

1 Plenary

Savage: Climate change and transport choices: using segmentation analysis to impact on sustainable transport policy [Department For Transport] [Paper\(pdf\)](#)

ABSTRACT: The Department for Transport 'Climate Change and Transport Choices' study has created a segmentation model of the adult (age 16 plus) population in England, based on a large-scale, nationally representative survey and qualitative (focus group) research. Nine 'segments' have been identified, each with a unique set of economic, demographic, geographic, behavioural and attitudinal characteristics. These include six 'car owning' segments and three 'non-car owning' segments. Overall, the segmentation reflected the key survey findings, including: - Higher income groups showed less sustainable transport behaviour - Better educated respondents tended to hold more 'pro-environmental' attitudes. - Those living in rural areas tended to show particularly high levels of car travel, more positive attitudes about cars and less positive attitudes about alternative modes. - Older age groups cycled less and tended to hold greater concerns about cycling. The segmentation has furthered understanding of the previously documented 'attitude-behaviour' (or 'value-action') gap. The strong links between education and income led to an apparent disconnection between attitudes and behaviour among higher income, highly educated respondents, who tended to be more pro-environmental in their attitudes but less sustainable in terms of their actual transport behaviour than lower income, less well educated respondents. In contrast, some less well educated, lower income groups demonstrated more sustainable behaviours than their attitudes might imply. The segment with the highest levels of car travel and car ownership was higher income but less well educated. This segment also prioritised 'speed / performance' and 'style / design' when buying a car. The study identified a set of 'golden questions' to support further research with each of the segments. Overall, the study has raised a wide range of issues for the development of future research, policies and local sustainable transport initiatives.

2A Rail (1)

Lyons: Comparing rail passengers' travel time use in Great Britain between 2004 and 2010 [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: This paper makes a contribution to the growing discourse and evidence base concerning travel time use, its meaning and value. In particular it provides a unique insight into aspects of stability and change regarding the travel time use of rail passengers in Great Britain between 2004 and 2010. Empirical evidence is presented on how rail passengers spend their time, how worthwhile they consider their time use to be, the extent of advance planning of their time use and how equipped for time use they are in terms of the items they have to hand when they travel. The results reveal a consistent dominance of reading for leisure, window gazing and working/studying as favoured travel time activities. Over the six year period the availability and use of mobile technologies has increased. Listening to music in particular has doubled in its incidence suggesting an increasing capacity for travellers to personalise the public space of the railway carriage. Most notably the analysis reveals a substantial increase in the proportion of travellers overall making very worthwhile use of their time. The paper relates such survey findings to the ongoing debate concerning how travel time savings are valued in preparing advice on transport investment decisions – currently pertinent in the UK in terms of high speed rail.

Dobruszkes: In search of evidence for mode shift and induced demand following HSR development – an international perspective [Oxford University, Transport Studies Unit] [Paper\(pdf\)](#)

ABSTRACT: By reviewing the existing literature, this paper analyses the extent to which high-speed rail (HSR) services around the world have attracted passengers from other modes of transport. There is unfortunately little evidence on the sources of HSR traffic, and available figures raise several problems notably because only market shares are available. The latter is usually given as percentages despite the potential changes in market size, and is not modelled to estimate the factors influencing modal shares or changes. Moreover, induced traffic is rarely taken into account. In this context, we are mainly able to confirm that in-vehicle travel time strongly influences the HSR market share against the airlines only, as cars, coaches and traditional trains (if remaining) may be cheaper and/or more flexible. Additional factors influencing modal shares or changes are access and egress times, frequencies, fares, previous rail market shares, remaining or not traditional rail services, etc. Finally, there is clearly a lack of comprehensive monitoring of the impact of HSR on intermodal competition. Consequently, the real environmental benefit of HSR remains largely unknown.

ABSTRACT: The UK government is currently developing plans for a new rail line built to High Speed Rail standards (i.e. greater than 125mph) to address the problem of constrained capacity on the main routes of the British railway network. Increased speed should reduce journey times, resulting in significant changes to travel choices, especially for long distance journeys. Previous literature has defined these changes as ‘network effects’ (Laird et al., 2005) or ‘self-stated behavioural responses’ (Loo, 2009) and these changes include trip re-timing, variations in trip frequency and changes of mode choice. An intense debate has continued since the High Speed Rail plans were announced in 2010 as to the merits and demerits of the scheme. Politicians, transport experts, the media and business have indicated scepticism, objection, support and indifference to High Speed Rail. Additionally, various public opposition and support groups have joined the debate. However, these views are those of a vocal minority, and it is possible that wider opinion might be based on errors in cognition and affect. Views on the potential benefits of High Speed Rail could be influenced by misunderstanding, misconception or lack of knowledge. Indeed TNS/BRMB (2011) surveyed opinions about High Speed Rail and found that nearly half of those interviewed had no awareness of the proposal, 10% claimed to know a fair amount, and only 1% thought they knew a great deal. This paper presents the findings of an examination of the attitudes and perceptions of long distance travellers regarding the High Speed Rail system, and the impact of cognitive and affective factors on travel behaviour responses. Focus groups add depth and richness to the understanding of travel mode choice when the nature of the alternatives from which to choose has changed. Six focus groups were conducted, collecting attitudes, perceptions and experiences of long distance travel including (where appropriate) the High Speed Rail proposal. The focus groups included a mix of genders, age groups and occupations, and took place in both rural and urban locations. Respondents were provided with indicative journey times for two alternative High Speed Rail systems and asked to discuss each, whilst giving an indication of how their travel behaviour might change in these circumstances. The focus group discussions were audio recorded and transcribed to allow for content and thematic analysis. The subsequent analysis revealed five key themes and a miscellaneous theme. The themes can be divided into sub-themes as follows: ? cost: travel costs; cost of alternative modes; who pays; reducing costs by increasing journey time (slow motion behaviour); time of purchase (advance / short notice); cost to the UK (construction / benefit); ? convenience: total journey duration (how the journey fits into the day); ability to carry luggage; convenience for destination; accessibility (access and egress - including onward transport); frequency; journey directness; ? quality of service: crowding; comfort / first class travel; reliability of service (punctuality); ability to work onboard; availability of work technologies (e.g. WiFi); journey time; service frequency; ? environment: cost versus environmental considerations; ? security: luggage security; personal security; and ? miscellaneous: travelling alone / with others; personal circumstances; fear of High Speed Rail; journey purpose. The most frequently occurring sub-theme was journey time, followed by travel costs, total journey duration and accessibility. Other frequently occurring sub-themes included personal and luggage security, comfort, ability to work onboard and the ability to carry luggage. A thematic map was developed to describe the issues and attitudes identified by respondents regarding their current and future travel behaviour. The map presents the key themes, as well as the sub-themes linking to them. Key findings from the focus groups indicate that current travel times are broadly considered to be acceptable although reductions would be welcomed. The low incidence of environmental considerations, which are given low priority in travel choices and were mentioned (unprompted) by only one respondent, may indicate that the environmental consequences of High Speed Rail are either not fully recognised, or that they are not a key consideration in transport decisions. Generally, the monetary cost was given a much higher priority than environmental cost. The findings here help to shape the psychological perspectives associated with the implementation of High Speed Rail. They also allow us to understand how the market might segment based on attitudes and demographic variables, including which segments might be prepared to pay, how much, and in what circumstances, for decreased journey times. References: Laird, J.J.; Nelthorp, J.; Mackie, P.J. (2005) Network Effects and Total Economic Impact in Transport Appraisal. *Transport Policy*, 12 (6), pp537-544 Loo, B.P.Y. (2009) How would people respond to a new railway extension? The value of questionnaire surveys, *Habitat International*, 12 (1), pp1-9 TNS-BRMB, (2011), High Speed Rail Scheme: survey of all adults aged 16+ in Great Britain

2B Safety

Darby: THE INFLUENCE OF MANAGERS ON FLEET VEHICLE CRASHES: AN APPLICATION OF MIXED MODELS [Loughborough University] [Paper\(pdf\)](#)

ABSTRACT: Data from various sources indicates that in most higher income countries approximately 25% of road collisions and 30% of occupational fatalities involve someone driving for work. This represents a significant cost to society, the economy, organisations and families. Such collisions are not confined to large commercial vehicles, but frequently involve smaller vehicles where driving is secondary to the employees' main task. Driving for work is associated with increased risk of involvement in a fatal or serious road traffic collision. Increasingly fleet management has focused on safety and driver behaviour as well as asset management and cost control. Studies have shown that managing the behaviour of both drivers and the organisation as a whole can contribute to incremental improvements in safety. Understanding crash risk must include the background of random events that drivers encounter. This variation has been taken into account when studying interventions such as speed camera location and training schemes. In contrast, the impact of managers on driver outcomes has been less well investigated particularly when based on actual motor insurance claims data. For this reason, this paper reports on a study that rigorously incorporates the influence of managers within a driver claims model; not simply as a nuisance factor but rather as a topic of interest. It is based on employees' insurance claims from a large UK company, which operates a fleet of approximately 37,000 vehicles and has made significant progress in applying a range of strategies to enhance driver safety over a 10 year period. The paper concludes that identifying managers lying outside the normal range, and associated manager characteristics, can lead to valuable interventions at higher levels of the organisation. This manager effect is found to be statistically significant indicating that the work has important implications for research, policy and practice to improve road safety performance.

Wood: Updating Predictive Accident Models of Modern Rural Single Carriageway A-roads [School of Engineering, University of Liverpool, UK] [Paper\(pdf\)](#)

ABSTRACT: Reliable predictive accident models (PAMs) are essential to design and maintain safe road networks and yet the models in current use were derived using data collected 20 to 30 years ago. Given that the national personal injury accident total fell by some 30% in the last 25 years, while over the same period road traffic increased by over 60%, significant errors in scheme appraisal and evaluation based on the models currently in use seem inevitable. The aim of the research project on which this paper is based is thus to develop practical methodologies to ensure that PAMs give unbiased estimates of accident frequencies. In this paper the temporal transferability of PAMs for modern rural single carriageway A-roads is investigated and their predictive performance is evaluated against a modern data set. Despite the age of these models the PAMs for predicting the total accidents provide a remarkably good fit to modern data; the inclusion of design variables in more complex models increases temporal stability. Models where accidents are disaggregated by type do not predict the total number of accidents as accurately, although the performance of these models can be improved by calibrating them against modern data.

Batool: Self-reported dimensions of aberrant driving behaviours among Pakistani drivers [Institute for Transport Studies, University of Leeds] [Paper\(pdf\)](#)

ABSTRACT: Research within the domain of road safety suggests that drivers' attitudes are key determinants of their driving behaviours. This paper consolidates the findings of an extensive study conducted on attitudes and behaviours of drivers in Lahore, Pakistan. The study categorised the sample of 429 drivers into four groups based on their attitudes towards road safety: autonomous drivers, opportunists, regulators and risk averse. This paper has explored the dimensions of aberrant behaviours possessed by these groups. Their behaviours were assessed with the help of one of the most commonly used self-reported measures, the Manchester Driver Behaviour Questionnaire (DBQ). A 29-item modified version of DBQ, which included a set of road traffic violations relevant to Pakistan, was used. Univariate analysis revealed that Pakistani drivers tend to engage more in risky overtaking, and close following than drink driving or speeding. The behavioural items were then subjected to principal component analysis with promax rotation. The analysis produced a four-factor solution with high internal reliability, namely drivers' behaviours related to intimidating other road users, behaving above the rules, commission of risk prone infringements, and competition for road space. ANOVA results identified significant behavioural differences among the groups on all these factors, such that 'opportunist drivers' surfaced to be the most dangerous and 'regulators' the least dangerous category of drivers. The results also identified that the behaviours of drivers in Pakistan were predominately linked to their attitudes towards

law enforcement and traffic rules-breaking. Based on these study results, this paper suggests a number of road safety interventions in the context of local needs.

2C Travel Behaviour and Commuting

Van Ristell: MODELLING THE EFFECTS OF CHANGING LOCAL AUTHORITY FUNDING CRITERIA FOR HOME TO SCHOOL PUBLIC TRANSPORT PROVISION [Loughborough University] [Paper\(pdf\)](#)

ABSTRACT: In the current economic climate, the British Government is revising all school travel funding and policies to highlight areas where savings and cuts can be made. One such budget area is the subsidising of home to school transport by local authorities which in 2009-2010 amounted to more than £1 billion. School travel is a key area in research and accounts for 15% of all bus journeys and 16% of bus mileage in Great Britain per year (DfT, 2011). Although the majority of this amount is spent on 'special educational needs' (SEN) travel (i.e. travel for students with learning and/or physical disabilities) and hence is difficult to reduce, funds of over £400m was still spent by local authorities in England on subsidising home-to-school transport provision to pupils. Unsurprisingly perhaps, the Government is thus reviewing the current system so as to highlight areas in which savings or changes can be made, although the indications are that the scope of this report falls short of recommending changes to primary legislation. In addition, it is understood that the commission is not conducting its own quantitative study on the detailed transport-related impacts of any proposed changes on local authorities or schools. The aim of this paper is to examine the policies relating to the funding criteria of home-to-school public school transport provision. Specifically, the paper employs a multilevel modelling technique to develop a series of relationships between bus usage by school and the level of spending by local education authorities on home-to-school bus travel provision while controlling for other factors such as school quality, land-use patterns and various proxies for household incomes. Essentially, the paper uses data from the 2009 School Census which is then supplemented by additional information from other sources. The School Census is an annual survey of all schools run by local authorities by the Department for Education (which was known as the Department for Children, Schools and Families until May 2010). Overall, the 2009 School Census provides information for over 7.4 million individual pupils across England attending over 21,000 Government maintained schools in 152 LAs. In addition to the School Census data, the Department for Education also provides publications regarding: 1. budget information relating to each LA's spending on the provision of home to school transport; and 2. the annual average exam achievement or 'quality' of schools. Specifically, the annual LA budget datasets of the DfE of the provide details of the annual home-to-school transport budgets of local authorities for both Special Educational Needs (SEN) and non-SEN travel. For the purpose of this study only non-SEN travel and budget has been included. Meanwhile the Key Stage Achievement Tables from the DfE provide details on the exam performance of schools at ages 10, 16 and 18 and in this paper the average grade achieved by school is used as a proxy for school quality. Meanwhile, data of the policies pertaining to the funding criteria employed by LAs in England for home to school transport provision were collected through an examination of the internet sites of all 152 LAs with education responsibilities and then coding the results for application into a usable dataset. A series of multilevel models were then developed for different age groups (i.e. primary school aged less than 11, secondary school aged from 11 to 16 and post 16 aged 17 years and above). Only random intercept models were developed as initial models estimated as a starting point indicated that over 90% of the variation in total bus mileage can be explained by the school-level factors. This suggests that more complex models such as random coefficients models could be avoided. The dependent variable – school-level bus mileage – was transformed into a logarithmic scale as this variable should be non-negative and hence this transformation would avoid the potential problem of obtaining a negative predicted value of bus mileage. The results suggest that there is a differential effect of funding on the total school-level bus mileage for primary (aged less than 11), secondary (aged 11 to 16) and Post 16 schools. As expected, factors affecting school-level bus mileage are different for different schools. LA-level land-use variables also show a mixed-effect on bus mileage. At primary school age, the more pupils who receive free school meals from the Government are more likely to use the bus in their journey to school. The average grade achievement of a school for secondary school and Post 16 pupils could be the result of these grades having more impact on later life and therefore pupils are more willing to travel further to reach the schools with higher exam achievement. Older children however, are more likely to use the bus in their journey to school when living in a rural area as oppose to more dense urban and metropolitan areas. Using the calibrated multilevel modelling techniques, a sensitivity analysis was carried out to quantify the reduction in bus usage if there is no funding available from local education authorities. The results suggest that if the LA budget becomes zero, school-level bus mileage in England would decrease by 16%, 27% and 10% for primary, secondary and Post 16 schools respectively. This decrease in bus mileage may result in the reduction of bus trips as some of the pupils would change their mode of travel (e.g. bus to car). In other words, 20,135 primary school pupils (from the total 125,842 based on the School Census), 252,928 secondary school pupils (from the total 936,770) and 6,078 Post 16 pupils (from the total 60,782) may look to

travel in other ways. For over 279,141 pupils to change from using the bus this could lead to 279,141 pupils (averaging 3.12 miles per journey as per the School Census) travelling twice a day (190 school days per year) resulting in over 331 million miles a year potentially being made by less sustainable modes of travel and thus leading to further congestion and environmental issues around England.

Fraszczuk: The parameters of excess commuting [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: Recently, researchers have shown an increased interest in an excess commuting phenomenon (Rodriguez, 2004; Ma and Banister, 2006; Murphy, 2009). However to date their main focus, when identifying excess commuters, was on time and distance-based methodology and there has been little agreement on what role monetary cost and physical effort play in the phenomenon. This study uses data collected in 2010 in Tyne and Wear, UK and tries to examine the excess commute from four different perspectives of: time, distance, cost and effort. Relatively new definition of excess travel, presented previously by Barr et al. (2010), is used to describe excess commuters and this gives a basis for two excess commute identification methods: pure values and generalised cost values. The results suggest that, although on a small scale for commuting, the excess travel phenomenon exists. However, numbers of excess commuters within the same sample vary (from 7% to 65%) and are dependent on variables considered and the methodology used. The outcomes of this study should assist public transport operators in shaping their policy and marketing of travel.

Price: 'Are we nearly there yet?' Parents' Attitudes to Long distance Travel with young children. [University of Leeds] [Paper\(pdf\)](#)

ABSTRACT: Tackling the increasing levels of car dependency amongst children has both current and inter-generational imperatives. Not only is increased car use amongst children linked to a reduction in their childhood physical activity - with consequent impacts on health problems such as obesity - it also shapes their subsequent travel choices as adults - with consequent impacts on the future potential to achieve more sustainable travel behaviour. Indeed, it seems clear that unless action is taken to diversify children's travel patterns, the challenge of modal shift will only intensify in future. It is, therefore, vital to take steps to address the mobility habits of children through their parents. To date policy interventions have focussed primarily on children's habitualised travel (i.e. promoting the use of walking and cycling for the journey to school through School Travel Plans) and there is little in the literature which looks at the way children experience leisure trips including those of a long distance nature. As Mackett (2001) demonstrates using data from the National Travel Survey, non-educational trips account for over 80% of children's travel when calculated as a proportion of total distance travelled, which leads the author to conclude that if action is to be targeted at children's use of the car it should be aimed much more widely than just at educational trips (p4). Hence, this paper reports on a study which included an in-depth qualitative survey amongst 25 sets of parents with young children, to explore their families current long distance travel behaviour, their attitudes to long distance travel as a family by rail and by road, and their perceptions of barriers to and enablers of greater use of rail by families for long distance travel.

2D Traffic Management (1)

Hamilton: Urban Traffic Control Evolution [University of Southampton] [Paper\(pdf\)](#)

ABSTRACT: Urban traffic control over the past sixty years has been a continued race to keep pace with ever more complex policy objectives and continually increasing vehicle demand. Without efficient traffic control urban areas suffer from increased congestion, increased pollution, decreased economic efficiency and decreased road safety. Over the decades, advances in vehicle detection and communications technologies have enabled a series of step changes in the capabilities of urban traffic control systems, from early (fixed time) signal plans to modern coordinated systems. A variety of urban traffic control systems have now been implemented throughout the world, each with individual strengths and weaknesses and this paper seeks first to compare the leading commercial systems (and some less well known systems) to highlight their key characteristics and differences between their underlying approaches, before assessing whether we truly have the urban traffic control systems we need to meet modern transport policy obligations and desires. This paper then moves on to consider the near and far future policy and technological landscape in which urban traffic control will need to be operating, to consider whether we are moving from an era of suffering from having only limited data availability to one of suffering from having too much (and often conflicting) real time data sources and to suggest that the potential ability to target control measures to individual vehicles will increasingly blur the traditional boundaries between 'information' and 'control'.

Williams: Assessment of temporal variation in vehicle emissions at an urban intersection [Imperial College London] [Paper\(pdf\)](#)

ABSTRACT: Signalised intersections are often cited as areas of high vehicle emissions and as a consequence have great importance for urban air quality and human exposure to pollutants. The competing demands for road space and consequent interruptions to flow lead to a general propensity of traffic to occupy the relatively higher polluting “acceleration” phase as opposed to the lower emitting “cruise” phase of operation. As well as increased emissions, junctions are also areas where there is significant mixing of air flows, and so the importance to air quality extends to adjacent links. They may therefore be viewed as areas of the road network where reductions in vehicle emissions and associated improvements in air quality can be sought. In order to reduce the production of emissions in this environment, a greater understanding of the mechanisms of pollutant formation is required, the first step being a characterisation of pollutant emissions distribution. This paper presents three methodologies for establishing the temporal variation in vehicle emissions. Outputs from a traffic microsimulation are processed, and emissions modelled using an instantaneous emissions database. Microsimulation outputs are further “time-sliced” in order to understand the temporal variation present in vehicle dynamics and hence emissions. Comparison is made to real-world driving patterns collected through the use of GPS and video, and to on-street pollution levels measured using a set of portable monitoring devices. Hourly averages and associated spatial distributions estimated through more established methodologies are compared to trends over shorter time-periods. The impact of traffic signal phasing, localised conditions and network incidents are demonstrated with particular attention to changes in local maxima and estimated influence on pedestrian exposure. Whilst differences between the three assessment methods are observed, they ultimately support the application of different approaches to analysis, with each contributing to improved understanding of urban air pollution hotspots.

Ahmed: Modelling Differential Bus Priority at Traffic Signals: Potential and Challenges [University of Southampton] [Paper\(pdf\)](#)

ABSTRACT: Improving regularity is the performance criteria for high frequency bus services in the UK. But traditional forms of priority at traffic signals, which give priority to all buses, have little effect on improving regularity. By providing priority according to the individual requirement of the buses, known as differential bus priority, regularity could be improved significantly. With the rapid development of AVL systems (e.g. iBus London), differential priority could be more practical and beneficial method and is feasible to be implemented. This paper is focused on micro-simulation modelling of differential bus priority at traffic signals. It firstly discusses state-of-the-art differential bus priority at traffic signals very briefly and the requirements for modelling such application. It then provides a comparison of three major commercial traffic simulation softwares in used today (VISSIM, AIMSUN, and PARAMICS) to identify the best tool for this purpose. The comparison is based on their ability and limitations to model differential bus priority. The strength and weakness of SIMBOL, a non-commercial micro-simulation tool developed in the TRG to model bus priority at traffic signals, is also considered. From literature review it is concluded that VISSIM is more capable to model differential bus priority at traffic signals. Finally the paper discusses the practical issues and challenges need to consider during the development of the model for the evaluation of differential bus priority at traffic signals by using VISSIM. This paper is based on the early stage of PhD research on this topic.

3A Flexible Transport Services

Velaga: Development of an Integrated Flexible Transport Systems Platform for Rural Areas Using Argumentation Theory [University of Aberdeen] [Paper\(pdf\)](#)

ABSTRACT: Flexible integrated transport systems (FITS) provide a promising approach to improving the efficiency and performance of transportation services. A FITS aims to provide passengers with flexibility in choosing routes, times, payment systems, and so on. In order to achieve this additional flexibility, a well-designed FITS integrates different modes of transport, possibly spanning multiple service providers, to provide more sophisticated, comfortable and cost-effective transport options. The concept of a FITS is not new; many existing systems including shared taxicabs, Dial-A-Ride services, and car-clubs contain elements of such a system. In this paper, we concentrate on rural areas, which generally suffer from lack of service availability and demand uncertainties, and for which existing FITS solutions are not well suitable. We present an agent based flexible transport systems platform developed using argumentation theory. Formal argumentation is a powerful technique borrowed from Artificial Intelligence, and is used to weigh up the conflicting choices available to both passengers and service providers. The resultant platform for FITS in rural areas acts as a virtual transport market place in order to more efficiently match existing demand and supply for transport services. After describing our system, we examine its performance using different practical scenarios drawn from synthetic case studies based on transport patterns found in rural Aberdeenshire, Scotland.

Le Vine: An approach for assessing the market and impacts of serviced automobility [Imperial College London] [Paper\(pdf\)](#)

ABSTRACT: Recent years have seen the emergence of various types of serviced automobility, in the form of operating models such as station cars, car clubs and even more recently cars-on-demand. What these services have in common is that they challenge the predominant nature of car use in which large up-front expenditures are required on fixed costs, in exchange for automobility on a comparatively low per-use basis. Such services also have in common that they challenge traditional techniques for analysing personal travel in which the unit of analysis is a trip or a tour. For any given journey, it is a near-certainty that using a personal car would involve less expense and hassle than using, say, a car from a car club. The value proposition to potential customers, however, relies on serviced automobility making sense for people who have some but relatively modest needs for car access, in that the fixed costs and bother of car ownership are avoided. The material presented in this paper is the culmination of a PhD study into understanding the market for serviced automobility. The research questions motivating this work are 1) how large is the market for these sorts of services, and 2) what are the knock-on effects? Following a brief discussion of the background relating to this material, purpose-developed theory is presented to describe the nature of the value proposition of serviced automobility as compared to either owning a car or being car-less. This theory is based on drawing explicit bi-directional links between 'strategic' choices in the travel domain such as purchasing a car or joining a car service, and 'tactical' choices such as how to perform day-to-day journeys, whereas traditional travel demand analyses specify such choices to be made in a sequential manner. 'Strategic' choices are generalised, from a starting point of whether or not to own a car, to also include owning a bicycle or public transport season ticket, or a subscription to a car service. The theory is then operationalised using a combination of revealed- and stated-choice data, in order to take advantage of their relative strengths. The revealed-choice data are a sample of 300 London households who took part in the 2004/05 UK National Travel Survey, which was enriched using online travel planning services to identify the journey characteristics of unchosen but available itineraries. The stated-choice data comes from a survey instrument designed specifically for this study, which asked respondents to make a pattern of choices indicating how they would get around through the course of a representative week. The survey was innovative in another respect, as it incorporated 'efficient' design principles in a unique constrained manner, in an attempt to balance between the statistical desirability of an efficient design and ensuring plausibility in the stated-choice game. The strategy for addressing the challenges of integrating the two datasets into a single analysis is discussed. Findings are presented with respect to two distinct forms of serviced automobility, one being the traditional car club model and the other being the 'cars-on-demand' system where cars are distributed across an urban area and able to be used for journeys on a one-way basis. (Such systems are beginning to appear in North America and the Continent, with quite high rates of take-up.) Findings are presented for a series of scenarios based on introducing these services to different parts of London and with different service features. The implications of the rates of take-up and usage of serviced cars are discussed as they pertain to usage of other methods of personal travel and demand for parking in urban and suburban neighbourhoods. The results are somewhat surprising: the prospective one-way system, for instance, can be expected to have a market penetration of some three-and-a-half times as many Londoners than the car club service model, though the

overall impact would be a net increase in car driving within London (including both personal cars and serviced cars). In the case of car clubs, the majority of people using the service are predicted to drive more than they otherwise would, though the minority who would drive less would each drive a lot less – and the net effect on the amount of car traffic would be broadly neutral. Lessons learned from employing the newly-proposed analytical methods are discussed, as well as the potential for wider applicability with respect to personal mobility, together with the open questions suitable for further enquiry.

Wright: Designing flexible transport services: guidelines for choosing the vehicle type and level of flexibility [University of Aberdeen] [Paper\(pdf\)](#)

ABSTRACT: A recent report by the Passenger Transport Executive research group concluded that cuts in local government funding as a result of the 2010 spending review will lead to a 20% reduction in bus services. Furthermore, 70% of councils in England have already reduced funding for subsidised services or increased fares. It is also expected that the 20% cut in the Department for Transport's bus service operators' grant, planned for 2012-2013, will further impact on bus services with the withdrawal of many routes which were previously regarded as stable and commercially viable. All of this is leaving local communities and vulnerable users more isolated, particularly in rural areas. As a result local authorities are being forced to look at new ways of maintaining services while still reducing costs. They have once again begun to seriously consider the role that flexible transport services (FTS) or demand responsive transport could have within local transport infrastructure provision. This paper offers a new approach to guide local authorities in the selection of the most appropriate vehicle types and levels of service flexibility which should be offered in the design of FTS for different environments. The guidance is evidence based and has been derived from detailed analysis of the economic performance of seven FTS pilot applications plus a further five feasibility studies conducted as part of the FLIPPER project (funded by the EU Interregional Cooperation Programme INTERREG IVC). A major conclusion from the analysis is that the product of the demand multiplied by the average trip distance provides a very strong indicator as to the type of vehicle which should be used and the level of flexibility which should be offered. The paper will introduce the FLIPPER project and the FTS which it has supported. The data collected to enable cross site evaluation of these services will be described and the results of the analysis presented. Finally a set of service design recommendations on vehicle type and service flexibility are provided for different environments (displaying different levels of demand and average trip lengths). It is hoped that this will prove to be a valuable aid in helping decide on the most suitable and cost effective FTS solutions in both urban and rural environments across Europe.

3B Research Methods and Techniques

Jain: Where am I? Researching on the move. [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: Mobile ethnography, go-along-interviews and autobiographical travel accounts all have emerged as approaches to capturing the constituent factors of the journey experience and the practices surrounding travel across modes (e.g. Fincham, et al, 2010). It reflects how transport research has actively incorporating social science thinking (and vice versa), and emphasises a conceptual shift in perceiving data that focus on the detail of the individual traveller and the travel context as having value. Yet the researcher embarking on such an approach may find methodological murkiness and ambiguities about the process, as this route is an emergent practice. Using mobile research vignettes (on public transport and while cycling), this paper will deconstruct the process of generating data on the move. Firstly, it will consider how research questions direct the approach; secondly, demonstrate how the research was conducted in the field; and thirdly, illustrate ways of writing the research narrative. In particular, it will focus on where the researcher is situated within this process; here it will consider the relationship between the autobiographical narrative of the researcher and the observations of others, and the tensions that can lie between the two in reporting the research. In summary the paper will indicate will consider the opportunities for 'mobile methods' in transport research (for example, how such mobile methods augment and elucidate other methodological approaches) and question how such research should impact on the policy process.

Clark: Exploring the interactions between life-events, neighbourhood choice and car ownership transitions: Insights from a retrospective longitudinal survey [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: A great deal has been written about the factors associated with cross-sectional variations in household car ownership. For example, observing that car ownership levels tend to increase with increasing distance from urban centres. However, much less has been discovered about the time dependent processes through which household car ownership states arise. Accordingly, this paper presents a study which addressed how and why household car ownership changes over time. Noting the lack of an agreed theory relating to the dynamics of household car ownership, the paper first puts forward a new framework depicting a life event driven process of car ownership change. The framework emerged through a qualitative analysis of 15 biographical interviews and was tested through a survey of 250 households located in one inner-urban and one outer-urban neighbourhood in Bristol. The results confirm the life event driven nature of car ownership level change and reveal that car ownership level changes are also strongly dependent on life stage. Younger households have a tendency to increase car ownership level from zero to one or more cars as they move towards middle age. Vehicle relinquishments are more likely to occur in older age following retirement in association with health and income constraints. Over 70 per cent of car ownership level changes recorded by the survey were associated with either a change in working circumstances, cohabitation, an adult joining or leaving the household, residential relocation, child birth or offspring reaching driving age. The survey also reveals a process of population churn in the two neighbourhoods and suggests that this acted to maintain both a stable population composition (in terms of life stage characteristics) and a stable aggregate car ownership level in the period since the 2001 census.

Wilson: Techniques for the Inference of Mileage Rates from MOT data [University of Southampton] [Paper\(pdf\)](#)

ABSTRACT: In 2005, the Vehicle and Operator Services Agency (VOSA) introduced a computerised system for reporting MOT (roadworthiness) test results and storing them in a Department for Transport (DfT) database. In November 2010, the DfT published this data - consisting of the results of 150,000,000 MOT tests from 2005 to the spring of 2010. Some fields, such as vehicle registration plates and unique VTS (vehicle test station) identities have been withheld from the published data in order to preserve anonymity. However, what remains still contains a wealth of information that is not available elsewhere. In addition to the results of the MOT test itself (including detailed reasons for failure), the data include: the vehicle odometer (mileage) reading; the vehicle manufacturer, type and engine capacity; the vehicle's year of first use; and the top-level postal area (letters only from the postcode) of the VTS. An unadvertised feature of the published data is that an internal database index may be used to track many individual vehicles from year to year throughout their test history. In consequence one has (on an individual vehicle basis) sets of (date,odometer) pairs, so that one may infer the average mileage rate of a vehicle between a pair of tests. This paper outlines Mathematical techniques that use large sets of these pairs to infer mileage rates across the vehicle population: (i) statically; (ii) on a given date; and (iii) for a given calendar year. In particular, vehicle usage may easily be disaggregated over vehicle age, class and geography, and longitudinal trends in usage may also be derived. Provocative examples will be provided. This work formed part of a wider collaboration with S. Cairns and S. Notley (TRL), F. McLeod (Southampton), J. Anable (Aberdeen) and T. Chatterton (UWE), funded by EPSRC EP/J004758/1.

3C Developing Countries

Akyelken: Transport Infrastructure Development and Female Labour Force: A multi-level analysis of female employment in Turkey [University of Oxford] [Paper\(pdf\)](#)

ABSTRACT: Over the last decade, several studies have been carried out to assess the impact of transport infrastructure development in terms of economic growth. In addition to travel time savings and increased freight volumes, economic externalities of transport infrastructure have been widely discussed at different scales. The labour market is particularly crucial for the role of transport infrastructure in the economy. Recently, it was emphasised that additional transport investment is not a sufficient condition for economic growth, but acts in a supporting role when other factors are at work. Economic externalities, including improvements in labour market economies, are one of the main necessary conditions and are supposed to be supported by political, institutional and financial conditions for bringing about economic development. The present study aims to extend the conditionality argument in two ways. First, the social and cultural contexts in which the (both developed and developing) regions are embedded are considered. Second, transport infrastructure is extended to cover transport infrastructure endowment, as well as improvements to it, which is indicated by annual additional investment in the region. The empirical analysis on Turkey explores the association between female labour and

transport infrastructure endowment and improvements in the existence of socio-cultural conditions in Turkey. In doing so, the determinants of female employment are also discussed from the perspective of physical capital development initiatives. Elucidating the association between economic, physical and socio-cultural determinants of female employment requires a carefully selected composite literature to position the question addressed in this paper. The analogy between two different strands of research is illustrated, utilizing the impact of development efforts on women and the labour market implications of highway development. The linking aspect is the role of culture, which influences the status of women during the development process. This expands the explanation of the role of transport infrastructure in development and culture to the changing physical landscape, articulating certain groups of people and regions. Turkey is a useful case study for the following reasons. First, although the real Gross Domestic Product (GDP) growth rate is around 6% (excluding the crisis period of 2008-2009), both female labour force participation and employment remain significantly low. Second, infrastructure investment in the country has dramatically increased in the last six years, and has been mainly targeted at low-income regions, where female employment is particularly weak (EBRD, 2010). For the empirical model on Turkey, the 2006 Household Structure Survey (HSS) and the 2009 Labour Force Survey (LFS) are utilized together with the cross-regional statistics on motorways, roads and transport infrastructure investment in 2003-2009. The 2006 HSS is used to form the perception indices that indicate the extent that gendered household roles are biased towards women and individual beliefs, as well as the religious beliefs, decision power of men in the household and participation in cultural activities. Pooled with the transferred indices, the 2009 LFS is used to construct a multilevel binomial logistic regression model with the status of woman in the labour market (paid employed or not in the labour force) used as a dependent variable. At the regional level, transport infrastructure investment, motorways, provincial roads, the number of secondary schools, individual beliefs and other socio-cultural family characteristics are used, whereas age, education, number of children in the household, and non-labour income (e.g. husband income) are examined at the individual level. By employing multilevel models, this paper provides a conceptual framework of the relationship of the contextual effects of regions and population compositions with female employment in Turkey. First, the regional variation is shown to hold after controlling for individual-level explanatory variables. Second, none of the transport infrastructure stock and investment variables was found to be significantly associated with female employment. Lastly, it is observed that the association between female employment and transport infrastructure becomes significant when considered together with educational attainment. Overall, the analysis illustrates the claims that transport infrastructure is a conditioning and a complementary factor in the existence of socio-cultural conditions, rather than an influence on development alone.

Ikem: Static Multiclass Truck Assignment: An application to Nigeria [Port Operations Research and Technology Centre, Imperial College London] [Paper\(pdf\)](#)

ABSTRACT: A problem commonly encountered in developing countries is the development of the city around an historic port, creating problems of traffic congestion on the approaches to the port. At the same time, ports are key to economic development, so finding ways to improve port access are important. Attention is being increasingly given to the role that inland container depots may play in improving port access. In the case of Lagos, an existing but no longer used railway line connects the port to the hinterland. This paper forms part of a study looking at the case for an inland container depot on the inland side of Lagos connected to the port by the railway line. In order to estimate the potential impact of such a development on traffic congestion in Lagos, a traffic model is required. This paper reports on the development of such a traffic model. The road infrastructure in developing countries is often poorly managed and maintained. For this reason, the physical condition of the links has a large influence on the speed at which a vehicle can travel and so influences the time spent en route. Thus, the link cost function used in assignment should not only take into account the effect of vehicle interaction but also the road condition. This paper presents the conceptual framework for assigning import and export freight traffic to road networks while considering the particular characteristics of the freight haulage industry in developing countries, taking Nigeria as a case study. The framework when applied predicts the distribution of freight through the road network. It proposes the use of a static multiclass user equilibrium assignment model to determine route choice and is based on the use of an existing inter-zonal container flow survey database. The classes represent containerized cargo categorized by the type of vehicle carrying the container or its contents. The class-specific link cost functions are non-separable, meaning there are interactions between the classes. Another feature of the model is that, in contrast with other assignment models, freight traffic is modeled while non-freight traffic is treated as exogenous. An example is used to illustrate the proposed model and solution algorithm.

ABSTRACT: Since reducing accident duration is one of the main targets of Traffic Incident Management (TIM) process, several approaches have been applied to analyse and predict accident duration. The main focus of this research is investigating the effects of traffic accident characteristics on accident duration using fully parametric hazard-based duration models with emphasis to Accelerated Failure-Time (AFT) metric. This analysis will assist traffic accident responders and traffic operators to understand what factors affect each part of the accident duration and as a result improving the efficiency of traffic incident management by better use of the available resources. This might in turn lead to minimise the adverse impacts of traffic accidents such as traffic flow, air pollution, fuel consumption, and secondary crashes. In order to analyse each interval time of the total accident duration, fully parametric Accelerated Failure Time (AFT) model was utilised. This model applied for both metropolitan network accidents and Abu Dhabi highway network accidents over a period of one year. All data of traffic accidents in this research was extracted from the UAE Federal Traffic Statistics System (FTSS) and Abu Dhabi Serious Collision Investigation Section (ASCIS). The FTSS database has comprehensive accident related information such as temporal characteristics (time of day, month of year), geographical characteristics (road, location), and accident characteristics (severity level, weather condition, injury details, and vehicle details). The second database is the records of ASCIS. These records contain the details of accident duration including reporting time, response time, clearance time, and the total time. Due to the data limitation, only four sub-models developed (three for urban accidents, one for highway accidents). The first model developed was reporting time of urban accidents. The results show that the average reporting time was 8.23 minutes and Log-normal AFT model with gamma heterogeneity provided the best fit to the accident reporting time. Also, reporting time found to be varied based upon temporal characteristics only in this research. Accidents occurred out of peak period are associated with lower reporting time comparing to peak period accidents. Another significant temporal variable found to be day of week. The results shows that accidents occurred in Friday were associated with lower reporting comparing to other days of week. However, it should be stressed that this reduction is still marginal (0.25%). Moreover, the results show that the reporting time of the accidents occurred on March was associated with lower reporting time comparing to the accident happened in other months of the year, whereas the reporting time of accidents happened in May were allied with higher reporting time. The second model developed was response time of urban accidents. The results show that the average response time was 6.48 minutes and Weibull AFT model with gamma heterogeneity provided the best fit to the accident response time. Response time found to be various base on some variables of the temporal characteristics and Geographical characteristics. The results show that accidents happened in February experienced lower response time comparing to the accidents that happened in other months of the year. Also, accidents occurred in Monday experienced higher response time comparing to other days of week. Finally, accidents occurred in Eastern Ring Road found to be associated with lower response time (18.12%) comparing to accidents occurred on other roads of the city. Clearance time of urban accidents was analysed in the third model. The results show that the average clearance time was 26.26 minutes and Weibull AFT model with gamma heterogeneity provided the best fit to the accident clearance time. Clearance time found to be various base on 11 statistical significant explanatory variables. Accidents occurred out of peak hours were associated with longer clearance time (17.59%) comparing to the clearance time of accidents occurred during peak periods. Additionally, the months such as August, January and March of the year were found to be significantly affect clearance time. One of these months (August) was associated with shorter clearance time (23.33%), whereas the other two months (January, March) found to be associated with longer clearance time (23.71%, 36.81% respectively). Furthermore, street variable namely Meena Street was associated with longer clearance time (39.05%). What's more, accidents that occurred on Commercial area and Car park were associated with lower clearance time (15.01%, 25.08% respectively). On the other hand, "Hit object" accidents had longer clearance time (34.49%) comparing to the clearance time of other accidents type. Finally, logically accepted result found which is longer accident clearance time observed when there was an increase in the number of casualties and the number of vehicles involved (3.80%, 13.97% respectively). The fourth model investigates the response time of highway accidents. The results demonstrate that the average response time was 14.22 minutes and Weibull AFT model with gamma heterogeneity provided the best fit to the accident response time. 11 significant variables found to be the base on differences in highway accident' response time. Three months of the year (February, April, and May) were found to have a significantly shorter response time than other months. In addition, it was found that accidents which occurred on Wednesdays were associated with longer response time. Furthermore, accidents occurring on the Mussafah and Al Mafraq-Sawameq highways were associated with a lower response time, whereas accidents occurring on the Abu Dhabi-Tarif and Sweihan highways were associated with a longer response time. Moreover, accidents which occurred when the road surface was covered by sand were associated with a longer response time. In terms of the accident characteristics, it was found that if the accident type was "Hit pedestrian" or "Hit object", the response time was shorter than for other types of accident. In addition to

that, the results show that there are many weak points in the current practices of traffic accident management in Abu Dhabi. Finally, several decision trees were developed per each interval time based on the resulted significant variables. This tool can be utilised as a decision making tool that traffic operators will be able to make use of it to take decisions regarding traffic diversion, and to disseminate traffic related information to the travellers.

3D Modelling Vehicle Emissions

O'Brien: Air Quality and Environmental Justice in the North East of England [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: The Climate Change Act 2008 set a legally binding target of at least an 80 percent cut in carbon dioxide (CO₂) emissions by 2050 against a 1990 baseline. In light of this agenda, the focus of existing and emerging legislation has been placed on developing and delivering low carbon strategies to meet short and long term goals. It is becoming increasingly apparent from recent policy that, while addressing greenhouse gas emission abatement agenda, existing policies could be exacerbating local and regional air pollution. There is growing concern that losing sight of air quality goals through the prominence of CO₂ agendas may result in failure to meet targets in both areas. Relationships between air pollution, health and deprivation potentially result in the highest cost to both the public and the government in terms of increased mortality and morbidity; hence establishing links between them is important and justifiable. The concept of Environmental Justice (EJ) questions whether certain socioeconomic groups bear a disproportionate burden of environmental externalities, and whether policy and practice are equitable and fair. Recent analysis of EJ at the national level in the UK has produced evidence of environmental injustice in the distribution and production of poor air quality. This research aims to produce a robust air quality modelling framework to map the effect that implementing low carbon transport strategies has on air quality in the North East of England. To assist in the development of the regional modelling and increase understanding of local level interactions, a case study at a finer spatial resolution is being undertaken centred on the City of Durham. Preliminary findings from microscale modelling are presented, and implications for wider regional modelling are explored. Additionally, an evaluation of the effect of low carbon strategies on the EJ of air quality in the North East is discussed.

Matar: Personal Exposure to indoor and outdoor air pollution near quiet, busy and congested streets [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: A number of studies have stated that most people spend more than 80% of their time indoors, therefore, exposed to both indoor and outdoor air pollution. Occupants of a building are exposed to total pollution, which is composed of indoor sources (cooking, smoking) and infiltrated outdoor pollution. Many studies have observed a link between indoor and outdoor pollution. The fabric of a building (doors, windows, ventilation etc.) has an influence on the infiltration of outdoor pollution into the building. There is a lack of knowledge of infiltration of pollution into buildings due to traffic on roads within their vicinity. The pollution levels along a road will vary continuously depending on traffic flow characteristics namely smooth, interrupted or congested. The aim of this study is to investigate personal exposure to indoor and outdoor air pollution simultaneously as a function of traffic characteristics and the activity patterns of people. This paper outlines the methodology adopted for static and dynamic monitoring of air pollutants of the occupants of six houses living closer to quiet, busy and congested streets and provides preliminary results of the survey campaigns carried out. The study area is Gosforth in Newcastle Upon Tyne, UK. Gosforth is located in the north of Newcastle city centre and it is one of two air quality management areas (AQMAs) declared by Newcastle City Council. The High Street, a narrow canyon, is a major radial running through Gosforth and it carries high levels of traffic to and from the city centre. An Automatic Urban and Rural Network (AURN) air quality monitoring station is located at a junction in the High Street. Traffic characteristic data will be collected during the surveys and in the future from automatic traffic monitoring systems which along with the AURN air quality monitoring station data will be used to characterise the traffic flow into regimes categories. Dynamic air pollution monitoring will be carried out by using a backpack equipped with monitoring devices (portable particle and carbon monoxide monitors and GPS device) to record spatial and temporal variations within specified microenvironments.

Robinson: Impact of electric vehicle users' recharging behaviour on well to wheel carbon emissions [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: The need to cut carbon emissions from the private vehicle sector is becoming an increasingly important issue. In the UK, it is anticipated that the electric vehicle (EV) will play a key role in contributing to the 80% emissions reduction target in the Climate Change Act 2008. Although there are no emissions at their point of use, there are carbon emissions associated with the electricity used to recharge the EVs' battery, which is generated from coal (870gCO₂/kWh), natural gas (370gCO₂/kWh), nuclear (zero emissions) and renewables (zero emissions). The contribution of these power sources to the overall grid mix varies depending on the time of day; meaning that the average carbon content varies from an 'off peak' minimum of 366gCO₂/kWh (at 03:00am) to an 'on peak' 466gCO₂/kWh at 18:00pm. Therefore, depending on when a vehicle is recharged, the carbon content of the electricity stored in the battery varies. The proposed paper will present a methodology for calculating the carbon content of the electricity stored in an EV battery, and apply this to six months of recharging data collected from a cohort of EV drivers taking part in the Switch-EV trials. Analysis showing the different drivers recharging patterns will be presented, along with comparisons of home, work based and public recharging times for both private vehicles and those in company fleets. For each EV, the subsequent carbon emissions will be quantified. The magnitude and distribution of these emissions will be compared graphically between vehicles, along with a comparison of the real world emissions against the theoretical minimum and maximum emissions based on the current UK grid mix. The potential emissions savings, assuming a switch to the minimum emission 'off peak' recharging scenario will then be calculated, based on the difference between the real world Switch EV data and this theoretical minimum.

4 Plenary

Cowie: Rail Freight in Great Britain – has privatisation made a noticeable difference? [Edinburgh Napier] [Paper\(pdf\)](#)

ABSTRACT: This paper briefly outlines the main changes brought about by the Railways Act 1993 with regard to the rail freight sector and then examines development of the sector since that time. It finds that although rail freight levels have increased, these increases fall well short of pre-privatisation aspirations and in the main have been as a result of changes that have occurred outside of the industry. The paper also finds little evidence of new operator entry into the rail freight business despite the removal of many legal barriers to operation. An overview of the main medium and longer term effects of rail freight reform is then given, principally through a literature review on US railroad deregulation, before productivity and scale effects within the British industry since privatisation are assessed. Productivity is found to have risen from negative values at the start of the period reviewed to very strong positive values by the end, and economies of scale, whilst significant, are estimated to be below a level that would represent a major barrier to entry. The need to achieve significant economies of scale therefore do not account for the low level of entry that has occurred since privatisation. Reasons for the industry's lack of significant development since privatisation are further considered under three general headings: industry performance, the wider freight market and the nature of the rail freight industry. The overriding conclusion is that policy needs to do more and be more innovative in incentivising the industry otherwise long term decline could very quickly set back in.

5A Technology and Low Carbon Transport (1)

Rivas Perez: Employment Vulnerabilities and Mobility Resiliencies in the NE of England [Institute for Transport Studies, The University of Leeds] [Paper\(pdf\)](#)

ABSTRACT: This paper is a timely contribution to the fields of social exclusion, transport mobilities and the geographies of employment and access to core services. It has been recognised for some time that differentials in everyday mobility contribute to processes of social exclusion. These differentials between different communities result in negative consequences for the access to employment and core services. The employment destination patterns of different socio-economic groups across a large urban area were analysed using kernel probability analysis of the Tyne & Wear Household Travel Survey (TWHTS), a large-scale travel census, and combined with key socio-economic data-sets. This analysis shows that different communities have markedly different employment geographies. This is related to availability of suitable work that can be accessed within the often-narrow time-geographies imposed by inadequate transport systems and the complexities of household scheduling. Using focus groups, whose participants were drawn from deprived neighbourhoods of Tyne & Wear, and included both those in work, job-seekers, and full-time carers, the issues of barriers to mobility and the resilience of household travel mobility in the face of changing circumstance were explored. The reliance on often very local employment by inhabitants of deprived neighbourhoods makes them vulnerable to shifts in both the geographies and temporalities of employment across an urban area, changes in household mobility. Particular difficulties arise when households attempt to combine child-care with work, with a lack of child-care services particularly in deprived neighbourhoods. Access to mobility is further compromised by reliance on an inflexible public transport system that does not allow for complex journeys within narrow time-windows.

Pridmore: Influence and Innovation – can patterns be detected in the take up of new vehicle technologies? [University of Aberdeen and EC Joint Research Centre] [Paper\(pdf\)](#)

ABSTRACT: Innovative passenger vehicle technologies – hybrid, electric and hydrogen vehicles - are anticipated to make significant, essential, contributions to carbon reduction in the transport sector. Current understanding of consumer uptake of these vehicles is, however, limited. One area of increasing research interest is how an individual's purchasing decisions can be influenced by other people's behaviour – what their peers and others say and do. For example, it is suggested that the attractiveness of a new vehicle technology can increase with its market penetration. This can be linked to influence through conformity and learning from other people's positive experiences. This paper aims to contribute to this important research area through testing the hypothesis that this influence could be detected quantitatively. Analysis of vehicle ownership in the UK and Sweden, spatially and temporally, is undertaken. First, GIS and Geoda (spatial analysis software) are used for a high level analysis of vehicle ownership – who owns what and where. Then, patterns are examined. Clusters or neighbouring 'hot spots' – ownership rates which are higher or lower than would be expected, by chance - are identified. The impact of socio-demographic and other influences such as exemption from congestion charging schemes are incorporated. In terms of influence, the presence of high level clusters, once these co-variables are accounted for, could indicate social process and diffusion. Temporal and spatial aspects – the diffusion of these high level clusters spatially over time to neighbouring areas - strengthens this inference. The outcomes of the analysis will be used to inform the choice of case study areas for qualitative research to further understand the potential role of peer and others' influence in vehicle purchase decisions.

Galatioto: Impact of virtual mobility on carbon emission: case of internet shopping [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: Transport, crucial to the economy, is one of the most important of infrastructures, in which international organisations are making considerable investment to deliver long term sustainability. Over the recent decade, Information Communication and Technology (ICT) has introduced innovation which has modified household activity, travel patterns and behaviours in our everyday lives, a particular example of interest is Internet shopping. This paper seeks to investigate changes in the characteristics of travel behaviour brought about by internet shopping and their implications on longer term sustainability, given that goods need to be delivered to the home and the time saved potentially generates extra trips. The data was collected in two ways, using a self-complete web-based questionnaire (456 respondents) and by interviewing shoppers in Newcastle (112). Details of questionnaire design; methodological approach; carbon emissions calculation of saved, substituted and delivery trips; statistical analysis and results are presented. Respectively, of internet (in-

store) shoppers 38% (47%) owned a minimum of one car and 11% (10%) more than three, 72% (69%) of vehicles were petrol and 28% (31%) of cars older than 8 years. 57% of internet shoppers visited in store shopping more frequently than in-store shoppers (53%). On-line shoppers (59%) purchase at least three commodities with preference for electronic goods (77%) and books (75%). 72% on-line shoppers saved more than 1 hour and leisure was main substitute activity. Delivery vans' fuel consumption (directly correlated with CO₂), ranged from 2.78-9 miles/litre, due to differences in vehicle type, driver behaviour and urban traffic congestion. What if scenarios modelling of emission, including cold start, were carried out for individual households and deliveries. The number of customers visited in a delivery was found to be very sensitive with overall savings found to be typically 205 grams/customer, with 13 customers served, suggesting that neighbours co-ordinating their deliveries result in substantial savings.

5B Accessibility

Craig: A Participatory Approach to Assessing Rural Accessibility Requirements [University of Aberdeen] [Paper\(pdf\)](#)

ABSTRACT: Being able to benefit from the opportunities available within their society should be a right for individual citizens. However, the higher unit cost of serving areas of low population density and high settlement dispersion means that securing this right in rural locations can depend on physical mobility. This in turn depends on the provision of appropriate transport; an opportunity in itself and one which is not immune from issues of cost. A two-fold problem exacerbated by limited resources therefore exists. Firstly, how the optimum opportunity set could be made available to people living in rural locations. And secondly, how those people could derive the maximum benefit from that opportunity set. The underlying contention of this paper is that to help resolve this problem, it is necessary to create a comprehensive picture of people's requirements both for opportunities and for the capabilities – particularly, in the rural context, transport related capabilities – that enable them to access, engage with and benefit from those opportunities. In other words it is necessary to create a picture of people's accessibility requirements. On-going research to explore how people living in rural locations could help to identify, capture and communicate their own accessibility requirements is presented. The discussion centres on the work of a small group of people drawn from settlements in rural Aberdeenshire, Scotland. That group are working in a participatory way to devise and trial an approach for building a richer understanding of the accessibility requirements of people living in and around their own settlements. If that approach proves feasible then it could help support the introduction of new services, the continuation of existing ones and the better use of resources for the benefit of all concerned.

Curl: The lived experience of accessibility: The importance of perceptions in measuring accessibility [University of Aberdeen] [Paper\(pdf\)](#)

ABSTRACT: This paper presents key results from a household survey undertaken in Nottingham designed to understand perceptions of accessibility. Emerging from the process of Accessibility Planning in the UK, the overall aim of this research is to compare the "lived experience" or individuals' perceptions of their accessibility to objective measures of accessibility used in transport planning. Accessibility Planning is the process by which accessibility problems are tackled, in order to reduce the barriers individuals face when accessing key destinations, and aims to achieve outcomes related to social inclusion and mode shift. While this process recognises multiple potential barriers to access, including journey time, location of services, cost, safety, travel information and travel horizons, the indicators against which progress is measured tend to be focussed on more easily measurable indicators such as journey time, using traditional measures of accessibility. However, in order to achieve the expected outcomes (in terms of social inclusion/mode shift) it is important to understand individual (subjective) perceptions of accessibility which will ultimately influence behaviour (Morris, 1979) and which may differ from objective measures of accessibility. While differences between objective and subjective social indicators are to be expected (Pacione, 1981), there is little understanding of the relationship between objective and subjective accessibility, as van Acker et al (2010) point out, while there has been considerable work focussing separately on both objective and subjective measures in transport but rarely an understanding of how subjective measures relate to objective conditions. The paper presents the results of a household survey undertaken as part of Phd research. Other work undertaken has included interviews with local authority officers responsible for Accessibility Planning and qualitative work using a mental mapping approach. The paper seeks to offer insights as to how and why individual perceptions of accessibility differ from objective measures of accessibility. The paper is structured as followed: Following the introduction and brief review of existing research into measuring and understanding perceptions of Accessibility, the survey methodology and approach to selection of sample areas is presented. Details of one part of the analysis, focussing on the difference between

objective and subjective measures of journey time accessibility is then presented before turning to address how individual's rate their level of accessibility. Finally the analysis seeks to understand what factors (objective and subjective) are important in explaining individuals' perceptions of accessibility. A household survey was sent to 2400 households in the Greater Nottingham area in order to elicit perceptions of accessibility which could then be compared with a national dataset of objective measures of accessibility - the Core Accessibility Indicators (DfT). The questionnaire asked questions relating to: travel activity; overall perceptions and satisfaction with accessibility in the local area; perceived journey times to a number of destinations; subjective ratings of key aspects of accessibility; and demographic information. A sample frame was selected using a multi stage cluster sampling process. Sample areas were stratified according to objective accessibility measures, indices of multiple deprivation (IMD) and mode of travel to work (Census 2001). A combination of the Royal Mail Postcode Address File (PAF) and the edited electoral register was then used to select individual households. The response rate was 14% (n=328), varying considerably across geographical area and influenced by IMD. Results suggest that while there is some correlation between the survey reported (subjective) and core accessibility indicator (objective) journey times across different destinations and modes of travel this is not a perfect linear relationship and taking the raw values into account there is a significant difference between the values in the two datasets. Differences are partly as a result of inaccuracies in perceptions (Witlox, 2007) and inaccuracies in calculation of objective measures. This study also suggests differences occur between individuals' with the same levels of objective accessibility which can be attributed to socio-demographics, attitudes to car use; community and environment; as well as familiarity with trip. Subjective ratings of journey times (poor-good); public transport frequency (infrequent-frequent) and choice of destinations available (limited choice-wide range of choice) are related to the objective indicators, but ratings are more strongly related to individual attributes. Not all individuals in a given area (with the same level of objective accessibility) perceive this in the same way and again these differences can mainly be explained by individual attributes. Therefore perceptions in accessibility are related to both objective conditions and individual attributes. If, as suggested by other work in this Phd, policy approaches such as Accessibility Planning wish to alter travel behaviour to achieve mode shift and social inclusion outcomes they should focus on both the objective or measurable levels of accessibility through the land use planning system and individual perceptions of accessibility. As suggested by Stanley and Vella - Brodrick (2009), policy based on neither objective or subjective measures alone are sufficient. Rather, both are needed if desired policy goals are to be achieved. Although perceptions can also be affected by changes in accessibility brought about through infrastructure or land use changes, they might also be changed by focussing on more individualised interventions as this work suggests that individual's demographics and familiarity with trip are as important as actual levels of accessibility in influencing their perceptions and therefore potentially their behaviour.

Titidezh: Modelling Transport Accessibility to Healthcare Facilities using Statistical Methods and GIS
[Loughborough University] [Paper\(pdf\)](#)

ABSTRACT: Transport accessibility to healthcare facilities is a priority issue in the United Kingdom and this has been recently demonstrated by the shift away from 'providing healthcare in acute hospitals' to moving care 'close to home'. It is not easy to measure transport accessibility since it is often highly subjective and deterministic. Current approaches to measuring accessibility primarily focus on the creation of accessibility contours based on distance or travel time and therefore such methods ignore individual differences (users' perception and their transport usage) and area-wide factors. This may result in health inequality with respect to accessibility to healthcare facilities. The objective of this paper is, therefore, to develop a user-based accessibility model by focusing on both individual transport usage (i.e. access to different transport modes and fuel consumption) and area-wide factors (e.g. transport network, public transport provision, safety/security and area deprivation). A questionnaire survey was carried out to measure users' perceptions of the accessibility to various healthcare facilities at Loughborough, Leicestershire. The responses from a total of 300 completed surveys are integrated with various datasets obtained from a range of secondary sources (e.g. Census, Ordnance Survey, Index of Multiple Deprivation) using a GIS technique. A multilevel (i.e. individuals nested within local areas) statistical model is employed to develop a relationship between user perception on the accessibility and the influencing factors affecting accessibility. The initial results suggest that area-wide factors such as income- and crime-indices along with the level of public transport provision, travel time by car, fuel consumption and the size of foot/bike catchments significantly affect accessibility to healthcare facilities. Based on the weighting of each of the factors, a range of policies can be developed that could lead to the reduction in health inequality in terms of fair access to health care provision.

5C Buses

Mahmoud: Using AHP to measure the gap between user-defined perceived and desired quality of bus service: A case study of Belfast City [University of Ulster] [Paper\(pdf\)](#)

ABSTRACT: Enhancing passenger patronage through a behavioural shift from car-based travel is an area of key policy concern in many developed countries and in particular the UK. Recently, the focus of public transport provision has shifted towards improving service quality, prioritising improvement schemes and reducing car dependency. As a result, it is essential to measure the level of quality offered by public transport services not only to identify the weaknesses, but also the desired strengths of the services, and moreover, to inform policy makers of the required quality improvements. Policies which aim to increase usage rates of public transport should be able to accommodate the level of service required by current users, and furthermore, the quality demanded by potential users. A review of the transport quality literature indicates that both desired and perceived quality complement each other and provide a comprehensive perception-based evaluation of service quality. Although attempts have been made to examine the quality of bus service through the evaluation of user's perceptions and attitudes, the application of desired quality measures are fairly limited. A review of consumer behaviour literature indicates that quality improvements have significant impact over customer satisfaction, level of involvement, and thereby behavioural intentions. It has been indicated that behavioural intentions are influenced not only by the perceived values of service quality, but also by the potential desires and expectations from the service. Therefore, an exclusion of the desired quality measures from the quality monitoring process could lead to limited results. A combined (desired/perceived) quality measure offers more than just information on the daily experience and perception of current users, but also knowledge of the expectations and hopes of potential users. The desired quality represents a keystone of the service quality management loop (performance and perception), as it influences the quality targeted by service providers as well as the quality perceived by current customers. Furthermore, an identification of the gap between desired and perceived quality is a prerequisite to the prioritisation of quality schemes and the need to meet the differential demands of each group (current and potential) through policy interventions. As a result, this research examines the quality of bus transit service by measuring user defined perceived and desired quality. The combined quality measure developed in this research utilises the data from 424 questionnaires collected across the City of Belfast. Participants evaluated the service quality by expressing their attitudes across a set of 29 quality indicators classified into 6 categories. Desired and perceived quality measures were expressed through judgments of importance and satisfaction towards bus quality indicators. The research developed two AHP (Analytical Hierarchy Process) models; each was constructed from two layers (quality indicators and service attributes). These models were developed to, firstly, identify the weight of importance for quality indicators, and secondly, to measure the level of satisfaction towards bus service for each category of users (current & potential). The data derived from the AHP models (importance/satisfaction) was analysed in various phases. A series of correlation analyses was carried out to identify different patterns of relationships between perceived and desired quality, furthermore, analysis of variance (ANOVA) was conducted to identify the level of variation between current and potential users towards bus service quality. An overall all quality measure of bus service quality was operationalised by combining weights of importance and satisfaction into a single output measure (quality index). Two main concepts were implemented in the process of developing bus service quality index: firstly, both current and potential users were given equal weight in the process, and secondly, the most reliable indicators give the most contribution to the final results. The results show that although both current and potential users have higher expectations from operational and fare attributes, they don't share the same attitudes towards bus service quality; potential users place the most importance on indicators related to journey characteristics (e.g. reliability, ease of access, multi-mode tickets, park and ride, and travel time), whilst, current users place the most importance on indicators related to efficient travel and the cost of journeys (e.g. network coverage, reliability, frequency, monthly discount, and ease of purchasing tickets). These results indicate that most of the current users were aware of the time associated with bus journeys. In addition, the research found that: the interaction between different quality measures (perceived/desired) generated new patterns of bus service quality assessment, and these patterns vary significantly by user category. Lastly, the implementations of the research findings provide policy makers with adequate information directed at different categories of users.

Andrews: 'Faring Well?' The Contribution of Free Bus Fares Policy to Maintaining and Improving Quality of Later Life. [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: Since April 2008, older people in England have been entitled to unlimited area-wide free travel by bus after the morning peak period, as part of the Government's wider initiatives to mitigate social exclusion in older age. The policy has resulted in a substantial rise in bus patronage amongst eligible pass holders, and consequently increased the cost to the Government of subsidizing these journeys. In the current times of economic volatility and uncertainty, it is thus important to understand the ability of Concessionary Fares policy to effectively and efficiently deliver its purported goal of improving quality of life in older age, an area which has previously been under-researched. This paper recognises there is currently only limited evaluation of the direct and indirect effects and consequences of providing a free bus pass relating to older people's quality of life, and to whom these benefits accrue. In particular there remains a poor understanding of the mechanisms and processes that underlie the translation of the scheme into meaningful individual benefit. This gap in knowledge is reflective of a research approach of the policy hitherto that has favoured a solely aggregate approach to investigating the effects of the policy, at the very expense of the rich contextual information that can provide an insight into the meaningful benefits derived from the scheme. This paper, drawing on relevant theory from an extensive literature review, presents analysis of a mixed methods research project, which entailed an on board survey of 487 concessionary pass holders on different four routes on an operator's network in Southwest England, and a series of ten focus groups with pass holders in different bus-using contexts. First, the paper supports previous research, finding that the benefits derived from a free bus pass vary considerably amongst different groups of pass holders, dependent on factors such as whether they have access to a car, whether they have a bus available, their ability to use it, and the age of the pass holder. The research supports growing recognition of the hierarchical nature of older people's mobility needs, in that functional mobility tasks often must be achieved before 'higher level' needs can be achieved, such as fulfilling a sense of independence, freedom and enjoyment. It is argued that the bus, by its nature, is in many cases reported to be more effective at assisting pass holders in realising these higher level needs, than providing for the more functional aspects. For example, during the focus group discussions, the bus was found to be more amenable to leisure and discretionary journeys, where there are less time pressures or deadlines. This perhaps suggests that the scheme provides greater contribution to improving the lives of those who already have an acceptable quality of life, raising questions about the social equity of the policy. Second, it is found that having a free bus pass has meant that some pass holders can make trips since having a pass that they could perhaps have afforded previously, but would not have been able to justify making if a fare were applicable. It is argued that these types of marginal/discretionary trips now being made as a result of the policy are often the most valuable and significant in the lives of older people. The evidence from this research suggests that on board social interaction and engagement is an important aspect of the trip, with the bus providing a neutral, informal space for this to occur, and one which is less stigmatising than traditional formalised spaces for older people. Furthermore, it is found that the opportunity to be social on the bus can in some cases represent a competitive advantage of the bus over the private car, thus stimulating sustainable modal shift of this growing segment of the population. Third, the paper finds that the ability and opportunity to increase trips by bus a result of the pass represents only one of a number of benefits afforded by the pass. Indeed, no statistically significant relationship was found between pass holders' actual increase in bus trips and them reporting an improvement in their quality of life since having a pass. Indeed, a third of survey respondents did not alter their bus trip frequency since having a pass, yet still reported an improvement in their quality of life. This suggests that the current aggregate-level evaluative approach to the policy may be undervaluing the true benefits of the scheme, through its inability to capture non trip increase-related benefits of the scheme, such as avoiding driving at night, the potential to travel (where travel is not actually undertaken) and the longer-term option to reduce car use. The paper concludes that policy makers evaluating the policy should move beyond considering solely its effects on bus trip frequency and route choice, in other words as a transport policy, to considering it as a social policy, recording its important indirect role in facilitating activities that would be less likely to have taken place prior to the scheme. It points to the irony that, in some cases, the benefits that are currently least effectively measured are in fact often reported to be the most significant contributors to meaningful improvements in quality of later life. Indeed, following this argument, removal of the scheme could potentially have a greater impact than simply reducing the amount of travel by bus. As the benefit of using the pass seemingly moves from each individual trip towards more general holistic benefit, policy makers are faced with the challenge of measuring these (often intangible) benefits that can provide justification for the existence of the scheme. Finally, the paper supports a move to smart card data analysis, which would allow the provision of useful and accurate data on the individual trips and provide the opportunity to link these data to trip makers' characteristics, thus gaining further insight into the distributional equity of the scheme.

Clayton: Is the bus boring? [UWE] [Paper\(pdf\)](#)

ABSTRACT: Contemporary research on travel-time use challenges the notion that travel-time is wasted, but is it always a positive experience? Previous studies have suggested that engaging in activity during travel-time increases the utility of a journey, thus regaining and maintaining control over time on-the-move is hypothesised to have a positive effect on the passenger experience. The results presented here challenge this finding in the specific context of bus travel. To explore bus passengers' travel-time use and the bus passenger experience, this research draws upon results from a mixed-methods approach: online Facebook discussions, focus groups, and a survey of 840 bus passengers conducted in Bristol, UK. Despite travel-time activity on the bus being an integral part of many journeys, a consistent association with improvements in journey experience and service perception is challenged. The personalisation and privatisation of travel space through activities – from reading to listening to iPods – may be purposively sought to disengage from the bus community, however, such technology use and disengagement may be symptomatic of uncomfortable experiences such as boredom and stress, as opposed to a creator of positive utility or enjoyment. Furthermore, disengagement can negatively impact upon the sociality of the bus space. It is suggested that wider factors are of more primary significance than travel-time activity in forming perceptions and experiences. Specifically, the primacy of service aspects is discussed, alongside personal characteristics such as age and social disposition. The conclusions will consider the implications for transport policy and bus operations.

Fonzone: An empirical evaluation of the behaviour of public transport users [TRI - Edinburgh Napier University] [Paper\(pdf\)](#)

ABSTRACT: The choice of the routes in public transport systems characterized by high frequency services is traditionally modelled through hyperpaths. The analysis of the existing literature on spatial decision making brings to light some simplifications in the behavioural model currently used in the hyperpath approach which potentially limit the validity of its outputs: The influence of mental maps and of learning and habits is neglected; The availability of real time information is not taken into account; Travellers are supposed endowed with perfect computing ability; Only expected travel times are included in the utility function. Since most of research on route choice behaviour does not concern public transport users, a web-based survey has been carried out to assess whether and to what extent the above-mentioned simplifications underpinning the hyperpath models are relevant. The survey has involved frequent public transport users from 25 countries. Information has been collected regarding respondents' actual choices and stated behaviour under hypothetical scenarios. The paper presents the main results of the survey and provides a detailed analysis of the attitude of transit users to use available information and to deal with strategies and expected travel times.

5D Modelling (1)

Snowdon: Evolution of adaptive route choice behaviour in drivers [University of Southampton] [Paper\(pdf\)](#)

ABSTRACT: Traffic assignment, the process by which vehicle origin-destination flows are loaded on to discrete paths traversing a road network, has been traditionally approached as a non-linear optimisation problem where travellers are expected to each minimise their own travel time. While such models are suitable for obtaining an 'average' expected network state, traffic conditions on a day to day basis are inherently uncertain due to variations in travel patterns and incidents such as vehicle breakdowns, roadworks or bad weather resulting in fluctuations in realised traffic flows. Further, such models do not consider the transition from one 'average' state to another when an aspect of infrastructure is changed such as a new road opening or the introduction of long term roadworks. This paper therefore examines the evolution of driver route choice over time in stochastic time-dependent networks, specifically focusing on how individual experience of network conditions guides future decisions and its relationship with en-route switching opportunities. Existing algebraic and empirical models of route choice evolution are discussed, particularly using discrete whole path choices to assess benefits of information provision. We propose that incorporating adaptive path routing based on expected correlations in traffic flow behaviour is more suitable than fixed path models for capturing the extent of observed uncertainty in network conditions. We present this issue and explore through simulation a model where drivers adapt expected link travel times for a given trip based on a combination of previous experience and discovered link travel times on that trip. We show how adaptive behaviour produces travel times which are on average faster than non-adaptive behaviour, confirming the potential of this modelling approach.

Sivakumar: A Systematic and Empirical Analysis of the Spatial Transferability of an Activity-based Travel Demand Modelling System [Imperial College London] [Paper\(pdf\)](#)

ABSTRACT: Activity-based travel demand models are being slowly but steadily adopted in practice as they provide a disaggregate and behaviourally realistic representation of travel behavior, and therefore travel demand, thus enabling the analysis of a wide range of policies. However, most operational activity-based models are still based only in North America. The primary barriers to the adoption of activity based models have been: (a) the lack of clarity of the advantages of these models over the more traditional trip-based models, (b) perceived issues of data requirements, and (c) the resources required to build an activity-based model from scratch. As part of the Urban Energy Systems project at Imperial College London, we have developed an activity-based travel demand model system for Greater London, which is the first of its kind in the UK. The operational model system was developed based on TASHA, a household-oriented activity scheduling model originally developed by Roorda et al at the University of Toronto. The London implementation of TASHA was developed in 3 stages; in each stage only one of the modules (activity generation, location choice, mode choice) in the model system was recalibrated and localised using London data. This paper presents a systematic analysis of the transferability of TASHA, an activity-based travel demand model system that was developed in Toronto, to London. We analyse the extent to which each of the three modules is spatially transferable, by comparing in stages the temporal and spatial patterns of the predicted travel demand against the observed patterns in the LATS/LTDS data. This analysis points to certain travel behaviours as being more universal and transferable than others, and can therefore help planners decide where to focus their resources in developing an activity-based travel demand model. The analysis also quantifies, within the context of this empirical study, the reliability of a spatially transferred model.

Bowkett: An agent based model of commuter mode choice [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: This paper presents a proof of concept model which adopts an agent based modelling approach to the understanding of the mode choice decision for the daily journey to work. The three main components of an agent based model are the agents themselves, the environment in which they exist and the rules which describe their behaviour as they interact with each other and their environment. The aim of the model is to assist in the evaluation of the effectiveness of a range of policy interventions, particularly those termed 'Smarter Choices' which are intended to influence commuters' choice of travel mode. This model of commuting behaviour categorises commuters into three groups; constrained, active and passive decision makers. The constrained group are limited in their choice of modes by their personal attributes such as car availability or environmental factors, such as distance to a bus service. Passive users remain with the mode they used the previous day unless they experience a change in journey time or cost which exceeds their threshold of tolerance for deviations from their normal experience. In these cases they re-evaluate their travel choice. Active commuters are those who are triggered by changes such as a house re-location or job move to actively consider a decision regarding their preferred transport mode. The agent based model for commuter mode choice is implemented in the AnyLogic simulation computer package. It is a dynamic model which traces an individual's choice of mode over time. It incorporates the influence of habits, illustrates lags in the impact of changes and quantifies the churn in the use of a particular mode over time.

6A Transport and Climate Change (1)

El Rashidy: A Resilience Assignment Framework using System Dynamics and Fuzzy Logic [Institute for Transport Studies] [Paper\(pdf\)](#)

ABSTRACT: This paper is concerned with the development of a conceptual framework that measures the resilience of the transport network under climate change related events. However, the conceptual framework could be adapted and quantified to suit each disruption's unique impacts. The proposed resilience framework evaluates the changes in transport network performance in multi-stage processes; pre, during and after the disruption. The framework will be of use to decision makers in understanding the dynamic nature of resilience under various events. Furthermore, it could be used as an evaluation tool to gauge transport network performance and highlight weaknesses in the network. In this paper, the system dynamics approach and fuzzy logic theory are integrated and employed to study three characteristics of network resilience. The proposed methodology has been selected to overcome two dominant problems in transport modelling, namely complexity and uncertainty. The system dynamics approach is intended to overcome the double counting effect of extreme events on various resilience characteristics because of its ability to model the feedback process and time delay. On the other hand, fuzzy logic is used to model the relationships among different variables that are difficult to express in numerical form such as redundancy and mobility.

Guiver: Winter Weather: Disruption and its Consequences [Institute of Transport and Tourism, University of Central Lancashire] [Paper\(pdf\)](#)

ABSTRACT: The severe weather in December 2010 disrupted journeys by most modes in many parts of the UK: closing airports, blocking roads, causing delays to public transport and turning pavements into ice rinks. This paper reports the findings of a nationwide on-line survey conducted during the cold spell with over 1,000 respondents and the analysis of 27 interviews with respondents. The paper describes how people prepared for and sought information before their journeys and the consequences of disrupted journeys to themselves and others. It examines the impact of journey length, purpose and mode on the action taken and the consequences of the disruption. Many respondents reported that their plans had been disrupted by the closure of their children's schools, rather than the travel conditions and 60% of respondents felt that schools are closed too readily. Clear consensus emerged that clearing pavements is as important as clearing roads with a degree of consensus about Britain's apparent unpreparedness in the expectation of more extreme weather through climate change. However, opinion is more divided on whether preparing for bad weather would be too expensive and about the willingness to pay higher taxes or fares to fund it. The interviews show a divergence of opinion on what should be the priorities for snow and ice clearance in bad weather with some stressing the importance of pavements and side roads for local travel and others believing that airports and motorways are more important. Priorities tend to reflect personal travel patterns. The tensions between these bottom-up/top-down approaches are examined and the implications for other aspects of transport policy discussed. The conclusions consider whether demands made at the height of disruption reflect lasting values or change after the initial frustration and whether transport priorities during spells of bad weather should be revised.

Cairns: Technology, Alternative Fuels and Low Emission Vehicles: win-win for air quality and climate change? [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: 1. Introduction At present, air quality and climate change targets and the associated policies and strategies used to achieve them, lack synergy. However, a recent government document entitled 'Air Pollution: action in a changing climate' revealed that future air quality targets need to be aligned with climate change measures (DEFRA, 2010). The document importantly highlighted that in order to achieve this alignment 'further work is needed to facilitate comparison of air quality and climate change impacts.' Therefore, this research aims to contribute to this knowledge gap by identifying road transport strategies that are win-win for air quality improvement and carbon dioxide reduction. More specifically this study aims to identify the level of change in technology, fuel or vehicle required in order for an air quality management area to be revoked and CO₂ emissions to be reduced. The city of Leicester and its associated road network were used as a case study for this investigation. 2. Method The study involved modelling emissions of CO₂, oxides of nitrogen (NO_x) and particulate with a diameter less than 10microns (PM₁₀) for a 2005 base case. Next the base case model input was edited to reflect various strategies. The dispersion of pollutant emissions were subsequently calculated using an atmospheric dispersion model. Emissions and concentration values were compared to the base case and those strategies which provided the greatest reduction in CO₂ emissions and reduction in nitrogen dioxide (NO₂) and PM₁₀ concentrations were identified. 2.1 Emissions Data The Leicester City Council (LCC) Local

Authority (LA) area was used to define the boundary of the study domain. An emissions inventory of this area was subsequently compiled based on data provided by LCC. The inventory comprised 219 point sources, 23 area sources and 3748 road sources. The inventory was spatially resolved for the base case year of 2005. Emissions rates for point and area sources were provided by LCC. However, link based emissions rates had to be calculated prior to dispersion modelling. Traffic flow, speed and vehicle fleet composition data were used as input for the Simple Emissions Modelling Framework (SEMFrame, Namdeo et al. 2011). SEMFrame is a highly flexible emissions tool which enables the calculation of link specific emission rates based on traffic data. Furthermore, it allows for the manipulation of vehicle fleet compositions at the EURO class level. SEMFrame uses vehicle flow and speed coupled with the 2009 DfT average speed-dependent emissions factors to calculate traffic related emissions. CO₂, NO_x and PM₁₀ emissions were calculated for the year 2005 in this investigation.

2.3 Dispersion Modelling The emissions inventory data, along with 2005 meteorological data were used as input parameters for an air quality model, ADMS-Urban (Carruthers et al. 1994). In order to gauge the accuracy of the emissions inventory compiled and to assess the ability of ADMS-Urban to predict pollutant concentrations spatially and temporally, the base case was validated through comparison with observed data. The accuracy of the emissions inventory compiled in the model and the diagnostic assessment of ADMS-Urban were evaluated according to the framework suggested by Chang and Hanna (2005). The model was shown to adequately predict PM₁₀ concentrations. However, the model significantly underpredicted NO₂ concentrations. The underprediction was attributed to the use of unrepresentative background emissions values. The model was calibrated in order to correct for the underprediction observed.

2.4 Strategy Development At present LCC is failing to meet the national air quality strategy (NAQS) limit values for NO₂ and declared central Leicester as an air quality management area in 2001. In addition, LCC aims to reduce its carbon footprint by 50% by 2025. Therefore, strategies were developed with the aim of revoking the AQMA in Leicester and maximising CO₂ reduction. SEMFrame was used to change vehicle fleet composition in order to reflect these strategies. The strategies developed fell under three broad categories: technology, alternative fuels and low emission vehicles. Initially strategies were developed to identify the maximum reductions that could be achieved through the substitution of 100% of a specific vehicle class with a 'cleaner' vehicle type. For example, if 100% of the bus fleet in Leicester was replaced with EUROVI vehicles reductions in NO_x and PM₁₀ emissions of 21% and 10% could be achieved respectively. The link emission values defined in the base case dispersion model set up were substituted with the strategy emissions values. The dispersion model was then used to re-calculate pollutant concentration values. The predicted concentration values were compared to the base case and assessed relative to the NAQS limit values. If a strategy proved to lower pollutant levels below the NAQS limit values and resulted in carbon dioxide emissions reductions then the percentage vehicle substitution was lowered from 100 by an increment of 25 and emission and concentration values were recalculated. This process continued until the threshold below which pollutant levels failed to meet NAQS limit values or CO₂ emissions were not reduced was found.

3. Results and Discussion Annual changes in CO₂ emissions and NO₂ and PM₁₀ concentrations are presented. The minimal amount of technology, fuel or vehicle change that was necessary for the withdrawal of the AQMA, whilst still maintaining CO₂ reductions was identified. The implications of these findings on future policy packages are discussed. References DEFRA., 2010. Air Pollution: action in a changing climate. Department of Environment, Food and Rural Affairs [online]. Available from: <http://www.defra.gov.uk/> [Accessed 2010]. Namdeo, A., Goodman, P., Mitchell, G and Hargreaves, T., 2011. Quantifying the Future Transport-related Air Quality Impacts of Land Policies for Cambridge, UK. 2011 Transportation Planning, Land Use, and Air Quality Conference, May 9-10 2011 Texas. San Antonio. 2009 DfT, Road vehicle emission factors 2009. Department for Transport [online] Available from: <http://www2.dft.gov.uk/pgr/roads/environment/emissions/> [Accessed 2009]. Carruthers et al., 1994. UK-ADMS: a new approach to modelling dispersion in the Earth's boundary layer. *Journal Wind Engineering*, 52, 139-153. Chang, J.C. and Hanna, S.R., 2005. Technical description and user's guide for the BOOT statistical model evaluation software package, version 2.0 [online] Available from: <http://www.harmo.org/kit/> [Accessed 2011].

6B Public Transport Modelling

Trozzi: DYNAMIC HYPERPATHS IN CONGESTED TRANSIT NETWORKS WITH FIFO BOARDING QUEUES [Centre for Transport Studies, Imperial College London, UK] [Paper\(pdf\)](#)

ABSTRACT: The concepts of optimal strategy and hyperpath were born within the framework of static frequency-based public transport assignment, where it is assumed that travel times and frequencies do not change over time and no overcrowding occurs. However, the formation of queues at public transport stops can prevent passengers from boarding the first vehicle approaching and can thus lead to additional delays to their trip. Assuming that passengers are informed about such delays and know that for certain stops/lines they will have to wait for the arrival of the 2nd, 3rd, ..., k-th vehicle, they may alter their route and mode choices, thus resulting in a different assignment of flows across the network. The aim of this paper is to investigate route choice behaviour changes as a result of the formation and dispersion of FIFO queues at stops within the framework of optimal travel strategies. A new model is developed, based on modifications of existing algorithms. Its ability to reflect the route choice changes is demonstrated through a numerical example. The methodology presented could potentially be embedded in a new dynamic public transport assignment algorithm for the simulation of passenger flows across the network.

Fu: Understanding the travel patterns on London Rail network: The use of Oyster card data [University of Leeds] [Paper\(pdf\)](#)

ABSTRACT: The growing use of smartcard systems in public transport greatly enhances the ability to collect massive quantities of traveller information. Not only is it employed to be a convenient way of fare payment, but the diverse travel data that it gathers can also help to enlighten both operators and researchers in many different ways. The Oyster system, which is managed by Transport for London (TfL) and implemented across the Greater London area, is one of the most successful applications. By virtue of the Oyster card data, both the system-wide performance and details of the anonymous card users' travel history can be observed, concerning every journey stage performed by all TfL modes of transport and most suburban National Rail wherever the Oyster is applicable. With the initial processing of a sampled set of Oyster card data, a typical O-D pair (Waterloo - King's Cross St. Pancras) is selected and interrogated in this paper. Then various investigations for travel time variability and reliability of service are presented, categorised by different time periods within a day and also between different days (weekdays and weekends). This paper mainly reports on initial analyses on the following specific objectives: (a) to make clear the context under which the data is generated and applied as well as the role that Oyster card data plays; (b) to explicitly expound what sorts of information the Oyster card data contains; and (c) to further examine the variations of travel times between certain periods with reference to various aspects of travel patterns discovered within the Oyster data.

6C Walking and Cycling (1)

Neves: A GPS based methodology to evaluate change in travel behaviour and carbon emissions following implementation of infrastructure for pedestrians and cyclists: a Cardiff Connect2 case study [University of Oxford] [Paper\(pdf\)](#)

ABSTRACT: There is a growing recognition that walking and cycling can play a significant role as an alternative to car use in short journeys, in reducing traffic congestion and carbon emissions from personal travel, as well as in promoting physical activity. However, evidence on how changes in the built environment, through physical infrastructure provision, can change travel behaviour and, ultimately, carbon emissions from personal travel is limited. An area in Cardiff, UK, where a foot and cycle bridge linked to new routes for pedestrians and cyclists is being implemented, was selected as a case study. The approach defined is a longitudinal panel study with a sample of residents in the area, over an extended period of time; this allow potential changes in travel behavior, as a result of the implementation of the scheme, to be measured as well as the longevity of any changes in travel towards walking and cycling. In order to objectively measure travel behaviour, participants have been asked to use personal GPS devices and actigraphs over periods of seven days. In addition, they are also asked to complete a new version of a travel diary, during the same period of time. After the measurement period, the devices are collected and data from the devices is cleaned, processed and analyzed using Geographic Information Systems (GIS). This combined methodology for data collection - devices and travel diary - has been responsible for providing a rich and unique set of travel data. Accurate data on trips distance (GPS) is used for generating carbon emissions profiles and records on the travel diaries, used to validate GPS data. Methodological approaches used and the technical issues surrounding this study will be discussed. And results

from field surveys undertaken in spring-summer 2011 presented for the first time. This paper will explore how, using a realistic evaluation approach coupled with GPS measuring devices and GIS software, improved infrastructure for walking and cycling affects travel and associated carbon emissions, in what ways, for whom and in what circumstances. The relation between improved connectivity and household proximity to physical infrastructure is also investigated.

Fonzone: An empirical evaluation of the behaviour of public transport users [TRI - Edinburgh Napier University] [Paper\(pdf\)](#)

ABSTRACT: The choice of the routes in public transport systems characterized by high frequency services is traditionally modelled through hyperpaths. The analysis of the existing literature on spatial decision making brings to light some simplifications in the behavioural model currently used in the hyperpath approach which potentially limit the validity of its outputs: The influence of mental maps and of learning and habits is neglected; The availability of real time information is not taken into account; Travellers are supposed endowed with perfect computing ability; Only expected travel times are included in the utility function. Since most of research on route choice behaviour does not concern public transport users, a web-based survey has been carried out to assess whether and to what extent the above-mentioned simplifications underpinning the hyperpath models are relevant. The survey has involved frequent public transport users from 25 countries. Information has been collected regarding respondents' actual choices and stated behaviour under hypothetical scenarios. The paper presents the main results of the survey and provides a detailed analysis of the attitude of transit users to use available information and to deal with strategies and expected travel times.

Bartle: Spreading the Word: A Social-Psychological Exploration of Word-of-Mouth Traveller Information in the Digital Age [University of the West of England, Bristol] [Paper\(pdf\)](#)

ABSTRACT: The use of 'formal' travel information pertaining to costs, routes, journey times, or real-time transport disruptions, and its role in travel behaviour (for example, choice of mode, route or departure time) has been widely studied, but little is known about the part played by 'informal' information, shared through word-of-mouth amongst friends, family, colleagues and other social networks, in relation to everyday travel. Furthermore, considerable investment has been made over recent decades in the development of sophisticated 'advanced traveller information systems', delivering formal, top-down information through media such as online journey planners, but less attention has been paid to parallel developments in the diffusion of bottom-up, user-generated information through 'electronic word-of-mouth' on the internet (acknowledged in the field of marketing as a growing source of influence on consumer behaviour). This thesis examined the role of word-of-mouth information diffusion within everyday travel behaviour and its emerging applications in the field of online traveller information, within a framework of social-psychological theories of behaviour and decision theory. The exploration of social-psychological factors underlying the use and effects of word-of-mouth traveller information led to an expansion of existing theory, whilst the research also generated practical recommendations for the wider incorporation of 'social design features' into certain forms of traveller information system. The research was undertaken in two empirical phases, both employing a qualitative methodology. Key research questions addressed in Phase 1 (exploratory) through interviews and focus groups were: with whom and in what circumstances do social interactions about travel occur, and to what sort of knowledge do they contribute? The study sought to explore participants' perceptions of the influence of word-of-mouth on their own, and others' travel behaviour, and to draw out social psychological factors underlying these processes, informed by theories and constructs such as social learning, social identity and pro-social behaviour. In Phase 2 (applied), the initial findings were translated into, and explored more deeply within, a case-study: an innovative, web-based traveller information system enabling users to share local travel information. The exploratory research phase revealed that a high value is attributed to informal advice obtained from those with first-hand experience of a particular trip ('local knowledge'), particularly its role in improving awareness of different travel alternatives and/or improving the trip experience. The social transfer of information was found to occur through: general social interactions about travel; passive absorption of information about specific trips; and the active seeking or offering of information during the planning or execution of a trip. General interactions about travel (for example, appraising the experience of using a particular transport mode), whilst not necessarily perceived as travel information, appeared to be influencing beliefs and attitudes, and shaping the psychological context in which travel choices might later be made. When trips were being actively planned or executed, word-of-mouth was thought to play a complementary role to formal information in the decision-making process, and was reported to have had a direct influence on trip details (e.g. route or departure time), but was less likely to affect participants' modal choice. 'Local knowledge' was deemed trustworthy primarily because it was based on the informant's direct experience (an instrumental-

reasoned explanation), but perceived trustworthiness could also be improved by social-psychological factors such as social proximity, group-identification and accepted norms of behaviour. When information was provided to others, factors such as empathy and reciprocity, both facets of pro-social behaviour, were common. These themes were explored in relation to all the common forms of everyday transport, but information about cycling emerged as an area of particular interest, and was selected as a focus for the second phase. Phase 2 (applications) set out both to validate the earlier findings within the context of a real-world traveller information system, and to explore certain findings in greater depth - in particular, the ways in which social norms and social identities around travel are established or reinforced in peer-groups through word-of-mouth interactions, and help to explain interpersonal influences on behaviour. An innovative case-study was developed for this purpose, in which 23 commuter cyclists in North Bristol shared their routes and other cycling-related information over a period of six weeks via a specially designed, map-based website entitled Cycology. Data were generated through: observation of interactions on the website; follow-up questionnaires and in-depth participant interviews. Interactions on the website were found to have influenced participants in a number of ways, ranging from a tangible effect on behaviour in the form of people using routes suggested by others on the website, to the strengthening of pro-cycling attitudes, to more subtle psychological effects on the way in which people experienced their commute. A key finding was the role which the case-study system played in building a sense of 'community' (group identification). This was linked to high levels of trust and pro-social behaviour amongst group members, which both reinforced positive views of cycling as a commuter mode, and increased people's propensity to act on information from others through a process of referent social influence (Turner et al., 1987). Together with the Phase 1 findings, this led to the proposed incorporation of additional 'social factors' into established information-processing models (e.g. Bettman, 1979). In conclusion, this research challenged conventional understandings of travel information as (exclusively) 'facts' provided by official sources to help the traveller make individual, utility-maximising choices. The present analysis has conceptualised travel information as something broader in which 'facts' are overlaid with subjective opinions, emotions and normative messages as they are communicated between people. The addition of a 'social layer' to the information means that social processes are also in operation alongside well-documented processes of individual, instrumental reasoning. In addition to theory development, the research also led to recommendations as to how user-generated information might be more widely incorporated into advanced traveller information systems, potentially enhancing the perceived reliability (and influence) of such systems, and, consequently, their effectiveness as a transport policy tool. Bettman, J.R (1979). An information processing theory of consumer choice. Massachusetts: Addison-Wesley Publishing company. Turner J.C., Hogg, M.A., Oakes, P.J., Reicher, S.D. and Wetherell, M.S.(1987). Rediscovering the Social Group. A Self-Categorisation Theory. Oxford: Blackwell.

Mahoney: If you build it, they will come: Travel Behaviour change in Response to Walking and Cycling Interventions [Oxford University] [Paper\(pdf\)](#)

ABSTRACT: Evidence of anthropocentric climate change demands a fundamental shift towards less carbon intensive modes of travel and transport. There is increasing potential for walking and cycling and the role they could play in reducing carbon emissions. The literature suggests that walking and cycling has the potential to change travel behaviour away from motorised modes, but there is a lack of credible evidence on the effects of infrastructural interventions on population-based levels of walking and cycling. An important question is how to increase this modal share and replace short car journeys with sustainable modes; Connect2, developed by Sustrans the sustainable transport charity, is an example of this approach. Through the use of a longitudinal mixed-method case study approach this research aims to investigate the changes and effects, over time, in travel behaviour at the household and local levels at the Connect2Cardiff site. This project is entitled "The Pont-y-Werin Bridge" connecting Cardiff and Penarth, a dormitory town to the southwest of the Capital. Before the Bridge (and the Cardiff Bay Barrage) was constructed the only way to travel between the two urban centres was to take public transport or to drive or cycle across the A4055. This road bridge, ominously called 'The Cogan Spur' is a busy four lane flyover dual carriageway; pedestrian access is nonexistent. The bridge is therefore the final 'missing link' in a 6.5 mile non-motorised circular route around the Cardiff Bay area. Thus it provides safer, more direct access to the city, the Taff cycling trail and the leisure route around the Bay. Data is being collected from a cohort panel of 60 Cardiff and Penarth-based households over two periods throughout 2011 and 2012. These participants were part of the original core baseline study undertaken in 2010 by the iConnect research consortium who received a baseline sample of 1,129 households. From these households, the sample for this study was taken from respondents who agreed to follow up research. This left a final sample of 700 households between the two urban areas willing to take part in this module of the research. Therefore a caveat for this study is that the sample is non-representative and lacks generalisability. From these 700 households, the sample for this study focused on respondents with a moderate to high intention to increase their levels of walking and/or cycling 'over the coming months'. This left a sample of 402 households with 100 contacted for

the pilot study (34% response rate) conducted in March, 2011 and 302 contacted for the 1st wave of data collection (39% response rate) in Spring the same year. Thus we were able to obtain a final study sample of 60 appropriate households with a variety of ages ranging from 20 to 79. Household interviews are used to examine attitudes, values and beliefs plus looking into the rationale behind peoples' behaviour choices. To support this, a subjective wellbeing survey, the Day Reconstruction Method will be used. The rationale behind this method is that mobility provides access for quality interactions that are necessary for life's necessities as well as social and emotional well-being. It is additionally widely accepted that mobility is critical for social integration in a complex urban society and is essential to the maintenance of life satisfaction and well-being because it allows one to more readily meet all the other life needs. This survey method takes elements from economics and psychology and is adapted from the work by Danny Kahneman and colleagues in 2002. The survey will be conducted with each member of the household to measure and identify 3 elements of wellbeing. Experiences, to determine overall life satisfaction and emotions during travel activities, examining both positive and negative affect (happy vs. sad or relaxed vs. anxious). The final element is eudemonics which looks into worthwhile/meaningfulness of travel activities (doing something that perhaps we don't want to do but we know somehow makes us happy (i.e. taking siblings screaming children to school). This aspect of the research is important as wellbeing is being measured by the current UK government at the population level, and the results will be able to determine, among other aspects, levels of wellbeing when people are using different modes of transport, and could therefore be policy relevant. The data will include looking at weekend vs. weekday travel and other time use aspects. Finally, to triangulate my data, an experiment using Personalised Travel Plans will be issued to 50% of the 60 households plus local National Cycling Network information as a way to identify whether providing additional personalised travel information to households has an effect on travel behaviour change. Contextual fieldwork has been underway since October 2009 to derive outcomes such as travel behaviour change and identify policy implications. It is anticipated that the mixed-methodology, the unique use of the subjective wellbeing survey and the insights into intra-household dynamics will reveal the degree to which this kind of physical intervention is successful for whom, for what purposes and in which type of contexts.

6D Travel Time

Milne: Network structure, route choice and the relative importance of distance and travel time [ITS, University of Leeds] [Paper\(pdf\)](#)

ABSTRACT: Traffic equilibrium models are generally defined over discrete networks, reflecting the constraints that exist on vehicle travel over the physical road network. If travel time were assumed to be the only factor affecting route choice, then an increase in overall demand would generally lead to modelled flows that would be spread over routes of varying distance. In UK practice, however, it is common instead to assume that drivers aim to minimise generalised cost, defined as a weighted sum of travel time and distance. This provides (through the relative weight of time to distance) a mechanism for the user to control the spread of modelled traffic across routes, when calibrating a model to observed conditions. However, this issue gains virtually no mention in theoretical research on network equilibrium models and therefore little is understood of its effect; indeed, in dynamic equilibrium cases it adds additional algorithmic complexity that means it is commonly explicitly ruled out (i.e. generalised cost is typically assumed only to be travel time). The purpose of the paper is to present both empirical and theoretical findings to explain the role and importance of this weight in network equilibrium analysis. Our empirical evidence revisits a previously-reported before-and-after study of a road capacity reduction in York in 2001, where both the calibration and predictive ability of the model was seen to be enormously affected by this weight. Our theoretical evidence develops a theory to explain the kind of effects observed in York, showing how both the route length distribution and the network capacity are strongly affected by the choice of this weight. We discuss how this is intrinsically related to the actual and perceived structure of the network available, and investigate how its impact varies across alternative network structures, eg grid, ring-radial.

Tsapakis: How Metro Strikes Affect Urban Travel Times in London [University College London (UCL)]
[Paper\(pdf\)](#)

ABSTRACT: The goal of this study is to investigate the impact of the latest five underground strikes on journey times in London's (UK) transport network during 2009 and 2010. The main data source of this study is Automatic Number Plate Recognition (ANPR) cameras, installed on the entrance and the exit of 670 travel links that cover the vast majority of the network and are equivalent to a total length of 1740 km. The determination of spatio-temporal differences of strike effects between the first and the remaining strike days, the identification of changes in departure and arrival times, the estimation of travel time delays within central, inner, and outer London, as well as between inbound and outbound traffic constitute the main objectives of the study. The total travel time within the examined areas, the excess delay and the corresponding percentage difference in journey times are the main performance measurements used. The most significant results showed that the second day of strikes resulted in significant delays as opposed to the first strike days. The peaks elongated by approximately 45-60 minutes, while the unique full-day strike had the highest percentage increase in travel times especially during the evening period (74.4%). Central London was generally affected the most especially during the morning peak experiencing an average increase in travel times of 34.8%, whilst it had the highest percent of negatively affected links (80%). The inbound traffic experienced, on average, high delays during the morning peak, whereas the outbound traffic yielded greater delays during the evening period.

Dissanayake: Investigating the Changes in Commute Times of Males and Females in North East England, 2003-2010. [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: This study uses the hazard based duration modelling methods to investigate commute patterns of males and females with the aim of exploring possible changes in commute times during 2003-2010, considering North East England as a case study. The analysis uses data from the Tyne and Wear household travel survey which has been conducted annually since 2003. The database consists of durations of travel activities for all trips that each individual makes within a typical weekday, including characteristics of trips as well as attributes of individuals and households. Parametric distributions were fitted to the data and their suitability was evaluated using adjusted Anderson-Darling test statistics and correlation coefficients. Accordingly, the hazard model with lognormal baseline specification was applied to the data to explore the changes in commute times. Probability density functions and hazard functions were produced to facilitate the investigation of the patterns of commuting activities generated by males and females for the whole period of 2003-10, followed by year on year analysis. The commute modes such as non motorised transport, car, and public transport were also given due attention in the analysis. The outcome of this study reveals that the commute times in the region are becoming longer in recent years for both males and females. Among the three modes considered, public transport and non motorised transport modes have more potential compared to car in generating longer commute times in the region.

7 Plenary

Chatterton: The continuing problem of air pollution from transport and important lessons for the control of greenhouse gas emissions [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: The UK is currently facing a threat of unlimited fines from the EU due to continuing breaches of air quality limit values for nitrogen dioxide and particulate matter. In the mid-1990s, when the current air quality management regime was established in the UK it was anticipated that by 2004, only a handful of ‘hotspot’ locations in the UK would exceed these limits. However, at the end of 2010, there were still over 500 Air Quality Management Areas declared in the UK in relation to these targets, and over 95% of these are related to emissions from road transport. This paper poses two key questions: 1) How could policy have got things so badly wrong? 2) If we have been unable to control ‘conventional’ air pollution emissions which have a perceptible local impact, what important lessons might be learnt with regard to the much greater challenge of reducing greenhouse gas emissions? Evidence is currently indicating that the failure to control levels of air pollution is due to a combination of unsuccessful attempts to limit the growth of road transport through effective demand management, combined with the non-delivery of predicted reductions in emissions from a range of new vehicle standards and technologies. There is significant potential for this pattern to be replicated in terms of the management of greenhouse gas emissions. This was clearly demonstrated when Transport Minister Phil Hammond stated, “It’s not the car that’s the problem, it’s the carbon”. Though technically correct, this statement suggests a similar reliance on technical emissions reductions in favour of demand management to that which has failed to deliver in terms of ambient air quality. The paper reviews the current evidence and policy, including issues of co-benefits and trade-offs between carbon management and air quality management. It argues that conventional air pollution might be a better driver for creating ‘behaviour change’ than climate change, and it discusses why anyone interested in reducing greenhouse gas emissions from the transport sector would be wise to heed the lessons of 15 years of failed air pollution policy.

8A Travel Behaviour and Low Carbon Transport

Harvey: Attitudinal characteristics of eco-driving behaviour and driver feedback devices [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: This paper addresses two questions: firstly, why do people continue to drive vehicles that are less ‘green’ than others, and secondly whether on-board driver feedback devices [telematics] might encourage drivers to drive in greener ways. Focus groups and questionnaire were used to explore these questions: the questionnaire was completed by respondents in the UK and Czech Republic and 8 focus groups were conducted in the UK with a variety of interested parties, including fleet drivers, energy-saving organisations, insurers and local authority planners and managers. The focus group discussions were transcribed and analysed thematically. In the questionnaire, Likert-style attitude statements were found to factor into four: energy-saving, general energy/environment concerns, don’t care and price/convenience motivation. Questionnaire findings included differences in factors and concerns for sustainability between Czech and UK drivers and that concerns expressed over sustainability were not reflected in actual reported eco-behaviours for either country. The focus group findings indicated that potential use for telematics devices was either to present drivers with targets and challenges, using simple, immediate and constructive information, or for feedback-informed insurance premia for younger drivers; vehicle-fleet managers would only consider installing such devices when a quick rate of return (e.g.<12 months) could be expected. Overall, there was little evidence to suggest drivers being motivated to improve their driving style to reduce impacts on the environment and increase fuel efficiency and these are much less of a priority for drivers than other considerations such as reducing travelling time which was given significantly more weight. In general, monetary incentives to improve driving style were not that powerful. These findings are discussed in relation to the need to provide drivers with incentives to drive in greener ways and in relation to attitude theories.

Daina: Development of a Stated Response Survey for Electric Vehicle's Users Charging and Mobility Behaviour [Imperial College London] [Paper\(pdf\)](#)

ABSTRACT: Electric vehicle (EV) users' charging behaviour will determine the temporal and spatial patterns of the load on the electric grid and therefore of the impacts on the grid infrastructure and on emissions from EV use. However, the current practice for estimating the load on the grid from EV charging neglects any specific modelling of charging behaviour; instead relying on stereotypical and extreme charging scenarios, e.g. "uncontrolled charging" or "home charging at night". These approaches are arbitrary and potentially misleading; they lack theoretical and behavioural credibility and are unable to assess the effectiveness of demand management measures such as time of use electricity. Moreover, the current approaches used for the simulation of EV use in large scale deployments is based on the assumption that EV will be used in exactly the same manner as conventional vehicle patterns, despite self-evident limitations in range charging opportunities. A particularly critical weakness is the complete neglect of the impact of EV charging behaviour and time varying electricity tariff structures on the timing of travel. One reason for the neglect of the interaction between EV charging and EV use behaviour has been the lack of data. Although observation of charging behaviour is increasing in EV trials, revealed preference data from these lack in variability of charging operation characteristics (e.g., charging rates and costs). In this paper we describe a stated response methodology to collect EV charging and use data for the estimation of random utility-based model of joint electric mobility and charging decisions. A stated adaptation section introducing respondents to EV use and charging operations is followed by stated choice tasks representing, to the authors' knowledge, the first attempt to capture trade-offs between charging operation attributes and timing of travel. This two-section structure is meant to mitigate the effect of unfamiliar hypothetical situations on response reliability. Preliminary results of survey piloting are finally reported.

8B Ageing and Mobility

Emmerson: In-Vehicle Navigation: The Perspective of Older Drivers [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: The UK, along with most other countries, has an ageing population. In 2009, 16% of the UK's population were aged 65 and over whereas by 2034 it is projected that this will have increased to 23%. A high percentage of the projected population will pass their 65th birthday as drivers, remaining so for decades after. However, to limit or stop older people from driving could lead to a loss of mobility and affect their wellbeing, particularly when alternative transport choices are limited. Therefore, the need to develop driving aids to maintain automobile access and mobility is becoming increasingly important for the ageing population. One of the most readily available forms of driving aids is in-vehicle navigation. However, the present configuration of information delivery and complex visual displays of in-vehicle navigation systems are not designed to meet the older drivers' needs. Furthermore, navigation for older adults has been identified as key to maintaining their mobility and hence their independence. In response to this, the purpose of this research is threefold. Firstly, it explores ways older adults navigate themselves and identify the failing features of current systems to meet the older drivers' satisfaction. Secondly, it investigates the potential benefits of in-vehicle navigation to assist older people in driving safely and maintaining healthy and active lifestyles for longer. Focus groups, in-car observations and questionnaire surveys will be adopted for these two stages. Lastly, new features of the in-vehicle navigation systems will be proposed and tested with older drivers through the use of a driving simulator and one-to-one interviews. The preliminary findings from the focus groups and in-car observations will be presented in this paper. The results of this research will provide insight and guidance into how in-vehicle navigation systems need to be reconfigured to assist in maintaining mobility and wellbeing for older drivers.

Tilley: Ageing and Mobility in Great Britain: past trends, present patterns and future implications [University of St Andrews] [Paper\(pdf\)](#)

ABSTRACT: Over the next decade the 'baby boomer' cohort will contribute to the proportion of those aged over 60 years old in the UK, which has also been termed an ageing population. The issue of how people will continue to be mobile in this context has not been considered as highly in comparison to other challenges such as state pension and healthcare provision. As such, this paper aims to develop insight into the changing travel behaviour of the elderly population and the future travel implications for the 'baby boomers'. The aim of this paper is to determine what the historic travel patterns in Great Britain are amongst the elderly using data from the National Travel Survey and the extent to which Age; Period and Cohort effects can explain change in travel behaviour over time.

8C Shared Space Environments

Moody: How do pedestrians move in a Shared Space scheme with high traffic flows? Is the pedestrian empowered or does a perception of risk give rise to anxiety and a disincentive to share the street with vehicles? [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: This study presents an investigation of pedestrian movement and attitudes within Shared Space schemes accommodating high traffic flows. By using a case study of Elwick Square in Ashford, Kent, the research provides an evidence base which addresses current knowledge gaps within the field. By using a combination of video analysis and on-street pedestrian interviews, research has found that an increased perception of risk can create a disincentive for pedestrians to share space with vehicles in a context of high traffic volumes. The findings cast doubt on several key elements of the Shared Space concept, highlighting the need to use Shared Space within the correct context in order to prevent pedestrian marginalisation and social exclusion. Over recent years the concept of Shared Space has been incorporated and embraced by an increasing amount of national design guidance, including key publications such as *Manual for Streets* (2007) and *Manual for Streets 2: Wider Applications of the Principles* (2010). The ideas behind Shared Space complement the place making principles endorsed within these documents, and as a result challenge academic and professional knowledge by promoting a fundamental change to the way streets should be designed. By removing highway infrastructure and allowing pedestrians, cyclists and drivers to occupy the same deregulated space, it is argued by some practitioners such as Hamilton-Baillie (2008) that Shared Space allows movement to be negotiated through social protocol rather than engineering solutions, producing a safer environment in which the dominance of the car is reduced and the place function of the street is recognised. Shared Space is a concept which relies upon the ideas of ‘environmental psychology’ and ‘risk compensation theory’. It is believed that a safer and more coherent environment can be formed by creating uncertainty and removing most of the signs, signals, markings and barriers from an area so that drivers, cyclists and pedestrians become more aware of their surroundings. The literature review demonstrates that the evidence base on which these claims are founded is still limited, with a number of important knowledge gaps remaining. A particular knowledge gap surrounds pedestrian movements in shared spaces. Despite the emphasis of advocates on the pedestrian experience, previous research has mainly focused upon accident comparisons, traffic speeds and traffic volumes. Other writers have called for a better understanding of pedestrian desire lines and attitudes, especially in schemes accommodating high traffic volumes (e.g. Quimby and Castle, 2006). To obtain an insight into the pedestrian usage of Shared Space a case study of Elwick Square in Ashford was conducted. The scheme has won a number of national design awards including the Town Regeneration Award presented by the Royal Town Planning Institute in 2009. Elwick Square is widely recognised as the first scheme in the UK to have implemented a layout based upon true Shared Space principles and also represents an area which mirrors the definition of Shared Space outlined by *Manual for Streets 2: Wider Applications of the principles* (Coulthard, 2009). The square accommodates high traffic flows of approximately 11,000 vehicle movements per day and is almost entirely unregulated, creating a space in which no user is formally prescribed priority. There is very little sign of segregation between modes with all users occupying a largely unmarked level surface. The study used on-street interviews and video analysis of pedestrian movements through Elwick Square. Graphical and statistical analysis of the video evidence was used to determine how ‘shared’ those movements are and who gives way in conflicts between pedestrians and vehicles. The interviews asked pedestrians for their views on the pedestrian environment, and a comparative assessment with the previous layout: the changes were made three years before the study and most interviewees had experienced both. Quantitative and qualitative analysis revealed some interesting gender and age-related differences in pedestrian attitudes. The findings cast doubt on several key elements of the Shared Space concept as adopted by *Manual for Streets 2: Wider Applications of the Principles*. The interviews revealed substantial majorities of pedestrians who “felt safer under the previous scheme” and “would prefer a conventional layout involving traditional pavements and traffic light crossings”. The findings show that an increased perception of risk can create a disincentive for pedestrians to share space with vehicles in a context of high traffic volumes. These disincentives are more pronounced amongst women and older pedestrians. In most conflicts between pedestrians and vehicles, the pedestrians gave way. The study concludes that a measure of a scheme’s success goes beyond accident and traffic data and requires a systematic analysis of pedestrian movements and attitudes, before and after a scheme’s implementation to understand the effect of the design on sustainable mobility. The study also suggests that traffic flow and the ratio between pedestrian footfall and vehicle movements are relevant factors when assessing the appropriateness of shared space solutions if they are to avoid marginalising pedestrian movements and increasing social exclusion.

ABSTRACT: The quality of streetscapes in cities and towns has an impact on health, lifestyles, property prices and travel patterns. Streetscape design is moving towards implementing slow and safe environments which promote a sense of vigilance and responsibility among street users. In this spirit, the segregation and control of vehicles and pedestrians is removed or reduced in shared spaces in order to introduce an element of uncertainty in terms of who has the right of way. However, there is a need to identify the conditions under which sharing street space with pedestrians is a feasible alternative to traditionally controlled street designs. As part of this aim, a mathematical model to describe the behaviour of shared space users is derived. This paper presents the model and supports it with data. The proposed model is based on the Social Force Model (SFM), which explains the acceleration of an object (like a pedestrian) in a two-dimensional space as the resolution of forces exerted by neighbouring objects (like other pedestrians, fixed obstacles) and the target (destination). The SFM has been successfully developed to model pedestrian behaviour and is implemented in microscopic traffic simulation software (VISSIM from PTV AG). The SFM resembles a car following model extended to two dimensions, and because of this extension has the potential to describe gap acceptance behaviour as well. An advantage of the SFM is that its parameters can be measured and therefore calibrated. In addition, the SFM can be modified to allow new objects different behaviours or actions to be included. This is accomplished by changing the desired direction and velocity parameters. The resulting model allows even multi-directional flows to be simulated. These factors all contribute to the choice of the SFM as the mathematical basis for the simulation and evaluation of shared space schemes. Since pedestrian movement and car traffic coexist within shared space environments, the basic SFM for pedestrians is modified by the addition of new objects representing vehicles. For vehicles it is necessary to define the effective field of view of the driver since vehicles are restricted with respect to change of direction and lateral movement is not possible. Further, there is a relationship between the steering angle and the velocity of a vehicle. There are more subtle behavioural effects as well, for example vehicles tend to pass each other on the left (in the UK) or tend to queue rather than overtake in congestions. The model for pedestrians is also modified as they are not only interacting with other pedestrians and boundaries but also with vehicles. In order to create a model of likely behaviour in shared space environments, SFM parameters are estimated from video traffic data collected in New Road, Brighton. The calibration procedures and field measurements to support accurate microscopic simulation are described. In order to extract pedestrian and driver velocity, direction, acceleration and deceleration, independently and in interaction with each other, a recently developed software tool, Trajectory Extractor, is used. Finally, macroscopic flow, speed and density relationships extracted from the video data are analysed. The basis of the SFM is a set of equations which express the acceleration and final desired direction of movement of an object of given mass, in two dimensions, as the sum of a driving force, social and physical interaction forces between it and the surrounding objects' or boundaries/obstacles, and a random velocity fluctuation term (to allow for behavioural heterogeneity). The anisotropic behaviour of human beings is also included in social interaction forces by a form factor term. There are as many such sets of differential equations as there are mobile objects. These ordinary differential equations are solved numerically over time by the predictor-corrector method called Gear algorithm. This method can deal with forces dependent on velocity and position. The Gear's fourth order predictor algorithm keeps two higher derivatives to be able to get a better estimation of the new position and velocity. The position and its higher derivatives are approximated by a Taylor series expansion in the predictor step. In the correction step, the predicted position, velocity and higher derivatives are corrected by using the difference of the predicted acceleration and the acceleration calculated from forces. This paper is composed of three sections. First, a review of the social force modelling field is presented. Then, the newly developed mathematical model for shared space users is described. It is noted that this model can be applied to other types of shared environments under a variety of different circumstances as each object is modelled individually. In the third section, the video data collected for a shared space street in Brighton is used to generate ranges of values for parameters in this model. The accuracy of the measurements is also reported. Based on the numerical results, it is concluded that the proposed mathematical model is capable of predicting the acceleration and the direction of movement of shared space users, both separately and in interaction with each other. The model offers a basis for understanding shared space user behaviour and its relationship to space design and traffic management. Therefore, it will help traffic engineers design shared spaces.

8D Transport Governance

Akram: Stakeholders' perceptions and views on transport governance and policy implementation challenges in Belfast [University of Ulster, Jordanstown Belfast] [Paper\(pdf\)](#)

ABSTRACT: The emphasis on the need to address growing travel demand and to manage high car journeys in terms of policy, planning and implementation are the key to effective transport governance in the Northern Ireland. This paper reports the findings from a series of focus groups and in-depth interviews of transport professionals, public representatives, transport operators and transport users in Belfast. The work provides insights into a range of transport policy and governance issues. It also presents the views of different stakeholders in identifying the barriers faced by the government to encourage the mode shift strategy. The responses identified perceptions, behaviours, and attitudes to underpin a move to a sustainable transport in the region, despite disconnection between policy decisions and implementation, issues and response, problems and solution. The paper explores how transport issues are perceived by transport organisations/departments and how trade-offs between different policy objectives are treated. The paper explores how these perceptions, often associated with institutional capacity, expertise and political maturity can be translated into improvements in transport policy/service delivery. The key findings indicate that political will, higher level of transport investments, balance in spending priorities and institutional ability to deliver transport policy decisions are likely required to achieve sustainable transport in the region.

Kamal: How has single transport authorities changed in developing countries? [University of Leeds] [Paper\(pdf\)](#)

ABSTRACT: How has single transport authorities changed in developing Asian cities? Single coordinating transport agencies for urban areas are strongly advocated by International Development Agencies and some researchers as a medium to strengthen the institutional framework for delivering improved transport for cities. While it has proven success in many developed countries, little is known about the broader benefits and challenges to changing the way transport is managed and coordinated in such contexts in developing Asian cities. The very different institutional contexts into which such approaches are to be integrated raises some interesting questions as to the effectiveness of transferring such a model. The research is intended to contribute to better understanding of the impact of single coordinating transport agencies in Asia using two case studies from Malaysia and India. The focus is to explore the motivation behind the creation of such bodies, to critically analyse the decision making process surrounding the establishment of the agencies and to understand how it contributes to improving the coordination of urban transport policy. This research also investigates key factors which contribute the performance of the coordinating agencies such as political will, autonomy, leadership, capacity of the agency and inter-organizational relationship. This research takes a qualitative approach involving semi-structured interviews with almost forty stakeholders in the urban transport sector, including, civil servants, private sector, academicians and NGO's augmented by informal observations and assessment of written materials. The paper will present analysis from the interviews which were completed in Summer 2011. The findings will discuss power, autonomy, leadership and how the various organizations relate to each other. Early work suggests that the bodies created have been frustrated in aspects of their mission by a failure to provide clear power and autonomy and they play more of a co-ordinating role which can be frustrated by the actions of unwilling partners.

9A Transport Policy

Hickman: SUSTAINABLE TRANSPORT FUTURES: PATHWAYS AND POLITICAL ECONOMIES
[University College London] [Paper\(pdf\)](#)

ABSTRACT: Over the last fifty years there has been much interest in cities – in their planning, design, degradation and regeneration – and in the last ten years, in particular, much discussion around sustainability, reducing greenhouse gas (GHG) and carbon dioxide (CO₂) emissions. Within this, there are aspirations towards sustainable travel. Progress however appears intractably difficult to make in the transport sector as the private car, largely fuelled by petrol or diesel, remains the mainstream mode of use and choice. In almost all cities we are experiencing increasing emissions in transport, the city fabric is often adversely impacted by planning for the private car, and many people complain of the daily grind of the commute as the worst part of their daily lives. Our travel behaviours are in crisis. This paper considers the different baselines, projections and opportunities for five very different contexts: from London and Oxfordshire (UK), Delhi (India), Jinan (China) and Auckland (New Zealand). The likely possibilities for reducing transport CO₂ emissions are examined relative to the aspirations of the IPCC (2007) and Stern (2007, 2009). The IPCC's central scenario (A1F1), assuming high economic growth and increased globalisation, estimates resultant world temperature increases of 4°C-6.4°C and expected sea level rises of up to 59cm, with hugely variable impacts globally. A central issue, therefore, is in the gap between the current business as usual (BAU) projections and the strategic policy ambitions to reduce the likely impacts of climate change. Scenarios are developed, assuming an equitable 0.5 tCO₂ per capita in transport CO₂ emissions, for each case study by 2050. The political deliverability of low carbon transport futures, however, remain a major obstacle to progress (Hood, 1986; Freund and Martin, 1993; Dunn and Perl, 2010). The growing body of scenario analysis and modelling of impacts by policy tool or package of tools is useful, but in the end redundant, if political deliverability is not possible. The paper therefore concludes in examining the scenarios insofar as the degree of public authority (legitimate coercion) required in implementation. Potential future transport behaviours are thus given greater credibility in terms of resilience.

Marsden: How does competition between cities influence demand management? [ITS, University of Leeds]
[Paper\(pdf\)](#)

ABSTRACT: Cities are potential sites of inter-jurisdictional competition for inward investment, population and public funds. There is considerable debate within the academic literature over how and why cities compete and for what. A range of perspectives exist over the conceptions of economic competitiveness that might explain the actions of city and regional policy-makers and officials and the extent to which marketised accounts of behaviour can be used to represent decision-making. Transport is one of several policy areas through which cities can compete. Competition can and does occur for public funding from national government and from the European Union. Demand management policy (land-use parking restraint, parking and congestion pricing) is a further site of potential competition with anecdotal evidence suggesting that fears of loss of business to neighbouring or competing cities limits the degree to which such policies are pursued. If true, this has potentially significant implications for the design of effective transport policies and for the governance of cities and city regions. This paper reports on a study involving 20 semi-structured interviews with 21 local and regional transport, planning and economic officers in 6 cities and a major town, all in England. The paper will overview how competition between cities, and collaboration for competitive advantage, is conceptualized through the lens of transport policy. Further attention will be given to the analysis of a series of questions and hypothetical scenarios regarding demand management policies within a city or town, the extent to which these are conditional on the action of other actors and the factors which appear to drive this. The paper concludes with discussion about the implications of the findings for policy and for research into the impacts of competition.

Waygood: Leaders and Laggards in Transport CO2 Emissions: The Challenges and Outcomes of Benchmarking Sustainable Urban Transport Systems Across Europe [University of the West of England, Bristol] [Paper\(pdf\)](#)

ABSTRACT: The transport sector accounts for 23% of total CO2 emissions in Europe and is the only sector for which emissions are continuing to increase. Recent changes in technology have failed to reduce CO2 emissions from this sector, partly because travel distances have increased at greater rates. Urban areas are a key focus of efforts to reduce transport CO2 in terms of absolute emissions, per capita emissions, and with respect to economic activity. Part of the European Union 7th Framework Programme for Research funded project CATCH (Carbon Aware Travel CHoice) has sought to help benchmark cities across Europe and identify cities that are 'leaders' in sustainable transport, and those that are flagging, by comparing emissions of CO2 from cities across the board. In the UK, the National Atmospheric Emissions Inventory provides information that allows for GIS analysis at a 1 km resolution and is used to derive local authority National Indicator 186 which provides a benchmark figure of per capita CO2 emissions with a transport component. The UK is one of the few EU countries where such high quality data is available, and even where other national sources are available it is difficult to assess the comparability of different datasets. However, in 2011, the European Environment Agency made a new spatial emissions database available as part of the European Pollutant Release and Transfer Register (E-PRTR) at a 5km resolution. CATCH used the E-PRTR data to benchmark over 100 key European cities on the basis of road transport CO2 emissions in the context of spatial and socio-economic data available from the EU Urban Audit and EuroStat. This paper considers the accuracy of the 5km resolution data when compared to the higher resolution national (UK) inventory, and presents an analysis of the benchmarking task, identifying which socio-economic factors are most closely linked with road CO2 emissions, and which cities appear to be leaders and which appear to be laggards.

9B Rail (2)

Chan: Dynamic Responsive Signal Control for Railways [University College London] [Paper\(pdf\)](#)

ABSTRACT: Railway systems are coming under increasing pressure to serve as a reliable and robust transport system for an increasing number of passengers. In the current financial climate, identifying ways in which to increase the capacity of the railway network without adding extra track is a matter of increasing focus. Railway Stations and Junctions are vital elements that constrain the network capacity. Limitation factors include the railway infrastructure, train schedules, control techniques, passenger flows, information management as well as other human factors and unpredicted variations. Some systems have been developed to support train operators in making decisions at major stations, but complex operations still rely on manual control and human judgement, and future conflicts and higher levels of optimisations will be demanding on unsupported control officers. This paper will develop a framework and control methodology to examine how capacity and service recovery for railway services can be improved by developing dynamic responsive control for junctions and stations. Interviews with industry experts in addition to analytical modelling have been conducted in order to understand current railway operations and to identify opportunities for development. Techniques used in other dynamic transport modes such as road traffic control and aviation scheduling are also reviewed to see how techniques from other transport industries can be applied to the railway industry. Algorithm developments for stations and railway junction's focus on minimising the traversing time of all trains and passengers through designated areas. Future implications of control decisions can be estimated using current traffic information so that methods of forward dynamic programming can be applied. Models and simulations of train operation are designed to represent constraints such as train motion, block signalling systems and timetables. The simulator can then be used to investigate in detail train operations under optimised control decisions and generates performance measures.

Yosritzal: IS THE USE OF TECHNOLOGY INFLUENCING THE PERCEPTION OF JOURNEY TIME? EXPERIENCES OF TRAIN TRAVELLERS [Newcastle University] [Paper\(pdf\)](#)

ABSTRACT: The widespread ownership of Information and Communication Technology (ICT) devices and access to mains voltage supply on trains has increased the potential to use travel time more productively. In the 1980's, research found that the perceived travel time was 8% higher than the actual travel time (Wilson, 1983). It is interesting to investigate whether the widespread use of the technology has led to statistically significant changes to perception of rail travel time and whether attitudes and behaviours are any different. The aim of this paper is to present the results of a comprehensive study of how technology influences the perception of time. Rather than using a mail back questionnaire, the data for this research was collected by interviewing 319 train passengers on-board during the journey between Newcastle and London. The questions examined: passenger's activities and whether ICT and entertainment media were used during the journey; demographic characteristics of respondents; the traveller's perception of time and willingness to pay for improved services (for example longer or shorter journeys). The study investigates relationships between actual and the perceived travel time and explores whether technology influences the value of time. Potentially, the outcome of this research can influence decision making regarding investment, operation and other policy interventions. This paper will present details of questionnaire design, survey methods and results. Early indications are that the perception of travel time has reduced from 1.08 to 1.00, being the same across the whole sample. However, the data reveals some interesting features. Therefore, cluster analysis is currently being used to establish whether specific traveller or trip characteristics govern any differences in the perception of travel time. The final results will be presented in the full paper. Reference Wilson, T. K. (1983) The Generalised Cost of Travel Involving Interchange. PhD Thesis. University of Newcastle Upon Tyne.

Pritchard: Investigating the key factors which affect emissions from rail vehicle operation - is a train really significantly less polluting than a car? [University of Southampton (Transport Research Group)] [Paper\(pdf\)](#)

ABSTRACT: Due to concerns about Climate Change, ambitious targets for Greenhouse Gas reduction have been set, including a reduction in overall GHG levels by 80% by 2050. The transport sector is responsible for about a third of GHG emissions (mainly CO₂), and technology improvements alone are unlikely to ensure that the targets are met. It will therefore be necessary to consider changes travel behaviour, which could include the encouragement of modal shift towards those modes which pollute less. Compared with road and domestic air travel, rail travel is generally viewed as "more environmentally friendly." Reasons for this include the fact that, for a train with steel wheels on steel rails, there is comparatively little rolling resistance, and so the motion of a train is thus quite efficient. An illustrative model has been developed to investigate the possible reduction in emissions which could be achieved by encouraging modal shift towards rail, using data for HS2 (the proposed High-Speed line) as an initial case study. However, it is noted that there are already some cars on the market which produce comparable amounts of CO₂ per passenger-km to some diesel trains. Although electric trains theoretically perform much better, there remains a need to assess the important factors affecting rail vehicle emissions. A detailed model is being developed in conjunction with Arup, to quantify the scale of the impact of factors such as stopping patterns and line-speed profiles. The model can calculate energy consumption (which is linked to CO₂ emissions) over a given route profile, and, although the outputs are currently limited and in need of validation, it is anticipated that useful results can be obtained. This detailed model will be used to assess the validity of some of the assumptions made in the illustrative model, and the data used to make improvements where possible.

9C Technology and Low Carbon Transport (2)

Potter: The role of company car taxation to promote low carbon vehicle technologies [Open University] [Paper\(pdf\)](#)

ABSTRACT: This paper presents a review of the CO₂ based company car taxation that has been in place in the UK since 2002. One aim of this ecotaxation reform was to promote the uptake of low carbon vehicle technologies, but in practice the tax reform led to the widespread use of diesel cars. With company cars making up 55% of new car sales, this has led to a major shift towards diesel in the UK car stock as a whole. In 2010 a modification to the company car taxation system was introduced, which provided a step change incentive for the drivers of low and ultra-low carbon vehicles. This change provides a financial advantage over diesel to the low carbon technologies of hybrid and electric vehicles. Since 2010 there has been an increase in the uptake of petrol-electric hybrid cars in the company car sector, but there remains a question as to whether the tax incentive is sufficient to promote the uptake of electric and plug-in hybrid cars. In this context, in October 2011 the Open University is holding a workshop for local businesses who have expressed interest in using electric vehicles for fleet and company car use. This is part of the OU's contribution to the Milton Keynes Plugged in Places programme. The workshop will provide information on what are the key influences upon businesses in evaluating low and ultra-low carbon vehicles and the influence of the new company car taxation incentives.

Morton: Diffusion Analysis of the Emerging Consumer Market for Low Emission Vehicles [University of Aberdeen] [Paper\(pdf\)](#)

ABSTRACT: A large degree of public and private funding is being allocated to accelerating the introduction of Ultra Low Emission powertrains for passenger cars, especially plug-in Hybrid and Pure Battery Electric Vehicles (EVs). If these new vehicles are to make a significant contribution towards increasing energy security whilst decreasing levels of air pollution and greenhouse gas emissions, a detailed understanding of the likely consumer demand for them is a fundamental requirement. The success of these new vehicles will be as much dependent on their desirability to customers as to their technical ability. This paper draws upon Roger's Diffusion of Innovation Theory to understand the potential importance of consumer 'innovativeness' as a precursor to at least the early adoption of new vehicle technology. It presents preliminary results from a household self completion survey conducted over two case study sites (Newcastle upon Tyne and Dundee) in which respondents were asked questions relating to both conventional vehicles and Ultra Low Emission Vehicles (e.g. electric powertrains). These questions included aspects of Consumer Culture Theory in addition to an innovation scale that covers the three main variations of innovativeness that have been identified in the literature: (1) personality traits (also referred to as innate innovativeness), (2) adoptive innovativeness that has further been segmented into (a) general adoption of consumer technology and (b) specific preferences towards Low Emission Vehicles. The results will be presented using Factor and Regression analysis and will aim to understand the relative importance of the constructs with respect to consumer preference towards Ultra Low Emission Vehicles. The results will contribute to understanding dynamic processes of consumer adoption of EVs including likely success of a variety of policy measures aimed at influencing electric mobility.

9D Modelling (2)

Martinez: Modelling Behavioural Responses to Tolling by Microsimulation [Edinburgh Napier University] [Paper\(pdf\)](#)

ABSTRACT: Microsimulation modelling is a widely accepted tool in the assessment of the impact of a wide variety of transport schemes. The robustness of a model depends on the accuracy with which traffic behaviour is represented. In the case of road pricing the key element lies in predicting motorist's behavioural responses when confronted with tolls. This behaviour is affected by an individual's willingness to pay to avoid a congested trip that will result in either increased journey times (measured as 'value of time') or a more variable journey time (measured as 'value of reliability'). This "subjective value of time" differs from the "social value of time" applied in project evaluation and which reflects the losses to society as a whole derived from longer travel times. Firstly, this paper reviews subjective values of time and reliability from a variety of schemes from around the world and finds that both VOT and VOR depend on a number of factors including the motorist's socioeconomic characteristics and the characteristics of the trip itself. Accounting for this heterogeneity is important in forecasting usage in the context of tolls. Secondly, this study will attempt to derive VOT and VOR values in a UK context. In the UK there is only one toll road, the M6Toll, which runs parallel to the heavily congested M6 around Birmingham. A Paramics microsimulation model of both roads has been developed, calibrated and validated using traffic data from the Highways Agency's Journey Time Database. By comparing results after each historical toll rise on the M6Toll, this model will serve to derive VOTs and VORs suitable to the UK context. These values will then be used to develop a new form of the cost equation that governs vehicle behaviour in simulation. This equation will include both VOT and VOR for the segments identified.

Sanaullah: Estimating link travel time from low frequency GPS data [Loughborough University] [Paper\(pdf\)](#)

ABSTRACT: Intelligent Transport Systems (ITS) have been developed in recent years to improve the effectiveness and efficiency of road networks by enabling infrastructure providers and users to take advantage of real-time traffic data to make optimal decisions. Examples of such systems include Advanced Traveller Information Systems (ATIS), Advanced Transport Management Systems (ATMS) and Dynamic Route Guidance System (DRGS). Travel time is one of the most important inputs to many such ITS applications, and specifically this information needs to be accurate and dynamic. For the estimation of travel time inductive loop detector (ILD), which is the most common vehicle detector technology, has been used since 1960's to estimate traffic states (i.e. occupancy, flow). However, the output from ILD is dependent on the location of ILD and the relationship between the output and travel time estimation is specific to individual links, which makes it time-consuming and costly for the whole network. As a consequence, recent developments have focused on moving sensors (i.e. probe vehicles equipped with GPS) to provide high accuracy speed (i.e. speeds of travelling vehicles), positioning and timing data to estimate travel time. Positioning data from GPS have also errors, especially in urban areas. Therefore, a map-matching technique is applied to match raw positioning data on to the road network so as to reliably estimate link travel time. This is challenging because most current map-matching methods are suitable for high frequency GPS positioning data (i.e. data with 1 sec interval) and may not be appropriate for low frequency data (i.e. data with 30 sec or 60 sec intervals). However, many moving sensors only retain low frequency data so as to reduce the cost of data storage and transmission. In addition, any map-matching method to be employed in travel time estimation needs to be fast and efficient so that a large number of GPS data positions can be processed within a short period of time. Accordingly, this paper reports the results of a research study that sought to better estimate travel time for more reliable and accurate evaluation of road network performance using data from moving sensors in 'near' real-time. In particular, this paper presents the analysis of GPS data obtained from the large scale field experiment on the interstate I-880 in the San Francisco Bay Area, California conducted by the University of California, Berkeley. A total of 77 vehicles equipped with GPS-enabled smart phones (Nokia N95) drove continuously for 8 hours on six to ten miles stretch of the freeway. In that experiment the GPS position and speed data were collected every 3 seconds which is then extracted at different ranges (i.e. 3, 6, 9, 30, 60, 120 sec) for the purpose of analysing data with low sampling frequency. A total of 471,389 GPS observations were processed altogether. The reference travel time data were recorded by high resolution video cameras, which provided the exact travel time of individual vehicles through license plate re-identification. A total 4,268 vehicles were matched during the experiment for the purpose of collecting reference data. The departure time was noted when vehicle started the trip and travel time was obtained by re-identifying it at the end of trip. For each time window length reference time was calculated by taking the average of true travel time given by all vehicles travelled in time window. Specifically, the project first determine the accurate location of a vehicle travelling on a road link by applying a map-matching (MM) algorithm at a range of frequencies (from 3 seconds to 120 seconds) to reduce the potential

errors associated with positioning systems (e.g. GPS) and digital maps whereby vehicles are sometimes assigned to the wrong road link. Secondly, a mathematical Travel Time Estimation (TTE) method is developed to estimate link travel time based on map-matched GPS fixes and speed data. The results are then validated using reference data from high resolution video cameras. The accuracy of the estimation together with the processing times taken for the algorithms to run were recorded and analysed. The input data used for the TTE algorithm includes time stamps, map-matched GPS position, speed of vehicle (m/s), and road network data. Based on the data given by randomly distributed GPS positions on the road network, travel time is estimated for all the links in the network. In the first step all the links travelled by individual vehicles were identified for the given length of time window (i.e. 5min, 10 min and 15min). Then the numbers of map-matched positions given by each vehicle were stored for all the links it travelled. The scenarios of varying number of map-matched GPS positions on different links in different time windows have been considered. The penetration rate of moving sensors varied in different time windows. Finally the TTE algorithm presents the results for different lengths of time window for the full data set. Overall, this paper examines the performance of the developed mathematical TTE algorithm considering the factors of data sampling frequency, sample size of moving sensors, map-matching method and length of time window. For the case of data with 3 sec sampling frequency, the relative forecast error has found to be 24% (i.e. an equal to error of 3 minutes), 18% (i.e. an equal to error of 2.4 minutes) and 28% (i.e. an equal to error of 3.5 minutes) for 5min, 10min and 15min time windows respectively. Once the relative forecast errors for other sampling frequencies are obtained, it would be possible to identify the factors influencing the travel time estimation method. It is expected that the accuracy of the developed method can further be enhanced with the optimum penetration rate (i.e. 2-3% of total vehicles) of moving sensors travelling on all links within the road network.

10A History of Transport

Dudley: Fulfilling a Need By Making a Difference: The Evolution of Academic Transport Studies in the British Isles [University of the West of England] [Paper\(pdf\)](#)

ABSTRACT: Allsop defines transport studies as the application of economic and social science, jointly with engineering and physical science, to an area of significant public policy and high public awareness. This is a definition that reflects not only the story of the historical development of academic transport studies over the past half century, but also carries within it many of the challenges and opportunities that persistently face it. This paper therefore takes the Allsop definition as a starting point, in order to examine and analyse the evolution of academic transport studies, with particular reference to its distinctive characteristics concerning the importance of contextual factors, and the associated need to solve real world problems. The principal method employed is evidence from semi-structured interviews with around twenty senior figures integrally involved in the development of academic transport studies. Given that transport is a derived demand, this entails that, to a significant extent, academic transport studies reflect the contextual needs of the evolving economic, political and social environment. Thus in order to first establish, and then maintain, its identity, this has required the study area to fulfil a need by making a difference in the everyday lives of society as a whole. In addition, the frequently complex nature of the problems means that finding feasible solutions increasingly requires work across a wide range of academic disciplines. After introducing and discussing the definition of transport studies, therefore, the second section of the paper outlines briefly some of the principal features of its historical development in academia, including both individual and institutional contributions, and encompassing the contribution of the Universities' Transport Study Group. At the same time, the defining characteristics of academic transport studies do present distinctive challenges and opportunities, including reconciling long-term research with the needs of public and political arenas; the responsibilities for professional training; and maintaining the identity of the study area in the trend towards greater disciplinary breadth. The third section examines the evolution of these developments through the perceptions and experiences of the interviewees, while the concluding section discusses briefly some of the implications for the future of the study area.

Beecroft: Engineering history: the Motorway Archive Trust and the construction of institutional perspectives on transport's past, present and future. [University of Aberdeen] [Paper\(pdf\)](#)

ABSTRACT: In recent years there have been a number of examples of transport and transport-related bodies which have sought to construct and represent a particular institutional perspective on transport's past, present and future. In this context, this paper examines the activities of the Motorway Archive Trust in seeking to represent and promote road transport history. The paper explores the motivations which lie behind this initiative, paying particular attention to both historiographical issues and the policy agenda. In relation to historiography, attention will be paid to the relative positioning of road and rail transport history in the UK, with comparison drawn with the United States and on issues surrounding the disciplines of institutional and contemporary history. In terms of the policy agenda, the paper examines the uses and role of historical enquiry in the shaping and representation of the Motorway Archive Trust's institutional perspective on road transport. The analysis will draw upon techniques in prosopography to examine the influence of social and professional networks in constructing institutional and cross-institutional perspectives on transport history and policy and in influencing the wider transport debate. The paper concludes by considering the broader relationship between transport history and policy and asks if there is a role for academic historians in the field of transport studies.

10B Traffic Management (2)

Scarinci: Ramp Metering for the management of motorway roads [University College London] [Paper\(pdf\)](#)

ABSTRACT: Motorway roads provided an important transport facility for people and goods that has social, environment and economic consequences. The demand for their use continues to increase, leading to congestion during busy periods. In the current economic climate, further expenses of the physical network will be limited and the social and environmental impact not widely accepted, so finding ways to make best use of existing infrastructure is a priority. Intelligent Transport Systems (ITS) have been identified as a way of achieving this. Several evaluations of ITS for motorway traffic management, such as Ramp Metering, Variable Speed Limit and Hard-Shoulder, have shown the effectiveness of these systems in optimizing the use of the motorway network, improving safety and traffic flow, and reducing congestion, travel time and environmental impact. Among these systems, Ramp Metering (RM) is particularly effective in highly congestion situations. The first RM system was installed on the junction 10 of the M6 in 1986, since then, up to 87 systems have been deployed in the most congested sections of the motorway network. Although the evaluation of the systems performance shows good results in several indicators, e.g. an average of 13% of travel time reduction, more detail analysis indicate that not all the RM installed have been effective. For this reason further researches on RM system are required. The focus of this research is the analysis and development of different RM control policies and their evaluation using simulation tools. This works aims to propose an answer to the following questions: (1) which is the best RM control policy for the UK motorway? Which is the best system configuration in term of physical geometry, detector configuration and lane changing policy? And, clearly, what is best? What is the objective of RM system? Is it reduction of travel time, number of incidents or fuel consumption, or increment in flow stability? A microscopic simulation approach has been chosen to evaluate the different RM control policies for its explicit description of the controlling and traffic signal systems, and vehicle behaviour and characteristics. The simulation model, developed by UCL, is based on two main sub-models for longitudinal and lateral movement of the vehicles. A modified version of Gipps' car-following model is used to represent the longitudinal progression of the vehicle along the lanes and an adapted version of Gipps' lane-change model simulates the lateral movements among the lanes. First results show that cooperative behaviour of vehicles must be incorporated into the original Gipps' framework to simulate correctly the merging manoeuvres. These behaviours reproduce the cooperation among vehicles to facilitate merging from the on-ramp lane, e.g. decelerating of vehicles already on the motorway or moving to the off-side lane. In addition to these sub-models, a representation of the supply and the demand are present. The supply represents explicitly lanes, allocation of turning movement to lanes, solid lines, speed limit, detectors and their locations, traffic lights, signal control policy, etc. The demand characterizes traffic with different type of vehicle, e.g. car, lorry, heavy good vehicle. The stretch of M6 between junction 19 and junction 16, where the RM is already implemented, has been used as case study. The calibration and validation of the model have been done comparing the site MIDAS data and the simulation output. The current control policy, feed-backward dynamic strategy ALINEA, have been evaluated and optimized for different scenarios. The research project is currently at an early stage, and so far the description, implementation, calibration and validation of the micro simulation model has been completed. The stage of evaluation and optimization of the current control policy has begun. Then, the existing and new control strategies will be studied, starting from a single intersection and ending with more complex scenario of multiple junctions synchronised by coordination algorithm. This research may lead to a better knowledge of the RM operation and traffic flow dynamics, and to define a more efficient way of managing the implemented systems using the most suitable strategy for every specific junction.

Guo: A computationally efficient 2-stage method for short-term traffic prediction on urban roads [Imperial College London] [Paper\(pdf\)](#)

ABSTRACT: Short-term traffic prediction plays an important role in intelligent transport systems. With accurate predictions of the traffic state, transport network managers can develop more sophisticated strategies to mitigate traffic problems before they occur. A number of statistical and data mining methods for traffic prediction are available in the academic literature, including time series analysis, Kalman filter and non-parametric methods. Most traffic prediction methods, however, need the process of training or parameter optimisation, which increases the difficulty of their implementation and limits their robustness. This paper presents a novel 2-stage prediction structure using the technique of Singular Spectrum Analysis (SSA) as a data pre-processing step to improve the prediction accuracy. Moreover, a new time series prediction method named Grey System Model (GM) is introduced to reduce the dependency on method training and parameter optimisation. To demonstrate these improvements, this paper compares the prediction results of SSA structure model with that of a non-SSA method. Another time series method, Seasonal Auto-Regressive Integrated

Moving Average (SARIMA) approach was chosen as the prediction function in these models. Prediction models using GM and SARIMA methods were calibrated and evaluated using real traffic flow data from a corridor in Central London under both normal and incident traffic conditions. The prediction accuracy comparisons show that the data pre-processing before the procedure of prediction using traditional time series methods can improve the final prediction accuracy. In addition, the results indicate that GM method outperforms SARIMA under both normal and incident traffic conditions on urban roads.

10C Transport and Climate Change (2)

Gegg: Aviation Biofuel: A stakeholder perspective of the current and future issues [Loughborough University] [Paper\(pdf\)](#)

ABSTRACT: Biofuels are strongly advocated by the aviation industry as a means of reducing emissions and lowering fossil-fuel dependency. Rising oil prices, increasingly stringent environmental legislation, and anticipated future growth within the sector have stimulated the development of renewable low-carbon fuels. However, the processes by which aviation biofuels will be introduced and used are not straightforward and there remains an urgent need to explore the drivers and constraints of market uptake; the role of policy support and the long-term future of the fuels within the sector. Using in-depth semi-structured interviews with key stakeholders, this paper examines industry perceptions associated with these issues and concludes that, although biofuels are fully certified for use in up to 50% blends in commercial aircraft, their economic viability will be reliant on high oil and carbon prices combined with clearly defined environmental legislation with respect to aviation biofuels. The research reveals: uncertainty surrounding the supply of suitable feedstocks, the sustainability of the fuels and the availability of policy support, as being key issues which need to be addressed before biofuels are commercialised. The research also reveals that the imminent inclusion of aviation within the EU Emissions Trading Scheme will create a zero accounting 'loop-hole' for biofuel which may uniquely influence the pattern of uptake in the EU vis-à-vis other world markets. In conclusion until concerns surrounding cost, sustainability of the fuels and longevity of policy support are addressed aviation biofuels will not form a significant share of the aviation fuel market.

Kelsey: The Impact of Significant Fuel Price Increases on Freight Mode Choice in the UK [University of Leeds] [Paper\(pdf\)](#)

ABSTRACT: It is quite possible that the transport industry will face much higher fuel prices in the medium term future. This paper investigates the impact of significant fuel price increases on UK freight mode choice. When fuel prices increase, variable costs of road freight (per tonne-kilometre) increase more quickly than for rail, suggesting that rail may become viable for more freight over shorter distances. This paper therefore uses the LEFT freight model to assess the probable change in break-even distance between road and rail for freight. The present situation regarding fuel use and levels of fuel taxation will be described, and the broad mode shift impacts of higher fuel prices will be discussed.

10D Walking and Cycling (2)

Gordon: Developing methodological approaches to analysing single point bicycle counts [University of Bolton] [Paper\(pdf\)](#)

ABSTRACT: Accurate estimation of bicycle traffic volumes and trends is important in transport monitoring and planning. Nationally, the UK government measures levels of cycling activity from information collected in the National Travel Survey (NTS), and from counts which form the National Road Traffic Estimates (NRTE). The Department for Transport has been concerned about monitoring mechanisms for some time and accepts that surveys tend to under-record the level of cycling activity nationally and that the incomplete coverage of surveying of traffic on minor roads and lack of coverage on traffic-free routes leads to an under-reporting of cycle activity. Volumes of motorised traffic are much greater than those for cycling, and cycle usage patterns are more varied and seasonal than those of motorised forms of transport. The establishment of patterns of cycling for different route types will help in understanding the variability in cycling. Current methods of analysis used for traffic counts are not sufficiently well disaggregated by route type to provide robust estimates of cycle traffic. Traffic estimates are produced using twenty two classes of route, six of which are minor roads where most cycling takes place. The six minor route classifications are: urban (London and non-London); rural (two flow levels) and; holiday routes (two flow levels). This paper investigates available cycle count data from Sustrans, a UK sustainable transport charity, and presents a range of route typologies for cycle traffic based on an analysis of patterns of use and their variability by season, day of week, and time of day.

Jones: Applying a life course perspective to the understanding of walking and cycling [UWE] [Paper\(pdf\)](#)

ABSTRACT: UK transport statistics suggest there was a marked decline in levels of walking and cycling in the second half of the twentieth century, yet how this played out in the life course patterns of walking and cycling of individuals and cohorts alive during the period is unclear and unknowable from present sources. This paper introduces research in progress that applies a life course perspective with a life history methodology to understand life course patterns of walking and cycling of individuals. Trajectories of walking and cycling are reconstructed with older and younger cohorts through life history interviews. These cohorts are drawn from the same families to construct Parent and Child dyads. Walking and cycling trajectories are depicted through biographical accounts, summary descriptive texts and visual depictions. Emergent findings are that wider social changes are apparent in inter-cohort variation in life course structure and timing and that this is producing inter-cohort variation in walking and cycling trajectories. There are also indications of intergenerational influence on walking and cycling trajectories within families a lot of which is mediated through caring roles. This approach has the potential to deliver a more sophisticated understanding of the processes of change in travel behaviour in individual lives, their relation to events in multiple life course trajectories, and the interdependency of life courses. Looking ahead, potential policy implications could include the need for a policy approach which recognises that the walking and cycling trajectories of different population cohorts are shaped by the social and historical contexts they experience.

11 Plenary

Mateer: Further analysis of Bus-based P&R impacts [University of Westminster/ Suffolk CC] [Paper\(pdf\)](#)

ABSTRACT: Bus-based park & ride (P&R) in Britain has received considerable attention, notably in work which indicates that total pcu-kilometres may increase, rather than decrease, when P&R is implemented, associated with factors such as diversion from conventional bus services (e.g. by Parkhurst, and Meek et al). Two studies, forming dissertations on the University of Westminster MSc Transport Planning & Management course, enable the impacts to be assessed further. In Ipswich, an existing P&R site (Bury Road) was closed recently. A 'before' survey enabled patterns of use to be assessed, and an 'after' survey followed up changes in behaviour by a substantial number (175) of those surveyed earlier. In the case of Chelmsford, an existing well-used P&R site (Sandon) has been followed by a second site (Chelmer Valley). Extensive survey data (an on-bus sample of 2,125) enables usage at both sites to be evaluated. Results confirm that some diversion from conventional bus service (and reversion to such use) is found, but higher at the Ipswich site. A limitation of earlier assessments of net changes in pcu-kilometres associated with P&R provision has been that an implicitly equal weighting was attached to each pcu-km concerned. However, removing a pcu-km from a congested urban road may substantially reduce external costs (congestion, pollution etc.), but additional pcu-km on low-density rural roads (for example, associated with diversion from conventional bus use) may incur much lower cost. In these studies a monetary value has been attached to pcu-km dependent upon road type (following the work of Glaister et al), and hence an aggregate monetised estimate made of the value of the net change in pcu-km observed.