

Introduction to Panel 6

Transport and mobility

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Introduction

Transport, along with domestic heating, presents one of the most intractable challenges in terms of decarbonisation. Emissions have only stabilised despite improvements in efficiency, driven by rapid growth in demand for mobility.

Panel 6 focused on the creation of sustainable and equitable passenger mobility systems and efficient freight transportation.

The legacy of Covid: teleworking & potential for travel reduction

The Covid-19 pandemic dramatically altered travel behaviour in a short space of time, showing that work – and many other activities – can be carried out virtually, minimising the demand for travel. What can we learn from this dramatic disruption and how can the observed benefits be retained in the post-pandemic future?

Bazzocchi et al (peer-reviewed paper 6-018-21) assess the potential for ‘smart working’, adopted as a result of the lockdowns in Milan, Italy. The study used smartphone data to evaluate travel behaviour change. Meanwhile Calderola & Sorrell (peer-reviewed paper 6-036-21) take a longer view of the impacts of teleworking on travel in England, providing a sobering perspective as a result of some of the indirect and longer-term impacts of home and teleworking.

Disruption can be an opportunity to change long-embedded travel habits, potentially for the better. Along this theme, Cassar (extended abstract 6-115-21) look at the travel behaviour of a particular group of young adults – students in a metropolitan city in the UK – asking the question how the more sustainable travel behaviours of this group can be maintained as they transition into the workplace.

Meanwhile, Anciaux & Castreman (peer-reviewed paper 6-171-21) study at the drivers of car use in Belgium and Canada, implying prescriptions based on the interdependence between car use and the essential practices of daily life.

Electrification a key part of the solution but we need to be smart to get the greatest benefits

It’s becoming clearer that the electrification of much of road transport will be a key part of the solution as we strive to achieve net zero, though heavy goods vehicles are a challenge because of their weight, range and payload requirements. The jury is still out, too, in terms of aviation and shipping.

The total cost of ownership of electric vehicles compared with ICE alternatives is an important area of discussion as the upfront cost of EVs are still higher than the conventional options. Moll & Link (peer-reviewed paper 6-044-21) look at the attractiveness of EVs under current tax and incentive schemes in Germany and find that official tax and incentive schemes may be needed for longer than is generally anticipated.

Covering related ground, Preuß & Scherrer, (peer-reviewed paper 6-182-21) look at diffusion of innovation theory, attempting to shed light on the question of whether knowledge can help to accelerate the adoption of transport innovations and under which conditions.

Abid et al (peer-reviewed paper 6-139-21) investigate the potential for widespread transport electrification, including the use of electro fuels, arriving at bullish conclusions.

The full life-cycle emissions of electric vehicles must be taken into account in policy decisions. In countries where coal still supplies a large part of the energy mix, the emissions benefits of

transport electrification are more limited. Clemens et al (peer-reviewed paper 6-017-21) look into different electricity generation mixes: coal-dependent countries, natural-gas dependent countries and hydropower dependent countries to determine breakeven times in terms of overall CO₂ emissions. Their research also introduces the potential for hydrogen storage or carbon capture and storage in terms of total emissions.

The electrification of transport offers challenges and opportunities in terms of the wider energy system. An increasingly renewable, intermittent energy supply infrastructure can benefit from the storage capacity of the batteries in a growing fleet of electric vehicles. Smart charging, involving vehicle-to-grid and/or vehicle-to-building (& vice versa) or other variations, could provide significant cost benefits and help to balance intermittent supply. Moura & Mohammadi (extended abstract 6-034-21) look at how new flexibility options are needed to ensure the matching between generation and demand at building and community levels. The study focused on the need for 'renewable energy communities'; how new legislation for the self-consumption of renewable generation could enable bilateral contracts between buildings or the establishment of renewable energy communities, in order to trade the renewable generation surplus. Meanwhile, Bhand et al. (peer-reviewed paper 6-086-21) look at the prospects for vehicle-grid integration (VGI) in the Indian context. The paper attempts to devise strategies that India should adopt for VGI, to facilitate EV adoption.

Apart from electrification, what else?

There remain challenges to the electrification of many areas of transport. Hydrogen is mooted as a potential solution for hard-to-electrify applications. Link et al (peer-reviewed paper 6-088-21) note that freight transport accounts for 40 % of global road transport greenhouse gas emissions. Their paper

looks at efforts to use hydrogen in internal combustion engines (H₂-ICE) with a modified, conventional powertrain as an alternative to more research-intensive fuel cells. Their research, focusing on Germany and India, suggests potential economic competitiveness by the mid-2030s.

Leopoldus et al (peer-reviewed paper 6-124-21) highlight the fact that despite efforts to increase energy efficiency, the final energy consumption of freight transport in Europe has increased in recent years. Food, beverages, and tobacco account for the largest share of tonne-kilometres in road freight transport and about a third of the transported products require refrigeration or cooling. Their paper presents an evaluation of different alternative refrigeration technologies available that could significantly lower energy use and emissions from this important source. Liapis et al (peer-reviewed paper 6-123-21) look at the potential for Energy Efficiency Obligation schemes (EEOs) to include transport-related elements amongst mandatory energy saving targets.

While much of the focus – and political preference in most countries – is on technical measures to reduce emissions, there is growing pressure on policymakers to give greater priority to policies which reduce the demand for travel. Zell-Ziegler et al (peer-reviewed paper 6-109-21) look at sufficiency measures in national energy and climate plans (NECPs), identifying measures targeting decarbonization up to 2030, as well as long-term strategies (LTSs) to 2050. They find that sufficiency measures, aiming to reduce personal and freight tonne kilometres, are significantly under-represented in the plans.

Behavioural measures are also a focus for Ortar et al (extended abstract 6-070-21), who look at the prospects for the disruption caused by the pandemic to create space for active travel and other advances in the urban context, and for Wemyss & Grieder (extended abstract 6-047-21), who adopt an innovative analysis of mobile phone data to investigate climate-friendly behaviour in terms of individual mobility and eating choices.