

Paper Title: A Cloud based Analytics Platform for Sustainable and Resilient Supply Chains

Cemalettin Ozturk (Munster Technological University), Reza Babazadeh (Munster Technological University), Conor Mulvey (Munster Technological University), Alex Vakaloudis (Munster Technological University) and Barry O'Sullivan (University College Cork, Ireland).

Abstract. In today's unpredictable socio-political, economic, and environmental landscape, organizations—including small and medium-sized enterprises (SMEs)—face unprecedented challenges in maintaining resilient supply chains. Many enterprises focus solely on minimizing business losses, often overlooking the environmental and societal consequences of their mitigation strategies. Additionally, access to essential hardware, software, and analytical expertise remains a major barrier to implementing effective resilience solutions. However, the growing availability of advanced yet affordable technologies, such as cloud-based open-source optimization, simulation, and artificial intelligence (AI) tools, now allows organizations of all sizes to adopt complex risk management strategies. This talk presents a novel approach for designing and applying an online analytical tool aimed at enhancing supply chain resilience across diverse organizational contexts. We will demonstrate how data analytics and risk management techniques can help organizations not only mitigate supply chain disruptions but also achieve adaptive, sustainable, and socially responsible business practices. By utilizing combinatorial optimization, simulation, and cloud computing platforms, businesses can enhance resilience while integrating sustainability and social responsibility into their operations.

Paper Title: Automated Pavement Condition Assessment: A Deep Learning Framework for Segment-Based PSCI Ratings

Waqar Shahid Qureshi (University of Galway), David Power (Pavement Management Services), Ibrahim Syed (TU Dublin) and Kieran Feighan (Pavement Management Servicesd)

Abstract. Pavement condition assessment is critical for transportation infrastructure, with the Road Management Office conducting surveys of regional and local roads in Ireland. These assessments use the PSCI (Pavement Surface Condition Index) scale, introduced in 2014, to evaluate road conditions based on visual distress identification. Ireland has 94,424 km of regional and local roads, comprising 95% of the total road network. This paper presents a deep learning-based framework for automated PSCI ratings for sequential road segments. The framework includes pavement pixel extraction, PSCI rating assignment, and the identification of contributing pavement segments. It applies a moving average median filter followed by a weighted mode to estimate the segment rating. The estimated ratings are then mapped using distance measurements and GPS coordinates. Building upon the previous work by Waqar Shahid Qureshi [1][2], which focused on image-based pavement rating using deep learning, this study introduces a segment-based approach. The previous studies demonstrated the feasibility of machine learning in classifying pavement conditions at the image level. However, local variations within a single image limited its generalizability. The proposed framework addresses these challenges by providing segment-based ratings for more consistent pavement condition assessments.

Paper Title: Integrating Generative AI into Street Experimentation: A Critical Framework for Urban Design Education

Caterina Villani (University College Dublin).

Abstract. Street experiments have gained traction as an urban planning approach that enables communities to explore alternative mobility and public space arrangements through low-cost, temporary interventions. These initiatives promote active travel and public life but often require significant spatial transformations, institutional backing, and community engagement. In many cases, design limitations and unresponsive planning processes hinder their wider implementation.

The rise of generative artificial intelligence (GenAI) presents new opportunities to reshape urban design education and practice. Emerging GenAI tools aim to make urban transformation more accessible by enabling diverse stakeholders to visualise potential changes—such as enhanced cycling infrastructure or expanded public seating—thereby fostering more inclusive and adaptable urban environments. However, these technologies also raise critical concerns regarding mobility justice, representation, and the unintended consequences of AI-driven design interventions.

Drawing on my experience designing and teaching an experimental tutorial on GenAI in urban design, this presentation introduces a critical framework for integrating these tools into planning education. I discuss strategies for engaging students in evaluating AI-generated urban futures, emphasising the need for a reflexive approach that interrogates biases, assesses spatial equity implications, and ensures that AI serves as a complement—rather than a replacement—to participatory and context-sensitive planning processes.

Paper Title: Archetypal Insights to Decarbonise Heavy Goods Vehicles: A Case Study of Ireland's Haulage and Freight Sectors

Ayodeji Adekanbi (Dublin City University) and James Carton (Dublin City University)

Abstract. The results of this work show that while over 99% of heavy goods vehicles (HGVs) in Ireland still rely on diesel, alternative low- and zero-carbon fuels such as HVO and Bio-CNG are emerging as transitional solutions, with growing adoption among fleet operators. The novelty of this work lies in its mixed-methods approach, combining qualitative interviews with fleet operators and quantitative data analysis to develop archetypal insights into HGV operations. The study highlights the significant emissions contribution of medium to long-haul diesel trucks and underscores the critical need for cross-border cooperation, particularly with Northern Ireland, the UK, and France, to advance decarbonisation. Operators support hydrogen trucks as a promising solution for long-haul operations, emphasizing the importance of green hydrogen for reducing emissions and stimulating economic growth in the haulage industry. The findings stress the necessity for comprehensive decarbonisation infrastructure, including vehicles, refuelling stations, and robust enhance government policy mechanisms to risks and reliability for adopters. mitigate early

Paper Title: An Irish Transport Perspective on Reference Class Forecasting

Joseph O'Connor (Department of Transport, Ireland) and Andrew Burrows (Department of Children, Equality, Disability, Integration and Youth).

Abstract. Reference Class Forecasting (RCF) is the subject of increasing interest in public investment decision-making, in Ireland and elsewhere. This paper relates to Policy Analysis and Evaluation, as it discusses the policies applied to RCF usage in the transport sector and makes recommendations to improve this. The paper reviews the use of RCF in the Irish transport sector and makes some recommendations on how to develop the use of RCF and improve cost and contingency estimation. The paper compares the application of RCF across different sectors and schemes and outlines how the application of RCF has developed in recent years, becoming a more central feature of the cost forecasting process in some recent projects such as Luas Finglas. Key findings of the paper include the importance of robust base cost estimation, clear communication, and consistency of approach in the use of RCF. Data quality when developing and applying the reference class is essential, and the collection of local datasets should be encouraged. The development of large contingency funds also raises questions for project and budgetary management, including the appropriate use and approval responsibilities for that funding, avoiding perverse incentives for the various actors, and ensuring value-for-money decisions are taken effectively.

Paper Title: Understanding Public Transport Non-Users William Brazil (NTA/TCD) **Abstract.** The modelling of trip-level mode choice comprises one of the most important elements of strategic transport modelling and the transport planning and service provision decisions it informs. Strategic transport models often assume that all trip makers consider each of the alternatives that comprise the respective choice sets, however this is unlikely to reflect the real-world decision making process that individuals engage in. Specifically with regard to public transport it is important to understand the current addressable market, and how mode consideration varies by trip maker and area type. To better understand this choice behaviour, the research undertaken in this study utilised data (responses from 7,995 individuals) collected as part of National Transport Authority's National Household Travel Survey of 2022 to assess the proportion of the Irish population that never takes public transport. A binary logistic regression model is used to mode non-use of public transport with respect to the socio-economic and demographic characteristics of the trip maker, access to car and bicycles, and the their area of residence. Results indicate that roughly half of those surveyed never take public transport, and non-use is highly correlated with a wide number of variables, with age and area of residence emerging as particularly string predictors.

Paper Title: Accessibility-based community vulnerability assessment to bridge failure: a spatial analysis of socioeconomic impacts

Amaya Vega (Atlantic Technological University), Myra Lydon (University of Galway) and Emma Fitzpatrick (University of Galway).

Abstract. Bridges are critical infrastructure that supports community connectivity to employment and essential services. Prioritising bridge maintenance interventions is a complex task that involves the consideration of various factors, such as the bridge's lifespan, characteristics, operating conditions, environmental impact, and the consequences of infrastructure disruption for local communities. Failures in bridge infrastructure can disproportionately affect rural communities, often amplifying existing socio-economic disparities. Due to their low-density residential patterns and scattered development, rural residents often experience long travel distances to employment and essential services, with significant reliance on car travel, and sparse public transport services. The sustainable development of rural areas requires the improvement of rural transport accessibility, which is considered a key enabler to achieving the Sustainable Development Goals (SDGs) of the 2030 Agenda. This paper investigates the vulnerability of communities to bridge failure by examining the accessibility implications and the socio-economic impacts of such events. Using network and accessibility analysis, the paper presents a methodological framework to analyse how bridge closures may disrupt access to essential services, employment centres, and healthcare facilities, focusing particularly on the identification of vulnerable populations. The paper integrates Geographic Information System (GIS) tools and accessibility analysis to generate accessibility-based community vulnerability scores. By using data on bridge locations, road transport networks, and small-area socio-economic statistics from the Census of Population of Ireland, results show the spatial distribution of vulnerable communities to bridge failure, highlighting the regions where these events are likely to have the most severe socio-economic impacts. The paper contributes to the area of transport planning, bridge maintenance and infrastructure investment prioritisation in the context of climate adaptation. Ultimately, the objective is to assist bridge managers and local authorities in providing equitable infrastructure planning that considers the needs of local communities, aiming to reduce the disproportionate impact of connectivity disruptions in these regions.

Paper Title: An IMO GHG Pricing Mechanism: Legal Challenges and Opportunities Ahead Goran Dominioni (School of Law and Government, Dublin City University)

Abstract. The International Maritime Organization (IMO) is working on the adoption of a greenhouse gas (GHG) emissions pricing mechanism through an amendment of MARPOL Annex VI. Various proposals are being considered for this item, including some GHG levies. A group of IMO member states have raised concerns that a GHG levy may face legal barriers related to compliance with WTO law, the IMO regime, and the inclusion in national legislation. This article assess these potential legal barriers and elaborates potential pathways to address these barriers.

Paper Title: A study to identify the key factors shared by successful cities with effective active travel networks Gerna Van Jaarsveld and Mark Frank (Arup Consulting Engineers)

Abstract. We aimed to uncover how successful cities in Europe have developed effective active travel networks over the past few decades. Our hypothesis was that it is possible to identify common factors among different European cities in the evolution of their active travel networks. By pinpointing these factors, we hoped to create a roadmap that other European cities could follow to achieve similar results more quickly, learning from the pioneers. Our methodology focused on medium-sized European cities, as these were viewed as simpler and more straightforward, without the complexities of a long history and agglomeration effects that might complicate the identification of key factors. We started by defining what constitutes a 'successful' city and an 'effective active travel network.' We then shortlisted six cities: Groningen, Bordeaux, Malmö, Graz, Freiburg, and Pontevedra. We conducted a desktop study to gain an initial understanding of the specific case studies and potential common factors. This process revealed potential factors under four broad categories: governance, strategic transport planning, design elements, and public support. We interviewed representatives from the shortlisted cities to gain deeper insights into the development of their active travel networks, focusing on these four categories. Based on these interviews and a better understanding of each city's active travel network development, we developed a detailed questionnaire that was subsequently completed by city representatives. The questionnaire focused on a series of ranking and elimination exercises to clearly prioritize the importance of eight success factors: leadership, funding, governance, demographics, geography and climate, urban footprint, planning process, and public consultation and political agenda.

Paper Title: Cycling as Traffic: The Importance of a Transport Planning Discourse for Cycling in Ireland Robert Egan (Centre for Transport Research, Trinity College Dublin) and Brian Caulfield (Centre for Transport Research, Trinity College Dublin)

Abstract. Reducing private car use while facilitating modal shift to cycling increasingly features as a major policy strategy to decarbonise mobility practices across many low-cycling contexts. One notable approach to achieve this shift has been to enact planning measures that redistribute rights to space, access or speed that favour the practice of cycling over driving. Through impinging on the accessibility of driving, these measures can trigger public opposition, which can in turn limit the scale and disruptive potential of these pro-cycling measures. In this presentation, we outline the features of a major transport planning discourse drawn upon in public opposition to a major redistributive active travel scheme proposed in Dún Laoghaire-Rathdown, Ireland. This oppositional 'technical discourse of transport planning' is normatively car-centric. It incorporates several major representations of transport and traffic: 'traffic' as car-based (im)mobility, roads as 'traffic' spaces, 'traffic' as an immutable substance, and traffic demand-led planning. Building on this analysis, we propose an alternative cycling-centric discourse of transport planning. We consider how this might help legitimise and depoliticise pro-cycling measures in Ireland, in the context of emerging discourses centred on redefining streets as places rather than thoroughfares.

Paper Title: Providing, Confining, and Fostering Mobility: The E-Cargo Bike as a Family Vehicle in Ireland

Robert Egan (Centre for Transport Research, Trinity College Dublin / Behaviour Economics Unit, SEAI), Hannah Julienne (Behavioural Economics Unit, Sustainable Energy Authority of Ireland) and Brian Caulfield (Centre for Transport Research, Trinity College Dublin)

Abstract. Like many low-cycling contexts in Europe, the practice of 'good' parenting is often intimately tied up with extensive private car use across Ireland. With the private car, parents spend considerable time transporting their children to various destinations and supplying the family household. In this study, we explored practitioners of 'cycle-parenting' in Ireland, who used private e-cargo bikes as a key component of their broader family mobilities. Using grounded theory, we illustrate how private e-cargo bikes are used to fulfil several contemporary parental responsibilities: providing mobility, confining mobility, and fostering mobility. Participants used their e-cargo bikes to provide mobility for their children to various destinations such as school and after-school activities. By confining their children as passengers – much like the car – parents could segregate their children from the dangers of the street, conserve their energy for alternative activities, and efficiently manage collective family schedules. In contrast to the car, providing mobility with the e-cargo was felt to sensitise children to their local areas and natural environments, while normalising cycling as an everyday mode of transport. To conclude, we consider how cycle-parenting with the e-cargo bike differs from alternative family mobilities, and assess its disruptive potential in the car-intensive context of Ireland.

Paper Title: Active travel to school: Analysing the importance of locational and sociodemographic factors and associated policy implications in Dublin, Ireland

Kevin Credit (National Centre for Geocomputation, Maynooth University) and Joanne Mancini (Department of History, Maynooth University)

Abstract. This paper analyses the commuting behaviour of 302,760 primary and secondary school students in the Dublin region using microdata from the 2022 Place of Work, School, College or Childcare - Census of Anonymised Records (POWSCCAR). The primary objective of the analysis is to understand the relative importance of locational and individuallevel sociodemographic features in predicting active travel to school; in other words, how much does where a student lives influence their commuting mode choice in comparison to their individual and family characteristics? To answer this question, we used a random forest classification model with commuting mode as the dependent variable; interestingly, the results show that the immediate neighbourhood of the school and residence are the most important predictors of student mode choice, followed by journey duration, county, and NUTS3 region, which highlights the overriding importance of the local built environment and the spatial distribution of existing schools in determining active travel patterns in Dublin. Then, to better understand the specific ways that locational and sociodemographic features intersect with mode choice, we used a k-means clustering algorithm to identify general 'types' of students in relation to their family and travel characteristics. Mode choice, sociodemographic, and locational characteristics for students move together in interesting ways; perhaps most concerningly, we classified 2.2% of students as the "most-disadvantaged in-commuters". These students tend to come from socio-economically disadvantaged families, take public transport to school (72%) and have by far the longest trip durations of any student group (72 minutes on average).

Paper Title: Mobility Outdoor Value Estimates (MOVE)

Felim Kelly (AECOM)

Abstract. Mobility and Outdoor Value Estimates (MOVE) is a pilot research collaboration between Transport Infrastructure Ireland (TII), Fáilte Ireland, and AECOM. The project aims to develop a methodology for monitoring the use and impact of Ireland's Greenways. A programme of intercept surveys and counts is underway to understand the profile and preferences of greenway users in Ireland. To date, 2,370 User Intercept Surveys have been undertaken of greenway users and over 130,000 active travel users have been recorded across the five greenways forming part of this pilot project.

The results of the surveys undertaken as part of MOVE will provide insights such as:

- Who uses greenways in Ireland?
- Why do people use greenways?
- How do people use greenways?
- What aspects of greenways are valued highly?
- Where can improvements be made?

This data will provide benchmarks for the usage of greenways and will assist TII in the planning and appraisal of future greenways schemes. Both TII and Fáilte Ireland will use the results to improve existing demand, economic and appraisal tools, and the results can be used to develop new models.

Paper Title: CRANN - Developing Climate Resilient Networks of Bridges

Myra Lydon (University of Galway), Maria Pregnolato (Delft University of Technology), Darragh Lydon (Queen University Belfast) and Kristopher Campbell (Dep. of Infrastructure)

Paper Title: An economic assessment of e-methanol fuel production for shipping using biogenic CO2 and direct air carbon capture

Asif Tanvir Bhuiya (University College Cork), Nathan Gray (University College Cork), Yunfei Li (University College Cork) and David M. Wall (University College Cork).

Abstract. The maritime sector needs to decarbonise by diversifying away from fossil fuels to alternative renewable fuels. Methanol has emerged as a promising renewable shipping fuel. Power-to-X technologies enable the production of emethanol whereby renewable electricity is converted to hydrogen through electrolysis and the hydrogen is then combined with a carbon source (CO2) to produce methanol fuel. This pathway is of particular interest to Ireland due to the large wind energy resource projected beyond 2030. The source and availability of CO2 for methanol production is a significant cost consideration. Biogenic CO2 from biomass has a lower associated cost of ca. 30 €/t but may not be sufficient to meet the large fuel demands of the maritime sector. Direct Air Carbon Capture (DACC) is more expensive at approximately 400 €/t but may be required to meet such demands by 2050. This study evaluates the economic feasibility of producing emethanol as a shipping fuel in Ireland by using anaerobic digestion as an initial biogenic CO2 source, and subsequently the cost implications of transitioning to DACC as a CO2 source to 2050. The results of the economic assessment indicate a methanol production cost of 0.76–1.27 €/kg, influenced by CO2 and the electricity prices associated with the Power-to-X process. These insights support policymakers and industry stakeholders in scaling methanol production for a future netzero maritime sector.

Paper Title: Improving Pedestrian Safety with Spatial Data & Scoring-Based Optimisation Models

Patrick Ballantyne (Department of Geography and Planning, University of Liverpool), Carmen Cabrera-Arnau (Department of Geography and Planning, University of Liverpool), Giada Garofani (Department of Geography and Planning) and Alex Singleton (Department of Geography and Planning, University of Liverpool)

Abstract. Every year there are an estimated 1 million road traffic accidents around the world, resulting in detrimental societal and economic impacts globally. In response, municipal authorities like Liverpool City Region are committing to 'Vision Zero' in an aim to reduce the number of fatal or serious road traffic accidents to 0 by 2040. A key step to achieving this goal is to invest and implement new pedestrian infrastructure and crossings which dramatically reduce the risks facing pedestrians as they interact with the urban realm, however the supporting data and intelligence for such decisions is notably evident. Thus, our research aims to fill this research gap by providing a new toolkit, comprising spatial data and a bespoke optimisation model, to identify optimal locations for new pedestrian crossings in Liverpool City Region. In the talk we describe our simple, computational optimisation model, and showcase how it is able to balance a number of important trade-offs related to spatial context, urban amenities, collision rates and population characteristics. We also introduce our model of engagement with policymakers, which is built on the key principle of "simpler is often better", whereby the use of a narrative dashboard tool has proven an effective medium to communicate the model recommendations, design and constraints to relevant stakeholders. Together we argue that the findings of this research have significant implications for how we visualise and use spatial data to improve pedestrian safety, and in policy settings more generally.

Paper Title: Insights from a discrete choice experiment on electric light commercial vehicle adoption by Irish small and medium enterprises

Nadiya Saba (PhD Researcher), Lisa Ryan (Professor of Energy Economics) and Aisling J. Reynolds-Feighan (Professor of Transport Economics)

Abstract. The transport sector remains one of Europe's largest energy consumers, facing pressing challenges such as carbon emissions, fossil fuel dependency, and environmental impact. Electric vehicles (EVs) present a viable solution, driving the transition toward a low-carbon transportation system for passenger and freight mobility. This study surveyed 446 Irish small and medium-sized enterprises (SMEs), gathering 2,676 observations through a discrete choice experiment (DCE) to compare vehicle adoption among internal combustion engine vehicles, battery electric vehicles, and plug-in hybrid electric vehicles. The results reveal a significant willingness to pay (WTP) for key attributes: €43 for each additional kilometre of range, €42 for every €100 saved on fuel costs, and a willingness to avoid charging times, reflected in a WTP of €60 per hour. These findings suggest that operational efficiency significantly influences purchasing decisions, often outweighing upfront costs. Latent class analysis further identifies distinct SME segments — one prioritising environmental sustainability and another emphasising cost-effectiveness. These results underscore the need for policy measures and infrastructure improvements to accommodate the diverse needs of commercial firms, propelling EV adoption across the SME sectors.

Paper Title: Assessing the Impacts of the Macroom, Moycullen and Ballyvourney

Kelly McCarthy (Transport Infrastructure Ireland)...

Abstract. This paper is part of a series of evaluations of the impacts of bypasses on towns and villages in Ireland. With the adoption in 2022 of the National Sustainability Mobility Policy and the Town Centre First Policy, TII is aware of the many opportunities that town bypasses can provide in support of such plans. As such, TII is carrying out a series of studies to obtain a comprehensive, evidence-based understanding of the impacts of TII-funded schemes on bypassed towns and villages, across a range of areas, including motorised and active modes; local economy; accessibility and social inclusion; safety; and the local environment. TII has carried out baseline studies in six towns bypassed (or due to be) by TII-funded national road schemes – Macroom, Westport, Moycullen, Baile Bhuirne, Listowel and Adare – collecting data on air and noise quality, travel modes, impacts on local business, impacts on congestion, town dereliction, road safety, and more. These studies include desktop research, on-street intercept surveys and focus group discussions. For comparative purposes, data collection will take place prior to the bypass openings, one year following the openings, and five years following the openings. Macroom is the first 'one-year' comparative study and report to be completed. These studies and this first paper on Macroom relate to 1. Sustainable Transport and Climate Change and 5. Transport Policy, Education and Governance.

Paper Title: Automated Speed Limit Sign Detection and Recognition: Large-Scale Testing on the Irish Regional Road Network

Ibrahim Hassan Syed (Pavement Management Services Ltd.), David Power (Pavement Management Services Ltd.), Waqar Shahid Qureshi (University of Galway) and Kieran Feighan (Pavement Management Services Ltd.)

Abstract. Speed limit sign detection and recognition are critical for road safety and infrastructure maintenance, particularly in ensuring an up-to-date inventory of speed limit signs. The manual visual inspection of speed limit signs is not only time-consuming but also a labour-intensive task. This study focuses on automating the detection and recognition of speed limit signs across Ireland's regional road network using a combination of deep learning-based object detection and optical character recognition (OCR) techniques. An object detection model was trained to identify speed limit signs in various environments, followed by an OCR system to extract numerical speed values. To evaluate the real-world applicability of the trained model, large-scale testing was conducted across Ireland's regional road network which covered different road conditions, weather, and sign placements. The results demonstrated the model's ability to detect and recognise speed limit signs in real-world scenarios. This automated approach can help local authorities monitor and maintain assets more efficiently, ensuring compliance with regulatory standards and improving road safety. Additionally, this study provides a scalable approach to traffic sign inspection and contributes to better traffic management and safer road networks.

Paper Title: Leveraging Large Language Models for Citizen-Centric Urban Accessibility Analysis: A Case Study Using Airbnb Reviews in Dublin

Mehdi Gholamnia (School of Architecture, Planning and Environmental Policy, University College Dublin, Dublin, Ireland.), Nasim Eslamirad (School of Architecture, Planning and Environmental Policy, University College Dublin, Dublin, Ireland.) and Francesco Pilla (School of Architecture, Planning and Environmental Policy, University College Dublin, Dublin, Ireland.)

Abstract. In recent years, the integration of crowdsourced data and advanced machine learning techniques has revolutionized urban transportation and accessibility analysis. Traditional models often depend on mathematical or statistical frameworks, which may not fully capture the nuanced experiences of city residents. This study introduces an innovative methodology that leverages Large Language Models (LLMs) to extract detailed accessibility insights from Airbnb review datasets, focusing on Dublin as a case study. By analyzing the user-generated content of Airbnb reviews, our approach uncovers authentic perceptions of urban accessibility directly from residents and visitors. This method aligns with recent advancements in urban planning, where LLMs have been employed to autonomously plan and manage urban activities, demonstrating significant potential in enhancing urban problem-solving and reducing reliance on human experts. Our findings reveal that LLMs techniques can effectively process semantic data from textual reviews, identifying key accessibility factors such as transportation availability, proximity to amenities, and neighborhood walkability. This methodology contributes to a more comprehensive understanding of urban environments and empowers urban planners and policymakers to make informed decisions that reflect the actual needs and experiences of city inhabitants. The result of this study demonstrated the efficacy of utilizing LLMs to analyze crowdsourced data for urban accessibility mapping. By tapping into the collective insights of Airbnb users, we offered a novel, data-driven approach that bridges the gap between traditional modeling techniques and the lived experiences of urban residents.

Paper Title: A preliminary technical evaluation of electrified island ferry services in Irelan

Nathan Gray (University College Cork), Richard O'Shea (University College Cork), David Wall (University College Cork) and Jerry Murphy (University College Cork)

Abstract. Ireland has a number of offshore islands that are home to a permanent population of approximately 3,000 people and attract over 300,000 visitors annually. The ferries that serve these islands are reliant on fossil fuels, therefore exploring decarbonisation pathways is key to ensuring the sustainable future of these communities. This study aims to evaluate the potential of electrified ferry services by considering two case studies: Tory Island in County Donegal and Sherkin Island in County Cork. Preliminary results indicate that the maximum battery capacity the ferry can accommodate is 4.23 MWh, which is insufficient to complete the daily schedule for both routes. Therefore, three different operational strategies were considered: hybrid operation, battery swapping, and opportunity charging. Hybrid operation reduces diesel consumption by 43% for the Tory Island route and 74% for Sherkin Island. Battery swapping requires three batteries to complete the daily schedule for Tory Island, while Sherkin Island only requires two. Opportunity charging requires the installation of two 1.8 MW charge points for Tory Island and two 186 kW charge points for Sherkin Island. The strategies assessed suggest that electrified island ferries in Ireland are technically feasible. However, hybrid operation relies on diesel to complete the daily schedule which results in increased CO2 emissions, battery swapping requires the purchase of multiple battery packs which could significantly increase capital costs, and opportunity charging could be problematic for rural electrified island ferries in Ireland.

Paper Title: Understanding Rail Patronage in Ireland using the National Rail Census 2024

Brendan Meskell (National Transport Authority)

Abstract. The annual National Rail Census is undertaken in November each year since 2012 (and prior to this in the Greater Dublin Area only). This research provides a comprehensive snapshot of rail usage across the entire Irish network. The census is an extensive process entailing the counting of all passengers boarding and alighting each train service at all 150 stations across the country during census day. The raw data from this research is then analysed to produce the data, which illustrates information such as route and hourly patronage, busiest stations and sections and the capacity of radial routes into the Greater Dublin Area as well as year-on-year trends. In addition to giving an overview of the methodology used to produce the census, the presentation at ITRN will highlight the key national and year-on-year trends that can be gleaned from the 2024 Census The busiest and least used sections and stations of the rail network will also be highlighted. The 2024 Census showed a continued increase in numbers post-pandemic as well as an increase on prepandemic numbers, demonstrating the importance of the rail network in Ireland's commuting patterns. Therefore, the presentation of this research may be of interest to researchers and practitioners seeking to understand rail usage patterns in Ireland.

Paper Title: Analyzing the Effects of Combining the International Roughness Index with Visual Inspection for cycleway pavement assessment

Muhammad Hassam Baig (University of Galway), Syed Muhammad Haider Shah (University of Galway), Saahil Khanna (University of Galway), Gerard O'Dea (Transport For Ireland), David Power (Pavement Management Services), Lorraine D Arcy (Technological University Dublin), Katleen Bell-Bonjean (Gort Cycle Trails), Waqar Shahid Qureshi (University of Galway) and Ihsan Ullah (ihsan.ullah@universityofgalway.ie)

Abstract. Assessing pavement condition is essential for ensuring the safety and comfort of cyclists on cycleways. Traditional assessments, which involve visual inspections and ride quality evaluations, are time-consuming. This study proposes an automated, low-cost solution for pavement condition assessment using a combination of sensors commonly available in action cameras and smartphones. These include a camera for visual inspection, an Inertial Measurement Unit for estimating road roughness, and speed, and a GPS for geolocation. This multi-sensor approach outperforms single-sensor methods, such as using only an accelerometer or a camera, while remaining significantly more cost-effective than machine-based surveys. We examine how integrating the International-Roughness-Index (IRI) with directional image classification can provide a more accurate understanding of pavement conditions. Results indicate that potholes, rough patches, and vegetation obstructions are easily identifiable in image data but are not always reflected in IRI values. However, variations in pavement materials (e.g., high-friction yellow asphalt vs. low-friction black asphalt) influence IRI values while visual assessments remain unchanged. Vegetation, which may not affect IRI, is clearly visible in images. Additionally, we introduce the Cycle Surface Condition Index, which integrates visual inspection and IRI measurements to provide an objective condition rating. This standardized assessment approach enables transportation authorities to adopt a more systematic and data-driven method for cycleway maintenance, ultimately improving cycling infrastructure.

Paper Title: The Economic Cost of Congestion in Ireland's Regional Cities 2022-2040

Yeonjung Song (Department of Transport), Rory Duggan (Department of Transport), David Maher (Department of Transport).

Abstract. This paper estimates the economic cost of congestion in three regional cities in Ireland from 2022 to 2040, using demand forecasts from the NTA's Regional Modelling Systems with two scenarios: Core Growth and Alternative Future. The study aims to assess the level of congestion within the regional cities over the coming decades, examining the modal split of the cost of congestion, assessing the proportion of congestion by transport modes as well as the time breakdown.

The results indicate that the cost of congestion in three regional cities will increase significantly over the period. The per capita figures show that planned transport interventions in each city's transport strategies will impact in reducing the overall cost of congestion. However, they are not sufficient to offset most of the increased cost driven by factors such as population, employment and economic growth. Increased congestion is an unavoidable consequence of economic and population growth, but it can be mitigated with infrastructure provision, a modal shift to sustainable modes, and behavioural change. To minimise congestion costs, accommodate the growing population, and meet climate policy obligations, continuous improvements in sustainable transport will be necessary in each regional city.

Paper Title: Utilising Automatic Vehicle Location (AVL) Data to Investigate the Impact of New Residential Developments on the Operation of BusConnects Services in the Greater Dublin Area

Brianna Greaney (National Transport Authority), Dhruv Kadam (National Transport Authority) and John Quinless (National Transport Authority)

Abstract. The objective of this research paper is to investigate the potential impact of high-density residential development on the efficiency of BusConnects services in the greater Dublin area. As urban areas continue to grow and undergo significant changes, understanding how these developments impact the provision of public transport services becomes increasingly important. To investigate this, a bus service delay index was created. This index encapsulates dwell times, measuring the time a bus remains idle at a stop and the travel time between stops, using Automatic Vehicle Location (AVL) data. This research will focus on a case study of a high-density residential development site in Palmerstown, Dublin. It will conduct a spatial comparative analysis of the delay index at the nearest bus stops before and after construction of the development. The anticipated application of this research will be to formulate a methodology which enables the NTA to assess the impact of future significant residential developments on BusConnects services both in terms of operations and scheduling. By identifying patterns and trends in dwell and travel times linked to new development, the aim is to allow schedulers to pre-empt future operational inefficiencies arising from similar changes in land use. This can lead to improved service optimisation, better utilisation of resources and enhanced passenger experiences.

Paper Title: Evaluating Multimodal Accessibility in Dublin Through a 15-Minute City Lens

Belal Edries (Trinity College Dublin), Brian Caulfield (Trinity College Dublin) and Vinny Cahill (Trinity College Dublin)

Abstract. The 15-minute city has emerged as a guiding principle for sustainable urban development, promoting equitable access to essential amenities within a short travel window. This study assesses spatial accessibility to key daily destinations (e.g., education) across four counties in the Greater Dublin Area. By comparing accessibility outcomes across multiple modes of transport, the analysis explores alignment with 15-minute city goals and identifies underserved areas. An opportunity-based accessibility approach is adopted, calculating the number of reachable Points of Interest (POIs) within a 15-minute travel time from each CSA (Small Area) centroid. Mode-specific travel time networks are constructed using open data and transport analysis libraries, including GTFS, OSMnx, and r5py. Travel times are derived through shortest-path computations on time-weighted street and transit networks. First-mile and last-mile walking legs are incorporated into multimodal travel chains to reflect realistic public transport accessibility. The study reveals significant variation in accessibility across counties and modes, highlighting spatial disparities and the modal dependence of opportunity reach. These findings offer valuable insights for transport planning and policy aimed at improving equity and supporting sustainable mobility goals in Dublin. This work also offers a spatial foundation for future integration into an Activity-Based Model (ABM), which aims to reflect the travel behaviour of Dublin residents. The resulting accessibility indicators may also serve as inputs to future travel behaviour modelling efforts, providing spatial context to support a deeper understanding of travel decision-making.

Paper Title: Synthetic Population Generation for Dublin Using Iterative Proportional Techniques Belal Edries (Trinity College Dublin), Brian Caulfield (Trinity College Dublin) and Vinny Cahill (Trinity College Dublin)

Abstract. Synthetic populations offer statistically representative, privacy-preserving alternatives to raw census microdata and are foundational for activity-based travel demand modelling. This study presents the generation of a synthetic population for four counties in the Dublin region—Dublin City, South Dublin, Fingal, and Dún Laoghaire–Rathdown—using the open-source simPop package in R. Microdata from the 2017 National Household Travel Survey (NHTS) is aligned with aggregated marginal distributions from the 2016 Place of Work, School or College – Census of Anonymised Records (POWSCAR) using iterative proportional techniques. Key demographic attributes (e.g., age and gender) are used as control variables, aggregated at the county level. A group-based imputation strategy is applied to address missing data in the census sample, ensuring a complete and internally consistent dataset for the synthesis process. The resulting synthetic population shows strong alignment with observed census marginals and serves as a critical input for the development of activity-based transport models tailored to Dublin's travel behaviour. This paper presents validation results and assesses the performance of iterative proportional techniques in generating statistically reliable synthetic populations. The work provides a practical, transparent case study using open-source tools and nationally representative data to support future transport planning efforts.

Paper Title: Exploring Factors Influencing Students' Travel Mode Choice: Comparative Insights of Two University Campuses

Tommy Coyne (Atlantic Technological University) and Ubaid Illahi (Atlantic Technological University)

Abstract. Many third-level campuses in Ireland lack extensive on-campus accommodation, necessitating daily student commuting. However, research on student travel behaviour remains limited. Given its contribution to urban mobility patterns, understanding these choices is vital for advancing sustainable transport policies and achieving Ireland's 2030 climate targets. This study examines the influence of socioeconomics, demographics, perceptions, and trip characteristics on student travel mode choices at two Atlantic Technological University (ATU) campuses- ATU Galway and ATU Sligo. It also assesses the impact of traffic demand management measures on students' willingness to change modes. Data from 441 students across both campuses were analysed using an online survey. A multinomial logistic regression (MLR) model examined factors influencing mode choice, while a binary logistic regression (BLR) identified student characteristics shaping perceptions of hourly parking fees on sustainable transport. Car use was the most common travel mode (44%), followed by walking (26%) and bus travel (20%) across both campuses. Over one-third of respondents lacked a Leap Card. Key factors influencing mode choice included proximity to a bus stop (<10 min walk), driving licence ownership, Leap Card possession, and travel distance (3–5 km). Responses on parking fees as a sustainability measure were found to be nearly evenly split. The findings highlight low uptake of public transport discounts, with limited Leap Card ownership potentially restricting travel beyond campus commutes. Policies should prioritise increasing student awareness and uptake of transport subsidies while enhancing infrastructure and incentives to support sustainable travel choices.

Paper Title: A Visual-Built Environment Approach to Assessing Commuters' Perceived Safety at Bus Stops

Apoorv Agrawal (University College Dublin), Francesco Pilla (University College Dublin) and Anna Mölter (University College Dublin).

Abstract. Across the globe, commuter priorities in public transport are shifting from cost-benefit analyses to overall service experiences, with the perception of safety emerging as a key determinant of ridership and satisfaction.

The literature highlights that despite advancements in research, some methodological, contextual, and theoretical gaps persist, underscoring the need for further exploration. Methodologically, most studies rely on traditional approaches with limited use of novel geospatial data sources or machine learning (ML) techniques, limiting scalability. Contextually, the role of infrastructure and the built environment in shaping perceptions of safety remains underexplored, particularly in bus transport, where stops are less secure and standardised than rail systems. Theoretically, data-driven studies often lack theoretical grounding, as existing safety theories are rooted in manual, qualitative methods that are hard to integrate with computational approaches. To address these gaps, this work presents a visual built environment approach to systematically assess perceived safety at bus stops. It outlines a framework for developing a scalable CPTED-based index using Street View Imagery (SVI), geospatial data, and machine learning (ML), thereby replacing manual audits with automated, data-driven analysis. The approach incorporates a GPT-based assistant for extracting CPTED indicators, participatory tools to capture commuter perceptions, and predictive modelling to examine the relationship between built environment features and perceived safety.

The methods and findings will provide data-driven insights for urban planners, transit agencies, and policymakers, offering a scalable and adaptable framework to enhance perceived safety in bus transport environments.

Paper Title: Assessing Pavement Surface Type Through AI: A Study on Pavement Surface Classification

Ibrahim Hassan Syed (Pavement Management Services Ltd.), David Power (Pavement Management Services Ltd.) and Kieran Feighan (Pavement Management Services Ltd.).

Abstract. Pavement maintenance requires significant resources and strategic planning to optimize maintenance decisions and consider long-term investment schemes. A key aspect of pavement assessment is classifying different surface material types, as different materials exhibit distinct performance characteristics and maintenance needs. Additionally, accurate classification of surface material is essential for selecting appropriate maintenance, optimizing resource allocation, and ensuring long-term pavement durability. Traditional manual classification methods are not only time-consuming but also labour-intensive. To address this challenge, this study explores an automated approach using deep learning and computer vision to classify four types of asphalt surface materials: Stone Mastic Asphalt (SMA), High Friction Surfacing (HFS), Hot Rolled Asphalt (HRA) and Surface Dressing (SD). We have trained two separate models using two different image-capturing setups i.e., forward-view and close-view images and compared their performance to evaluate the impact of different perspectives on classification accuracy. Furthermore, to assess the models' generalizability, the trained models were tested on various road sections across Ireland's road network. By integrating automated material classification with existing manual inspection methods, the proposed approach aims to improve the accuracy and efficiency of the visual pavement inspection process, leading to more cost-effective road maintenance strategies.

Paper Title:Using physiological stress to evaluate cycling infrastructure – an overview of the SHIFT project Anna Molter (University College Dublin), Nakisa Soltani (University College Dublin), Peter Kearney (University College Dublin), Sonia Soubam (University College Dublin) and Brian Caulfield (University College Dublin).

Abstract. A modal shift from driving to cycling is one of six vital high impact sectors listed in the Irish government's Climate Action Plan. However, to increase cycling in Ireland, suitable infrastructure is needed that is safe to use for cyclists of all abilities. Perceived lack of safety is a major barrier to cycling in Ireland, and there are currently no statutory requirements to evaluate cycle lanes post construction. Recent advances in wearable technology allow a number of physiological biomarkers of stress to be measured continuously. These biomarkers can be used to identify moments of stress, which can be correlated to the location and surroundings of an individual during a cycling trip. The aim of the SHIFT project is to measure moments of stress in cyclists to provide insights on characteristics of the road environment on perceived safety. The project focuses on families commuting to school by bike, as the prevalence of cycling in primary school children is particularly low. The project work was carried out in two stages: (1) two types of wearable devices (wristband, ring) were tested in a laboratory setting by 19 volunteers riding on stationary exercise bikes. This was to ensure that the physiological stress signal can be detected during exercise. (2) Thirty parents wore the wearable devices and an action camera for one week on their school commutes. Preliminary results suggest that moments of stress can be detected during exercise and that repeated measurements of the same school route can identify stress hot-spots on roads.

Paper Title: Is some Irish active travel funding having an opposing effect?

Shane Foran

Abstract. The Climate Action Plans commit the state to promoting active travel, including cycling, as a key intervention in efforts to reduce greenhouse emissions derived from transport. Significant funds have been allocated for schemes with an active travel component. A predominant theme in the literature is that conflicts between cycle traffic and (heavy) motor traffic should be avoided and space should be allocated to achieve this. It is also understood in the literature that motor traffic should be managed to keep through-traffic away from inappropriate locations i.e the Dutch Sustainable Safety system. Removing through-traffic is an established means to make mixing cycle and motor traffic more acceptable on local roads. I review a series of proposed or implemented active travel/sustainable transport schemes with reference to the question of whether they are likely to improve or disimprove cycling access and comfort. The schemes are tested against the findings and recommendations of a wide body of established literature and road design guidance on how best to recognise the needs of cycling. An inescapable finding is that the manner of some Irish active travel and sustainable transport schemes is removing space and access for cycling and creating increased conflicts between cycle traffic and motor traffic. The origins of this paradoxical outcome of Irish active travel funding is explored with reference to its sources in current Irish design guidance, in particular the Design Manual for Urban Roads and Streets. Recommendations are made for updates to guidance to bring it in line with best practice.

Paper Title: Understanding perceptions of safety on public transport in Ireland Erica Fox (DCU)

Abstract. Insufficient behavioural change has impacted the Irish transport sectors emission reductions targets as transport emissions have continued to rebound since the COVID-19 pandemic (EPA, 2024). The continued high reliance on the private car in both urban and rural areas (NTA, 2024) suggests that there are issues with the availability and suitability of current public transport infrastructure. An online survey was conducted from August - October 2024 to examine transport behaviour in Ireland. Survey results reveal that safety concerns on public transport modes were significantly different across genders, with females reporting feeling more unsafe on public transport modes compared to males. Additionally, results indicate that infrastructural improvements, such as better lighting and more visible security presence, could increase feelings of safety on public transport.

Paper Title: Examining the use of Porous Asphalt on Irish National Roads James Stretton (ATU) and Brian McCann (ATU) **Abstract.** One of the primary benefits of porous asphalt or open grade asphalt is its permeable nature that allows water to infiltrate down into the pavement thus reducing surface water on the road. The use of this type of pavement has been shown to have safety benefits by the reduction of spray and aquaplaning of vehicles traveling on it. Ireland has one of the wettest climates in Europe and experiences over 1000mm of rainfall per annum however the exact usage of porous asphalt on the national roads is unknown. The TII have specifications for the use of porous asphalt, however it's use on high-speed roads (roads >60km/hr), is currently a deviation for the standard and requires TII approval. The objective of this research is to establish how many of Irelands national roads are constructed with porous asphalt, identify what road design consultancies and asphalt contractors perceptions are on porous asphalt and gain an understanding as to why the use of porous asphalt on highspeed roads is a deviation from the standard. Using the snowball sampling methodology, questionnaires and interviews will be carried out with members of the TII and local authorities, road design consultancies, civil and asphalt contractors in Ireland. Preliminary results show that designers and contractors believe that there would be a benefit in using porous asphalt on national roads and that further research into the product would be a worthwhile pursuit.

Paper Title: Forecasting Demand Changes from Cycling Investments William Brazil (NTA/TCD) and David Conlon (NTA).

Abstract. Investment in active travel has greatly increased in recent years. Furthermore, to meet cycling targets outlined in documents such as the Climate Action Plan and the respective metropolitan transport strategies, investment in active modes is likely to continue to increase over the coming years. Given the significant increases in investment required to provide such a cycling-friendly environment, there is a requirement for the assessment and appraisal of cycling schemes to conform with guidance and best practice in the area for Transport Scheme Appraisal. However, the assessment of active travel investments is a relatively new area of transport appraisal, and the forecasting of changes to cycling demand as a result of such investments is still emerging. To meet the needs of modellers wishing to forecast cycling demand responses to smaller scale investments, the NTA has developed a small scheme cycle forecasting tool based upon the impact of marginal changes to the utility of cycling along a given route/section. This tool uses parameters from the NTA's regional model combined with existing research and guidance to enable to modellers to quickly forecast cycling demand for schemes below the resolution of traditional transport modelling tools.

Paper Title: Adopting a Well-being Approach to Assessing Climate Action in The Transport Sector David Maher (Department of Transport) and Kyle Moore (The Department of Transport).

Abstract. This paper examines the application of the Well-being Framework, which is proposed by the Department of the Taoiseach in Ireland, in the context of examining climate policy in the transport sector. Adopting a well-being approach to measuring societal progress involves movement away from viewing GDP/ other economic indicators as the primary measure of growth in society and moving to a more holistic approach. Transport has both direct and indirect impacts on well-being. The methodology in this paper applies a five-step framework developed by the Department of Public Expenditure NDP Delivery and Reform (DPENDR) to assess the well-being impacts of public policy. The results of a well-being budget tagging exercise were used to link the existing expenditure sub-heads of the department to the dimensions of the well-being framework and allowed for the identification of gaps where new indicators were required. The paper examined how existing publicly available data sources could be used to fill these gaps and provide additional insights on well-being. The paper recommends indicators in the areas of accessibility, affordability, safety and air pollution. This paper recommends that current indicators in the Revised Estimates for Public Service Performance Reports could be updated to place a greater emphasis on well-being

Paper Title: Recent Advances in Vertical Axis Wind Turbines for Sustainable Highway Energy Generation Meisam Gordan (University College Dublin) and Abdollah Malekjafarian (University College Dublin) **Abstract.** Wind energy is one of the most promising renewable energy resources for power generation. Wasted energy recovery has recently gained global attention due to the severe energy crisis. Among the various wasted energies, highway wind energy, which is generated by the movement of vehicles, has not been valued until recent years. The increasing demand for electrical energy in highway applications, such as self-powered traffic signals, roadside lighting, surveillance cameras, toll gates, battery charging of electric vehicles, and petrol station electrical systems, especially in regions with low and variable wind speeds, has led to ongoing efforts to develop specially designed Vertical Axis Wind Turbines (VAWT) that can efficiently convert wind energy generated by vehicles traveling on highways into electricity to power the mentioned applications. For example, with the rapid increase in the number of electric vehicles, the use of wind energy on highways has become even more significant and part of the energy required to charge these vehicles can be sourced from traffic-generated wind. In this context, this paper presents the latest advances in VAWT design, optimization, and implementation in highway environments, covering topics such as blade aerodynamics, system integration, and techno-economic feasibility.

Paper Title: Shifting to Sustainable Mobility: Analysing User Interest in Mobility Hubs in Dublin

Tushar Pramod Choudhari (Department of Civil Engineering, Indian Institute of Technology Roorkee, India), Ubaid Illahi (Department of Civil Engineering and Construction, Atlantic Technological University Sligo, Ireland), Brian Caulfield (Centre for Transport Research, Dept of Civil, Structural and Environmental Engineering, Trinity College Dublin, Ireland) and Margaret O'Mahony (Centre for Transport Research, Dept of Civil, Structural and Environmental Engineering, Trinity College Dublin, Ireland).

Abstract. Ireland's Climate Action Plan aims to achieve a 50% reduction in carbon emissions by 2030 through the implementation of the Avoid, Shift, and Improve framework. The transition to sustainable transport modes via mobility hubs has emerged as an effective strategy for decarbonising the transport sector. Mobility hubs contribute to reducing car ownership, parking demand, and vehicle maintenance costs while enhancing access to multimodal transport options such as buses, trains, bicycles, and shared vehicles. Despite these advantages, inducing a behavioural shift toward mobility hub adoption remains a critical challenge. To address this issue, this study conducts behavioural change trials in the Sandyford region of Dublin, Ireland. A comprehensive questionnaire survey was administered to 64 participants to identify barriers to mobility hub adoption prior to the introduction of such facilities. Ordinal logistic regression was applied to determine key factors influencing user interest. The results indicate that 59.4% of respondents expressed a positive inclination toward using the mobility hub app ("Definitely Yes" or "Yes"), while 29.7% were uncertain, and 10.9% showed no interest. Further analysis examines the relationship between demographic attributes, travel behaviour, and psychological determinants with adoption likelihood. Findings suggest that younger individuals, frequent public transport users, and those with pro-environmental attitudes exhibit a higher probability of adoption. Additionally, higher-income groups and individuals already engaged in shared mobility services demonstrate increased interest. This study provides critical insights into mobility hub adoption patterns, offering data-driven recommendations for targeted marketing strategies and feature optimisation to enhance user engagement.

Paper Title: Evaluating the Impact of the TRACT EV App on Electric Vehicle Adoption in Ireland: Insights from Behavioural Change Trials

Ubaid Illahi (Atlantic Technological University Sligo), Tushar Pramod Choudhari (Department of Civil Engineering, Indian Institute of Technology Roorkee, India), Brian Caulfield (Trinity College Dublin, Ireland) and Margaret O'Mahony (Trinity College Dublin, Ireland)

Abstract. Electric Vehicles (EVs) offer better driving performance, comfort, ease of charge, low running cost, and, more importantly, they produce zero tailpipe emissions. They are considered one of the sustainable solutions to achieve Ireland's climate goal: to reduce 50% of transport emissions by 2030. However, many prospective EV buyers still face two dilemmas: (a) will their daily journey align with the car's travel range, and (b) how can they benefit from fuel savings? To address this, this study has conducted behavioural change trials with the help of a newly developed TRACT EV application. More than 1,500 people have downloaded the application, and some have actively interacted with it. After signing up in the app with the user's car details, it records the user's distance travelled (in km) and provides information about (a) average yet tailored fuel cost savings compared to their petrol/diesel/hybrid vehicle, (b) the potential reduction in carbon emissions if they switch to EV, and (c) personalised travel range requirements. Based on the user's weekly travel, a travel range recommendation is provided in the app weekly. Additionally, a weekly pop-up question is displayed requesting their willingness to shift to EV. The responses are recorded on a 7-point Likert scale. Based on over 8 months of data, the app has recorded over 1 million km driven by Irish car drivers who could save more than 60 tonnes of carbon emissions (CO2) if switched to an EV. When asked about their willingness to switch to an EV, 78% positively reacted, and 11% were not interested in shifting to EVs. Based on these preliminary results, this study discusses an exploratory analysis to identify the barriers to shifting to EVs. Overall, the trials conducted in this study aim to simplify the decision-making process for those considering an EV, providing insights tailored to individual driving habits.

Paper Title: Rural Mobility in Transition: Evaluating Public Transport Expansion and Car dependency in Roscommon, Ireland

Peadar Ó Súilleabháin (National Transport Authority), Thomas Bibby (National Transport Authority), Roy Harford (National Transport Authority), Páraic Carroll (University of Melbourne), John Nott (National Transport Authority) and Barry Colleary (National Transport Authority).

Abstract. This study examines rural transport provision in Roscommon County, Ireland from 2016 to 2024 from the perspective of accessibility and service coverage. Using a combination of empirical data and the NTA's transport models, the study sheds light on gaps in the models of public transport via the lens of the Connecting Ireland programme and associated TFI Local Link services. The analysis considers both regular rural scheduled/timetabled and demand-responsive services. We also relate to private car vehicle kilometres as reported in CSO data, deprivation data and the NTA's National Household Travel Surveys. Roscommon county (population approximately 70,000) which is west of the river Shannon has a higher level of "forced car ownership" as reported by Carroll, Benevenuto and Caulfield in 2021. The county is predominantly rural and has higher levels of deprivation, historically lower levels of investment in public transport but has been receiving good levels of such investment in rural public transport we present some preliminary analysis of available data. The historical dispersed settlement patterns of farming communities makes it challenging to service their transport needs without private car ownership and use, and hence the resulting CO2 emissions. This research contributes to the need to explore rural mobility challenges and highlights the need for continued investment to address issues of transport disadvantage in rural Ireland.

Paper Title: Examining Algorithmic Bias in Pedestrian Detection Networks

Clara Killeen (Atlantic Technological University (ATU)) and Shane Gilroy (Atlantic Technological University (ATU))

Abstract. How do Pedestrian Detection algorithms, a key component for the functionality of Autonomous Vehicles, perform when detecting pedestrians using mobility aids? Underrepresentation in training datasets used can lead to lower performance for underrepresented classes; it is critical that these datasets be fair and representative. This paper assesses the performance of typical object detection algorithms on datasets which contain a high percentage of mobility aid users, to see if these algorithms' performance is correlated with mobility aid use. Another aim is to train a model using datasets with high representation of mobility aid users, to assess the representation (# of mobility aid users/ # pedestrians) of mobility aid users in other popular pedestrian detection datasets. Analysis on the representation of these datasets is typically not reported when published and having this model would allow more visibility on representation. The base model used for this model is a Faster R-CNN object detection model with Feature Proposal Network (FPN), which is then trained on a combination of three datasets - MobilityAids, Crossroad Camera with some additional images from the InOutDoor dataset using the Detectron2 library. This model achieves 70% Average Precision (AP) and 75% Recall on the MobilityAids test set. In addition to that, all classes of mobility aids achieved at least 63% AP. As one of the main areas of use for this algorithm would be in autonomous vehicles, it is highly related to the theme of Smart Mobility and Emerging Technologies.

Paper Title: Developing pavement quality metrics for cycle paths and greenways

Louise Mahoney (School of Engineering, University of Galway), Eoghan Clifford (School of Engineering, University of Galway), Brian Mulry (PMS Pavement Management Services Ltd), Kieran Feighan (PMS Pavement Management Services Ltd) and Joe McHale (PMS Pavement Management Services Ltd).

Abstract. Ireland has approximately 400 km of greenway which is expected to, along with other cycle infrastructure expand quickly. In designing such infrastructure, it is important to note that cyclists are more exposed to the impacts of poor pavements and can suffer vibration related injuries. While there are robust standards for measuring road pavement quality, these are lacking for cycling infrastructure. Recently, technology such as the XenoBike (Xenomatix, Belgium) has been developed to measure pavement condition along cycle lanes using LIDAR, cameras and other equipment. However, the degree to which pavement condition metrics correspond to cyclist experience remains largely unexplored. The research compares the relationship between pavement condition indices recorded by the XenoBike and measurements by three cyclists using smartphone-based accelerometer sensors along sections of the Great Western Greenway (Mayo, Ireland). The study analyses how bicycle type, cycling speed, tyre pressure and width and cyclist weight impact vertical acceleration data. In addition, the cyclists' subjective experiences were captured through a qualitative survey. Dynamic Comfort Index (DCI) was found to be an effective indicator of the real-world pavement condition for cyclists albeit it varies depending on bicycle type and speed. The research also examined how acceleration measurements from bicycles correlate with pavement condition data from the XenoBike. This can enable measurements on standardised equipment such as the XenoBike to be translated into "real-feel" metrics for cyclists. The outputs of this work will inform the development (nationally and internationally) of robust standards for pavement design and maintenance in greenways and other cycle infrastructure.

Paper Title: Economic Costing Study of Climate Change Impacts on Transport Networks in Ireland

Benjamin Obe (Trinity College Dublin), Clement Kwekukyei (Economic and Social Research Institute), Julie Clarke (Trinity College Dublin) and Kelly Debruin (Economic and Social Research Institute).

Abstract. Ireland's transport network, essential for economic stability, is increasingly vulnerable to climate change impacts. While the risks posed by extreme weather events are increasingly recognised, the broader economic losses across sectors remain understudied. With projected increases in flooding, storms, droughts, and heatwaves, assessing these cascading economic risks associated with physical climate risk for the transport sector in Ireland is crucial. This study addresses this gap by conducting an assessment of recent extreme weather events in Ireland and the impacts on the road transport network in terms of physical damage and associated operational disruption. Furthermore, using a combination of historical data and scenario-based assessments, the study estimated the costs of infrastructure damage and service disruptions. A Computable General Equilibrium (CGE) model was subsequently used to analyse the cascading economic effects, revealing how disruptions in transport infrastructure ripple through the economy. Preliminary findings indicate that the broader economic losses are multiples of the direct damage costs alone, emphasising the need for targeted adaptation strategies. This study will inform climate resilience planning in Ireland and contribute to global policy discussions on strengthening critical infrastructure against evolving climate risks.

Paper Title: Cycling to School: Investigating Parental (and Prospective Parental) Perceptions and Student Travel Behaviour in Ireland

Rafael Costa Dionisio (Atlantic Technological University Sligo, Ireland), Robert Egan (Trinity College Dublin, Dublin 2, Ireland) and Ubaid Illahi (Atlantic Technological University Sligo, Ireland)

Abstract. Commuting to school by private car contributes to transport-related emissions. To achieve the 2030 and 2050 emission reduction targets, promoting and adopting active travel is essential. Since parents determine the travel mode of primary school children, capturing their perceptions is crucial for developing effective policy frameworks and promoting active travel. This study aims to assess the factors influencing primary school children's adoption of cycling, with a particular emphasis on cycling infrastructure and safety perceptions of both the parents and prospective parents in Ireland. The study uses a mixed-methods approach, collecting both qualitative and quantitative data through surveys. Statistical methods are employed to analyse the data, identifying key trends and correlations. Based on the literature review and study context, the factors investigated include commuting distances, parental cycling behaviours, local traffic speeds, cycling infrastructure, and traffic-calming measures. The study also examines how children's cycling skills, as perceived by parents (and prospective parents), influence the likelihood of cycling to school. The findings provide evidence-based policy recommendations for policymakers, urban planners, and school administrations. By improving cycling infrastructure and fostering a supportive environment, the study seeks to encourage active commuting for primary school children, reducing the reliance on private cars and contributing to transport-related emission reductions.

Paper Title: Migrating to Move: Sludge Audits for Irish Employment Permit Policy and Public Transportation Philip Jeremiah Ryan (SMARTlab University College Dublin)

Abstract. Failures of public transportation systems are regularly due to a lack of fundamental employees, such as drivers or mechanics, who can be sourced through international recruitment. Ireland's labour shortages in its transport system are similar to other "1st world" countries, and a short comparative analysis will be presented, along with alternatives such as national education and training programmes, improvement of worker conditions, and automation. The paper presents a sludge audit reviewing Irish migration policies for Non-EEA national workers associated with public transportation. It identifies failures in organisational processes, bureaucratic friction in hiring such workers, and by relation in maintaining and providing consistent public transportation services. The Irish General Employment Permit and related visa processes are set out and analysed through vignettes of Irish public transport scenarios, primarily focusing on the use of an ineligible list of Standard Occupation Categories (SOC) that has many transportation roles, and the use of quotas for exceptions to these restrictions. Combining insights from both migration and transportation policies such as fragmentation of labour pools due to deregulation, while highlighting unique characteristics of drivers, mechanic and maintenance roles, the analysis argues conflicts in the policies create misfires.

Paper Title: On Track for Transformation: Assessing Demand and Simulating Feasibility for Rail Commuting in the Northwest as a Tool for Climate Action and Regional Growth

Holly Briere-Edney (ATU Sligo) and Brian McCann (ATU Sligo).

Abstract. This research examines the historical and policy context of the Irish rail network and explores the feasibility and potential impact of introducing a morning commuter rail service into Sligo Town, a designated regional growth centre currently lacking early rail access. The project aligns with national and EU objectives for emission reduction, modal shift, and enhanced regional connectivity. A public survey conducted as part of the study received 533 responses, showing strong support for an earlier service and a clear willingness among car-dependent commuters to shift modes if viable alternatives are provided. To assess technical feasibility, a custom-built simulation tool is being developed using geospatial data and coded in Python. The model enables dynamic testing of additional services on the existing Sligo-Dublin line, analysing passing times, delays, and optimal scheduling solutions. Preliminary findings suggest that a morning service could be introduced with minimal infrastructure changes and no major disruption to current services. Additional stakeholder interviews with Irish Rail operatives, councillors and business groups are planned to further assess practical challenges and institutional willingness of service implementation. The research aims to contribute meaningful insights to future transport planning and help rebalance Ireland's rail network in favour of sustainable, regionally inclusive development.

Paper Title: Irish & UK Aviation in 2025: An Assessment of the Pandemic Impacts Aisling Reynolds-Feighan (University College Dublin) **Abstract.** This paper analyses the post-pandemic recovery of Irish and UK aviation markets relative to European, North American, and global benchmarks using detailed daily airline schedule data (2019–2024). Building on previous findings of Europe's severe downturn, both Irish and UK markets registered among the largest drops in seating capacity. Despite this steep contraction, both returned to pre-pandemic capacity by the third quarter of 2022, with the Irish market exhibiting especially strong subsequent growth. Resilience metrics are applied to Irish and UK airports within a standardised airport classification scheme, enabling comparisons with airports in the European Common Aviation Area (ECAA) and North America. The study further examines airline competitiveness and equipment impacts across key route groups—namely Ireland–UK, Intra-ECAA, North Atlantic, and other global segments—offering insights into the broader implications for market structure and fleet planning.

Paper Title: Assessment of embodied carbon during the construction phase of road infrastructure projects in Ireland

Ronan Keane (ATU) and Dr Brian McCann (ATU)

Abstract. This research evaluates methodologies for assessing and managing embodied carbon emissions during the construction phase of major road infrastructure projects in Ireland which includes lifecycle stages A1-5: raw materials, transport, and construction. It critically analyses current Irish practices, in particular Transport Infrastructure Ireland's (TII) Carbon Tool, comparing them to international best practices and standards. The study focuses on the recently completed N22 Baile Bhuirne to Macroom Road Development and compares it to the ongoing M28 Cork to Ringaskiddy Motorway and the M7 High-Speed Framework Pavement Scheme. Through retrospective analysis, the N22 project provides a baseline for embodied carbon emissions on roads projects using conventional construction practices. Scenario building is used to investigate the impact of different carbon mitigation techniques such as the use of GGBS in concrete, Reclaimed Asphalt Pavement, Hydrotreated Vegetable Oil as a fuel during the construction phase, etc. The findings highlight gaps in current Irish practices and provide actionable recommendations for robust carbon management in future road projects. This research emphasises the critical importance of early-stage carbon assessment, sustainable procurement, and low-carbon construction methodologies in road projects to achieve Ireland's national net-zero greenhouse gas emissions target by 2050.

Paper Title: A Systematic Literature Review: Heavy Goods Fleet Replacement under Sustainability Considerations Qichen Li (University College Dublin) and Paula Carroll (University College Dublin)

Abstract. The logistics sector accounts for 9% of China's total carbon emissions, with road freight transportation contributing 87% of the sector's emissions. Consequently, reducing carbon emissions in road freight transportation emerges as a pivotal priority. In order to achieve carbon neutrality, the development of alternative fuel vehicles to replace fossil fuel vehicles has become one of the effective emission reduction strategies in the freight transportation industry. Considering different electric powertrain technologies, ranges, charging times, charging infrastructure, and economic feasibility, fleet managers are compelled to explore a multiplicity of fleet replacement strategies within the confines of a planning horizon constrained by economic and sustainability considerations. This paper presents a systematic literature review on fleet replacement problems and provides a comparative analysis of different technologies for a future alternatively fuelled road freight mix. Existing literatures exhibits a research gap in the electrification transition strategies for heavy goods fleets. Through comparative analysis of diverse prototypes, this study identifies mathematical optimalisation models for fleet replacement across varying operational scenarios. These findings provide valuable insights to inspire researchers and practitioners in conducting further studies and practical implementations related to the electrification of road freight logistics fleets.

Paper Title: Understanding Car Ownership: a review and data analysis in support of the NTA's model update Warren Whitney (National Transport Authority), Ian Burden (SYSTRA), Wen Zhang (National Transport Authority) and Barry Colleary (National Transport Authority) **Abstract.** This paper presents an overview of certain components of the analyses conducted in preparation for the updating of the National Transport Authority's Car Ownership model. The forecasting of car ownership is of increasing importance to transport planning, due to its role in forecasting travel demand, its importance to environmental analysis, and developments in the area arising from recent trends and the emergence of new mobility alternatives. The NTA's model forms an essential part of the National Demand Forecasting Model, which in turn provides details of travel demand for the Authority's entire Regional Modelling System. A literature review examines a number of topics relevant to the updating of the model, including other existing or recent Irish car ownership models, selected examples from other jurisdictions and recent trends affecting car ownership generally, along with general reviews of car ownership model. A data analysis conducted using 2016 and 2022 census POWSCCAR data to identify trends in car ownership and the impacts of key factors is also discussed. Conclusions are then drawn in relation to trends in car ownership and recommendations made for further research.

Paper Title: Modelling the Integration of Mobility-as-a-Service to create a Sustainable non-urban Transport System

Jack Mc Shane (Atlantic Technological University Donegal), Eoghan Furey (Atlantic Technological University Donegal), Marion McAfee (Atlantic Technological University Sligo), Leo Creedon (Atlantic Technological University Sligo) and Padraig Gallagher (Atlantic Technological University Donegal)

Abstract. Lack of public transport services in non-urban areas have led to increased levels of car ownership and usage in Ireland. The transport requirements of citizens who may not have access to private cars and depend on public transport could be met through connecting various modes of transport on a needs-based system, where transport is supplied where demand is observed. It was found that in the review of literature significant research has been undertaken and completed in creating sustainable urban transport systems but research into sustainable transport systems in non-urban areas was found to be scarce. To evaluate Mobility-as-a-Service (MaaS) in non-urban areas, a multimodal shared MaaS transport simulation model will be developed and incorporated with MaaS principles such as cost reduction, increased availability, multimodal options, and pollution reduction. The outputs of the model such emissions impacts, transport costs, and travel time will be analysed to evaluate what adjustments are needed to the inputs of the model to ensure a sustainable MaaS system in non-urban areas and if it can achieve current and future societal goals. This model will focus on addressing the transport challenges associated with trips that are determined as non-regular or 'ad-hoc' in nature where they happen spontaneously without planning or preference. This research also aims to address goal 11 Sustainable Cities and Communities of the Sustainable Development Goals (SDGs) by promoting more sustainable, inclusive, and resilient settlements through the development of more efficient non-urban transport systems but also contributes towards targets in other SDGs including goals 8, 10, and 13.

Paper Title: ECONOMIC IMPACT OF EU INITIATIVES FOR ALTERNATIVE FUEL TRANSITION IN THE IRISH MARITIME INDUSTRY

Alina Kovalenko (School of Business, Maynooth University), Kamalakkannan Sivappirakasam (School of Business, Maynooth University), Patrick Rigot-Muller (School of Business, Maynooth University) and Joseph Coughlan (School of Business, Maynooth University)

Abstract. This study assesses the economic impact of European Union maritime regulations, particularly the Emissions Trading System Directive and the FuelEU Maritime Regulation, on shipping companies operating in Irish ports through 2050, as well as the Alternative Fuels Infrastructure Regulation (AFIR) on ports. The analysis focuses on penalties and allowances associated with continued fossil fuel use for different types of vessels (RoRo, RoPax, container ships, and tankers). Additionally, the risk of stranded assets under alternative fuels infrastructure regulation is examined, with particular attention to the economic viability of onshore power supply investments. The study focuses on the most frequent callers at ports in the Republic of Ireland. Various scenarios involving biofuel blending and alternative fuels, such as green methanol and e-LNG, are considered and discussed based on their expected impact on operating costs and potential compliance with future GHG intensity limits. The findings will provide insights into cost implications and offer strengthened policy recommendations to support a sustainable transition to alternative fuels in Ireland's maritime sector.

Paper Title: Life Cycle CO2e Intensity of Commercial Aviation Scenarios with Specific Sustainable Aviation Fuels

Aron Bell (Trinity College Dublin), Liam A. Mannion (Trinity College Dublin), Mark Kelly (Trinity College Dublin), Mohammad Reza Ghaani (Trinity College Dublin) and Stephen Dooley (Trinity College Dublin)

Abstract. The aviation industry has set ambitious targets of achieving net-zero emissions in 2050. Sustainable aviation fuel (SAF) is the primary emission reduction mechanism for the sector in the short/medium-term. Directly relevant to the topic of Sustainable Transport and Climate Change, this study performs life cycle assessment (LCA) to account the total carbon dioxide equivalent (CO2e) emissions embodied in specific SAFs: the hydrotreated esters and fatty acids (HEFA) pathway utilising used cooking oil feedstock, and the Power-to-Liquid (PtL) pathway utilising captured CO2. Realistic supply chains are considered, the results are compared to the requirements of regulatory frameworks, and the specific use cases of these SAFs are modelled on commercial flights, with actual aircraft data provided by Ryanair. This LCA is performed from first principles, allowing full control over the inputs, assumptions, and operating equations for a specific, granular, and transparent study. The CO2e intensity of the HEFA SAF is calculated to range from 3 - 22 gCO2e/MJ and the PtL SAF ranges from 11 - 101 gCO2e/MJ depending on the scenario details of location, electricity source, and hydrogen source. The modelled SAF may reduce life cycle CO2e emissions by up to 97%, relative to conventional aviation fuel. SAF offers the greatest potential CO2e reduction for commercial flights per revenue-passenger-kilometre (gCO2e/RPK) compared to new aircraft technology and operational measures. However, the large range in results highlight that specificity and rigorous supply chain analysis are crucial for the accurate determination of the life cycle CO2e that is embodied in SAF and emitted during commercial aviation.

Paper Title: Physical activity levels and transportation factors of students in Trinity College Dublin

Cuisle Forde (Trinity College Dublin), Sanela Begic (Trinity College Dublin), Vera Lee (Trinity College Dublin), Ithnan Roberts (Trinity College Dublin), Michael Kelly (Trinity College Dublin) and Claudia Gosalvez (Trinity College Dublin)

Abstract. Intro: Regular physical activity helps to prevent and manage many health conditions; however, only 37% of Irish adults achieve national physical activity recommendations. Active transport is a sustainable way to achieve habitual physical activity and benefit personal and planetary health. Previous work carried out under the Healthy Trinity Smarter Travel Committee informed an advocacy campaign for a Bike to College Scheme for Students, included in the January 2025 programme for government. Our work seeks to quantify the health benefits of active transport for Trinity students by identifying the proportion of Physical Activity (PA) levels attributable to college-related transportation. Methods: 16 students across Trinity campuses completed an anonymous survey on their primary transport methods. Additionally, the PA of 14 participants was objectively measured using accelerometry for one week. Data was analysed using Actilife software to quantify physical activity levels across three intensities and calculate overall daily PA, PA due to general transport, and PA due to college-related transport. Results: Most participants travel to Trinity campuses daily on foot. On average, students spend 63.45 ± 21.35 minutes daily in moderate to vigorous physical activity (MVPA). Overall, 32% of daily PA is attributable to transport, 17% to non-college, and 15% to college-related transport. This supports active transport as a tool to aid not only in a climate crisis, but also promote health benefits.

Paper Title: Assessing the Impact of Cycle Lanes on Emergency Response Times: A Case Study of Limerick City Muhammad Huzaifa Butt (University of Limerick) and Ross Higgins (University of Limerick) Abstract. In 2024, the government's total funding for active travel infrastructure surpassed €1 billion, delivering over 600 km of cycling, walking, and wheeling infrastructure since 2020 under the National Transport Authority's (NTA) Active Travel Programme. The 2024 Active Travel Investment Programme is set to fund approximately 800 new and existing projects nationwide, reinforcing Ireland's commitment to sustainable and accessible urban mobility. However, despite these significant investments, public concerns regarding emergency response accessibility remain a barrier to the implementation of cycling infrastructure. One of the most frequently cited arguments against cycle lanes is their potential to delay emergency response times. This study empirically assesses whether cycle lanes in Limerick City impact emergency response efficiency by analysing emergency response times before and after cycle lane implementation. Additionally, interviews with emergency service personnel have been completed to understand their perspectives and experiences of emergency responses in areas with new cycle infrastructure. Preliminary findings indicate that while public opposition frequently frames cycle lanes as obstructive to emergency services, statistical tests on four separate road links, confirmed no significant difference in response times before and after the development of a cycle lane. Furthermore, international evidence highlights instances where well-designed cycling infrastructure has improved emergency access. This study contributes to the active travel discourse by providing data-driven insights into the compatibility of cycling infrastructure and emergency response efficiency. Our findings aim to inform policy decisions and infrastructure designs that balance active travel goals with emergency service accessibility, ensuring a sustainable and resilient transport network.

Paper Title: Enhancing Perceived Safety in Urban Public Transport: An Assessment of Key Measures and Passenger Concerns

Ajeni Ari (Technological University Dublin), Lorraine D'Arcy (Technological University Dublin), Maria Chiara Leva (Technological University Dublin) and Mary Kinahan (Technological University Dublin)

Abstract. This study conducts an assessment of safety measures influencing perceived safety on urban public transport systems. By capturing user perceptions and key safety parameters through interviews and surveys, the research identifies critical safety concerns voiced by passengers. Utilizing statistical and qualitative analysis, the study extracts applicable themes and explores socio-cultural barriers affecting perceived safety. The findings reveal that effective safety measures, such as increased surveillance, accessibility, and prompt response to incidents, significantly enhance passengers' sense of security. Additionally, the study highlights the impact of transport attributes, such as cleanliness and punctuality, on users' willingness and capability to use public transport services. The insights gained from this research provide valuable recommendations for policymakers and transport authorities to improve safety measures and foster a safer, more inclusive public transport environment.

Paper Title: ISCycle: Examining an ebike loan intervention on transport behaviour in an urban area in Ireland.James Green (Health Research Institute, University of Limerick), Louise Foley (University of Limerick), Anna Barrero (Health Research Institute, University of Limerick), Yvonne Ryan-Fogarty (University of Limerick), Catherine Woods (Health Research Institute, University of Limerick), Colin Fitzpatrick (University of Limerick) and Cathal Walsh (Trinity College Dublin)

Abstract. Objectives: Electric bikes (ebikes/pedelecs) offer a potential replacement for private car journeys, facilitating longer trips and greater load capacity than conventional bikes, benefitting both the climate and human health. This study examines the effect of a loan intervention on distance and frequency of trips per transport mode, physical activity, and transport-mode habit strength, as well as a test of loan length. Methods: A randomised controlled trial is being conducted, with participants randomised to one of three ebike loan durations (4-, 8-, or 12-weeks) or a waitlist control. Participants in the intervention group receive an ebike that meets their transport needs (e.g., commuter, folding, cargo ebike). Cycling accessories and training are provided if needed. Measurements include self-report questionnaires and mobile and ebike-fitted GPS logging. In addition to baseline and post-intervention, measures will be repeated at 12- and 24-months to assess long-term impacts. Key findings: To date, over 200 participants have been recruited, with preliminary results (n = c.130), showing an increase in cycling of 8km per week, but a complex picture related to whether this increase in cycling is reducing car use. At 12 month follow up, subsequent purchase of an ebike appears high. Findings will be updated. Conclusions: Understanding how ebike loans influence transport behaviours will guide strategies to promote active and sustainable travel modes. Results from the ISCycle intervention will be relevant across policy sectors including transport, as well as health, environment and climate, with implications for inclusive and active mobility.

Paper Title: The effects of connected autonomous vehicles on the resilience of transportation networks under disruptive events: a scoping review

Josue Ortega (University College Dublin), Beatriz Martinez-Pastor (University College Dublin) and Rui Teixeira (Trinity College Dublin)

Abstract. Nowadays, resilience in transportation networks is a crucial factor in dealing with disruptive events caused by climate change, extreme weather events, and disruptions in mobility systems. Emerging technologies, such as Connected Autonomous Vehicles (CAVs), are presented as an option to improve the resilience of transportation networks under these disruptive events. The successful integration of transportation networks and CAVs could not only strengthen resilience attributes (Robustness, Redundancy, Resourcefulness, and Rapidity) but also mitigate problems such as traffic congestion, accidents, or communication and network failures, which are derived from adverse weather conditions and infrastructure failures. This article, through an exhaustive systematic review, using the PRISMA-ScR protocol, aims to investigate how CAVs contribute to resilience based on two main approaches: (1) how disruptive events such as infrastructure failures and CAV failures affect resilience in the transportation network and (2) how adverse weather conditions (rain, snow, fog) impact the performance of the resilience of transportation network with CAVs. This review contributes to the current body of knowledge by highlighting the possibilities, opportunities, and challenges of integrating CAVs into transportation networks. It also offers methodologies that can be refined according to technological advances and the changing requirements of the Intelligent Transportation Systems (ITS) sector.

Paper Title: Assessing Green Shipping Corridor Potential in Ireland: A Prefeasibility Study

Kamalakkannan Sivappirakasam (School of Business, Maynooth University), Alina Kovalenko (School of Business, Maynooth University), Patrick Rigot-Muller (School of Business, Maynooth University) and Joseph Coughlan (School of Business, Maynooth University).

Abstract. As the Irish economy grows, the maritime sector remains crucial for trade, underpinning Ireland's international competitiveness, with 90% of internationally traded goods by volume transported by sea. Maritime activity in Ireland heavily relies on fossil fuels, therefore, decarbonizing the Irish maritime transportation sector has become crucial. This research investigates how a smooth transition to alternative fuels and technologies can be achieved through establishing Green Shipping Corridors (GSCs) between Ireland and its major trading partners. Hence, this study presents a prefeasibility assessment of GSCs, focusing on feasibility evaluation and identifying potential corridors and vessel candidates serving Ireland. Automatic Identification System (AIS) data was used to identify vessels calling at Irish ports during 2023 and 2024. As a result, 41 RoRo and RoPax vessels, 39 container vessels, and 10 tankers were identified, collectively consuming 0.672 million tonnes of fuel and emitting 2.04 million tonnes of CO₂ annually. In the detailed GSC analysis, corridors and vessels were prioritized based on their emission reduction potential and the regularity of vessel operations serving Ireland. The findings highlight the need to define different GSC types based on vessel-specific voyage patterns: RoRo and RoPax vessels operate on point-to-point corridors, container vessels follow network corridors, and tankers use round-trip corridors. This necessitates different GSC planning and strategies for alternative fuel adoption. The results also identify the following potential early mover GSC candidates: RoPax - Dublin-Holyhead, RoRos - Dublin-Liverpool, Containers - Dublin-Rotterdam-Cork, and Tankers - Milford Haven-Dublin/Belfast/Avonmouth/Cardiff/Plymouth.

Paper Title: Sligo Coastal Mobility Route Selection and Design Evaluation

Dr Brian McCann (Atlantic Technological University, Sligo), Holly Briere-Edney (Atlantic Technological University, Sligo), Stephen Gallagher (Atlantic Technological University, Sligo), Gavin Browne (Atlantic Technological University, Sligo), Caolan Harkin (Atlantic Technological University, Sligo), Mark Wrafter (Atlantic Technological University, Sligo) and Ken Russell (Atlantic Technological University, Sligo).

Abstract. This applied research study by undergraduate Civil Engineering students was undertaken to determine potential route and design options for the proposed Sligo Coastal Mobility Route project which originated from local community groups. The project is incorporated into the Sligo County Development Plan, and aims to improve the accessibility, safety and quality of cycling infrastructure between key residential and tourist centres, Strandhill and Rosses Point and the Sligo urban area along a route of high attraction, connectivity and amenity. The project involved a review of sustainable mobility and active travel design policy and guidelines, and an investigation of the current road and cycling infrastructure between Strandhill, Sligo, and Rosses Point. Route condition and attribute investigations used field surveys and Google Map imaging, and questionnaire surveys of stakeholder preferences were used to determine optimal route locations, route constraints and potential design options to promote modal shift to cycling. A multi-criteria analysis was performed to evaluate the merits of proposed route options based on safety, connectivity, directness, comfort and scenic value parameters from the data. It was found that 54% of survey respondents rated enhancing safety as a primary objective, followed by improving local mobility. The MCA analysis indicated that the highest scoring route for the northern Rosses Point to Sligo section was less direct than others but allowed for segregation from traffic, avoiding road space restrictions, and was flatter and adjacent to the coast. For the southern Strandhill to Sligo section a route that provided improved connectivity and space for high quality cycling lanes was favoured.

Paper Title: A perspective on three sustainable hydrogen production technologies with a focus on technology readiness level, cost of production, and life cycle environmental impacts

Yunfei Li (UCC), David Wall (UCC) and Nathan Gray (UCC)

Abstract. Hydrogen will play an important role as both an energy vector and as a molecule in essential products in the transition to climate climate-neutral economy. However, the optimal sustainable hydrogen production system has not been defined due to specific challenges such as energy conversion efficiency, economic cost, and associated marginal abatement cost. This review summarises and contrasts different technologies available for sustainable hydrogen production including for their potential development, future improvements, barriers to large-scale industrial application, capital and operating costs, and life-cycle environmental impact. The polymer electrolyte membrane (PEM) water electrolyser shows significant potential for large-scale hydrogen production in the short-term, with a higher technology readiness level (expected to be 9 by 2030) and a levelized cost of hydrogen anticipated to be 4.15-6 €/kg H2 in 2030; this equates to a 50% decrease as compared to figures for 2020. The four-step copper-chlorine (Cu-Cl) water thermochemical cycle for hydrogen production typically performs better than the three- and five-step Cu-Cl cycle in terms of life cycle environmental impact, however, due to system complexity and high capital expenditure, this technological pathway holds strong potential for long-term application as the technology continues to evolve. Biological conversion technologies (such as photo/dark fermentation) for hydrogen production are at a lower technology readiness level, and the system efficiency of some of these pathways such as biophotolysis are very low (less than 10%). Biomass gasification presents a more mature technology owing to its higher system efficiency (40%-50%). Biological conversion systems are generally more expensive and therefore require substantial advancement to become competitive with hydrogen production through electrolysis.

Paper Title: Weather Impacts on Punctuality and Reliability: Evidence from Irish Regional Bus Services .Peter Lennon (TCD) and Dr. Julie Clarke (TCD)

Abstract. Ireland's climate has grown increasingly extreme in recent years, with a noticeable rise in the frequency and intensity of severe weather events. This has highlighted the vulnerability of critical infrastructure systems, such as public transport, to climate hazards. This study investigates the impacts of adverse weather on regional bus services, using eight years of data (2017–2024) from seven regional routes in the south and east of Ireland. Daily measures of punctuality and reliability, captured through Automatic Vehicle Location systems, are used to assess how weather affects service provision. Two models were employed: a multiple linear regression to estimate the effect of weather on the proportion of stops reached on time, and a binary logistic regression to evaluate the likelihood of service cancellations. Both models control for route-specific characteristics and temporal variation. While research in this area has been focused on urban public transport, this study examines impacts on regional services which often provide essential connections for rural communities. The results reveal that colder temperatures and high winds are associated with reduced bus punctuality, which is also generally lower during the autumn months compared to January. Regarding reliability, heavy rainfall, and storm-level winds are strong predictors of service cancellations. Notably, the examination of lagged weather variables suggests that colder temperatures can increase the risk of disruption the following day. These findings offer evidence-based insights for operators and policymakers preparing climate adaptation plans to improve the resilience of public transport services.

Paper Title: The Impacts of Driver Assist Technologies and Older Adults' Driving Patterns and Behaviours

Tom Hall (Trinity College Dublin), Sanela Begic (Trinity College Dublin), David Mockler (Trinity College Dublin), Melaine Bouroche (Trinity College Dublin), Cuisle Forde (Trinity College Dublin) and Tadhg Stapleton (Trinity College Dublin)

Abstract. As the use of driver assist technology has grown, there is uncertainty whether these systems help or hinder older drivers. This systematic review aimed to synthesize the available evidence on the impacts that driver assist technologies have on older adults' driving patterns and behaviours. Specifically, Advanced Driver Assistance Systems (ADAS) not exceeding SAE level 2 as well as In Vehicle Information Systems (IVIS) were examined. The systematic review was conducted up to April 2025. The inclusion criteria contained current or recently retired drivers who are 65 years old+, naturalistic driving scenarios, driving simulators and qualitative studies (surveys, questionnaires and focus groups). From these studies, driving outcomes as well older drivers' perceptions on driver assist technologies were assessed. A total of 19 studies met the inclusion criteria. Overall, it was found that a number of driver assist technologies demonstrate the potential to improve older drivers' safety. Moreover, understanding the functionality of the technology as well as having the opportunity to use these driving systems has a strong positive impact on older adults' perceptions of driver assist technology.

Paper Title: Revolutionising Transport Noise Mapping: Citizen Participation and Big Data

Enda Murphy (University College Dublin) and Eoin A. King (University of Galway)

Abstract. Traditional approaches to transport noise mapping often rely on limited datasets and modelling assumptions that may not capture the lived experiences of communities affected by environmental noise. This paper proposes a transformative framework for noise mapping by integrating citizen participation with big data analytics, offering a more dynamic, inclusive, and accurate representation of urban soundscapes. Drawing on recent advances in participatory sensing and crowdsourced mobile data, we explore how citizen-reported smartphone-derived geospatial data can supplement official monitoring systems. In particular, we harness data from SILENCIO to outline how this approach can be utilized in practice. The proposed approach enables close to real-time, high-resolution noise maps that reflect not only decibel levels but also temporal variability. Ultimately, the integration of citizen science and big data represents a paradigm shift in how transport noise is understood, measured, and managed in the pursuit of sustainable and resilient cities.