MAASLAB, UCL ENERGY INSTITUTE

UCL

Dr. Emmanouil (Manos) Chaniotakis , Dylan Turk Johnson, Prof. Paul Ekins

Report details:

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Report prepared for:	London North Eastern Railway (LNER)
Authors:	Dr. Emmanouil (Manos) Chaniotakis, Lecturer, MaaSLab, UCL Dylan Turk Johnson, Researcher, MaaSLab, UCL Prof. Paul Ekins, Professor, UCL Institute for Sustainable Resources
Project coordination:	

1 Introduction

1.1 Background, aim and scope

Transport is currently the sector with the highest CO_2 emissions in the UK (Department for Business, Energy & Industrial Strategy, 2022) and congestion is affecting well-being and efficiency, costing the U.K. nearly 8 billion pounds annually[1]. Decarbonisation of the transport sector forms a vital step in achieving the UK’s goal of cutting greenhouse gas emissions and becoming carbon neutral by 2050. Within transport, trips by cars and taxis are the largest contributors to emissions (Department for Transport, 2021a). Reduction of car dependency has been one of the topics receiving increased attention by the transport research community, practitioners, and public authorities, for many years. Yet, approximately 68% of all trips in England are still being completed by car (Department for Transport, 2021b) in either privately owned vehicles or taxis.

Leisure[2] trips constitute the most common trip purpose in the UK (23% of all trips performed in 2019) followed by shopping and commuting (Department for Transport, 2020). At the same time, according to the 2019 GB Tourist Annual Report[3], inbound tourism for leisure purposes (holidays) accounted for 60.5 million trips in 2019 (KANTAR, 2020). The vast majority of these trips are performed by car, contributing to the significant externalities caused by car-travel, such as congestion and pollution. Trips performed by public transport consistently exhibit, for most trips, lower emissions per passenger, while contributing to road network efficiency, by reducing congestion.

2 Our methodology and data

2.1 Overview of our approach

The analysis presented in this report follows three main stages, shown in Figure 2-

travellers’ choices for leisure trips and there could be (faster, cheaper, more convenient) alternatives which are not captured. As such this iterative planning process for maximising travel utility based on individual users’ choices is not captured, since we aim at capturing the potential benefits/drawbacks if everyone was shifting one trip.

- Where available, the -shortest travel time- unimodal trip was selected. Where a unimodal trip alternative was not available (i.e. trip only possible when using more than one mode of transport, such as car and train or bus and train), it was assumed that the additional non-primary mode was assigned to the primary mode.
- Trips reported are essentially tours that include both the trip from the origin to the destination and the trip from the destination to the origin. The report assumes that the mode used for travelling to the destination would be the same as the mode used to return to the origin, following the same route. This also assumes that the trips performed start and end in September and October (for the Power of One Autumn

modes and routes. The produced outcome included distance matrices for each alternative mode (main mode + modes to reach stations) which were then used for the estimation of the impact indicators.

2.5 Estimation of Impact Indicators

The estimation of the impact indicators was based on the distance matrices produced by the route alternative specification, using the following assumptions:

- The average petrol car trip had a carbon intensity of 0.11 kgCO2e per passenger per kilometre
- The average train trip had a carbon intensity of 0.0355 kgCO2e per passenger per kilometre
- The average LNER train trip had a carbon intensity of 0.0295 kgCO2e per passenger per kilometre (carbon intensity provided by LNER, difference due to the electrification rate)
- The average bus trip had a carbon intensity of 0.103 kgCO2e per passenger per kilometre

3 Results

3.1 Leisure trips in September and October:

Overall, for September and October the investigation found that without intervention and based on the scaling up methodology, 10.25 million leisure tours will take place, of which 6.1 million will be from cars, 2.2 million will be from trains, 0.5 million will be from buses and 1.45 million trips will be performed by “other” modes (air-travel, motorbikes, walking, cycle). This would result in approx. 656 million kgCO2e emissions emitted from cars, trains, and buses for leisure trips, based on the extracted leisure trips. Cars will contribute 85% of these emissions and are estimated to emit 549 million kgCO2e while making up 60% of trips. Trains will only contribute 10% of these emissions and are estimated to emit 67 million kgCO2e while comprising about 21% of all leisure trips. Finally, buses will contribute 6% of these emissions and are estimated to emit 41 million kgCO2e. The investigation also found that without intervention, 39 million hours will be spent travelling on cars, trains and buses. Considering just these three transport modes, Cars will contribute 70% of time spent while making up 69% of trips. Trains will only contribute 21% of total travel while comprising of 25% of trips. Buses comprise of 9% of travel time, while comprising 6% of trips. Significantly, the investigation found trains to be the most time-efficient mode of transport, as it was shown to be 20.6 km per hour faster than the car equivalent.

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3.2 Power of One Scenario

The Power of One scenario represents the scenario where it was assumed that those who completed a leisure trip in September and October by car or bus, would shift just one of those trips from the modes of transport bus or car to rail. This would result in a shift of 48% percent of car and bus-based forms of transport to rail. This 48% is the percentage value that represent the total quantity of car and bus trips that would shift to cars in the power of one scenario, which is equivalent of everyone travelling, shifting one trip towards rail. The ‘Power of One’ scenario demonstrates the significance of shifting towards low carbon forms of transport. Overall, this scenario modal shift away from cars results in a reduction of approx. 2.9 million cars travelling for leisure. This would result in a **28.4% reduction of total leisure trip emissions** from the key modes of transport (car, bus, rail) for these months.

Figure 3-2 Total Travel time spent travelling, England and Scotland results

3.3 Annual “Power of One”

This investigation also estimated the annualised value of the “Power of One” scenario. To extract annual values, the Origin-Destination matrices (containing the number of trips from any origin to any destination considered in this study) were scaled up based on a weighting factor that preserve Origin-Destination distribution of trips and transport mode share. The weighting factor used to scale up trips was estimated based on the annual number of trips from the UK Tourism Survey (i.e. annual number of trips divided by number of trips in Sept/Oct). The total number of tours performed yearly is 103.34 million (206.69 million trips) matching the number of trips for ‘Holiday’ and ‘Visiting Friends and Relatives’ for the whole UK. Assuming the September/ October transport mode share and travel destinations in England and Scotland, 123.34 millions of these trips will be from cars, 44.27 millions will be from trains and 20.16 million will be from bus trips. This would result to approx. **6613.55 million kgCO2e emissions** emitted from cars, trains and buses for leisure trips, based on the extracted leisure trips. Cars will contribute 84% of these emissions and are estimated to emit 5531.29 million kgCO2e while making up 69% of trips. Trains will only contribute 10% of these emissions and are estimated to emit 672.1 million kgCO2e while comprising approximately 25% of all leisure trips. Finally, buses will contribute 6% of these emissions and are es8 9.96 Tf1 0 0 1 256.01 5 58866 0 594. aremit ET

study found that a 48% modal shift away from cars and buses to trains resulted in a 28.4% reduction on total leisure trip emissions from the key modes of transport. Furthermore, it was found that this same modal shift away from cars, resulted in a 7.0% reduction in total time spent travelling from the key modes of transport, which translated to 6 million hours of time saved from leisure trips taken in September and October.

References

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