University College Cork
30th August to 1st September 2011

Irish Transport Research Network
Annual Conference (ITRN2011)
Energy & Transport
Programme & Proceedings

Hosted by
UCC
Coláiste na hOllscoil de Corcaigh, Eire
University College Cork, Ireland

Co-organised by
CIT
Institute of Technology, Ireland

ISBN: 978-1-906642-41-9
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ITRN2011 Welcome Note

On behalf of the organising committee of the 2nd Irish Transport Research Network Conference (ITRN2011), we would like to welcome you to Cork for a great event dedicated to the sustainability of future transportation systems. ITRN2011 is hosted by University College Cork and is co-organised by the University of Limerick and Cork Institute of Technology. In conjunction with ITRN2011, we are also pleased to host the inaugural workgroup meeting of the Institute of Electrical and Electronic Engineers Vehicular Technology Society (IEEE VTS) UK and Republic of Ireland Chapter. We are very fortunate to have experts from government, industry and academia to speak and chair the various parallel sessions at ITRN2011.

The main theme of this year’s conference is Energy & Transport. Transport represents one of the fastest growing contributors to greenhouse gas (GHG) emissions and biggest consumers of fossil fuel worldwide. In fact transportation accounts for about a quarter of world energy demand and for more than half of all the oil used annually. Therefore sustainability and energy efficiency in transportation systems is particularly relevant with concerns over climate change, security of energy supply and environmental pollution. Energy demand also has strong modal variations across land, maritime and air transportation. Improvements in transport sustainability will be driven by research and development with better use of our existing transportation infrastructure, smarter use of Information Communication Technology in all modes of transport and the application of alternative fuel vehicles across all transport modes in captive fleets. Alternative fuel vehicles can be powered by a myriad of sources including electricity, natural gas, compressed natural gas, biogas and hydrogen.

I would like to thank the keynote speakers, session chairs and panellists for making ITRN2011 a strong industry academia event. Additionally, I would like to thank the patrons of ITRN2011, especially Bord Gáis Networks, Science Foundation Ireland, the Port of Cork and Enterprise Ireland for their generous support. I would also like to acknowledge the support provided by ESB ecars for the IEEE VTS workgroup meeting. I would like to especially recognise the staff of University College Cork, Dr. Brian Caulfield and all the ITRN Committee members for their support and time. Finally, it is our sincere wish that you not only gain knowledge from the conference to better face the transport and energy challenges ahead, but you also use ITRN2011 as a positive networking opportunity. I look forward to meeting you in University College Cork!

Dr. Aoife Foley

on behalf of ITRN2011
Northern Ireland and Republic of Ireland Committee

Dr. Aoife Ahern, University College Dublin, Chair ITRN
Dr. Brian Caulfield, Trinity College Dublin, Secretary ITRN
Mr. John Henry
Dr. Bidisha Ghosh, Trinity College Dublin
Prof. Julian Hine, University of Ulster, Jordanstown
Dr. Aoife Foley, University College Cork & Queen’s University Belfast
Dr. Shaun McFadden, Dublin Institute of Technology
Ms. Rosin Murray, Dublin Institute of Technology
Prof. Aisling Reynolds Feighan, University College Dublin
Dr. Amaya Vega, National University of Ireland Galway, Treasurer ITRN
ITRN2011 Committee

Dr. Aoife Ahern, University College Dublin

Dr. Brian Caulfield, Trinity College Dublin, Co-Chair ITRN2011

Dr. Aoife Foley, University College Cork & Queen’s University of Belfast, Chair ITRN2011

Prof. Tom Cosgrove, University of Limerick

Ms. Kay Cullinane, University of Limerick

Ms. Hannah Daly, University College Cork

Dr. Bidisha Ghosh, Trinity College Dublin, Editor, Proceedings of the ITRN2011

Mr. Stephan Koch, University College Cork

Dr. Paul Leahy, University College Cork

Mr. Conall Mac Aogusa, RPS Group

Dr. Shaun McFadden, Dublin Institute of Technology

Ms. Celine McInerney, University College Cork

Mr. Alan Morrison, University College Cork

Dr. Jerry Murphy, University College Cork

Dr. Brian Ó Gallachóir, University College Cork

Dr. Vikram Pakrashi, University College Cork

Dr. Niamh Power, Cork Institute of Technology

Mr. Ian Winning, Cork City Council
Conference Sponsors

Many special thanks to our IEEE VTS workshop and ITRN2011 conference sponsors and supporters.
Things to do in Cork

**Places to visit!**

– Obviously University College Cork!
– Lewis Glucksman Gallery, University College Cork, Cork City.
– Blackrock Castle Observatory, Castle Road, Blackrock, Co. Cork. [www.bco.ie](http://www.bco.ie)
– Crawford Municipal Art Gallery, Emmet Place, Cork City. [www.crawfordartgallery.ie](http://www.crawfordartgallery.ie)

**Places to eat!**

**The Farmgate** in the English Market.
Tel: +353 (0)21 427 8134
[www.farmgate.ie](http://www.farmgate.ie)

**Nash 19**, Princes St Cork, Cork City.
Tel: +353 (0)21 4270880

**The Boardwalk Bar and Grill**, Lapp’s Quay, Cork City.
Tel: +353 (0)21 4279990.

**Cafe Paradiso**, 16 Lancaster Quay, Cork City.
Tel: +353 (0)21 4277 939
[www.cafeparadiso.ie](http://www.cafeparadiso.ie)

**An Cruibin**, 1 Union Quay, Cork City.
Tel + 353 (0) 21 431 0071
[www.themeatcentre.com](http://www.themeatcentre.com)

**Isaacs**, 48 MacCurtain Street, Cork City.
Tel +353 (0)214551348
Email cork@isaacs.ie

**Greene’s Restaurant**, Hotel Isaacs, 48 Mac Curtian Street, Cork.
T: +353 (0)214552279
Email: greenes@isaacs.ie

**Idaho Café**, 19 Caroline Street, Cork.
Tel: +353 (0)21 427 6376
Jacques, Phoenix Street, Cork.
Tel: +353 (0)21 4270634
Email: jacquesrestaurant@eircom.net

The Cornmarket Store, 40A Cornmarket Street, Cork City.
Tel: +353 (0)21 4274777

Jacobs on the Mall, 30A South Mall, Cork City.
Tel: +353 (0)21 425 1530

Some watering holes!

The Franciscan Well - 14 North Mall Enjoy, check-out the unique character of this microbrewery.

Fionnbarra’s - Douglas Street, a trendy traditional pub.

The Bodega - Cornmarket Street 'The Most Beautiful Bar in Ireland'. Open Late and Serving Food 7 Nights.

Counihans - Pembroke Street is one of Corks institutions.

The Sextant - Albert Quay a rocking place to go, with free pig on a spit on a Friday afternoon.


The Long Valley - Winthrop Street, perfect sandwich with a pint.

The Idle Hour – best place for a boogie on the bar!

The Hi B Bar – upstairs on Oliver Plunkett Street, a must do in Cork City and mobile phones are not allowed.
Map of Cork City, University College Cork & Parking Arrangements

Full details on commuting, access and parking around University College Cork is available at [http://www.ucc.ie/en/build/commuting/](http://www.ucc.ie/en/build/commuting/)

Cork City Map

[Map of Cork City, University College Cork & Parking Arrangements]

Map of Area around Campus

[Map of Area around Campus]

1 = Perrott Avenue Car Park
2 = Perrott’s Inch Car Park
Visitors Parking
Visitor car parking is available at Perrott’s Inch and at Perrott Avenue car parks. Please enter the car park as normal at the barrier and take the ticket dispensed. Typically this is charged at an hourly rate, however, for ITRN2011 a special rate of €5/half day and €10/full day has been agreed with the Buildings & Estate Office at University College Cork. These special vouchers can be purchased at registration (cash only).

Park & Ride
University College Cork was the first University in Ireland to operate a Park & Ride scheme. At the moment there are two car parks available:
- Dennehy’s Cross (PCB sports grounds)
- Pouladuff Road (near the South Ring Road).

Shuttle Bus
Shuttle buses operate frequent services from inside the Main Campus entrance at College Road. The service also includes the Lee Maltings Complex (Tyndall NATIONAL Institute) on Dyke Parade/ Prospect Row (using the bus stop on Dyke Parade/Mardyke St.). Both park & ride car parks are open all year. Dennehy’s Cross operates during the summer months as a Park & Walk facility only (approx 5 mins walk to Brookfield, 10-15 minutes to Main Campus). If requested for ID on the shuttle buses, please show your ITRN2011 conference badge.
**Taxis Service**

A free phone for ABC taxis is located in the Student Centre on the ground floor at the bottom of the main internal staircase across from the information desk. To contact ABC directly call (021) 4961961.

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**Campus Map**

![Campus Map Image]
Main Time Table of Events

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<td>9.00am to 10.30am</td>
<td>Registration</td>
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| 10.30am to 1.00pm | IEEE VTS – United Kingdom & Republic of Ireland Inaugural Chapter | - Dr. James Rohan, Electric Vehicle Battery Systems, Tyndall @ University College Cork  
- Dr. Martin Glavin, NUI Galway  
- Mr. Frazer McKimm, DHS Ltd.  
- Dr. Dirk Pesch, Cork Institute of Technology  
- Mr. Brendan Finn, ETTS Ltd.  
- Dr. Mazhur Bari, SolarPrint Ltd. | ORB_101 | - Dr. Keith Nolan, CTVR @ Trinity College Dublin |

| 1.00pm to 2.00pm | Lunch | Buffet | Main Rest | - |
| 2.00pm to 4.00pm | EV Project Showcase & Technology Discussions | - Mr. Senan McGrath, ESB ecars  
- Dr. Liana Cipcigan, Cardiff University  
- Ms. Celia Chambers, Department for Regional Development Northern Ireland  
- Mr. Ian Winning, Cork City Council  
- Mr. Robert Evans, Cenex  
- Dr. Yvonne Hübner, Newcastle University | ORB_101 | Ms. Gemma O’Reilly, Environmental Protection Agency |

<p>| 6.30pm to 8.00pm | Pre-conference Launch | Welcome by the Lord Mayor Cork City, Cllr. Terry Shannon &amp; the Mayor of Cork County, Cllr. Tim Lombard, Dr. Michael Murphy, President of University College Cork &amp; Mr. Kevin Murray from the Cork Chamber of Commerce | Council Chambers, City Hall | Prof. Tony Lewis, University College Cork |</p>
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<td>Registration</td>
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<tr>
<td>9.45am to 10.45am</td>
<td>Brief Opening Address</td>
<td>Aula Maxima</td>
<td>Dr. Jerry Murphy, University College Cork</td>
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<td></td>
<td>Welcome note by:</td>
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<td>- Dr. Michael Murphy, President University College Cork</td>
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<td>- Minister Alan Kelly, T.D., Minister for State at the</td>
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<td>Department of Transport</td>
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<td></td>
<td>- Mr. John Mullins, Chief Executive, Bord Gais Éireann</td>
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<td></td>
<td>- Dr. Aoife Ahern, University College Dublin</td>
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<tr>
<td>10.45am to 1.00pm</td>
<td>Opening Plenary Session Keynote Speakers:</td>
<td>Aula Maxima</td>
<td>Dr. Aoife Foley, University College Cork</td>
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<td></td>
<td>- Ms. Laura Burke, Director Environmental Protection Agency</td>
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<td>- Dr. James M. Irvine, University of Strathclyde</td>
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<td>- Mr. Hiro Kaneko, International Energy Agency</td>
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<td>- Dr. Mary Reidy, IEEE</td>
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<td></td>
<td>- Dr. Brian Ó Gallachóir, University College Dublin</td>
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<td>1.00pm to 2.00pm</td>
<td>Lunch Buffet</td>
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<td>Industry Events</td>
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<td>Alternative Fuel Vehicles</td>
<td>Concourse</td>
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<td>2.00pm to 3.30pm</td>
<td>Parallel Sessions</td>
<td>ORB_101</td>
<td>Mr. Fergal McGrath, Bord Gais Networks</td>
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<td>Session A Alternative Fuel Vehicles</td>
<td>ORB_123</td>
<td>Mr. Ger Buckley, ESB ecars</td>
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<td>Session B Transport Electrification</td>
<td>ORB_156</td>
<td>Mr. Graham Brennan, Sustainable Energy Authority of Ireland</td>
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<td>ORB_144</td>
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<td>3.30pm to 4.30pm</td>
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<td>4.30pm to 5.30pm</td>
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<td>ORB_101</td>
<td>Mr. Fergal McGrath, Bord Gais Networks</td>
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<td>ORB_123</td>
<td>Mr. Ger Buckley, ESB ecars</td>
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<td>Session B1 Transport Electrification</td>
<td>ORB_156</td>
<td>Mr. Graham Brennan, Sustainable Energy Authority of Ireland</td>
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<td>Session C1 Energy Efficiency in Transport</td>
<td>ORB_144</td>
<td>Dr. Brian Ó Gallachóir, University College Cork</td>
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<td>Social Event - Panel Discussion, Gala Dinner &amp; Prize Giving Ceremony</td>
<td>Staff Common Room</td>
<td>Prof. Gerry Wrixon, Tyndall @ University College Cork</td>
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<td></td>
<td>- Dr. Ralph Griewning, Siemens</td>
<td>&amp; Aula Maxima</td>
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<td>- Mr. Marvin Cooke, Toyota</td>
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<td>- Dr. J Hayes, University College Cork</td>
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<td>- Mr. Declan Colley, Irish Examiner</td>
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<td>- Mr. David Twohig, Renault France</td>
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<td>- Dr. Mary Reidy, IEEE</td>
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<tr>
<td>Time</td>
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<td>Speaker(s)</td>
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<tr>
<td>8.30am to 9.30am</td>
<td>Registration</td>
<td>Coffee &amp; Tea</td>
<td>St. Finbarre’s, English Market, St. Finbarre’s Cathedral etc</td>
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<tr>
<td>9.30am to 12.00pm</td>
<td>Social Event</td>
<td>Walking Tour of City Centre by Cllr. Kieran McCarthy</td>
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<tr>
<td>9.00am to 10.30am</td>
<td>Parallel Sessions</td>
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<td>Session A2</td>
<td>Smarter Transport including ICT &amp; ITS</td>
<td>Mr. Paul Bennett, ITS Ireland</td>
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<td>Session B2</td>
<td>Transport Infrastructure, Technology &amp; Materials</td>
<td>Mr. Tom King, Direct Route</td>
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<td></td>
<td>Session C2</td>
<td>Transport Logistics &amp; Freight – Aviation &amp; Maritime</td>
<td>Mr. Brendan Keating, Port of Cork</td>
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<td>Session D2</td>
<td>Public Transport</td>
<td>Dr. Brian Caulfield, Port of Cork</td>
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<tr>
<td>10.30am to 11.00am</td>
<td>Break</td>
<td>Coffee &amp; Tea</td>
<td>ORB Foyer Floor 1</td>
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<tr>
<td>11.00am to 12.30pm</td>
<td>Parallel Sessions</td>
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<td>Session A3</td>
<td>Transport &amp; the Environment</td>
<td>Dr. Paul Leahy, University College Cork</td>
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<td>Session B3</td>
<td>Transport &amp; Society</td>
<td>Dr. Aoife Ahern, University College Dublin</td>
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<td></td>
<td>Session C3</td>
<td>Transportation Modelling</td>
<td>Dr. Albert Daly, National Roads Authority</td>
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<td>Session E3</td>
<td>Pedal Power</td>
<td>Dr. Bidisha Ghosh, Trinity College Dublin</td>
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<td>Session F3</td>
<td>Saddle Power</td>
<td>Dr. Vikram Pakrashi, University College Cork</td>
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<tr>
<td>12.30pm to 1.30pm</td>
<td>Lunch</td>
<td>Buffet</td>
<td>Mini Rest</td>
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<td>1.30pm to 3.30pm</td>
<td>Brief Closing Address by Chair ITRN2011</td>
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<td>Dr. Aoife Foley, University College Cork</td>
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<td></td>
<td>Closing Plenary Session</td>
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<td>Aula Maxima</td>
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<td>Closing Keynotes</td>
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<td>Prof. Tom Cosgrove, University of Limerick</td>
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<tr>
<td>3.30pm to 4.00pm</td>
<td>ITRN Order of Business</td>
<td>AGM &amp; Election</td>
<td>Dr. Aoife Ahern, University College Dublin</td>
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<tr>
<td>4.00pm to 4.30pm</td>
<td>End</td>
<td>Coffee &amp; Teas</td>
<td>Aula Maxima</td>
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</tbody>
</table>
Biographies (in alphabetical order by surname)

Dr. Aoife Ahern is a senior lecturer in University College Dublin in the School of Architecture, Landscape and Civil Engineering. Prior to her appointment to UCD, she was a lecturer in civil engineering in Trinity College Dublin. Aoife graduated from Trinity College Dublin in 1998 with a first class honours degree in civil engineering and then completed a PhD in University College London in 2001. Her topic of research was the potential impacts of new public transport infrastructure on travel behaviour. Aoife’s areas of research are travel behaviour, road safety, land use and transport infrastructure interactions and social exclusion arising from transport disadvantage. She has supervised 8 research students and currently has four doctoral students under supervision and one postdoctoral researcher. She also carries out research in engineering education and the role of the engineer in society. Dr. Ahern was involved with setting up the ITRN in 2009 and has been Chair of ITRN since September 2010.

Paul Bennett is an Executive Board member of ITS Ireland and is currently the E-Safety Observer for Ireland, an EU initiative to develop and implement innovative technical solutions to enhance road safety. Paul is the Practice Manager and Senior Consultant for IBI Group Ireland and has over 20 years experience in Traffic Management and Control, and development of ITS products and services. Previously as Director of Serco Transport Services in the UK, Paul led a number of urban and motorway ITS projects and contracts. He was also part of the development team that brought speed and red light cameras to the UK and has been a major contributor to a number of road safety and public transport initiatives.

Gerard Buckley has over 25 years experience in the electricity industry, in power generation, transmission and project management with ESB. Gerard is currently Chairman of TC20 ETCI Technical Committee which is responsible for the co-ordination of standards in Renewables and Electric Vehicle infrastructure in Ireland. From 2007 to 2010 Gerard was Chairman of the Electro-Technical Council of Ireland. He is a Fellow of the Institution of Engineers of Ireland. Gerard is currently Programme Manager for ESB ecars and is responsible for the roll-out of Electric Vehicle infrastructure in Ireland. The purpose of the programme is to support learning about EV technology, standards, safety, interaction with the grid, market systems, ICT and user behaviour.

Dr. Mazhar Bari is Chief Executive Officer of SolarPrint Ltd. He has a Ph.D. and MPhil in Physics from the University of Cambridge (1996), B.Sc. (HONS) in Experimental Physics from University College Dublin (1991), MBA from The Michael Smurfit Graduate School of Business, Dublin (2003). He was the Programme Manager of a €6M SFI funded research project on Nanoscale Spin Electronics (2001-2006). Dr. Bari was also involved in five EU projects when he was Programme Manager at Trinity College Dublin between 2001- 2006. His core expertise is in nanomaterials, thin film device fabrication and device physics. He has published over 20 papers and is the inventor or co-inventor of six patents. Through SolarPrint, Dr. Bari is now a leading authority on the DSSC technology and commercialisation, regularly invited to speak at solar and energy-harvesting conferences world-wide.

Graham Brennan is a graduate of University College Galway and Cranfield University. He worked initially in the offshore oil and gas sector in Aberdeen and later worked for Rolls-Royce Aero Engines in Derby, UK. From there he joined Sustainable Energy Authority of Ireland in 2002 to manage the Renewable Energy Research Development and Demonstration programme. This included Ireland’s first biomass CHP system, liquid biofuel projects, innovative wind and ocean technologies. He was the author of Ireland’s Ocean Energy Strategy before moving on to his current role of Sustainable Transport Programme Manager for SEAI with responsibility for development and management of the Electric Vehicle Grant Scheme.

Laura Burke joined the Environmental Protection Agency in 2004, as the Director of the EPA’s Office of Communications and Corporate Services. She took over the position of Director of the EPA’s Office of Climate, Licensing Research and Resource use in August 2008. She is currently a member of the FP7 Environment Advisory Group which is the European Union’s main instrument for funding research in Europe. She is a graduate chemical engineer of University College Dublin and holds an MSc from Trinity College Dublin. Prior to joining the EPA she worked in the private sector, primarily in the area of Waste Management.
Dr. Brian Caulfield is a Lecturer in the Department of Civil, Structural and Environmental Engineering at Trinity College Dublin and a PI at the Centre for Transport Research. Brian’s research interests include transport planning, transport modelling, smarter travel modes, cost-benefit analysis, renewable energy and energy economics. Brian is a member of some academic and professional bodies. He also sits on two committees with the Transportation Research Board based in Washington D.C., USA. Brian has published 14 international journal articles, over 30 conference papers and is reviewer for a number of international high impact journals. Brian is currently Secretary of the Irish Transport Research Network.

Professor Graham Currie is an international expert in public transport. He leads the Public Transport Research Group at the Institute of Transport, Monash University, Australia. He is Vice Chair of US Transportation Research Board committee on Light Rail Transit and also an international member of their Bus Transit Committee and the UITP academic network. He has published over 150 papers in leading research journals and conferences related to public transport covering fields such as ridership, evaluation, performance and strategy. Graham specialises in research on the impacts of transport disadvantage and is author of a book published by Emerald Press later this year called ‘New Perspectives and Methods in Transport and Social Exclusion Research’. He also directs the Social Research in Transport Research Clearinghouse a free repository of papers to assist growth of research in the field.

Marvin Cooke, Director – Production Engineering at Toyota Motor Europe, based in Brussels. Marvin joined Toyota Motor Manufacturing UK (TMUK) as a Manufacturing Engineer in 1991 and has since held various posts within all vehicle manufacturing areas including Director of Production Operations at TMUK until the end of 2010. Transferred to the European Headquarters at the beginning of 2011 into current role. In 2010, Toyota Motor Manufacturing UK made history as the first vehicle plant to manufacture ‘full hybrid’ vehicles in Europe. Among Marvin’s responsibilities has been the practical implementation of the world famous Toyota Production System (TPS) in Europe, building Avensis and Auris cars that exceed customers’ expectations. After graduating from Nottingham Trent University with a BEng Hons in electrical and electronic engineering, Marvin worked as an engineer for Pirelli Tyres at both Burton-on-Trent and Carlisle plants. Before joining Toyota, Marvin worked as a consultant engineer within the food and drinks industry.

Dr. Liana M. Cipcigan is a Lecturer at the Cardiff University. Her most recent position was Research Associate at Durham University worked in the EPSRC founded project, ‘Intelligent active energy management for small scale energy zones’. Previously she was collaborating with the Technical University of Cluj-Napoca, Romania and Alberta University, Canada. She received her Ph.D. in Electrical and Computer Engineering from the Technical University of Cluj-Napoca, Romania in 2001. She worked at Technical University of Cluj-Napoca, Romania from 1995 to 2001 as Senior Lecturer. Her research experience is covering active network management techniques, multi-agent control systems and integration of renewable energy into electrical networks. She is a member of the IEEE.

Declan Colley is a journalist and writer. Having worked in Dublin and Wexford he joined the then Cork Examiner in 1981 and in 1986 was appointed the Motoring Editor for that newspaper - a position he has held since then. In this position he has witnessed the genesis of several generations of technological innovation in the automotive world. Declan also worked in various other positions within what is now the Irish Examiner, including a ten year stint as Deputy Sports Editor. After 27 years as a staff member with the Examiner Group, Declan left in 2008 to pursue a career as a freelance journalist and writer and has since written two books on horse racing and is currently working on another. He still covers motoring for the Irish Examiner and is now one of the longest serving motoring writers in the country.
Kay Cullinane graduated from the University of Strathclyde in Glasgow with an honours degree in Civil Engineering in July 2007. Since then she has been working as a Traffic and Transportation Engineer with Malachy Walsh and Partners Consulting Engineers in Cork. She commenced a research master’s degree at the University of Limerick in 2009. This fortuitously coincided with the announcement of the ‘Smarter Travel Areas’ competition by the Department of Transport among local authorities in Ireland. A plan for Smarter Travel Limerick has been established as part of this competition. The main aim of my research is to find out how best to ensure this plan for Smarter Travel Limerick can be successful in developing a local culture of Smarter Travel. My research will attempt to synthesise all the factors required to design a community engagement strategy for Smarter Travel Limerick. Kay is also a member of the ITRN2011 Committee.

Dr. Albert Daly is Research Manager at the National Roads Authority. He is a member of a number of organisations involved in research including FEHRL, ERTRAC, CEDR TG Research, Bridge Owners Forum, ICE Bridges Panel. He is a Chartered Engineer with over 25 year experience in the provision and management of Civil Engineering research and consultancy. Prior to joining the National Roads Authority was a Project Manager with the Transport Research Laboratory (TRL) for 18 years, where he specialised in the design and behaviour of bridges and has worked for numerous clients around the world including the UK Highways Agency, World Bank, Asian Development Bank, and the Australian Aid Agency. He is the author of over 150 papers and reports and has presented numerous papers in national and international conferences.

Robert Evans is an experienced manager with specialist skills in public affairs and marketing focused on market development for environmental technologies within the transport sector, including low carbon vehicles, vehicle emissions control and fuel cells. Robert graduated in Management Science and spent his early career with Johnson Matthey in a variety of positions in market research and marketing before specialising in public affairs and market development, culminating in the role of Director, Public and Government Affairs for Johnson Matthey’s Environmental Catalysts and Technologies business. Robert joined Cenex in December 2005 and has overseen the companies’ development and growth from a start-up to an organisation with a turnover of c£2.2m per annum, running programmes and projects for organisations across the public sector.

Celia Chambers is Head of Transportation Policy Unit in the Department for Regional Development where she is responsible for the development of integrated and sustainable transport policies aimed at promoting modal shift away from the private car to more sustainable modes such as low emission vehicles, public transport and active travel. Celia is also the leader of the Northern Ireland Plugged in Places Project. The scope of the Northern Ireland project is pilot electric vehicle infrastructure to be piloted in six locations. The locations are Belfast as the main centre of population along with five council areas principally located adjacent to the South. The five Council areas are Armagh City, Derry City, Enniskillen and Newry, which have a high penetration of cross-border trade along with Larne council area which is included as it encompasses the ferry port and is a major entry and exit point for tourist and business traffic.

Hannah Daly is an Irish Research Council for Science, Engineering & Technology (IRCSET) doctoral candidate in Energy Policy and Modelling at the Sustainable Energy Research Group (SERG) at the Environmental Research Group at University College Cork. Her supervisor is Dr Brian Ó Gallachóir. She graduated with a degree in Mathematical Sciences in 2009. Hannah’s research focuses on creating a bottom-up model to project the impacts of policy measures of transport energy consumption and CO2 emissions in the Irish private car fleet. Hannah is also a member of the ITRN2011 Committee.

Dr. Aoife Foley is an Environmental Protection Agency (EPA) Climate Change Research Fellow. Prior to that Aoife was a Lecturer at the School of Engineering in University College Cork. She is a Chartered Engineer with Engineers Ireland and has 16 year’s extensive industrial experience with ESB International, Siemens and SWS. She is a member of the IEEE Power Energy Society and Vehicular Technology Society. This September, Aoife will join the School of Mechanical and Aerospace Engineering at Queen’s College, Belfast as a Lecturer in Sustainable Energy & Transportation Systems. She is a member of the IEEE 2030.1 workgroup report on transport electrification. She has more that 20 peer reviewed articles. Aoife is Chair of the ITRN2011 Committee and member of the ITRN Committee.
Dr. Martin Glavin graduated from NUI, Galway in 1997 with a BE in Electronic Engineering, and with a PhD in 2004. He was employed as a lecturer since September 1999. He has worked in collaboration with local industry in the area of digital signal processing for a range of automotive applications since 1999 and currently supervises a number of MEngSc, PhD and postdoctoral researchers working in the areas of image processing, networking and sensor fusion. He is joint director of the Connaught Automotive Research (CAR) Group (http://www.car.nuigalway.ie/) with Dr. Edward Jones.

Dr. Bidisha Ghosh is a lecturer in the Civil, Structural and Environmental Engineering Department in Trinity College Dublin, Ireland where she has been since 2008. She received a B.E. degree from Jadavpur University, India in 2003 and she received her PhD in 2007 from Trinity College Dublin. Her expertise lies in the field of time-series modelling and its application to engineering problems. She has applied predictive time-series analysis in modelling traffic flow and speed, air pollutants, rainfall and flooding. Her research work mainly focuses on utilising time-series analysis in traffic and transportation engineering. In this regard, apart from short-term traffic forecasting, her research interests also involve incident detection, network modelling for cyclists, crash and noise barrier modelling. Finally, Bidisha is also a member of the ITRN2011 Committee and member of the ITRN Committee.

John Henry was the first Director/Chief Executive of the Dublin Transportation Office. He was centrally involved in the development of the comprehensive transport strategy for Dublin known as A Platform for Change. In the early 1980s, he was involved in the development of a settlement strategy for the Greater Dublin Area followed by a two-year period spent on a traffic and road maintenance contract in the Middle East. John is also a member of the ITRN Committee.

Dr. Ralph Griewing gained a degree in theoretical electrical engineering at the University of Siegen and the Georgia Tech Research Institute in Atlanta, USA. He started his career at Siemens AG in Munich in 1991 in the company’s Communications Systems group. In the years that followed he held various management positions in Germany, Eastern Europe and Australia. With the founding on the joint venture Nokia Siemens Networks GmbH in 2007, Ralph was appointed a member of the executive management with responsibility for the global account Deutsche Telekom. Since March 2010, Mr. Griewing has been in charge of setting up global electromobility business at Siemens AG.

Dr. John Hayes has over twenty years of automotive experience. He worked as an R&D engineer and technical manager at General Motors on the EV1 program for the decade of the 1990’s before joining University College Cork as an academic specializing in power electronics and energy systems. For the EV1 program, he specialized in propulsion inverter, EMI, and charging technologies, contributing to SAE J1773. The main area of his academic research and industrial consultancy is in power electronics, magnetics, and energy management for electric powertrains. He has several patents and many peer reviewed publication.

Professor Julian Hine currently holds the Translink Chair of Transport at the University of Ulster (Professor of Transport). He is based in the School of the Built Environment and the Built Environment Research Institute. He is currently a member of the Centre for Research on Property and Planning and leading the development of a new research centre in Transport and Highways. His research interests are focused in a number of areas including transport policy and planning, GIS and transport, transport disadvantage and social exclusion, and pedestrian behaviour and mobility. Prior to joining the University of Ulster, Professor Hine was previously based at the Transport Research Institute at Edinburgh Napier University and Heriot-Watt University. Julian is also a member of the ITRN Committee.
Dr. Yvonne Hübner is a Senior Research Associate in Intelligent Transport Systems in the Transport Operations Research Group at Newcastle University and Module Leader for CEG8414 'Intelligent Mobility; Policy and Practice'. She is responsible for the soft data collection of the electric vehicle trials in the Northeast of England (Switch-EV) and works on OASIS, a large scale integrated project co-financed by the European Commission. Yvonne specialises in transport policy and the unintended consequences that can arise from the implementation of new technologies. Previously, Yvonne worked as Principal Policy Advisor at the IET where she facilitated the transport sessions of cross-government events on engineering, infrastructure and climate change adaptation.

Hiroyuki Kaneko works at the International Energy Agency in the Transport Sector of the Energy Technology Policy Division. He is responsible for transport energy modelling up to 2050. An electrical engineer he was Manager at the Research Planning Department and the Electronics Research Laboratory at the Nissan Research Centre in Japan, where he analysed global energy and environmental trends and future scenarios and researched power electronics for electric propulsion systems. In the nineties he was a visiting scientist at Delft University of Technology. He has co-authored a number of International Energy Agency reports including the recently published Smart Grids Technology Roadmap to 2050. He is a member of the Institute of Electrical Engineers of Japan. He is currently modelling energy in transport as part of the International Energy Agency 2050 exercise.

Brendan Keating has been Chief Executive of the Port of Cork Company since December 2002. Prior to that he was City Manager in Limerick for 4 years and before that he was Assistant City Manager in Cork City. In the position of Chief Executive his primary focus has been on planning port infrastructure, and the delivery of higher levels of efficiency and quality throughout the Port of Cork.

Dr James Irvine is a Reader in the Department of Electronic and Electrical Engineering at the University of Strathclyde in Glasgow, where he leads the Mobile Communications Group. He is currently working on the UK Mobile VCE research programme, as Academic Co-ordinator of 'Instant Knowledge'. He has led work in the previous two MVEC Core programmes, being Academic Co-ordinator of the Software Based Systems and Personal Distributed Environment. He is a co-author of "Digital Mobile Communications and the TETRA System" and “Data Communications and Networks: An Engineering Approach”. He has seven patents and over 120 peer-reviewed publications. He has been an elected Board Member of the IEEE Vehicular Technology Society since 2002, and was President for the term 2008-9. He currently serves as the Society’s Vice-President Publications, as well as chairing the IEEE’s Editorial Board for Engineering, Technology and Computing Portals.

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Stephan Koch is the Commuter Plan Manager at University College Cork. He is in charge of physical access for a community of c. 20,000 on a day-to-day basis. Stephan has a degree (Dipl.-Ing.) in Transport Planning and Operations of Technische Universität Berlin. While the Commuter Plan caters to the full range of available transport modes, the emphasis is on facilitating and promoting sustainable means of access to the campus, away from the single occupancy car journey. Before coming to Ireland, he worked in several R+D projects in the field of public transport, mobility planning and railway technology in the Berlin-Brandenburg region. Stephan is also a member of the ITRN2011 Committee.

Professor Tony Lewis is Director of the Hydraulics and Maritime Research Centre at University College Cork. He has special competence in ocean energy development. Professor Lewis has been the Alternate Delegate for Ireland to the Ocean Energy Implementing Agreement under the auspices of the International Energy Agency (IEA), since 2003 and is one of the founding members of the European Ocean Energy Association. Professor Lewis was also Coordinating Lead Author for the Ocean Energy chapter in the IPCC published on Mitigation of Climate Change with Renewable Energies.

Dr. Senan McGrath is the Chief Technology Officer with ESB eCars. A chartered Electrical Engineer, he also holds a Commerce degree. Prior to his current assignment he was the Sustainability Manager for ESB Networks and before that he was the Manager of ESB Fleet and Equipment Business where he initiated the ESB Green Fleet Programme. He has held senior management positions in the Networks and Customer parts of the business. He has worked for ESB International in the Far East, the Caribbean and Eastern Europe. He is a member of the Eurelectric Task Force on Electric Vehicles and has had a key role in the development of the ESB ecar programme.

Peter Malone has been Chairman of the National Roads Authority for the past 10 years overseeing the extension of the road network including the Inter Urbans from Dublin to Waterford, Cork, Limerick, Galway and Newry. He is an Hotelier and Businessman and worked and worked in Jurys Hotels from 1974 to 2000. In 1989 he became Managing Director of the 32 group hotel chain and during his time another 32 including the very successful Jurys Inn Chain was added. Since 2000 he has been Chairman and a board member of a number of companies. For the past three years he has been Chancellor and Chairman of the University of Limerick. For the last six years he has chaired the Business Tourism Forum for Failte Ireland with members of the Industry on the board. The main aim is to insure more conferences come to Ireland.

Mr Conall Mac Aongusa is an experienced senior transport executive with over 22 years experience in major transport consultancies, in Ireland, Europe and overseas. He contributed a review of the EU White Paper on Transport for Ireland and has carried out evaluations for the EU Commission. He is a Council Member of the Association for European Transport (AET). He is a member of the Economic and Regional Development Committee of Cork Chamber and of Cork County Council Planning SPC and is a Director of Transport and Innovation Ltd, an independent traffic and transport consultancy.

Fergal McGrath is the Networks Sales Strategic Planning Manager within Bord Gáis Networks Commercial Department and is responsible for the development of the Sales & Marketing Strategy which aims to increase gas network utilisation. A key initiative in this regard is the investigation into the market potential for natural gas as a transport fuel in Ireland. Fergal is an Electronic Engineering graduate from University College Dublin and worked for three years in the semiconductor industry before joining Bord Gáis. Fergal’s ten years experience with the company began in Communications & Instrumentation and also includes three years in Grid Control where he worked in the operation of the high pressure gas network. Fergal has recently completed an MBA with Henley Business School.

Dr. Paul Leahy is the Science Foundation Ireland Stokes Lecturer in Wind Energy Engineering. His PhD research on high-resolution fluid measurement systems for fusion plasmas at the Culham Centre for Fusion Energy in the UK. He commenced postdoctoral work in environmental engineering and atmospheric sciences with the Hydrometeor research group at University College Cork in 2004. His current research interests include quantifying the effects of weather extremes, climate change and wind variability on power generation; operations of energy storage facilities in supporting renewable electricity generation; and autoproduction of wind energy by industrial energy users. He has published more than 30 papers. He is a member of the IEEE and the American Geophysical Union. Paul is also a member of the ITRN2011 Committee.

Shaun McFadden is a lecturer Dublin Institute of Technology. Prior to that Shaun worked in the private sector as a design engineer with Timoney Technology Ltd. and specialised in off-road vehicle solutions. Shaun has also provided engineering consultancy work to the automotive industry on several OEM projects. Shaun’s doctoral research was funded by the European Space Agency and involved a microgravity solidification experiment onboard the MAXUS 7 sounding rocket. He collaborated with CMU and Boeing on the design of special-purpose, hybrid-electric vehicle projects for the US Government (DARPA and ONR). Dr McFadden’s current area of research is turbine engines, vehicle dynamics modelling and fatigue analysis of automotive components. He is a Chartered Engineer and has over 20 peer-reviewed articles. Shaun is also a member of the ITRN Committee.
Tony McGrath has twenty years experience in the management of engineering and consultancy projects for a range of public and private sector clients. He leads PM Group’s Strategic Planning Division which covers activities in the areas of Site Selection, Due Diligence, Master Planning and Project Permitting. His technical speciality is in the areas of Location Selection and Site Master Planning where he has led a number of high profile assignments for clients in Europe and Asia in the Life Science, Advanced Technology, Energy and Public Infrastructure sectors. Tony is also highly experienced in the area of stakeholder consultation for major capital projects covering; Local Authorities, Utility Providers, Community Groups, Industry, and Government and NGO bodies.

Dr. Alan P. Morrison is a Senior Lecturer in the School of Engineering in University College Cork. From 1996 until 1998 he was responsible for Silicon Optoelectronics Research within the Technology Characterisation and Modelling Group at the National Microelectronics Research Centre (NMRC) (now the Tyndall National Institute). He is an Academic Member of the Tyndall National Institute. He is a Senior Member of the IEEE and a member of the IEEE Photonics Society and a life member of the IEEE Electron Devices Society. He is an SFI Principal Investigator and author/co-author of more than 90 scientific publications in peer reviewed international journals and conference proceedings.

Dr. Jerry D. Murphy is Lecturer in Transportation Engineering in University College Cork and Principle Investigator (PI) in Bioenergy and Biofuels in the Environmental Research Institute (ERI). Jerry served as the International Energy Agency (IEA) Country Representative for Ireland for Task 39 Liquid Biofuels (2007 - 2009) and at present serves on IEA Task 37 Energy from Biogas (2010 - 2012). Jerry served as Chair of an International Energy Agency (IEA) Biofuels Conference in Cork in 2008 and an EPA biomethane conference in Cork in 2010. He has published extensively with c. 42 peer review journal papers, 21 international conference papers and a further 22 invited lectures; his work has been cited over 420 times in peer review press. He is on the editorial board of Renewable Energy. Jerry is also a member of the ITRN2011 Committee.

Kevin Murray is an independent engineering consultant. He is a member of the Board of Directors of Cork Chamber and Chairman of the Chamber’s Transport & Infrastructure Committee. He also represents the Cork Business Pillar on the Transport SPC of Cork County Council. Kevin is a Chartered Civil & Structural Engineer with over 23 years experience as a consultant in Ireland and the United Kingdom. He is a former chairman of the Cork Region of Engineers Ireland. For several years he was a director of the Irish subsidiary of one of Europe’s largest construction consultancy firms.

Celine McInerney is a Lecturer in the Department of Accounting & Finance in University College Cork. Prior to that she worked for many years in the private sector in finance and investment in New York and London. She has a Bachelors degree in Business Science a Diploma in Statistics from Dublin City University and M. Litt. From Trinity College Dublin. She is also studying for a PhD electricity markets in University College Cork and University College London.

Roisin Murray graduated from Institute of Technology Tallaght, Dublin with a BSc in Manufacturing Engineering in 2002 and obtained a ME in Advanced Engineering from Dublin Institute of Technology (DIT) in 2004. She joined the Department of Transport Engineering at DIT (2005) where she worked on transport research (2005-2010) and was appointed Assistant Head of Department in 2010. She has also managed an Innovation Partnership project ‘Low Noise Solutions for Night Deliveries’ (2005 – 2007) and some FP6 projects for DIT such as SILENCE, BESTUF5 (Best Urban Freight Solutions) and NICHES (2005-2008). She is currently the PI on various national and European research projects (InterReg IVB) including INTRADE (Intelligent Transportation for the Dynamic Environment), which is co-funded by Dublin Port Company and ENEVATE (European Network on Electric Vehicles and Transferring Expertise, co-funded by Electricity Ireland (formerly ESB). Roisin is also a member of the ITRN Committee.

John Mullins was appointed Chief Executive of Bord Gáis in December 2007 and was also appointed to the Board in December 2007. Mr Mullins is a member of the Investment/Infrastructure Committee. He has held senior management positions with Greenstar, ESBI, ESBI International and PricewaterhouseCoopers and was Chief Executive of Bioverda, part of the NTR plc. Group prior to joining Bord Gáis. He is a Fellow of Engineers Ireland and is a member of the University College Cork Governing Body. He is also President of the Cork Chamber of Commerce, Chairman of Anam cara Charity and a Director of the COPE Foundation.

Frazer McKimm graduated from University and the Royal College of Art in London, where he specialised in Human Computer Design (HCI). In 1991 Frazer set up a design and engineering company in Milan. His company developed mostly HCI solutions for the IT and telecommunications sector. Home networking and digital broadband products were some of the key products. As a result McKimm Studios built up an network of international clients in Europe, Asia and the US. In 2000 McKimm Studios started working with Fiat, from which Frazer formed DHS in Dublin to apply HCI to software predominantly for the automotive industry.
Dr. Keith Nolan received his PhD degree in electronic engineering in 2005 and a BAI degree in 2000 all from the University of Dublin, Trinity College, Ireland. He is a research fellow with the Telecommunications Research Centre (CTVR) at the University of Dublin, Trinity College. He has served as organiser, chair, and co-chair of demonstrations for IEEE DySPAN symposia, and on numerous TPCs for conferences concerning cognitive radio and dynamic spectrum access technologies. He currently serves on the management committees for COST Actions IC0902 and IC0905 (COST-TERRA) and chairs an economic and regulatory working group within COST-TERRA. He also serves as a liaison officer between the Wireless Innovation Forum (WInnF) and both COST Actions IC0902 & IC0905. Dr. Nolan is a technical co-author of the IEEE P1900.1 standard, and has published widely on topics relating to signal processing, software and cognitive radio, and dynamic spectrum access systems. He is a founder member of the IEEE VTS UK and Republic of Ireland Chapter.

Dr. Brian Ó Gallachóir is a Lecturer in Energy Engineering in University College Cork. He is also Principal Investigator in Energy Policy and Modelling research in University College Cork’s Environmental Research Institute. The main focus of his research is the development of energy modelling tools to inform energy policy. In the area of transport energy, his research includes modelling past and future energy demand associated with private car, freight and air transport and quantifying the impacts of private car taxation, electric vehicles, renewable energy targets and emissions reduction targets on transport energy demand and supply. He is Chair of the IEA’s Executive Committee on Energy Technology Systems Analysis Programme (ETSAP). Brian is an elected member of the RIA Climate Change Committee and a member of the Technical Analysis Steering Group on Climate Change and Energy Security. Brian also provides strategic advice to SEAI’s Energy Policy Statistical Support Unit and Energy Modelling Team and is a member of the ITRN2011 Committee.

Dr. Vikram Pakrashi is a Lecturer in the Department of Civil and Environmental Engineering in University College Cork. Vikram is a Chartered Engineer and works with key infrastructure elements. In the industry, he has been active mainly in design, assessment and testing of bridge structures. Vikram graduated from Jadavpur University, Kolkata, India with a BE in Civil Engineering (2003) and a PhD from Trinity College Dublin, Ireland (2007). His research interests are in time-frequency analysis techniques, signal processing, structural health monitoring and control, vibrations of structures and reliability analysis. Before joining University College Cork, Vikram worked as a Consultant Engineer in Roughan & O’Donovan consulting engineers in the bridges group. Vikram is also a member of the ITRN2011 Committee.

Dr. Dirk Pesch is Head of the new Nimbus Centre for Embedded Systems Research at Cork Institute of Technology. Dr Pesch received a Dipl.Ing. degree from RWTH Aachen University, Germany, and a PhD from the University of Strathclyde in Scotland, both in Electrical & Electronic Engineering. He has 15 years research and development experience in national and EU funded projects. He has over 100 journal, book chapter, and conference publications in his area of expertise. He is involved in a number of national and international research projects and is the lead Principle Investigator for the SFI funded NEMBES research cluster and a member of the steering committee of the Irish Wireless Sensor Net-works (WISEN) Industry Lead Research Cluster.

Dr Sean O’Sullivan has a BS in Electrical Engineering from Rensselaer Polytechnic Institute and an MFA in Film Production from the University of Southern California. Sean was a founder and President of the US-based Mapinfo for its first 6 years, the pioneering company in “desktop mapping” and was involved until it was ranked #28th largest US microcomputer software companies and top 50 of the Inc 500 fastest growing companies in the United States. He has been on the board of directors of the Massachusetts Software Council; co-founded the Center for Open Software at Rensselaer, the “Breakfast with the Stars” program at MIT, and the "Change the World Challenge" at Rensselaer. He also founded international humanitarian organization JumpStart International leading it from 0 to 3,500 workers. Sean SOSventures Investments Ltd, the Irish subsidiary, is headquartered in Kinsale, Ireland. Sean is co-founder and Managing Director of Aovego Ltd., which was spun-out of Mapinfo in March 2009, at which time he stepped down as Executive Chairman of Mapinfo.

Gemma O’Reilly is a research specialist in socioeconomics and technology in the Environmental Protection Agency’s Climate Change Research Programme. She was a member of the Domestic Offset Committee set up by the EPA. Gemma is also a member of the Irish delegation to the United Nations Framework for Climate Change and Control where she also provides analytic support to the European Union lead negotiator. Gemma has an MA in economics and an MSc in Environmental Policy from University College Dublin.
Dr. Niamh Power is a Lecturer in the Civil & Structural Department in Cork Institute of Technology. She teaches environmental engineering and infrastructure. Her area of expertise is biogas as a transport fuel. Niamh coordinates the Certificate in Environmental and Energy Engineering in Cork Institute of Technology. She is a member of Engineers Ireland and has a number of peer reviewed international journal articles. Niamh is also a member of the ITRN2011 Committee.

Dr. James Rohan is research activity leader for Electrochemical Materials and Energy at Tyndall National Institute, University College Cork. Between 1994 and 1996, he worked as a Senior Scientist with EIC Laboratories (Norwood, Massachusetts) developing lithium ion polymer gel rechargeable batteries for the USABC (United State Advanced Battery Consortium). He established the battery and fuel cell research activities at Tyndall. In Ireland, he has had research collaboration with Intel, HP, Harris Semiconductor, Bourns Electronics and Pfizer. He leads the Tyndall advanced battery activity for two EU FP7 projects, Nanofunction and Guardian Angels, the recently announced Future and Emerging Technology Flagship Pilot programme. He has over 90 publications in the area of electrochemical materials and energy.

Dr. Mary Reidy is currently a member of United States of America National Grid’s Smart Technology Center in Liverpool, NY and is responsible for identification of appropriate university-industry collaborations, including the development of a Smart Grid curriculum as part of the US Department of Energy’s (DOE) ARRA FOA 152 grants. She is also currently serving as Chair of the IEEE p2030.1 working group, which will provide a guide to those interested in the interconnection and interaction of electric transportation and the electric grid. The p2030.1 working group is part of the IEEE’s Smart Grid Interoperability Working Groups, which support the work of the National Institute of Standards Technology (NIST) under the Department of Energy (DOE). She is a licensed professional engineer in New York State, and has earned an MBA, M.Eng., BSEE and BS in Accounting.

Professor Aisling Reynolds-Feighan is Associate Professor of Transport Economics at the School of Economics, University College Dublin, and Research Associate of the UCD Geary Institute. Aisling’s research interests include airport policy and competition, air transport networks, transport system organisation, and transport metrics. She has recently completed a research project on A comparative analysis of air transport metrics for the Irish Research Council for the Humanities and Social Sciences (IRCHSS), and is working on a project to identify the social and economic implications of establishing an Air Bridge between North West Wales and Eastern Ireland.

David Twohig is currently Deputy Chief Vehicle Engineer for one of Renault’s Electric Vehicle projects – ZOE, to be launched in mid-2012. David has 19 years’ experience in automotive design and development, having previously worked for Nissan, both in the UK and in Japan. He was appointed Deputy Chief Vehicle Engineer with Nissan in 2002 and led the engineering team responsible for the highly-successful Nissan Qashqai, spending a year in Japan. In 2006 he was transferred within the Renault-Nissan Alliance to work in Renault’s global engineering headquarters near Paris. After some time spent in advanced platform engineering, David was asked to lead the engineering team responsible for one of Renault’s four new electric vehicles.

Dr. Amaya Vega is a post doctorate research fellow in the Irish Centre for Rural Transformation and Sustainability (ICERTS). Prior to that she worked as a lecturer in Economics at NUI, Galway and as an assistant lecturer in Economics at University College Dublin. Her research focuses on the assessment of conceptual issues critical to rural development such as rural employment clustering, accessibility and sustainability in rural areas. Her doctoral research focused on the use of spatial analysis tools for the study of residential location and travel behaviour decisions. She was awarded a Marie Curie Fellowship in Economics, Policy and Appraisal at the Institute for Transport Studies, University of Leeds, UK and the ICO Foundation Research Scholarship from the Government of Spain. She has published in Urban Studies and Transportation Research Part A. Amaya is also a member of the ITRN Committee.
Phil Verster completed his Masters degree in Electrical Engineering and worked in the electricity supply industry for 7 years before joining Rolls Royce as a senior manager responsible for manufacturing and project management of control systems. From there he joined the UK rail industry as site manager and Production Director of Bombardier Services followed by an appointment as Fleet Director to “turn around” a failed rail franchise. Phil joined Irish rail in 2007 as the Chief Mechanical Engineer and is currently the Deputy CEO and Chief Engineer with responsibility for all the Engineering disciplines. Phil’s primary interest is in organisational change, continuous improvement and the development of organisational leadership using “Lean” thinking and Lean Manufacturing techniques.

Ian Winning is a Senior Executive Engineer in the Roads & Transportation Directorate at Cork City Council and has been responsible for the specification, design, implementation and project engineering of the Contract 1996-2000 to install the UTC System and subsequent upgrades to the latest MC3 version of SCOOT UTC in Cork. Responsibilities include the management and development of various ITS system, maintenance and up-grading of public lighting to modern ‘Intelligent Street Lighting’ to deliver more energy efficiency solutions is a part of his remit. He has been in charge of the City’s input to a series of transport projects funded by various programmes of the European Union and National Transport Authority. Participation on the Green eMotion project to promote the deployment of charging infrastructure and the use of EVs on a widespread basis with Irish and European partners is a key commitment. Ian is a Chartered Member of Engineers Ireland. Ian is also a member of the ITRN2011 Committee.

Dr. Gerard T. Wrixon was President of the National University of Ireland, Cork from 1999 to 2007. He was Chairman and founder of Farran Technology and was a director of General Semiconductor Inc., as well as a member of the boards of Telecom Eireann, DII Group Inc. and Allied Iris Investment Bank. He is currently on the board of FEXCO. Gerard is an expert in PV. As a graduate he worked for the Fokker Airkraft Company in Amsterdam as a development engineer. He was also founder and Director of the National Microelectronics Research Centre (now the Tyndall National Institute) and a Professor of Microelectronics at University College Cork. He is a member of the Royal Dublin Society, the Royal Irish Academy and a Fellow of Engineers Ireland and the IEEE. In 2000 he was awarded the IEEE Third Millennium Medal.
IEEE VTS – United Kingdom & Republic of Ireland Inaugural Chapter Meeting

The IEEE VTS concerns itself with land, airborne and maritime mobile services; portable commercial and citizen’s communications services; vehicular electrotechnology, equipment and systems of the automotive industry; traction power, signals, communications and control systems for mass transit and railroads. The brand new United Kingdom and Republic of Ireland Chapter has been set up thanks to the continued efforts of Dr. Oliver Holland, from King’s College London, Dr. Keith Nolan, Trinity College Dublin and Dr. Aoife Foley, University College Cork. This new chapter will serve the more than 150 VTS members in the UK and Republic of Ireland Section of IEEE. Dr. Holland is the interim Chapter chair.

The special free IEEE VTS workshop and inaugural chapter meeting will be held on the 30th August in the O’Rahilly Building (ORB) in University College Cork. It is supported by ESB ecars.

Agenda of the chapter meeting:
1. Welcome and overview of the VTS UK&RI Chapter
2. Objectives
3. Ideas – brainstorm and discussion
4. Future direction and work plan
5. Collaboration and interaction - discussion
6. AOB
7. Close of meeting

Organisers:
Dr. Aoife Foley, University College Cork, Ireland, aoife.foley@ucc.ie
Dr. Keith Nolan, Trinity College Dublin, Ireland, keith.nolan@tcd.ie
Dr. Oliver Holland, King’s College London, UK, oliver.holland@kcl.ac.uk

ESB ecars
Leading the charge
Social Activities

Pre-conference Launch
The pre-conference launch will take place in Council Chambers of the historic City Hall Cork on the 30th August at 6.30pm. The City Hall is located on Anglesea Street in the City centre. IEEE VTS and ITRN2011 delegates will be officially welcomed to Cork by the Lord Mayor of Cork City, Cllr. Terry Shannon, the Mayor of County Cork, Cllr. Tim Lombard, Dr. Michael Murphy, President of University College Cork and Mr. Kevin Murray from the Cork Chamber of Commerce. Light refreshments, wine and finger food will be served. The launch will be chaired by Professor Tony Lewis, University College Cork.

Cork city was founded by St Finbarre over 1,000 years ago it has grown from a trading merchant city to a cosmopolitan vibrant 21st century city of today. The city situated on the banks of the river Lee is home to 123,000 people. It is the 2nd largest city in the Republic of Ireland. The area of the city is 3,731 hectares. Cork is a university city with a total student population in excess of 25,000. The city has two main third level education institutes - University College Cork and Cork Institute of Technology.

Panel Discussion, Prize Giving Ceremony & Gala Dinner
The drinks reception, panel discussion, Gala Dinner and prize giving ceremony and will take place in the Staff Common Room and the Aula Maxima, or Great Hall on the 31st August at 6.15pm. The Aula Maxima is the symbolic heart of University College Cork. It is the venue for many of the formal events in the Academic year. Two impressive stained glass windows illuminate the hall. The window on the east wall commemorates the great mathematician, George Boole (1815-1864), the first Professor of Mathematics at University College Cork, whose algebra became the foundation of modern computer science.

The panel discussion will be held before the Gala Dinner. This will be a traditional style panel discussion, where the 6 speakers will present for a maximum of 5 minutes each, followed by an open floor with the audience for questions and answers. The panel discussion will be chaired by Professor Gerard Wrixon. The working title of the panel discussion topic is 'Transportation technology and the road to improved energy efficiency and emissions reduction in the 21st Century'. The prize giving ceremony is after the Gala Dinner. 16 prizes will be awarded in total, including the best paper prize in the alternative fuel vehicle session sponsored by Bord Gáis Networks and the overall best paper prize.
Walking Tour

The walking tour of Cork City will start at 9.30am on the 1st of September from the O’Rahilly Building in University College Cork. Bring a light rain coat just in case or an umbrella. The walking tour has been given free of charge by Cllr. Kieran McCarthy. Kieran is a born and bred Cork man. He has great love for his hometown and today remains dedicated to promoting the past, present and future of this city.

Kieran studied Archaeology and Geography at University College Cork. On completing his Joint Honours BA degree, he went on to undertake a Masters in Geography. Even after devoting four years to furthering his knowledge of the city, Kieran wasn’t satisfied to leave his love of all things Cork and is now completing a PhD on the River Lee Valley. His commitment to instilling a sense of pride in the community is demonstrated through his involvement in two well-established school projects currently running in Cork. The first, the ‘Discover Cork: Schools’ Heritage Project’, was founded by Kieran in 2003 and has now been implemented in 90 schools across the city and county. The second ‘Understanding Europe’, is a European Studies Programme for transition years.

Kieran has also written ten books dedicated to Cork and has published a wide range of articles including his well-known weekly column in the Cork Independent ‘Our City Our Town’ which has built a loyal following over the past 12 years. Kieran is committed to his community and city and wants to lead the way forward in bringing Cork City into the next stage of growth and development. He was elected to Cork City Council in June 2009 as an Independent Councillor. He is a member of the following Council functional committees - Housing, Planning and Recreation and Amenity. He is a member of the Arts Committee, Heritage Forum and Recreation and Amenity’s Strategic Policy Committee. He is also Chairman of the Cork-San Francisco Sub twinning committee.
## Parallel Sessions

**31st August: 2.00pm to 3.30pm**

### Session A – Alternative Fuel Vehicles – including natural gas, CNG and hydrogen

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<th>ID</th>
<th>Title &amp; Abstract</th>
<th>Authors</th>
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<tbody>
<tr>
<td>88</td>
<td>A life-cycle technical assessment of biofuel options for Ireland</td>
<td>Niamh Power and Eoin Deasy, Cork Institute of Technology</td>
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<td>158</td>
<td>Natural Gas as a Sustainable Transport Fuel – A case study on Italy and Spain</td>
<td>Patrick Callanan, Bord Gáis Networks and Aoife Foley, University College Cork</td>
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<td>121</td>
<td>Examining the optimal fuel type for urban bus operations</td>
<td>Fearghal Ryan and Brian Caulfield, Trinity College Dublin</td>
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### Session B – Transport Electrification

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<td>83</td>
<td>Research Programme associated with the ecar Ireland Project</td>
<td>Senan McGrath, ESB ecars</td>
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<td>97</td>
<td>Large-scale Deployment of Electric Vehicles</td>
<td>David Twohig, RENAULT SA</td>
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<td>105</td>
<td>A Study of the 10% Electric Vehicles target on the Single Electricity Market</td>
<td>Aoife Foley, Barry Tyther and Brian O Gallachóir, University College Cork</td>
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<td>126</td>
<td>Power System Reserve from Electric Vehicles</td>
<td>Eamon Keane and Damian Flynn, University College Dublin</td>
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### Session C – Energy Efficiency in Transport

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<tr>
<td>91</td>
<td>An advanced model for estimating Green House Gas emissions for Irish air transport</td>
<td>Gregg Patrick, Central Statistics Office</td>
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<td>115</td>
<td>The potential for increased efficiency in the Irish Freight Sector</td>
<td>Eoin O'Reilly, National Transport Authority</td>
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<td>128</td>
<td>Rail Freight in the Republic of Ireland</td>
<td>Juan Carlos Carrasco Gimenez, Edward Sweeney and John Harvey, Dublin Institute of Technology</td>
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<td>148</td>
<td>Energy efficiency and LRT</td>
<td>Paolo Carbone, Railway Procurement Agency</td>
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### Session D – Greening Transport

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<tr>
<th>ID</th>
<th>Title &amp; Abstract</th>
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</table>
| 119 | Learning to cycle again: examining the benefits of providing tax-free loans to purchase new bicycles | James Leahy* and Brian Caulfield~  
* = Bike to Work & ~ = Trinity College Dublin |
| 84  | Urban Sprawl and Travel Energy Consumption: The Case of the Walloon Region of Belgium | Anne-Francoise Marique and Signid Reiter, University of Liege - LEMA |
| 86  | Effectiveness of transport governance structures in local policy implementation for the management of car dependency: A methodological framework | Waseem Akram, Julian Hine and Jim Berry, University of Ulster |
| 140 | An analysis of the role of bicycle-sharing in a European city: the case of Dublin, Ireland | Enda Murphy* and Joe Usher~  
* = University College Dublin & ~ = Department of Transport |
### Session A1 – Alternative Fuel Vehicles – including natural gas, CNG and hydrogen

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<tr>
<td>103</td>
<td>A Well-to-Wheel Analysis of Electric Vehicles and Greenhouse Gas Savings</td>
<td>Aoife Foley, Beatrice Smyth, Jerry Murphy and Brian Ó Gallachóir, University College Cork</td>
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<td>154</td>
<td>A technical &amp; Economic Appraisal of Bio-methane for Small to Medium Scale Development from Resources Indigenous to Ireland</td>
<td>Daniel J. Goulding and Niamh Power, Cork Institute of Technology</td>
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<td>159</td>
<td>Could gaseous transport fuel have a future in Ireland?</td>
<td>James Browne, Thanasit Thamsiriroj and Jerry D Murphy, University College Cork</td>
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### Session B1 – Transport Electrification

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<tr>
<td>131</td>
<td>Range estimation for the Nissan Leaf and Tesla Roadster using simplified power train models</td>
<td>Rui Pedro De Oliveira, Sean Vaughan and John Hayes, University College Cork</td>
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<td>125</td>
<td>The Role of Microgeneration in Displacing Carbon Dioxide Emissions from Motor Vehicles in Ireland</td>
<td>Gerard T. Wrixon, University College Cork</td>
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<tr>
<td>141</td>
<td>Impact of Weather Conditions on Electric Vehicle Performance</td>
<td>Paul Leahy, Aoife Foley and Brian Ó Gallachóir, University College Cork</td>
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### Session C1 – Energy Efficiency in Transport

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<td>150</td>
<td>Assessing the Environmental Performance of Public Transport: A Case Study of the Luas System</td>
<td>Michael Dempsey, Railway Procurement Agency</td>
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<td>96</td>
<td>An Analysis of the Energy Efficiency of the Bicycle</td>
<td>John Dawson, <a href="http://www.cyclist.ie">www.cyclist.ie</a></td>
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<td>99</td>
<td>Shopping Travel Behaviour in Dublin City Centre</td>
<td>David O’Connor**, James Nix**, Simon Bradshaw and Enda Shiel ** = Dublin Institute of Technology # = Irish Environmental Network</td>
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<td>143</td>
<td>Two technological approaches for long-term private car energy policy modelling in Ireland</td>
<td>Hannah Daly and Dr. Brian Ó Gallachóir, University College Cork</td>
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### Session D1 – Transport Stats & Economics

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<td>An Econometric Analyses of Irish Residential Transport Expenditures</td>
<td>John Eakins, University College Cork</td>
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<td>112</td>
<td>A Comparative Study of the Travel Patterns of Vehicle Owners and Persons who do not own a Vehicle</td>
<td>Mairead Griffin, Central Statistics Office</td>
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<td>161</td>
<td>Commuting: A Virtual Poll Tax across Irish Regions</td>
<td>Karyn Morrissey †, Amaya Vega †, Cathal O’Donoghue † = National University of Ireland, Galway</td>
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<td>120</td>
<td>An examination of the factors that impact upon multiple vehicle ownership: The case of Dublin, Ireland</td>
<td>Brian Caulfield, Trinity College Dublin</td>
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<th>Session Chair – Mr. Paul Bennett, ITS Ireland</th>
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<td>Designing a Community Engagement Strategy for Smarter Travel Limerick using Precedent Studies and Focus Groups</td>
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<td>Personalised Travel Planning in Midleton</td>
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<td>A Self-Informed Bridge Assessment, Maintenance and Management Tool for Bridge Monitoring</td>
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<td>156</td>
<td>Short-term Traffic Flow Forecasting using Dynamic Linear Models</td>
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<tr>
<td>Kay Cullinane and Tom Cosgrove, University of Limerick</td>
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<td>Elaine Brick, AECOM</td>
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<td>Stephen Hand, Aoife Foley, Gillian Bruton, Damir Bekić and Eamon McKeogh # = University College Cork &amp; ~ = University of Zagreb, Croatia</td>
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<td>Tipei Mai, Bidisha Ghosh and Simon Wilson, Trinity College Dublin</td>
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<tr>
<th>Session B2 – Transport Infrastructure, Technology &amp; Materials</th>
<th>Session Chair – Mr. Tom King, Direct Route</th>
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<td>124</td>
<td>A Network Scan of Horizontal Road Geometry</td>
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<td>132</td>
<td>Development of Roadside Safety Barriers using Natural Building Materials</td>
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<td>102</td>
<td>Determining Impact of Bus-Stops on Roadway Capacity</td>
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<td>106</td>
<td>Development of a New air intake and Exhaust System for a Single Seat Race Car</td>
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<tr>
<td>Desmond O’Connor, National Roads Authority</td>
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<td>Giuseppina Amato, Fionn O’Brien, Ciaran Simms and Bidisha Ghosh, Trinity College Dublin</td>
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<td>Johnnie Ben-Edigbe and Nordiana Mashros, University of Technology Malaysia</td>
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<td>Damien Kennedy, Gerry Woods and Darragh Forrest, Dublin Institute of Technology</td>
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<tr>
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<th>Session Chair – Mr. Brendan Keating, Port of Cork</th>
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<td>A Constraint-based Approach to Ship Maintenance Scheduling for the Irish Navy</td>
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<td>Evaluation of Business Models in Freight Transport under consideration of Multimodal Aspects</td>
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<td>The Importance of Product Distinction in Lifecycle and Product Chain Analyses</td>
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<td>Achieving Paperless Freight Transport</td>
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<td>76</td>
<td>Time4trucks: Freight Transportation &amp; Congestion relationships in Urban Areas: Methodology Approach &amp; Saving Potentials</td>
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<tr>
<td>George Boyle, James Little, Joseph Manning and Roman van der Krogt, University College Cork</td>
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<tr>
<td>Christian W. Flotzinger, Gerald J. Aschauer and Friedrich Starkl, Upper Austria University of Applied Sciences</td>
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<td>Conor Walsh and Alice Bows, University of Manchester</td>
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<td>Gráinne Lynch, National Maritime College of Ireland and Gary O’Connor, Nautical Enterprise Centre</td>
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<td>Gerald J. Aschauer, Christian W. Flotzinger and Friedrich Starkl, Upper Austria University of Applied Sciences</td>
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<th>Session D2 – Public Transport</th>
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<td>75</td>
<td>Bus Transit Service Quality Monitoring in the UK: A Methodological Framework</td>
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<td>100</td>
<td>An Appraisal of Proposed and Existing NTA Corporate Structures</td>
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<td>160</td>
<td>How to Improve High-Frequency Bus Service Reliability Through Scheduling</td>
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<td>BRT or LRT – the feasibility of LRT or BRT for UCD</td>
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<td>Examining the Barriers to Sustainable Inter-City Transport in Ireland</td>
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<tr>
<td>Moataz Mahmoud, Julian Hine, Anil Kashyap, University of Ulster</td>
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<tr>
<td>David O’Connor, Dublin Institute of Technology</td>
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<td>Grace Fattouché</td>
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<td>Neil Montague and Sarah McNally, University College Dublin</td>
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<td>Gerard Cafferkey and Brian Caufield, Trinity College Dublin</td>
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1st September: 11.00am to 12.30pm

**Session A3 – Transport & the Environment**

**Location:** ORB_101

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**Session B3 – Transport & Society**

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Note from Editorial Committee

The Irish Transport Research Network has gained considerable momentum with the dedication of all members. A very strong and interesting programme of events and activities is planned. In terms of the quality of the papers submitted, approximately 47% of the abstracts were rejected after the review process. This indicates a very good overall standard. We are also delighted to announce that we are in the process of arranging two special issue journals for the best papers submitted to ITRN2011 with the Proceedings of the Institution of Civil Engineers in their Energy and Transport journals. As details are fleshed-out and finalised in September we will provide additional updates and contact authors directly with instructions.

This year’s ITRN conference features two plenary sessions, one panel discussion, three special technical sessions and sixteen parallel sessions with 70 oral presentations. Authors, discussants, session chairs, keynote speakers and workshop leaders from industry, the public sectors, semi-states and academia from both Ireland and abroad meet at ITRN2011 in University College Cork to discuss current and future important issues in transportation. The central theme of the conference is Energy and Transport. In this context, research papers on energy demand and efficiency in different sectors of transportation and alternatively fuelled vehicles were presented and discussed. Important and popular research areas, such as, transport and environment, non-motorised travel and Intelligent Transport Systems, were also presented and discussed.

The efforts of the members of the Conference Committee, the ITRN Scientific Committee and the Editorial team will make this conference a resounding success.

Dr. Bidisha Ghosh

on behalf of the ITRN2011 Editorial team
Abstracts

Session A – Alternative Fuel Vehicles – including natural gas, CNG and hydrogen

ID 88: A life-cycle technical assessment of biofuel options for Ireland
Eoin Deasy, Cork Institute of Technology
Niamh Power, Cork Institute of Technology

The purpose of this work is to determine the optimum biofuel for Ireland from a production process viewpoint; involving an in-depth life-cycle technical assessment. The importance of this work becomes apparent once one considers the escalating worldwide concern over global warming, climate change, instability and unrest in the oil producing regions of the world and over dependence on import fossil fuels. Therefore, within this work, particular emphasis is placed on the sustainability and practicality of crop production and biofuel processing from a technical and environmental viewpoint. The approach involves an in-depth energy balance of two biofuel options; biomethane and biodiesel. Within this approach, the work takes into consideration both direct and indirect energy consumption at the crop production stage and the biofuel processing stage. This technique allows for the overall life-cycle energy consumption to be calculated; from which the true net-energy is determined and all associated life-cycle carbon dioxide emissions are established. The motivation for this analysis stems from the potential of biofuels to assist Ireland in meeting obligations outlined in the ‘Renewable Energy Source Directive’ (2009/28/EC). Grass silage (three cut) and barley are the two indigenous crops investigated for biomethane, while oilseed rape is the crop chosen for biodiesel analysis. Each crop is investigated and scrutinised in relation to overall energy consumption and net-energy created per hectare of crop cultivated; this is followed by outlining the associated carbon dioxide emissions – giving an indication of the optimum biofuel for Ireland. The results show that biodiesel produces 48.3GJ/ha of gross energy (GE) (29.0GJ/ha of net-energy (NE)) with emissions of 41.2kgCO₂/GJ-NE. For biomethane, it is demonstrated that grass silage and barley created 237.6GJ/ha-GE and 56.8GJ/ha-GE respectively (196.8GJ/ha and 33.5GJ/ha of net-energy), with associated carbon dioxide emissions of 21.9kgCO₂/GJ-NE and 51.1kgCO₂/GJ-NE. The results show that biomethane from grass silage is the optimum biofuel for Ireland – demonstrating superior net-energy per hectare of crop with the lowest associated carbon dioxide emissions per unit of energy created.

ID 158: Natural Gas as a Transportation Fuel – A case study on Italy and Spain
Patrick Calanan, Bord Gáis Eireann
Aoife Foley, University College Cork

Internationally, many countries use natural gas is used as a transportation fuel in it’s compressed form and is referred to as Compressed Natural Gas (CNG). CNG offers an alternative transport fuel and can be mixed with biogas. Global environmental concerns and air quality in urban areas relating to gaseous emissions from transport have led to the growth in the use of CNG. There is an estimated 13 million Natural Gas Vehicles (NGVs) currently in operation worldwide. Across Europe, many countries are replacing traditional diesel oil captive fleets such as buses used for public transport and heavy and light goods vehicles used for freight and logistics with CNG vehicles. Initially, this was to reduce localised air pollution in urban environments. However, with the need to reduce green house gas emissions CNG is considered as a cleaner more energy efficient and environmental friendly alternative to diesel oil. This paper briefly examines the growth of NGVs in Europe and worldwide. A case study on the introduction of CNG in Spain and Italy is presented. As part of the case study, policy interventions are examined. Finally, an analysis of private and public refuelling stations in both countries is provided. This study and the role of CNG is relevant because of the existing European Union Directive 2009/28/EC target, requiring that 10% of transport energy come from renewable sources, not alone biofuels such as biogas.
ID 121: Examining the optimal fuel type for urban bus operations
Fearghal Ryan, Trinity College Dublin
Brian Caulfield, Trinity College Dublin

Public service fleets offer an attractive option for introducing new renewable fuels and alternative technologies on a large scale, which allow for the reduction of both greenhouse gas emissions and exhaust air pollutants. This study examines the use of biomethane (bio-CNG) and compressed natural gas (CNG) for part of the bus fleet in Dublin. Dublin is typical of many urban centres with a large bus fleet; therefore the results found in this paper could be applied to other urban bus fleets. The emissions produced from the 2008 fleet based at one of the city’s seven bus depots were compared to use of new diesel and bio-CNG buses, which were modelled using COPERT 4, a road transport emissions model developed by the European Commission. The optimum feedstock for bio-CNG production in Ireland was then investigated, as well as the quantity of feedstock needed to produce the required bio-CNG to fuel the bus fleet examined. The merits of producing bio-CNG in Ireland were analysed in order to determine the best policy. As expected the results showed a substantial decrease in all exhaust emissions from the use of bio-CNG buses compared the 2008 fleet. Grass silage was chosen as the optimum feedstock for production of bio-CNG in Ireland, and it was calculated using a sensitivity analysis that 1,349 ha is the land take needed to produce the grass silage for bio-CNG required to run the bus fleet examined. Examining the benefits of using bio-CNG in urban bus operations

Session B – Transport Electrification

ID 83: Research Programme associated with the ECar Ireland Project
Senan McGrath, ESB ECars

Ireland is one of the leading countries in the world with regard to the provision of an electrical vehicle charging infrastructure. This has presented many challenges but it has also meant that Ireland is in a favourable position with respect to the limited supply of electric cars. Being at the forefront of developments also creates the need/opportunity for many diverse research needs. Many of the projects are multi-partner and receive some funding from the EU programmes such as FP7 and Interreg. Others involve only Irish organisations. The paper focuses on the research projects that are underway and the context in which they arise. It seeks to give an overview of a comprehensive research plan and does not detail results.

ID 97: Large-scale deployment of electric vehicles
David Twohig, Renault SA

The Renault-Nissan Alliance has rapidly positioned itself as the world leader in proposing the all-electric EV (Electric Vehicle) as the first realistic large-scale alternative to the internal combustion engine (ICE) vehicle. This paper discusses why the EV is now – in 2011 – a realistic answer to the global challenges faced by the transport industry. Renault proposes a mass-production and mass-market approach to this new market, in order to make a real environmental impact, and to offer for the first time truly affordable electric vehicles to the end customer. Renault forecasts that EVs will represent approximately 10% of European vehicle sales by 2020. To achieve this, Renault proposes a full vehicle line-up, from 2-passenger urban vehicles, through family hatchbacks and sedans to LCVs (Light Commercial Vehicles). This paper presents an overview of the range, and some of the technology used in these vehicles. Developing and deploying a suitable charging infrastructure in parallel to the vehicles is a key success factor to the successful mass roll-out of EVs. Renault, together with its key partners, is developing a breakthrough charging infrastructure. Renault is strongly supporting the development of a low-cost AC infrastructure, allowing widespread installation of charge points in public and private locations. The paper discusses some of the key challenges that remain to achieve widespread adoption of EVs, including the impacts of Government incentives, competition and consumer perception of EVs. The paper gives a brief outline of the Irish situation in wide-scale deployment of EVs, focusing on the partnership in place with the Irish government and the ESB (Electricity Supply Board). In conclusion, the paper suggests ways in which public and private bodies can further support the wide-scale deployment of EVs.
ID 105: A study of the 10% electric vehicles target on the single electricity market
Aoife Foley, University College Cork
Barry Tyther, University College Cork
Brian Ó Gallachóir, University College Cork

In late 2008, the Government of the Republic of Ireland set a specific target that 10% of all vehicles in its transport fleet be powered by electricity by 2020 in order to meet European Union renewable energy targets and greenhouse gas emissions reduction targets. Internationally there are similar targets. This is a considerable challenge as in 2009, transport accounted for 29% of non-emissions trading scheme greenhouse gas emissions, 32% of energy-related greenhouse gas emissions, 21% of total greenhouse gas emissions and approximately 50% of energy-related non-emission trading scheme greenhouse gas emissions. In this paper the impacts of 10% electric vehicle charging on the single wholesale electricity market for the Republic of Ireland and Northern Ireland is examined using the PLEXOS wholesale electricity market model used in the Single Electricity Market of the Republic of Ireland and Northern Ireland. The energy consumed and the total carbon dioxide emissions generated under different charging scenarios is quantified and the results of the charging scenarios are compared to identify the best implementation strategy.

ID 126: Power system reserve from electric vehicles
Eamon Keane, University College Dublin
Damian Flynn, University College Dublin

Electric vehicles (EVs) are a promising source of flexibility for the power grid. This paper looks at the ability of EVs to provide power system reserve by studying the potential driving and charging profiles of EVs in an Irish context. The results show that the potential for EVs to provide contingency reserve is strongly dependent on the time of day, day of week and the seasonal effect of climate control on EV energy consumption. The driving and charging patterns are more variable on the weekends than weekdays, which add uncertainty to the availability of contingency reserve. There is significant daily variation in EV charging however there may be potential to fill these troughs in reserve availability through aggregation with other household loads through demand side management.

Session C – Energy Efficiency in Transport

ID 91: An advanced model for estimating Green House Gas emissions for Irish air transport
Gregg Patrick, Central Statistics Office

This paper presents an advanced model for estimating greenhouse gas emissions for flights to and from Irish airports. This model is based on three different sources. Firstly, there is the Central Statistics Office (CSO) A1 database, which provides flight stage data on flights to and from Irish airports, including passenger numbers and freight, classified by aircraft type. Secondly, there is air traffic control data, held by Eurocontrol, the EU air traffic control agency, which provides real-distance information on flight paths for various airport pairs. Thirdly, there is the European Environment Agency (EEA) air pollutant emission inventory guidebook, which provides standard fuel burn characteristics for the main aircraft types. The model integrates data from these three sources to provide estimates of greenhouse gas emissions for each route, for each aircraft type. It also relates these emissions to passenger numbers on the routes. As such, the model provides a very detailed, comprehensive, bottom-up methodology for estimating greenhouse gas emissions for Ireland’s air transport.

ID 115: The potential for increased efficiency in the Irish freight sector
Eoin Farrell, National Transport Authority
Owen O’Reilly

In light of the current economic situation in Ireland, this paper will investigate the potential of the freight sector in Ireland to adapt, and ways it can develop into a smarter, more economic and efficient industry. With profit margins getting tighter, and fuel cost rising, it is necessary to explore the potential for the freight industry to modify operational parameters, looking towards a more efficient use of resources, and the use of technology.
The paper will present key findings from the National Transport Authority’s (NTA) Survey of Freight Managers in the Greater Dublin Area (2010), which in conjunction with information from the Central Statistics Office’s (CSO) Road Freight Transport Survey (2009), will establish the make-up of the sector, the current use of resources and technologies, and aspects of the industry where efficiencies and competitiveness could be improved. The information gathered will form the basis of an investigation into the potential for new initiatives in the freight sector, including the potential for the introduction of technology and changing work practices in the industry. This will draw on emerging national and European initiatives, including those considered during the European Commission (EC) funded SMARTFREIGHT project, which looked at potential urban freight management measures, such as the use of Information and Communication Technology (ICT) in freight delivery management. The paper will present how applicable such initiatives are in the Irish context, and if so, what would be required to allow the freight sector to embrace these technologies, and deliver better financial and environmental efficiency.

**ID 128: Rail freight in the Republic of Ireland**
Juan Carlos Carrasco Gimenez, Dublin Institute of Technology
Edward Sweeney, Dublin Institute of Technology
John Harvey, Dublin Institute of Technology

In a world where freight transport is increasing, efficiency is essential. Transport by rail is characterised by its low fuel consumption per tonne. This mode of transport became extremely important during the last century but unfortunately it has been losing its importance in the logistics sector with the passing of time. However, we are currently witnessing an important transformation in the railway sector throughout Europe. This has been promoted by the European Union, with a significant allocation of resources to this issue. With the objective of increasing the volume of goods transported by rail, European nations are conducting a transformation process of their infrastructure and rolling stock. In Ireland, the outlook for rail freight is not very positive since its market share has been dangerously decreasing. This paper presents an analysis of the current situation in the Republic of Ireland. The research is based on a range of secondary sources, as well as a series of semi-structured interviews carried out by the authors with current rail freight customers. A focus group comprising rail freight experts was also used to identify possible future scenarios.

**ID 148: Energy efficiency and LRT**
Paolo Carbone, Railway Procurement Agency

One of the key developments in terms of public transport for Dublin in recent years is the introduction of Luas. Its energy efficiency translates thanks to the high patronage in low carbon emissions per capita that compare favourably not only with other transport modes in Ireland but also with other LRTs abroad. Indeed Luas could be made even more efficient by reducing further the amount of energy consumed mostly to power the trams. While there are several measures that can be implemented to reduce consumption none of them delivers on its own a significant improvement. This paper reviews current practice in traction systems for LRT and Metro and provides an overview of technological developments that aim to make this transport mode even more efficient by maximising the amount of energy that is recovered through regenerative braking. Only in recent years the industry has focussed its attention to and R&D investment in this area and as consequence the information available is limited to theoretical studies. Very few applications are in commercial service, therefore the actual performance of these solutions in terms of energy savings and returns on the required investments are not clear. Technologies such as on-board energy storage stationary storage and reversible substation are described. The paper provides a qualitative assessment of the solutions from the view point of the asset owner/operator. The conclusion is that these solutions need still to prove their value in saving energy and delivering an actual return as both capital and life cycle costs are not fully defined yet.
Session D – Greening Transport

ID 119: Learning to cycle again: examining the benefits of providing tax-free loans to purchase new bicycles
Brian Caulfield, Trinity College Dublin
James Leahy, Bike to Work

This paper examines the benefits of introducing revenue incentives for the purchase of bicycles. In 2009, the Irish government introduced a tax relief scheme whereby employees could purchase a bicycle through their employer. The motivation for introducing this scheme was to encourage workers to cycle to work on a regular basis and to promote sustainable transport. Under the scheme the employer purchases a bicycle and accessories up to the value of €1,000 for the employee and deducts the cost from the employee’s salary over a 12 month period. The deduction is from the before-tax salary leading to savings of up to 51% for the employee. The main contribution of this research is to show how individuals, who hadn’t owned a bicycle in the past five years, have changed their perceptions of cycling and improved accessibility to the bicycles and cycling after using this scheme. This is a key group of interest to transport planners. This paper explores the motivations for these newcomers to purchase a bicycle under the scheme and examines what factors were most influential in their decision to purchase a new bicycle. The findings presented in this paper demonstrate the main factors that encouraged these individuals to partake in the scheme were health reasons and cost considerations. The results also show that this cohort of individuals who hadn’t cycled in a number of years was shown to be using their bicycles on a regular basis.

ID 84: Urban sprawl and travel energy consumption: the case of the Walloon region of Belgium
Anne-Francoise Marique, University of Liege - LEMA
Sigrid Reiter, University of Liege – LEMA

In the actual context of growing interests in environmental issues, reducing energy consumption in the transport sector, which represents 27% of final energy in the Walloon region of Belgium, appears as an important policy target. Although it is often argued that more compact urban forms would significantly reduce transport energy consumption, urban sprawl is a concern in a large part of the regional territory. Moreover, assessment tools dedicated to transport energy consumption are lacking. In this context, the paper first presents a quantitative method developed to assess the transport system in the Walloon region of Belgium. Statistical data available at the neighbourhood scale and characteristics of cars and public vehicles are used to predict transport needs and assess energy consumption as far as home-to-work and home-to-school travels are concerned. Three index are presented and mapped (the energy performance index, the modal share and the mean distance travelled) to investigate the interdependences between spatial planning, urban sprawl and travel energy consumption in the Walloon region of Belgium. Three complementary scales are used: the “municipality” scale allows highlighting the general structure of the territory whereas the “former municipality” and the “census block” scale (the smallest geographical unit in which data are available in Belgium) highlight more detailed phenomenon. The evolution of the performance index between 1991 and 2001 and the difference in energy performance between home-to-work and home-to-school travels are also presented. Our main findings are presented and highlight that urban planning acts upon travel energy consumption. We show particularly that main cities present low energy consumption. However, a local scale approach is useful to highlight the existence of secondary suburban and rural cores presenting low transport energy consumption. In this respect, distance from home to destination is paramount while the mode of transport used has a lower impact.
ID 86: Transport governance, structures and policy implementation: a methodological framework
Waseem Akram, University of Ulster
Julian Hine, University of Ulster
Jim Berry, University of Ulster

The variety of transport governance models in existence in the UK are the result of devolution and successive local government re-organisations which has had a significant impact on the form and content of regional transport strategies and local transport planning practice. A key policy challenge is the increasing need to manage transport demand and encourage the use of public transport; walking and cycling whilst at the same time reducing levels of car dependency. This paper explores the link between the delivery of transport policy and planning across the UK and the nature of institutional structure stability and change. The paper looks at the existing variety in transport governance structures; their roles for translating regional/local policy themes into practice and their orientation towards integrated transport decisions during the policy implementation process. The literature indicates that the problem with policy implementation is that it is not an activity that can be planned and organised in a systematic way, rather it is a dynamic process that can be managed as the result of events and lessons learnt. The paper also explores how governance and institutional structure development can be informed by policy implementation theory; which can itself be used to help explain the range of policy implementation responses to real world practice based challenges (including capacity, administration, management, finances, and public acceptance). The paper concludes with an evaluation of the current working and policy implementation practice in the UK and presents a methodological research framework to investigate further the different dimensions associated with transport policy implementation.

ID 140: An analysis of the role of bicycle-sharing in a European city: the case of Dublin, Ireland
Enda Murphy, University College Dublin
Joe Usher, Department of Transport

In recent years, problems associated with automobile use have led to a marked shift in the orientation of transportation policy towards the promotion of more sustainable modes of transport. Central to this policy has been a heightened interest in bicycle-sharing schemes in major cities in the developed world. These initiatives seek to increase the modal share of cycling, improve the mobility of the general public and reduce the environmental impacts of private automobile transport. Existing research investigating the role and impact of bicycle-sharing schemes in European cities is sparse. Within this context, this paper investigates the role and impact of the recently implemented bicycle-sharing scheme in Dublin. Using evidence from 360 questionnaire surveys, the research focuses on the use of the bicycle-sharing scheme as an integrative mode for the rest of the city’s transport system, and particularly for the public transport system. The research also examines the scheme’s dichotomy in terms of its functionality during the peak and off-peak periods as well as investigating the socio-economic profile of its users.

Session A1 – Alternative Fuel Vehicles – including natural gas, CNG and hydrogen

ID 103: A Well-to-Wheel Analysis of Electric Vehicles and Greenhouse Gas Savings
Aoife Foley, Beatrice Smyth, Jerry Murphy and Brian Ó Gallachóir, University College Cork

The European Union has set a target for 10% renewable energy in transport by 2020, which will be met using both biofuels and electric vehicles. In the case of biofuels, for the purposes of meeting the target, the biofuel must achieve greenhouse gas savings of 35% relative to the fossil fuel replaced. For biofuels, greenhouse gas savings can be calculated using life cycle analysis, or the European Union default values. In contrast, all electricity used in transport is considered to be the same, regardless of the source or the type of electric vehicle. However, the choice of the electric vehicle and electricity source will have a major impact on the greenhouse gas savings. This paper examines different electric-vehicle scenarios in terms of greenhouse gas savings, using a well-to-wheel life cycle analysis.
ID 154: A technical & economic appraisal of bio-methane as a transport fuel for small to medium scale development from resources indigenous to Ireland

Daniel J. Goulding, Cork Institute of Technology
Niamh Power, Cork Institute of Technology

The cost at the pump for traditional transport fossil fuel consumers is at a critically high level. Recent tensions in oil producing countries have put security of supply into jeopardy and this uncertainty has lead to all-time high fuel prices. This is extremely significant for Ireland, as currently 89% of our energy requirements are accounted for by imported fossil fuels. In addition to high fuel prices, the European Union (EU) Renewables Directive (2009/28/EC) states that 10% of the final energy demand in the transport sector must be generated by renewable resources in 2020. A clear focus on transport energy production from renewable resources is required if Ireland is to achieve EU targets, reduce high fossil fuel import quantities and lower transport fuel prices. The utilisation of biomethane as a transport fuel is an established technology in countries such as Germany and Austria. Biomethane has many clear advantages over traditional fossil fuels with regard to carbon emissions reduction, sustainability and its potential contribution to the Renewables Directive. In Ireland, there are a number of indigenous resources that can be deployed to produce biomethane. Agricultural entities such as grass silage, maize, barley and animal slurries are ideal for producing biomethane energy and can also offer a new sustainable practice for the farming industry. With Irish landfill capacities entering the minimum availability phase, diversion of biodegradable municipal waste (BMW) is necessary to meet the EU Landfill Directive (99/31/EC) targets of 75% BMW reduction to landfill by 2016 [3]. The production of biomethane from BMW can perform as a dual purpose technology; as renewable transport energy production and as a sustainable waste management tool for the future. Biomethane from BMW can assist Ireland satisfy both the Renewables and Landfill Directives by utilising an otherwise redundant resource. The analysis concludes that agricultural biomethane production and biomethane from BMW are both economically viable for Ireland. Biomethane from BMW is the optimum feedstock for Ireland as a gate-fee can be charged for the treatment of waste. Biomethane from BMW produces 115.6 m^3 biomethane/t BMW with 11.8 t BMW required to fuel one gas car for a year. Full development of such an industry can meet 1.9% of the Renewables Directive targets by 2020.

ID 159: Could gaseous transport fuel have a future in Ireland?

James Browne, University College Cork
Jerry Murphy, University College Cork

As petrol and diesel prices continue to rise at the pumps and with world peak oil production looming, the need to diversify transport fuel is becoming an ever more important topic at national and international level. The use of compressed natural gas vehicles (CNGVs) fuelled by a blend of natural gas and biomethane (BioCNG) could present an economically and environmentally sound alternative to the current petroleum dominated transport sector. However, obstacles to the introduction of CNGVs and CNG infrastructure in Ireland exist. In order for CNGVs to make an impact in Ireland’s efforts to diversify transport fuel greater investment in CNGVs and associated infrastructure is necessary.

Session B1 – Transport Electrification

ID 131: Range estimation for the Nissan Leaf and Tesla Roadster using simplified power train models

Rui Pedro De Oliveira, University College Cork
Sean Vaughan, University College Cork
John Hayes, University College Cork

In this paper, simplified EV power train models are used to estimate range for the Nissan Leaf and the Tesla Roadster. The models are compared with published manufacturer specifications for range under various route and driving conditions, and for various drive cycles. The models are validated against test results for the Nissan Leaf and Tesla Roadster vehicles, where the test route topography is modelled using Google Earth and a GPS-based smart-phone application. Excellent correlations are demonstrated between the experimental results and manufacturer data and the vehicle models. Impacts of battery degradation with time and vehicle HVAC loads are considered in the study.
ID 125: The role of microgeneration in displacing carbon dioxide emissions from motor vehicles in Ireland
Gerard Wrixon, University College Cork

Micro generation (MG) in Ireland, generally domestic wind and/or PV plants of less then 6 kW, have a role to play in ensuring that Ireland fulfils its EU commitment of having 10% of its transport energy (excluding aviation and marine transport) come from renewable sources by 2020. MG is also of great interest as issues have arisen (IAE Report on Energy Policy, 2011) on the feasibility of having 40% of electricity in the R of I being produced from wind farms by 2020. MG plants are particularly suitable in rural locations not well served by public transport and have the advantage of not requiring additional investment in the electricity distribution system. Making the charging of electric/hybrid vehicles a priority of the energy from such MGs could ensure that a substantial contribution of charging energy comes from renewable sources. It could also make MG an attractive investment option for rural/individual house dwellers were a suitable incentive scheme for the generated RE in place, as is the case in other EU countries. This paper examines the consequences of introducing MG in Ireland and concludes that with current EV growth scenarios, substantial increases could be made both to the RE content of transport energy as well as to the displaced CO2 emissions over those currently predicted without MG.

ID 141: Impact of Weather Conditions on Electric Vehicle Performance
Paul Leahy, Aoife Foley and Brian Ó Gallachóir, University College Cork

Seasonal and day-to-day variations in travel behaviour and performance of private passenger vehicles can be partially explained by changes in weather conditions. Likewise, in the electricity sector, weather affects energy demand. The impact of weather conditions on private passenger vehicle performance, usership statistics and travel behaviour has been studied for conventional, internal combustion engine, vehicles. Similarly, weather-driven variability in electricity demand and generation has been investigated widely. The aim of these analyses in both sectors is to improve energy efficiency, reduce consumption in peak hours and reduce greenhouse gas emissions. However, the potential effects of seasonal weather variations on electric vehicle usage have not yet been investigated. In Ireland the government has set a target requiring 10% of all vehicles in the transport fleet to be powered by electricity by 2020 to meet part of its European Union obligations to reduce greenhouse gas emissions and increase energy efficiency. This paper fills this knowledge gap by compiling some of the published information available for internal combustion engine vehicles and applying the lessons learned and results to electric vehicles with an analysis of historical weather data in Ireland and electricity market data in a number of what-if scenarios. Areas particularly impacted by weather conditions are battery performance, energy consumption and choice of transportation mode by private individuals.

Session C1– Energy Efficiency in Transport

ID 150: Assessing the environmental performance of public transport – a case study of the Luas system
Michael Dempsey, Railway Procurement Agency

There is much debate about the environmental impacts of different modes of transport. This has been driven by increased concern among policy makers about the energy efficiency and environmental impacts of transport. On the one hand, concerns about climate change have generated a renewed focus on ways in which countries can meet their Greenhouse Gas (GHG) reduction targets. On the other hand, peak oil and its implications for long term fossil fuel prices have given rise to concerns about the economic sustainability of current travel patterns. In Ireland, the assessment of environmental impacts has been included in the formal appraisal systems for some time. Capital appraisal guidelines require that explicit account be taken of the impact on GHG of capital investment projects. However, to date there has been little empirical evidence on the environmental emissions associated with different passenger modes in Ireland. This paper aims to inform the debate on the environmental performance of alternate modes by assessing the environmental emissions generated by the Luas light rail system in Dublin, and placing this in the context of available evidence from other modes. The key parameters informing the overall performance of the mode in environmental emissions terms are identified. Ideally, the assessment of the passenger transport modes should adopt a life-cycle approach to the energy use and environmental emissions of different modes. The analysis is restricted to operational phase for now, but
further work will examine emissions during the construction and decommissioning phases in order to facilitate a move towards life-cycle emissions assessment.

ID 96: An analysis of the energy efficiency of the bicycle
John Dawson, www.cyclist.ie

Ireland depends to a great extent on energy imports, and transport is the single most energy-consuming sector (39%); this dependency has grown significantly in recent years, up 51% over the period 1990-2004. Further, Irish transport is very car dependent, by European Standards. Therefore the price of oil and issues of security of supply are significant concerns for Ireland. A growing number of voices are also questioning the social, health and environmental costs of car dependence. This paper reviews the bicycle, from an energy perspective. The bicycle offers an unparalleled energy efficiency, compared especially to the motor car, for urban transport; it is not only the most efficient means of utilising human power for transport, but also offers a speed, range and flexibility that compares very favourably with alternatives. Cycling is increasingly being seen as an essential component of a sustainable future for urban transport. The energy efficiency of the bicycle is considered from three perspectives: operation (i.e. riding), manufacture (of bicycles) and infrastructure (building and maintaining roads). Some consideration is given to factors that affect the energy performance of the bicycle, which is however, found to be close to optimal already, and has been so for many years. Finally, this paper makes an analysis of the energy implications of a modest uptake in cycling in an Irish context.

ID 99: shopping travel behaviour in Dublin city centre
David O’Connor, Dublin Institute of Technology
James Nix, Irish Environmental Network
Simon Bradshaw
Enda Shiel

Traders on Dublin’s two main shopping streets considerably over-estimate spending by shoppers travelling by car and Luas while significantly undervaluing the spend of bus passengers and pedestrians. A study interviewed 1,009 shoppers on Grafton and Henry streets seeking to identify differences (if any) between perceived and actual spending levels by travel mode. Bus carried 35% of shoppers to Grafton St and 49% to Henry St; this compares with traders’ perceptions of 31% and 40% respectively. Measured in value terms, bus proved the most lucrative mode to both streets, delivering 38% of the total spend on both streets, when outliers are excluded. Pedestrian travel was similarly under-valued. Traders believed that 11% would walk to shop on Grafton St while on Henry St traders estimated that 6% of their customers came on foot. The actual figures are 20% and 19%, according to the survey. Car transport was overvalued by traders. On Grafton St traders perceived that car would account for 13% of customers whereas in reality car-borne shoppers made up 10%. Traders on Henry St believed car would carry 19% of shoppers but in fact only 9% came by car. The situation is similar for Luas: traders perceived 28% of Grafton St shoppers would arrive by tram compared to 13% in reality, and again on Henry St, traders thought Luas would carry 19% but it served just 10%. Bus priority and pedestrian enhancement may therefore warrant greater investment. The imbalance in cycling mode share between Grafton Street and Henry Street should also be investigated further.

ID 143: Two technological approaches for long-term private car energy policy modelling in Ireland
Hannah Daly, University College Cork
Brian Ó Gallachóir, University College Cork

Two technological approaches for modelling future private car energy and emissions in Ireland have been developed, one using a car stock model (CSM) and the other an energy systems model (Irish TIMES) with a car component. The CSM uses historic sales, activity and scrappage rates to develop a fleet demographic model, simulating the structure of the car fleet and vehicle activity for each year up to 2050. Imposed technologically-oriented scenarios, such as Ireland’s 10% electric vehicle target, can determine the impact of emerging technologies or policy measures on baseline energy demand and contribution towards climate targets. In contrast, the Irish TIMES model is an energy optimisation framework for the Irish energy system which identifies the least cost technology mix to satisfy a specified energy service demand, subject to renewable and emissions constraints. Both models are designed for informing policy development in response to climate targets and
energy security planning: Private car energy demand has not decoupled from economic activity as in other sectors, resulting in a growth in CO₂ emissions in this transport mode of 164% between 1990 and 2009. This continuing trend will make it increasingly difficult for Ireland to meet stringent CO₂ reductions by 2020. Along with demand side measures for reducing the activity of the car fleet, the government is proposing technological solutions for improving the sustainability of transport and achieving these targets. Detailed modelling is a necessary step to ensure that these measures can achieve the intended results and in a cost effective way. This paper will firstly present energy scenarios from each model, which both have strong but different focuses on policy analysis. The CSM is used to model the impact of specific measures and technologies, including the 10% electric vehicle target and the potential diffusion of other alternative-fuelled vehicles, scrappage schemes and new-car emissions caps, on a baseline, and in this way can compare the effectiveness of technological targets in terms of their contribution to energy efficiency and emissions targets. On the other hand, the TIMES model generates the least cost mix of technologies for each sector. We present results for private cars technologies up to 2050 under a number of scenarios constrained by emissions limits and lower shares of renewable energy. The second purpose of this paper is to describe the process of soft linking the two models, whose methodologies are complementary.

**Session D1 – Transport Stats & Economics**

**ID 134: An econometric analyses of Irish residential transport expenditures**
John Eakins, University College Cork

This paper uses data from the 1999/00 and 2004/05 survey of Irish households to analyse the determinants of residential petrol and diesel expenditures. A double hurdle model is estimated in order to take into account the fact that a proportion of households do not make any purchases of petrol or diesel during the sample period. Such a methodology has never previously been applied to residential petrol or diesel expenditures. Location, age and social status of the HOH, possession of cars and the number of adults all have a strong influence on petrol and diesel expenditures. The estimated income elasticities for the two fuels are decreasing over the 1999/00 and 2004/05 time period suggesting that both petrol and diesel are becoming more of a necessity commodity in the Irish household’s budget. The effect is much less pronounced however when we consider households with positive expenditures of petrol and diesel only.

**ID 112: A comparative study of the travel patterns of vehicle owners and persons who do not own a vehicle**
Mairead Griffin, Central Statistics Office, Cork

Up until recently, one of the main sources of national travel data was the 2006 Census of Population data (Powcar - Place Of Work Census of Anonymised Records). This dataset covers the principle mode, time and duration of ‘usual’ journeys to work, school and college. No details on modal splits or other journey types are available from Powcar. In order to bridge the gap in travel data, a pilot National Travel Survey (NTS) was conducted as part of the Quarterly National Household Survey (QNHS) in the fourth quarter of 2009. The NTS is one of the most comprehensive household studies of travel patterns ever to be conducted in the state. The survey was conducted over the period October 2009 to mid January 2010 and the results published in July 2011. The main aim of the pilot NTS was to gather micro-level information on journeys made within the island of Ireland, by residents of the state aged 18 and over and the mode(s) of transport used for each journey. To allow for supplementary analysis of some of the local factors that can influence the mode of travel used, additional information on the availability and use of public transport, bicycles and motorised vehicles was also collected. The inclusion of data on public transport and vehicle ownership is an important feature of the survey. This information provides scope for significant additional analysis of the travel patterns of Irish residents. While not included in the original publication, a subsequent analysis of the NTS 2009 data by vehicle ownership showed that there were significant differences in the travel profiles of vehicle owners when compared with respondents who were not vehicle owners. The purpose of this paper is to outline some of the key differences identified by this analysis.
ID 128: Commuting: a virtual poll tax across Irish regions
Karyn Morrissey, National University of Ireland, Galway
Amaya Vega, National University of Ireland, Galway
Cathal O’Donoghue, Teagasc, Galway

This paper combines a spatial microsimulation model with a classic model of travel demand for the valuation of commuting travel times in Ireland. The aim of the research is to investigate the potential variations in the value of commuting travel times relative to disposable income across Irish regions. Preliminary empirical analysis of commuting data in Ireland provides evidence to suggest a non-linear relationship between the values of commuting travel-time and the duration of the commuting trip. Thus, a rationale arises for the simulation of the value of commuting travel time across various travel-time bands for motorised modes of travel to work. The simulation process generates individual-level value estimates for each small-area geographic unit in Ireland. GIS tools are subsequently used to characterise the spatial distribution of the value of commuting travel time relative to individual disposable income across Ireland, establishing if there are regional variations that suggest commuting as something similar to a regional ‘virtual’ poll tax.

ID 120: An examination of the factors that impact upon multiple vehicle ownership: The case of Dublin, Ireland
Brian Caulfield, Trinity College Dublin

This paper examines the characteristics of households with multiple car ownership in Dublin, Ireland. Data from the 2006 Census of Ireland are analysed to ascertain the characteristics of these households. The analysis of multiple car ownership presented herein examines individual specific, transport availability, and household characteristics to provide an indication of the individuals most likely to have access to more than one vehicle. Understanding the characteristics of households with more than one car is important for many reasons, such as how policies for emissions reductions or pricing regimes might affect households. Ireland, like many countries has recently launched a number of electric vehicle and car sharing schemes. Traditionally these schemes have been aimed at reducing multiple car ownership; therefore it’s important to develop an understanding of the households that would most likely give up an extra car and use a car sharing scheme or an electric vehicle. Also from a sustainability point of view, greater levels of car ownership can result in unsustainable transport patterns. This paper examines the Census data using a multinomial logit regression model to determine what are the relationships between multiple car ownership levels and several household characteristics. The findings of the paper demonstrate that occupation, public transport availability and residential density all have an impact upon the decision to own more than one vehicle.

Session A2 – Smarter Transport including ICT & ITS

ID 142: Designing a Community Engagement Strategy for Smarter Travel Limerick using Precedent Studies and Focus Groups
Kay Cullinane, University of Limerick
Tom Cosgrove, University of Limerick

Almost 7 out of 10 people in Limerick drove to work, school, or college in 2006 with 63% of residents commuting a distance of 1 to 9km Successful change has been implemented in European and, more recently, in UK and Australian cities, to reverse the effects of unsustainable travel. For example in Groningen in the Netherlands, an average of 1.4 urban bicycle trips per person per day were made, making up more than 50% of the total trips in 2008 .This shows the potential that exists for achieving a Smarter Travel Limerick with the associated benefits which are well documented. This research aims to create a rational basis for designing and implementing a plan for Smarter Travel Limerick with particular reference to a community engagement strategy. The paper will be of interest to researchers, designers and policy makers in Smarter Travel. The objective of the study is to develop a local culture of Smarter Travel in Limerick communities using best international practice and thereby achieve behavioural change in travel mode choice. As part of this research census and survey travel data for Limerick and data from the Limerick focus groups together with the data from the chosen international exemplar city precedent studies is analysed. This data is complex and is of both quantitative and qualitative
type. The analysis provides a rationale to allow proposals for an appropriate Community Engagement strategy to be formulated. The scope and duration of interventions and likely mode shift that can reasonably be anticipated are also discussed. Typical hard (i.e. physical infrastructural) measures are outlined. Literature on Smarter Travel is also reviewed including results from a comprehensive study of six international exemplar Smarter Travel Cities. Current travel modes and travellers mode choice criteria in Limerick city are investigated considering the literature review and the findings of the data analysis. Finally, a design and implementation plan with particular emphasis on community engagement for Limerick Smarter Travel is outlined.

ID 147: Personalised travel planning in Midleton, County Cork
Elaine Brick, AECOM

Smarter Travel funding was awarded to the Chartered Institute of Highways and Transportation in 2009 to deliver a Personalised Travel Plan (PTP) in Midleton, County Cork. The aim of the project was to reduce car dependency, especially for short local trips, in light of increasing congestion and parking pressures in the town centre. These issues are despite the town having a relatively flat terrain, suitable for cycling and walking, and a good public transport network. Delivery of the PTP in Midleton, despite just a relatively small number of participants, was a success in terms of the objectives and targets set. Residents expressed a genuine enthusiasm for using more sustainable travel modes making it apparent that minor investment in marketing and promotion can present long lasting benefits. The following paper outlines the methodology for PTP delivery and outlines the impact of PTP delivery on travel behaviour and attitudes. The paper concludes with a summary of the success factors of the project as well as its limitations.

ID 156: A self-informed bridge assessment, maintenance and management tool for bridge monitoring
Stephen Hand, University College Cork
Aoife Foley, University College Cork
Gillian Bruton, University College Cork
Damir Bekić, University of Zagreb, Croatia
Eamon McKeogh, University College Cork

The continual inspection, assessment and maintenance of bridges requires a multidisciplinary approach. Beyond a good understanding of structural engineering, a bridge inspector must have a good knowledge and appreciation of geotechnics, hydraulics, hydrology, materials and even transport management. A number of international standards and guidelines exist based on experience, historical events and best practice in industry. However, the risk-informed decision-making process in bridge monitoring is complex. Thus, the application of intelligent assessment measures built using Bayesian Logic controls can assist in ensuring a fail-safe bridge inspection programme. This paper provides a review of some existing bridge assessment, maintenance and monitoring guidelines and standards. In addition, the Self-Informed Bridge Inspection, Assessment and Maintenance Management Tool (SIBIAM) developed using a Bayesian Logic approach is presented. SIBIAM uses a GIS (Geographic Information Systems) specialised software tool. The purpose of SIBIAM is to provide for bridge owners, an up-to-date inventory of bridge condition and maintenance information by collecting and monitoring relevant bridge and river parameters for input to a management database.

ID 150: Short-term traffic flow forecasting using Dynamic Linear Models
Tiep Mai, Trinity College Dublin
Bidisha Ghosh, Trinity College Dublin
Simon Wilson, Trinity College Dublin

Intelligent Transportation Systems (ITS) is an emerging concept which has been utilised to improve efficiency and sustainability of existing transportation systems. Short term traffic flow forecasting, the process of predicting future traffic conditions based on historical and real-time observations is an essential aspect of ITS. The existing well-known algorithms used for short-term traffic forecasting include time-series analysis based models. Among the time-series models, the Seasonal Autoregressive Integrated Moving Average (SARIMA) is one of the most precise statistical models in this field. In the existing literature SARIMA models are mostly used in its multiplicative form and the parameters of the model are mostly estimated using a frequentist approach. Estimation of the large scale multiplicative SARIMA model for traffic flow forecasting often proves to be
complex and computationally expensive for researchers and end-users. In this paper, an additive SARIMA model has been employed to predict traffic flow in short-term or near-term future. The Dynamic Linear Model (DLM) representation of the additive SARIMA model has been used here to reduce the number of latent variables. Traditionally in a frequentist approach, point estimations of the SARIMA model parameters are obtained by maximizing the likelihood, but in this paper the marginal posterior density of each of the parameters has been explored by applying a Bayesian inference framework. Markov Chain Monte Carlo (MCMC) sampling method has been used to develop the Bayesian inference framework. For such sampling method for SARIMA, a problem of serial correlation has proved to be quite serious; however in the additive form, with the help of a carefully designed Metropolis-Hastings algorithm (a type of MCMC algorithm) this problem has been mitigated. The efficiency of the proposed prediction algorithm has been evaluated by modelling real-time traffic flow observations available from a certain junction in the city-centre of Dublin.

Session B2 – Transport Infrastructure, Technology & Materials

ID 124: A network scan of horizontal road geometry
Desmond O’Connor, National Roads Authority

This paper examines GPS data collected from road condition surveys carried out on approximately 2,500 kilometres of largely unimproved roads in Ireland. Such surveys are carried out periodically across the network. The analysis exploits some of the underused data collected during these surveys, principally speed data. By utilising GPS data, it was possible to detect significant speed differential along routes at specified intervals. This allowed for inconsistencies in the horizontal road alignment to be identified. The volume of data that is currently accessible facilitated a network scan to be conducted on 2,570 km of national secondary roads in Ireland. Collision and traffic flow data were processed to calculate collision rates for locations characterised by large speed differentials associated with challenging horizontal alignment. In addition horizontal route consistency was assessed using a sinuosity value. These two results were used together to show how horizontal road curves can be classified in the absence of detailed geometry information. The results show that rural roads, characterised by isolated bends, pose the greatest risk to the road user. However the variance of the observed speed differential is not as critical a contributory factor of collision risk as originally anticipated.

ID 132: Development of roadside safety barriers using natural building materials
Giuseppina Amato, Trinity College Dublin
Fionn O’Brien, Trinity College Dublin
Ciaran Simms, Trinity College Dublin
Bidisha Ghosh, Trinity College Dublin

The Irish National Roads Authority is seeking low-cost roadside barrier solutions for National Secondary Roads suitable for implementation following road realignment projects. This paper introduces methods for the development of new designs for road-side safety barriers which will utilize freely available low-cost natural building materials (e.g. stone wall, earth etc.) and will meet the cost, aesthetic and engineering requirements. A fundamental momentum-based impact analysis has indicated that the mass available in natural building materials has the potential to provide sufficient containment of passenger cars on national secondary roads. The analysis indicates that it may be possible to replace the stiffness present in existing steel, concrete and steel-wire barrier designs with mass by using earth and stone mounds of approximately 1 metre depth. The paper also evaluates the potential of employing well-established computational modelling techniques to test the ability of the proposed new design concepts to meet the required standards of safety as defined by the European Standard EN 1317. The detailed computation modelling has been carried out using the multibody dynamics based software package MADYMO. The MADYMO models are benchmarked using data from existing tests at the Transport Research Laboratory (TRL) in the UK, and the force deformation response of the proposed components for the designs will be experimentally evaluated. In addition, a new method for scaling physical impact tests which allows tuning of the required crush characteristics and acceleration time histories will be used. In this way, scaled physical tests will be carried on to get preliminary results and to test the viability of the proposed designs.
ID 102: Determining impact of bus-stops on roadway capacity
Johnnie Ben-Edigbe, University of Technology, Malaysia
Nordiana Mashros, University of Technology, Malaysia

Roadway capacity is a quantitative assessment of traffic stream properties. It is based on relationship between flow, speed and density. A bus stop is a designated place where buses stop for passengers to board or alight. Bus stops are normally positioned on the highway and the bays are either located on or off the road carriageway lane to reflect the level of usage. The study is aimed at determining capacity loss and traffic shockwaves associated with bus stop locations along the carriageway lane of a single lane highway. The off-peak hour study was carried out in Skudai Town, Malaysia. An average dwell time of 50s was recorded. The roadway was divided into three sections (A-downstream, B-transit, and C-upstream). Bus stops are located at section C. Based on the hypotheses that on street bus stops would lead to roadway level of service reduction, volumes, speeds and vehicle types were surveyed for 4 weeks. Bearing in the mind that surveys were carried out different locations, volume and speeds relationships were used to compute roadway capacities for the different scenarios. Roadway capacities were computed using quadratic relationship between flows and densities. Results and analyses showed significant differences in roadway capacities for the on and off street bus stops. Roadway capacity loss of 23.4 per cent was recorded, and -25km/h propagation of velocity shockwaves. Ideally, the survey should have been carried out at the same location for different scenarios, but this is not practicable as it would have required the construction and reconstruction of bus stops. Notwithstanding, the study concluded that on-street bus stops have significant impact on roadway capacity loss.

ID 106: Development of a new air intake and exhaust system for a single seat race car
Damien Kennedy, Dublin Institute of Technology
Gerry Woods, Dublin Institute of Technology
Darragh Forrest, Dublin Institute of Technology

This paper deals with the design, analyses and testing of a new air intake system for a single seat race car designed and manufactured by a team of DIT students for the 2011 formula student competition in Silverstone. It also deals with the design, CFD analyses and noise emission testing of a new exhaust system for the vehicle which is powered by a 600cc Suzuki GXR engine. The new air intake system was developed to satisfy the rules of the formula student competition which required a 20mm restriction to be placed on the air intake system. It was a requirement that all engine airflow passed through this restrictor. Implementation of the air restriction also meant that a new engine map was required for effective operation of engine. This paper looks at a number of different alternative air intake designs and compares the air flow simulations using CFD analyses. The use of rapid prototyping techniques to produce a physical model is discussed. The design and manufacture of a new throttle body is also presented. The process for engine remapping and dyno test results are also presented. The competition also required an exhaust system with noise emissions below 110db. This paper presents the design and analyses of alternative exhaust paths and noise emission testing.

Session C2 – Transport Logistics & Freight – Aviation & Maritime

ID 108: A constraint-based approach to ship maintenance for the Irish navy
George Boyle, University College Cork
James Little, University College Cork
Joseph Manning, University College Cork
Roman van der Krogt, University College Cork

The Irish Naval Service performs an annual maintenance on each of its ships, known as a “refit”. During a refit, the ship is taken out of normal service and maintenance activities are performed for twenty working days. The ship must be available for patrol at the end of the refit period, so timely completion is essential. The officer in charge of the dockyard must organise the team of workers, coordinate with the ship’s staff and other naval units, and enlist the services of outside contractors when necessary. Naval refits are characterised by constraints that reflect the confined working environment of the ship, which presents numerous mechanical and safety challenges. In the extreme case, there are tasks that require an entire area of the ship to be cleared
on health and safety grounds. The nature of such tasks means that delays can have significant knock-on effects. Furthermore, many of the estimates of task duration, particularly of engine repair work, cannot be fully confirmed until the engine has been dismantled and a thorough inspection conducted. These facts create considerable uncertainty in the extent of work required, and so the ability to quickly react to changes and reschedule is paramount, in order that the ship be ready to return to patrol duty. In this paper we present a scheduling model based on constraint programming that deals with the issues of space and safety, while giving particular focus to the aspect of coping with unexpected changes. It has undergone initial evaluation on a real scenario at the Irish Naval Service dockyard. An advanced model for estimating Green House Gas emissions for Irish air transport.

**ID 87: Evaluation of business models in rail freight transport under consideration of multimodal aspects**

Mag. Christian W. Flotzinger, LOGISTIKUM – Upper Austria University of Applied Sciences
Mag. Gerald J. Aschauer, LOGISTIKUM – Upper Austria University of Applied Sciences
Dr. Friedrich Starkl, LOGISTIKUM – Upper Austria University of Applied Sciences

Within the field of cargo transport and mono- and multimodal transport in general and in particular the rail processes have so far contributed rather insignificantly to the reduction of road traffic volume. This is the result of limited capacities concerning terminals, the necessity of special reloading devices entailing high investment costs and time losses handling the cargo, as well as wide-spread scepticism regarding adherence to delivery dates, traceability of consignments and flexibility of intermodal transport. In short, to solve these problems innovative and market-oriented solutions are needed. One possible approach is using the business model as an analysis-tool. There is the need of systematic and scientific exploration which potentials and advantages innovative business model solutions provide. Compared to monomodal chains on the road the mono- and multimodal processes in rail freight transport are much more complex and risky. Therefore it is a difficult challenge for organizations to design and implement the complex construct of business model correctly and thus successfully. The research project is based on the assumption, that successful business model innovations in sustainable transport provide positive effects on the modal split and contribute significantly to the sustainable optimization of the overall traffic system.

**ID 110: The importance of product distinction in lifecycle and product chain analyses.**

Conor Walsh, University of Manchester
Alice Bows, University of Manchester

Competing cargo types exhibit different logistical requirements and transport demands. This results in a variety of emission estimates attributable to the transport of freight. This is most evident in the distinction amongst cargo carried by different ship types. The relationship between engine size, capacity, utilisation, empty routing etc. will not be uniform amongst different ships. Similarly, different product types (such as containerized cargo, bulk or volume/general goods) will have different requirements for cargo handling and loading or unloading services. This is equally valid for transhipment. In order to assess the impact of specific product requirements, the transport emissions associated with an equivalent product chain were estimated for container, dry bulk, wet bulk, and volume (general) cargo. This identifies the main determinates of emissions within each product stage. For example, the operations of a boiler will increase the port based emissions associated with liquid bulk. For overland transport, capacity utilization is seen as being vital with bulkier goods requiring more space, hence resulting in higher emissions. The overall results demonstrate the importance of distinguishing between bulk and non-bulk goods and demonstrates how efficiencies in one stage (such as a slower ship speed) can be negated by inefficiencies in another (such as underutilized road transport). This is vitally important considering the carbon intensive nature of road based transport. Such distinctions highlight the importance of placing shipping within the context of the wider transport and logistics chain to consider any emission factors expressed in tonne-km in context and has broader relevance for lifecycle or product chain analyses and comparisons.
ID 138: Achieving paperless freight transport
Gráinne Lynch, National Maritime College of Ireland
Gary O’Connor, Nautical Enterprise Centre

The realisation of the European Union’s vision of paperless freight transport contributing to a cleaner environment, security of energy supply, transport safety and security is certainly challenging. Arguably idealistic, paperless freight transport across all modes of transport, all cargo types, all business roles, all geographical and political borders, all currencies and fiscal regimes in the transport and logistics domain is fraught with resistance from many stakeholders. An approach that builds an understanding of freight transport processes, data flow and compliance requirements from the ground up and develops a standardised freight transport process model and standardised message exchange framework is the primary goal of the e-Freight project. This paper outlines the genesis of paperless trade and transport strategy in the EU, the approach taken by the e-Freight project in addressing standardised and security information flow that supports the physical flow of goods and the reasons why a research approach is the key to driving change in the way the world does transport.

ID 76: Time4trucks-freight transportation & congestion relationships in urban areas—methodology approach and savings potentials
Mag. Gerald J. Aschauer, Logistikum – Upper Austria University of Applied Sciences
Mag. Christian W. Flotzinger, Logistikum – Upper Austria University of Applied Sciences
Dr. Friedrich Starkl, Logistikum – Upper Austria University of Applied Sciences

On the one hand, the transportation sector is besides the energy sector one of the most responsible sectors for emissions, especially for emissions of carbon dioxide. Road freight transportation dominates the modal split measured in tonne kilometers and is in the EU-27 in charge of a great part of CO₂ emissions; the share of the transport sector is further increasing. On the other hand road infrastructure cannot be extended to the dimension of truck transportation growth and so leads to capacity limits on road infrastructure. Congestion and bottlenecks are the results of this development. Congestion does not only mean an inefficient usage of existing infrastructures; because of a broken down traffic flow, the emission of harmful substances, energy consumption and the production of CO₂ compared with an undisturbed traffic flow is significantly higher. Due to this relationship, organizational measures to reduce congestion and bottlenecks resulting from overloaded infrastructure have to be taken for the contribution to sustainable freight transportation. The research project provides a methodology to remove truck traffic from the rush hour periods through a co-operative approach amongst road operators and the industry.

Session D2 – Public Transport

ID 75: Bus transit service quality monitoring in UK: a methodological framework
Moataz Mahmoud, University of Ulster
Julian Hine, University of Ulster
Anil Kashyap, University of Ulster

Transport stakeholders face many challenges in providing transit services that satisfy customer demands. Three main obstacles have been identified both in the transport literature and governmental publications including traveller behavioural intentions, service quality, and the quality monitoring process. Recently, the focus of public transit service provision has been shifted towards improving the quality monitoring process, prioritising development schemes, and reducing car dependency. In order to address these demands, different approaches have been proposed using indicator-based evaluations of bus service quality. Due to the wide range of indicators associated with this exercise, there is a need to define a concise set of bus service quality indicators that can be readily implemented by operators and managers, moreover, to constitute an integrated framework that involves all stakeholders’ perceptions and demands under one roof. This research aims to develop a methodological framework for monitoring bus service quality within the UK context. This framework addresses both traditional quality parameters (subjective indicators) and system performance parameters (objective indicators) in a combined single output measurement model. The service quality loop has been investigated and gaps in quality schemes have been derived. In addition, a short list of service quality indicators has been derived.
from different expert perspectives including those of academics, operators, users, policy makers and local authorities. A key outcome of this research is the development of an integrated evaluation framework for monitoring bus service quality.

ID 100: An appraisal of proposed and existing NTA corporate structures
David O’Connor, Dublin Institute of Technology

The National Transport Authority was established originally as a land-use and transport planning agency whose aim was to coordinate and integrate transport infrastructure and service delivery in the Greater Dublin Area and, subsequently, to manage public passenger transport licensing nationally. This paper looks at the corporate structure of the NTA and, comparing it to other transport systems, assesses its incorporation, particularly in terms of accountability. Many analysts consider institutional arrangements as the most fundamental aspect of delivering effective transport systems. A range of governance systems exist for urban transport authorities. The NTA most closely reflects the model of a public agency with sub-contracted services. Within this structure, levels of accountability and integration with local democracy appear to be very limited, with little or no public representation and the agency excerpting control over all land use development plans within its administrative area. Evidence from other jurisdictions indicates that those systems with high levels of democratic involvement and the most effective distribution of strategic, tactical and operational planning lead to the most efficient and sustainable transport networks. Analysis of the NTA corporate structure suggests that, while it possesses strong strategic and planning controls, a number of factors – including its lack of accountability, its unclear relationship with other transport agencies and its overly broad geographic remit – may hinder its ability to deliver its stated objectives. Comparison with the public transport federation or “verkehrsverbund” model, in particular, show that increased democratic involvement, combined with greater powers over operational agencies may be a more effective means to creating a sustainable transport network. A recent bill and current government policy also suggest that this may be a more appropriate direction for the Greater Dublin Area.

ID 160: How to improve high-frequency bus service reliability through scheduling
Grace Fattouche

This paper outlines a scheduling process for improving high-frequency bus service reliability based on a model which uses Automatic Vehicle Location and Automatic Passenger Count data. Developing a schedule for high-frequency bus routes involves balancing the costs to the passengers and the cost to the transit agency. Passengers are interested in short travel times and short, reliable waiting times. In order to assess the trade-off between trip speed and reliability, transit planners need to follow a clear scheduling process, which explicitly projects and evaluates the tradeoffs between overall travel time and reliability. The proposed model estimates the cost of any given schedule for waiting passengers, onboard passengers and the transit agency based on the existing variability in running times and headways. The scheduling process involves finding the time point schedule which minimizes the total cost with the help of the model. The model is based on two critical hypotheses: (i) consecutive bus vehicle trips are independent and (ii) consecutive segment running times for a particular bus trip are independent. These two critical hypotheses were shown to be true on two high-frequency bus routes analysed in Chicago; Route 95E and 85. For each route, the schedule which minimises the total passenger cost was determined. The schedules obtained with this generalised cost minimisation approach showed improved reliability and overall passenger service quality – at the same operating cost - compared to the current schedules on both routes, as well as compared to traditional approaches. A sensitivity analysis has shown that in most cases the generalised cost minimisation schedule can significantly improve reliability and overall passenger service quality over traditional approaches.

ID 151: BRT or LRT – the feasibility of LRT or BRT for UCD
Neil Montague, University College Dublin
Sarah Mc Nally, University College Dublin

Standard buses are the only form of public transport serving UCD, and it is the largest employment centre in the city that is not located near a DART or Luas line. As a result, UCD is inaccessible to large areas of Dublin, compromising its potential catchment area. This report assesses the feasibility of providing a BRT or LRT link to UCD. To analyse potential route corridors, two main methods were undertaken. The first was analysis of census
data, including population density and modes of travel to work for census enumeration areas in Dublin, the smallest area for which census outputs are issued. POWCAR data was then used to plot trip matrices on a map of Dublin, analysing transport patterns in the south Dublin area. Route corridors were assessed in terms of the number of residents and places of employment located within 600m of the route line, compared to the route lengths. The interchange potential for each route with other transport modes was also assessed. A stated preference survey was then carried out amongst UCD students, to assess their preferences for rapid transit corridors, and their likely change in travel patterns if one was provided. This range of data was then correlated to produce a preferred route corridor for the scheme. A rapid transit link to UCD was found to be feasible, with an orbital BRT system from Merrion to Sandyford the preferred option. This would connect UCD to both the DART and Luas Green Line corridors by rapid transit, opening up a much wider catchment area to UCD and the south east Dublin area at large.

**ID 123: Examining the Barriers to Sustainable Inter-City Transport in Ireland**
Gerard Cafferkey, Trinity College Dublin
Brian Caulfield, Trinity College Dublin

Over the past decade the Irish government has invested intensively in a large national motorway network. One of the side effects of this investment has been that now inter-city travel is now considerably cheaper and quicker by car over any other mode. The main objective of this research is to identify and examine the barriers to sustainable inter-city transport in Ireland. The majority of sustainable transport research takes place in an urban context with very little research has focused on understanding the factors to encourage alternative modes on inter-city trips. A stated preference study was conducted to determine what are the factors that impact upon individuals’ mode choice when conducting an inter-city trip. The results of this paper demonstrate that there are several factors that impact upon individuals’ mode choice decisions when undertaking an inter-city trip. The main factor that was found to impact upon mode choice was the requirement to have a car in the destination city.

**Session A3 – Transport & the Environment**

**ID 72: Indoor/outdoor air quality relationship in urban commercial buildings: Dublin case studies**
Avril Challoner, Trinity College Dublin
Laurence Gill, Trinity College Dublin

Legislative reductions in air pollutant limit values seek to better outdoor air quality, in turn reducing associated illnesses such as cardiopulmonary mortality, strokes and lung cancer. This study focuses on two major traffic related pollutants NOx (NO2 + NO) and PM2.5 (particulate matter with aerodynamic diameter less than 2.5µm). Previous research suggests that people now spend up to 90% of their day indoors (Dimitroulopoulou et al., 2001) yet in Ireland no legislative indoor air pollutant limits exist. This research aims to determine the relationship between exposure of staff to specific air pollutants in Irish working environments (e.g. shops, offices) and factors such as ventilation systems and door design. Simultaneously measurements of two traffic generated pollutants. NOx and PM2.5, have been taken indoors and outdoors of the buildings under investigation. Outdoor concentrations were measured in two locations either directly outside the building at ground level or at the air intake of the buildings ventilation system. To date seven work places located on busy street canyons of Dublin city centre have been monitored and clear relationships between indoor and outdoor concentrations have been observed at the sites. Results indicate that indoor concentrations can be significantly greater than outdoor concentrations, e.g. Indoor / Outdoor (I/O) ratios of up to 2.3 for NO2 and 2.13 for PM2.5. Clear differences in I/O (indoor to outdoor concentration ratio) for PM2.5 and NOx were also observed for working and non-working hours. Daily diurnal patterns have been noted for both indoor and outdoor, with strong patterns for NO2.
ID 109: Relative NOX emissions from road transport, for different vehicle types and technologies
Stephan Leinert, Environmental Protection Agency
Bernard Hyde, Environmental Protection Agency
Eimear Cotter, Environmental Protection Agency

This paper consists of two parts: Part 1 looks at the effect on total NOX emissions of the recent changes in the VRT/motor tax system and the subsequent changes in purchasing patterns towards diesel-fuelled vehicles. This work projects the impact of this move to diesel vehicles for new car purchases out to 2020. Part 2 presents a new methodology that allows an initial estimate to be made of the impact on NOX emissions of, for example, a move between technologies within a vehicle class (e.g. from Euro 1 to Euro 6) or a move between vehicle classes (e.g. from petrol to diesel). Road transport is a major contributor to NOX and greenhouse gas emissions in Ireland. In 2009, transport contributed nearly 50% to total national NOX emissions. Currently, there is a strong focus on reducing emissions from the transport sector through a range of policies and measures. A key measure, introduced in 2008, is to link VRT and motor tax to g CO2/km to encourage the purchase of more fuel efficient vehicles. Recent evidence suggests that this change in the taxation system has resulted in a change in purchasing patterns with diesel-fuelled vehicles making up a higher proportion of new car purchases. This work shows that, assuming the trend towards the purchase of new diesel vehicles continues, NOX emissions will be 24% higher in 2020 relative to a baseline scenario. NOX emissions are projected to be 28% higher in 2020 if the trend towards the purchase of new diesel vehicles continues and these new vehicles increase their annual mileage as a consequence of purchasing more fuel-efficient vehicles.

ID 127: Carbon Capture and Storage as a mitigation option within transport
Shaun Redmond, Dublin Institute of Technology

Since 1990 there has been a phenomenal growth of approximately 160% in greenhouse gas emissions from Ireland’s transport sector. Ireland has a number of legally binding commitments to reduce its CO2 emissions by 2012; it also has a number of reduction targets for the year 2020 which materialised as a result of the 2007 Energy White Paper. From this it may be seen that Ireland must take somewhat radical measures if the proposed targets are to be realised. The research paper looked at how the mitigation option of Carbon Capture and Storage (CCS) may be used to reduce CO2 emissions attributed to the transport sector. Road transport is responsible for 97% of emissions from the transport sector, the paper attempted to identify the most viable way of incorporating CCS technology into reducing transport related emissions. The proposed inclusion of CCS in an Irish context meant addressing a number of issues which could affect its ability to contribute to emissions mitigation. Areas such as cost, public support, policy formation, ability to fulfil energy targets and alternatives where all examined within the paper. A key issue for its implementation was the area of public perception. A survey was undertaking to examine the Irish public’s attitudes and beliefs to climate change and in particular CCS. Research was also conducted into the average travel (Air & Land) undertaken by the Irish public, which produced results highlighting the average travel emissions per person. As the results show there is support for the inclusion of CCS in Ireland, they also show that there is a high of travel emissions per person in Ireland. This meant that theoretically CCS offered a feasible means of reducing CO2 emissions caused by travel in Ireland. The paper put forward a means of incorporating CCS technology into the transport industry. Taking the example of automobiles, it was suggested that a “store and deposit” scheme be introduced to the Irish market. The initiative would work off the same principle that fuelling a car is based upon. As a car consumes fuel, CO2 is produced, but instead of being released into the atmosphere it would be captured and stored in a compartment within the vehicle until the vehicle needs to be refuelled. When the vehicle is being pumped with fuel it will deposit its stored CO2 into a larger storage component at the garage site. When the time comes for the large fuel tankers to deliver more fuel to the site, it will collect the stored CO2 and transport it to a network of pipeline where it would join the rest of emissions coming from Coal fired power plants and be per mentally stored in CO2 storage sites. It may therefore be said that on the basis of the findings of the paper CCS has the public support to be implemented in Ireland and can theoretically aid in reducing CO2 emissions related to the Irish travel sector, which are key contributors to the harmful emissions being released into the environment.
Sustainability and its implications for transport planning is an area of growing interest in academia and policy making. The concept of sustainability originally reflected concerns about current resource consumption and goals of equity to future generations. Conversely, from an economic point of view, sustainability focuses on the idea of maximising resource efficiency, which in the case of transport planning translates into achieving better accessibility, or the ability to reach activities and destinations, with less resource consumption. This paper suggests a methodological framework to determine the basis for local-level transport prioritisation in urban areas. This research draws from recent research on the concept and measurement of sustainable accessibility. The analysis moves away from the use of broad measures of accessibility and sustainability, which tend to focus on the use of motorised modes. Instead, it uses the spatial information that can be obtained from the actual multi-modal analysis of urban trips and in particular, of the journey to work. In the context of the recent economic crisis in Ireland, the methodological framework suggested here is a valuable planning tool for sustainable transport, as well as a contribution to the literature on accessibility and sustainability indicators.

**ID 130: The Development of a Multi-criteria Analysis Tool for the Assessment of Inter-urban Cycleways**

Orla McCarthy, Trinity College Dublin  
Brian Caulfield, Trinity College Dublin  
Dermot O’Dwyer, Trinity College Dublin

The needs of cyclists can vary depending on the motivation for their trip. In an urban environment, there may be a choice between cycling on road for commuters or in parks for recreational cyclists. However, an inter-urban network, which may span greater distances and connect with many towns and villages, would need to be capable of satisfying the needs of all potential users. Using national and international literature; a list of criteria is developed and a corresponding matrix is created. The relative importance of the different aspects of the cycleways is established using survey data. This, in conjunction with the criteria matrix, informs a multi-criteria analysis tool, for use in the planning, and rating, of inter-urban cycleways. Candidate route options for an inter-urban cycleway between Dublin and Mullingar are then evaluated using the multi-criteria analysis tool.

**Session B3 – Transport & Society**

**ID 118: Determining the welfare effects of introducing a cap-and-share scheme on rural commuters**

David McNamara, Trinity College Dublin  
Brian Caulfield, Trinity College Dublin

This paper evaluates the welfare effects of introducing a cap-and-share scheme on the end users of transport in Ireland while focusing on individuals who undertake daily commute trips. Two regions are studied; the urbanised Dublin Metropolitan Region and the rural Western and Border Region. Economic welfare analysis determines the effects of the scheme on each region. The findings show a significantly higher welfare loss to commuters residing in sparsely populated rural areas in comparison to urban commuters. This finding is also true of commuters living in relatively deprived areas which frequently are also rural regions whereas the more affluent areas bear less of the welfare loss than deprived areas.

**ID 73: Towards a ‘usable-past’ for the future of mobility**

Colin Divall, Institute of Railway Studies & Transport History, York, UK

Globalization raises serious concerns about ecological sustainability and social equality. This paper proposes that historians write a ‘usable past’ framed by the imperative of addressing these issues. The transport and communication networks that underpin global trade and travel offer an opportunity to narrate such a past. In particular business enterprises have historically helped to shape the ways consumers think about and realize bodily movement. By contributing to a genealogy of these mobility cultures, historians can help to uncover the mythic traces that continued to shape contemporary public and policy understandings of global mobility. How
can we turn the history of globalization – recently characterized by Geoffrey Jones as ‘a central issue, and perhaps the central issue in business history’ (Jones 2008: 141) – towards the pressing political challenges raised by today’s business activities?

**ID 89: What Hope is There for us as old fogeys in the future? A review of travel behaviour of older people: current trends and future prospects.**
Kiera McDonald, University of Ulster
Julian Hine, University of Ulster
Neale Blair, University of Ulster

Within the next 15 – 25 years the UK and Irish populations aged 65 years and over will increase considerably; inversely, the population aged less than 16 years will decrease though at a significantly higher rate. Perception, accessibility, service options, modal choice, urban or rural domiciliary location, income and social inclusion are all factors believed to affect the travel behaviour of older people, with the effects tending to increase with age. In the context of the island of Ireland, limited research has been carried out specifically to ascertain the changes in travel behaviour which result from ageing and also how the needs of an ageing population in terms of their travel behaviour can be met in an age of austerity. This paper firstly examines the linkages between mobility and lifestyle choices for older people through an international review of the research literature and then, through a review of policy responses on the Island of Ireland, addresses areas of key concern, whilst at the same time recognising that older people’s transport needs and lifestyles are increasingly diverse. The paper concludes by identifying the gaps in the research literature and ways in which praxis should change.

**ID 148: Exploring an innovative approach by SECAD to sustaining a rural transport initiative**
Ian Coughlan, University College Cork
Mary O’Shaughnessy, University College Cork
Pat Enright, University College Cork
Ross Curley, South & East Cork Area Development Ltd. (SECAD)
Ryan Howard, South & East Cork Area Development Ltd. (SECAD)

In 2001 the Irish government established the Rural Transport Initiative (subsequently to become known as the RTP) with a stated aim to address the issue of social exclusion caused by lack of access to transport. However in recent times due to the economic challenges facing the countries services such as the rural transport initiative have been targeted for significant budgetary cuts and/or complete cessation. The Report of the Special Group on Public Service Numbers and Expenditure (2009) called for an end to the Rural Transport Programme with an estimated saving of approximately €11m to the national exchequer. It is within this context that rural transport services providers are increasingly faced with the challenge to develop economic strategies to self sustain. The purpose of this paper is to present the findings of an exploratory study into the proposed development of one such strategy.

**Session C3 – Transportation Modelling**

**ID 152: Estimation of Density and Gaps in Congested Traffic**
Eugene O’ Brien, University College Dublin
Alessandro Lipari, University College Dublin
Colin Caprani, Dublin Institute of Technology

In common practice, traffic measurements are carried out using presence-type detectors, such as magnetic induction loops. When aggregated, a loop detector returns flow, occupancy and average speed, for a given period of time. Sometimes microscopic quantities can also be collected, such as time gaps between vehicles and individual speeds. Spatial quantities, such as density and inter-vehicle gaps, are usually only estimated from temporal data, under the assumption of constant speed. However, in congested conditions, such estimates are likely to significantly differ from the actual values, since the speed varies greatly as a result of stop-and-go waves. Spatial quantities are useful whenever it is important to accurately know the number of vehicles on a stretch of road and their distribution. For instance, they are essential for calculating traffic loading on long span bridges. The aim of this paper is to study both macroscopic and microscopic spatial quantities and evaluate the
accuracy of their estimation from one presence detector. A micro-simulation software tool is used. The software implements a car-following model which has been found to successfully replicate many different kinds of single-lane congestion. It can output both temporal quantities from virtual point detectors and spatial quantities from snapshots taken from a virtual camera. Then spatial quantity estimates are compared to their actual values for different kinds of single-lane congestion. It is found that density and gap estimates can greatly differ from the actual values, especially in their maximum values.

**ID 145: A cycle route planner mobile-app for Dublin City**
Maurice Gavin, Tyndall National Institute
Bidisha Ghosh, Trinity College Dublin
Vikram Pakrashi, University College Cork
John Barton, Tyndall National Institute
Brendan O’Flynn, Tyndall National Institute

In a road network, cyclists are the group exposed to the maximum amount of risk. Route choice of a cyclist is often based on level of expertise, perceived or actual road risks, personal decisions, weather conditions and a number of other factors. Consequently, cycling tends to be the only significant travel mode where optimised route choice is not based on least-path or least-time. This paper presents an Android platform based mobile-app for personalised route planning of cyclists in Dublin. The mobile-app, apart from its immediate advantage to the cyclists, acts as the departure point for a number of research projects and aids in establishing some critical calibration values for the cycling network in Dublin.

**ID 153: Extension of a lane-changing model to a multi-lane micro-simulation tool**
Colin Caprani, Dublin Institute of Technology
Eugene O’Brien, University College Dublin
Alessandro Lipari, University College Dublin

Traffic micro-simulation models can be divided into car-following and lane changing models. Many microscopic models have been proposed in the past. Most of them have been considered valid if capable of reproducing traffic flow conditions at aggregate level, although they should be compared to microscopic data, such as trajectory data. In spite of the progress made recently, trajectory data is still very difficult to collect, as it requires aerial photographs and intensive image processing analysis. Therefore there is still a lack of suitable data for calibration and validation of lane-changing models. In this paper, a car-following model is combined with a lane-changing model. While in the majority of lane-changing models the lane change decision is based on a gap acceptance criterion, the model used here introduces a new approach, weighing the acceleration advantage of a current lane changing vehicle against the acceleration disadvantage imposed on the surrounding vehicles. We show that the addition of the lane changing model to the car-following one leads to some unrealistic behaviour, which requires some adjustments in the car-following model formulation. Specifically, simulations show that overtaking vehicles cut in front of vehicles on the slow lane allowing for an inconsistent gap. Micro-simulations are run for two-lane same-direction uncongested traffic. No on- or off-ramps are included, so the lane changes studied can be classified as discretionary, i.e. a driver changes lane because of a perceived advantage and not to follow a specific path required by the journey. Two model modifications which lead to a more realistic behaviour are proposed. These are based on available data and do not significantly increase model complexity.

**ID 137: Traffic flow predictions employing neural networks in a novel traffic flow regime separation technique**
Stephen Dunne, Trinity College Dublin
Bidisha Ghosh, Trinity College Dublin

Predictions of fundamental traffic variables in short-term or near-term future are vital for any successful dynamic traffic management application. Univariate short-term traffic flow prediction algorithms are popular in literature. However, to facilitate the operationalities of advanced adaptive traffic management systems, there is a necessity of developing multivariate traffic condition prediction algorithms. A new multivariate short-term traffic flow and speed prediction methodology is proposed in this paper where the traffic flow and speed observations from uncongested (or linear) and congested (or non-linear) regimes are regime-adjusted to ensure
consistent system dynamics. The prediction methodology is developed using Artificial Neural Networks (ANN) algorithms in conjunction with adaptive learning rules. These learning rules demonstrate significantly improved accuracy and simultaneous reduction in computation times. Additionally, the paper attempts to identify the most suitable adaptive learning rule from a chosen pool of rules. The validation of the prediction methodology is performed using traffic data from multiple locations in the United Kingdom (UK). The results indicate that the proposed multivariate forecasting algorithm is effective and computationally parsimonious to simultaneously predict traffic flow and speed in freeway or highway networks.

Session E3 – Pedal Power

ID 129: Throughput and delay in a discrete simulation model for traffic including bicycles on urban networks
Jelena Vasic, Dublin City University
Heather Ruskin, Dublin City University

The ‘greening’ of transport is an ongoing concern in today’s cities, with many struggling to reach carbon emission targets. One relevant area for effecting change is encouragement and facilitation of alternative, non-motorised transport modes, such as cycling and walking. Understanding the dynamics of non-motorised flows and their interaction with motorised traffic in an urban context is fundamental to exploring these alternatives and has been a recent focus of much technical (and social) research. In this paper, we describe the development of an agent-based simulation framework for mixed traffic on urban networks and its application to a basic network scenario, in which heterogeneity takes the form of lane-sharing by bicycles and cars. Performance is analysed in terms of throughput for different network and signalisation parameter values.

ID 98: Facilitating Cycling to Counter the Impacts of Urban Sprawl
John Lynch, University College Cork
Aoife Foley, University College Cork

It has been estimated that $100 billion dollars could be saved in the United States of America by five percent of non rush hour traffic shifting from cars to bicycles. Driving is far from being a cheap mode of transport. A combination of factors such as long commuting distances to work, large scale urban sprawl and increased decentralisation of city populations due to various government policies since the 1970s has encouraged a damaging and unsustainable form of land use across urban centres of the United States. In Ireland similar trends of excessive daily driving can be observed in the environs of the larger towns and cities - in the hubs and gateways. In contrast, European countries such as the Netherlands and Denmark have gone to great lengths to ensure that fewer citizens have to experience the waste of time involved in negotiating cars on congested roads; their cities have been engineered to prioritise the cyclist so much so that it is the vehicle of choice in and around their capital cities. Current land use zoning in Irish cities such as Dublin has served to increase private car traffic on wide and costly roads. Dublin’s outer orbital motorway, was originally constructed to divert traffic coming from national primary routes away from the city centre, now serves primarily to connect the city’s sprawling suburbs. According to the National Spatial Strategy published in 2002 the projected number of cars on Irish roads could double in the years between 1996 and 2016. The percentage of the population getting around by public transport or by walking and cycling is consistently decreasing. This paper examines the role that the adequate provision of a cycling infrastructure can play in improving urban quality of life while also combating future sprawl.

ID 144: Analysis of the Non-Motorized Commuter Journeys in Irish Cities
Bidisha Ghosh, Trinity College, Dublin
Karen McMorrows, Trinity College, Dublin
Anneka Lawson, Trinity College, Dublin

Non-motorized commuting such as, walking and cycling to work has been recognized as critical in attaining sustainability in urban mobility. Owing to this recognition, in recent years there has been a surge of interest among policy makers and practitioners in improving and encouraging non-motorized commuting in Ireland. This paper presents a multiple logistic regression (MLR) based approach to explain the non-motorized mode share of commuter journeys in terms of relevant socioeconomic, transportation and household specific factors in five
major cities of Ireland. The non-motorized modes are analyzed using the latest available Irish census data (2006). Age, gender, socioeconomic status and several commuter journey specific variables have been identified as the major determinants to influence the choice of travel mode for commuter journeys. The findings reaffirm that the significance of the major determinants in influencing the choice of non-motorized transportation as the preferred mode of commuting are often region or locality specific. Hence, the developed models are important tools in understanding the effectiveness of the policy interventions in promoting non-motorized travel in utilitarian purposes across the major cities of Ireland.

ID 136: Perception of Safety Among Cyclists in Dublin City
Anneka Ruth Lawson, Trinity College, Dublin
Vikram Pakrashi, University College Cork
Bidisha Ghosh, Trinity College, Dublin
Liam O’Brien, Trinity College, Dublin

Non-motorized travel modes such as, walking and cycling has been recognized as critical in solving problems related to growing traffic congestion, harmful vehicle emissions and public health issues. As a result, in recent years the policy makers and practitioners are actively promoting walking and cycling as sustainable alternatives to motorized travel. Unlike walking, cycling requires sharing of road space with other modes of travel. To promote cycling in a city like Dublin, it is important to establish the safety and efficiency of the existing road transport network from a cyclist’s perspective. This paper presents a study on understanding the safety behaviour and perceived safety of cyclists in the city of Dublin. A questionnaire based survey was conducted on the existing cyclists in Dublin. The survey responses were analysed in an Ordered Logistic Regression framework to identify the factors which act as motivators and deterrents in influencing the safety experience of cyclists. The findings of this analysis reaffirms that cyclists do not consider that they experience superior safety than car-drivers. This indicates that serious policy interventions are necessary to improve the safety experience of existing cyclists which in turn will motivate non-cyclists to convert to cycling.

Session F3 – Saddle Power

ID 135: Route selection of the proposed cycle route along the Dublin to Mullingar Corridor
Gerard Deenihan, Trinity College Dublin
Brian Caulfield, Trinity College Dublin
Dermot O’Dwyer, Trinity College Dublin

Presently there is no official method for the route selection of a cycle route. In this project adopted a similar method used by the NRA for the route selection of road projects, however the extensive detail required was not replicated to the same degree. For this project, GIS equipment is used extensively. This in combination with 2006 census data allows predicted usage to be determined and analysed along different routes. The GIS data is also used in combination with COBERT IV determining the environmental benefits of the routes. Safety was also an issue in the selection of the most appropriate route. The Road Safety Authority’s data on collision locations in conjunction with site inspections with the GIS equipment allowed for the safety to be considered effectively in route examination.

ID 163: Route selection, design assessment and cost considerations of cycling corridors within the National Cycle Network
Richard Manton, Postgraduate Student, NUI Galway
Eoghan Clifford, Lecturer, Civil Engineering, NUI Galway

The establishment of a National Cycle Network (NCN) has been proposed by the Department of Transport, Tourism and Sport with the intention of connecting major urban centres and opening extensive rural routes. Three key interest groups have been identified as potential users of the NCN: (i) commuters, (ii) leisure cyclists and (iii) cycle tourists. Furthermore the new transport policy to 2020 – “Smarter Travel: Towards a Sustainable Transport Future” – and a National Cycling Policy have also been adopted. The vision behind the cycling policy is to “create a strong cycling culture in Ireland” and states that all cities, towns, villages, and rural areas will be bicycle friendly. It is envisaged that, by 2020, 10% of all trips will be by bicycle. The development of a NCN of
rural and urban cycle routes is a specific objective of the National Cycling Policy Framework (NCPF) published in April 2010. Careful analyses are required in the route selection and design process to maximise user traffic and user-satisfaction and to optimise the potential economic benefits. Current transport trends in Ireland are not sustainable. About 1.1 million people drive to work (57% of commuters), almost half of whom commute less than 10 km. Cycling - a low-carbon and healthy means of commuting - has fallen from 5.9% in 1986 to the current level of 1.9%, or 36,000 people. Furthermore, the numbers of primary and secondary students cycling to school have dropped by 80% and 85% respectively since 1986. The main reason for the decline in cycling has been attributed to safety concerns due to a lack of cycling infrastructure. It is envisaged that the NCN as well as the implementation of the objectives listed in the NCPF could have the potential to reverse this trend and lead to a five-fold increase in cycling commutes. The value of cycle tourism in Europe in 2009 was approximately €54 billion. Current cycle tourism in Ireland is underperforming in comparison with the rest of Europe; in 2009, only 2% of visitors cycled, spending an estimated €97 million. The restraints on the development of a more lucrative cycle tourism industry have been found to be predominantly infrastructural (e.g. dangerous, poor quality and unsuitable roads and bad signposting). Tackling these issues could also lead to an increase in the number of tourist and day-trip/leisure cyclists. Route design must be shown to have the potential to deliver significant economic, health and environmental benefits according to the three different user groups identified. Optimisation of route selection and engineering design (low cost, safe and easily maintained routes) is necessary. This study considers the various aspects of route selection, engineering design and potential cost benefits that can lead to optimal development of rural cycleways.

ID 114: Promoting cycling at University College Cork: Experiences with new services offered UCC Campus-Bike and others
Stephan Koch, Commuter Plan Manager, University College Cork

Within the last two years, the promotion of cycling as a daily means of transport has gained significant momentum in Ireland. The Department of Transport’s Smarter Travel programme and the National Cycle Policy Framework have boosted a number of projects and new services to support utilitarian cycling. One demonstration project granted funding in the 2009 Smarter Travel funding call is UCC CampusBike, a communal bicycle fleet system to be available to potentially 2,800 members of staff throughout the University College Cork campus. UCC CampusBike offers staff members access to a bicycle on an hourly basis during the working day, independent from bringing their own bicycle in the morning. While in last year’s ITRN 2010 paper “Cycling Promotion in a University Context” the author gave an overview of various cycling related services a university can offer – in particular what UCC have been doing in this field – this year’s paper will describe the experiences of the actual set-up and operation of the UCC CampusBike project, which started operation in March 2011. Challenges and solutions in the design of a straight forward, technically low scale bike fleet system for a large enough, but still non-anonymous target audience (as opposed to systems like the Dublin Bike scheme) will be presented, from a practitioner’s perspective, along with the first results of its usage evaluation. How far can such a scheme contribute to a modal shift from motorised to non-motorised short trips and to related savings of carbon emissions? What impact would easy access to a bicycle (as provided by UCC CampusBike) have on people’s perception of cycling as a means of transport? What impact does a bundle of other cycling-related services (e.g. provision of changing facilities, general awareness raising, “Cycle to Work scheme”) have on a long term modal shift in commuting journeys? Questions such as these will be considered on the basis of fresh UCC statistics.

ID 147: Bicycle Infrastructure Preferences – A Case Study of Dublin
Elaine Brick, AECOM
Orla Thérèse McCarthy, Department of Civil, Structural and Environmental Engineering, Trinity College Dublin
Brian Caulfield, Department of Civil, Structural and Environmental Engineering, Trinity College Dublin

This paper examines infrastructure preferences for cyclists in Dublin. The culture for cycling in the city has grown substantially over the past decade and much debate exists as to what type of infrastructure individuals require. The Irish National Cycle Policy Framework acknowledges that investment in cycling infrastructure type and quality in Ireland has been ‘in many cases, inadequate’ and has, generally, not led to an overall increase in cycling numbers. In order to ensure future investment is targeted where it is likely to be most effective in achieving adopted mode share targets for cycling, the following research has been undertaken to determine the
factors which most influence cycling route choice. In particular, the research aims to determine the factors, which have greatest influence on cycle route infrastructure preference the correlation between the level of cycling confidence and preferred types of infrastructure and route characteristics. A stated preference survey, undertaken by almost 2,000 cyclists and non-cyclists, was used to gauge preferences for a range of infrastructure types and route characteristics. Results from the survey were compared against individual characteristics, such as age, gender and level of cycling confidence. This comparison provides the authors with a robust data set to determine infrastructure types, which are most likely to influence a mode shift to cycling.