

Peak car use in Britain

Summary

- National statistics indicate that average car miles per person in Britain has levelled off since the 1990s, even though there was steady economic growth from the mid-1990s to 2007.
- The Department for Transport (DfT) forecasts that car miles per person will begin to grow again as the economy recovers, based on estimates of three key drivers: GDP, fuel cost and population growth.
- Peak car proponents argue that in the future car use per person will remain static or decline, and that social, cultural and spatial factors will be increasingly important in determining the overall amount and modes of travel in the future.
- Evidence indicates that behind this overall levelling off of car miles per person, there are contrasting behavioural trends between different groups of transport users. It suggests that lifestyle and attitudinal factors interact in a complex way with each other and with broader economic factors and government policies around transport and land use planning.
- However, it is unclear to what extent recent changes in travel behaviour are the result of choices or of constraints, and data limitations make it highly difficult to evaluate the relative importance of alternate explanations and their impact on future travel behaviours.

Background

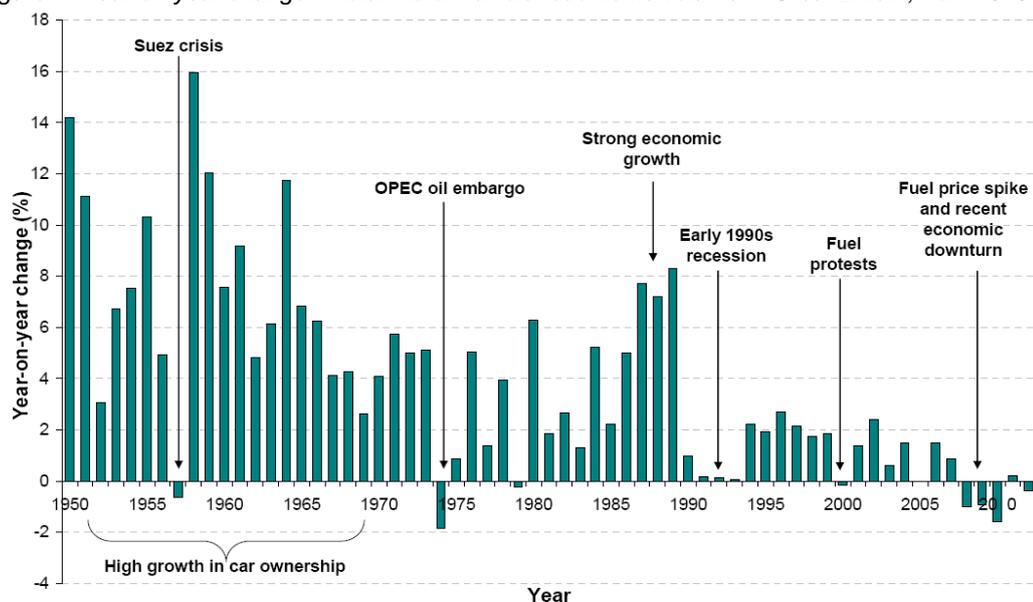
There are different definitions of 'peak car'; however, the key hypothesis is that car miles per person per year has reached a historic peak and that in the future, it will remain static or decline.¹ By contrast, the central forecast produced by the National Transport Model (NTM), which is used by the Department for Transport (DfT), projects that car miles per person per year will begin to grow again as the economy recovers, but at a declining rate.² Estimating future trends in traffic is important because infrastructure development, land use and environmental and climate change policy require long-term planning. If estimates of growth forecasted by the NTM are inaccurate this will impact on the robustness of DfT's cost-benefit decisions regarding investment in road infrastructure. This briefing focuses on Great Britain, but highlights key international findings where relevant.

Past trends in traffic

Since the early 1950s there have been marked changes in how people travel. The total distance travelled by people in Britain across all transport types has increased fourfold, from 135 billion passenger miles in 1952 to 508 billion passenger miles in 2007. The most popular types of transport have changed within this timeframe. In 1952 bus and coach travel accounted for the largest share at 42%, whilst travel by car or van accounted for about 27%; however, in 2007, bus and coach travel had declined to 6%, while travel by car or van accounted for the largest share of distance travelled at 84%.³

In terms of all motor vehicle road traffic (cars, taxis, buses, coaches, motorcycles, light vans and heavy goods vehicles), national statistics indicate that since the 1950s the long term trend in the volume of road traffic in Britain has been one of growth, but that over the last 20-25 years there has been a progressive decline in the rate of traffic growth. In 2012, the overall motor vehicle traffic volume was 302.6 billion miles, over 10 times higher than in 1949 (28.9 billion miles). Traffic grew by 50% during the 1980s, by 14% during the 1990s and by 6% between 2000 and 2009. It peaked at 314.1 billion miles in 2007. It then fell for three consecutive years; the first consecutive annual falls since traffic records began. Since 2010 traffic volumes have remained broadly stable and 2012 levels are similar to those seen in 2003.⁴ Historically, low or negative traffic growth has tended to occur at times of economic recession or fuel price spikes, as shown by the markers in Figure 1, which represents year-on-year change in total motor vehicle road traffic volume in Britain, from 1949 to 2011.

Figure 1: Year-on-year change in total motor vehicle road traffic volume in Great Britain, from 1949 to 2011⁵



Car traffic

Since the 1980s, cars have accounted for around 80% of all motor vehicle traffic, and have been the main contributor to changes in the volume of overall motor vehicle travel.⁶ Between 1991 and 2011, total car miles in Britain increased from 208.3 billion miles to 240.7 billion miles.⁷ However, over the same time period, the total population of Britain increased from approximately 55.9 million in 1991⁸ to 61.4 million in 2011.⁹ The British National Travel Survey (NTS) provides evidence that the number of car/van miles driven per person per year¹ has decreased by about 7% between 1995/97 and 2012. In London, the number of car/van miles driven per person per year has decreased by 37% in the same timeframe, which is much more than the national average.¹⁰ The levelling off of car miles per person per year in the last 15-25 years has also been observed in other countries with high levels of car ownership and use, including France, Germany, Japan and the USA.¹¹

Traffic on the Strategic Road Network

The Strategic Roads Network (SRN) consists of most of the motorways and some 'A' roads in England, which are managed by the Highways Agency. Despite making up only 2.4% of road length in England, in 2012 the SRN carried 32.7% of all road traffic and 65.5% of all HGV traffic.¹² It is difficult to determine the change in traffic over time specifically on the SRN because since 1999 the management of parts of the SRN has been transferred from the HA to relevant Local Authorities (22.7%). Taking this into account, best estimates are that traffic volumes on the SRN grew by 7% from 2002 to 2012, compared to a 3% fall experienced by Local Authority managed roads in the same time period; however these statistics are experimental and should be treated with caution.¹³ This suggests that there are different rates of growth on different classes of road, and that the SRN may be under more pressure than its local counterparts due to a concentration of traffic on these road classes, and a relative increase in car miles per person amongst populations using the SRN.

Comparative trends in rail use

The levelling off of car miles per person contrasts strongly with trends in rail traffic in Britain. Following a period of decline in passenger mileage starting in the late 1950s, and flat demand during the 1970s and 1980s, there has been a steady and continual increase in rail traffic since the mid-1990s, right through the recent recession. Between 1995/7 and 2005/7 passenger miles per person on the National Rail network grew by 50%, due almost entirely to higher proportions of the population travelling by train, rather than to existing users making more frequent or longer rail trips.¹⁴

Future trends in traffic

Both proponents and opponents of 'peak car' would generally agree that the number of car miles per person has levelled off or declined since the mid-1990s. Both would also largely agree that changes in travel behaviour are influenced by wider economic factors, as well as social, cultural and spatial factors. However, they disagree as to the primacy of these drivers.

Models estimating increasing traffic growth

In July 2013, DfT published 'Action for Roads', which stated that they expect to see a return to nationwide traffic growth once the economy grows, based on supporting forecasts from the NTM.¹⁵ DfT state that the NTM takes into account a wide range of explanatory factors for the level of road traffic, including congestion levels, demographic changes, manufacturing growth, as well as availability and cost of alternative modes of transport.² However, the NTM finds that the three key drivers for road traffic on the strategic road network are population, income and fuel costs (fuel price and fuel efficiency). Based on estimates of 20% population

¹ Please note that the National Travel Survey (NTS) combines figures for car and van use. The NTS also makes a distinction between driver miles and passenger miles for cars/vans. Car/van passenger miles have decreased by 11% from 1995/97 to 2012. Figures prior to 1995/97 have not been included as data from 1995 onwards have been weighted, causing a one-off uplift in distance travelled per person from 1992/94 to 1995/97.

² Personal correspondence.

growth in England from 2010 to 2040, a rise in GDP per capita of 57% and a fall in fuel costs of 28%, the 2013 central forecast is that total car miles across all classes of roads will increase by 39% from 2010 to 2040 (44% on the SRN and 37% on the non-SRN). In terms of car miles per person, this equates to an increase of 20% percent by 2040 (14% above pre-recession levels). Although this is an increase in car miles per person, it is a smaller increase relative to changes in GDP and fuel price than observed in the past. The 2013 forecast estimates that the rate of traffic growth relative to income growth will continue to decline over time as we move towards saturation in the market, where rising incomes fail to result in demand for additional cars.¹⁶

Models estimating static or declining traffic growth

Proponents of 'peak car' argue that lower growth in GDP and higher fuel prices are important factors, but that they are not sufficient to account for changes in travel behaviour in isolation.¹⁷ They highlight that car miles per person remained stable during the years of steady economic growth from the mid-1990s to 2007.¹⁸ There are various models of explanation for this trend across supporters, but all suggest that there are complex interactions between economic factors and social, cultural and spatial factors, and that these are likely to endure over time to some extent. Consequently, proponents project that on average car miles per person will remain static or decline, even in a growing economy. Taking this into account, they argue that social, cultural and spatial factors will be increasingly important in determining the overall amount and modes of travel in the future.¹⁹

Key factors underlying the peak car debate

Three key observed changes in driving behaviour that contribute to much of the debate as to whether traffic growth is likely to increase, remain static or decrease in the future are outlined below. Whilst there is broad agreement that these changes have occurred, there is debate as to whether economic factors are the key drivers, or whether changes in travel behaviour, land use patterns and demographics will endure beyond economic recovery. This impacts on projections of future car use.

More older people are driving, but less younger people are driving

The number of older people holding a full driving licence has increased. Between 1995/97 and 2012 the proportion of people aged 70 and over holding a licence increased from 38% to 58%, and the proportion of people aged 60-69 increased from 63% to 79%. This is due to an ageing of existing licence holders rather than large numbers of newly qualified drivers in older age groups. By contrast, the proportion of young adults (aged 17-20) with a full driving licence has decreased since the early 1990s when driving licence holding for this age group was at its highest. In 1995/97, 43% of those aged 17-20 held a full licence, compared with a low of 27% in 2004 and 36% in 2012.²⁰ Key evidence as to the reasons for these changes and their likely future impact is below.

- Although more older people (aged over 60) drive than they used to, average car mileage per person peaks in people's 40s and thereafter decreases.²¹ Further, growth in the number of older people driving is generally held to be in line with expectations, because the replacement of carless generations by fully motorised generations is still ongoing, especially for women. This broad trend has also been reported in Germany and France.²²
- The proportion of young people holding a licence in Britain fluctuates year on year and the data does not show a linear downward trend since the early 1990s. However, a systematic review found that driver licensing amongst young people had declined in the last 10-20 years in a number of developed countries, including the US, Australia, Norway, Sweden and Britain.²³ This trend is of key interest within the peak car debate, as it is contrary to what was expected in the past. If it endures, it could mean that car miles per person will gradually fall off as 'generation Y' reach middle age and replace the current generation of highly car-dependent users.²⁴

There is not consensus on whether declining youth licensing is due to choice or constraint. Evidence shows that changes in the affordability of driving (including increasing costs of learning to drive and car insurance and decreasing youth employment) is important. It also suggests that changes in lifestyle (such as more higher education, later marriage and greater urbanisation) and attitudinal factors (such as perception of the car as a status symbol) are also important factors, either in their own right or as modifiers of economic influences.²⁵ Importantly though, it is not clear whether these trends will persist as young people grow older, or whether they are simply delaying getting a license and more research is needed to better understand these complex influences. However, some research in Britain indicates early signs of partial persistence and that the later learning is associated with lower car miles per person in comparison to early learning.²⁶

More women are driving, but men are driving less

Overall, in 2012 men drove nearly twice as many miles per year than women on average (4,291 miles compared with 2,475 miles). However, between 1995/97 and 2012 the average car mileage driven by men fell by 20%, compared to a 25% increase in mileage driven by women.²⁷ This trend has been examined in detail in several studies, including one published by the RAC Foundation based on the NTS survey.²⁸ Key findings from this report are below.

- For men aged 30 and over, reductions in driving mileage were reported to be the result of less miles per driver, with the proportion of males who were drivers remaining stable. The report found that the key factor accounting for most of the reduction in miles by men aged 30 and over was a sharp fall in company car use, which appears to be linked to changes in fiscal policy and that this is likely to be largely a one-off step change reduction. They concluded that if company car mileage is discounted, then there has been a pattern of continuing growth in private car use for those aged 30 and over, outside London, up to 2007.
- For men in their 20s, car miles per person fell by nearly 2,000 miles, or 30%, between 1995/7 and 2005/7. Data indicates that this is due to a combination of fewer young men driving and a reduction in mileage on the part of those who do drive.
- For women, growth in driving levels is partly due to an increasing proportion of the female population becoming drivers. About half of the growth in women's car mileage has been for commuting and work-related travel. It is unclear whether future car use by women will follow current trends among men.

Overall, the 'company car effect' fits well with the changes in travel behaviour amongst middle-aged men. However, the largest reductions in company car miles have been among men classified as 'professionals', and private car miles have also fallen for this group, indicating no aggregate switch from company to private car miles.²⁹ More research needs to be conducted to determine the impact of competing options on the reduction in company car usage, such as using a private car and claiming a business mileage rate or having some form of light van.³⁰ This is important because research around future traffic growth has tended to focus on car use, which has historically been the main contributor to changes in the volume of traffic; however from 2002-2012 traffic volume for all vehicle types decreased except for light goods vehicles (vans), which increased by over a fifth (21.5%).³¹ As such, vans are of growing relevance to overall traffic levels on Britain's roads, and research is needed to understand the differences in how cars and vans are used. Further, the 'company-car effect' cannot explain the sharp downward trend in driving among young men.

People drive less in urban areas, but more in rural areas and on motorways

There is wide agreement that the data indicates differential travel behaviours in different locations, with the distance travelled by car per person in England varying more than fourfold between the most and least urbanised areas (Inner London and mainly rural districts).³² Further, whilst growth in urban areas is decreasing, growth in rural areas has remained static or is increasing.³³ The volume of traffic on motorways has also grown, by 8.4% from 2002 to 2012.³⁴ Key factors influencing this trend are outlined below.

- **Saturation of demand.** The average time spent travelling has remained fairly static over time at around one hour a day (the 'Marchetti wall' effect).³⁵ Some researchers, including a former Chief Scientist at DfT, have argued that people have historically used faster modes of travel, such as the car, to achieve a wider choice of destinations (shops, entertainment etc.) by travelling further within that time.³⁶ However, as roads have become busier the benefits of travelling by car may diminish, especially in urban areas where roads can be highly congested and there is wide choice within a small area. In urban locations (and especially London), this shift has been accelerated by investments in public transport, which has become faster and more reliable, and policy measures to restrict traffic and parking space (such as the congestion charge in London).
- **Re-urbanisation.** Models of population growth and spatial distribution indicate that long-standing trends of counter-urbanisation (movements from conurbations and cities to smaller towns and rural areas) are increasingly being offset by population growth in London and other larger urban areas. This is likely due to a combination of demographic factors (a concentration of international migrants and younger adults generally in these areas) and land use planning policies promoting urban regeneration, the use of 'brownfield' (previously developed) land and higher densities in new developments.³⁷

The NTM takes into account a range of demographic and land use factors in different geographical areas, but it is intended to be a policy tool for the national level. DfT accepts that the NTM has not accurately represented trends in London, but argues that this does not significantly affect the forecasts.³⁸ However, some peak car proponents have highlighted that recent trends for specific groups of people or places are much more apparent at a disaggregate level.³⁹ For example, some researchers argue that although the impact of geographical location on aggregate car use was relatively small alongside the large increases in use generally prior to the 1990s, as the rate of growth overall has declined the issue of spatial distribution has become much more important in explaining current travel behaviour and influencing future trends. Further, DfT's forecasts assume no change in Government policy beyond that already announced. However, researchers have stressed that car use will be shaped by future policies around land use planning and measures to reduce driving, including the viability of alternative modes of transport.

References

- 1 Goodwin, P. & Van Dender, K. (2013). "Peak Car" — Themes and Issues. *Transport Reviews*, 33(3), 243–254. Available at: http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.804133#_Um1FZXC-3PY; Goodwin, P. (2012). Three views on peak car. *World Transport Policy and Practice*. Available at: <http://eprints.uwe.ac.uk/16119/21/wtpp17.4.pdf#page=9>. Goodwin, P. (2012). Peak travel, peak car and the future of mobility: evidence, unresolved issues, and policy implications, and a research agenda. *International Transport Forum Discussion Papers*. Available at: <http://ideas.repec.org/p/oei/iftaab/2012-13-en.html>; Le Vine, S. and Jones, P. (2012). *On the Move. Making sense of car and train travel trends in Britain*. RAC Foundation. Available at: http://www.racfoundation.org/assets/rac_foundation/content/downloadables/on_the_move-le_vine_&jones-dec2012.pdf; Metz, D. (2013). Peak Car and Beyond: The Fourth Era of Travel. *Transport Reviews*, 33(3), 255–270. Available at: http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.800615#_Um1FQ3C-3PY; Van Dender, K. and Clever, M. (2013). *Recent Trends in Car Usage in Advanced Economies – Slower Growth Ahead? Summary and Conclusions of the ITF/OECD Roundtable on Long-run Trends in Car Use*, Paris, 29-30 November 2012. Discussion Paper No 2013-09, International Transport Forum, OECD. Available at: <http://www.internationaltransportforum.org/itrc/DiscussionPapers/DP201309.pdf>.
- 2 Department for Transport (2013) *Action for roads: a network for the 21st century*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212474/road-transport-forecasts-2013.pdf and Department for Transport (2013). *Road transport forecasts 2013 – extended version*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/225483/road-transport-forecasts-2013-extended-version.pdf.
- 3 Office for National Statistics (2010). *Social Trends 40: 2010 edition. Chapter 12, Transport*. Available at: <http://www.ons.gov.uk/ons/rel/social-trends-rd/social-trends/social-trends-40/index.html>.
- 4 Department for Transport (2013). *Annual Road Traffic Estimates: Great Britain 2012*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/208950/road-traffic-statistics-2012.pdf
- 5 Department for Transport (2013). *Annual Road Traffic Estimates: Great Britain 2012. Chart TRA0101e*.
- 6 Department for Transport (2013). *Annual Road Traffic Estimates: Great Britain 2012*.
- 7 Department for Transport (2013). *Table TRA0101, Road traffic (vehicle miles) by vehicle type in Great Britain, annual from 1949 to 2011*. Available at: <https://www.gov.uk/government/statistical-data-sets/tra01-traffic-by-road-class-and-region-miles>.
- 8 Office for National Statistics (2010). *Social Trends 40: 2010 edition. Chapter 1, Population*. Table 1.1.
- 9 Office for National Statistics (2013). *Population and Household Estimates for the United Kingdom, March 2011*. Available at: http://www.ons.gov.uk/ons/dcp171778_304116.pdf.
- 10 Department for Transport (2013). *National Travel Survey 2012*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/243957/nts2012-01.pdf.
- 11 Kuhnimhof, T., Zumkeller, D., & Chlond, B. (2013). Who Made Peak Car, and How? A Breakdown of Trends over Four Decades in Four Countries. *Transport Reviews*, 33(3), 325–342. Available at: http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.801928#_UoC193C-3PY; Le Vine, S. and Jones, P. (2012). *On the Move. Making sense of car and train travel trends in Britain*. RAC Foundation; Millard-Ball, A., & Schipper, L. (2011). Are We Reaching Peak Travel? Trends in Passenger Transport in Eight Industrialized Countries. *Transport Reviews*, 31(3), 357–378. Available at: <http://www.internationaltransportforum.org/itrc/DiscussionPapers/DP201213.pdf>; Van Dender, K. and Clever, M. (2013). *Recent Trends in Car Usage in Advanced Economies – Slower Growth Ahead? Summary and Conclusions of the ITF/OECD Roundtable on Long-run Trends in Car Use*, Paris, 29-30 November 2012. Discussion Paper No 2013-09, International Transport Forum, OECD.
- 12 Department for Transport (2013). *Annual Road Traffic Estimates: Great Britain 2012*.
- 13 Department for Transport (2013). *Annual Road Traffic Estimates: Great Britain 2012*.
- 14 Le Vine, S. and Jones, P. (2012). *On the Move. Making sense of car and train travel trends in Britain*. RAC Foundation.
- 15 Department for Transport (2013) *Action for roads: a network for the 21st century*.
- 16 Department for Transport (2013). *Road transport forecasts 2013 – extended version*.
- 17 Cohen, M. J. (2012). The future of automobile society: a socio-technical transitions perspective. *Technology Analysis & Strategic Management*, 24(4), 377–390. Available at: http://www.tandfonline.com/doi/abs/10.1080/09537325.2012.663962#_Um1H-nC-3PY; Goodwin, P., & Van Dender, K. (2013). "Peak Car" — Themes and Issues. *Transport Reviews*, 33(3), 243–254; Kuhnimhof, T., Zumkeller, D., & Chlond, B. (2013). Who Made Peak Car, and How? A Breakdown of Trends over Four Decades in Four Countries. *Transport Reviews*, 33(3), 325–342; Millard-Ball, A., & Schipper, L. (2011). Are We Reaching Peak Travel? Trends in Passenger Transport in Eight Industrialized Countries. *Transport Reviews*, 31(3), 357–378; Stokes, G. (2013). The Prospects for Future Levels of Car Access and Use. *Transport Reviews*, 33(3), 360–375. Available at: http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.800614#_UoC7eXC-3PY.
- 18 Van Dender, K. and Clever, M. (2013). *Recent Trends in Car Usage in Advanced Economies – Slower Growth Ahead? Summary and Conclusions of the ITF/OECD Roundtable on Long-run Trends in Car Use*, Paris, 29-30 November 2012. Discussion Paper No 2013-09, International Transport Forum, OECD.
- 19 Metz, D. (2013). Peak Car and Beyond: The Fourth Era of Travel. *Transport Reviews*, 33(3), 255–270 and Stokes, G. (2013). The Prospects for Future Levels of Car Access and Use. *Transport Reviews*, 33(3), 360–375.
- 20 Department for Transport (2013). *National Travel Survey 2012*.
- 21 Le Vine, S. and Jones, P. (2012). *On the Move. Making sense of car and train travel trends in Britain*. RAC Foundation.
- 22 Kuhnimhof, T., Zumkeller, D., & Chlond, B. (2013). Who Made Peak Car, and How? A Breakdown of Trends over Four Decades in Four Countries. *Transport Reviews*, 33(3), 325–342.
- 23 Delbosc, A., & Currie, G. (2013). Causes of Youth Licensing Decline: A Synthesis of Evidence. *Transport Reviews*, 33(3), 271–290. Available at: http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.801929#_Um1HbnC-3PY.
- 24 Stokes, G. (2013). The Prospects for Future Levels of Car Access and Use. *Transport Reviews*, 33(3), 360–375.
- 25 Delbosc, A., & Currie, G. (2013). Causes of Youth Licensing Decline: A Synthesis of Evidence. *Transport Reviews*, 33(3), 271–290; Goodwin, P. & Van Dender, K. (2013). "Peak Car" — Themes and Issues. *Transport Reviews*, 33(3), 243–254; Kuhnimhof, T., Armoogum, J., & Buehler, R. (2012). Men shape a downward trend in car use among young adults—evidence from six industrialized countries. *Transport Reviews*, 33(3), 325–342; Van Dender, Kurt and Clever, Martin (2013). *Recent Trends in Car Usage in Advanced Economies – Slower Growth Ahead? Summary and Conclusions of the ITF/OECD Roundtable on Long-run Trends in Car Use*, Paris, 29-30 November 2012. Discussion Paper No 2013-09, International Transport Forum, OECD
- 26 Goodwin, P. & Van Dender, K. (2013). "Peak Car" — Themes and Issues. *Transport Reviews*, 33(3), 243–254 and Stokes, G. (2013). The Prospects for Future Levels of Car Access and Use. *Transport Reviews*, 33(3), 360–375.
- 27 Department for Transport (2013). *National Travel Survey 2012*.
- 28 Le Vine, S. and Jones, P. (2012). *On the Move. Making sense of car and train travel trends in Britain*. RAC Foundation.
- 29 Le Vine, S. and Jones, P. (2012). *On the Move. Making sense of car and train travel trends in Britain*. RAC Foundation.
- 30 Le Vine, S., Jones, P., Polak, J. (2013) The contribution of benefit-in-kind taxation policy in Britain to the 'Peak Car' phenomenon. *Transport Reviews*. 33(5). Available at: http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.827267#_Um1E33C-3PY.
- 31 Department for Transport (2013). *National Travel Survey 2012*.
- 32 Headicar, Peter. (2013). The Changing Spatial Distribution of the Population in England: Its Nature and Significance for "Peak Car." *Transport Reviews*, 33(3), 310–324. Available at: <http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.802751>.
- 33 Le Vine, S. and Jones, P. (2012). *On the Move. Making sense of car and train travel trends in Britain*. RAC Foundation.
- 34 Department for Transport (2013). *Annual Road Traffic Estimates: Great Britain 2012*.
- 35 Department for Transport (2013). *National Travel Survey 2012*.
- 36 Metz, D. (2013). Peak Car and Beyond: The Fourth Era of Travel. *Transport Reviews*, 33(3), 255–270. Available at: http://www.tandfonline.com/doi/abs/10.1080/01441647.2013.800615#_Um1FQ3C-3PY.
- 37 Headicar, Peter. (2013). The Changing Spatial Distribution of the Population in England: Its Nature and Significance for "Peak Car." *Transport Reviews*, 33(3), 310–324; Newman, P. (2012). Briefing: Peak car use—what does it mean for urban design and planning? *Proceedings of the ICE-Urban Design and Planning*. 165(4): 197-200. Available at: <http://www.icevirtuallibrary.com/content/article/10.1680/udap.12.00018>; Williams, Ian and Jin, Ying (2013). *The impacts of urban densification on the supply and demand for transport*. Paper accepted at European Transport Conference 2013. Frankfurt, 30 Sept-2 Oct; WSP and Arup (2005). *Impacts of Land use Planning Policy on Transport Demand and Congestion*. Cambridge: WSP/ARUP for DfT. Available at: http://www.wspgroup.com/upload/documents/PDF/news%20attachments/PPG13_Final_Report.pdf.

³⁸ Department for Transport (2013). *Road transport forecasts 2013 – extended version*.

³⁹ Goodwin, P. (2012). *Peak Travel, Peak Car and the Future of Mobility*. Discussion Paper No 2012-13, International Transport Forum, OECD.