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Inspiring Futures for Zero Carbon Mobility (INFUZE)

Overshoot: An analysis of progress, risks and opportunities for decarbonising surface transport

Greg Marsden

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Executive Summary

This report is published nearly five years on from the Department for Transport's Decarbonisation Plan. It provides an assessment of carbon reduction progress and plans which the Department promised to do, but has not undertaken.

The headline is simple. The current plans will significantly overshoot the anticipated progress set out by the Climate Change Committee. Every time a carbon reduction pathway is published, the shape looks the same but the ambition slips back.

Some things are now clearer. The phase out of the sale of fossil fuel cars and vans is established through the ZEV mandate and this is absolutely critical to the planned decarbonisation pathway. Work now turns to how to manage the transition for the HGV sector. It is also clear that the Department for Transport has little interest in managing road traffic demand as part of the strategy. Its projections assume that traffic will grow at twice the rate seen in the past 25 years. This makes little sense.

In order to accommodate this anticipated growth in traffic, very aggressive assumptions about the shift to miles driven in electric vehicles are required. This involves also imagining very high sales volumes, not seen since before the pandemic. There is a very strong risk of a much bigger carbon overshoot as the fleet turnover is unlikely to reach these levels, particularly in a cost-of-living crisis. The plan also reveals an assumed growth in the size of the car fleet of 10 million vehicles by 2050. Not only does this further risk the deterioration of liveability in our towns and cities, it poses a major threat to carbon reduction through the additional manufacturing emissions that this requires, including from batteries.

Any drift in policy, which seems plausible given the general economic and global headwinds into which the plan is being delivered, could see a doubling of the carbon overshoot. The worst-case scenario suggests an overshoot equivalent to the entire carbon budget for surface transport from 2031 to 2050.

The implications of this report should be profound. They should impact the strategic case for every plan, scheme and, therefore, the allocation of funds across national networks and local government. Saying anything critical of decarbonisation policy at a time where some political parties are targeting 'net zero nonsense' could be fuel to the flames. However, whilst we have

run out of road space for minor adjustments in policy to make a difference to meeting our carbon budgets, every action that is taken matters to the level of overshoot. It is also important to stress that decarbonisation is not somehow separate from improving the affordability, health and resilience of our communities and the productivity of the economy. There remain opportunities for a more radical and exciting rethink of how we access and use vehicles and move around. This report calls for a national Task Force to be established to explore this potential.

1. Purpose

It is well established that the transport sector is the largest source of carbon emissions in the UK, as in many parts of the world. In 2025 the Climate Change Committee estimated that transport[1] as a whole was responsible for 36% of all greenhouse gas emissions, with surface transport responsible for 25% all emissions (CCC, 2025a). This paper focuses on surface transport emissions.

Despite the size of the sector, surface transport has repeatedly been slower to decarbonise than the Climate Change Committee has anticipated, with emissions in 2025 over 60% higher than had been suggested a decade previously (CCC, 2015). The assumptions in 2015 were for a reduction in absolute traffic levels, a more rapid than observed adoption of electric vehicles and more substantial improvements in the efficiency of conventional vehicles than was realised. However, more recently, significant progress has been made with the legislation of the phaseout of the sales of fossil-fuel vehicles for cars and light goods vehicles through the Zero Emission Vehicles Mandate (DfT, 2025) and a consultation being brought forward for how to manage the transition for Heavy Goods Vehicles (DfT, 2026a). The pathway may be becoming clearer, but where are we on ambition? What are the key risks? And what are the implications for wider transport policy?

"We will publish our progress and review our pathway at least every five years" (DfT, 2021: 17)

In 2021 the UK Department for Transport published its first Transport Decarbonisation Plan (DfT, 2021) setting out a raft of commitments and a pledge to review the progress against the plan in 2026. No such review seems to be forthcoming. A whole of government Carbon Budget and Growth Delivery Plan (DESNZ, 2025) was published in October 2025. However, whilst the report runs to over 200 pages, it is not possible to transparently understand the assumptions which are made in establishing the baseline or the scenario set out in the plan.

In January 2026 an Environmental Information Regulations Request was issued and in March 2026 the data was released. This report compares the data in this release to the plans for the sector set out in the December 2020 6th Carbon Budget (CCC, 2020),

[1] Including international aviation and shipping.

Transport Decarbonisation Plan (July 2021) and 7th Carbon Budget (February 2025) to set out what has changed. It provides the transparent check on progress which a review of the Transport Decarbonisation Plan could, and should, have done.

Ambition on carbon reduction continues to slip back. Whilst there is now a more credible pathway, it is one that overshoots what the Climate Change Committee believed possible and is replete with risks. The Carbon Scenario Estimator Tool (Marsden, 2023) has been further developed to explore these risks and to consider alternative policy scenarios which could reduce the overshoot. The reality is that it has taken too long to put the policies in place to bend the curve for transport. Without a radical rethink, the question is not if we overshoot but by how much. That has important implications for wider transport policy.

This report is structured around the key factors which determine the overall emissions produced by the sector. Section 2 explores the assumptions being made about the size of the fleet, including new car sales and vehicle fleet turnover. Section 3 explores how quickly it is assumed that fossil fuel miles will be replaced with miles driven by electric or other zero emission vehicles. Section 4 examines the assumptions made about how the efficiency of the remaining fossil fuel fleet will change over time. Section 5 sets out what has been assumed about the total vehicle miles driven under different scenarios. Taken together these provide an insight into the key elements of carbon reduction. The report takes this analysis beyond the in-use emissions from driving and also examines the implications of a growing vehicle fleet with increased electrification on manufacturing emissions. Section 7 uses the CaSE model to explore key sensitivities to examine how important further action on traffic reduction or electrification might be. It also explores best and worst-case scenarios. Section 8 draws together the findings from the report in a series of conclusions. In the light of the recent Integrated National Transport Strategy for England and the new Scottish Climate Change Action Plan, a small set of targeted recommendations are developed for different stakeholder groups.

2. Size and Age of the Fleet

Key findings:

- **Likely overestimation in the growth of the car fleet.**
- **Risk that new car sales are too optimistic which inflates rate of EV penetration.**
- **Trend of an ageing car fleet is assumed to reverse which could inflate carbon savings.**

The Transport Decarbonisation Plan (TDP hereafter) did not set out its assumptions on the size of the vehicle fleet or the assumptions about new car sales and retirement rates. The focus of the ZEV mandate policy is on the percentage of electric vehicles sold each year. What matters to carbon reduction is the reduction in fossil fuel vehicle miles driven, which also depends on how many fossil fuel vehicles are sold up to 2030 and how quickly existing fossil fuel vehicles are retired. It is important to note that the average age of the car fleet has increased from 7 years and 5 months in 2015, to 9 years and 10 months in the decade from 2015 (RAC Foundation, 2025) with a reduction in new car sales particularly since the Covid-19 pandemic. Figures 1 and 2 show the Department for Transport's assumptions around total fleet size for cars and vans respectively. The HGV fleet has a very modest increase over time. Figure 3 shows the assumed new car sales figures and Figure 4 the retirement rates.

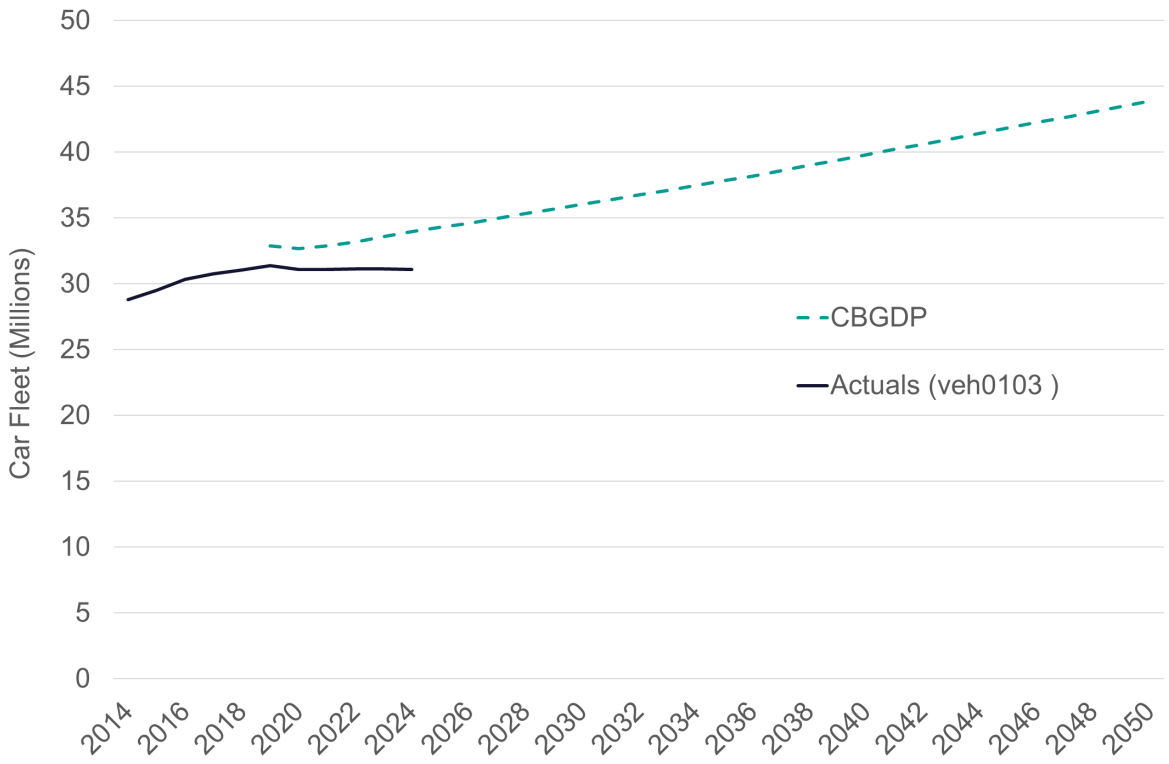

Figure 1: Observed and projected car fleet size

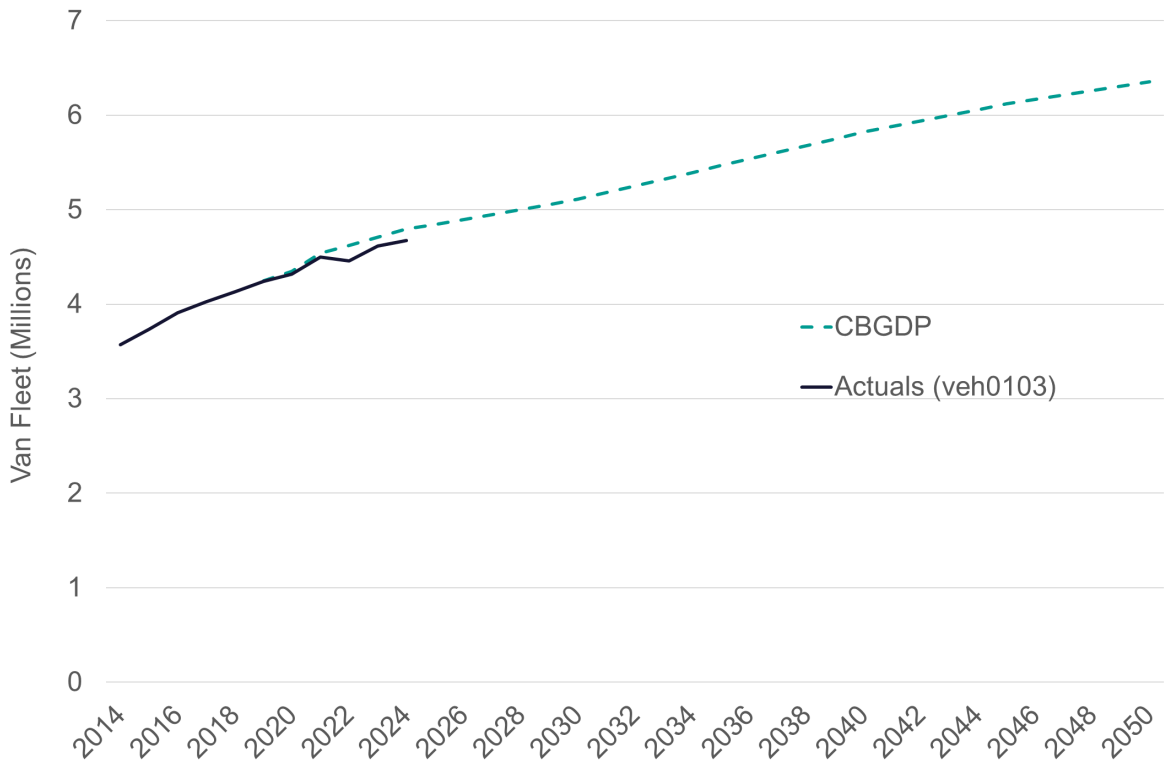

Figure 2: Observed and projected van fleet size

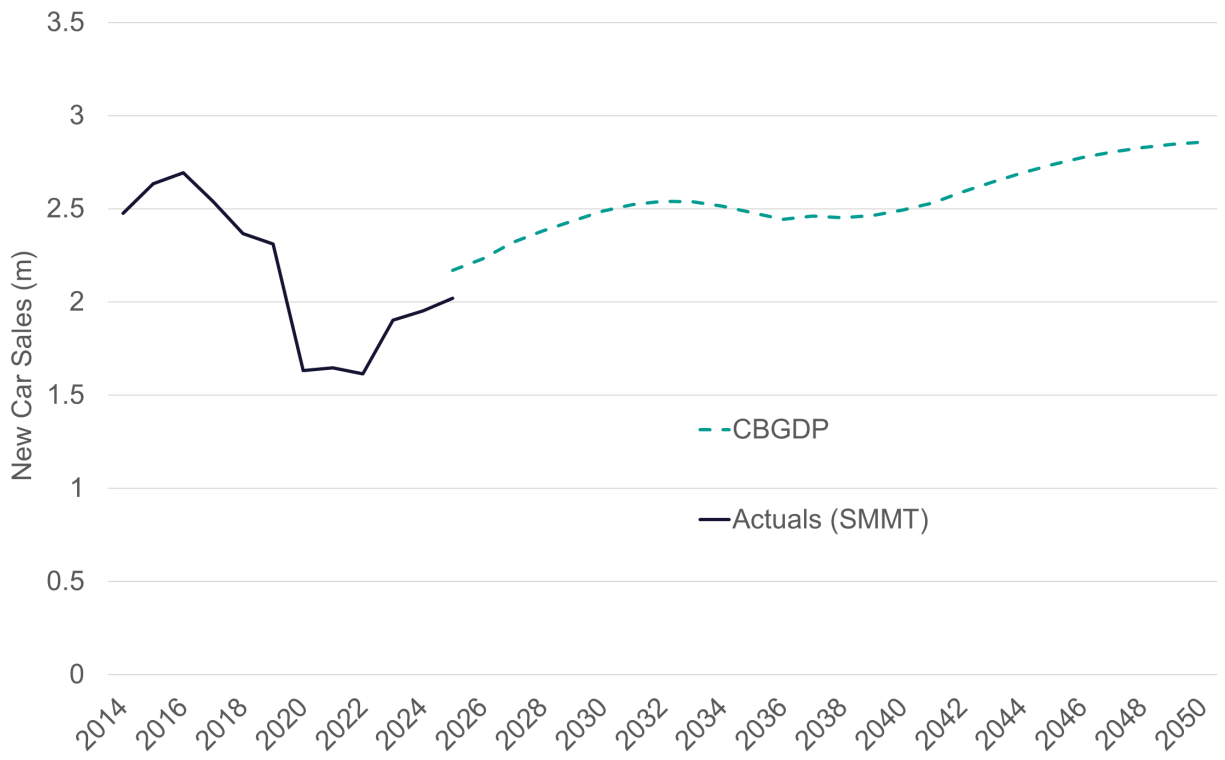

Figure 3: Actual and Projected New Car Sales

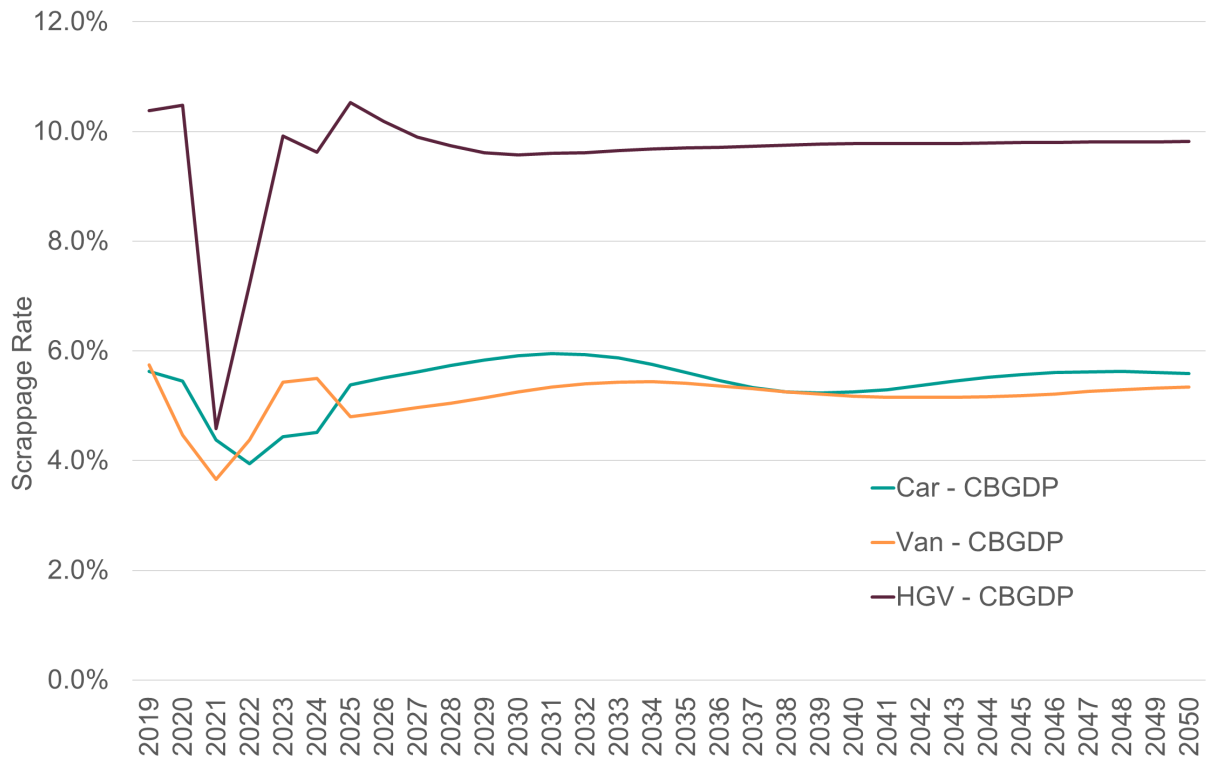

Figure 4: Historic and projected retirement rates (% of fleet)

The growth in the total fleet is driven by assumptions from the Department for Transport's national car ownership model. It is clear that the projection is already overestimating vehicle ownership rates. Much of the growth in ownership will be driven by the projected growth in population over the period to 2050. However, given the cost-of-living crisis and the current global geopolitical uncertainty, it seems highly likely that the growth in total fleet is an overestimate. This matters, as the assumptions about vehicle ownership also feed into the decisions around mode choice and miles driven in the National Transport Model (Section 5). It is worth noting that not only is it anticipated that there will be an additional 10m vehicles, but the implication, when put together with the traffic growth forecasts (Section 5) is that each vehicle will be driven less each year (14% less per vehicle by 2050). It is unclear why such outcomes would emerge or what the behavioural underpinnings for such assumptions would be. These vehicles would be parked up in our streets and neighbourhoods, gobbling up space which is already hard to find and further damaging the liveability and accessibility of our communities.

There are also quite aggressive assumptions made about the growth in new car sales. This matters because it steers the speed at which electric vehicles enter the fleet and so any undershoot here will mean that a greater percentage of vehicle miles would continue to be made in fossil fuel powered vehicles. This needs to be seen in the light of the assumptions also on vehicle scrappage rates. As noted above, whilst people have been holding on to their vehicles for longer, the assumptions in the GBGDP are that the scrappage rate will rise, thus reducing the average vehicle age and clearing fossil fuel vehicles out of the fleet faster. This would act to reduce overall emissions and is an assumption which currently has significant uncertainty attached to it.

The expected growth in van ownership is broadly in line with recent trends, although the assumptions behind this remain poorly understood. The reasons behind the broadly linear increase in van fleet require further exploration. The HGV fleet is projected to remain broadly constant in size and has historically been far less dynamic in total fleet size shift. The greater uncertainties for HGVs revolve around the timing and nature of a transition away from the current diesel fleet (discussed further in Sections 3 and 4).

3. Electrification of the Fleet

Key findings:

- **The proportions of miles driven in zero emission vehicles are close to, or below the lowest levels of ambition set out by DfT in 2021.**
- **There remains significant uncertainty over the ability to meet the switch implied by these curves.**
- **The key leading indicator of progress is the percentage of miles driven by EVs and by fossil fuel vehicles.**

The anticipated breakdown of the fossil fuel and electric (or other zero emission) vehicle sales for cars are shown in Figure 5. The impacts of the ZEV mandate can be seen, in particular over the period from 2026 onwards. In the period from 2030, the format of the targets is yet to be concluded and so the fossil fuel line is likely to represent Plug-In Hybrid or equivalent.

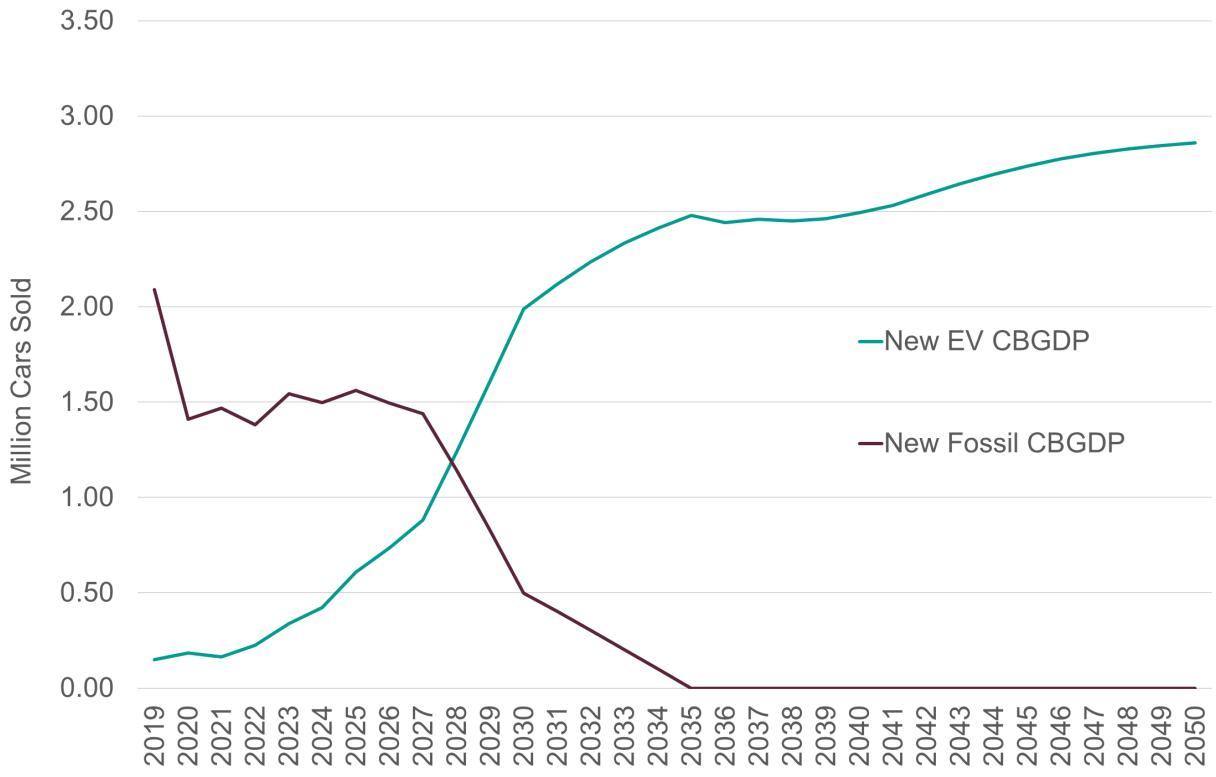

Figure 5: New Car Sales Estimates for EVs and Fossi Fuel Cars in CBGDP

Figures 6, 7 and 8 show the Department for Transport's anticipation of how the interaction between growth in fleet size and sales of EVs interact with distance travelled, to provide the proportion of all vehicle miles travelled by zero emission vehicles for cars, vans and HGVs respectively.

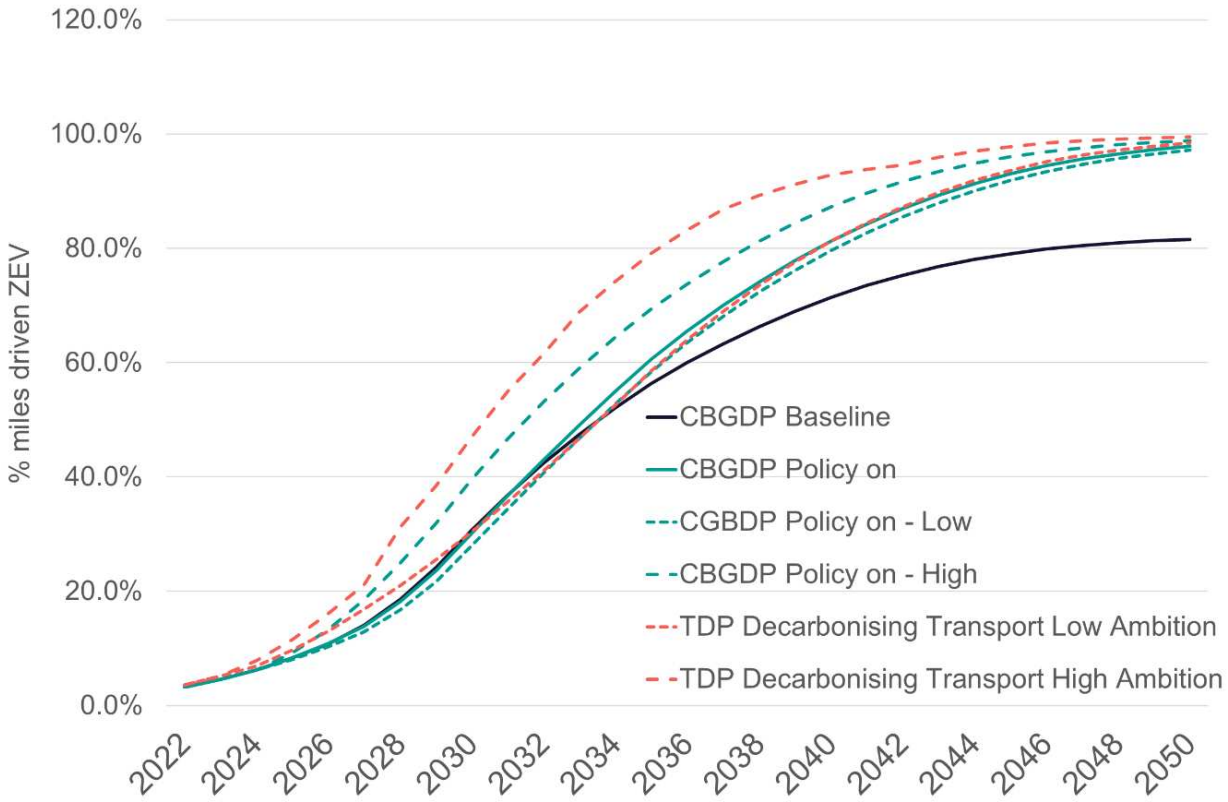

Figure 6: Percentage of car miles driven in zero emission vehicles (CBGDP and TDP)

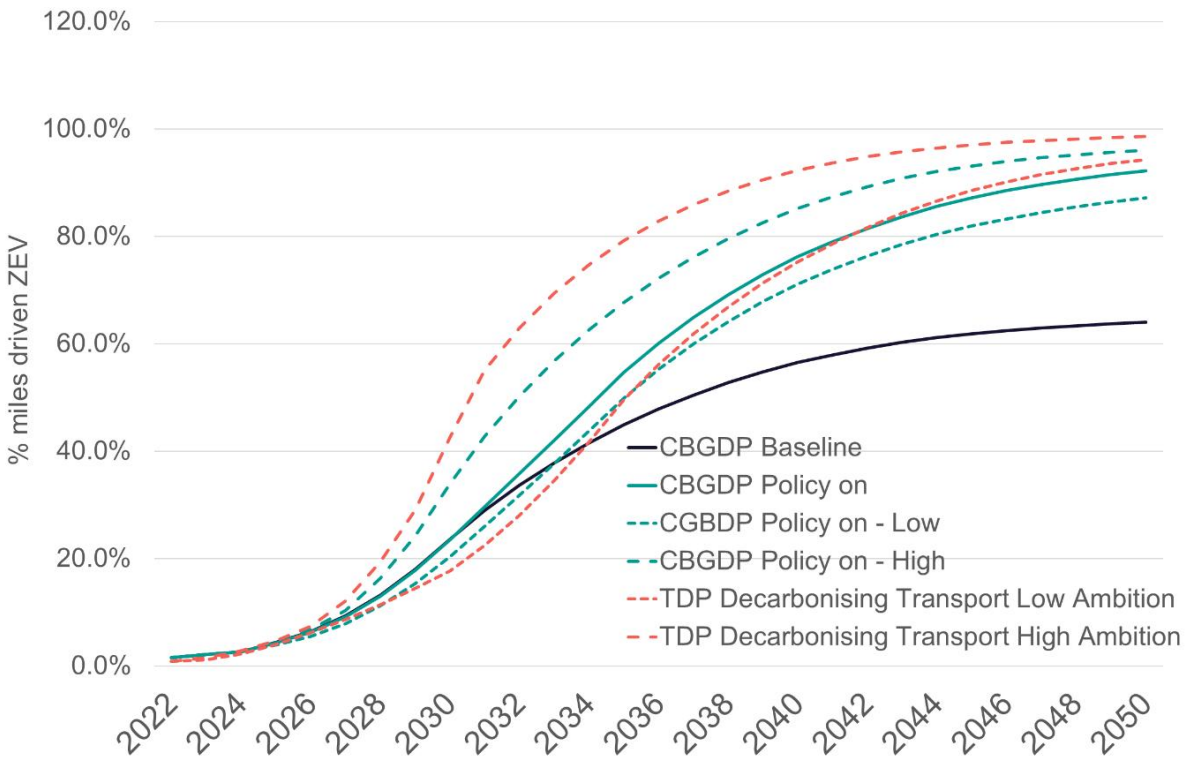

Figure 7: Percentage of van miles driven in zero emission vehicles (CBGDP and TDP)

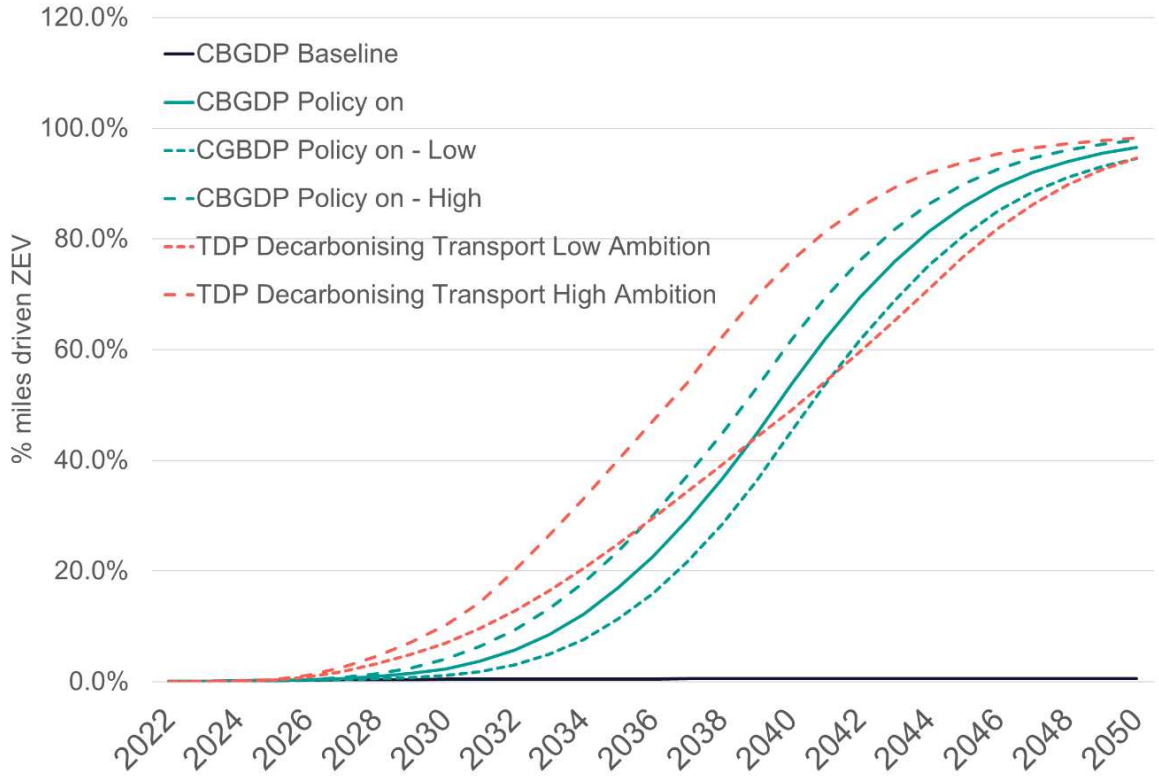

Figure 8: Percentage of HGV miles driven in zero emission vehicles (CBGDP and TDP)

For cars, the 2026 CBGDP Policy On framework is the current anticipated scenario, which tallies broadly with the lowest ambition curve of the 2021 TDP. For Vans (Figure 7), the curve tracks above the lowest ambition TDP scenario but remains around 20% fewer zero emission miles per annum than the high ambition scenario. For HGVs (Figure 8) the CBGDP anticipates a slower adoption than the low ambition TDP until 2039, suggesting higher than anticipated fossil fuel mileage from HGVs. Across the board, the proportion of miles driven by zero emission vehicles is close to or below the lower end of expectations from the TDP. These assumptions also rely on high levels of new car and van sales which, as set out in Section 2, have significant risk associated with them. However, in a period where it is understood that vehicle manufacturers continue to lobby for a watering down of the phaseout of fossil fuel vehicle sales, maintenance of at least the current commitments seems absolutely vital to the future pathway for decarbonisation.

4. Efficiency of the Fleet

Key findings:

- **New fossil fuel vehicle sales are anticipated to drive a 6% to 12% reduction in CO_2 per km travelled.**
- **Monitoring the achievement of on-road reductions is important as this represents an important portion of early period carbon reduction.**

The two primary drivers of carbon from surface transport are the number of miles driven in fossil fuel vehicles and the emissions for each kilometre travelled. This section shows the assumptions about the future efficiency of the fleet with the car and van pathways shown in Figure 9.

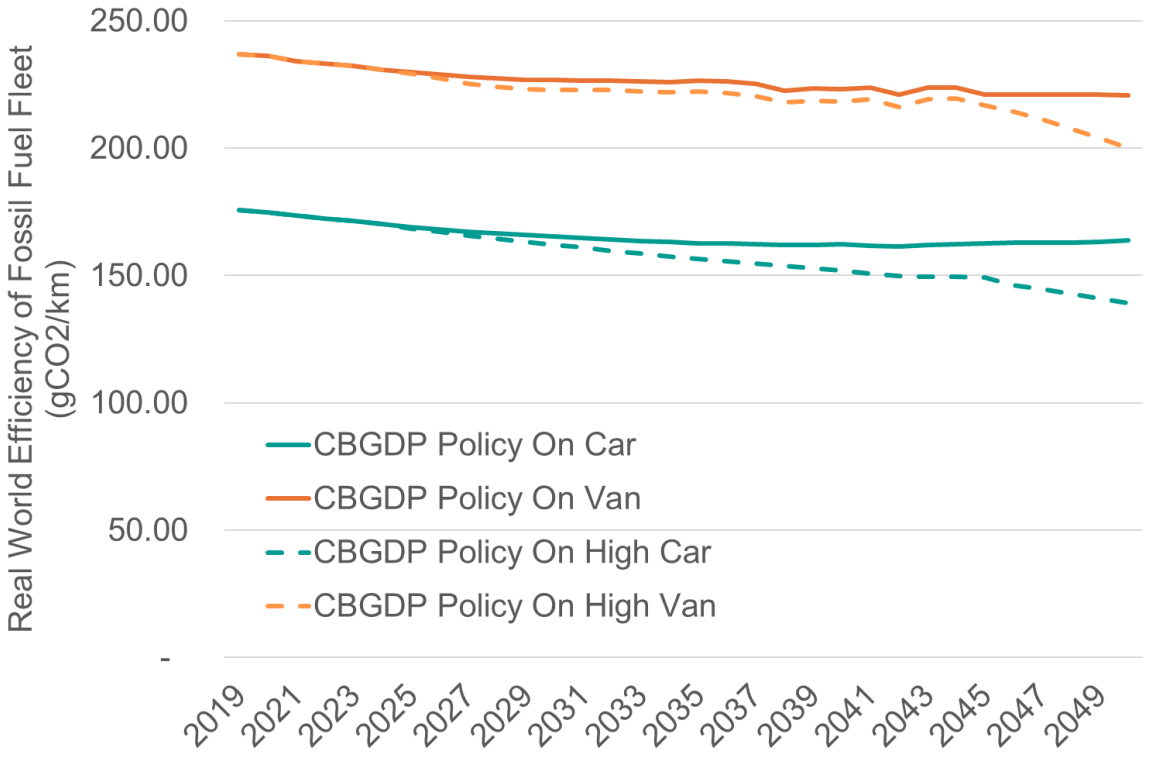

Figure 9: Assumed Real Word Efficiency of Car and Van Fleet in CBGDP

There is a modest improvement forecast in real-world efficiency of the fleet for car and van with a more significant improvement for HGVs as shown in Table 1. The changes are a result of the combination of increased hybridisation of new cars and vans, as well as lower carbon content from fuels, with higher levels of biofuel blends in diesel for HGVs and some aerodynamic improvements. Whilst the overall outturn changes look modest, they imply much more significant improvements in the vehicle fleet being sold today, as these are the

only vehicles that can bring the average down. Any reduction in sales or of the anticipated efficiency of new vehicles, or their real-world performance compared with laboratory test cycles could reduce these efficiency gains and this needs to be monitored. It remains the case that much more could have been achieved in reducing average real-world emissions from the fossil fuel fleet had there not been significant upsizing of cars to SUV type models over the past two decades (Axsen and Bhardwaj, 2026).

Table 1: CBGDP Policy on Relative emissions of fossil fuel fleet

Vehicle Type	2030 as a % of 2019	2040 as a % of 2019
Car	94	92
Van	96	94
HGV	91	88

5. Road Traffic Levels

Key findings:

- **The CBGDP has largely abandoned aims to cut overall distance travelled.**
- **The assumed growth rates for car traffic and traffic overall are far higher than the rates seen since the turn of the century.**
- **An independent review of the credibility of the road traffic forecasts should be conducted.**

Previous research has shown that the only way to stick within transport's anticipated contribution to carbon budgets has been to achieve an absolute reduction in road traffic levels of at least 20%, particularly early in the carbon budget period before the fleet electrifies (Brand et al., 2020; Hopkinson et al., 2021; Marsden, 2023). This has not happened (Figure 10), although car and HGV traffic remained below 2019 pre-pandemic levels in 2024 (2.6% and 3.5% respectively). Van traffic increased by 9.3% over this period, meaning overall traffic was 0.7% below pre-pandemic levels, albeit with a greater mix of higher emitting vehicles (vans relative to cars) than pre-pandemic. Traffic growth has been, at best, modest since the year 2000. For car traffic it averages 0.4% per annum, although for vans it is 3.4% per annum, whilst for HGVs there has been a decline of 0.2% per annum.

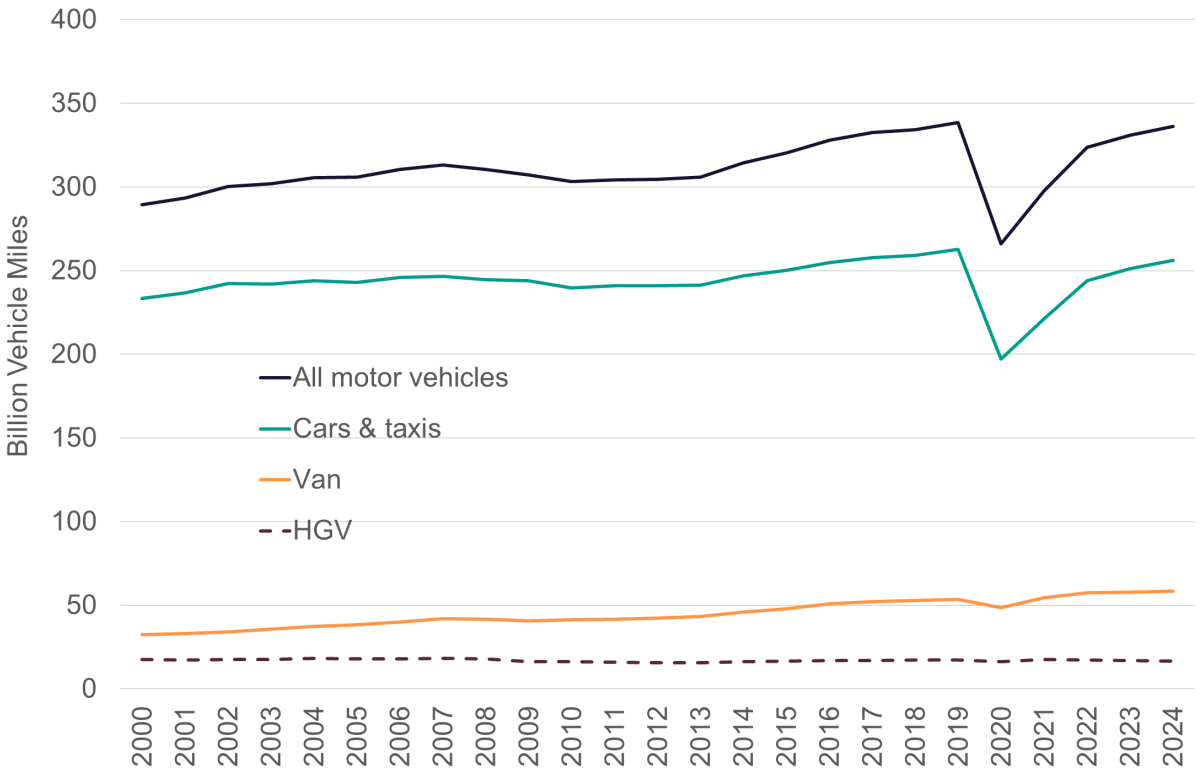

Figure 10: Historic road traffic

Source: https://roadtraffic.dft.gov.uk/

Figure 11 shows a comparison of the forecast growth in road traffic set out in the TDP, the GBGDP and a recent Progress Report to Parliament from the Climate Change Committee (CCC, 2022). The data period shown is 2025 to 2040 as this was the period for which data was available across all of the data sources.

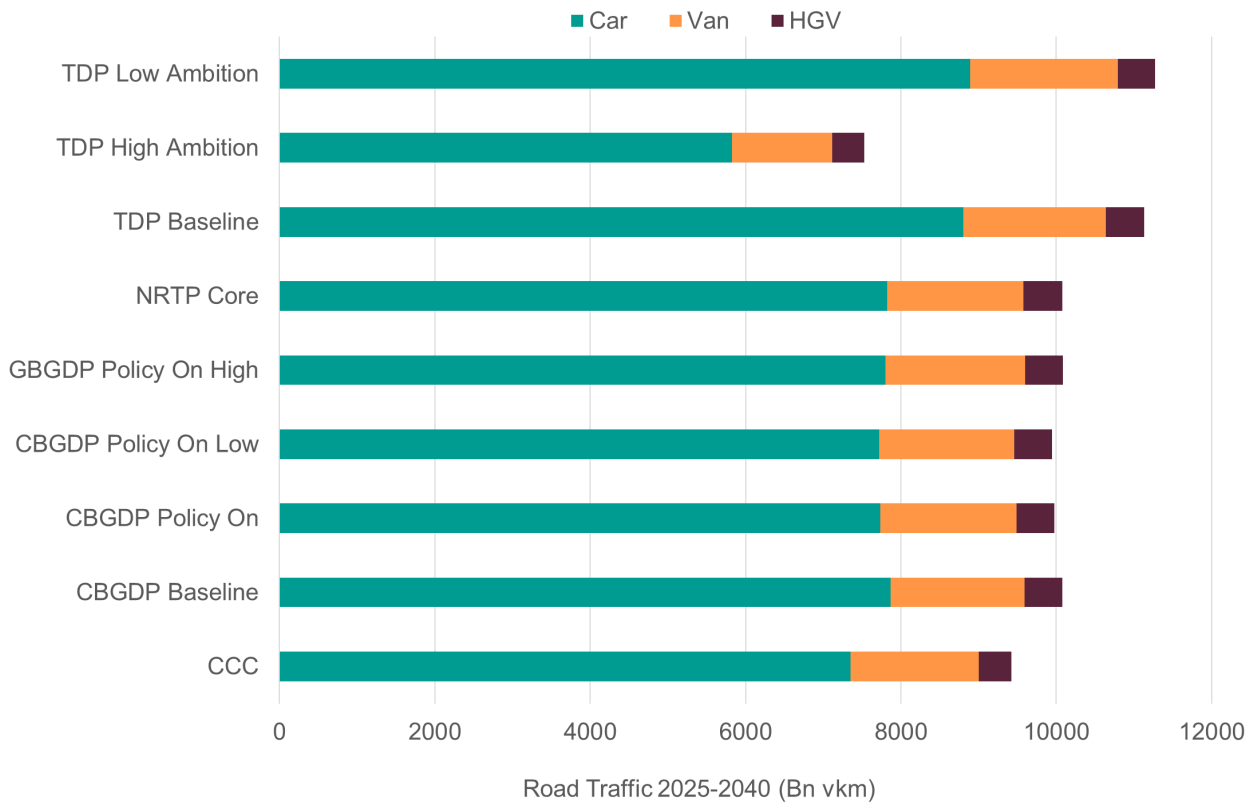

Figure 11: Road Traffic 2025 to 2024

The TDP Baseline[2] and TDP Upper Scenarios should be dismissed as comparators because, by 2025 they are already 5% higher than the CBGDP Baseline and continue to grow far faster than the CBGDP baseline. The first key comparator is, then, between the National Road Traffic Forecast (NRTP) Core Scenario and CGBDP Policy On as this represents the difference which the CBGDP is anticipating to make to vehicle miles travelled compared to business as usual. Almost no difference emerges, with the CBGDP being just 1% lower for all traffic than NRTP Core over the 15-year period. There is no serious commitment to road traffic reduction either in relative or absolute terms implied in the CBGDP. Absolute traffic levels in the CBGDP Policy On scenario would be 16% higher in 2040 than in 2025. Table 2 below shows the historic growth rates of traffic for cars, vans and HGVs set against those anticipated in the CBGDP Policy On scenario.

[2] Lower baseline.

Table 2: Observed and Anticipated Annual Growth Rates

Vehicle Type	Average annual growth rate 2000-2024	Projected average annual growth rate 2025-2040 GBGDP
Car	0.4%	1.1%
Van	3.4%	1.9%
HGV	-0.2%	0.6%
Total	0.7%	1.2%

The Department for Transport is planning for an annual growth in car traffic which is more than double the historic rate from 2000 to 2024 with overall growth 67% higher than has previously been observed. The results are staggering, in that they fail to address the direction of travel required by the Climate Change Committee[3], but also because they anticipate change on a scale not seen this century. From a carbon perspective, it would make sense to plan for less growth, not more. It has previously been observed that the Department for Transport's forecasts overestimate road traffic relative to outturn values (Goodwin, 2025) and it seems necessary to urgently review how these values come to be adopted as both the ownership and mileage assumptions are unrealistic.

The data suggests that, with the exception of van traffic, that road traffic levels are broadly stable. There are counteracting forces of increasing population but also a long-term structural decline in the miles driven per head of population (Figure 12). It is time to revisit the model of social preferences and economic interactions which underpin road traffic growth as these appear very different today to those which led to the boom in road traffic in the latter half of the last century (Marsden et al., 2018).

[3] The Climate Change Committee growth rate anticipated over the period 2025 to 2040 is 0.7% in line with historic growth rates which could equally be labelled as unambitious.

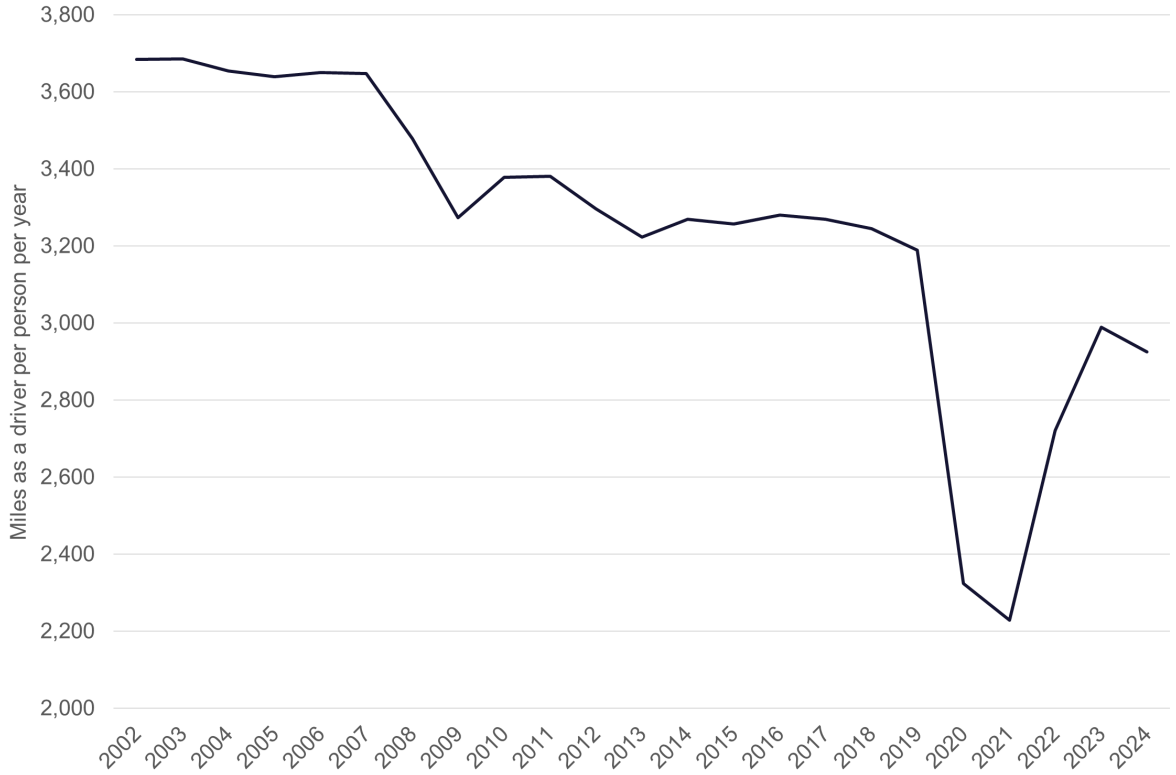

Figure 12: Decline in per capita distance driven

Source: nts0409

6. Carbon Reduction

Key findings:

- **The CBGDP downgrades the anticipated carbon reductions from surface transport by around 15% compared to the 7th Carbon Budget.**
- **The planned growth in the vehicle fleet, coupled with electrification could make vehicle manufacture a more important source of carbon emissions than driving within a decade.**
- **There is an urgent need for a strategy shift to a lower carbon and more pro-growth strategy.**

This section compares the CBGDP estimates with those set out for surface transport in the 6th Carbon Budget (CCC, 2020) and 7th Carbon Budget (CCC, 2025a). The carbon figures for the CBGDP have been estimated using the CaSE model from the data provided by the EIR request. All of the source data and the modelling assumptions are publicly available (click for link). Figure 13 shows the comparison over time. As noted previously, the 7th Carbon Budget represented a reduction in ambition over the 6th Carbon Budget but some of the increases in later periods were offset by the unanticipated dip during the Covid-19 pandemic when traffic levels fell. However, despite this loosening of ambition it appears that the CBGDP is anticipating further overshoot compared with that set out by the Climate Change Committee.

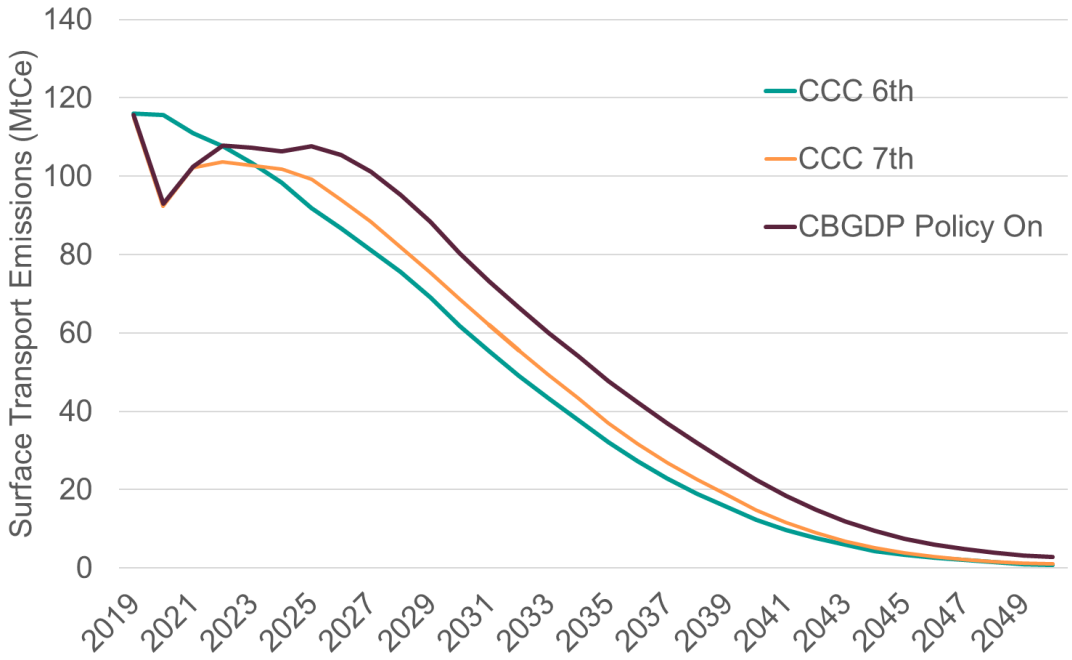

Figure 13: Loss of carbon ambition over time in surface transport

The CaSE model suggests that CBGDP will overshoot the pathway estimated by the 7th Carbon Budget by over 220MtCe or around 15%. This is the result of a number of different assumptions between the reports. The Climate Change Committee estimated a reduction in vehicle miles travelled of 8% to 10% compared with business as usual, for example, drawing on evidence from best practice examples. The Climate Change Committee has also consistently overestimated the volumes of EV sales that have so far been delivered into the fleet.

It is also important to highlight the wider implications of the pathway set out . As Figure 1 shows, the Department for Transport is planning for an additional 10 million vehicles in the fleet. Most of the new vehicles bought over the period will be electric and, whilst electrification reduces the in-use emissions from driving substantially, some of these gains are offset by additional energy and material costs in the construction of EVs. Table 3 below provides an indicative comparison of the emissions burdens of the construction and disposal phase of an ICE and an EV.

Table 3: Whole Life Carbon Emissions from Different Stages in the Vehicle Life Cycle

Component	Car (ICE) tonnes	Car BEV	
		Battery	Total
Manufacturing	4.50	4.69	9.11
Assembly	0.80	0.83	1.58
Disposal	0.23	0.06	0.28
Fluids	0.82	0.20	
Total	6.36	11.17	

Source: International Transport Forum, 2021

If we apply those factors to the vehicle sales projections for cars shown in Figure 6, then we can see the change in total emissions burden from vehicle manufacture (Figure 14). We note that there is an intermediate Plug-In Hybrid Vehicle option which can run on fossil fuel or battery for shorter ranges. However, whilst it is assumed that these cars will run on over 80% electric mileage, the current utilisation in electric mode is closer to 25% (T&E, 2025) and so net emissions could be higher than both ICE and EV from a whole life perspective. This will be further explored as part of the INFUZE project.

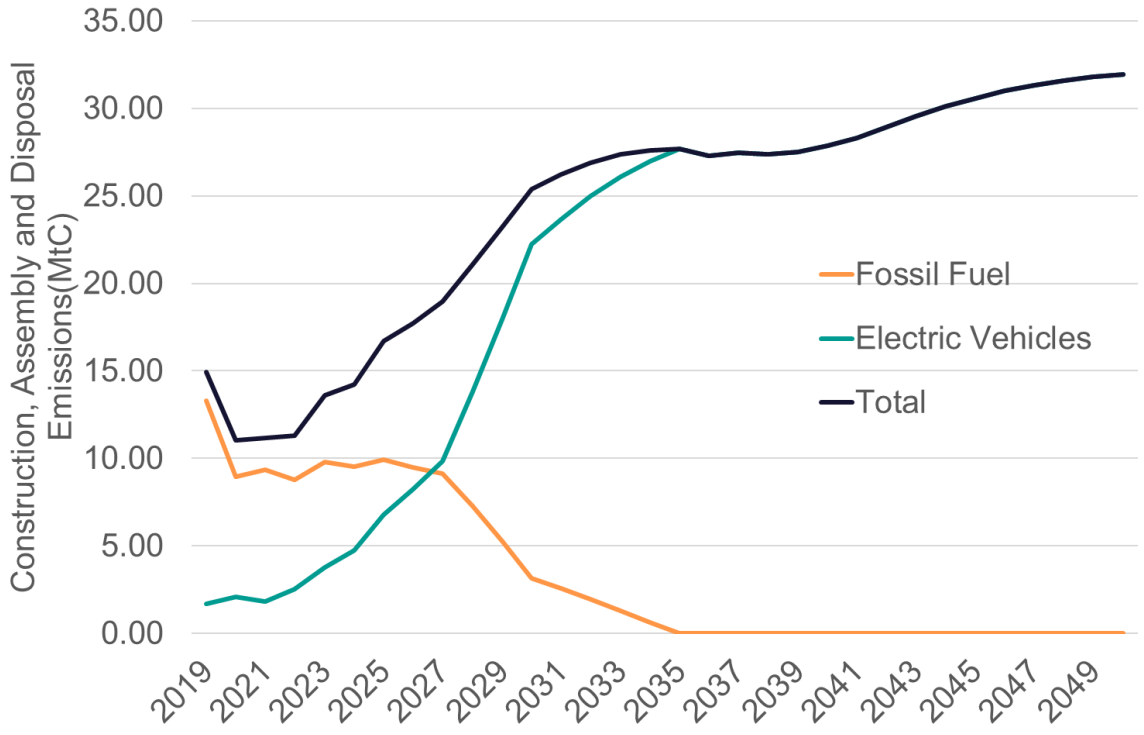

Figure 14: Estimate of manufacturing and Disposal Emissions from new cars

These figures should be seen to be provisional. A more up-to-date set of estimates of life-cycle emissions is being developed as part of the INFUZE project (https://in-fuze.org.uk/). It is also very difficult to know how these figures might change. This will depend on where in the world vehicles and batteries are manufactured and the net balance of imports and exports. These emissions also count, when incurred within the UK, as industrial emissions and some of these emissions are therefore already captured in the national accounts. However, these arguments should not obscure the fact that the joint growth in vehicle sales, coupled with electrification, have to be considered in assessing the success of our transport decarbonisation strategy. Thus far, production emissions have been 'out of sight, out of mind', but they really matter. We explore the potential for technological improvements in energy, production and vehicle fleet composition in Section 7. For now, the scale of change suggests that manufacturing emissions from cars could exceed in-use emissions by the mid-2030s. Whether or not the emissions burden is pushed elsewhere in the economy for accounting purposes, this increase results from the choices underpinning the national transport strategies across the UK.

Overall then, the CBGDP is planning for a significant overshoot compared with the 7th Carbon Budget. The implications of this overshoot depend on the perspective adopted. First, an argument is mounted that there are no sectoral targets and it is in terms of a whole economy that progress should be considered (HMG, 2025). That would perhaps work if the rest of the economy were ahead of schedule. However, the 2025 Annual Progress Report to Parliament (CCC, 2025b) shows that it is not, with 14% of carbon reduction having insufficient plans, 20% with significant risks and 23% with some risks. What we have instead, is the largest sector lagging in its reduction pathway. A second argument is that any overshoot can be swept up by further increases in the levels of carbon sequestration available through so-called negative emission technologies. These remain unproven at scale in a commercially viable manner (CCC, 2024) and so the precautionary principle would suggest that this is not an appropriate solution.

This analysis points towards a third argument. The plan set out in the CBGDP is not the best plan for the transport sector. It does not adequately support the meeting of the carbon targets and it is bad for growth. This final argument on growth rests on the Department for Transport's own analysis. The NRTP Core Scenario will see a 27% rise in congestion across the whole road network by 2060. This is a drag on UK productivity and on the efficiency of our freight movements. It creates a false hope that investment will 'cut congestion' when it is set in a wider strategy to 'raise congestion'. Planning for the nation to become more car dependent continues to also expose people to fuel price shocks and instability in global critical minerals, the effects of which are significant at the time of writing. It is also noted earlier, that the numbers suggest that more cars will be owned but they will be driven less – which imposes further economic costs as well as impacting on liveability of our local communities. Section 7 explores the different key variables that could still impact on our carbon overshoot and identifies where the opportunities to make a difference still exist. Section 8 presents some recommendations for actions to change pathway.

7. Scenario Analysis

Key findings:

- **The overshoot can be almost halved by a radical traffic reduction response.**
- **Advancing EV uptake for cars, vans and HGVs by around 2 years before the mid-2030s could almost halve the overshoot.**
- **Vehicle efficiency measures in the remaining fossil fuel fleet sold matter but could perhaps only tackle 10% of the overshoot.**
- **The only scenario which meets the expectations of the 7th Carbon Budget requires throwing the kitchen sink at the problem – with radical traffic reduction, accelerated EV adoption and fossil fuel efficiency improvements. That is not the plan set out in the CBGDP.**
- **The risks of failing to hit the CBGDP plans are substantial. The overshoot could easily double with small delays in a switch to EV miles driven.**

There are no planned scenarios left where surface transport can meet the expectations set out in the 7th Carbon Budget. This section reviews the key levers which might change the scale of the overshoot, assessing both how significant any risks of under-delivery are, and what scope there is for coming closer to or meeting the 7th Carbon Budget with greater policy application. The primary levers are road traffic levels, EV penetration rates, scrappage rates of older fossil fuel vehicles and the efficiency of the fossil fuel fleet. The section then turns to addressing the impacts of a different size and composition of the vehicle fleet. A final scenario ('kitchen sink') looks at what the most ambitious or optimistic combination of policies could, in theory, achieve.

7.1 Road Traffic Levels

Section 5 identified a likely overestimate of road traffic growth in the CBGDP. There seems little point in assessing the risk of overshooting this as the plan is already over the carbon budget and the line might well be considered an upper bound. Four alternative options have been assessed as shown in Table 4:

- Historic is a scenario where, from 2026 car growth rates are held at the growth rate of 0.4%. Van growth rate has been at 3.4% but for this scenario the lower long-term growth rate in the GBGDP is used. For HGVs, rather than estimating a decline, the growth rate is chosen halfway between the historic and the CBGDP.

- Car Frozen is based on historic, but with car traffic held constant at 2025 levels for 2026 to 2050.
- All Frozen holds van and HGV traffic at 2025 levels in addition to the assumptions in Car Frozen.
- Twenty Twenty One represents an emergency response scenario similar to the impacts of the second year of the Covid-19 pandemic. Traffic is reduced in 2027 to 2021 levels for cars. HGV traffic is frozen, but van traffic is assumed to grow at historic rates as more home servicing would be done.

Table 4: Alternative Traffic Scenarios

Scenario	Vehicle Type	Assumption
Historic	Car	Growth rate of 0.4% (historic)
	Van	Growth rate of 1.9% (CBGDP)
	HGV	Growth rate of 0.2% (midway historic and CBGDP)
Car Frozen	Car	Frozen at 2025 levels
	Van	Growth rate of 1.9% (CBGDP)
	HGV	Growth rate of 0.2% (midway historic and CBGDP)
All Frozen	Car	Frozen at 2025 levels
	Van	Frozen at 2025 levels
	HGV	Frozen at 2025 levels
Twenty Twenty One	Car	2027 onwards at 2021 levels
	Van	Growth rate of 3.4% (historic)
	HGV	Frozen at 2025 levels

Figure 15 shows the carbon pathways implied by each of these different traffic futures. It is clear that quite drastic reductions in road traffic are needed to begin to cut the budget overshoot. Even the Twenty Twenty One scenario, which has an immediate 18% reduction in car traffic in 2026 which is maintained throughout does not bridge the gap, providing a 6% cumulative total emissions reduction compared to Policy On. Figure 16 compares the cumulative emissions and overshoot of all of the scenarios relative to the 7th Carbon Budget.

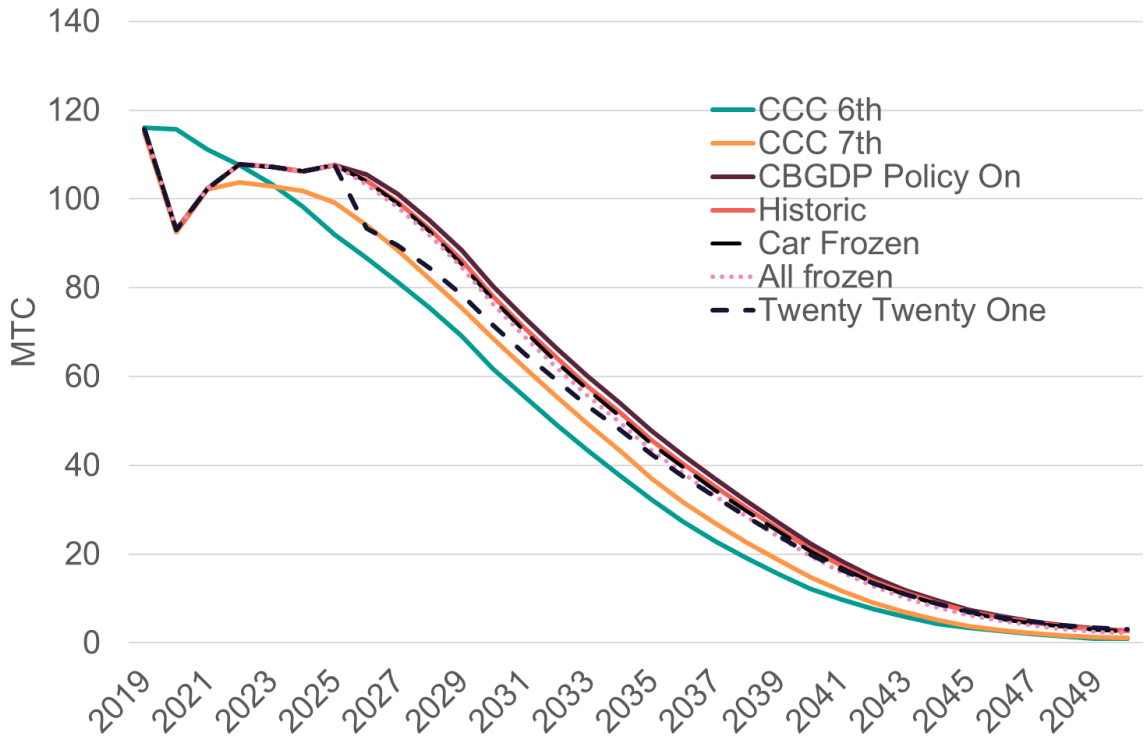

Figure 15: Carbon Pathways from Traffic Scenario Analysis

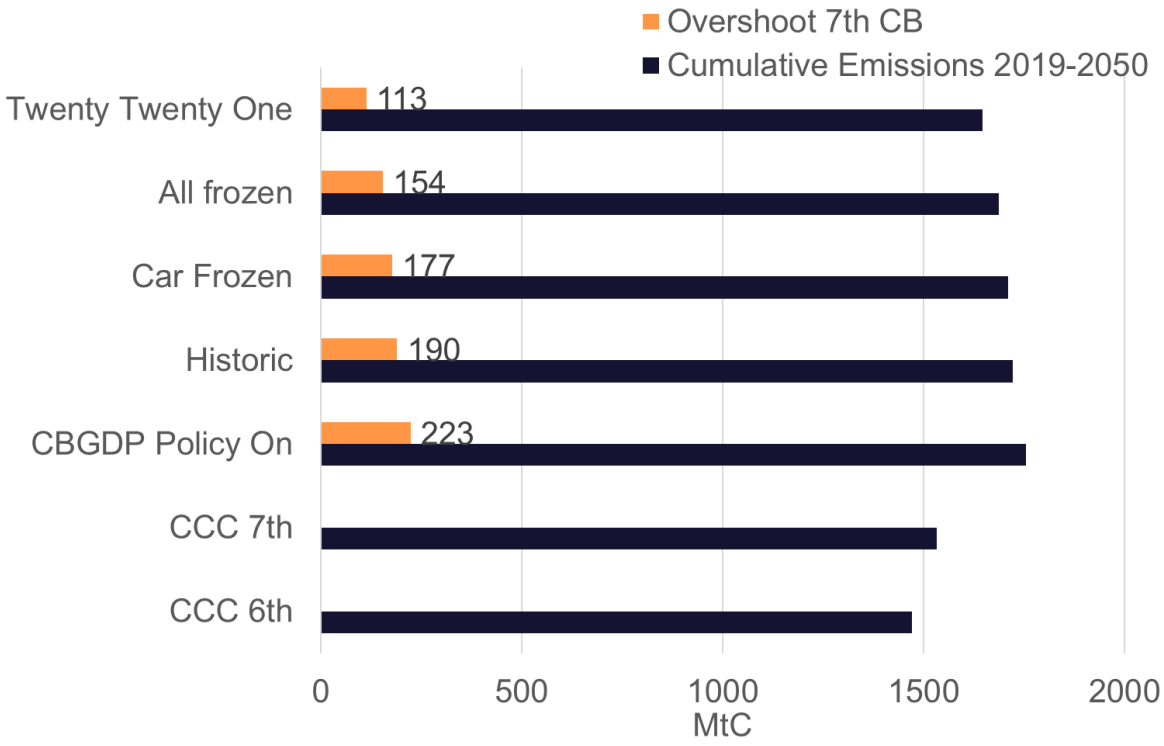

Figure 16: Cumulative Emissions and Overshoot to Seventh Carbon Budget from traffic scenarios

7.2 Electric Vehicle Uptake

One of the reasons that only radical changes in road traffic levels make a reduction in carbon emissions is because we are now entering a period where it is assumed that the fleet will rapidly switch over to zero emission (largely electric) vehicles. This means that the carbon benefit of switching away from cars is diminished over time, although this is not the only reason to consider changing travel demand. The next scenarios explore the sensitivity of the pathways to different assumptions on EV penetration (Table 5). One scenario considers an accelerated amount of miles driven in EV, which could be achieved through accelerating the uptake of EVs, greater shared use of the EV fleet instead of fossil fuel cars, or targeting EV adoption to higher mileage users. The second scenario looks at the implications of bringing forward HGV electrification by two years. The final scenario examines the risks of slower than anticipated EV adoption, with sales remaining closer to current levels and people holding on to their fossil fuel cars for longer – both of which have been the case in recent years.

Table 5: EV Uptake Scenarios

Scenario	Vehicle Type	Assumption
Accelerate	Car	+10% in the proportion of miles driven electric by 2034 with change post 2035 following same S curve from 2035 levels as previously assumed.
	Van	
	HGV	
HGV Advance	Car	CBGDP Policy On
	Van	CBGDP Policy On
	HGV	2032 Policy On brought forward to 2030. 2029 adjusted to mid-point of 2028 and new 2030 value.
Decelerate	Car	-10% in the proportion of miles driven electric by 2035 with change post-2035 following same S curve from 2034 levels as previously assumed and period 2026 to 2034 adjusted to interpolate.*
	Van	
	HGV	

*This was equivalent to pushing back ambition by 2 years and this is how the change was operationalised.

Figure 17 shows the carbon pathway implications of the different scenarios, and Figure 18 shows the cumulative emissions and overshoot relative to the 7th Carbon Budget. The assumptions made on the proportion of miles driven in EV are critical to the carbon outcomes. A 10% increase in uptake rate can halve the carbon overshoot (a reduction of 114MtC) whilst a 10% reduction in uptake rate could almost double the carbon overshoot (an increase of 203 MtC to 426 MtC). As set out in Sections 2 and 3, the assumptions made

in the CBGDP would be difficult to achieve. Accelerating this would require much more radical policy intervention. The risks of underdelivering are substantial. None of these scenarios reduces emissions to the level demanded within the 7th Carbon Budget.

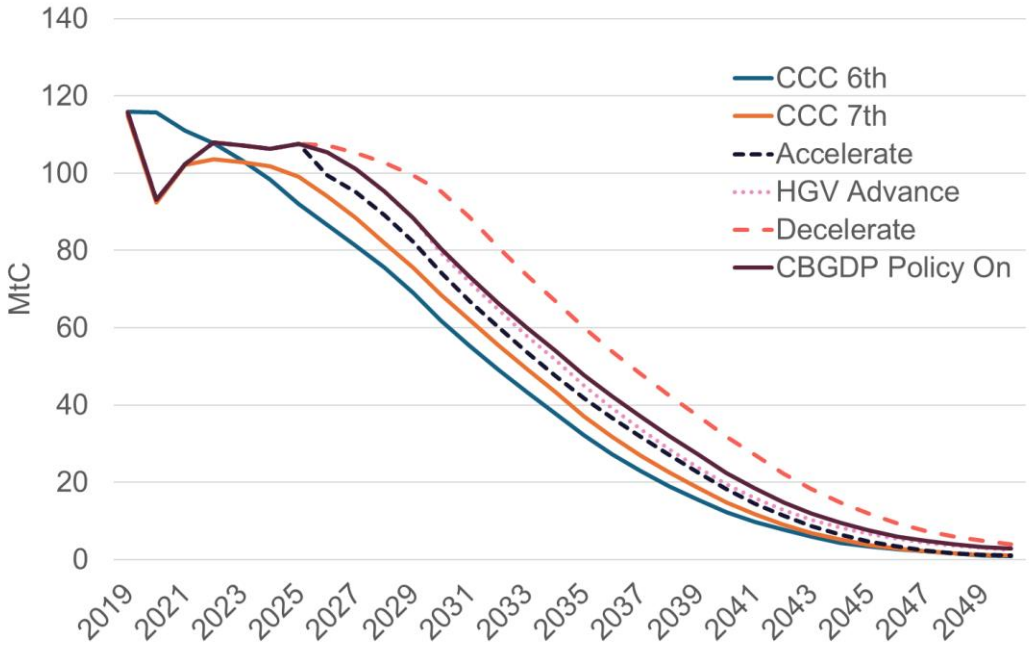

Figure 17: Carbon Pathways from EV Scenario Analysis

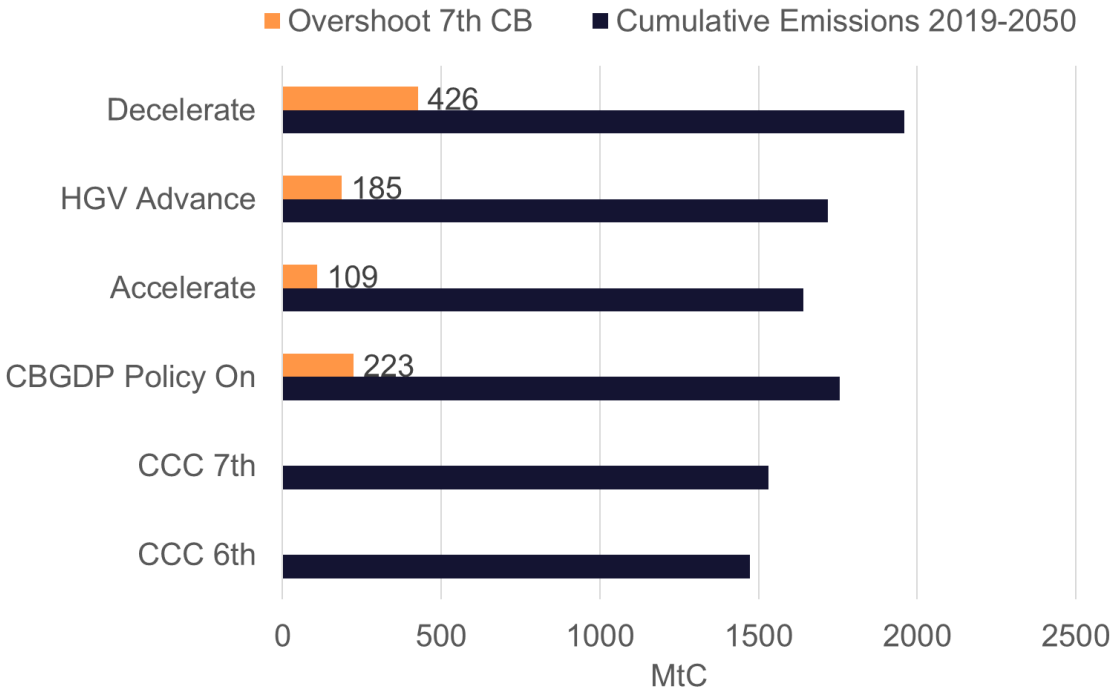

Figure 18: Cumulative Emissions and Overshoot to Seventh Carbon Budget for EV Scenarios

7.3 Fossil Fuel Vehicle Efficiency

Improvements to the efficiency of the remaining new fossil fuel vehicles which are sold, or the blend of lower carbon fuels in the fuel being used, will impact on overall emissions. The least ambitious case modelled here represents the Baseline scenario set out in the GBGDP, with the most ambitious being Policy On – High from the CBGDP. Table 6 shows the assumptions on overall g/km of CO_2 per type of vehicle implied by each scenario.

Table 6: Efficiency improvements in scenarios

	2019 g/km CO_2	% Emissions relative to 2019 levels					
		Baseline		Policy on		Policy on High	
		2030	2050	2030	2050	2030	2050
Car	175.79	95	97	94	93	92	79
Van	237.00	96	95	96	93	94	84
HGV	754.73	91	77	91	77	91	77

Figure 19 shows that there is little difference between the carbon outcomes irrespective of the scenario. The majority of the existing fossil fuel fleet of cars and to a slightly lesser extent vans, is already in circulation and so improvements in efficiency to new fossil fuel powered cars and vans sold does not impact total fleet efficiency much. For HGVs the story is somewhat different. However, the scenarios contain almost no variation between them on HGV assumptions.

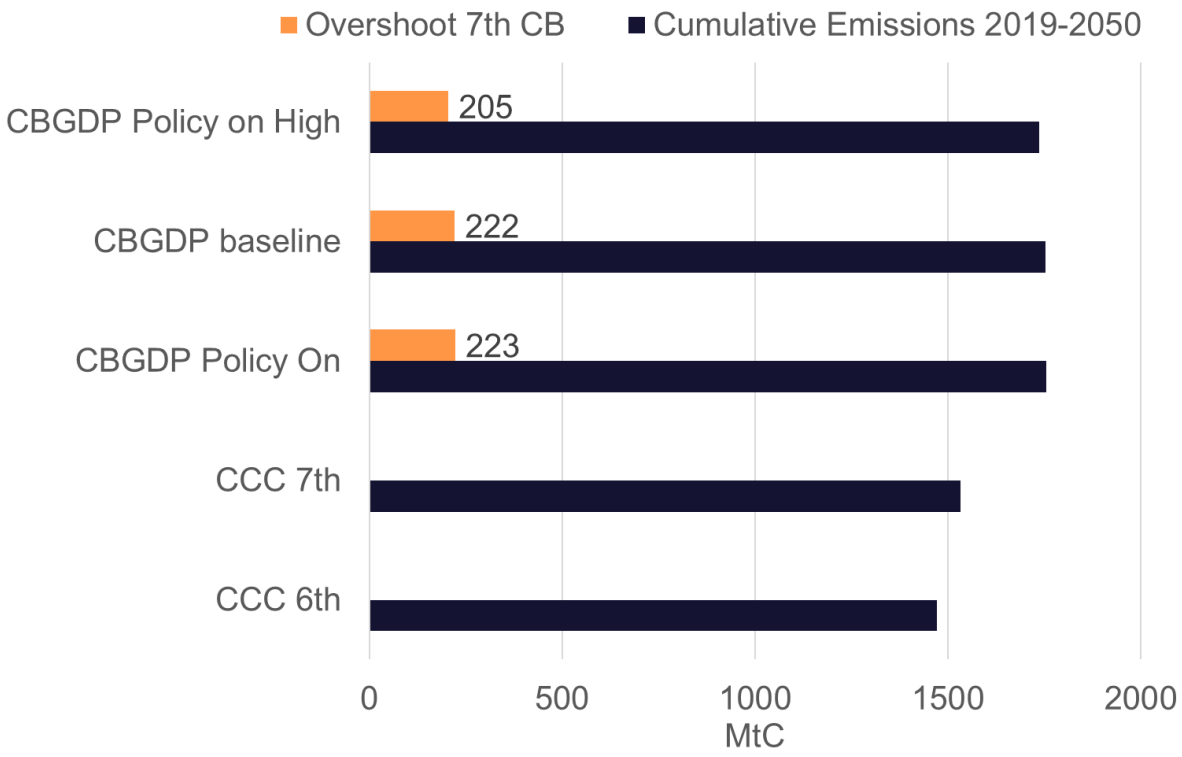

Figure 19: Cumulative Emissions and Overshoot to Seventh Carbon Budget for Efficiency Scenarios

7.4 Vehicle Fleet Assumptions

This final set of scenarios explores the implications of different assumptions about the nature of the new car fleet. In particular it explores scenarios where battery capacity is 25% lower (Smaller Battery) and 25% higher (Larger Battery) in a typical vehicle than the averages assumed earlier in the report. This would reflect a strategy of downsizing or upsizing the vehicle fleet. It also explores the impacts of a reduction in emissions associated with the extraction and manufacturing processes as the energy servicing these demands becomes greener, with reductions in emissions of 50% by 2040 (50% emissions cut by 2040). Finally, it explores what would happen if vehicle sales did not recover beyond 2019 levels of 2.24m, which they have yet to do.

Figure 20 shows the difference in cumulative carbon outcomes across the scenarios. Improvements in the carbon efficiency of the manufacturing process are very important, but much of this happens outside of the UK for products like batteries. It is also important to note that the only scenario in which the annual manufacturing and disposal emissions are

lower than 2019 levels by 2050 is the one with both a limit on new vehicle sales, and a 50% improvement in vehicle production emissions. Other choices also matter. The difference between smaller and larger battery sizes is 159 MtC which is 70% of the carbon budget overshoot from in-use emissions.

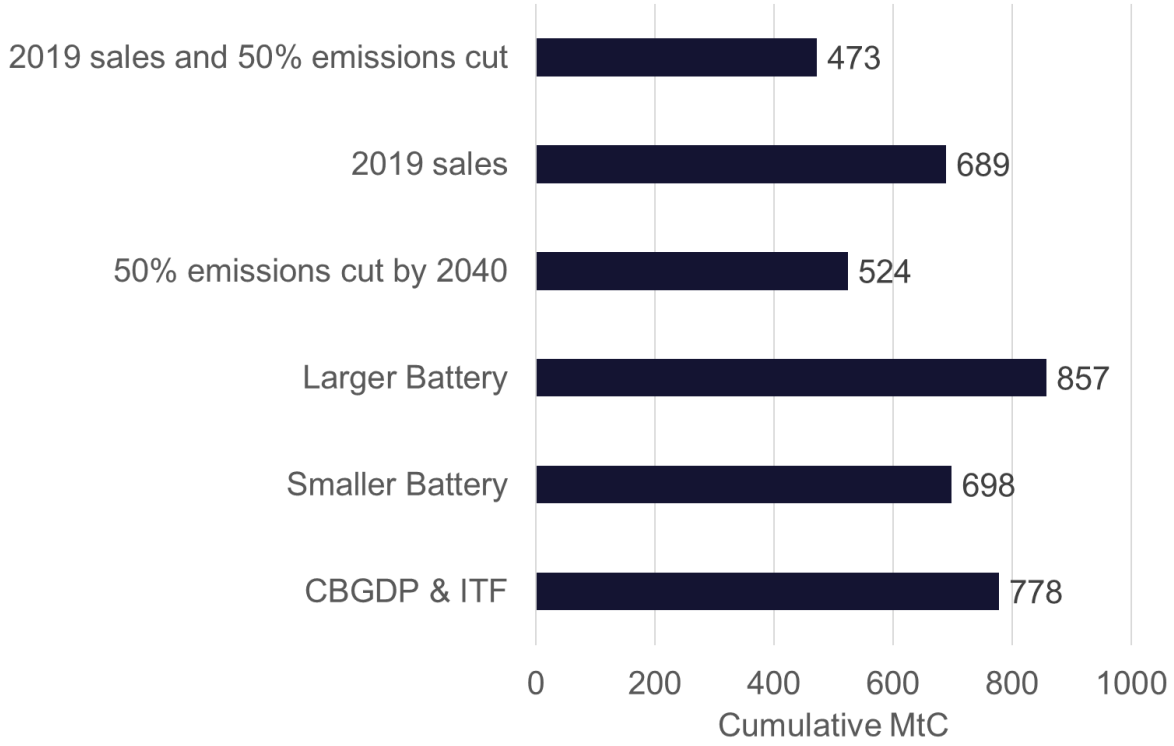

Figure 20: Cumulative Carbon Impact of alternative vehicle transition and technology choices

7.5 Kitchen Sink and Worse Case

None of the scenarios above get close to the expectations set out in the 7th Carbon Budget. This final scenario takes the most optimistic position from each of the scenario sets to see whether, in combination, the 7th Carbon Budget expectations remain within reach. These assumptions are:

- Twenty Twenty One for traffic – representing an emergency road traffic reduction scenario which is maintained throughout;
- Accelerate – which brings forward the proportion of EV miles driven by cars, vans and HGVs by 10% by 2034;
- Policy On, High – which has the most ambitious pathway for the efficiency of new fossil fuel vehicle sales and biofuel impacts on carbon from fuels.

Figure 21 shows that the ‘kitchen sink’ manages to meet the expectations set out in the 7th Carbon Budget. There is just a 4 MtC overshoot across the period which is close enough to zero to be within the bounds of modelling error, given the range of assumptions in play. Of course, whilst this remains theoretically possible, it is not even close to being the scenario on the table represented by the CBGDP.

As well as an optimistic ‘all in’ scenario an assessment has also been made of what would happen if the current policy approach underdelivered and some of the delivery risks materialised, referred to as ‘Worse Case’. These assumptions are:

- Policy On for traffic – representing the Department for Transport core road traffic growth scenario moderated only slightly by mode shift and increases in vehicle occupancy (but above historic traffic growth rates);
- Decelerate – which pushes back the proportion of EV miles driven by cars, vans and HGVs by 10% by 2034. This would represent outcomes aligned with lower sales volumes of EVs and an ageing fossil fuel fleet;
- Baseline efficiency – where anticipated efficiency of new fossil fuel vehicle sales and further biofuel savings are not realised in real-world conditions.

This scenario shows an overshoot of some 425 MtC with this representing 128% of that set out in the 7th Carbon Budget (also shown in Figure 21). This shows that the CBGDP Policy On scenario cannot be taken for granted. The gap between the prize of greater action and slower than anticipated progress is over 4 years of current emissions. That might not sound much, but it is the equivalent of all of the budgeted cumulative emissions from 2031 to 2050. The risks associated with under delivery are remarkably significant and calls for further backtracking resisted.

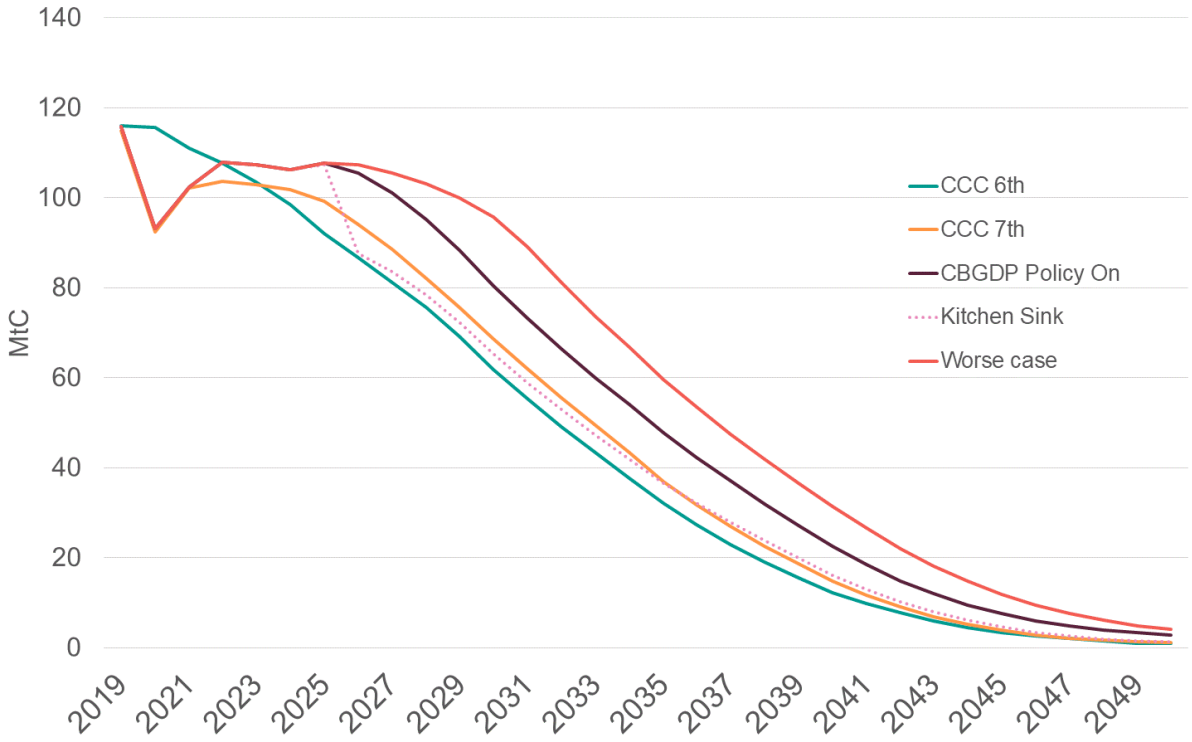

Figure 21: Carbon Pathways from Kitchen Sink and Worse Case Scenario comparison

8. Conclusions and Recommendations

This final section is divided into two sub-sections. The first sets out the conclusions of the analysis of the data on carbon reduction on the presumption that it will remain important for transport to meet the obligations implied by the 7th Carbon Budget. As noted earlier, as the largest emitting sector simply passing the burden elsewhere or to negative emission technologies is not in line with the precautionary principle. The second section identifies some key next steps and actions from policy actors at a local and national scale. These findings are set out in light of the recent publication of the Scottish Climate Action Plan (Scottish Government, 2026), Better Connected, which is the Department for Transport's Integrated National Transport Strategy (DfT, 2026b) and the requirements set out for Local Transport Plans in guidance to that strategy (DfT, 2026c).

8.1 Carbon Overshoot Conclusions

There are different drivers of carbon which can be dealt with in different ways to achieve the necessary carbon reduction pathways. They involve trade-offs and delivery risks. This report demands further urgent investigation of path changing possibilities given the concluding facts set out in the following eight points.

8.1.1 Ambition on surface transport decarbonisation continues to weaken

From one carbon budget to the next and from one government delivery plan to the next, the levels of carbon reduction expected from surface transport diminish. The carbon reduction curve looks very familiar, but it gets pushed back in time. The current plans in the Carbon Budget Growth and Delivery Plan suggest an overshoot of around 223 MtC from those set out in the 7th Carbon Budget.

8.1.2 There are big delivery risks and every action counts

The assumptions set out in the plan have challenging EV adoption targets in them as well as vehicle efficiency improvements. If there is slippage against expectations of even a

couple of years, then the overshoot grows to around 425 MtC. That corresponds to the carbon budget set aside for transport for 2031 to 2050 inclusive.

8.1.3 The size and nature of the car fleet matters

This topic is missing in action in transport policy. Underpinned by seemingly unsupportable assumptions about a linear increase in car ownership, an additional 10m vehicles are forecast in the fleet by 2050. The embodied emissions involved in this are significant relative to in-use emissions and need to feature in transport carbon policy, even if the outcomes fall elsewhere in the national carbon balance sheet. A smaller car fleet and a fleet with smaller batteries, as well as more efficient manufacturing processes all have to play a part in decarbonising transport. Similar concerns apply to vans and HGVs.

8.1.4 The assumptions on volumes of EV adoption are a key risk

The scale of new car sales anticipated in the CBGDP is overly optimistic. Imagining high sales of cars is necessary to draw through the volumes of EVs into the fleet so that the percentage of fossil fuel miles driven are reduced. The recent ageing of the existing fleet and the continued supressed sales of new cars relative to a decade ago suggest that the CBGDP assumptions are questionable. The ZEV mandate is working in terms of the percentage of new cars sold which are electric. This should be maintained, but it is the sales volume assumptions which are likely to be below the planned scenario.

There are other ways of reducing fossil fuel miles driven by, for example, targeting EVs at high mileage users or enabling shared access to EVs through greater use of car clubs, community ownership models or potentially social leasing. These options, and the case for a stronger support package for them, require urgent exploration.

8.1.5 The anticipated levels of road traffic growth are not credible

The CBGDP takes, as its base, the forecasts from the National Transport Model. The rates implied are twice those seen in the past 25 years. The economy is in a state of low growth and facing considerable external global uncertainty and higher prices. It is incredulous that this remains the core scenario on which transport planning is based. These assumptions

make planning to meet carbon targets much more difficult. It is not clear why the Department for Transport is using these as the core scenario around which to plan. Lower traffic levels (relative to the current expectations) will reduce the carbon overshoot, but a more substantial response is still necessary to correct this.

8.1.6 Urgent reductions in road traffic help cut the carbon overshoot

Whilst previous analysis has suggested that reductions in absolute miles travelled by 2030 of 20% would put us back on track for carbon reduction, it is now too late in the decade for that level of action to be enough. Traffic reduction later in the period has reduced impact if the proportion of EV miles driven increase as planned. The gap cannot be bridged by traffic reduction alone, as even an immediate emergency response akin to that in 2021, as restrictions were beginning to be lifted during the Covid-19 pandemic, would only halve the current planned overshoot.

Road traffic reduction remains the main tool in the box to bridge the gap between the plan and the Carbon Budget expectations. It is also the main tool to mitigate against the very clear risks that the proportion of EV miles driven falls short of those set out in the plan. The level of ambition on road traffic reduction set out in the CBGDP is negligible with much left to the actions of local authorities, discussed further below.

8.1.7 The case for radical action extends beyond carbon reduction

This analysis has shown that we are essentially out of road on delaying action on decarbonising transport. The legislative pathways in the Zero Emission Vehicle Mandate provide clarity but also bound what seems possible. There remains a very small window of opportunity to stay on track with surface transport's responsibility to decarbonise. It requires a kitchen sink approach to radical traffic reduction, rethinking how we own and share cars so that we can reduce the total carbon footprint of our travel and a major investment to support the uptake in freight decarbonisation options. This is not currently on the table. The case for change does not rest solely on carbon grounds. The current plans for rising traffic will increase congestion and act as a drag on productivity. It seems imperative to consider whether there are other ways forward.

The current oil price shocks and instability in the Middle East could act as a potential catalyst to change to reduce the nation's exposure to these risks. However, whether there will be sufficient political will to stick with the logic of developing a more resilient approach to mobility must be questioned once the immediate risks recede. The levels of traffic reduction ambition set out in the TDP in 2021 during the Covid-19 pandemic have dwindled to nothing.

8.1.8 There is scope to think and act differently

The path to reducing carbon involves trade-offs between how far we travel, how many cars we have, how quickly we retire older fossil fuel cars, and how quickly we bring new EVs into the fleet. There are different combinations which can achieve this which could command public confidence.

The current approach is to refuse to turn any taps off. It involves high traffic growth, high EV sales and faster vehicle retirement rates. It produces a much larger fleet which is used less intensively. It builds additional congestion costs into the economy and additional ownership and running costs. It has significant delivery risks. It continues to expose the public to energy price shocks.

It is equally plausible that different pathways could be adopted. A smaller vehicle fleet for cars which are more shared between households or communities is possible, working alongside a better connected and integrated transport system. Incentives could be given to rapidly retire fossil fuel vehicles and to ensure a more rapid turnover of EVs, with those in shared use being used more intensively and replacing more fossil fuel miles. This would reduce production emissions for vehicles and reduce the scale at which road traffic needed to be moderated or reduced in absolute terms to deliver carbon savings.

The current approaches set out in the Carbon Budget Growth Delivery Plan and the revised Scottish Climate Action Plan both represent extensions of business as usual. Whilst each recognises the potential of alternatives to the car, neither has commitments which are yet sufficient to deliver on this. Indeed, the underlying assumptions suggest that there is a resignation that the alternatives will have very limited impact.

8.2 Specific Recommendations

This report is first and foremost an analysis of the carbon implications of the existing delivery plans and their key sensitivities. In light of a recommitment to more integrated transport and a stated desire by local and national government to meet the goals of the Climate Change Act, the report concludes with some recommendations to different actors to understand and take action on some of the path-changing opportunities which exist. Each will require further exploration before they can be actioned.

8.2.1 Introduce a high bar on carbon impacts for further infrastructure investments (All Scheme Promoters)

The case for significant expansion of infrastructure needs to be rethought. New investments continue to be justified on their growth benefits with the additional carbon from any given scheme written off as small relative to the national totals. If a bath is full then it doesn't matter whether a cup or a bucket of water is added, the bath overflows. It is the responsibility of the Climate Change Committee to call this out, but it is time for the profession to recognise the significance of these facts and stop planning for overshoot. It is important to not look to cost-benefit analysis in appraisal to sort out these controversies, it is the strategic case that needs to properly recognise where we are on carbon delivery. If new infrastructure is desirable, then the question must be asked as to where the savings that would allow for that come from?

8.2.2 Revise core planning assumptions (National and Local Governments)

Alongside this report, the data from the EIR issued has been released (click here to download). I am also publishing the various assumptions underpinning the modelling scenarios covered in the report (in a way which is still not standard practice by governments at all levels). This has exposed serious issues with forecasts for:

a) Vehicle ownership;
b) Road traffic growth;
c) Fleet turnover.

A review of whether our current tools are robust in their own terms is essential given the disconnect between outturn values and projections. A more in-depth root and branch review of the forecasting tools in use which enable different futures to be explored is also necessary. This will enable a more nuanced exploration of shared, powered light electric and increasingly autonomous forms of transport to influence the nature of the fleet we own and access. There is also a need to explore wider social change and the impacts on the journeys we make, and our relationship with owning and using cars in different places.

8.2.3 Set out honest but ambitious pathways for reducing traffic growth (Local Governments)

The findings of this report have profound implications for devolved administrations and local governments. Most authorities have set out more ambitious carbon reduction targets than the UK Climate Change Act implies. Scotland has a legislated net zero target for 2045. Some authorities had set out timescales of the next 5 to 10 years to become net zero. The science shows that this is not going to be possible with business-as-usual planning. Targets can signal ambition, but they can also lead to frustration if they are too far divorced from reality. It is time to reset towards ambitious, but credible, strategies so that the true scale of carbon ambition can be understood.

The Department for Transport has produced guidance for local authorities and tools for setting out Quantifiable Carbon Reduction from their actions and has mandated reporting on this as part of the recent Local Transport Plan guidance, as well as being part of existing Integrated Settlements with Mayoral Combined Authorities. It is essential that the outcomes reported are aligned with what the funded commitments can deliver. The sector needs to move away from simply stating future ambition to being transparent about what is planned to be delivered.

This report suggests that even radical levels of travel reduction will not be sufficient to get back on track to the 7th Carbon Budget projections. However, any form of traffic reduction remains an essential part of closing the gap or mitigating against the further delivery risks identified. It will then be for the Department for Transport and the devolved administrations to work out how the gaps that remain can be closed.

8.2.4 Use a very simple headline indicator set to scrutinise progress (Climate Change Committee)

Alongside this report, the data from the EIR that I issued has been released. I am also publishing the various assumptions underpinning the modelling scenarios covered in the report (in a way which is still not standard within the Department for Transport). To know whether or not we are on track requires an honest assessment of the key indicators of change:

- Efficiency of the remaining fossil fuel fleet;
- Numbers of vehicles sold and their embodied carbon;
- Scrappage rates of existing fossil fuel vehicles;
- Percentage of miles driven in electric or other zero emission mode;
- Total miles driven.

There are lots of other things that count or that could be counted which would explain how these variables can be changed. Policies can be introduced for many reasons beyond carbon, but these are the variables which count in whether or not they are substantial carbon reduction policies.

8.2.5 Establish a task force to explore new mobility solutions and pathways (Department for Transport and Devolved Administrations)

The recent Better Connected strategy set out many different ways in which alternatives to private car use can be improved and set out a credible action plan to tackle these (DfT, 2026a). However, it stopped short of setting out an ambition on mode shift away from the car or challenging the assumptions which have underpinned transport planning. It does not provide an answer to the carbon challenge.

As this report indicates, there are other ways of reducing fossil fuel miles driven by, for example, targeting EVs at high mileage users or enabling shared access to EVs through greater use of car clubs, community ownership models or potentially social leasing of powered light electric mobility. A smaller car fleet and a fleet with smaller batteries, as well as more efficient manufacturing processes must all play a part in decarbonising transport. Anything which departs from the business-as-usual planning for car ownership growth,

which sits at the heart of national planning processes, will require major institutional change. How might it work? Where might it work? For whom will it work best? Could it be enacted quickly? Do the social benefits exceed any costs associated with it? Whilst the context is different, similar questions need to be asked about routes to decarbonising the movement of goods also.

No country has yet tried to transition away from the existing individual ownership model and use model. If the scope for these options is to be properly understood, then they need to be at the forefront of inquiry and not just a side bar in national and local strategies as they appear to be. A task force has been established by England's Economic Heartland to explore maximising the integration of transport. This report shows the need for an equivalent task force to explore how a paradigm shift in shared mobility could work for the interests of the people, places, and businesses of the UK as well as the planet. The INFUZE project is exploring the joint social and environmental case for change and building tools which could support this.

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