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# Achieving a sustainable transport sector in the UK: the effect of UK transport reform and change in population's travel decisions on the reduction of energy consumption and CO2 emission within the transport sector

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## Appendix – Notes on Data Sources

### *Short and Long Distance Categorisation*

Department for Transport (2010) state short and long distance travel has important differences relative to travel as a whole in terms of travel frequency, purpose share and mode share. Short Distance travel in the UK is based predominately on frequent, convenient trips; and usually for the purpose of commuting to work or local shopping, whilst the purpose of UK long distance journeys are classed as ‘leisure’ i.e. visiting friends and relatives, UK tourism, day trips, business trips, sports/entertainment, holidays, students travelling between university and home etc (DfT 2010). The National Transport Statistics (2009) define long distance travel as 50 km or more; hence this value is used in the investigation. To enhance this further a time is incorporated; the DfT (2010) states the average short distance trip in the UK takes an average of 33 minutes and the longest time is just under 1 hour; thus the borderline for short and long distance travel is set at 50 km and 60 minutes (DfT 2010).

*Table 5 Data: Basic Values for Short Distance Travel (National Transport Survey 2009; 2010; DFT 2010).*

Raw data from National Transport Statistics (2009), *table 13* was converted into kilometres and manipulated by calculating the mean distance for each transport mode for short distance travel, using weighted percentages to give average distance. Fuel Used, Energy Consumed and CO<sub>2</sub> released were obtained from the Department of Transport website; DfT (2010).

The full capacity values, or numbers of seats, were obtained from:

- The Rail Performance Society (2011) – Rail: Average Commuter Train, 6 Carriages. Bus: Average Local and Inner City Bus, where a local bus is defined as a bus that travels between cities, towns and villages, and an inner city bus is travel to and from a city centre.

**Table 13. Raw Data To Calculate Average Distance For Short Distance Travel (National**

Mode	Under 1 mile	1 to under 2 miles	2 to under 5 miles	5 to under 10 miles	10 to under 25 miles	25 to under 50 miles	50 to under 100 miles	100 miles and over	All lengths	Unweighted sample size (trips '000s)
<b>Private:</b>										
Walk	157	56	14	-	-	0	0	0	228	86
Bicycle	3	5	5	2	1	-	-	0	15	5
Car/van driver	23	63	132	87	65	16	5	3	395	144
Car/van passenger	13	37	76	45	31	8	4	3	217	82
Motorcycle	-	-	1	1	1	-	-	-	3	1
Other private <sup>1</sup>	-	1	3	2	1	1	-	-	9	3
<b>Public:</b>										
Inner-city bus	1	4	9	4	1	-	0	0	19	7
Other local bus	1	7	24	11	5	-	-	-	49	17
London Underground	-	-	2	4	3	-	0	-	9	3
Surface rail	-	-	1	3	6	3	2	1	16	6
Taxi/ minicab	-	3	5	2	1	-	-	-	11	4
Other public <sup>2</sup>	-	-	1	1	-	0	0	-	2	1
<b>All modes</b>	<b>199</b>	<b>178</b>	<b>272</b>	<b>162</b>	<b>115</b>	<b>29</b>	<b>12</b>	<b>7</b>	<b>972</b>	<b>358</b>

*Transport Statistics 2009).*

*Table 2 Data: Basic Values for Long Distance Travel (Google Maps 2010; Car Fuel Data 2006; The World Bank 2010; National Transport Statistics 2010; Virgin Trains 2010; CCT 2010; Rail Performance Society 2011; DfT 2010; Air Southwest 2010).*

Road Transport (Car): Route distance and time were obtained through Google Maps (2010), an inventory of specifications of over 3500 motor vehicles present on UK roads (Car Fuel Data 2006) was used to calculate average fuel consumptions and CO<sub>2</sub> emissions; and energy consumption was calculated from there using conversion calculations. Frequency of mode was calculated using a combination of data from The World Bank (2010) and National Transport Statistics (2010).

Rail: The most direct journey by rail from Plymouth to Glasgow is the Cross Country 'Voyager' train to Birmingham New Street, and then the Virgin 'Pendolino' on to Glasgow; fuel consumption, CO<sub>2</sub> release and capacity data were obtained from Virgin Trains (2010) and CCT (2010), from diesel or electric traction accordingly (ATOC 2007). Whereas, route times, frequency of availability and price were obtained from National Rail Enquiries 2010 and the route distance (rail track) from Plymouth Station to Glasgow Central station obtained through an email contact at Rail Performance Society (2011).  
Aviation: Air southwest Turboprop aircraft is the mode of transport used for air travel between Plymouth and Glasgow; the basic values were obtained from a combination of calculations using data from DfT (2010) and Air Southwest (2010).

*Table 5 Data: Current and Actual Capacity Values for Each Mode of Transport and Number of Services Per Day (Air SouthWest (2010); VanMierlo and Maggetto 2007; DfT 2008; DfT 2010)*

Car (*Short Distance- SD*): The Rail Safety and Standards Board (2007) state the load factor for an average passenger car is 32%, whilst VanMierlo and Maggetto (2007) give occupancy data at 35% for cars. Therefore an average was taken and 33.5% is taken as average car capacity.

Local Bus (*SD*): The Average capacity for a UK local bus is 42%, stated by DfT (2010)

Inner-city Bus (*SD*): VanMierlo and Maggetto (2007) and DfT (2010) give occupancy data 60% for intercity buses.

Rail Non-Peak (*SD*): VanMierlo and Maggetto (2007) give 40% occupancy data for non-peak trains.

Rail Peak (*SD*): VanMierlo and Maggetto (2007) give 70% occupancy data for peak trains.

Car (*Long Distance – LD*): The Rail Safety and Standards Board (2007) state the load factor for an average passenger car is 32%, whilst VanMierlo and Maggetto (2007) give occupancy data at 35% for cars. Therefore an average was taken at 33.5%.

Train (*LD*): VanMierlo and Maggetto (2007) give 40% occupancy data for non-peak trains.

Internal Flight (*LD*): The Rail Safety and Standards Board (2007) give occupancy data from many different airlines: 74%, 80.5% and 84.5%, whilst the Air SouthWest website state a capacity rate of 80%; as this is also the average of the values from The Rail Safety and Standards Board (2007), 80% is taken as capacity load factor.

*Services Per Day:* To calculate impact and potential saving per day, for long distance travel the number of services per day are used in calculations to produce *tables 8 and 9*. For the train, National Rail Enquiries (2010) is used for services per day and Air Southwest (2010) is used for the internal flight.

*Table 6 Data: Proposed Capacity Values using the targets from Transport 2010.*

The actual capacity ( $C_2$ ) is the values obtained in *table 9* and the Proposed 2010 capacity ( $C_3$ ) is calculated using percentage increase of the Transport (2010) objectives; 50% for rail use and 10% for bus use. Yet, to evaluate the true reform methods the actual increase is incorporated; +2% for rail and -1% for bus, hence a 48% increase for train use and 11% increase for bus use are tested.

*Table 7 Data: Basic data for reduced energy intensity methods (Boretti 2010; VanMierlo and Maggetto 2007).*

The capacity values that are used are  $C_2$ , obtained in *table 9*, and the energy and  $CO_2$  values are obtained from a combination of studies: Boretti (2010) and VanMierlo and Maggetto (2007), where the calculation accuracy of the reduced energy vehicle model is expected to be within a 5%.