

Carbon prices: The right charge for motorists?

1.0 Introduction

The Royal Automobile Club Foundation and the Society for Motor Manufacturers and Traders (SMMT) have developed this paper to highlight the differences that exist between the values of carbon used in different industry sectors and in Government calculations.

Both the RAC Foundation and the SMMT recognise and support the urgent action required to curb climate change, but are keen that the actions taken to mitigate its effects are implemented fairly and consistently across all sectors. This paper seeks to promote awareness and spark discussion on this subject.

2.0 The price of carbon

The price of carbon currently varies enormously across different markets, which makes it difficult for businesses to plan effectively and for consumers and businesses alike to understand the costs of their actions. A variety of values appear to be in use within government when designing policies such as abatement regulations and environmental taxes.

If everybody is charged a common value for each unit of carbon they emit then they will respond to an aligned incentive. The costs to society of abatement and the overall cost of reaching carbon reduction targets will also be as low as possible. On the other hand, if some people are charged much more than others for their carbon then those charged the least will be given too little incentive to reduce their emissions relative to those charged the most: the consequence will be waste and an avoidable loss of well being to the population as a whole.

Table 1 summarises some of the different and varying costs of carbon that are currently in use. These are compared to the Shadow Price of Carbon (SPC), which is intended to reflect the full cost to society of climate change caused by each additional tonne of GHG emissions. This is the price currently used by UK government to assess the cost benefit of policies and is taken as the benchmark for this paper.

Table 1: Summary of Carbon Prices

	£/tCO ₂	Deviation from SPC (%)
Shadow Price of Carbon – SPC (CO₂ equivalent)	25.50	-
EUETS Phase II (March 2009)	9	-64
EUETS Phase II (2008 average)	18	-29
Climate Change Levy (CCL) average for gas & elec	9	-65
Carbon Reduction Commitment price (2012)	12	-53
UK ETS (current price)	1.50	-94
Carbon off-set price (ClimateCare)	8	-66
Red diesel	36	42
Air passenger duty (short haul – 2tCO ₂ equivalent)	5	-80
MOTORIST		
Fuel Duty (approx average for petrol/diesel)	213	+735
VED standard rate (based on average 2008 car's CO ₂)	66	+157
VED proposed first year rate (based on 2008 car's CO ₂)	70	+175
London CO ₂ congestion charge proposal*	3,469	+13,505
Richmond residents parking charges	40	+55
EU new car CO ₂ Regulation (technology cost)	140	+451
EU new car CO ₂ Regulation (penalties 2015 €95/g)	365	+1,333

* cost from standard to high emitting car

The highest values of carbon are more than one hundred times greater than the lowest. This sends a confusing signal to consumers, industry and policy makers. It is also clear that the automotive sector and motorists may pay significantly above the shadow price of carbon (SPC). In general, other sectors pay closer to the SPC.

2.1 Shadow Price of Carbon

The UK Government uses the shadow price of carbon (SPC) to assess the cost benefit of policies¹. **This is taken as the benchmark for this paper** as it is intended to reflect the full cost to society of climate change caused by each additional tonne of GHG emissions, quoted as CO₂ equivalent. The SPC in 2007 prices was £25.5/tCO₂ in 2007, £26/tCO₂ in 2008, £28.1/tCO₂ in 2012, £29.8/tCO₂ in 2015, £32.9/tCO₂ in 2020 and £59.6t/ CO₂ in 2050.

There are many other sources, like the Intergovernmental Panel on Climate Change (IPCC) which says that the social cost of carbon is approximately £38 (\$70).

Stern, in his review on the economics of climate change believes that the social cost of carbon is around £45/tCO₂ (\$85) (http://www.hm-treasury.gov.uk/sternreview_index.htm) – two thirds higher than the UK Government figure.

The other costs of carbon detailed in Table 1 are explained in the Annex.

¹ For the official statement of policy on this from DEFRA see <http://www.defra.gov.uk/environment/climatechange/research/carboncost/pdf/HowtouseSPC.pdf>

3.0 What are motorists currently paying for carbon?

Motorists, vehicle manufacturers and suppliers understand that they should bear a cost for the environmental impact of their activities and that one of these costs is attributable to carbon emissions.

Duties on road fuels and other road taxes and charges are often claimed to be aimed at reducing carbon emissions. Indeed, the United Kingdom National Accounts (The Blue Book: 2008 edition, Table 13.7) classify all of Vehicle Excise Duty, fuel duty and VAT on fuel duty as "Government revenues from environmental taxes". However, the carbon prices paid by motorists and road freight hauliers, appear to be well in excess of the general price for carbon or the price paid in other sectors, e.g. aviation, industrial power and domestic heating.

In spite of this it is generally understood that motoring taxes and charges are not in place simply to cover CO₂ emissions, but greater transparency is needed from Government on what they are intended to represent, especially moving forward during these difficult economic times. The motorist is currently likely to be charged in several different ways for the cost of carbon for the same journey – either directly via fuel duty or indirectly via the price of the vehicle or other forms of taxation. The environment is increasingly cited as the reason for raising taxes. The position needs to be clarified.

According to our calculations motorists are more than covering any carbon emissions costs that could be levied upon them. For example, if just 1/8th of the fuel duty were to cover CO₂ emissions, the motorist would be covering the Shadow Price of Carbon (SPC).

3.1 Fuel duty as a carbon tax

Fuel duty could be presented as a carbon tax. It directly reflects the "user pays" principle and the more fuel used the more carbon is emitted.

Road transport fuel duty yield in 2006 was £23.45 billion. Carbon emissions from road transport in 2006 were 120.3MtCO₂ (135MtCO₂ by end user) report the Department for Transport's Transport Statistics GB.² This is equivalent to £195/tCO₂ (or £174/tCO₂ by end user).

Based on the carbon content of the fuel, the carbon cost implied by fuel duty is around £220/tCO₂. This is on a par with the figure based on duty yield and emissions from road transport above. One litre of petrol produces 2.31kg of CO₂, whilst one litre of diesel produces 2.68kg CO₂. To generate 1tCO₂ requires 433 litres of petrol or 373 litres of diesel. Based on the current duty of 52.35p/litre this equates to £227/tCO₂ for petrol and £195/tCO₂ for diesel. Given total fuel consumed by cars in the UK is split approximately 80% petrol and 20% diesel (TSGB table 3.1) this equivalent to £220/tCO₂. For all road transport the fuel split is nearer 45% petrol and 55% diesel, giving an average cost of £209/tCO₂.

Given the average car is driven 14,000kms per annum (TSGB table 9.17) this would use some 1,250 litres of petrol or just over 1,000 litres of diesel (based on average fuel efficiency – TSGB table 3.4). At present duty rates this is equivalent of almost £650 for a petrol car and nearer £530 for a diesel car.

² TSGB <http://www.dft.gov.uk/pgr/statistics/datatablespublications/tsgb>

3.2 Vehicle Excise Duty (VED) as a carbon tax

VED has been differentiated for cars registered since March 2001 on the basis of their CO₂ emissions (See: Table 2). From 1 May 2009 a new 13 band system (A-M) will replace the current seven band system (A-G). In 2010 a first year rate is set to apply for all new car registrations.

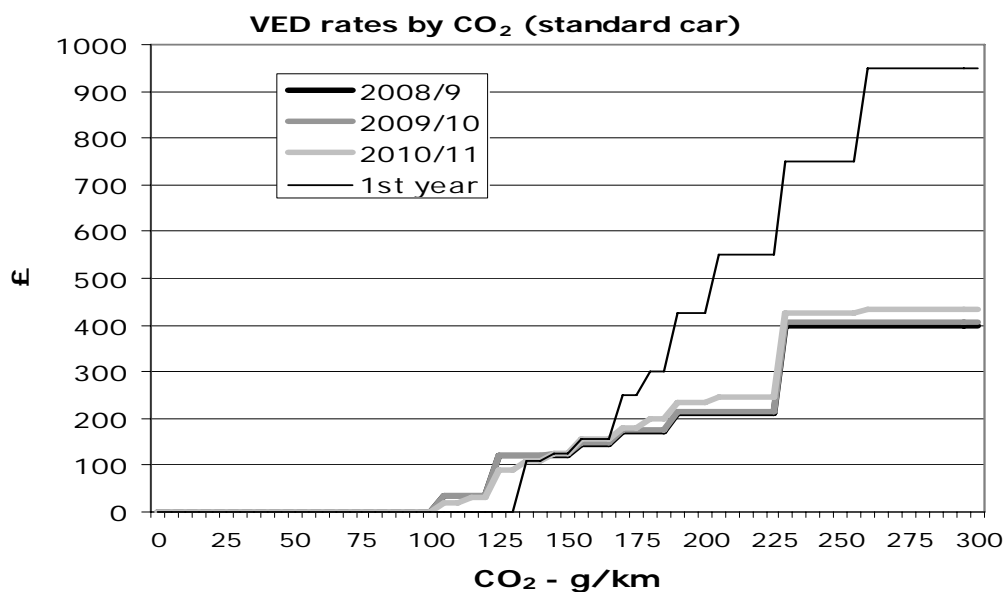
Table 2: VED for cars 2008-2011 (registered from March 2001)

Pre 04/09		From 01/05/09		Standard rate*			First year rate
Band	CO ₂ g/km	New band	CO ₂ g/km	2008-09	2009-10	2010-11	2010-11
A	Up to 100	A	Up to 100	£0	£0	£0	£0
B	101-120	B	101-110	£35	£35	£20	£0
C	121-150	C	111-120	£35	£35	£30	£0
		D	121-130	£120	£120	£90	£0
		E	131-140	£120	£120	£110	£110
D	151-165	F	141-150	£120	£125	£125	£125
		G	151-165	£145	£150	£155	£155
E	166-185	H	166-175	£170	£175	£180	£250
F	186-225	I	176-185	£170	£175	£200	£300
		J	186-200	£210	£215	£235	£425
		K**	201-225	£210	£215	£245	£550
G	Over 255	L	226-255	£400	£405	£425	£750
		M	Over 255	£400	£405	£435	£950

*AFV discount: 2008-09 A-E £20, F-G £15, 2009-10 A-I £20, J-M £15, 2010-11 onwards £10 all cars

** All cars over 225g/km registered 1 March 2001 - 23 March 2006 in K band

Figure 1: 2007/08 VED Charges in Relation to CO₂ Rates



These data are presented graphically in figure 1. This shows the modest increases in the standard rate of VED over time and a trend to a more graduated scheme.

The first year rate shows a significantly larger range, with a much higher penalty for higher emitters than in the standard rate.

The average new car in 2008, which emitted 158g/km CO₂, would be a 'D' band and pay £145 under the current system moving to a 'G' band car under the new system from 1 May 2009. Assuming VED was only charged to cover the CO₂ emitted and based on an assumed mileage (14,000kms pa – source TSGB) then the VED for the average new car would be the equivalent to £65.55/tCO₂, more than 2.5 times the SPC. Alternatively if 40% of the VED charge was used to cover the SPC then the motorist would off-set their total CO₂ emissions. For a motorist using a car emitting 99g/km and doing the national average mileage they emit 1.4tCO₂ but pay nothing in VED. A motorist with a car emitting 260g/km doing the same mileage emits 3.6tCO₂ and pays £400 in VED, the equivalent of £110/tCO₂. For the first year rate the implied carbon charges for a 158g/km, 99g/km and a 260g/km emitting car would be £70/tCO₂, £0 and £260/tCO₂ respectively.

3.3 EU new car CO₂ regulation penalties

A proposed new car CO₂ regulation is due to be agreed at an EU level by Spring 2009 which will call for cars to achieve 130g/km on average across Europe by 2012. Manufacturers will face steep fines if this target is not reached. Currently the fines are expected to start at £15 (€20) in 2012 and rise to £75 (€95) in 2015 per gram of CO₂ away from the target multiplied by volume of new car registrations. So, for example, if a manufacturer missed its target by 10g/km and sold 1 million cars then they would face a £750 million (€950mn) fine in 2015. Each manufacturer will have a specific target, calculated based on a weight parameter.

The proposed penalties equate to a carbon price of £375/tCO₂ (€475/tCO₂). This is based on the assumption that a car drives 200,000km over its lifetime, so one gramme of CO₂ emitted above target corresponds to 200kg of excess emissions, or 0.2tCO₂.

Within the European Climate Change Programme, the independent scientific institute, TNO, assessed in 2006 the costs and CO₂ reduction potential of different measures, including vehicle technology, biofuels and infrastructure. The costs of moving towards 120gCO₂/km by 2012 through vehicle technology were calculated to be over £2,800 (€3,600) on average per vehicle. The costs of achieving 130gCO₂/km were almost £2,000 (€2,500) per vehicle. TNO went on to suggest that the societal costs, taking into account the price of technology and the fuel savings for consumers, would be £100 to £180/tCO₂ (€132 to €233/tCO₂), depending on the oil price.

ACEA³ also demonstrated that of the car-related measures to reduce emissions, vehicle technology was the most expensive and other measures, such as eco-driving, would be far more cost-effective (See: Figure 2). Similarly the costs of CO₂ reductions in other sectors or the cost of CO₂ certificates were much lower than the cost of car-related measures.

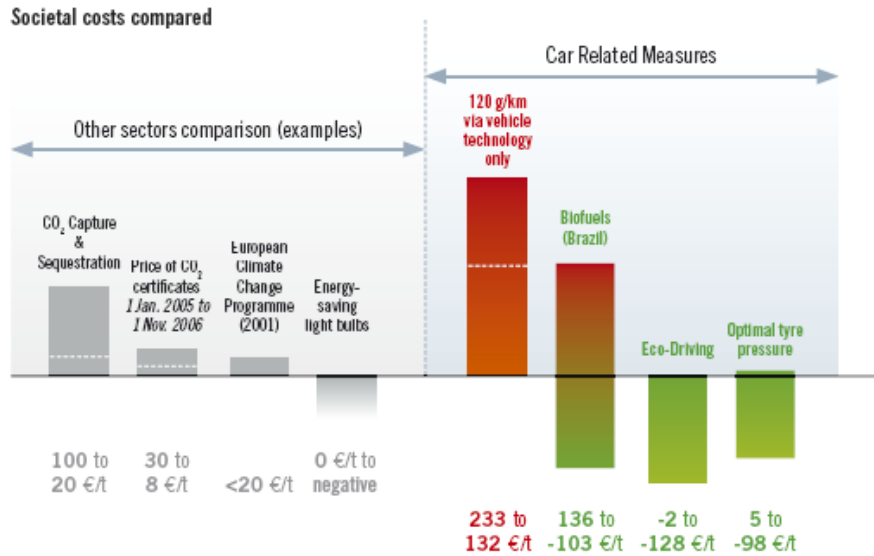
The BDI/McKinsey Report⁴ similarly reported that the automotive industry and motorists are treated disproportionately compared with both the shadow price of

³ www.acea.be

⁴ <http://www.mckinsey.com/client-service/ccsi/>

carbon and the cost of CO₂ abatement in other sectors (see pages 32 and 41 respectively).

Figure 2: ACEA chart of costs of measures to reduce CO₂ emissions



3.4 Local policies as a carbon tax

Local authorities are increasingly developing their own policies and schemes, which charge residents locally for environmental impacts. The previously proposed London Congestion Charge Proposal and the London Borough of Richmond parking charges are discussed here as examples.

3.4.1 London Congestion Charge CO₂ Charging Proposals

Under proposals put forward by London Mayor Ken Livingston in early 2008, which have now been withdrawn, CO₂ emissions were to be used as a base for charging vehicles entering the congestion charge zone in London. Vehicles emitting between 120 and 225gms CO₂ /km were to pay £8 per day (i.e. the current charge). Charges for vehicles emitting more than 225gms CO₂/km would have paid £25 per day. Vehicles emitting less than 120g/km would have paid nothing.

On the basis of charged vehicles making two trips of 20kms, two trips of 10kms and two trips of 5 kms each day, total daily use averages 70kms.

If we assume a £8 day vehicle emitted 165g/km (the 2007 UK average) and a £25 a day vehicle emitted 235g/km (so only 10g/km over the 226g/km and above band) then the difference in emissions is 70g/km. Based on the car travelling 70kms that is 4,900g CO₂ emitted or 0.0049tCO₂. Given the price difference of between the two charges was £17 that equates to £3,469 per tCO₂ – or 136 times the shadow price of carbon.

3.4.2 London Borough of Richmond Parking Charges

The London Borough of Richmond has proposed graduated residents' parking permits based on emissions band as shown in the table 2 below. Charges are for the first residents' parking permit issued to a member of any household in respect of vehicles first registered on or after 1 March 2001.

Table 3: London Borough of Richmond parking charges, based on CO₂ emissions (bands as in current VED system)

Residents' Category*	Period	Band A	Band B	Band C	Band D	Band E	Band F	Band G
1A or 1B	3mth	£0	£17.50	£31.50	£38.50	£45.50	£52.50	£105.00
1A or 1B	6mth	£0	£30.00	£54.00	£66.00	£78.00	£90.00	£180.00
1A or 1B	12mth	£0	£50.00	£90.00	£110.00	£130.00	£150.00	£300.00
1A or 1B	24mth	£0	£95.00	£171.00	£209.00	£247.00	£285.00	£570.00
2	3mth	£0	£13.10	£23.60	£28.85	£34.10	£39.35	£78.75
2	6mth	£0	£22.50	£40.50	£49.50	£58.50	£67.50	£135.00
2	12mth	£0	£37.50	£67.50	£82.50	£97.50	£112.50	£225.00
2	24mth	£0	£71.25	£128.25	£156.75	£185.25	£213.75	£427.50
3	3mth	£0	£8.00	£14.40	£17.60	£20.80	£24.00	£48.00
3	6mth	£0	£14.00	£25.20	£30.80	£36.40	£42.00	£84.00
3	12mth	£0	£22.50	£40.50	£49.50	£58.50	£67.50	£135.00
3	24mth	£0	£42.50	£76.50	£93.50	£110.50	£127.50	£255.00

*Category LBR uses based on location – broadly, closer to centre equates to higher charge

Taking the 6 month permit as an example for Band B (average CO₂ emissions 110g/km) the charge amounts to £22.50 and for Band F (average CO₂ emissions 205g/km) £67.50. On the basis of 12,000kms per resident's car per annum a Band B vehicle would emit 1.32tCO₂ per annum and a Band F vehicle 2.46tCO₂ per annum. This is difference of £42 and 1.14tCO₂, equivalent to a price of £39.50/tCO₂.

4.0 Recent policy developments

The Climate Change Act, which received Royal assent at the end of November 2008), provides a legal framework for ensuring that Government meets its commitments to tackle climate change. The Act requires that emissions are reduced by at least 80% by 2050, compared to 1990 levels. The Committee on Climate Change (CCC) was set up as an independent body as part of the Act. Its core function is to recommend what the level of the UK's 'carbon budgets' should be. The carbon price of £40/tCO₂ is used as the basis for the proposals put forward in the committee's first advice 'Building a low-carbon economy – the UK's contribution to tackling climate change', published in December 2008.

The report stresses that transport has its role to play in allowing the UK to meet its climate change obligations. This is because:

- Transport CO₂ emissions currently account for around a quarter, of total CO₂ emissions in the UK.
- Road transport is responsible for the majority of domestic transport emissions, with cars, vans and HGVs accounting for around 86% of emissions.
- Emissions from domestic transport have increased 9% since 1990 (to 2006). This is accounted for by vans and HGV's rather than cars.

The committee advises that the best way to reduce domestic transport emissions is to provide more efficient vehicles, promoting eco-driving and switching to more carbon efficient modes of transport.

The RAC Foundation and SMMT believe that the advice provided by the CCC with reference to vehicles has the correct emphasis. There is however some concern at reference to more 'carbon efficient modes of transport': public transport is not necessarily the most carbon efficient transport mode. Amongst other things the calculation depends crucially on the loadings achieved on any additional public transports services and the numbers of passengers who have actually transferred from cars. It is also important that the different costs of carbon, as already mentioned in the paper are fully considered in future policy development.

5.0 Environmental taxes

The government collects an array of taxes, but some it classifies as environmental and publishes these on the ONS website (http://www.statistics.gov.uk/downloads/theme_economy/BB08.pdf table 13.7). A summary of the 2006 revenue is presented below.

Table 3 UK government revenue from environmental taxes

	2006 £mn	2007 £mn
Fuel duty	23,448	24,512
VAT on fuel duty	4,103	4,290
Vehicle excise duty	5,010	5,384
Air passenger duty	961	1,883
Climate change levy	711	690
Landfill tax	804	877
Aggregates levy	321	339
Total	35,348	37,975
Motorist total	32,561	34,186
Motorist total as % total	92.1%	90.5%

This shows that motorists pay over 90% of the environmental taxes collected by government. Given that road transport emitted 120.3MtCO₂ in 2006 that is equivalent to over £270 a tonne, or more then 10.5 times the SPC.

6.0 Carbon price per tonne for average motorist

Given average mileage, fuel consumption and CO₂ performance, the cost for a typical motorist is over £660 in fuel duty and £145 in VED – a total of just over £800 per year. Using the ClimateCare calculator the average car emits around 3tCO₂ per annum. So the average cost per tonne is almost £270 a tonne – a

figure very similar to that calculated by looking at environmental taxes and total emissions.

7.0 Conclusions

The paper finds that there is a range of values being used for the cost of carbon. There are many different types of carbon charge – through carbon offsetting or the carbon price markets from various energy efficiency schemes – and that the carbon prices across these are different. This makes for a confusing picture for industry, consumers and policymakers alike.

The paper also asks the question: is the motorist paying too much for carbon? The answer appears an unequivocal “yes”, if, as in the official national accounts, motoring taxes are regarded as “environmental taxes”. In most cases the orders of magnitude are large – in the region of 5 to 20 times larger than the shadow price of carbon and in some cases even more extreme. Charges on motorists are not purely based on CO₂ emissions, but it is clear that the motorist is more than covering the cost of any emissions and in most cases several times more. Furthermore, those same emissions are often covered by a number of different taxes and charges, so in effect motorists are paying for the cost of carbon several times.

It is hoped this paper will start a debate on the subject, which will help generate a better understanding of the different measures in place and how, in the longer term, a move to a more harmonised price can be achieved.

Annex: Description of other carbon prices referred to within the paper

Carbon price

The carbon price is often referred to as the price per tonne of carbon dioxide (CO₂). The figures used in this paper all refer to CO₂. It should be noted that 1 tonne of carbon (1tC) = 3.67tCO₂. Therefore to convert CO₂ prices to carbon prices the figures should be multiplied by 3.67 (or 44/12).

Exchange rates

£1 is assumed to be equivalent of €1.258 and \$1.853 in this paper. These were the average exchange rates in 2008. It should be noted that exchange rates vary over time. The sterling values cited in this paper are rounded.

The EU Emission Trading System (ETS) price

Prices in the European emissions trading system (ETS) market averaged around £18 (€25) in 2008 according to European Climate Exchange⁵ (and ranged from €13.72-€29.33). The ECX report for March 2009 says the average price has fallen to just €9.96 or some £9.20 (based on £1=€1.08).

In November 2008 the UK government auctioned four million allowances for the EU ETS, for £54 million, equivalent to £13.50 each. A second auction was held on 24 March 2009, with a further four million allowances sold at a clearing price of just over £10 (€10.98)

The price in phase 3 could be £12 to £40 (€15 to €50) according to the Carbon Trust (<http://www.carbontrust.co.uk>), although others have been more specific – e.g. Deutsche Bank at £32 (€40) a tonne (http://www.db.com/presse/en/content/press_releases_2008_3930.htm).

UK Emission Trading System (ETS) price

Prices in the UK emissions trading market are between £1-£1.50/t. This largely reflects significant over supply in this market.

Climate Change Levy (CCL) price

Firms in the UK pay a climate change levy (CCL). There are different rates for electricity and gas (and other fuels), for each kWh used. This figure can be converted in tCO₂ and works out at approximately £8 for gas and £10 for electricity, or an average of £9/tCO₂. Climate change agreements (CCAs) allow energy intensive industries to receive a discount on their CCL liability if they meet energy efficiency targets. If firms better these targets they can generate allowances which can be traded on the UK ETS.

Carbon Reduction Commitment (CRC) price

The carbon reduction commitment (CRC) is expected to be introduced from 2010 and cover emissions from large energy using organizations not already in the EU ETS or CCAs. The CRC will involve a cap on the number of emissions allowances. These allowances will be distributed via an auction process. The CRC is due to have a fixed rate price of CO₂ for the first three years of £12/t, thereafter it will become a market led auction with the price of allowances expected to increase potentially to be in line with the EU ETS price.

⁵ www.ecx.eu

Carbon offset prices

There is a vast array of companies offering businesses and consumers the ability to offset the carbon footprint of various activities. The price paid for such offsets is typically well below the SPC. ClimateCare⁶ is one of the better known companies and they currently charge £8.62/tonne of CO₂.

Sometimes these offset prices are determined by joint initiative (JI) and clean development mechanism (CDM) credits, projects in developing countries which are recognized as delivering carbon savings. JI/CDMs can be used to meet EU ETS targets.

Red diesel

Farmers and the rail sector can use "red diesel". If hauliers or other motorists are found using it they face large penalties. Red diesel has just a fifth of the duty, at 9.69p/litre, on it compared to diesel used by road transport users in general.

Aviation

There is no duty on aviation fuel. However, there is an air passenger duty (APD) rate, which is £20 for specified European destinations and £80 for all other destinations. There are reduced rates of APD, at £10 and £40, which apply to the lowest class of travel on any flight. In 2007 94% of passengers only paid the reduced rates. Based on a short haul flight to Europe creating 2tCO₂ this is broadly equivalent of £5/tCO₂. For an international flight creating 4tCO₂ this is broadly equivalent of £10/tCO₂. From 1st November 2009 the APD will change so that the duty is based on the plane, to encourage greater occupancy.

Company car tax (CCT)

Company Car Tax (CCT) is based on CO₂ emissions, but it is seen as a tax on a benefit in kind.

⁶ www.jpmorganclimatecare.com