Road Transport Forecasts 2013

Results from the Department for Transport's National Transport Model

1.1 Road Transport Forecasts 2013 presents the latest results from the Department for Transport's National Transport Model (NTM) for traffic demand, congestion and emissions in England up to 2040.

1.2 The NTM is designed to forecast long-term trends (currently 2010 to 2040 in five year intervals) rather than individual years. The NTM Road Traffic Forecasts should not be viewed as what we think will actually happen in the future, or what we want the future to look like. The forecasts are what may happen, based on:

- Our current understanding of how people make travel choices
- The expected path of key drivers of travel demand
- Assuming no change in government policy beyond that already announced.

The nature of travel demand and the SRN

1.3 Transport demand is derived from the people and goods that society wishes to move around, given the costs and benefits of doing so. By and large, people do not demand transport for its own sake – it is a means to an end and dependent on the needs of the economy and preferences of people in society. Demand is therefore not a fixed quantity – it's a result of factors that influence people's decision making and which, in aggregate, determine its size and pattern.

1.4 The SRN is composed of motorways and other trunk roads in England, and is managed by the Highways Agency. It now encompasses 4,400 miles of road. Despite representing only 2% of the English road network, the SRN carries over a third of car and van traffic and over 65% of heavy vehicles (freight) traffic.

The three key drivers of travel demand

1.5 Demand for road travel is driven by 'macro' factors, like population, demography, economic growth, money cost of driving. Demand is also driven by more 'micro' influences on individuals' decision-making such as personal circumstances and preferences. These drivers of demand are constrained by network capacities and performance limitations.

1.6 The forecasts presented in this paper show the results of the NTM under central assumptions for the three key drivers. This paper also presents the impact of high/low projections for population, GDP per Capita and oil prices. A description of the three key drivers, how they impact of travel demand and the projections used in the modelling are detailed below.

Population

1.7 A rise in population mean there are more people choosing to travel for economic and personal needs and more transportation of goods and services. This will increase car ownership and the total number of trips taken.

1.8 Based on ONS projections, the central forecasts for car travel demand assumed that the population in England to rise by around 20% (or 10.5 million people) from 2010 to 2040, putting substantial additional pressure on the network. The low population projection assumed a rise of 10% and the high a rise of 30%.[1]

1.9 Demographics of a population can also play a significant role in transport demand. In particular population ageing will decrease number of trips, as older people tend to make fewer trips. The forecasts assume that the proportion of population that is aged 65+ rises from 16% in 2010 to 23% in 2040.

Economic Growth

1.10 A rise in GDP per capita means individuals will have more disposable income, a higher value of time and increase their general demand for goods and services. As people are better off they may also spend a share of their increased income on road transport through purchasing and using a car. Moreover, as economic activity increases because of higher consumption levels, road transport demand is also likely to increase in order to allow for additional production and distribution of goods and services through commercial freight vehicles.

1.11 Based on OBR projections, the central forecasts for travel demand assumed that GDP per Capita to rise by around 66% from 2010 to 2040. The low GDP per Capita projection assumed a rise of 37% and the high a rise of 101%.[2]

Fuel Cost of Driving: Fuel price and fuel efficiency

1.12 The money cost of driving impacts on transport demand as the higher the money cost of road transport relative to alternatives (other travel modes or activities) the lower the projected demand will be.

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1 The modelling of future trip rates and car travel demand uses the ONS 2008 Principal Population projections which are the basis of DfT's detailed population and demographic projections, NTEM 6.2, produced in 2011. For forecasts of commercial vehicle traffic growth (Light Goods and Heavy Goods vehicles) the ONS 2010 Low Migrant Variant population projection was used to be in line with the OBR's projection of economic growth. High and Low population projections are also from the ONS and are based on assumption variants of assumptions on population birth rates, life expectancy and net migration. See http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Population+Projections

2 Source: GDP growth rates consistent with Budget 2013 OBR Economic Outlook and June 2012 OBR Fiscal Sustainability Report long-term growth projections. GDP per capita relates to forecast growth in GDP per capita in the UK. In previous publications GDP used official HMT/OBR GDP based on the RPI deflator; OBR has recently shifted to a CPI Deflator methodology, which has increased GDP by an average of 0.2% per annum, although this does not reflect any actual change in the underlying economy. The low/high GDP per capita sensitivities were estimated using the OBR's 80/20 percentile 5 year ahead GDP forecasts and after this their low/high productivity forecasts.

1.13 The cost of driving includes various elements such as the costs of purchasing a vehicle, insurance, fuel costs and servicing costs. The fuel cost of road travel is highly dependent on the oil price, taxation on the marginal use of road transport (fuel duty and VAT) and the fuel efficiency of the vehicle (i.e. the miles that a vehicle can travel per litre of fuel). Reductions in the cost of driving increase the number of car trips and distance per trip as road travel becomes cheaper.

1.14 Combining projections of fleet fuel efficiency and fuel price determines the fuel cost of driving per mile. The fuel cost of driving has increased in 2011 due to increase in the oil price, but in the future fuel economy improvements will reduce the fuel cost for cars and Light Goods Vehicles (LGVs). From 2010 to 2040 these fuel costs of driving are projected to fall by 24% for cars and 7% for LGVs. For Heavy Goods Vehicles (HGVs) the fuel cost of driving is projected to rise as increases in the fuel price outweigh improvements in fuel efficiencies. From 2010 to 2040, HGV fuel cost of driving is projected to rise by 36%.

1.15 These forecasts have used the central, low and high oil price projections from DECC published in autumn 2012.

Network Capacity and Congestion

1.16 The time cost of travel is a key driver of demand at the 'micro' level because it is unique to each individual and situation. However, the time cost of travel by road will also be influenced by some 'macro' factors that affect average speeds, such as network capacity and congestion. A rise in journey time cost of driving will lower demand for road transport.

1.17 The NTM has a representation of the road network that is updated in line with the Highway Agency road programme and agreed local road schemes. Around 400 lane miles of capacity have been added to the existing network by 2020 based on the Spending Review 2010 (SR 2010)[3], Growth Review 2014 and the announcement in May 2012 of six schemes designed to ensure the maintenance of a "pipeline" of future Highways Agency projects[5].

Updating the NTM

1.18 Peer review and external validation have consistently shown that the National Transport Model (NTM) provides robust results and is fit for purpose as a high level strategic model. Nevertheless, the assumptions and methodologies used by the NTM are kept under review. Many of the main forecasting assumptions, such as forecasts of GDP are updated before each new forecast and the projections set out in this paper have made use of the latest available data.

[3] The Investment in Highways Transport Schemes (2010) sets out the projects assumed in the modelling. http://webarchive.nationalarchives.gov.uk/20110504115831/http://www.dft.gov.uk/pgr/roads/network/strategic/highwaystransportschemes/pdf/highwaystransportschemes.pdf

[4] http://cdn.hm-treasury.gov.uk/2011budget_growth.pdf

[5] More information on future HA transport infrastructure schemes to upgrade the Strategic Road Network can be found here: http://www.highways.gov.uk/our-road-network/managing-our-roads/major-projects/highways-agencys-future-delivery-programmes/future-spending-reviews/

1.19 We are continuously upgrading and improving the NTM incorporating new features and adapting the modelling assumption to observed trends. Future NTM projects include:

- Analysis and recalibration of trip rates;
- Investigation of LGV market maturity assumptions;
- London travel forecasting (see Box 2); and
- Incorporation in the fleet of ultra-low emission vehicles (see Box 3).

1.20 We aim to stay open and keep engaging with external stakeholders extensively in the future. We will collaborate with experts and professionals to make sure we communicate our vision, our NTM development programme and that these are widely recognised as appropriate.

Road Traffic Projections

1.21 This section presents the NTM forecasts of traffic demand growth over the period to 2040. As described in the previous section the main changes to the central demand forecast from 'Road Transport Forecasts 2011', have been to revised central projections of population, GDP, and oil prices.

1.22 Figure 1 below shows the NTM forecasts for total traffic on the all roads in England up to 2040. Table 1 details the forecasts for total traffic on the SRN, Non-SRN and all roads in England through to 2040. The NTM starts from a base year of 2003 and projects traffic in 2010 and every 5 years to 2040. Overall we can see that the NTM has modelled the general trend in total traffic from 2003-2010, with flat growth attributable to the economic slowdown and sustained high oil prices. The NTM projects that traffic will be sluggish up to 2015 in line with projected low GDP growth and high fuel costs. As England then moves out of the recession and rapid fuel efficiency improvements significantly decreasing the fuel cost of driving, traffic is expected to rise by 19% from 2015 to 2025. As the rate of improvements in vehicle fuel efficiencies declines after 2025 we observe a slower growth in traffic. The central forecast from 2010-2040 projects traffic to grow by 41% for Non-SRN roads, 46% for SRN and an average of 43% for all roads.

1.23 Figure 1 and Table 1 below also show the impact of sensitivities of the three key drivers discussed above, one of top of another. For example, below we can see the impact of the low population projection, then low population and low GDP per capita, then finally the forecasts if we also saw a high oil price. This combined low demand scenario assumes that all three sensitivities occur which is highly unlikely and should be seen as extreme scenario.

1.24 There are many other variables that have not been included where further scenario testing could be done. We will continue to review how we can represent uncertainty within the forecasts.

Figure 1: England Traffic on all roads (bn vehicle miles)

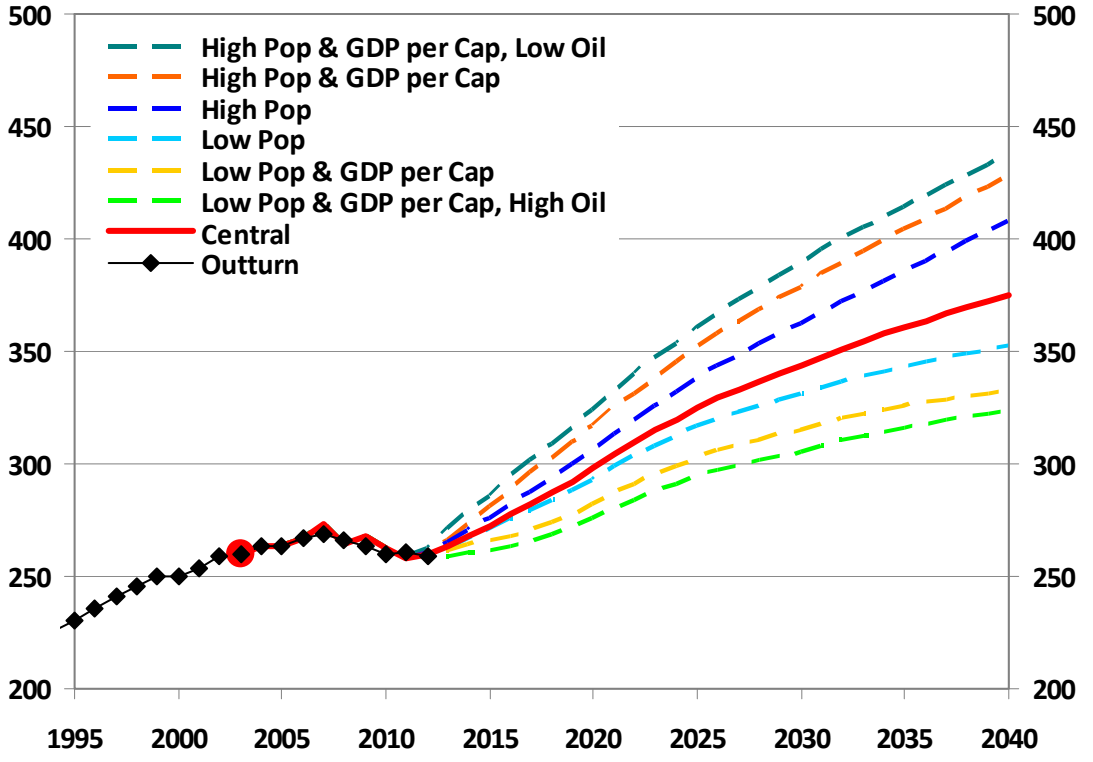

Figure 2: England Traffic on the SRN (bn vehicle miles)

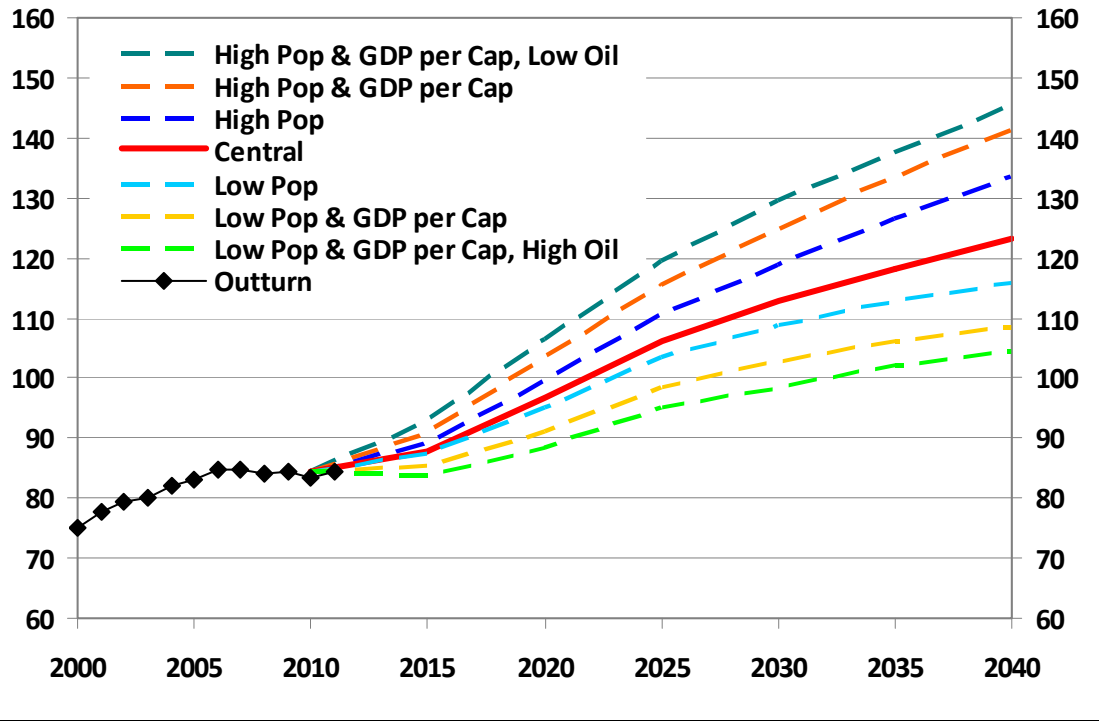

Table 1: England Traffic % growth by Road, Vehicle type and Scenario, 2010-2040

	Road Type	Car	LGV	HGV	PSV	Total
Low Pop & GDP per Cap, High Oil	SRN	24.7%	45.7%	-8.9%	-0.3%	23.6%
	Non-SRN	21.0%	45.6%	-16.7%	0.7%	23.0%
	All	22.1%	45.6%	-11.8%	0.5%	23.2%
Low Pop & GDP per Cap	SRN	29.7%	50.6%	-7.2%	-0.3%	28.2%
	Non-SRN	24.0%	49.9%	-17.9%	0.7%	26.1%
	All	25.8%	50.1%	-11.1%	0.5%	26.8%
Low Pop	SRN	34.7%	70.7%	14.5%	-0.3%	37.0%
	Non-SRN	28.0%	70.0%	6.4%	0.7%	32.8%
	All	30.1%	70.2%	11.5%	0.5%	34.2%
Central	SRN	43.5%	80.0%	21.5%	-0.3%	45.6%
	Non-SRN	36.7%	79.4%	14.3%	0.7%	41.5%
	All	38.8%	79.6%	18.8%	0.5%	42.8%
High Pop	SRN	54.5%	98.6%	36.6%	-0.3%	58.0%
	Non-SRN	48.0%	98.1%	31.6%	0.7%	53.9%
	All	50.0%	98.2%	34.8%	0.5%	55.2%
High Pop & GDP per Cap	SRN	58.5%	117.4%	69.8%	-0.3%	66.9%
	Non-SRN	51.7%	117.5%	69.8%	0.7%	60.7%
	All	53.8%	117.5%	69.8%	0.5%	62.7%
High Pop & GDP per Cap, Low Oil	SRN	63.2%	125.0%	72.9%	-0.3%	71.8%
	Non-SRN	54.7%	124.8%	66.6%	0.7%	64.1%
	All	57.3%	124.9%	70.6%	0.5%	66.6%

Box 1: HS2 Impact on SRN

In 2026 the new High Speed rail line between London and Birmingham will be finalised, and in 2033 the second phase, the Y network from Birmingham to Manchester and the Yorkshire, will be open to the public. This new line represents a major link connecting key urban and economic areas of the country attracting an important share of long distance passenger's trips along its trajectory.

We complement the traffic forecasts presented in this section with an assessment of the impact HS2 is projected to have on car traffic on the SRN, using the demand projections produced by HS2 Ltd.6 HS2 Ltd forecasts that around 7% of its travel demand will be shifted from road travel. In 2037 this means that around 25,000 trips per day, equivalent to 0.9% of long distance inter-zone car trips will be shifted to HS2. This 0.9% is equivalent to one year's traffic growth and highlights that the impact of HS2 does not affect the key facts and conclusion of this document.

[6] http://www.hs2.org.uk/news-resources/publications/economic-documents

Box 2: London Scenario

Our London forecast is higher than what other institutions such as Transport for London are currently projecting. This is partially because the NTM is designed to project national traffic levels, not regional or local ones. We are aware of this discrepancy and analysis of our forecast from 2003-2010 shows that although the NTM predicts a fall in London car traffic of 1.5%, this was not as great as the actual 7.8% fall in traffic count statistics.

We believe that the reason for this short-term model error and long-run discrepancy with other forecasts is due to:

UUCar Ownership – the number of cars per person in London has been relatively flat over the last decade. While we have different car ownership saturation levels for different area types, including London, these may need to be re-estimated.

Public Transport - London has seen high levels of investment in public transport, capacity and quality improvement on buses and rail based public transport. London will continue to see high levels of investment in public transport with increase in capacity into the future, e.g. Cross Rail. We will need to revisit our modelling on the impact this may have on car travel.

Road capacity, car parking space cost and availability – There is evidence to suggest that In recent years London road capacity has been significantly reduced due to bus lanes, congestion charge and other road works. There is also a significant constraint and cost to parking in London which would reduce the demand to travel by car. We will need to revisit our modelling on the impact this may have on car travel.

A sensitivity scenario has been constructed for the 2020 NTM forecast that attempted to match TfL forecasts for car ownership and car traffic for the same period7. Using this sensitivity we were then able to evaluate the impact of that this would have on the NTM forecast for England SRN traffic growth. This scenario assumed the same level of cars per person in London in 2020 as has been seen in recent years. This meant the number of cars per person in London was reduced from 0.39 in the central case to about 0.33 cars per person in this scenario. Also, a 10% constraint to London roads capacity was applied as in recent years London road capacity has been significantly reduced due to bus lanes, congestion charge and other road works. We are investigating what London road capacity constraint should exactly be, in the meanwhile, 10% best approximates the potential impact.

As a result of this scenario sensitivity, the NTM 2020 forecast broadly matched TfL's forecast with total London car ownership fell by 16% in 2020 compared to our current NTM central forecast, with 2020 London car traffic around 9% lower than our central forecast. Overall, car traffic on the SRN in 2020 was around 1% lower than central forecast. Therefore it appears that this London car traffic over-forecasting issue in the NTM does not significantly affect the forecasts for England SRN traffic growth.

Road Congestion Projections

1.25 With constrained road space, road traffic growth means greater pressure on the network and therefore higher levels of congestion. Congestion here is measured in 'lost time' – the difference in journey time between modelled and 'free flow' speeds. The NTM forecasts where congestion problems may arise by comparing traffic demand with road capacity.

1.26 Table 2 below shows that by 2040 the central scenario projects that on the SRN lost seconds per mile will increase by 114%, whereas average speed will decrease by 8%. The proportion of all traffic travelling in highly congested condition on the SRN will significantly increase to 15% by 2040. Even in the extreme 'Low pop, GDP per Cap and High Oil' scenario a deterioration in travelling conditions is still present, with lost seconds per mile on the SRN rising by 36% and average speed travelled falling by 2%.

Table 2: Traffic and measures of delay - England, SRN

		2010-2040 % change			% of traffic in very congested conditions[8]
	Road Type	Total Traffic	Congestion (Lost Sec's/Mile)	Vehicle Speed	
Low Pop & GDP per Cap, High Oil	SRN	24%	36%	-2%	8%
	Non-SRN	23%	25%	-4%	11%
	All	23%	26%	-4%	10%
Low Pop & GDP per Cap	SRN	28%	47%	-3%	9%
	Non-SRN	26%	31%	-5%	11%
	All	27%	32%	-5%	11%
Low Pop	SRN	37%	79%	-6%	12%
	Non-SRN	33%	42%	-7%	13%
	All	34%	45%	-6%	13%
Central	SRN	46%	114%	-8%	15%
	Non-SRN	41%	56%	-9%	14%
	All	43%	61%	-9%	15%
High Pop	SRN	58%	179%	-13%	21%
	Non-SRN	54%	78%	-12%	17%
	All	55%	87%	-12%	18%
High Pop & GDP per Cap	SRN	67%	245%	-17%	27%
	Non-SRN	61%	93%	-14%	19%
	All	63%	107%	-14%	21%
High Pop & GDP per Cap, Low Oil	SRN	72%	278%	-19%	30%
	Non-SRN	64%	101%	-15%	19%
	All	67%	117%	-15%	23%

Road Emissions Projections

1.27 The reduction of greenhouse gas (GHG), Nox and PM10 emissions is a domestic and international policy aim. The NTM allows us to forecast the impact of changing traffic demand, policy and technological advancement on emissions which account for the vast majority of transport emissions. The forecasts presented below assume no further emission reducing policies for road transport beyond those announced to meet the first three carbon budgets and expectations in the uptake of Ultra Low Emission Vehicles (see box 3 below). They therefore represent what would happen if no further emission reducing policies were introduced beyond current announced policy and expectations, and should not be interpreted as a statement of policy.

1.28 This document assumes improvements in car fleet fuel efficiencies due to EU car CO2 regulations for 2015 (130g CO2/km) and 2020 (95g CO2/km) plus complementary measures implemented through EU regulations, including gear shift indicator lights, low rolling resistance tyres, tyre pressure monitoring systems and fuel efficient air conditioning systems.

1.29 In this forecast improvements in van fleet fuel efficiencies due to EU new van CO2 target being met in 2017 (175g CO2/km) and in 2020 (147g CO2/km) were assumed. These reflect current committed policy, though in practice we would expects on going improvements in vehicle fuel efficiency after 2020.

1.30 Ultra-Low Emission Vehicles (ULEVs) are assumed to lead to a further reduction in CO2 emissions, assuming that 5.31% of car mileage is powered by mains electricity by 2030 in alignment with WebTAG guidance.

1.31 For HGVs we assume that industry led action leads to 5% improvement in HGV efficiency over 5 years in addition to improved efficiencies from the roll out of Low Rolling Resistance Tyres (LRRT) for HGVs due to EU regulation.

1.32 It is assumed biofuels achieve a road fuel share of 8% by energy by 2020, and then from 2021 the use of biofuel reverts back to the Renewable Transport Fuel Obligation level of 5% by volume. This reduction in biofuel volumes is for modelling purposes only and does not imply any change in policy or in government commitment to renewables.

1.33 Other assumptions include the Local Sustainable Transport Fund reduction of urban car trips by around 2% in 2015 with decay in impact over time, and an expanded use of Low Carbon buses within London, further reducing CO2 emissions from road transport.

Box 3: Ultra-Low Emission Vehicles (ULEVs)

The government's Carbon Plan (2011) set out the likely scale of greenhouse gas (GHG) reductions necessary in transport to meet the government's goal of reducing GHGs by 80% in 2050. It concluded that almost every new car and van needs to be zero-emission at the tailpipe by 2040.

Government policies are already encouraging the uptake of ultra-low emission vehicles such as electric cars, supporting the early market through upfront purchase subsidies and infrastructure provision. Administered by the Office for Low Emission Vehicles, bringing together officials from BIS, DECC and DfT, these policies are a first step on the road to the decarbonisation of cars and vans.

We have estimated the impact of announced and committed policies on uptake of ULEVs. The technologies covered by these models include pure electric, hybrid, plug-in hybrid and fuel-cell vehicles.

We have used these estimates to adjust the total estimated emissions from the National Transport Model. We are working to develop the NTM to incorporate ULEVs so that key outputs such as CO2 emissions and air pollutants are estimated directly by the NTM.

1.34 Figure 3 and Table 3 below presents the outturn data and forecasts for CO2 in England on all roads. Up to 2030 CO2 emissions are projected to decline by 20% before starting to slowly rise again due to increasing travel demand. Without further policy intervention and improvements in fuel efficiency, this would imply a 15% reduction on 2010 levels by 2040.

Figure 3: England All Roads CO2 (mtCO2) Forecasts

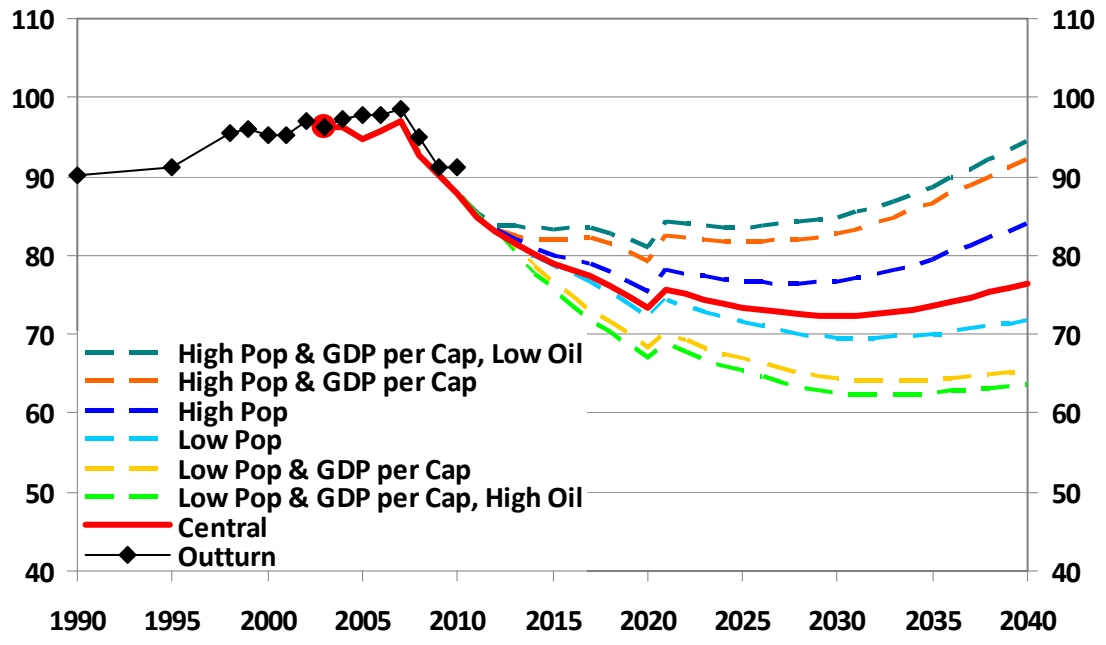

Table 3: England CO2 emissions % change by Vehicle type and Scenario, 2010-2040

Scenario\Vehicle	Car	LGV	HGV	PSV	Total
Low Pop & GDP per Cap, High Oil	-38.3%	-5.2%	-23.3%	-11.2%	-29.7%
Low Pop & GDP per Cap	-36.4%	-2.2%	-22.3%	-10.7%	-27.8%
Low Pop	-34.1%	11.0%	-3.0%	-9.6%	-20.5%
Central	-29.4%	17.4%	3.6%	-8.2%	-15.4%
High Pop	-23.3%	30.0%	17.7%	-6.1%	-6.8%
High Pop & GDP per Cap	-21.0%	42.7%	48.2%	-4.6%	2.6%
High Pop & GDP per Cap, Low Oil	-19.1%	47.6%	50.4%	-3.9%	5.0%

1.35 Road transport NoX and PM10 emissions from 2010-2040 are forecast to fall substantially by 62% and 93% respectively. Figures 4 and 5 below present NTM projections of NOx and PM10 emissions from road transport in England up to 2040. The NTM forecasts a continuing downward trend until 2025, in line with historical precedent and deployment of new vehicle EURO standards. After 2025, PM10 and Nox emissions are projected to plateau, at significantly lower levels than those observed in 2010.

Figure 4: England All Roads Nox (kt) Forecasts

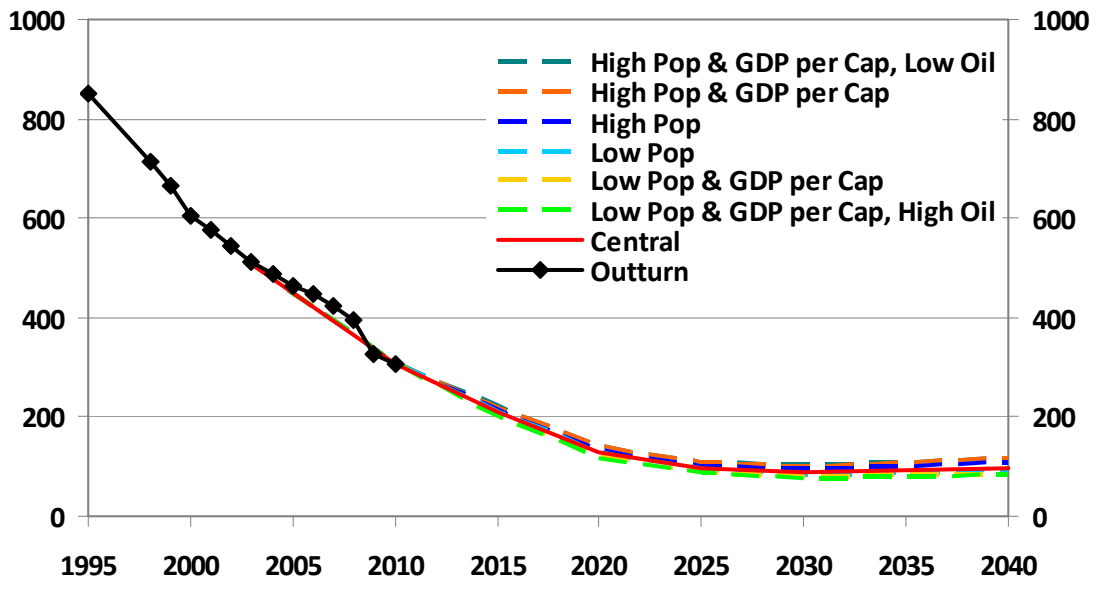

Figure 5: England All Roads PM10 (kt) Forecasts