

# Annual Research Report 2011

## INTRODUCTION

*Dr Richard Batley, Director of Research and Innovation*

The past year has seen a number of changes in the leadership and organisation of research at ITS. Dr Richard Batley was appointed Director of Research & Innovation, following completion of Dr Susan Grant-Muller's term of office, and Dr Simon Shepherd was appointed to the new position of Projects Director, with responsibility for leading major research projects and initiatives. There has also been a re-refresh of the Institute's research groups (and research group leaders); the four groups are now Economics & Discrete Choice (led by Dr Stephane Hess), Safety & Technology (Dr Natasha Merat), Sustainable Transport Policy (Frances Hodgson), and Spatial Modelling & Dynamics (Dr Richard Connors).

As is the norm at ITS, research activities have, throughout 2011-12, covered a hugely diverse set of topics, and engaged with a vast array of sponsors and stakeholders covering the breath of the academic, policy and industrial communities. Among the highlights have been:

- ITS' hosting of the 2nd International Choice Modelling Conference, drawing delegates from across the globe, and the leading academics and practitioners in the field of discrete choice analysis.
- The award of the €14.5m 'Ecodriver project' - over the next four years, ITS will lead a European consortium in developing innovative new technologies to help motorists to significantly reduce their fuel consumption.
- ITS leading a major new 3 year research council UK project - 'Disruption', which will study how people adapt when faced with disruptions to their daily routines.
- A new research project funded by the European Investment Bank which will extend ITS' pioneering work on the meta-analysis of values of time, to include evidence from across mainland Europe.
- The 'Freight Route Choice' project, commissioned by the UK Department for Transport, exploiting new opportunities for applying GPS data to examine the movement of around 600 road freight vehicles.

## RESEARCH FACILITIES

The University of Leeds Driving Simulator (UoLDS) is the UK's most sophisticated research facility of its type. It provides a safe and controlled environment to support research in driver behaviour and transport safety. Fully flexible hardware and software can fashion a multitude of highly realistic, virtual scenarios in a range of driving environments. The driving simulator offers the scope to undertake a wide variety of research, including much that would not be safe, ethical or cost effective to do on real roads. It is supported and operated by an expert team, who can tailor virtual scenarios and experimental data collection to the exact requirements of a particular investigation. It has been a key research tool for a number of studies in 2011, such as the safety implications of automated driving, and the effects of polyphenols on driving performance. For more information please visit the UoLDS website: [www.its.leeds.ac.uk/facilities/uolds](http://www.its.leeds.ac.uk/facilities/uolds) or contact Dr Hamish Jamson the Facility Manager: [A.H.Jamson@its.leeds.ac.uk](mailto:A.H.Jamson@its.leeds.ac.uk)

## STAFF CHANGES

**Peter Bonsall** retired from ITS in 2011, after 37 years' service; he remains involved with ITS as a Visiting Honorary Emeritus Professor. **Tom Worsley** joined ITS, following his retirement from the UK Department for Transport, on a part-time basis as a Visiting Fellow in Transport Policy. New support staff included **Jennifer Cleaver**, Resources Co-ordinator and PA to the Directors; **Keith Harrison**, PhD Student Co-ordinator; and **Susan Illingworth**, Project Administrator for ecoDriver.

## ACADEMIC VISITORS

During 2011 ITS welcomed **Professor Giulio Cantarella** of the University of Salerno, Italy, hosted by Professor D Watling; **Dr Qun Chen** of South Central University, China, hosted by Dr H Chen; Professor **Ann Forsyth** of Cornell University, USA, hosted by Dr M Tight; **Professor Martin Hazelton** of Massey University, New Zealand, hosted by Professor D Watling and **Dr Edoardo Marucci** of University of Roma Tre, Italy, hosted by Dr S Hess. Shorter incoming visits to ITS included: **Dr Maria Borjesson** and **Professor Jonas Eliasson** of the Royal Institute for Technology (KTH), Sweden, hosted by Professor P Mackie; **Professor Edward Chung** of Queensland University of Technology, Australia, hosted by Dr R Liu; **Professor Fumitoshi Mizutani** of the University of Kobe, Japan, hosted by Dr A Smith. Four further visitors were welcomed from Japan, all hosted by Professor D Watling: **Dr Miho Asano** of the University of Nagoya, **Dr Takamasa Iryo** of the University of Kobe, **Dr Shoichiro Nakayama** of the University of Kanazawa and **Dr Jan-Dirk Schmoecker** of the University of Kyoto.

## POSTGRADUATE RESEARCH VISITORS AND RESEARCH INTERNS

**Megersa Abate**, Technical University of Denmark (Dr A Fowkes and Professor J De Jong supervised); **Julián Arellana**, Universidad del Norte, Colombia (Dr S Hess supervised); **Susan Córdoba**, on secondment from Yorkshire Forward (Dr G



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Marsden hosted); **Daniel Gillett**, EPSRC Research Intern, (Dr Y Barnard supervised); **Tatjana Ibraimovic**, Universita della Svizzera Italiana, Switzerland (Dr S Hess supervised); **Vikki Gibson**, Queen's University Belfast, UK (Dr S Hess supervised), **Marie Ripoche**, Research Intern, Ecole Nationale des Travaux Publics de l'Etat, France, (Dr Y Barnard supervised); **Amanda Stathopoulos**, École Polytechnique Fédérale de Lausanne, Switzerland (Dr S Hess supervised).

### PhDs AWARDED

Four PhDs were awarded since last year's TEC report: **Ofelia Betancor** 'Pricing externalities in air transport markets: a case study of Madrid Barajas Airport.'; **Hamish Jamson** 'The effects of varying characteristics of Driving Simulator design on their validity as research tools.'; **John Nellthorp** 'Transport investment, pricing and use of resources.'; **Janos Gyarmati-Szabo** 'Statistical extreme value modelling to study roadside air pollution episodes.'

### RESEARCH STUDENTS

**Afzal Ahmed** 'A Real Time Traffic Prediction Model for Freeway Networks from Heterogeneous Data'; **Segun Aluko** 'Comparative Evaluation of Bus Transit and Rail Transit for Public Transit within Southwest Nigeria'; **John Armstrong** 'Analysis of Transport Network Vulnerability under Static and Dynamic Assignment'; **Erica Ballantyne** 'How is urban freight logistics affected by transport demand management measures and policies?'; **Zahara Batool** 'Aberrant driving behaviour and attitudes towards road safety in Pakistan'; **Anzir Boodoo** 'Walking as an integral part of sustainable transport policy'; **John Buckell** 'The Location and Magnitude of Inefficiency in the National Health Service'; **Chris Carribine** 'Analysis of Potentials for Capacity Maximisation and Environmental Impact Reduction in Aviation Networks through Standardised Operations'; **Kaushali Dave** 'Preference elicitation and preference uncertainty: An application to noise valuation'; **Joel Dodsworth** 'Development of Network-wide Traffic Signal Control Algorithms to Achieve Stable Network Conditions for Oversaturated Traffic Conditions'; **Jeffrey Dumont** 'Understanding Heterogeneity in Decision Processes across Individual Agents and Choice Contexts'; **Rawia El Rashidy** 'Use of Digital Data and ICT Systems to Improve Resilience of Transport Systems to Future Climate Extremes'; **Fahmi Fahmi** 'Integrating Disaster Mitigation Strategies in an Integrated Land Use and Transport Plan for Urban Transport Sustainability'; **James Fox** 'Temporal Transferability of Mode-Destination Models'; **Qian Fu** 'Modelling Commuters' Travel Behaviour of Route Choices on the London Underground'; **John Haith** 'Understanding capacity use and performance and implications for the pricing of congested rail networks'; **Stephen Hanley** 'Benchmarking Emerging Vehicle Fleet Technologies'; **Probo Hardini** 'Developing a Model of Land Use Characteristics and its Impact to the Road Service'; **Nick Herbert** 'Hearing Loss and Its Effect on Driving Performance'; **Daryl Hibberd** 'In-vehicle Systems - Developing a multiple warnings strategy'; **Nurul Hidayati** 'Modelling the effects of the physical facilities 'school safety zones' on passenger car equivalent values on urban roads'; **Jie Huang** 'Formulation and Solution of Network Design Problems Relating to the Achievement of Sustainability in Transport Networks'; **Calvin Jephcote** 'Spatio-Temporal Correlative Analysis of the Health Effects of Urban Air Pollutants from Traffic'; **Fatimah Kamal** 'What do single transport authorities change in developing countries?'; **Christopher Kelsey** 'Green Logistics: Optimal Freight Networks for Future Transport Conditions'; **Andrew Koh** 'Particle swarm optimisation for transport planning'; **Ben Kolosz** 'Assessing the Sustainable Performance of Inter-Urban Intelligent Transport'; **Georgios Kountouriotis** 'Vision, attention and steering'; **Andyka Kusuma** 'Traffic Performance and Capacity Analysing of the Coordinated Traffic Signal Roundabout'; **Christopher Leahy** 'Understanding Passengers' Behavioural Responses to Public Transport Network Reliability'; **Chao Lu** 'Autonomisation of Traffic Incident Management'; **Tony Magee** 'Modelling passenger demand for Rail Services'; **Mojtaba Moharrer** 'The mutual influence of overconfidence and driving skill on each other'; **Helen Muir** 'Pedestrian Casualties and Deprivation: the Contribution of Exposure, Behaviour and Attitude'; **Said Munir** 'An investigation into new trends in air pollutant concentration (particularly ozone and nitrogen oxides)'; **James Musgrave** 'An Evaluation of the Transtheoretical Model of Change Behaviour to increase the short term usage of public transport to venue-based music events by young adults'; **Munajat Nugroho** 'A Model of CO<sub>2</sub> Emissions and Freight Transport Chain Choice for Indonesia'; **Steven O'Hare** 'The Importance of Transport'; **Stephen Parkes** 'Electric Vehicle Trials'; **Ian Philips** 'The future role of walking and cycling in a world of health inequality and resource scarcity - understanding and modelling the impact on travel, lifestyle and policy'; **Rahman Pilvar** 'Development of a modelling framework for optimising the interaction between planned street works and the performance of transport networks'; **Shafiq Rahman** 'Improved public bus transport in Dhaka City'; **Martin Rivas** 'The Dynamics of Access: a study of social inclusion, job opportunities, travel mobilities and developing the Gateshead Metro Centre'; **Padma Seetharaman** 'Departure Time and Route Choice Modelling in a Congested Road Network for Enhanced Public Transport System Performance'; **Doh Shin** 'Explanation of factors influencing cyclists' route choice using actual route data'; **Janos Szabo** 'Statistical extreme value modelling to study roadside air pollution episodes'; **Yvonne Taylor** 'The Involvement of Sleep Deprivation or Disorders as Causation Factors in Road Deaths Amongst Serving Police Officers in the UK and How to Educate Drivers in the Dangers of Impaired Driving and Driving While Tired'; **Evona Teh** 'Development of a workload estimator'; **Andrew Tomlinson** 'Inferring personal movement patterns using locational data captured from mobile devices for transportation data collection'; **Phillip Wheat** 'Application (and development of) cost modelling and efficiency methods to transport problems'; **Zhitao Xiong** 'Development of UoLDS with Intelligent Traffic Environment'; **Noor Yahaya** 'Temporal and spatial variations of ultra-fine

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particles in the urban environment'; **Sheriff Yakubu** 'The Impact of the Petroleum Industry on Investments in Transport Infrastructure in Ghana: An Empirical Analysis of Transport Demand in Ghana'.

### RESEARCH PROJECTS commenced in 2011

#### **ACTUM (Analysis of activity-based travel chains and sustainable mobility)**

Grant holder: S Hess

Investigators: S Hess, A Daly, R Batley, D Watling

Funded by: Danish Strategic Research Council

Dates: Jan 2011 - Dec 2015

Research Group: Economics and Discrete Choice

Coordinating partner: Danish Technical University

**Abstract:** The objective of this research project is to develop a new decision support methodology for transport policy evaluation. The project will focus on thoroughly analysing, understanding and representing Danish activity patterns and social relations that determine travel. This information will be used in the design of an instrument able to evaluate sustainable transport policies that need a balance between guaranteeing mobility and reducing transport externalities (e.g., CO<sub>2</sub> emissions).

The proposed methodology will be based on a novel disaggregate person- and household-based activity-based framework. The framework will be grounded on the comprehension of the motives for personal activity participation, the process of activity scheduling, and the integration of disaggregate decisions at the mode and the route choice level. Moreover, the framework will explore new techniques for the efficient collection of data about activity (and hence travel) patterns through the use of individual GPS data loggers and in-depth interviews. The project will provide a better understanding and prediction of how restrictions within daily activity patterns influence the travel pattern. It is also an ambition to identify how changes in the transport system may influence the activity pattern, for example how improved accessibility may generate positive effects in terms of labour market changes and working hours. Such effects are overlooked in the existing decision support methodologies in Denmark.

#### **Advanced Traffic Flow - Theory and Control**

Grant holder: D Ngoduy

Investigator: D Ngoduy

Funded by: Engineering and Physical Sciences Research Council

Dates: Sep 2011 - Sep 2016

Research Group: Spatial Modelling and Dynamics

**Abstract:** Active Traffic Management (ATM) is a scheme for improving traffic flow and reducing congestion on motorways. It makes use of automatic systems and human intervention to manage traffic flow and ensure the safety of road users. Information and communication technologies (ICT) are now in the early stages of transforming transportation systems by integrating sensors, control units (traffic signals, message signs) and automatic technologies with microchips to enable them to communicate with each other through wireless technologies. In Japan and South Korea, the deployment of ICT in ATM programs has led to significant improvement of traffic network performance. In the coming decade ICT will considerably progress worldwide so that intelligent equipped vehicles, in which the driving tasks are shifted from the driver to the vehicle will make up a significant share of the traffic flow. Networks containing a mixed composition of manual and equipped vehicles are defined as heterogeneous intelligent traffic systems. This project seeks solutions for an improved ATM program to monitor and control intelligent traffic networks. The complex issues in real-life data collected from multiple sources will be tackled using a new real-time model-based intelligent traffic control framework to predict the transitions between free-flow, congestion and stop-and-go jams, and to investigate the true causes of such congestion. A sequence of immediate control actions will be established in order to reduce congestion, travel time and air pollution.

#### **Buses and Economic Growth**

Grant holder: D Johnson

Investigators: D Johnson, P Mackie, A Jopson, J Laird

Funded by: Greener Journeys

Dates: Dec 2011 – May 2012

Research Group: Economics and Discrete Choice

**Abstract:** Buses are a fundamental aspect of the transport system. They facilitate access to all the aspects of society that keep the economy moving: employment, education, business meetings and retail. These are the indirect economic benefits of bus travel. A number of policy interventions are available to government (central and local) which would impact on the quality/price of public transport service and hence the level of accessibility for users. Many studies have been undertaken which have sought to measure the direct benefits of such policy interventions. This study takes this literature forward by focusing on the indirect economic benefits of bus travel. The value to the economy of getting people to work, getting them to business meetings, training our future generations, stimulating investment and providing the lubrication to trade that allows potential buyers to access retailers, and the second round benefits that flow from that.

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### **Bundesverkehrswegeplanung (BVWP) – Scientific Advice**

Grant holder: A Guehnemann

Investigator: A Guehnemann

Funded by: German Federal Ministry of Transport, Building and Urban Development

Dates: Oct 2011 – Sep 2013

Research Group: Sustainable Transport Policy

**Abstract:** The project is to provide scientific advice and research support for the development of an appraisal methodology for the German Federal Transport Infrastructure Plan to support their fulfilment of the research contract 'Grundsätzliche Überprüfung und Weiterentwicklung der Nutzen-Kosten-Analyse im Bewertungsverfahren der Bundesverkehrswegeplanung' for the German Ministry of Transport.

### **COMPASS (Optimised Co-Modal Transport for Reducing Carbon Emissions)**

Grant holder: B Matthews

Investigators: B Matthews, N Balijepalli, S Shepherd, S Hess, H Chen

Funded by: European Commission FP7

Dates: Nov 2011 – Nov 2013

Research Group: Economics and Discrete Choice

Coordinating partner: Transport Research Institute - Edinburgh Napier University

Collaborative partners: Istituto di Studi per l'Integrazione dei Sistemi, Mcrit SL, MKmetric Gesellschaft für Systemplanung mbH, TRT Trasporti e Territorio, TTS Italia, Technical University of Vienna, Uniwersytet Gdanski.

URL: [www.fp7-compass.eu](http://www.fp7-compass.eu)

**Abstract:** This project will address three principal topics; challenges arising from the key European socio-economic trends, challenges arising from environmental concerns, and challenges arising from technological change. The general objectives of COMPASS are 1) To provide an overall picture of future travellers' needs in the light of the key socio-economic trends, 2) To analyse how ICT and ITS applications can meet future travel and access demands, favouring the integration of multi-modal transport solutions and 3) To assess how these solutions can contribute to the de-carbonisation of transport activities. The key inputs of the Institute for Transport Studies will involve, firstly, investigating the potential of ICT and ITS applications to provide behavioural data and information to improve travel surveys and data collection and, secondly, analyzing the potential contribution of ICT solutions to European transport goals – including their contribution to the de-carbonisation of transport.

### **Surface Transport Costs**

Grant holder: J Shires

Investigators: J Shires, C Nash, A Smith

Funded by: The Community of European Railway and Infrastructure Companies (CER)

Dates: Oct 2011 – Jan 2012

Research Group: Economics and Discrete Choice

Collaborative partner: CE Delft

**Abstract:** The objective of this study was to provide an overview of all the main transfers between the government sector and the land transport sector, separately for road and rail, as well as the external costs of both modes for four selected European countries (UK, Germany, The Netherlands and Poland). Differences between countries and trends over time are identified and explained (if possible). Based on the results a comparison of the social costs of road and rail transport and revenues/expenditures from/to taxes, charges and subsidies for these modes are made. The results will feed into the policy making of the Community of European Railway and Infrastructure Companies (CER).

### **Disruption**

Grant holder: G Marsden

Investigators: G Marsden, J Shires, C Mullen

Funded by: Engineering and Physical Sciences Research Council

Dates: Jun 2011 – Aug 2014

Research Group: Sustainable Transport Policy

Collaborative partners: University of Aberdeen, University of Brighton, Glasgow University, University of Lancaster, Open University and the University of the West of England.

URL: [www.disruptionproject.net](http://www.disruptionproject.net)

**Abstract:** Disruption is a three year project funded under the Research Council UK's Energy Programme seeking to identify new ways to develop and implement lower carbon and more energy efficient travel. The project suggests that businesses and individuals are more adaptable to new situations than is typically assumed and that this could open new opportunities to change patterns of living such that they are less dependent on carbon intensive travel. The project will explore, through a series of practical studies, the extent to which travel practices that are assumed to be routine are frequently disrupted at scales ranging from the personal to the national.

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Analysis of disruptions presents a window of opportunity to study the maintenance, substitution, abandonment and protection of work, household or other activities and how these relate to or are shaped by travel. In turn these insights can help reveal the kinds of changes, to transport systems, social systems, individual lifestyles etc that are needed to inspire conversions to lower carbon travel.

### **ecoDriver**

Grant holder: S Jamson

Investigators: O Carsten, S Jamson, H Jamson, N Merat, J Tate, R Batley, J Nellthorp, F Lai, A Jopson

Funded by: European Commission

Dates: Oct 2011 – Sep 2015

Research Group: Safety and Technology

URL: [www.ecodriver-project.eu](http://www.ecodriver-project.eu)

**Abstract:** Environmentally friendly driving, or ecodriving, is becoming an increasingly important topic among the intelligent transport systems community because carbon emissions need to be curbed in the context of climate change mitigation policies. In general, drivers are not aware that certain behaviours elevate fuel consumption and result in unnecessary emissions. Ecodriving interventions try to modify such behaviour in order to maximise energy efficiency and improve traffic flows – without compromising safety. The ecoDriver project aims to achieve a 20% reduction of CO<sub>2</sub> emissions and fuel consumption in road transport by delivering effective ecodriving advice and feedback. This will be achieved by maximising the effectiveness and acceptance of ecodriving interfaces (using graphical interfaces, haptic feedback or auditory messages). Driving style, traffic conditions, powertrain type and vehicle type will be studied independently using a common methodology to test and compare the effectiveness of nomadic and built-in ecodriving systems. The field trials, using passenger cars, light and heavy commercial vehicles and buses will be carried out in seven European countries. The results from the field trials will be scaled-up and social cost-benefit analyses will be carried out to assess the economic feasibility of a potential market deployment of the ecoDriver system.

### **European-Wide Value of Time Meta-Analysis**

Grant holder: M Wardman

Investigators: M Wardman, P Chintakayala, G de Jong

Funded by: European Investment Bank

Dates: Aug 2011 – May 2012

Research Group: Economics and Discrete Choice

**Abstract:** Mark Wardman has over the past fifteen years undertaken a number of meta-analyses of values of time and also of price elasticities and time elasticities. These are amongst the largest such studies of their type and have influenced policy makers and practitioners. A feature however is that they were all based on UK evidence. In this new study the value of time meta-analysis has been extended across mainland Europe. Evidence is drawn from over 3100 values in nearly 400 studies and 26 European countries between 1960 and 2011. A wide range of travel attributes are covered. The study provides a number of useful insights into trends in methodology as well as differences across different countries. The meta-model, developed to explain how values vary over time and countries, yields a number of important insights, including how values of time vary with income, mode, purpose and distance, amongst other things. The meta-model's implied valuations are largely consistent with official value of time evidence in Western Europe but do challenge the values used in the emerging economies of Eastern Europe.

### **Federal Highways Agency Modelling**

Grant holder: S Hess

Investigators: S Hess, A Daly

Funded by: Federal Highway Administration, USA

Dates: Aug 2011 – Jul 2014

Collaborative partners: RSG, Mark Bradley

Research Group: Economics and Discrete Choice

**Abstract:** This project works on methods to improve long-distance passenger modelling in the U.S. The research will involve exploration of long-distance travel behaviour to establish a model structure and model components that are sensitive to policy variables and also representative of the population. The aim is to develop a long-distance passenger travel demand forecasting model framework for use in transport planning applications using microsimulation data and surveys.

### **FOT-Net 2**

Grant holder: Y Barnard

Investigators: Y Barnard, O Carsten, F Lai, S Jamson

Funded by: European Commission FP7

Dates: Jan 2011 – Dec 2013

Research Group: Safety and Technology



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**Abstract:** Field Operational Tests (FOTs) are large-scale testing programmes aimed at a comprehensive assessment of the efficiency, quality, robustness and acceptance of ICT solutions used for smarter, safer, cleaner and more comfortable transport solutions, such as navigation and traffic information, advanced driver assistance and cooperative systems. The current project is a sequel to the first FOT-Net project of 2008-2010. The prime goal of FOT-Net 2 is to increase the momentum achieved in FOT-Net 1. The project aims to gather European and international stakeholders in a strategic networking platform to present results of FOTs, to identify and discuss common working items and promote a unified approach for FOTs. The ITS role is particularly oriented at conducting seminars on FOT evaluation issues, and coordinating five groups working on extending the Field Operational Test support Action (FESTA) methodology.

### Global Positioning System (GPS)

Grant holder: S Hess

Investigators: S Hess, A Daly

Funded by: UK Department for Transport

Dates: Apr 2011 – Jan 2012

Research Group: Economics and Discrete Choice

**Abstract:** The efficient movement of freight around the road network is essential to the UK economy. Any policy or infrastructure decisions that have an impact on this movement should thus be based on a solid understanding of such movements, and especially the factors influencing the choice of a specific route. This project makes use of existing GPS data containing information on the movement of around 600 HGVs over a period of one month. The aim of the project is to first process this data into individual trips and, thus identifying the actual route chosen by a specific truck driver for a specific journey. Next, we construct a database of alternative routes that the driver could have used. The resulting dataset is then used in the estimation of choice models that explain the chosen route on the basis of attributes defining the various routes. This will allow us to understand the relative sensitivities to travel time, cost, type of road, and various other factors potentially influencing route choice.

### Guest Researcher Programme – extension

Grant holder: A Smith

Investigators: A Smith, P Wheat, C Nash

Funded by: Centre for Transport Studies, Royal Institute of Technology (KTH) and Swedish National Road and Transport Research Institute (VTI).

Dates: Apr 2011 – Mar 2013

Research Group: Economics and Discrete Choice

**Abstract:** This project is an extension of a previous two year visiting researcher arrangement. The research is focussing on three main areas. First, developing ITS and CTS research on estimating marginal (wear and tear) rail infrastructure costs, which is important information needed to set track access charges, given European legislation on enhancing competition and ensuring economically efficient and fair charges for access to the common infrastructure. In particular the research is seeking to better understand marginal renewal costs, through corner solution panel models and exploring dynamic approaches. Secondly, the research aims to quantify the impact of contracting out of rail maintenance activity in Sweden on costs and efficiency using stochastic frontier analysis techniques. Third, the research will explore how to better model heterogeneity between decision making units, including modelling the impact of climate variables and quality measures.

### Intelligent Speed Adaptation in New Zealand

Grant holder: S Jamson

Investigators: S Jamson, O Carsten

Funded by: MWH New Zealand Ltd

Dates: Aug 2011 – Jun 2012

Research Group: Safety and Technology

**Abstract:** A large body of overseas research has shown that Intelligent Speed Adaptation (ISA) systems are potentially effective in reducing speeds and the risk of crashes. However, much of this research is from jurisdictions with significant urban crash problems; in New Zealand, more high severity crashes occur in rural areas and loss of control on bends is a key crash type. This research evaluates the feasibility and effect of an ISA system in a New Zealand context, where speeds, particularly those at rural 'out of context' curves are a major cause of vehicle crashes. Focusing on advisory ISA systems (that do not exert any actual control over the vehicle), user acceptance and compliance were examined using focus groups and on-road trials. Staff at ITS provided background information on current research initiatives for ISA and provided a discussion piece on user perception of ISA and the impact of possible incentives. Building on research carried out in ITS, guidance with the planning and analysis of the focus groups in New Zealand was provided, along with input into the development of questionnaires and experimental design.

### Large Changes in Generalised Journey Time

Grant holder: M Wardman

Investigators: M Wardman, P Wheat

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Funded by: Association of Train Operating Companies (ATOC)

Dates: Aug 2011- May 2012

Research Group: Economics and Discrete Choice

**Abstract:** Generalised Journey Time (GJT) is a concept unique to the railway industry in Britain and has been used since the 1970s as a means to represent the overall timetable related quality of a train service. The primary objective of this research was to identify robustly whether GJT elasticities differ for large changes in GJT, and if so, to develop guidance in the Passenger Demand Forecasting Handbook (PDFH) to reflect this. The project also aimed to provide guidance on the best formulation of GJT and its long run elasticity. In addition to the most extensive review of rail timetable related elasticities ever undertaken, the research included a meta-analysis, an econometric analysis of a very large amount of ticket sales data and detailed case studies of events on 8 corridors. The study concluded that variations in the GJT elasticity by size or sign cannot be justified. However, it identified that, on non-London non-season ticket flows, somewhat more emphasis should be placed on interchange and that the long run recommended GJT elasticity should be increased. The study strongly supports two railway conventions that contrast with standard transport planning practice. Firstly, that the use of separate terms to GJT and fare is preferable to a composite generalised cost term. And secondly, that the railway industry practice of assigning a high penalty to having to interchange and a low penalty to connection time is preferable to the standard transport planning practice of a low interchange penalty and high premium weighting of connection time.

### Measures to Improve Personal Security

Grant holder: M Wardman

Investigators: R Batley, J Nellthorp, M Wardman, J Shires, D Johnson

Funded by: Rail Safety and Standards Board (RSSB)

Dates: Apr 2011 - May 2012

Research Group: Economics and Discrete Choice

**Abstract:** The project aims to provide a quantifiable assessment of two schemes for improving personal security. Secure Stations is a scheme for rewarding station operators, through accreditation by the British Transport Policy (BTP), for managing security and demonstrating to customers their desire to reduce crime. Following its launch in 1998, 1010 stations have received accreditation. Safer Parking is a similar scheme, accredited by the Association of Chief Police Officers (ACPO), intended to encourage car park providers to improve security and reduce criminal activity, the fear of crime and the perception of crime in car parks. This scheme was launched in an earlier guise in 1992, and has comprehensive national coverage. For this project RSSB's interest is restricted to car parks at railway stations. We aim to arrive at a valuation of the impact of the passenger security measures (e.g. CCTV, ticket gates, lighting etc) applied by various locations in order to achieve the BTP and ACPO accreditations. The data collected will indicate the effectiveness of these two schemes in improving personal security, compared to the costs incurred implementing those measures. We will develop a general framework for assessment of individual personal security measures, and identify valuation data that can be generalised in future assessments.

### Multi-Level Governance and Carbon Management

Grant holder: G Marsden

Investigators: G Marsden, C Mullen, C Kelly

Funded by: Environment and Social Research Council

Dates: May 2011 – Jun 2013

Research Group: Sustainable Transport Policy

Collaborative partners: University of Sheffield, University of Glasgow and Lund University.

URL: [www.its.leeds.ac.uk/transport-carbon](http://www.its.leeds.ac.uk/transport-carbon)

**Abstract:** The research examines whether and how governance structures make a difference to policy effectiveness (design and delivery) and accountability within the field of carbon emissions management and the transport sector. The research is theoretically-informed and considers the extent to which Multi-Level Governance and related tools can shed light on structures and processes that are not understood and which are crucial in the delivery chain. It is particularly appropriate due to the complex interplay of policies in carbon management for transport across six spatial levels and the many non-governmental public bodies and private sector delivery agencies involved in transport.

Around 50 interviews have now been conducted with key stakeholders nationally and within four local areas in England and Scotland. Further interviews are planned at a European scale. Workshops will be held in the 2012/13 to explore some key contentions which are emerging around the setting of carbon targets, network governance and the extent to which carbon management 'matters' and is embedded in accountability structures.

### ORIGAMI (Optimal Regulation and Infrastructure for Ground, Air and Maritime Interfaces)

Grant holder: S Shepherd

Investigators: S Shepherd, S Hess, J Shires, P Bonsall

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Funded by: European Commission

Dates: Feb 2011 - Jan 2013

Research Group: Spatial Modelling and Dynamics

Coordinating partner: Transport Research Institute (TRI), Edinburgh Napier University

Collaborative partners: Mcrit SL, MKmetric, Istituto di Studi per l'Integrazione dei Sistemi, Technical University of Vienna, Uniwersytet Gdanski.

URL: [www.origami-project.eu](http://www.origami-project.eu)

**Abstract:** Effective solutions to existing problems in long-distance door-to-door passenger transport chains require the provision of attractive integrated networks and services. This is likely to require vision and co-operation between stakeholders in the public and private sectors. ORIGAMI will build on the substantial body of knowledge on long-distance passenger transport already available from past and current projects (in particular KITE, LINK, INTERCONNECT, HERMES and CLOSER) by collecting a substantial body of new data on the attitudes of long-distance travellers to alternative future transport supplies and by collating examples of best practise and of new, yet untried, technical solutions. One strand of work will then analyse the technical solutions, investigate the extent to which solutions found in one mode can be transferred to other modes, identify barriers to be overcome, and discuss the findings with stakeholders. Another strand of work led by ITS will investigate traveller behaviour and attitudes in different countries and regions in order to identify the factors, demographics and traveller requirements which are likely to influence future trends in travel behaviour. Scenarios will be developed to investigate alternative futures and pathways towards a successful intermodal transport system and a range of modelling approaches will be used to forecast the demand for different modal combinations in the different scenarios. Solutions will be evaluated against relevant criteria for European transport policy. Recommendations will be made and disseminated amongst policy makers and other stakeholders including industry representatives and researchers.

### Regional Econometric Benchmarking of Network Rail

Grant holder: A Smith

Investigators: A Smith, P Wheat

Funded by: Office of the Rail Regulator

Dates: Sep 2011 – Apr 2012

Research Group: Economics and Discrete Choice

**Abstract:** This is an extension of previous work done for the Office of Rail Regulation which was used as part of the 2008 periodic regulatory review to inform the determination of efficiency targets and funding for Network Rail, Britain's rail infrastructure provider. The work has used innovative techniques to separate external (company-wide) from internal (regional) inefficiency by utilising a dataset comprising several railways and for each railway, several regions within the country (see Smith and Wheat, 2012, Journal of Productivity Analysis). The work extended the model utilised in previous work in several ways, including permitting heteroscedasticity in the noise and inefficiency components, and seeking to separate persistent inefficiency from unobserved heterogeneity by utilising the Mundlak transformation. The research is being used alongside other methods to make judgements about future efficiency targets and funding for Network Rail at the 2013, Periodic regulatory review.

### Revenue Management Review

Grant holder: J Toner

Investigator: J Toner

Funded by: First Group plc

Dates: May 2011 - Jun 2012

Research Group: Economics and Discrete Choice

**Abstract:** First Group sought to understand further the range of techniques available for Revenue Management (RM), including both forecasting and optimisation. The review of the principles and practice of price discrimination (PD) and yield management (YM), in transport and other sectors, enabled First Group to establish the potential applicability to First's various businesses.

### Step Change in Sustainable Urban Transport

Grant holder: M Tight

Investigators: D Watling, P Timms, C Mullen, D Milne

Funded by: Engineering and Physical Sciences Research Council

Dates: Feb 2011 - Sep 2012

Research Group: Sustainable Transport Policy

**Abstract:** There is an accepted need to promote step changes towards more sustainable urban environments. While many model-based desk-studies have aimed to simulate such environments as part of a decision support tool, they adopt many unvalidated, hypothetical assumptions, particularly in the way that major transport focused interventions might impact on both behaviour and the effectiveness of the infrastructure. There is very little real evidence of what works and what can be used to promote such changes, deriving from the physical nature and make-up of urban environments and in the way that



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people choose to act and behave. The research aims to fill this evidence gap, providing an empirically grounded frame for the modelling of transformational futures. We have begun undertaking the first largely qualitative longitudinal panel study of households which focuses on their transport activity. This work is being complemented by the study of historical information over longer periods of time, making use of available information from a variety of transport and non-transport databases. In parallel, the use of alternative metaphors is being explored as the basis for developing new modelling paradigms that are able to exploit the evidence-base being compiled. Finally, we are exploring the use of alternative planning procedures in which to embed such approaches.

### **SUNSET (Sustainable Social Networking Services for Transport)**

Grant holder: S Grant-Muller

Investigators: S Grant-Muller, F Hodgson, N Thomopoulos

Funded by: European Commission

Dates: Feb 2011 - Jan 2014

Research Group: Sustainable Transport Policy

Coordinating partner: Stichting Novay (NL)

Collaborative partners; University of Leeds (UK), DOCOMO, Communications Laboratories Europe GmbH (DE), Queen Mary and Westfield, College, University of London (UK), , Eco2Win AB (SE), LocatieNet (NL), Universiteit Twente (NL), Gemeente Enschede (NL), Viktoria Institute (SE).

URL: [www.sunset-project.eu](http://www.sunset-project.eu)

**Abstract:** Continued growth in personal mobility has consequences in terms of safety, economic efficiency and the environment. SUNSET aims to address these issues by taking a new approach to urban mobility management using the latest ICT technologies. This is based on a user-centred mobility paradigm involving cooperation by information sharing and provision of positive incentives between travellers, road authorities and other parties. The information is targeted on individual travel behaviour, and thus allows road authorities to fine-tune their transport policies and allows individuals to meet their personal objectives. The personalized approach can also help to alleviate other societal problems such as social safety, social exclusion and even personal health. ITS is leading the evaluation methodology for the success and impacts of the concept (Susan Grant-Muller) and the development of incentives to be implemented in a Leeds Living Lab (Frances Hodgson). In the first year of research the project has developed prototype software for evaluation in the first living lab in Enschede (Netherlands).

### **Surveying Vehicle Emissions across West Yorkshire**

Grant holder: J Tate

Investigator: J Tate

Funded by: DEFRA Air Quality grant scheme

Dates: Jun 2011 – May 2012

Research Group: Safety and Technology

**Abstract:** ITS has been measuring the tail-pipe emissions of road vehicles at drive-through monitoring sites in Bradford, Kirklees, Leeds and York. The measurements, when combined with detailed Vehicle Registration Information allow the on-road vehicle fleet emissions to be characterised, broken down by vehicle type (car, van, light and heavy commercial vehicles, bus), age, fuel type, emission standard (e.g. Euro 0 - 5). This combination of RSD emission measurements and vehicle registration information provides a rare opportunity to: 1) study the composition of the vehicle fleet being driven on the road in detail; 2) study the emission characteristics of each vehicle fuel type and Euro standard on the road. With an improved evidence base and understanding of the proportion of vehicle miles driven by different vehicle type sub-categories (fuel type and Euro standard) and characterisation of on-road vehicle emissions in Air Quality Management Areas, the Local Authorities will be able to: a) design targeted and more effective management strategies; b) better specify vehicle fleet proportions in emission models; and c) calibrate emission models.

### **SUSTRAIL (The sustainable freight railway: Designing the freight vehicle – track system for higher delivered tonnage with improved availability at reduced cost)**

Grant holder: P Wheat

Investigators: J Nellthorp, D Johnson, A Whiteing, A Smith

Funded by: European Commission

Dates: Jun 2011 - May 2015

Research Group: Economics and Discrete Choice

Coordinating Partner: TRAIN (Ital) and Network Rail (GB)

Collaborative partners: 29 academic and industry partners across the EU.

URL: [www.sustrail.eu](http://www.sustrail.eu)

**Abstract:** EU freight transport is expected to grow by some 50 % in tonne-kilometres by 2020. In many areas rail has been displaced from a dominant position by road transport services. The latter have grown and developed in capability and levels of sophistication that have not been matched by rail service providers. SUSTRAIL aims to contribute to the rail freight system to allow it to regain position and market, and the proposed solution is based on a combined improvement in

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both freight vehicles and track components. ITS is leading the development of the business case within SUSTRAIL, in collaboration with university and rail industry partners from 13 countries. ITS is also leading specialist work on infrastructure capacity benefits: Faster rail freight services running closer to line speed can free up paths for passenger and freight traffic. ITS is also leading the task of examining cost-reflective charges, which can play a key role in minimising whole system cost by aligning operator incentives with the track damage costs caused by a particular vehicle type.

### The Forge

Grant holder: G Marsden

Investigators: G Marsden, P Timms, D Milne

Funded by: ESRC

Dates: May 2011 – Oct 2013

Research Group: Sustainable Transport Policy

**Abstract:** The Forge social science researcher network for transport and travel aims to link social scientists from a range of backgrounds undertaking research on or relevant to transport, travel and mobility. The project will achieve these aims through two main routes: 1) Running three Summer Schools in 2011-2013 with subsidised attendance for 40 research students and early career researchers. 2) Establishing a network of research students and early career researchers which will promote knowledge sharing, interaction, publication development and career growth. The Summer Schools will act as a key focal point for the activities of the network. The network will be managed through a website where researchers can set up profiles and find researchers with common interests. Participants will also be able to apply for small quantities of funding to pay for travel and workshop costs for meetings on specific topics which will be open to network members. Summer School 2011 was on the theme of Crises with that in 2012 focussed on “Time, Travel and Every Day Life”. Details of how to join the network and how to apply for the Summer School are available at [www.its.leeds.ac.uk/theforge](http://www.its.leeds.ac.uk/theforge)

### Train Control (Challenging Established Rules for Train Control through a Fault Tolerance Approach)

Grant holder: R Liu

Investigators: R Liu, A Koh, M Carey, A Whiteing

Funded by: Engineering and Physical Sciences Research Council /Rail Safety and Standards Board

Dates: Mar 2011 – Sep 2013

Research Group: Spatial Modelling and Dynamics

Collaborative partner: Engineering 2050 Research Centre at the University of Salford

**Abstract:** The project is one of six grants awarded from the EPSRC Strategic Partnership with railway industry, all concerned with ‘overcoming the constraints caused by stations and junctions on the railway network’. The aim of this project is to develop a new integrated approach for train control and rail network design to enable a more optimised use of capacities at stations and junctions through the use of an approach based on fault tolerance, rather than on the conventional safety rules. The operation of rail networks is safe-guarded through the use of train control and protection systems which follow strict and often over conservative rules. However, the use of such rules e.g. conservative speed profiles on approaching signal blocks has a knock-on effect on other trains and can cause a network to operate at considerably less than its full achievable capacity. This project will develop a fault tolerant approach to the design and operation of the rail network by integrating track design with dynamic routing and scheduling. The project uses novel evolutionary computational approaches particularly suited for combining multi objective optimisation with risk management.

### Transport Policy Making

Grant holder: P Mackie

Investigators: P Mackie and T Worsley

Funded by: Rees Jeffrey Road Fund

Dates: Oct 2011 – Mar 2013

Research Group: Sustainable Transport Policy

**Abstract:** Recent history has been notable for the profusion of transport policy documents. A number of academic books have been written which adopt the working hypothesis that these documents are an expression of implementable policy and comment, usually with disappointment, on the failure to deliver of the last fifteen years. The proposition underlying this project is that policy statements are rarely more than aspirational in nature and pay inadequate attention to financial, deliverability and public acceptability constraints. This is not to belittle the worth of writing down from time to time what the aspirations are. But the real content of transport policy is best deconstructed from the decisions which Government takes faced with a range of engineering, economic and planning advice mixed with advocacy from lobby groups, the pressure of public opinion and political considerations and in the face of budget, deliverability and other constraints. Our thesis is that transport decisions are the outcome of three overlapping spheres of influence or ‘world views’—technocratic, public/social and political. The way in which these are blended together in the crucible which produces the decision is something we seek to study. So too is the role of the project champion. Who is it who really believes in the project and is able to make it happen? We shall see that projects and policies lacking powerful champions are at a clear disadvantage.

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To illustrate this, we have chosen eight case studies of transport policy in action and give an accurate description as it relates to the political economy. Lessons are brought together in a closing synthesis in which we consider the implications for future transport policy and policy-making.

### **TRANS-TOOLS 3 (Tools for transport forecasting and scenario testing) (TT3)**

Grant holder: S Hess

Investigators: S Hess, A Daly, A Fowkes, D Johnson, H Chen, A Whiteing, G de Jong

Funded by: European Commission

Dates: Mar 2011 – Feb 2014

Coordinating partner: Danmarks Tekniske Universitet

Collaborating partners: Kungliga Tekniska Hogskolan, Stockholm; Rapidis APS, Denmark; Tetratplan AS, Denmark;

University of Oxford, UK; National Technical University of Athens; John Bates; Statens Vag Och

Transportforskningsinstitut, Sweden; Nestear Sarl, France; Eldgenossische Technische Hochschule, Zurich; Univerzitet u Beogradu, Serbia; Fomterv Mernoki Tervezo ZRT, Budapest; Austriatech GMBH, Vienna.

Research Group: Economics and Discrete Choice

**Abstract:** The purpose of this project is to upgrade and further develop the current TRANSTOOLS model (TT2) to a new and improved European transport demand and network model. The TT3 will deliver a validated and user friendly model providing policy makers with a tool for assessing and developing better transport policies.

### **Travel to the GP**

Grant holder: C Kelly

Investigator: C Kelly

Funded by: Bradford and Airedale PCT

Dates: Oct 2011 – May 2012

Research Group: Sustainable Transport Policy

Coordinating partner: LIHS, University of Leeds

Collaborative partner: D Pearson

**Abstract:** This project is calculating and comparing the carbon footprint of patient journeys to and from a GP practice in West Leeds (following a travel survey implemented at the practice) using three methods including GIS mapping. It is then exploring, through focus groups with patients and clinicians, methods for identifying and reducing avoidable trips.

### **University of Leeds Travel Survey**

Grant holder: J Shires

Investigator: A Whiteing

Funded by: University of Leeds

Dates: Apr 2010 – Jun 2010

Research Group: Economics and Discrete Choice

**Abstract:** This annual travel survey collects data on travel behaviour from UoL staff and students to assist with the University's travel planning and to enable the calculation of Scope 3 travel emissions in accordance with new local authority environmental planning controls. This involved looking at both commuting and business travel for staff and travel between term time residences and the university sites for students.

## RESEARCH PROJECTS completed in 2011

### **CityMobil**

Grant holder: H Jamson

Investigators: C Kelly, S Shepherd, G Marsden, A Gühnemann, N Merat

Funded by: European Commission FP6

Dates: May 2006 – Dec 2011

Research Group: Safety and Technology

URL: [www.citymobil-project.eu](http://www.citymobil-project.eu)

**Abstract:** CityMobil is a major European research, development and demonstration project addressing automated transport systems in urban environments. The focus is on the real-life implementation and assessment of the benefits at three sites: the Personal Rapid Transport system at Heathrow's Terminal 5; the Cybernetic Transport System at Rome's new Fiera Exhibition Centre; and the Hybrid Transport System (guided bus/tramway system) in the city of Castellón. Delays in the construction of the three schemes resulted in an extension of CityMobil until December 2011, however project work undertaken by ITS was already complete. ITS' role in the project involved the construction of strategic (MARS) and microsimulation (DRACULA) models to assess the future impacts of new technologies in four European cities; the development and application of a framework to evaluate automated transport systems; co-ordination of links between CityMobil and the Heathrow T5 PRT; and use of the University of Leeds Driving Simulator to assess the human factors issues associated with transfer of control between manual and fully-automated driving. A key output of ITS' work was the

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City Application Manual, aimed at policy makers. It provides guidance as to how individual cities may make optimum use of the tools developed in the project, and the approach which cities might adopt in deciding whether or how to adopt emerging transport technologies.

### **GHG-TransPoRD (Reducing greenhouse-gas emissions of transport beyond 2020: linking R&D, transport policies and reduction targets)**

Grant holder: S Shepherd.

Investigators: P Timms, A Günemann, M Tight, A Jopson, N Balijepalli

Funded by: European Commission

Dates: Oct 2009 – Dec 2011

Research Group: Spatial Modelling and Dynamics

Coordinating partner: Fraunhofer-ISI

Collaborative partners: TRT, JRC, TML

URL: [www.ghg-transpord.eu](http://www.ghg-transpord.eu)

**Abstract:** The main objective of GhG-TransPoRD project is to support the EU in defining a feasible research and policy strategy for greenhouse gas (GHG) reductions of transport. The project aim was to contribute to the development of a research strategy for the EU to reduce the GHG emissions of the different transport modes (road, rail, air and shipping) linking this research strategy with the available policy measures. The project began with an analysis of patents and assessment of R&D efforts in the transport sector along-side a review of potential GHG reductions to be had from technology and policy interventions until 2020 and 2050. These were presented at workshops in Paris and Brussels. Since then we have estimated CO<sub>2</sub> abatement cost curves which will inform policy and technology packaging. The packages were modelled and results presented to stakeholders at a final conference in Brussels (December 2011). The results demonstrated the need for both technology and policy if the EU is to meet its GHG reduction targets, in particular for the urban case they also showed that urban policies contribute little without an associated behavioural change towards more active modes of transport.

### **INTERCONNECT (Interconnection Between short and long distance Transport Networks)**

Grant holder: P Bonsall

Investigators: P Bonsall, B Matthews, J Shires, D Johnson, R Batley, S Hess, A Whiteing

Funded by: European Commission

Dates: Jun 2009 - May 2011

Coordinating partner: Transport Research Institute – Edinburgh Napier University

Collaborative partners: MKMetric (Germany), MCrit (Spain), TRT (Italy), Tetraplan (Denmark), University of Gdansk (Poland).

Research Group: Spatial Modelling and Dynamics

URL: [www.interconnect-project.eu](http://www.interconnect-project.eu)

**Abstract:** This project addressed the potential for greater efficiency and reduced environmental impact of passenger transport by judicious encouragement of integration, co-operation and, where appropriate, competition in the provision of local connections to long distance travel. The project focused on journeys which might benefit from more effective interconnection between different modes and services, and on those situations where effective interconnection is currently hampered by institutional barriers, lack of investment, or failure to innovate. The study outputs are available via the project website, and include case studies analysing local connections to long distance transport encompassing a range of modes and European contexts, and a 'toolkit' of interventions which show particular promise. One of the case studies focused on the potential impact of enhanced local connectivity to and between airports in central Scotland, and included collection of new data on revealed and stated preferences. INTERCONNECT was successfully completed and has resulted in growing interest in this area of research and, consequently, a series of follow-on projects, including ORIGAMI and COMPASS.

### **ITERATE (IT for Error Remediation And Trapping Emergencies)**

Grant holder: O Carsten

Investigators: O Carsten, F Lai, Y Barnard, N Merat, H Jamson, A Horrobin, M Daly

Funded by: European Commission

Dates: Jan 2009 - Dec 2011

Research Group: Safety and Technology

**Abstract:** The ITERATE project developed and validated a unified model of driver behaviour applicable to all surface transport modes including cars, trains, and ships. The model included five factors; culture, personality, experience, operator state, and task demand, for capturing the interaction between the operator and on-board support systems. Behavioural data were collected by a range of apparatus including high-fidelity driving simulators in the UK and Sweden, train simulators in Sweden and France, and bridge simulator in Sweden. Two identical portable simulators equipped with interchangeable control interfaces for car and train driving were also built for experiments across five countries; UK, Sweden, France, Italy and Israel. The experiment results suggested that model factors are mostly shown to be relevant.

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Operators in different cultures are not alike and personality does not account for between-operator differences. The project results are applicable to improving the design and safety assessment of innovative technologies. This provides a useful tool for system manufacturers as well as authorities to assess Intelligent Transport Systems.

### **Lancashire ISA**

Grant holder: O Carsten

Investigators: O Carsten, F Lai, S Jamson

Funded by: Department for Transport

Dates: Apr 2009 – May 2011

Research Group: Safety and Technology

**Abstract:** The primary objective of this project was to deploy advisory ISA for Lancashire drivers based on a cost effective platform. The ISA system consisted of an off-the-shelf satellite navigation system with the added functionality of displaying speed limits covering Lancashire, Blackpool, and Blackburn with Darwen, and of advising the driver visually and auditorily upon vehicle speed exceeding the speed limit. A field trial took place to validate the effectiveness of the advisory ISA system. The trial collected over 2.8 million miles of driving data contributed by 402 participants. The results from the field trial suggested that advisory ISA can be effective for assisting drivers' compliance with speed limits. User acceptance of the advisory ISA system was also encouraging. In addition to the user trial, the digital speed limit map was made available to all Lancashire drivers, which can be used as an add-on functionality to portable satellite navigation systems.

### **Modelling Travel Behaviour (Conceptual and Methodological Approaches to Representing, Understanding, Analysing and Modelling Travel Behaviour)**

Grant holder & Investigator: R Batley

Funded by: ESRC (via UKTRC)

Dates: Jun 2011 – Aug 2013

Research Group: Economics and Discrete Choice

Collaborative partner: Imperial College London

**Abstract:** The objective of this scanning exercise was to bring together communities of social science and transport researchers to debate and discuss the challenges faced in the conceptualisation and modelling of travel behaviour, to take stock of the current array of conceptual and methodological approaches available and anticipate likely future directions of development for the field, and thereby stimulate creative interaction between researchers from transport and the social sciences more broadly. Rich intellectual exchanges at the workshops have led to the identification of several new, exciting and tractable inter-disciplinary research ideas, some of which are expected to lead to high quality research proposals. The workshops have also helped create new research collaborations capable of addressing these challenges. The keynote presentations from the workshops together with a synthesis of ideas from the project team will be disseminated in the special issue of a high quality journal. And a final synthesis workshop communicated the key findings from the project to key stakeholders from the policy and practitioner communities, who provided valuable feedback. The project will therefore, we hope, lay the foundation for significant advance in the analysis and modelling of individual travel behaviour within the transport domain and more widely.

### **National Secondary Road Network Needs Study**

Grant holder: J Laird

Investigators: J Laird, A Guehneemann, P Mackie, M Maher

Funded by: National Road Administration, Ireland

Coordinating partner: RPS (Ireland)

Dates: Aug 2009 – Sep 2011

Research Group: Economics and Discrete Choice

**Abstract:** This very large study reviewed the whole 2,600km of national secondary roads in Ireland with the objective of identifying a future secondary road network and an outline programme for its delivery. Our role in ITS was to develop the appraisal methodology, including Multiple Criteria Analysis, and to survey and analyse walking and cycling behaviour and valuations. The project identified 65 sections of the national secondary road network which should be prioritised for upgrading. Additionally it was found that for 74% of these schemes the incremental benefits of including cycling and walking facilities exceeded the costs of doing so.

### **Noisy Optimization in Transport**

Grant holder: M Maher

Investigators: R Liu, D Ngoduy

Funded by: Leverhulme Trust

Dates: Oct 2009 - Mar 2011

Research Group: Spatial Modelling and Dynamics



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**Abstract:** Many complex transport systems are represented by simulation models, as they offer the means to try out alternative policies or strategies and study their effects prior to implementation. The search for the values of the decision variables that optimize some measure of system performance is often a challenging task because the number of possible solutions is generally huge and there are typically many local optima. A variety of approaches have been adopted to tackle such complex combinatorial optimization problems, including evolutionary algorithms, particle swarm optimization, simulated annealing, and many others. The project investigated a modern approach known as the *cross entropy method*. Previous work had demonstrated its successful application to the problem of the optimization of traffic signal settings in a network, using a detailed, but *deterministic*, traffic simulation model. The research investigated the application of the method to *noisy* problems – that is, where the simulation model used to evaluate the trial solutions is Monte Carlo in nature and consequently the outputs are subject to random error, or noise – and developed a systematic and soundly-based approach. Successful applications were made to various forms of network signal optimisation problem, some involving stochastic assignment, and to the calibration of traffic models.

### Openair (Open Source Air Pollution)

Grant holder: K Ropkins

Investigator: K Ropkins

Funded by: Natural Environment Research Council with additional funding from DEFRA, AEA and several local authorities.

Dates: Oct 2008 – Sep 2011

Research Group: Spatial Modelling and Dynamics

Collaborative partner: David Carslaw, King's College London.

**Abstract:** This project, also known as 'openair' provides the air quality community with freely distributed, innovative, open-source data analysis tools designed for the analysis of air pollution data and dispersion model output. The underlying theme of the project is that considerably more useful information can be gleaned from air quality data using tools specifically designed for the purpose than would otherwise be the case. The tools are now widely used by central and local government, consultancies, regulators and university researchers. Many of these tools would normally require specialist visualisation or statistical software but have been made available in the highly developed open-source statistical software called R. The website, [www.openair-project.org](http://www.openair-project.org), provides more details on the project and the current version of the openair package. The project will be continuously developed over the next few years and we are keen to receive user feedback to ensure the tools are of maximum benefit to the community.

### Plug in Vehicles Economics and Infrastructure Project (PiVEIP)

Grant holder: P Bonsall

Investigators: P Bonsall, S Shepherd, S Shen, A Fowkes, D Johnson, A Whiteing, R Batley

Funded by: Energy Technologies Institute

Dates: Mar 2010 – Jun 2011

Research Group: Spatial Modelling and Dynamics

Collaborative partners: Arup, EoN

**Abstract:** A major project to predict the uptake of electric vehicles and to assess the implications for electricity consumption and overall emissions. The work of ITS in sub project 3 (Economics and Carbon Benefits) included; the development of a dynamic model to explore the impact of factors such as user familiarity on the uptake trajectory; the specification of a range of scenarios and sensitivity tests to be explored using a consumer response model developed elsewhere in the project; development of routines and algorithms to capture effects such as the dependence of continued supply of charge points on the existence of a viable business model; the impact of access to public charge points on recharge behavior; and the consequences of reduced use of petrol vehicles for government revenues. ITS was also responsible for a stream of work using optimization procedures developed in a previous project (Fowkes et al. 1998 *Transportation Research* A32 no 2 pp149-157) to identify 'optimal' policy packages (seeking to meet emissions reduction targets at minimum cost to the UK Government) in different scenarios (e.g. assuming different electricity generation mixes, different rates of growth in GDP and in automotive technology). Our findings showed that under the 'most likely' assumptions for the global and national environment and with moderate Government policies, PiVs are expected to achieve a 19% share of the UK parc by 2050, with this share being dominated by PHEVs (11%), and REEVs (7%), rather than BEVs (1%). In-use CO<sub>2</sub> emissions reduction is predicted to be 69% on 1990 levels for this case.

### Shetland Fixed Links Strategy - Socio Economic Study

Grant holder: J Laird

Investigator: J Laird

Funded by: Shetland Islands Council

Dates: Feb 2011 - Nov 2011

Research Group: Economics and Discrete Choice

**Abstract:** This study examined the economic benefits of replacing four ferry crossings in Shetland with tunnels. This involved the assessment of the degree of service rationalisation that would occur in the public sector and an assessment of the welfare benefits of travel time savings and scheduling benefits to the island communities. The study applied PhD

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research undertaken at ITS in a policy related environment. The project was used by Shetland Islands Council to help identify which tunnel to take forward to construction first.

### **TURBLOG WW (Transferability of Urban Logistics Concepts and Practices from a World Wide Perspective)**

Grant holder: P Timms

Investigators: P Timms, T Whiteing, D Quinn

Funded by: European Commission

Dates: Oct 2009 – Sep 2011

Research Group: Spatial Modelling and Dynamics

Coordinating partner: TIS.PT (Portugal)

Collaborative partners: NEA (Netherlands), INOVA+ (Portugal), BHTRANS (Brazil), PTL-UNI (Peru), TIS.BR (Brazil)

URL: [www.turblog.eu](http://www.turblog.eu)

**Abstract:** The main activities of this study included: (1) creating an international network of experts and a platform for the exchange of ideas, information and policies concerning the field of urban logistics; (2) developing and applying (in four case study cities) a methodology for assessing the transferability of urban freight transport measures. The project held four international workshops, in Lisbon, Lima (Peru), Paris and Belo Horizonte (Brazil), and organized technical visits in Europe (Paris, London, Newcastle, Gateshead, Rotterdam and Utrecht) and in Latin America (Lima, Cusco, Belo Horizonte and Rio de Janeiro). All deliverables and workshop presentations are available from the project website.

ITS contribution: ITS produced Deliverable 1 'A worldwide overview on urban logistic interventions and data collection techniques', and was responsible, in conjunction with Cariacica city prefeitura, for carrying a 'transferability case study' in Cariacica, Brazil (a city with a population of approximately 350k). This case study employed a 'light' version of the project's transferability methodology, making a summary diagnosis of freight transport problems in the city and running two stakeholder workshops. It was concluded that this light approach was particularly suitable for making transferability assessments in small cities lacking resources to make full transferability analyses.

### **Understanding Walking and Cycling**

Grant holder: M Tight

Investigators: A Jopson, F Hodgson, C Mullen, A Whiteing

Funded by: Engineering and Physical Sciences Research Council

Dates: Oct 2008 – Sep 2011

Research Group: Sustainable Transport Policy

**Abstract:** It is widely recognised that an increase in walking and cycling for short journeys in urban areas could significantly reduce traffic congestion, improve the quality of the urban environment, promote improved personal health, and contribute to a reduction in carbon emissions. This is demonstrated by a wide range of policy initiatives by national and local governments, by health authorities and a variety of non-governmental organisations. Recent reviews of research on travel behaviour have emphasised that the ways in which travel decisions are made remains poorly understood, especially in the context of complex and contingent household travel arrangements. This project sought to fill the research gap. Two key aims were: 1) develop better understanding of the complex ways in which households and individuals make everyday travel decisions about short trips in urban areas and 2) develop a 'toolkit' that helps planners, policy makers and others concerned with promoting more sustainable travel practices in urban areas to target policies and interventions more effectively. The research adopted a mixed methodology, with the main emphasis on in-depth qualitative research, and examined individual, family and household decision making in four different neighbourhoods engaging potential users with the development of outputs. Outcomes are presented in the final report:

[www.its.leeds.ac.uk/fileadmin/user\\_upload/UWCRptSept2011.pdf](http://www.its.leeds.ac.uk/fileadmin/user_upload/UWCRptSept2011.pdf)

### **Value of Local Environment Factors**

Grant holder: M Wardman

Investigators: M Wardman, J Shires, P Chintakayala, J Nellthorp

Funded by: Department for Transport

Dates: Dec 2011 – Mar 2012

Research Group: Economics and Discrete Choice

**Abstract:** There is a clear link between the state of the local environment and quality of life. However, prior to this study it was not possible to value the link explicitly in monetary terms, making decisions on resource allocation for these areas challenging. Valuations had been developed for some specific elements of, for example street lighting and traffic noise yet there was a lack of consistent evidence across a wide range of factors. This study used Stated Preference methods to provide monetary valuations of a wide range of local environmental factors. These were urban quiet areas, fly-tipping, litter, detritus, fly-posting, graffiti, dog-fouling, chewing-gum, trees, light pollution and odour. A thorough programme of testing how to represent these attributes was conducted and the emphasis was on individuals' willingness to pay for improved conditions as experienced in their locality. A sample of over 561 respondents was obtained in three contrasting locations. There was a high degree of correspondence between the importance ratings of factors and their monetary valuation. The most important variables were litter and fly-tipping with light pollution and graffiti the least important.

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### Welch's Grape Juice

Grant holder: N Merat

Investigator: N Merat

Funded by: Welch's

Dates: Oct 2011 – Jul 2015

Research Group: Safety and Technology

Collaborative partner(s): Professor Louise Dye, Dr. Clare Lawton, Institute of Psychological Sciences

**Abstract:** The primary objective of this project is to conduct a proof of principle study to investigate the potential for high polyphenol drink to improve cognitive function and driving performance in working mothers of pre-teen children (under 13 years old), assumed to experience stress from the demands of diverse family and work responsibilities.

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- Andersson M, Smith ASJ, Wikberg A, Wheat PE.** Estimating the marginal cost of railway track renewals using corner solution models. *Transportation Research Part A: Policy and Practice. Transportation Research Part A*, **46** (6), 954–964
- Batley R, Dargay J, Wardman M.** The impact of lateness and reliability on passenger rail demand. *Transport Res e-log* **47**(1):61-72.
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### CONFERENCE PRESENTATIONS

**Abou Zeid M, Ben-Akiva ME, Bierlaire M, Choudhury CF, Hess S.** Attitudes and Value of Time Heterogeneity. 90th Annual Meeting of the Transportation Research Board. Washington, D.C. (TRB).

**Armstrong JA, Connors RD, Watling DP.** Identifying Critical Links in a Transport Network: A Measure Based Approach versus a Structural Approach. 43rd annual UTSG conference, Milton Keynes (UTSG).

**Atkinson S, Matthews B.** Arena venues and travel behaviour – a case study of Sheffield Hallam Arena. UTSG.

**Balijepalli NC, Ngoduy D, Watling D.** The Two-regime Transmission Model Applicable for Dynamic Network Loading Model. TRB.

Titles were:

**Bonsall P, Schade J, Roessger L and Lythgoe W.** Factors affecting people’s engagement with survey tasks. Presented at the 9th International Conference on Survey Methods in Transport, Chile.

**Bonsall P.** So What Is All This Data For? Presented at the 9th International Conference on Survey Methods in Transport, Chile.

**Bristow A, Wardman M, Shires J, Gühnemann A, Tight M.** Do the costs of aircraft noise nuisance change over time? A repeat study. *Internoise*.

**Connors R, Hess S, Daly A.** On the computation of probit choice probabilities. Second International Choice Modelling Conference, Oulton Hall, Leeds (ICMC).

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**Crockett J, Lowe S, Fox J, Daly A, Vitouladiti S, Bates J.** A greening of the private vehicle fleet? An examination of the market for low emission vehicles in London. European Transport Conference, Glasgow (ETC).

**Daly AJ, Fox J, Patruni B.** Pivoting in travel demand models. ETC.

**Daly AJ, Hess S.** Simple Approaches for Random Utility Modelling with Panel Data. TRB.

**Daly AJ, Hess S, Train KE.** Ensuring Finite Moments for Willingness to Pay in Random Coefficient Models. TRB.

**Daly AJ, Tsang F, Rohr C.** The value of small time savings for non-business travel. ETC.

**Dumont J, Adler TJ, Hess S, Neafsey WC.** Using individual-level parameter estimates to investigate evidence of lexicographic behavior and heterogeneity in information processing strategies. ICMC.

**Figlar B, Öttl G, Gühnemann A.** Costs and benefits of a noise trading scheme for airports – The MIME project. Osaka, Japan. Editors: Internoise.

**Flötteröd G, Liu R.** Disaggregate path flow estimation in an iterated DTA microsimulation. TRB.

**Fox J, Daly A, Patruni B, Milthorpe F.** Extending the Sydney Strategic Model to represent toll road and park-and-ride choices. ETC.

**Guehnemann A, Laird J, Pearman A.** Prioritising a national road investment strategy using MCA. ETC.

**Hess S, Daly AJ, Hensher DA, Adler TJ.** The role of constants in WTP computation. ETC.

**Hess S, Hensher DA.** Making use of respondent reported processing information to understand attribute importance: a latent variable scaling approach. ETC.

**Hess S, Stathopoulos A.** Linking response quality to survey engagement: a combined random scale and latent variable approach. ICMC.

**Hess S, Stathopoulos A.** Modelling multi-attribute reference-dependence in choice experiments: Does one size fit all? TRB.

**Hess S, Stathopoulos A, Campbell D, O'Neill V, Caussade S.** It's not that I don't care, I just don't care very much: confounding between attribute non-attendance and taste heterogeneity. ETC.

**Hess S, Stathopoulos A, Daly AJ.** Allowing for heterogeneous decision rules in discrete choice models: an approach and four case studies. ETC.

**Hess S, Stathopoulos A, Daly AJ.** Mixing of Behavioural Processes: Modelling Framework and Four Case Studies. TRB.

**Hodgson FC, Barnard Y, Bradley M, Lloyd A.** Exploring the acceptance of mobile technologies using walking interviews. Human Factors and Ergonomics Society- European Chapter, Leeds, UK.

**Isaacson V, Kelly C, Pearson D.** Travelling to see the doctor - What is the impact on climate change? SAPC North, Leeds.

**Jamson AH, Merat N, Carsten OMJ, Lai FCH.** Fully-automated driving: the road to future vehicles. 6th International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design, Lake Tahoe, CA.

**Jamson SJ, Lai FCH.** Are novelty effects of road safety treatments observable in simulator experiments? TRB.

**Jamson SL.** Does legislation influence drivers' propensity to use Nomadic Devices whilst driving? Driver distraction and inattention, Gothenberg.

**Johnson D, Matthews B, Hess S, Bielefeldt C.** An indirect flight from my local airport or a direct flight from an alternative regional airport – how does surface access influence the decision? ETC.

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**Koh ATM, Shepherd S, Watling D.** Cooperative and Non Cooperative Models of Toll Pricing Competition Between Cities. Proceedings of the 16th International Conference of the Hong Kong Society for Transportation Studies. 239-246.

**Lai FCH, Carsten OMJ.** Futuristic traffic management. ETC.

**Lai FCH, Carsten OMJ.** Intelligent Speed Adaptation – The Next Generation of Traffic Management Tools. 3rd International Conference on Transportation Engineering, Chengdu, China.

**Laird JJ, Page M, Shen S.** Valuing rural footways and cycleways. ETC.

**Liu R.** Modelling motorway merge: the current practice in the UK and towards establishing general principles. 6th International Symposium on Highway Capacity, Stockholm.

**Liu R, Li X.** Stability analysis of a multi-phase car-following model. TRB.

**Maher MJ, Ngoduy D.** Cross entropy method for a deterministic optimal signalization in an urban network. TRB.

**Matthews B, Lythgoe F, Milne D.** Long distance rail travel: are we missing the local connection? UTSG.

**Merat N, Jamson AH.** A Driving Simulator Study to Examine the Role of Vehicle Acoustics on Drivers' Speed Perception. 6th International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design, Lake Tahoe, CA.

**Nash CA.** European transport policy and sustainability - the role of rail. 70th anniversary conference of the Japan Society of Transport Economics, Kobe, Japan.

**O'Neill VL, Hess S, Campbell D, Hutchinson G.** Incorporating latent attitudes in analysing food choices. ICMC.

**Orr S, Hess S, Sheldon R.** Consistency and Fungibility of Monetary Valuations in Transport. TRB.

**Panchasara A, Matthews B, Jamson S.** Driven to distraction – a study of the impacts of music tempo and genre on driver behaviour. UTSG.

**Ropkins K.** Measuring Emission Impact Trends in Environmental Data Time-Series. 21st CRC Real World Emissions Workshop, San Diego, US.

**Ropkins K, Hodges J, Togwell P.** Complementary Monitoring Programmes as part of an Industrial Practice Air Quality Management Plan: Method Selection, Data Analysis and Application. Clean Technologies in the Steel Industries, Second International Conference, Budapest, Hungary.

**Rose JM, Hess S, Bliemer MCJ, Daly A.** Impact of Varying the Number of Repeated Choice Observations on Mixed Multinomial Logit Model. TRB.

**Rose JM, Hess S, Collins A.** Impact of Violations of Model Assumptions: Role of Lexicography, Inconsistent Choices, and Changing Preferences in Model Estimation. TRB.

**Scarsi G, Smith ASJ, Wheat PE.** Sub-company efficiency analysis of railway infrastructure: panel data SFA. 12th European Workshop on Efficiency and Productivity Analysis, Verona, (EWEPA).

**Smith ASJ, Nash CA, Nilsson JE.** Measuring the Success of Rail Reforms. 2nd European Rail Transport Regulation Forum Performance and Governance in Railway Markets, Florence School of Regulation.

**Smith ASJ, Nash CA, Wheat PE.** The impact of rail franchising on labour productivity and input prices – evidence from Britain. International Conference on Competition and Ownership in Land Passenger Transport (Thredbo), Durban, South Africa.

**Smith ASJ, Wheat PE.** How does the choice of the scaling function in BC92-type models affect inefficiency estimates? Observations and generalisations. EWEPA.

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**Stathopoulos A, Hess S.** Modelling multi-attribute reference-dependence in choice experiments: Does one size fit all? TRB.

**Stathopoulos A, Hess S.** Revisiting reference point formation, gains-losses asymmetry and non-linear sensitivity: one size does not fit all! ETC.

**Sumalee A, Siripirote T, Watling DP.** Estimation of activity-based model parameters and trip chain demand from vehicle identification data. 9th Eastern Asia Society for Transportation Studies Conference, Jeju, South Korea.

**Tight MR, Timms PM, Watling DP, Guehnemann A.** Achieving radically different urban walking and cycling futures in the UK by 2030 – imagining different pathways. Royal Geographical Society IBG Annual International Conference, Imperial College London, UK, (RGS).

**Timms PM, Tight MR, Watling DP, Guehnemann A, Miles A, Moore N.** Pathways to achieving radically different urban walking and cycling futures in the UK by 2030. Walk 21: The International Conference on Walkable and Livable Communities, Vancouver, Canada.

**Turner J, Hodgson FC, Porter G, Maudesley E, McCann G.** Changing the game for Africa's infrastructure: what role does South-South cooperation play in addressing Africa's infrastructure gap and under what terms?. European Centres for African Studies conferences, Uppsala, Sweden.

**Watling DP, Koh A, Shepherd SP.** Competition between cities and between travellers in transport networks: Model formulation, equilibria and solution approaches. Kuhmo-Nectar Conference on Transport Economics, Stockholm, Sweden.

**Wheat PE, Smith ASJ, Greene W.** How confident can we be about confidence intervals for firm specific inefficiency scores from parametric Stochastic Frontier Models? EWEPA.

### BOOKS AND BOOK CHAPTERS

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**Barnard YF, Carsten O, Lai F.** From theoretical model to experimental data: A structured approach to design experiments to seed a model of vehicle operation with new systems. In Human Modelling in Assisted Transportation. Editors: Carlo CP. 109-117. Springer-Verlag New York Inc.

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**Mackie PJ.** Cost-Benefit Analysis in Transport; A UK Perspective. In Improving the Practice of Transport Project Appraisal. 149: 79-99. OECD.

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**Munir S, Chen H, Ropkins K.** Non-parametric nature of tropospheric ozone and its dependence on nitrogen oxides: a view point of vehicular emission. In Air Pollution XIX. Editors: Brebbia CA, Longhurst JWS, Popov V. **147**: 93-104. WIT Press.

**Nash CA.** Competition and Regulation in Rail Transport. In A Handbook of Transport Economics. Editors: de Palma A, Lindsey R, Quinet E, Vickerman R. 928 pages.

**Nash CA, Matthews B.** Transport Pricing and Subsidy. In The handbook of Transport Studies. Editors: Notteboom T, Shaw J. Sage.

**Nash CA, Smith ASJ.** Reforming railways: Britain. In Reforming railways: Learning from Experience. Editors: Drew J, Companies CoERal.

### REPORTS

**Bonsall P,** Travel-Mode Choice Interventions to Reduce Car Use in Towns and Cities. Presented to the Behaviour Change Enquiry of The House of Lords Select Committee on Science and Technology.

**Carslaw D, Beevers S, Westmoreland E, Williams M, Tate JE, Murrells T, Stedman J, Li Y, Grice S, Kent A.** Trends in NO<sub>x</sub> and NO<sub>2</sub> emissions and ambient measurements in the UK. DEFRA Air quality library.

**Guehnemann A, Batley R, Figlar B, Öttl G.** MIME - Analysis of different noise permit and market methods. Market-Based Impact Mitigation for the Environment (MIME) Project (Deliverable D18).

**Guehnemann A, Connors R, Nellthorp J, Figlar B, Öttl G, de Lépinay I.** MIME - Report on Airport/ATM and Market Simulation.. Market-Based Impact Mitigation for the Environment (MIME) Project (Deliverable D16 – Volume 2 (Market Model)).

**Guehnemann A, Connors R, Nellthorp J, Kelly C, Figlar B, Öttl G, de Lépinay I.** MIME - Proposed candidate market methods and market modelling framework. Market-Based Impact Mitigation for the Environment (MIME) Project (Deliverable 13).

**Guehnemann A, Pearman A, Laird J.** National Secondary Roads Needs Study - MCA Methodology Report. MCA Methodology Report (MDT0436Rp0065).

- Ends -