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EV transition comment from the centre-right think tank the Centre for Policy Studies in May 2023 in a report in the Independent newspaper in May 2023

### How will UK road tax rates change in the coming years?

Setting road tax rates will never be an easy task for the Chancellor of the Exchequer as there are so many vehicle use and environmental factors influencing the choices that can be made when of course there is an underlying need to collect funds through road taxes to cover a wide range of road use and maintenance costs. The Centre of Policy Studies has called for a [‘major overhaul’](#) of the UK’s motoring taxation system, with a “suggestion that a “pay-as-you-drive charge” should be introduced and that it should initially apply to zero emission vehicles (ZEVs) such as electric cars before being expanded to cover all vehicles. This would replace the “outdated and onerous tax system” of fuel duty and vehicle excise duty (VED), the document stated.” In the Spring Budget 2024 the Chancellor announced road tax would apply to the growing number of electric vehicles from April 2025. That was necessary with the ending of sales on petrol and diesel fuelled cars in the 2030s when the tax revenue from that group of vehicles would inevitably fall.

But with all projects, like changing road tax rates, the key issue is “what are the aims of the project?” Without a clear idea of those aims the project is often at risk of becoming a “mystery tour” with scope creep and unintended consequences! In those cases Donald Rumsfeld’s memorable statement brought attention to known knowns, known unknowns, and unknown unknowns. [Link](#)

Here Victor Smith looks at some of the issues and choices to be made when of course there is an underlying need to collect funds through road taxes to cover a wide range of road use and maintenance costs.

### Road taxation

The focus tends to be on generating tax income to:

- **Maintain the roads infrastructure and develop it where necessary** – currently the increase in potholes

and the poor repair rates are very much topics motorists are very aware of.

- **Encourage the use of more environmentally friendly vehicles** with the intention of supporting the UK Government’s aim of ending the sale of new fossil fuel vehicles by around 2030. To get momentum into the take up so drivers are encouraged to buy electric vehicles (“EVs”), whether full or hybrid EVs, various incentives are used in the UK and in other countries. Those incentives have included making EVs road tax exempt and providing other attractive benefits like access to bus lanes or exemptions from congestion or **low emission zone (LEZ)** charges. But as those incentives can produce useful results inevitably Governments have to scale back the concessions as those incentives are successful in bringing the desired results.

Triple the number of EVs are now being driven on UK roads since 2019, with the number reported to have reached around 900,000. In the Budget in 2023 and again in the recent Spring Budget 2024 the Chancellor indicated road tax would apply to EVs from April 2025. Similar reductions in road tax intended to encourage EV use in other countries have been seen (for example in Norway) and then later gradually withdrawn.

- **Introducing low emission zones** to reduce air pollution from NOx from fossil fuelled cars and also rubber particulates. We have seen that in major urban areas in the UK, not least with the expansion of the Ultra Low Emission Zone (ULEZ) in the Greater London area extending out to the M25 circular motorway.

### Key factors creating a growing road infrastructure maintenance cost burden - increasing levels of road use and wear rates

The increasing levels of **road use** for many years have been a main factor causing the growing road maintenance burden, but the UK is currently grappling with another increasingly issue which is a real concern – a **noticeable growth in potholes**. The situation appears to have a surprising perpetrator at its core – **heavier cars** causing significantly **higher wear rates** on the road surfacing.

The increasing weight of modern cars, both fossil fuelled and electric vehicles, has become a recognised cause of the rise in the number of potholes seen in recent years. We have seen buyers shift towards getting heavier EVs and also larger and heavier petrol and diesel SUVs and 4x4s which have become increasingly popular. The move to even heavier EVs, particularly SUV-style EVs, will also cause greater stress on road surfaces.

But it’s not just large SUVs piling on the pounds: the move to electrification has seen **even modest sized cars become heavier**. The three-door Mini has increased in weight from around 1050kg (1.03 ton) for the petrol model

to 1440kg (1.42 ton) for the EV model – a 37% increase. EVs were once hailed as saving our environment but a recent report by the Telegraph newspaper highlighted the potential role the growth of both more EVs and heavier petrol and diesel SUVs and larger 4x4s has had in exacerbating the UK's pothole problem.

With EV weights often around 390kg (0.4 ton) more than their petrol and diesel counterparts, primarily due to their heavy batteries, EVs put more stress on the roads. Asphalt surfacing suffers greater movement from heavier vehicles leading to small cracks that ultimately form into the plague of potholes we have seen in recent years. An estimated £12 billion is needed to address the existing potholes across the UK, which is more than just a minor annoyance for motorists but a growing danger for road users and a serious maintenance cost burden for local and national government in the UK.

### How does the increase in vehicle weight affect wear rate?

A method adopted by highways engineers and researchers to assess damage on road surfaces caused by heavy vehicles uses the '**fourth power formula**' - **the greater the axle load of a vehicle, the stress on the road caused by the motor vehicle increases in proportion to the fourth power of the axle load**. This "formula or law" was discovered in the course of a series of scientific experiments in the United States in the late 1950s and was decisive for the development of standard construction methods in road construction. In a series of tests it was found that there is a connection between the thickness of the pavement, the number of load transfers and the axle load, and that these have a direct effect on the service life and condition of a road. The accuracy of the law of the fourth power is disputed among some experts, since the test results depend on many other factors, such as climatic conditions, in addition to the factors mentioned above.

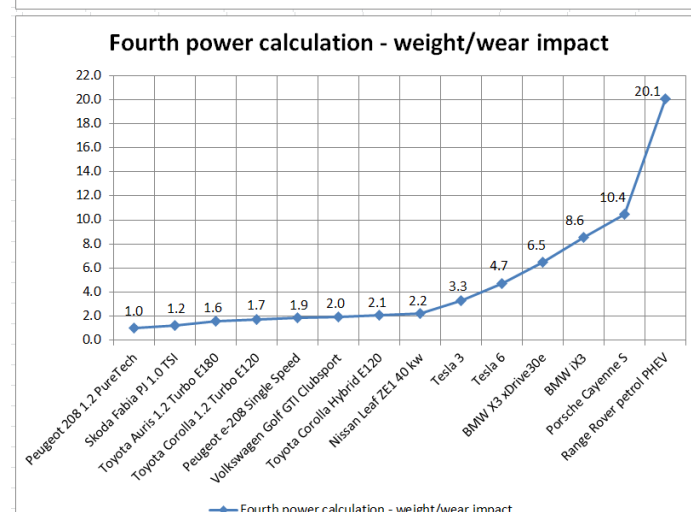
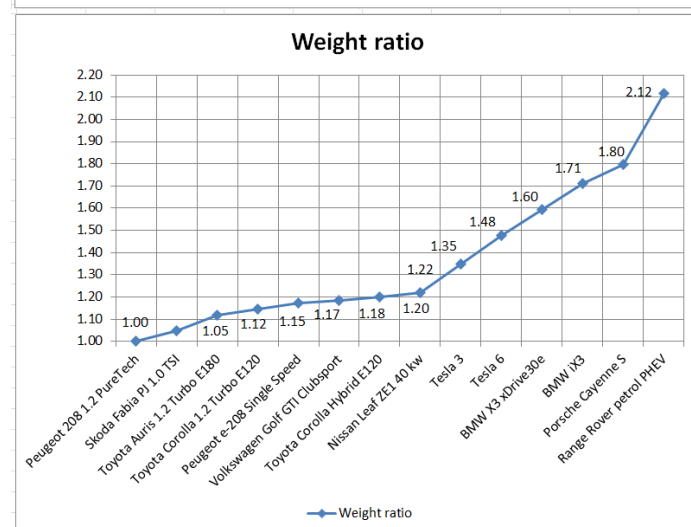
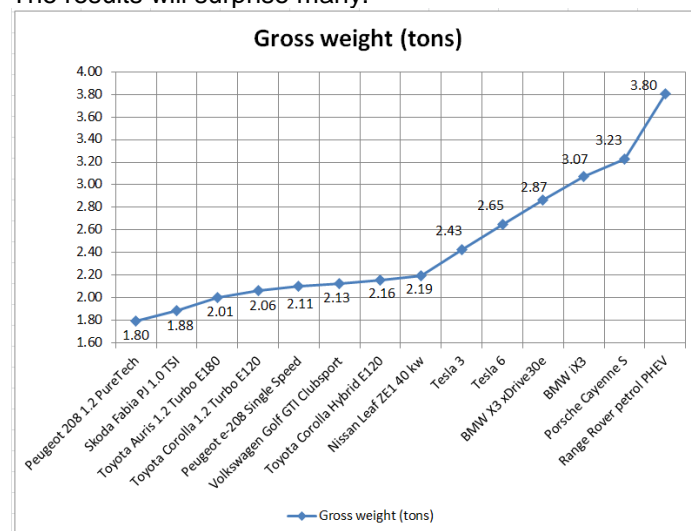
As an example of the fourth power calculation:

Car with a gross weight of 1 ton  
 Heavier car with a gross weight of 2 tons  
 Fourth power calculation is  $2 \times 2 \times 2 \times 2 = 16$   
 times larger wear rate effect.

Looking at a selection of cars and their gross weight and then applying the "fourth power" calculation:

Vehicle	Gross weight kg	Gross weight ton	Fuel type	Price £	Fourth power	Weight ratio
Peugeot 208 1.2 PureTech	1630	1.80	petrol	£21,840	1.0	1.00
Skoda Fabia PJ 1.0 TSI	1709	1.88	petrol	£19,510	1.2	1.05
Toyota Auris 1.2 Turbo E180	1820	2.01	petrol	£22,080	1.6	1.12
Toyota Corolla 1.2 Turbo E120	1870	2.06	petrol	£29,600	1.7	1.15
Peugeot e-208 Single Speed	1910	2.11	EV	£21,400	1.9	1.17
Volkswagen Golf GTI Clubsport	1930	2.13	petrol	£26,950	2.0	1.18
Toyota Corolla Hybrid E120	1955	2.16	hybrid EV	£30,340	2.1	1.20
Nissan Leaf ZE1 40 kw	1990	2.19	EV	£28,500	2.2	1.22
Tesla 3	2200	2.43	EV	£39,990	3.3	1.35
Tesla 6	2405	2.65	EV	£44,990	4.7	1.48
BMW X3 xDrive30e	2600	2.87	petrol	£48,060	6.5	1.60
BMW iX3	2789	3.07	EV	£63,790	8.6	1.71
Porsche Cayenne S	2930	3.23	petrol	£70,400	10.4	1.80
Range Rover petrol PHEV	3450	3.80	PHEV	£104,020	20.1	2.12

The results will surprise many.



### Current road tax rates in the UK

The well-established road tax arrangement in the UK has been an annual charge for each car, but over recent years, with a growing awareness of the impacts of vehicle

emissions from internal combustion engines and from particulates in the air from both those engines and from tyre particulates from wear on road surfaces, the **road tax bands have been tweaked** to take account of emissions

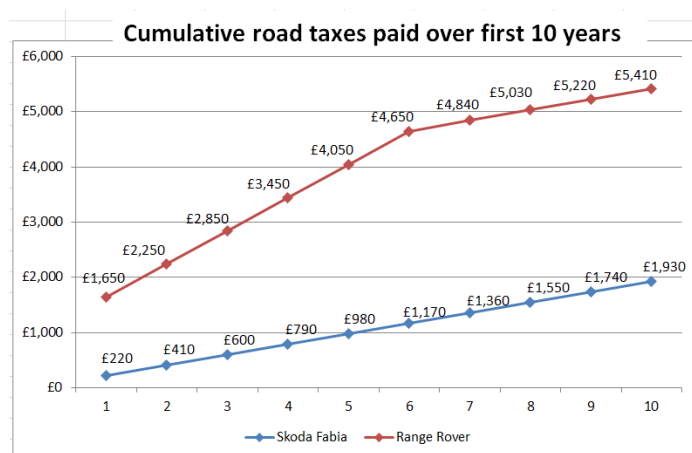
- **First-year road tax rate is based on CO2 emissions, broken down into a number of bands**

This change was introduced several years ago and takes account of the different emissions levels for groups of vehicles as a serious contributor to air pollution, not least in urban areas.

**First tax payment when you register the vehicle**

CO2 emissions (g/km)	First-year VED
0	£0
1 - 50	£10
51 - 75	£30
76 - 90	£135
91 - 100	£175
101 - 110	£195
111 - 130	£220
131 - 150	£270
151 - 170	£680
171 - 190	£1095
191 - 225	£1650
226 - 255	£2340
Over 255	£2745

- **Standard VED rate** payable each year from Year 2 was raised in the Spring Budget 2024 by 5.5% from £180 to **£190** and took effect from 1<sup>st</sup> April 2024.
- **Additional annual charge of £410 on top of the standard rate of VED of £190 for vehicles costing £43,000 or more.** It's payable in the second to fifth years if you have a car or motorhome with a 'list price' more than £40,000 based on the published vehicle list price before any discounts the day before the vehicle is first registered and taxed.



Example current road tax take over the first 10 years

The graph above illustrates the current road tax take over the first 10 years for two petrol fuelled cars - a modest Skoda Fabia and an expensive and heavy Range Rover.

The table below compares the purchase prices of the two cars and their gross weights and the "fourth power" factor indicating the potential comparative wear rate could be over 16 times greater with the significantly heavier Range Rover. It's interesting the total road tax over the first 10 years does follow the increase in gross weight (and probably the consequent wear rate on the road) for the two cars.

	Skoda Fabia	Range Rover	Times larger
Price new	£19,510	£104,020	5.3
Gross weight	1.88	3.80	2.0
Road tax over 10 years	£1,930	£5,410	2.8
Fourth power	1.2	20.1	16.6

In some major urban areas there are also **low emission zone charges** like the Ultra-Low Emission Zone (ULEZ) in the Greater London area (or the "Khan do it tax" at £12.50 a day!) which claim to contribute environmental benefits, but for many drivers they are seen as simply a brazen tax raising scheme and an unwelcome increase in the cost of living burden.

### Key issues influencing future road tax policies

The main issue with any tax and benefits system is the cost of administering the system which determines the net receipts as tax income. Simple tax systems often are more effective and tend to generate higher net receipts but may not satisfy some economists, social campaigners and environmental purists. Let's look at some of the road tax options based on "vehicle use".

- **Pay as you drive charge**

This system will need some electronic system installed in each vehicle to monitor and report the level and location of road use by individual vehicles to the body administering the collection of this road use tax. That administration cost will inevitably reduce the net receipts and the charge will be a repeated irritation for vehicle users having to decide whether to drive before making each journey.

**Suggested effectiveness rating 3 out of 10**

- **Current road tax system tweaked to hit heavier vehicles that are seen as causing higher wear rates on road surfacing and structure**

The current system does that by having higher road tax rates in the first year for vehicles with higher CO2 and particulate emissions **and** then an additional VED rate for vehicles with a higher purchase price, currently new vehicles costing £40,000 or more. Those more expensive vehicles tend to be larger and heavier – like



Teslas, Range Rovers and other large vehicles – and consequently have higher wear rates on the roads.

There is clearly some relationship between the total road tax paid and the comparative weight of the cars and also the price of the cars when new, particularly above the current £43,000 starting point for the additional VED charge. But it probably need more thought on how to set the higher rates for the heavier cars.

**Suggested effectiveness rating 3 out of 10**

- **Road tax charged by wear rate**

Whilst this would have a much more direct link between the damage to the road surface and structure created by heavier vehicles when compared with much smaller and lighter vehicles, it does rely on the “fourth power formula” to derive the exact scale of the wear rate which I mentioned earlier is open to challenge by some engineers.

**Suggested effectiveness rating 4 out of 10**

- **Restricted access to LEZs**

The systems that have been set up by local authorities in major conurbations like London, have certainly reduced the use of cars in the LEZ which have the higher emissions levels, but the schemes are very unpopular and are seen as a cash generation system for the benefit of the local authority. Several candidates standing for election in the Greater London mayoral election have cancelling the LEZ charges as a key part of their election campaign.

**Suggested effectiveness rating 9 out of 10**

This tax may be effective but LEZs are very unpopular with the public putting a heavy financial burden on both residents and tradespeople when using non-compliant cars and vans inside the LEZ zone. If they have an older non-compliant vehicle they are faced with the stark option of pay the daily charge or invest in getting a new or secondhand compliant car or van.

From the above analysis the **current road tax system**, based on the vehicle’s emissions and purchase price as a new vehicle, does reflect to some extent the increase in wear rate created by the gross weight and size of a vehicle. But as petrol and diesel powered vehicles become a significantly lower proportion of the new vehicles on the roads and gradually, as they age, they will become a less active part of vehicle road use, the dominant vehicles will become EVs.

Personally I feel hydrogen powered vehicles will also play a significant part, particularly with heavy vans and trucks (HGVs) and buses. So then most cars on the roads will be heavy EVs which have a relatively higher wear rate, whereas hydrogen powered vehicles may be less heavy on a comparative basis but in absolute terms still very

much heavier than cars because most hydrogen fuelled vehicles will be HGVs or buses.

### **What road tax changes are we likely to see over the next 5 to 10 years?**

The Chancellor has already announced EVs will have to pay road tax from April 2025 and that was inevitable because, with a growing proportion of EVs on the roads, having them as VED exempt would have seen the total VED tax income fall from the reducing proportion of petrol and diesel fuelled vehicles on the road. But Government policy will continue to aim to encourage both the take up of EVs and the end of the sale of new petrol and diesel fuelled cars by around 2030. Then the stock of fossil fuelled vehicles will gradually reduce over the next ten to 15 years or so, but nonetheless during that time the VED income from the users of those vehicles will continue to be a useful source of tax revenue helping to cover a part of road maintenance and development costs.

To maintain a good flow of road tax income **over the next 5 to 10 years, tweaking the existing VED rates will almost certainly continue to be used by the Chancellor, with an increased use of VED tax rates based on new vehicle prices** (for both EVs and fossil fuel cars) as there is a broad relationship between new car prices and their gross weight and the consequent wear rates. That tweaking will be designed to maintain an adequate flow of road tax income to make a substantial contribution to covering road maintenance and development costs.

### **Treasury comments**

A Treasury spokesperson has said: “We are making sure that motoring tax revenues keep pace with the switch to electric vehicles, whilst keeping it affordable for consumers, and have no plans to introduce road pricing. With the EV transition accelerating, it’s right that all drivers start to make a fair tax contribution through changes to Vehicle Excise Duty but we continue to support the electric vehicle revolution through over £2.5 billion in incentives.”

### **Footnotes**

**NOx** - in atmospheric chemistry, NOx is shorthand for nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>), the nitrogen oxides that are most relevant for air pollution. NOx gases are usually produced from the reaction between nitrogen and oxygen during combustion of fuels, such as hydrocarbons, in air; especially at high temperatures, such as in car engines. In areas of high motor vehicle traffic, such as in large cities, the nitrogen oxides emitted can be a significant source of air pollution. [More & air pollution](#)

**Particulates** - non-exhaust emissions come from wearing down motor vehicle brake pads, tyres, road surfaces and

from other of particles on the road. This particulate matter is made up of micrometre-sized particles and causes negative health effects, including respiratory disease and cancer. Very fine particulate matter has been linked to cardiovascular disease. Multiple epidemiological studies have demonstrated that particulate matter exposure is associated with acute respiratory infections, lung cancer, and chronic respiratory and cardiovascular disease. Studies have shown that non-exhaust emissions of particles from vehicles can be greater than particles due to engine exhaust. [More on particulates](#)

**Low-emission zone (LEZ)** is a defined area where access by some polluting vehicles is restricted by the **imposition of a substantial daily access charge** (£12.50 per day for access to the ULEZ in Greater London which extends to the M25 orbital motorway) which aims to deter drivers on non-compliant vehicles with the claimed aim of improving air quality. This may encourage people to use public transport and other vehicles such as bicycles and some alternative fuel vehicles, hybrid electric vehicles, plug-in hybrids, and zero-emission vehicles such as all-electric vehicles. [More on LEZ](#)

**Fourth power law** (also known as the fourth power rule) states that the greater the axle load of a vehicle, the stress on the road caused by the motor vehicle increases in proportion to the fourth power of the axle load. This law was discovered in the course of a series of scientific experiments in the United States in the late 1950s and was decisive for the development of standard construction methods in road construction. [More on "fourth power rule"](#)