# THE UNINTENDED CONSEQUENCES OF FREEZING FUEL DUTY

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# THE UNINTENDED CONSEQUENCES

# OF FREEZING FUEL DUTY

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## EXECUTIVE SUMMARY

Increasing costs for road users is politically difficult. This is one of the reasons why we have had seven years and eight consecutive budgets where fuel duty has been frozen at a time of historically low oil prices and austerity.

The result of seven years of fuel duty freezes is that the price of fuel at the pump is 13% lower than it would otherwise have been. While the freeze has been welcomed by many road users and has undoubtedly been of benefit to people struggling on low incomes dependent on car travel, there have been some unintended consequences.

As a direct result of the freeze in fuel duty since 2011:

- Traffic has grown by 4%, worsening both congestion and pollution
- The increase in traffic has produced an additional 4.5 million tonnes of $CO_2$, including 2.8 million from cars and taxis and 1.7 million from lorries and vans[1]
- The increase in traffic has produced 12 thousand tonnes of NOx, and 816 tonnes of PM10s[2]
- The freeze on fuel duty since 2011 has cost the Treasury around £7 billion in lost tax revenue[3]. In addition, there had been less rail revenue and more rail subsidy
- Public transport usage has decreased by between 1.3% and 3.9% causing there to be up to 60 million fewer rail journeys and up to 200 million fewer bus journeys[4]

The impact of congestion means that the above figures underestimate the increase in $CO_2$, NOx and PM10s. Emissions from road traffic increase by approximately 40% as the result of congestion[5]. It is also likely that the decline in bus use is even greater because of the increase in congestion caused by the growth in traffic. Buses suffer more from congestion than any other mode of transport. Congestion has been causing bus speeds to fall by on average 10% every decade, causing bus patronage to all by 10-14%[6].

The Government has stated that from the financial year 2019/20 fuel duty will be uprated each year in line with the growth in the RPI. They are right to make this commitment. It is vitally important that Government delivers on this commitment as a minimum if it is to begin to send the right price signals to road users.

Currently price signals are leading to worsening pollution and congestion. This year, for the first time since 2000, the $CO_2$ emissions from the average car sold in the UK

[1] Calculations based on data from Office for National Statistics, Environmental Accounts: November 2017
[2] Calculations based on data from Office for National Statistics, Environmental Accounts: November 2017
[3] Calculation based on data from OBR, 2017
[4] Rail Statistics Gov. UK (2016) and Bus statistics Gov.UK (2018)
[5] Bath and Boriboonsomin, 2008
[6] Prof David Begg, report for Greener Journeys 2016, The Impact of Congestion on Bus Passengers

has increased. The cheaper fuel price combined with the improved efficiency of vehicles has encouraged consumers to purchase larger vehicles with an increase in demand for SUVs[7].

Government needs to begin to redress the balance if it is to tackle some of the most serious externalities arising from motoring including pollution and congestion. Economic analysis conclusively demonstrates that many road users do not cover their external costs, especially in congested urban areas. The challenge is that the public feel they are paying too much for their road use. Since the fuel duty protests in 2000, followed by the referendums on congestion charging in Edinburgh and Manchester, levying additional charges on road users has become politically difficult.

In the medium to longer term, the impact electric vehicles will have on Government finances and traffic volumes will be serious. The Government plans to phase out sale of petrol and diesel cars by 2040 (2030 in Scotland). Whilst the new electric vehicles will be cleaner and safer, they will not solve the congestion problem and they will leave a hole in the Treasury finances When the £29 billion paid in fuel duty disappears. If driving is cheaper congestion will worsen. Unless a new way to pay for road use is introduced to replace fuel duty:

- Traffic on our roads will increase by an additional 30%. This is in addition to the 40% growth in traffic already predicted by DfT by 2035[8], leading to an overall increase in traffic of approximately 70% by 2035.

Politically it will be very challenging for Government to impose a compulsory change in how we pay for road use. However, the advent of autonomous vehicles presents the opportunity to introduce a voluntary change in how we pay for road use. The desire to operate vehicles in autonomous mode will be strong enough for many to accept the condition that they pay differently for road use. This is a one-off opportunity to get the public to adopt change.

**RECOMMENDATIONS**

1. **Government to honour its commitment to increase fuel duty at least in line with inflation at next Budget**
2. **Policies to encourage modal switch from car to public transport, walking and cycling**
3. **Government to move to a new model for paying for road use**

[7] SMMT 2018
[8] DfT Road Traffic Forecast 2017

# 1. THE CHALLENGE

***Economic analysis conclusively demonstrates that many road users do not cover their external costs. However, the challenge for Government is that the public feel that they are already paying too much.***

***Increasing costs on road users is politically difficult. This is one of the reasons why we have had eight consecutive budgets where fuel duty has been frozen at a time of historically low oil prices and austerity.***

## 1.1 Many road users do not cover their external costs

Economists believe that many road users are paying too little road tax as they don't in aggregate cover their external costs. External costs include congestion, accidents, local air pollution, noise, greenhouse gas emissions, harm to landscape and biodiversity.

Department for Transport (DfT) research in 2010 (the last year that this data was published) showed that road users failed by a considerable margin to cover their external costs. [Appendix I – Marginal External Costs and Taxes paid by road users]

We would encourage DfT to update this research and forecast how the gap between externalities (primarily congestion) and what road users pay in tax will increase in the future, if current road tax rates remain unchanged.

Most estimates would indicate that congestion accounts for more than 80% of externalities. As we move towards a vehicle fleet that is electric, with dramatic reductions in emissions and considerably less noise from quieter electric vehicles, we can expect the proportion of externalities accounted for by congestion to grow even further while the contribution from pollution diminishes.

When we add to this the advent of autonomous vehicles which, by removing human error, are predicted to reduce road accidents by up to 80%, plus the relentless rise in traffic, it is clear that congestion is the overwhelming externality.

## 1.2 The public believe they are paying too much road tax

The challenge we face in factoring external costs into the price of motoring is that the public feel they are already paying too much in road taxation.

Since the fuel duty protests in 2000, followed by the referendums on congestion charging in Edinburgh and Manchester, levying additional charges on road users has become politically toxic. The public believe they are paying too much in road tax as it dwarfs the amount spent on road investment and maintenance. They do not recognize the external costs of motoring, especially that their journey imposes a congestion cost on other road users.

The result of the failure of road taxation to cover externalities is that we over-consume roads and make incredibly inefficient use of them with very low car occupancy rates. If the external cost of individual road journeys was covered in the tax paid, then road capacity should rise to accommodate rising traffic and an efficient allocation of resources would occur.

### 1.3 Fuel duty has been frozen for eight consecutive budgets

It is difficult for politicians not to have affinity with public opinion. This explains why we have had eight consecutive budgets where fuel duty has been frozen - despite the price of oil hitting historically low levels and public finances under severe strain.

Fuel duty has not been increased since January 2011 when it was increased from 58.19p per litre to 58.95p per litre. It was cut by 1p per litre in the budget two months later (March 2011) to 57.95p per litre. It has been frozen at this level since. This means there have been eight consecutive budgets where fuel duty has not been increased, not even in line with inflation.

This has been trumpeted as a boost to motorists. In his 2016 budget, the Chancellor, Philip Hammond, said: “This will save the average car driver £130 per year and the average van driver £350 per year. It is a tax cut worth £850 next year and means the current freeze is the largest for 40 years”

While this freeze in fuel duty has been welcomed by motorists and van users there have been unintended consequences which policy makers should take cognisance of and certainly be aware of if they continue with this policy.

### 1.4 The price of road fuel is a divisive issue

The price of road fuel is one of the most divisive political issues in the country, with campaigners demanding both higher and lower duties.

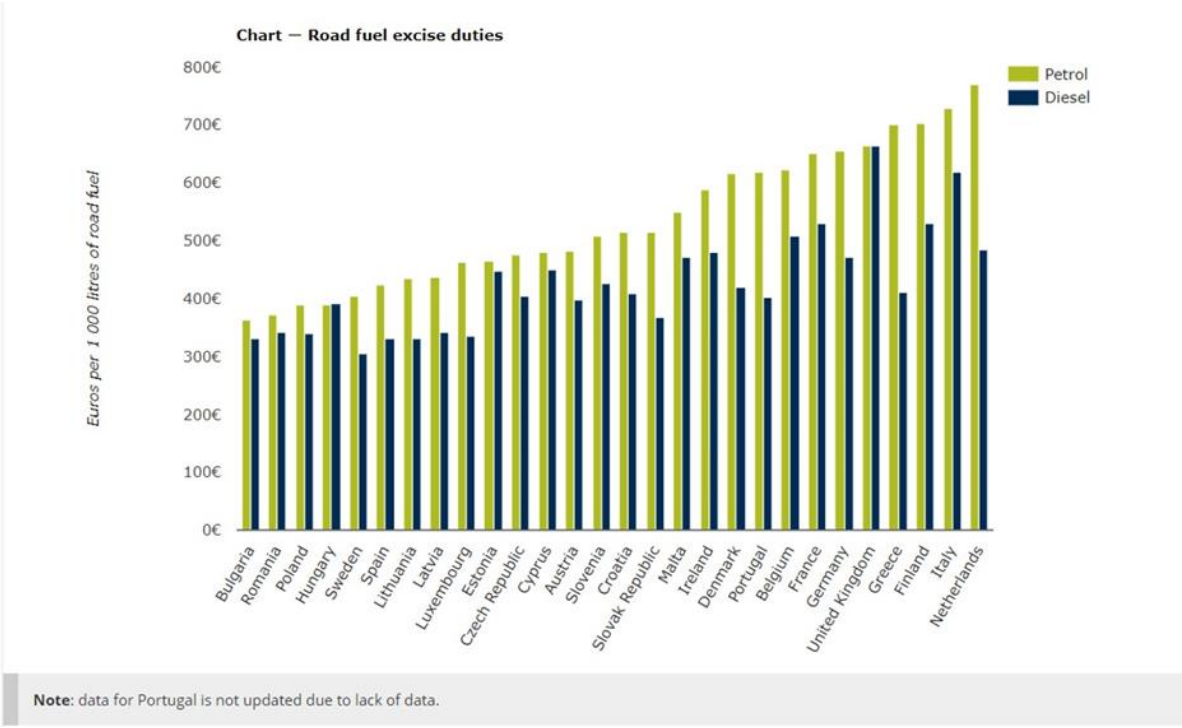
Environmental groups insist that the levels of duty charged by the Government fall short of meeting the true environmental costs of motoring. They point to the rising numbers of short private car journeys and call for higher duties to discourage "unnecessary" vehicle use.

While the Fuel Duty Escalator was introduced with an explicit environmental purpose, opponents of the fuel duty regime reject this approach as ignoring important factors. People living in rural areas, it is argued, cannot be driven onto public transport by high fuel excise duties in the way that the environmental lobby demands, because the availability of public transport is inadequate. Car is seen as a necessity for many people especially those who live in rural areas.

More widely, it is frequently argued that public transport everywhere is not good enough to encourage people out of their cars, and that as such, higher duties result in nothing more than financial penalties for drivers. The state of the transport

infrastructure, and the levels of taxation extracted from motorists in general, are a widespread cause of resentment amongst the public[9]

It is often argued that the UK has the highest fuel prices in Europe, a claim which is not borne out by the evidence. The chart below shows four European countries with higher fuel duty levels than the UK[10]. It should also be noted that motorway tolling is also much more prevalent in mainland Europe than it is in the UK.




[9] OBR 2017
[10] European Commission Environmental report 2017

## 2. UNINTENDED CONSEQUENCES OF FREEZING FUEL DUTY

***While the freeze in fuel duty has been welcomed by many road users and has undoubtedly been of benefit to people struggling on low incomes and dependent on car travel, there have been both winners and losers.***

***This section examines the unintended consequences of freezing fuel duty in terms of growth in traffic; decline in rail and bus patronage; increased levels of pollution; and, reduced income for the Treasury.***

### 2.1 Increased volume of traffic

Following seven years, including eight budgets, where fuel duty has been frozen, the price of fuel is lower than it would otherwise have been, and this has resulted in more road traffic.

If fuel duty had been increased in line with inflation since 2010 it would be 23% higher than it is today[11]. This would make it 13.33p higher at 71.28p per litre (based on price at the pump March 2018). In addition, the VAT on fuel at 20%, which is charged on the post fuel duty price, would add another 2.66p per litre, increasing the price by 16p per litre.

With the price for unleaded petrol at an average of 122p per litre (March 2018) an increase of 16p per litre would represent a 13% increase in the price at the pump.

We assume in this report an average fuel price elasticity of demand of -0.3[12]. The fuel price elasticities in academic studies typically range from -0.1 to -0.5. The result depends on the purpose of travel, the largest elasticity being -0.79 for long distance holiday travel. This is an outlier which hasn't influenced the average calculation but is included to show just how price sensitive long-distance holiday travel can be.

The higher elasticity of -0.79 for long distance holiday traffic would imply over 10% more car trips for this purpose as a direct result of the decision to freeze fuel duty. This is one reason why long distant train operators such as Virgin East Coast experienced much lower growth in rail travel than they had forecast. Long distance holiday car trips are one of their major competitors!

The result of seven years of fuel duty freezes is that the price of fuel at the pump is 13% lower than it would otherwise have been. Applying the average fuel price elasticity of demand for road transport, this means that the freeze in fuel duty has resulted in almost 4% more road traffic with the all the additional congestion and pollution associated with it.

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[11] Office for National Statistics 2017 RPI All Items: Percentage change over 12 months.

[12] Pat Dunkerley, Charlene Rohr and Andrew Daly, RAND Europe 2014, Road traffic demand elasticities- A rapid evidence assessment,

## 2.2 Impact on rail and bus patronage

Cheaper fuel costs boost demand for car travel and reduce demand for rail and bus travel. This is defined by economists as "cross elasticity of demand". The cross elasticity of demand between the cost of motoring and demand for rail and bus is between 0.1 and 0.3[13]. This means the 13% reduction in fuel costs as a result of the freeze in fuel duty would lead to an average fall in demand for rail and bus of between 1.3% and 3.9%.

The former chief transport economist at DfT, Professor Tom Worsley, deployed the cross elasticity of demand figure of 0.25 in his research into rail demand forecasting:

"Prior to the freeze in fuel duty rising car fuel costs had been contributing to increase in rail patronage. Car fuel costs increased by 24% between 2007 and 2010 and this would account for growth in rail patronage of around 6% over the three years 2007/8-2010/11, a period during which actual rail patronage growth was 16%.

It would appear that the increase in car fuel costs explain around a third of the growth in rail patronage between 2007/8 and 2010/11. Changes in car journey times also have an impact on rail demand although, when compared to fuel costs, such changes tend to be small over a short period. Data on traffic speeds since 2007 shows a slight increase in speed, which might offset some of the transfer from car accounted for by higher fuel costs. Changes in fuel costs explain around a third of the change in rail patronage".[14]

The fall in the real price of fuel at the pump is one factor which can explain the slowdown in rail patronage growth in recent years.

The lower cost of fuel at the pump as a result of fuel duty declining in real terms has had a direct impact on rail patronage. It is one reason to explain the sluggish rail patronage growth since 2014 and then the 1% decline in rail patronage for the last quarter of 2017[15]

If we apply the 0.25 cross elasticity of demand[16], then the 13% fall in the real price of fuel resulting from fuel duty being frozen has led to a 3.25% fall in rail use.

As the result of the freeze in fuel duty since 2011, public transport usage has decreased by between 1.3% and 3.9% causing there to be 60 million fewer rail journeys and 200 million fewer bus journeys over the period since 2011.[17]

### *Urban areas*

The problem with using average elasticity estimates is that they disguise significant variations for different journeys. In rural areas where public transport is often not a

[13] Tom Worsley, 2012, Rail Demand Forecasting

[14] Tom Worsley, 2012, Rail Demand Forecasting

[15] ORR, National Rail Trends, 2018

[16] Rail demand forecasting using the passenger demand forecasting handbook On the Move Supporting Paper 2. Tom Worsley Dec 2012

[17] Rail Statistics – Gov.uk (2016) Bus Statistics – Gov.uk (2018)

viable option the cross elastics of demand between car and public transport is much lower. Changes in the cost of motoring therefore will have little impact on public transport use.

However, in urban areas the market is more competitive between car and public transport. This is reflected in higher cross elasticity of demand estimates with one study stating they were as high as 0.59 for rail and 0.55 for bus[18].

If we use these higher cross elasticities between car costs and rail and bus demand, then the 13% fall in fuel costs resulting from fuel duty being frozen would lead to a 7.65% fall in rail use and a 7.15% fall in bus use.

In urban areas, public transport use is remarkably sensitive to car costs, but car use is much less dependent on public transport costs. This reflects differences in market shares of public and private transport: a small percentage change in car travel can amount to a large percentage change public transport use.

However, we need to qualify the above estimates with an acknowledgement that more car traffic results in more road congestion. Whilst this makes rail travel more attractive it is bad for bus travel as buses suffer more from congestion than any other mode of transport. In urban areas bus speeds have been falling by an average of 10% every decade with the downward trend accelerating in recent years. For every 10% increase in road congestion there is a 10-14% fall in bus patronage[19].

## 2.3 Increased levels of pollution and congestion

The seven-year freeze in fuel duty means that the volume of traffic is 4% greater than it would otherwise have been.

This has resulted in an additional 4.5 million tonnes of $CO_2$, including 2.8 million tonnes from the increase in car traffic, and 1.7 million tonnes from the increase in lorries and vans. The increased volume of traffic has also produced an additional 12 thousand tonnes of NOx and 816 tonnes of PM10s vans[20].

This assumes a direct correlation between car traffic volumes and $CO_2$, i.e. a 4% increase in car traffic results in a 4% increase in $CO_2$. But this underestimates the increase in $CO_2$ as the extra traffic increases congestion and slower traffic speeds increases emissions per vehicle km. Emissions from road traffic are increased by approximately 40% as a result of congestion[21].

[18] Wardman 1997: Institute of Transport Studies, University of Leeds: referenced in: "The demand for public transport: The effects of fares, quality of service, income and car ownership", University of Leeds Paulley, Balcombe, Mackett, Et al. (2006).

[19] Prof David Begg, report for Greener Journeys 2016, The Impact of Congestion on Bus Passengers

[20].Calculations based on data from Office for National Statistics, Environmental Accounts: November 2017

[21] Bath and Boriboonsomin, 2008

The increased volume of traffic has led to worsening congestion. Excess traffic is the main cause of congestion. TfL estimate that 75% of traffic congestion is caused by excess traffic with only 7% down to road works[22].

Not only has the increased volume of led to worsening congestion, congestion itself has further exacerbated levels of pollution. In nose-to-tail traffic, tailpipe emissions are three to four times greater than they are in free flow traffic[23].

Whilst it is difficult to quantify the precise correlation between the freeze in fuel duty and increased levels of congestion, there is no doubt that the freeze contributes to an overall trend of worsening congestion and pollution.

Urban traffic speeds are falling by on average 2% every year[24], causing both congestion and pollution to rise. Halving average city traffic speeds leads to a 50% increase in NOx emissions from larger vehicles[25].

Traffic congestion in the UK's largest cities is 14% worse than it was five years ago, and in the last year alone has deteriorated by 4%[26]. Falling traffic speeds drastically worsen air quality. Morning peak traffic average speeds in central London for example have fallen from 16 kmph in 2006 to 12 kmph in 2016[27], causing a 10% increase in NOx from diesel cars and vans, and a 25% and 27% increase for buses and trucks.

## 2.4 Social equity implications

Approximately 4.9% of households total expenditure goes on vehicle fuel. It is often claimed that the poorest are hit most by fuel duty, yet expenditure on fuel accounts for only 3% of expenditure by households in the lowest income decile. This compares with 5.9% for households in the 8th and 9th income deciles[28].

People on lowest incomes are less likely to own a car and more likely to depend on bus travel. There are also serious health impacts arising from car travel. Research by the University of Surrey shows that drivers commuting in diesel cars produce six times as much pollution as the average bus passenger, yet bus passengers suffer far more from pollution in our cities than those travelling in cars[29].

The research from the University of Surrey shows that bus passengers are disproportionately affected by particulates (PMs), ultrafine particles (PNCs) and black carbon (BCs) compared with motorists, yet motorists are responsible for more of these pollutants per passenger journey than bus passengers. This is a clear

[22] Travel in London Report 9, Transport for London 2016
[23] Environmental Factors in Intelligent Transport Systems, IEE Proceedings, M.C. Bell 2006
[24] Department for Transport Congestion Statistics 2017
[25] Low Carbon Vehicle Partnership, 2017
[26] TomTom June 2016
[27] Travel in London Report 9, Transport for London 2016
[28] Institute of Fiscal Studies, 2017
[29] Environment International Today, University of Surrey 2017

violation of the core principle of environmental justice: those who contribute the most to air pollution in our cities are the least likely to suffer.

## 2.4 Reduced income for the Treasury

Chancellor Philip Hammond has described the freeze on fuel duty as a 'fiscally expensive' measure which was delivered to ease the financial pressure on families[30].

The freeze on fuel duty since 2011 has cost the Treasury around £7 billion in lost tax revenue[31]. In 2000 fuel duty represented 2.3% of GDP but today with eight years of fuel duty being frozen it represents only 1.5% of GDP.

Reduced tax receipts are not the only direct cost to the Treasury. Premiums paid to DfT have fallen on profitable rail franchises and subsidies have increased on loss making ones a result of the freeze on fuel duty.

### *Electric Vehicles pose a fiscal and congestion threat*

The Government plans to phase out sale of petrol and diesel cars by 2040 (2030 in Scotland). The Committee on Climate Change have forecast that 60% of new cars will be electric by 2030. The impact electric vehicles will have on Government finances, traffic volumes and congestion will be significant unless a new way to pay for road use is introduced.

The National Infrastructure Commission notes that whilst "new vehicles will be cleaner and safer, they will not solve the congestion problem. In fact, if driving is cheaper and more attractive they will make congestion worse."[32]

[30] Chancellor Philip Hammond evidence to Treasury Select Committee, 25th April 2018
[31] Source: OBR 2017
[32] Congestion, Capacity, Carbon: Priorities for National Infrastructure, National Infrastructure Commission October 2017

## 3. GETTING THE PRICE SIGNALS RIGHT

***If the pricing of road use does not cover external costs, road space is over consumed creating congestion, pollution and all the associated economic, social and health costs. Government must send the right price signals to road users and incentivize a switch from car to more sustainable transport.***

***The impact electric vehicles will have on Government finances and traffic volumes will be serious unless a new way to pay for road use is introduced. Whilst this has hitherto been too challenging politically, the advent of autonomous vehicles presents a window of opportunity to introduce a new way of paying for road use.***

### 3.1 Government intends to increase fuel duty in 2019/20

The Government has stated that from the financial year 2019/20 fuel duty will be uprated each year in line with the growth in the RPI. Given the Government's track record on postponing or cancelling increases in fuel duty in line with inflation there must be a question mark about whether they will deliver on this commitment. This is a concern that is shared by the OBR[33]

It is vitally important that Government delivers on this commitment as a minimum if it is to send the right price signals to road users and begin to tackle some of the most serious externalities: pollution and congestion.

### 3.2 Impact on public finances of cleaner vehicles.

The Government plans to phase out sale of petrol and diesel cars by 2040 (2030 in Scotland). The Committee on Climate Change have forecast that 60% of new cars will be electric by 2030.

[33] OBR 2017 in Budget 2011, the Government cancelled the pre-existing fuel duty escalator (where fuel duty rates were due to rise in line with RPI inflation plus a penny a litre in every year until 2014-15). The rate was also cut by one pence a litre in April 2011. The April 2011 RPI rise was delayed until January 2012 and the April 2012 rise was delayed until August 2012;

- in Autumn Statement 2011, it delayed the planned January 2012 RPI rise until August 2012– thereby planning a rise before the next Autumn Statement;
- in June 2012, it delayed the planned August 2012 RPI rise until January 2013;
- in Autumn Statement 2012, it cancelled the planned January 2013 RPI rise and pushed back each subsequent year's April RPI rises until the end of the Parliament to September;
- in Budget 2013, it cancelled the planned September 2013 RPI rise;
- in Autumn 2014, it cancelled the planned September 2014 RPI rise;
- in Budget 2015, it cancelled the planned September 2015 RPI rise;
- in Budget 2016, it cancelled the planned April 2016 RPI rise; and
- in this Autumn Statement, the Government has cancelled the planned April 2017 RPI rise.

The Office for Budget Responsibility (OBR) forecast that by 2029/30 fuel duty will make up only 1.1% of GDP compared to 1.7% today. For VED, the figures are 0.1% and 0.3% respectively.

The total decline in motoring taxes is equivalent to £13.2 billion a year in today's terms. This is roughly the revenue generated by increasing the basic rate of income tax from 20p to 23.4p, increasing VAT from 20% to 22.7%, or increasing fuel duty by more than 50%[34]

## 3.3 Projected increase in traffic volumes

Electric vehicles currently pay no tax on running costs, other than VAT on electricity consumed, and are exempt from Vehicle Excise Duty. The fuel/energy costs of running a petrol car are 14.55p per mile, compared to just 0.03p per mile for running an electric car[35].

This fall in the cost of running a car will result in an increase in traffic (vehicle kilometres) of around 30% when the car fleet is electric [See Appendix I: Projected growth in traffic calculation].

This 30% estimate is in addition to the 40% growth in traffic predicted by DfT by 2035[36], leading to an overall increase in traffic of around 70%.

While electric vehicles provide a solution to our air quality challenges, depending on how the electricity is generated, they will significantly exacerbate our congestion problem in the absence of introducing a new way to pay for road use.

## 3.4 Disruptive technologies and trends

The exponential growth in online shopping has led to a proliferation in the number of delivery vehicles on the road. We need to make much more use of the road network for the movement of freight and parcels when it is less busy. This includes evenings and through the night.

Uber and other private hire vehicle (PHV) apps bring benefits to the consumer in terms of cheaper rides and easier access. However, there is a tipping point when the sheer numbers of new PHV registrations adds significantly to congestion levels. This needs to be managed.

Department for Transport has forecast that the vehicle fleet will be all electric by 2050. Unless a way is found to ensure that electric vehicles pay for road infrastructure then these costs will be borne by the taxpayer. This will expose serious equity and fairness issues.

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[34] Institute of Fiscal Studies: "Fuel for Thought, The what, why and how of motoring taxation" May 2012
[35] AA: Motoring Costs 2014 and pod-point.com
[36] DfT Road Traffic Forecast 2017

Autonomous Vehicles (A.V.s) will make it more appealing for passengers to spend longer travelling as they can be more productive if they don't have to be attentive at the wheel of the vehicle. Average journey length could increase significantly with A.V.s. Congestion consequences will be drastic if Government does not take action.

## 3.5 Increasing road capacity

There is a widespread assumption that congestion is primarily a supply side problem with too little of the tax paid by road users being used to pay for more and better maintained road capacity.

However, while there is a strong case for more capacity where the investment case is justified, 80% of the U.K.'s congestion is in urban conurbations and 40% is in Greater London alone[37]. Increasing road capacity in urban areas is challenging to say the least.

There is little appetite for demolishing residential dwellings or to tarmac over what little green space there is. The pressure now, and in the future, is how to make our cities more people friendly by reallocating road space from the movement of people and goods to exchange/people space[38]. This has already happened in London, which is one of the reasons why congestion in the capital has become so acute in recent years. Even where we can increase road capacity, without a fair and efficient charging system it will fill up too quickly.

The central problem we face is inefficient use of road capacity. Car occupancy rates languish at around 1.2 per vehicle; roads are sparsely used for large parts of a 24-hour cycle; freight and parcels are too often delivered when the road network is busy rather than quiet; taxi's and private hire vehicles (PHVs) are more expensive to hire when the roads are least busy.

It is difficult to think of any other sectors where we are making as inefficient use of a scarce resource as we do with road space. The priority must be to tackle inefficiency and not just reach for the capacity lever.

## 3.6 Changing how we pay for road use

Politically it will be very challenging for Government to impose a compulsory change in how we pay for road use. However, the advent of autonomous vehicles (A.V.s) offers the opportunity to make a change in how we pay for road use voluntary.

If road users want to deploy their vehicle in fully autonomous mode, not only should they satisfy the authorities on safety issues, they should also agree to pay for road infrastructure and congestion costs through road pricing. The desire to operate vehicles in autonomous mode will be strong enough for many to accept the condition

[37] Commission for Integrated Transport, Paying for Road use, 2002
[38] Mayor of London's Roads Task Force 2015

that they pay differently for road use.  This is a one-off opportunity to get the public to adopt change.

Moreover, there is a widely recognized risk that artificial intelligence will increase unemployment and that we should tax artificial intelligence to create a more level playing field for organisations which employ people.  A.V.s will eliminate millions of driving jobs.  It would be unfair if companies were to continue to pay tax on their employees (such as employers NI contributions) while companies operating A.V.s pay nothing.

With regards electric vehicles, the Office for Road and Rail Regulation(ORR) should be given an objective of incentivising take up but setting out a longer-term strategy to ensure that eventually they pay for electric charging, road infrastructure and congestion costs. The first two would be distance based and the latter time based. We need to pass a tipping point where electric vehicles are price competitive and take up would not be discouraged by charging for infrastructure and congestion.

We need to avoid the criticism government has faced on diesel where take up was encouraged and incentivised and the public purchased diesel vehicles on good faith. The ORR would need to set out a longer-term pricing strategy, in the same way that the Bank of England gives warnings that interest rates will not always be low, to prevent the public from taking on affordable debt when interest rates rise.

## 5. CONCLUSION & RECOMMENDATIONS

Increasing costs on road users is politically difficult. However, it is vitally important that Government creates the right price signals if we are to reduce congestion and pollution and create a more equitable society.

While the freeze in fuel duty has been welcomed by many road users there have been unintended consequences in terms of growth in traffic; decline in rail and bus patronage; increased levels of pollution; and, reduced income for the Treasury. As a minimum, Government must honour its commitment to increase fuel duty in line with inflation at the next Budget.

Government also needs to ensure that innovations and disruptive technologies work in society's interests and do not exacerbate congestion. The impact electric vehicles will have on Government finances and traffic volumes will be severe unless a new way to pay for road use is introduced. The move to autonomous vehicles presents a window of opportunity to move to a new model for paying for road use.

### RECOMMENDATIONS

1. **Government to honour its commitment to increase fuel duty at least in line with inflation at next Budget**

2. **Policies to encourage modal switch from car to public transport, walking and cycling.**

3. **Government to move to a new model for paying for road use**

## APPENDIX I – *Marginal external costs and taxes paid by road users (pence per km)*

Department for Transport research in 2010 showed that road users failed by a considerable margin to cover their external costs:

| Year | Congestion | Environment /Safety | Fuel Duty + VAT | Uncovered Costs |
|---|---|---|---|---|
| 2000 | 7.3 | 2.2 | 5.2 | 4.3 |
| 2010 | 12.3 | 1.6 | 3.9 | 10.1 |

A few things to note from this research. The pence per km raised from fuel duty and VAT fell by one third between 2000 and 2010 as a result of more fuel-efficient vehicles. We can expect this trend to accentuate as the vehicle fleet becomes increasingly more fuel efficient and we move to zero emissions with electric vehicles.

There is a shortfall of 10 pence per km on what road users should be paying if they were to cover their external costs. Note how the shortfall more than doubled over the decade. Whilst fuel efficient vehicles reduce both environmental cost and fuel duty paid they do nothing to tackle congestion.

## APPENDIX II – *Projected growth in traffic calculation*

If Government doesn't introduce a new way for paying for road use the average fuel/energy costs of running a car will fall from 14.55p per mile to 0.03p per mile[39]. This fall in the cost of running a car will result in an increase in traffic (vehicle kilometres) of **around 30%** when the car fleet is electric.

This calculation is based solely on the change in fuel/energy costs of electric cars versus petrol cars. It is based on an averagely priced petrol car £18,000-£25,000 on a mileage of 15,000 p.a.[40]

The price elasticity of demand for fuel used in this calculation is -0.3. This is an average of the range of elasticities -0.1 to -0.5[41].

While electric cars are currently more expensive to purchase than petrol and diesel cars, and there is doubt about their battery life and the cost of replacement, this will change as technology advances.

"As we scale up production E.V.s are going to become cheaper and we expect battery costs are going to fall"[42].

[39] AA: Motoring Costs 2017 and pod-point.com
[40] AA: Motoring Costs 2017
[41] Study for DFT: Road Traffic elasticities -A rapid evidence assessment, Dunkerley, Rohr and Daly, 2014
[42] Tate and Palmer, Journal of Applied Energy, University of Leeds, 2017