalities within a population.

**PHD COMPLETIONS IN 2017**

Aisling Doyle: in December 2017, Aisling Doyle successfully defended her PhD thesis titled 'An investigation into the thermal characteristics in an electric car.' (Supervised by Prof Tariq Muneer and Dr Zuansi Cai).

Shelly-Ann Julien: In November 2017, Shelly-Ann successfully defended her PhD thesis titled 'International Trade Economics, firm/industry level evolutionary technical efficiency and productivity.' (Supervised by Dr Jason Monios and Dr Jonathan Cowie).



Joseph Appiah: Joseph successfully defended his PhD thesis titled 'Investigation of car following modelling methodology using traffic sensors.' (Supervised by Prof Wafaa Saleh and Kathryn Stewart).

**PUBLICATIONS**

Cowie, J; Ison, S (2017). *The Routledge Handbook of Transport Economics*. Taylor & Francis (Routledge)

Cowie, J (2017): **Competition and complementarity in road freight: key drivers and consequences of a dominant market position**. Taylor & Francis (Routledge).

Merkert, R., Cowie, J (2017): **Efficiency assessment in transport service provision**. Taylor & Francis (Routledge)

Muneer, T., Kolhe, M., Doyle, A (2017): **Electric Vehicles: Prospects and Challenges**. 1st Edition, Elsevier.

**JOURNALS**

De Gruyter, C; Rose, G; Currie, G; Rye, T; van de Graaff, E (2017): **Travel plans for new developments: a global review**. Transport Reviews. Taylor & Francis (Routledge).

De Gruyter, C; Rose, G; Currie, G; Rye, T (2017): **Travel Plans for New Developments: A Global Review**.

Hrelja, R; Monios, J; Rye, T; Isaksson, K; Scholten, C (2017): **The interplay of formal and informal institutions when creating well-functioning public transport systems**. International Journal of Sustainable Transportation. Taylor & Francis.

McTigue, C; Rye, T; Monios, J (2017): **The role of reporting mechanisms in transport policy implementation by local authorities in England**. Case Studies on Transport Policy. Elsevier.

McTigue, C; Monios, J; Rye, T (2017): **Identifying barriers to implementation of local transport policy: An analysis of bus policy in Great Britain**. Utilities Policy. Elsevier.

Monios, J, Bergqvist, Ri (2017): **Identifying competitive strategies for each phase of the intermodal terminal life cycle**. Research in Transportation Business and Management. Elsevier.

Monios, J (2017): **Cascading feeder vessels and the rationalisation of small container ports**. Journal of Transport Geography. Elsevier.

Martin Moral, E; Fonzone, A (2017): **Bike share usage characterization-initial results from a cluster analysis of London santander cycles scheme data**.

Rye, T; Hunter, D; Wretstrand, A (2017): **Trends In the Use of Dial-a-Ride and DRT Services – in Sweden and the UK**.

Urquhart, N; Fonzone, A (2017): **Evolving Solution Choice and Decision Support for a Real-World Optimisation Problem**. Association for Computing Machinery

**PRESENTATION & CONFERENCE ARTICLES**

McTigue, C., Monios, J., & Rye, T. (2017, May). **Identifying barriers to implementation of bus policies by local authorities in the UK**. Paper presented at Scottish Transport Applications and Research Conference, Technology and Innovation Centre of the University of Strathclyde.

Rye, T. (2017, January). **Joined up transport infrastructure: value for money investment**. Presented at Scottish Transport Infrastructure Conference, Edinburgh

Rye, T., Hunter, D., & Wretstrand, A. (2017, January). **Trends In the Use of Dial-a-Ride and DRT Services – in Sweden and the UK**. Poster presented at Transportation Research Board Annual Meeting, Washington DC.

Rye, T. (2017, May). **Transport and economic growth**. Presented at SCOTS AGM, Pitlochry.

Rye, T., Alexander, P., Karolina, I., Robert, H., Claus Hedegaard, S., & Christina Lindqvist, S. (2017, August). **The politics and policies of collaboration: towards a critical understanding of public transport governance**. Paper presented at International Conference Series on Competition and Ownership in Land Passenger Transport, Stockholm.

Rye, T., Hrelja, R., & Mullen, C. (2017, August). **Partnership working between operators and public transport authorities. Qualities and working practices for functioning collaboration**. Paper presented at International Conference Series on Competition and Ownership in Land Passenger Transport, Stockholm.

Rye, T. (2017, May). **Why does new transport infrastructure seem to cost more in Scotland and Great Britain than in other northern European countries?**. Paper presented at Scottish Transport Applications and Research Conference, Glasgow, Scotland.

**OTHER**

Rye, T. **Nobody digs roads worsened by work**: Newspaper article in the Scotsman.

Saleh, W. (2017): **Electrical cars: An option for the Gulf States?**

Downey, L; Saleh, W; Karbeche, M; Muley, D (2017): **ITS related pedestrian crossing features at signalised intersections**.

Saleh, W. (2017): **Evaluating the effects of various incentives on motorcyclists' adoption of an idle-stop system in Taiwan**.

Since it was established in 1996, the Transport Research Institute (TRI) at Edinburgh Napier University has delivered high quality transport research, consultancy and knowledge transfer projects to a range of clients and funding bodies.

Edinburgh Napier continues to encourage and support active travel and public transport following commitments publicly embedded within the University wide Environmental Sustainability Policy. Almost £200,000 of external funding has been provided by organisations such as Cycling Scotland and Sustrans to support initiatives including segregated path development and the employment of a Campus Cycling Officer. Networking opportunities are strengthened through bodies such as the Environmental Association for Universities and Colleges.  
[www.bit.ly/ENU-Transport](http://www.bit.ly/ENU-Transport)

*Informing decisions.  
Shaping policy.*

## ADVISORY BOARD

We'd like to thank our dedicated Advisory Board members for their continued support throughout the year. Our Advisory Board comprises: Prof George Hazel (Chair), Prof Richard Allsop (Emeritus Professor of Transport Studies at UCL), Alex Macaulay (Partnership Director of SEStran), Dr Kit Mitchell (Emeritus member of TRB and member of CIHT), Martin Richards (Executive Chairman of MVA until his retirement), John Martin (Transport Consultant), Neil Paulley (Visiting Professor at the University of Surrey, retired), Prof Keith Dickinson (Higher Education Consultant & Academic Adviser), Dr Steve Cassidy (Managing Director, Viaqqio Ltd, part of the ESP Group), Neil Johnstone (SYSTRA), Kirsty Lewin (Sustrans UK Board Member), and Laurence Kenney (ChargePlace Scotland Programme Manager at Transport Scotland).

[blogs.napier.ac.uk/tri](https://blogs.napier.ac.uk/tri)  
[@EdNapierTRI](https://twitter.com/EdNapierTRI)

*If you would like further information on any of the projects or details contained in this Annual Report, please contact Yvonne Lawrie at the address below:*

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