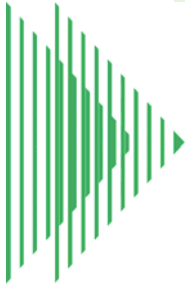


UNIVERSITY OF WESTMINSTER



# ***Internalising the External Costs of Light Goods Vehicle Transport in Britain***

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**IMPORTANT NOTE:**

The Department for Transport is currently producing revised external costs for LGV and HGV activity. The estimates of the total external cost of LGV and HGV operations in Britain in 2006 presented in this report will be subject to revision when these revised external costs are made available by the Department for Transport.

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<http://www.greenlogistics.org>

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## **List of abbreviations**

DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EC	European Commission
ECMT	European Conference of Ministers of Transport
EEA	European Environmental Agency
FTA	Freight Transport Association
FVA	Foreign vehicle activity
gvw	gross vehicle weight
HGV	Heavy Goods Vehicle
LGV	Light Goods Vehicle
ppl	pence per litre
PM	Particulate matter
VED	Vehicle Excise Duty

## **1. Introduction**

The importance of light goods vehicles (LGVs – goods vehicles up to 3.5 tonnes gross weight) in terms of the total weight of goods that they move in Britain is relatively small compared with large rigid and articulated heavy goods vehicles (HGVs – goods vehicles over 3.5 tonnes gross vehicle weight). However, LGVs are very important for a number of reasons:

- LGVs are of ever-greater importance in terms of the final delivery of many time-critical, high value goods.
- They are also widely used in industries that provide a wide range of support services that companies, other organisations and individuals are dependant on.
- The LGV fleet is very large and growing (there are more than seven times as many LGVs, as there are HGVs licensed in Britain by taxation class).
- In addition, the LGV fleet in Britain is growing at a faster rate than the fleet of goods vehicles over 3.5 tonnes.
- The LGV fleet travels more than twice as many vehicle kilometres each year than the total goods vehicle fleet over 3.5 tonnes in Britain (64 billion vehicle km by LGVs in 2006 compared with 29 billion vehicle km for HGVs).
- LGVs perform a far greater proportion of their distance travelled in urban areas than HGVs (37% of vehicle kilometres performed by LGVs were on urban roads in 2006 compared with 17% of HGV vehicle kilometres).
- The LGV fleet consumes equivalent to 25% of the total diesel and 3% of the total petrol consumed by all motorised road transport vehicles in Britain.

LGVs have tended to receive relatively little attention in terms of either official data collection or detailed research into their activities. However, this situation has begun to change a little in the last few of years, with research carried out as part of the Review of Freight Modelling project for the Department for Transport (Allen, Browne and Wigan, 2002), the Department for Transport's Privately-owned and Company Van surveys (DfT, 2004a; DfT 2004b), survey work at Nottingham Trent University (Cooke, 2003 and 2004), work for the AA Motoring Trust as part of the Living with the Van project (AA Motoring Trust, 2006, Lang and Rehm, 2006; Land 2006), and work by Momenta for the DfT (Momenta, 2006).

Light goods vehicles play a key role in providing goods and services to businesses and other organisations in Britain, resulting in important economic and social benefits.

Against these benefits, however, must be set a range of environmental and infrastructural costs, many of which are borne by the community at large rather than the companies operating LGVs. These costs are associated with the emission of air pollutants and greenhouse gases, traffic noise, accidents, congestion and road wear.

In its “Sustainable Distribution” document (DETR, 1999) and subsequent policy statements the British government has identified a series of policy measures designed to make logistical operations more sustainable in economic, social and environmental terms. It is very difficult to forecast the net impact of these measures both individually and collectively because of uncertainty about the extent to which the environmental costs of freight transport are currently internalised by taxation and the amount by which taxes might have to rise to enforce the ‘polluter pays principle’ in the freight sector.

The ‘fair and efficient pricing’ policy promoted by the European Commission (EC, 2001 and 2006) aims to ensure that all external damage caused by road traffic is fully internalised in the price of transport. It argues that pricing should be fair, meaning that ‘polluters’ are obliged to pay the marginal social cost of their activities, and efficient, giving them an economic incentive to reduce the negative effects of these activities (EEA, 2006). At an EU level, freight movement by all modes is responsible for a third of the total external costs of transport, with the movement of people accounting for the rest (INFRAS, 2004).

The purpose of this report is to estimate the total external costs imposed by LGVs in Britain and to measure the degree to which these externalities are internalised by duties and taxes paid by LGV users. As well as estimating the external costs of all LGV operations, the report also considers the external costs of LGV trips involving the delivery and collection of goods, as well as other LGV trips types and purposes. Although this report focuses on LGVs, it also compares the findings for LGVs with estimates of the external costs imposed by HGVs in Britain using results derived using the same methodology that was also carried out as part of the Green Logistics project (Piecnyk and McKinnon, 2007).

Internal costs, sometimes referred to as market or private costs, are the costs borne directly by road freight transport operators. These costs consist of operating costs and capital investments in facilities and vehicles which eventually need to be replaced.

The adverse impacts of LGVs impose external costs which are not borne by those who generate the LGV traffic but by society as a whole. Hence, externalities are not normally taken into account in the decisions made by transport users. Internalisation measures aim to correct this anomaly by increasing the price of transport services in proportion to all the relevant social and environmental costs generated (Beuthe et al., 2002, Baublys et al., 2005). Placing an appropriate value on external costs of LGVs is, therefore, fundamental to their internalisation.

External costs included in this calculation relate to the negative effects of air pollution, greenhouse gas emissions, noise, accidents and congestion. LGVs' contribution to the cost of providing, operating and maintaining road infrastructure is not an externality as such, but has to be calculated to determine its share of road taxation. It is out of the remaining taxes that the environmental and congestion costs should be recovered. For this reason, the calculation also includes LGVs' allocated share of infrastructure costs. See section 2 of the report by Piecyk and McKinnon (2007) for further discussion of these external costs.

In order to produce this analysis, LGVs have been segmented into eight categories based on three key attributes that affects the vehicle usage, fuel consumption, and emissions rates of the vehicles:

- Ownership (company- or privately-owned)
- Propulsion (petrol or diesel powered)
- Weight (car-derived – up to 1.8 tonnes gross weight, or 1.8 – 3.5 tonnes gross weight)

Please refer to another report produced as part of this project for further discussion of this LGV segmentation (Allen and Browne, 2008).

Another report produced as part of the Green Logistics project has calculated the external costs of LGV and HGV operations in London (Allen, Piecyk and McKinnon, 2008).



## **2. Internalisation of the external costs imposed by LGVs**

### **2.1. Taxes and charges borne by LGV operators in Britain**

A small proportion of LGVs run on petrol (approximately 3% of the British LGV fleet) while the vast majority run on diesel. In the UK ultra-low sulphur diesel and petrol are liable for fuel duty and for Value Added Tax (VAT) at a rate of 17.5% of the full retail price. Additionally, vehicle ownership incurs Vehicle Excise Duty (VED). Apart from one motorway link and a few tolled bridges and tunnels, there are no direct infrastructure charges in Britain.

The following calculations were based on the average bulk and retail diesel and petrol fuel prices at 1<sup>st</sup> July 2006 – 79.15 pence per litre (ppl) and 83.66 ppl, respectively for diesel, and 81.65 ppl and 83.32 ppl respectively for petrol (FTA, 2006). An assumption that 80% of fuel used will be purchased in bulk by drivers of company-owned LGVs and 50% purchased in bulk by drivers of privately-registered LGVs. A duty rate of 47.10 ppl for petrol and diesel at the 2006 level has been used to ensure the same base year for all calculations.

Although most LGV operators are VAT-registered and can recover this tax through VAT transactions, VAT passes along the supply chains and it is finally borne by one of the direct or indirect transport users. Hence, VAT is included in the estimate of the income generated by duties and taxes from LGVs.

Estimates of the annual distance travelled by LGVs can be obtained from two different data sources available from the Department for Transport (DfT), one based on road traffic counts and the other based on surveys of company-owned and privately-owned van operators. These two methods of estimating vehicle kilometres performed by LGVs produce different result. DfT road traffic count data estimates that LGVs performed a total of 64.3 billion vehicle kilometres on British roads in 2006. Meanwhile, the DfT van surveys of 2003 (the only year in which both the company- and privately-owned van surveys took place) provide an estimate of 49.9 billion vehicle kilometres. If the van survey results are revised upwards by the change in LGV vehicle kilometres estimated by the road traffic count data between 2003 and 2006 (11%) this provides an estimate of 55.4 billion vehicle kilometres in 2006 according to the van surveys. Therefore there is a discrepancy of 8.9 billion vehicle

kilometres between these two methods of estimation, which affects estimates of the total fuel duty and VAT on fuel collected from LGV operators. VED is paid per vehicle per annum, and is therefore unaffected by distance travelled.

In 2006, £3.6 - 4.1 billion was collected from LGV fuel duty, VAT and VED (depending on the vehicle kilometres estimate used). Approximately 70% of this was from fuel duty and only 10% from VED (Table 1).

2006 (£ million)	LGVs up to 1.8 tonnes gvw				LGVs 1.8 – 3.5 tonnes gvw				All LGVs
	Company- owned		Privately- owned		Company- owned		Privately- owned		
	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	
<b>Using van survey estimate of vehicle km</b>									
Fuel duty (47.1 ppl)	325.0	15.0	185.1	20.0	1314.2	47.4	452.2	92.6	2451.4
VAT (17.5%)	96.7	4.6	56.0	6.1	390.9	14.4	136.8	28.4	733.8
VED	47.5	1.5	55.2	3.5	152.7	3.7	144.2	16.6	424.8
<b>Total</b>	<b>469.2</b>	<b>21.1</b>	<b>296.2</b>	<b>29.7</b>	<b>1857.7</b>	<b>65.6</b>	<b>733.1</b>	<b>137.5</b>	<b>3610.1</b>
<b>Using road traffic count estimate of vehicle km</b>									
Fuel duty (47.1 ppl)	377.3	17.4	214.9	23.2	1525.8	55.1	525.0	107.5	2846.2
VAT (17.5%)	112.2	5.3	65.0	7.1	453.8	16.8	158.8	32.9	852.0
VED	47.5	1.5	55.2	3.5	152.7	3.7	144.2	16.6	424.8
<b>Total</b>	<b>537.1</b>	<b>24.2</b>	<b>335.0</b>	<b>33.9</b>	<b>2132.3</b>	<b>75.5</b>	<b>828.0</b>	<b>157.0</b>	<b>4123.1</b>

Table 1. Duties and taxes paid by LGV operators in Britain in 2006.

## 2.2. External cost of LGV operations in Britain

A spreadsheet has been constructed based on freight and traffic data from the government's Company Van Survey (DfT, 2004a), Survey of Privately-Owned Vans (DfT, 2004b), the National Road Traffic Survey (NRTS) (DfT, 2007), and Vehicle Licensing Statistics (DfT, 2008). It models the relationship between LGV activity in Britain and a series of freight transport-related externalities, including climate change, air pollution, noise and congestion.

The estimates of congestion, noise and infrastructure costs are based on valuations provided by the DfT and used in a recently published report on the external costs of food distribution in the UK (DEFRA, 2007) (Table 2). The infrastructure, noise and congestion cost values were originally expressed in 2002 prices and have been

inflated to 2006 values using the Retail Price Index (RPI). The cost of accidents was given in 2005 prices and RPI was again used to re-base it to the 2006 level. These external costs may, in reality, differ for car-derived LGVs (i.e. up to 1.8 tonnes gw) and heavier LGVs (i.e. 1.8 – 3.5 tonnes gw) but only an average external costs for all LGVs is available.

	Motorway	Rural	Urban
Infrastructure	0.01	0.09	0.09
Noise	0.17	0.07	0.32
Congestion	2.87	2.25	19.82
Accidents	2.01	2.01	2.01

**Table 2. Infrastructure, noise, congestion and accident costs for LGVs in 2006 (pence per km).**

The estimates of emissions of carbon dioxide (CO<sub>2</sub>), hydrocarbons (HC), nitrogen oxide (NO<sub>x</sub>) and particulate matter (PM10) were derived from the National Atmospheric Emissions Inventory (NAEI)<sup>1</sup>. In the NAEI spreadsheet “emission factors for CO<sub>2</sub> refer to 'ultimate CO<sub>2</sub>', referring to all the carbon in the fuel emitted at the tailpipe as CO<sub>2</sub>, CO, unburned hydrocarbons and particulate matter which ultimately have the potential in forming CO<sub>2</sub>”. Carbon monoxide (CO) emissions were not, therefore, modelled separately. The cost of carbon emissions was calculated using the values quoted by Clarkson et al. (2002). This cost was updated to the 2006 level in accordance with the Green Book (HM Treasury, 2003). The ‘Air Quality Damage Cost Guidance’ report (DEFRA, 2006b) was used to calculate the cost of PM10, NO<sub>x</sub> and SO<sub>2</sub> emissions while the ‘Damage Cost for Air Pollution’ report (DEFRA 2006a) was the source of cost data on volatile organic compound (VOC) emissions (Table 3).

<sup>1</sup> Available online at: [http://www.naei.org.uk/datachunk.php?f\\_datachunk\\_id=8](http://www.naei.org.uk/datachunk.php?f_datachunk_id=8)

Air pollution costs (£ per tonne)	LOW	MEDIUM	HIGH
C	45.85	85.27	164.10
PM motorway	11118	13627	16136
PM rural	11118	13627	16136
PM urban	74749	91618	108487
VOCs	0	1	2
NO <sub>x</sub>	1407	1728	2050
SO <sub>2</sub>	2290	2780	3269

**Table 3. Air pollution costs (2006 prices).**

The full external costs by LGV category are shown in Table 4 using LGV vehicle kilometre estimates derived from DfT Company- and Privately-Owned Van Surveys (i.e. the lower estimate of LGV vehicle kms). These include environmental, infrastructural and congestion costs. The total costs have been estimated at £6.6 billion, £6.7 billion and £6.8 billion using, respectively low, medium and high emission cost values. The results show that a relatively small proportion of the total external costs of LGVs are accounted for by emissions costs (7-9% of total external costs). Company-owned diesel LGVs with a weight of 1.8 - 3.5 tonnes can be seen to be responsible for the highest proportion of total external costs, followed by company-owned diesel LGVs with a weight of up to 1.8 tonnes. This is due to the fact that these categories of LGVs are responsible for the majority of vehicle kilometres performed by LGVs.

2006 (£ million)	LGVs up to 1.8 tonnes gvw				LGVs 1.8 – 3.5 tonnes gvw				All LGVs
	Company- owned		Privately- owned		Company- owned		Privately- owned		
	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	
Low estimate	1136	39	652	53	3359	83	1156	165	<b>6643</b>
Medium estimate	1143	40	657	54	3405	84	1172	166	<b>6721</b>
High estimate	1154	40	664	54	3468	84	1193	168	<b>6827</b>

**Table 4. Total external costs of LGV operations in Britain (using DfT Van Survey estimates of vehicle kms)**

Table 5 shows the full external costs by LGV category using LGV vehicle kilometre estimates from road traffic counts (i.e. the higher estimate of LGV vehicle kms). The

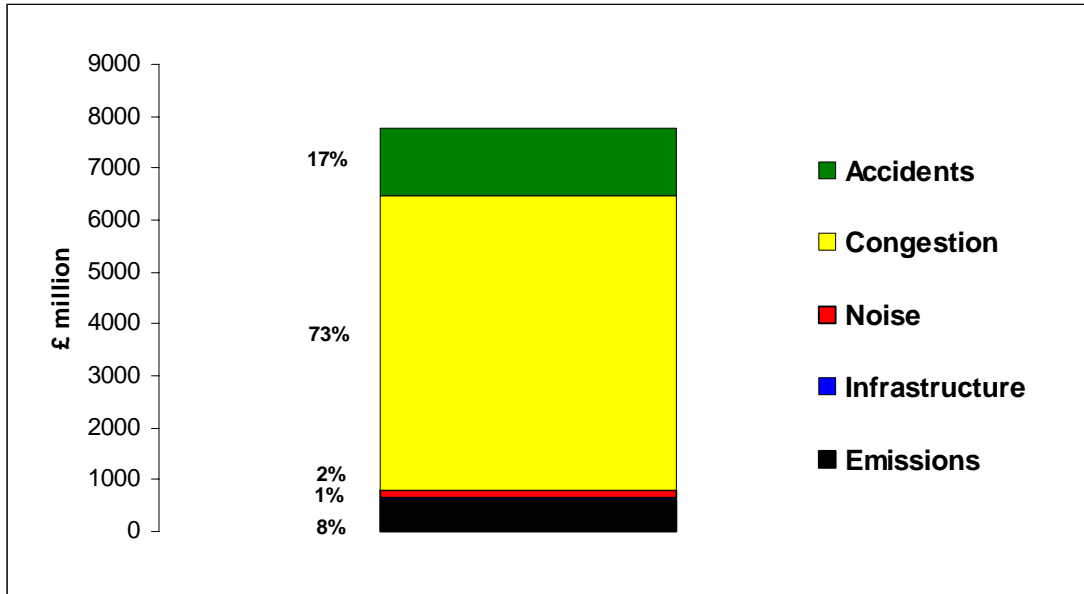
total costs have been estimated at £7.7 billion, £7.8 billion and £7.9 billion using, respectively low, medium and high emission cost values.

2006 (£ million)	LGVs up to 1.8 tonnes gvw				LGVs 1.8 – 3.5 tonnes gvw				All LGVs
	Company- owned		Privately- owned		Company- owned		Privately- owned		
	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	
Low estimate	1318	46	755	62	3885	97	1337	191	<b>7690</b>
Medium estimate	1326	46	761	62	3936	97	1355	193	<b>7776</b>
High estimate	1338	47	769	63	4006	98	1378	195	<b>7894</b>

**Table 5. Total external costs of LGV operations in Britain (using road traffic count estimates of vehicle kms)**

Therefore, depending on the LGV vehicle kilometre and the emission cost values used, the total external costs of LGV operations in Britain is estimated to be £6.6 – 7.9 billion.

Overall, 72-74% of the total external costs is attributable to congestion, 16-17% to traffic accidents, 7-10% to air pollution and greenhouse gas emissions, 1-2% to noise, and 1% to infrastructure (Figure 1). As some gases, such as methane and carbon monoxide, contribute both to global warming and air pollution, it has not been possible to split the external costs associated with these emissions between climate change and reductions in air quality. An indication of the climate change component can be given by focusing on CO<sub>2</sub> emissions from LGV exhausts as these have no effect on air quality. On this basis, climate change costs would represent around 4-5% of the total external costs of LGV operations in Britain.



**Figure 1. Total external costs of LGV activity in Britain (using medium emissions costs and road traffic count vehicle km estimates)**

Unlike HGVs, LGVs perform other activities in addition to the delivery and collection of goods for companies. They are also used to provide a wide range of commercial services to establishments, for commuting to and from work, and for personal trips (including, for example, shopping, leisure trips and visiting friends and relatives). LGV trips can therefore be subdivided into categories based on the trip type (i.e. whether the trip is primarily carried out for to collect or deliver goods or not – “freight” or “non-freight”) and the trip purpose (i.e. whether the trip is for commercial or personal reasons). This classification is more fully described in another report written as part of this project (see Allen and Browne, 2008). Using this LGV trip type/purpose approach LGV trips can be divided into four categories: i) Commercial freight trips, ii) Commercial non-freight trips, iii) Personal freight trips, and iv) Personal non-freight trips. Commercial non-freight trips can be further disaggregated into commuting trips (i.e. journeys to and from work) and all other commercial non-freight trips (including service-related trips, the carrying of personnel, and empty trips by goods carrying vehicles), giving a total of five types/purposes for LGV trips. Table 6 provides an estimate of the proportion of total LGV vehicle kilometres associated with each of these LGV trip types/purposes.

Trip type/purpose	Company-owned LGVs	Privately-owned LGVs	All LGVs
Commercial: non-freight (i.e. service)	30%	15%	25%
Commuting	32%	45%	36%
Commercial: freight (i.e. delivery/collection)	34%	23%	30%
Personal: freight and non-freight	4%	17%	8%
<b>Total</b>	100%	100%	100%

Note: Company-owned LGV data is average for 2003-2005. Privately-owned LGV data is for October 2002- September 2003.

**Table 6. Estimate of the proportion of total LGV vehicle kilometres accounted for by trip type/purpose.**

Table 6 shows that LGV commercial freight trips (i.e. those involved primarily with the collection and delivery of goods) only account for 34% and 23% of LGV vehicle kilometres for company- and privately-owned LGVs respectively. Commuting accounts for 36% of all LGV vehicle kilometres, while commercial non-freight trips account for 25% of all LGV vehicle kilometres. Personal trips account for 8% of all LGV vehicle kilometres.

Table 7 shows the estimated external cost estimates associated with these five LGV trip types/purposes for company- and privately-owned LGVs, using medium emission cost values.

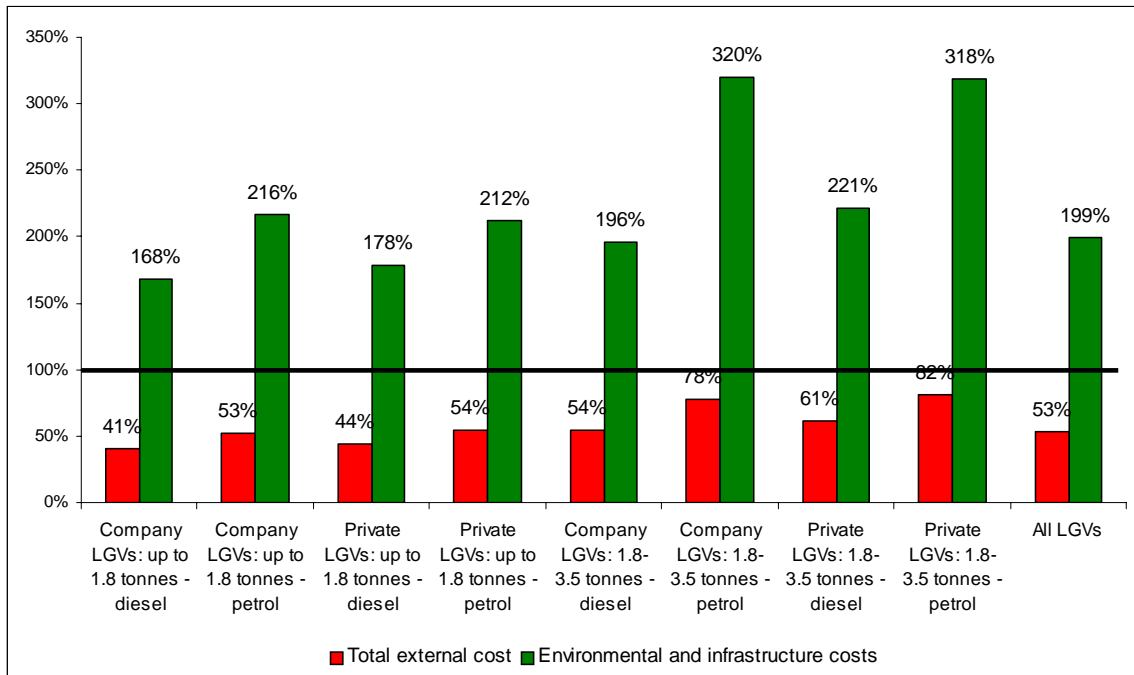
2006 (£ million) Trip type/purpose	Company- owned LGVs	Privately- owned LGVs	All LGVs
<b>Using van survey estimate of vehicle km</b>			
Commercial: non-freight (i.e. service)	1396	304	1700
Commuting	1516	924	2440
Commercial: freight (i.e. delivery/collection)	1578	469	2047
Personal: freight and non-freight	182	351	534
<b>Total</b>	<b>4672</b>	<b>2049</b>	<b>6721</b>
<b>Using road traffic count estimate of vehicle km</b>			
Commercial: non-freight (i.e. service)	1615	352	1967
Commuting	1754	1070	2823
Commercial: freight (i.e. delivery/collection)	1825	543	2368
Personal: freight and non-freight	211	407	618
<b>Total</b>	<b>5405</b>	<b>2371</b>	<b>7776</b>

Table 7. Total external costs of LGV operations in Britain by trip type/purpose and vehicle ownership (using Van Survey and road traffic count estimates of vehicle kms and medium emission cost values).

### 2.3. Degree of internalisation of external costs

The assessment of the degree to which the total external costs imposed by LGV traffic in Britain are currently internalised by duties and taxes paid by transport users is based vehicle kilometres from road traffic counts (i.e. the higher estimate of vehicle kms) and medium emission cost values.





**Figure 2. Internalisation of external costs by LGVs in Britain in 2006**

The duties and taxes paid by LGV operators cover on average 53 per cent of the total external costs (i.e. environmental, noise, accidents, congestion and infrastructure costs) imposed by British-registered LGVs in Britain (Figure 2). This varies from 41% to 78% depending on the category of LGV (with petrol powered LGVs covering a greater proportion of their total external costs than diesel-powered vehicles).

Congestion costs constitute approximately 70-75% of the full external costs of LGV traffic in Britain. If these congestion costs are excluded, it appears that taxes currently exceed the value of the remaining externalities for all LGV categories. Results for all LGVs indicate that, on average, in 2006 these vehicles paid twice as much in duties and taxes than their allocated infrastructural and environmental costs (excluding congestion costs).

In the light of recent re-assessments of the impact of climate change, these estimates of the degree of internalisation may turn out to be too optimistic. New research on the economics of climate change suggests that this element of external costs may have a significantly higher value than previously assumed. If so, the tax-to-cost ratio would be lower than calculated, reinforcing the case for sustainability measures to reduce the environmental damage done by LGVs. The Stern report

suggests that the cost of carbon should be around £265 per tonne in 2006 prices – roughly three times higher than the medium value of the social cost of carbon factored into the above calculations.

The estimates of the external costs and their internalisation reported in Section 3 are based solely on the activities of UK-registered LGVs. Foreign-registered LGVs have been omitted from the calculations as no data is available about the penetration of these vehicles. However, the number operating in Britain is expected to be far smaller than is the case among goods vehicles over 3.5 tonnes gross weight.

### **3. Comparison of internalisation of external costs by LGVs and HGVs**

Piecyk and McKinnon (2007) have already used the same methodology as used in this paper to estimate the duties and taxes paid by HGVs, the external costs imposed by HGVs, and the extent of internationalisation of external costs by HGVs in Britain. This section compares the results presented in this paper for LGVs with the earlier results for HGVs. It also adds together the estimates produced for LGVs and HGVs to provide total external costs for road freight transport in Britain.

#### **3.1. Taxes and charges borne by LGV and HGV operators**

Table 8 compares the duties and taxes paid by LGVs and HGVs, using estimates of vehicle kilometres performed by each from company surveys carried out by DfT (the Van Survey and Survey of Privately-Owned Vans in the case of LGVs, and the Continuing Survey of Road Goods Transport in the case of HGVs). In 2006 £3.6 billion was collected from LGVs, compared with £4.7 billion from HGVs in fuel duty, VAT and VED. In total, £8.3 billion was collected in fuel duty, VAT and VED from all road freight vehicles in registered in Britain (Table 6). In the case of LGVs 68% of this was from fuel duty and 12% from VED, while for HGVs 73% of this was from fuel duty and 6% from VED.

2006 (£ million)	LGVs	HGVs	Total
Fuel duty (47.1 ppl)	2451.4	3412.3	5863.7
VAT (17.5%)	733.8	1014.9	1748.7
VED	424.8	271.0	695.8
<b>Total</b>	<b>3610.1</b>	<b>4698.2</b>	<b>8308.3</b>

**Table 8. Duties and taxes paid by LGV and HGV operators in Britain in 2006 (using Van Survey and CSRGT estimates of vehicle km).**

### 3.2. External cost of LGV and HGV operations in Britain

Table 9 compares the external costs of LGVs and HGVs in Britain, using estimates of vehicle kilometres performed by each from company surveys carried out by DfT (the Van Survey and Survey of Privately-Owned Vans in the case of LGVs, and the Continuing Survey of Road Goods Transport in the case of HGVs). The estimated total external costs of LGV and HGV operations in Britain in 2006 were relatively similar. The total costs of road freight operations (HGVs and LGVs) have been estimated at £13.3 billion, £13.8 billion and £14.5 billion using, respectively low, medium and high emission cost values. When using the medium emission cost values, HGVs accounted for 51% of these external costs and LGVs for 49%.

2006 (£ million)	LGVs	HGVs	Total
Low estimate	6643	6688	<b>13331</b>
Medium estimate	6721	7050	<b>13771</b>
High estimate	6827	7684	<b>14511</b>

**Table 9. Total external costs of LGV and HGV operations in Britain in 2006 (using Van Survey and CSRGT estimates of vehicle km).**

Table 10 shows the proportion of total external cost accounted for by emissions, infrastructure, noise, congestion, and traffic accidents for LGV and HGV operations based on the medium emissions cost values.

2006 (proportion of total external cost)	LGVs	HGVs
Emissions	8%	15%
Infrastructure	1%	23%
Noise	2%	2%
Congestion	73%	40%
Accidents	17%	19%
Total	100%	100%

**Table 10. Importance of external cost categories for LGV and HGV operations in Britain (using Van Survey and CSRGT estimates of vehicle km and medium emission cost values).**

Congestion comprises a far greater proportion of total external costs for LGVs than for HGVs (but it is also the greatest cost category for HGVs). Infrastructure costs are the second most important cost category for HGVs, but the least important for LGVs. Focusing on CO<sub>2</sub> emissions, climate change costs represent approximately 8% of the total external costs of HGV operations in Britain, but only 4% of the total external costs of LGV operations.

However, as discussed in section 2.2, whereas HGVs are used almost entirely for the collection and delivery of goods, LGVs perform a range of other activities in addition (this includes providing a wide range of commercial services to establishments, for commuting to and from work, and for personal trips). Table 11 compares the external costs associated with LGV commercial freight trips (i.e. collection and delivery of goods) with HGV trips in order to provide an estimate of the external costs associated with freight transport activity by LGVs and HGVs.

2006 (£ million)	LGVs	HGVs	Total
Using medium emission costs values	2047	7050	<b>9097</b>

**Table 11. Total external costs of LGV and HGV freight operations in Britain in 2006 (using Van Survey and CSRGT estimates of vehicle km and medium emissions cost values).**

The estimate in Table 11 indicates that the total external cost of road freight activity in Britain in 2006 was £9.1 billion (when using medium emissions cost values). HGVs account for 77% of these external costs and LGVs for 23%. This compares with the estimate of the total external costs of all LGV and HGV activity in Britain in 2006 of £13.8 billion.

### 3.3. Degree of internalisation of external costs by LGV and HGVs

The duties and taxes paid by British-registered LGV and HGV operators cover on average 53 per cent and 67 per cent respectively of the total external costs (i.e. environmental, noise, accidents, congestion and infrastructure costs) they impose in Britain (Table 11). In total (i.e. LGVs and HGVs combined) road freight operators cover 59% of their total external costs in Britain.

If congestion costs are excluded, LGV operators paid almost twice as much in duties and taxes than their allocated infrastructural and environmental costs in Britain in 2006, while HGV operators paid 112% of their allocated infrastructural and environmental costs in taxes and duties.

2006	LGVs	HGVs	Total (LGVs + HGVs)
Total external costs	53%	67%	59%
Environmental and infrastructural costs*	199%	112%	140%

Note: \* Environmental and infrastructural costs is defined as total external costs excluding congestion costs

**Table 12. Proportion of external costs covered by duties and taxes for LGVs and HGVs in Britain in 2006 (using medium emission cost values).**

## 4. Internalisation of the external costs of road freight transport across Europe

Efforts to calculate the external costs of transport (including road freight) have been attempted in other European studies, and the results of these studies can be contrasted with the results presented in this report in order to examine differences in the relative importance of the external costs of LGVs and HGVs compared with passenger transport, as well as with other freight modes. However, such comparisons need to be treated with caution as although European studies make use of national taxes and duties on LGVs and HGVs, they typically use an EU-wide average figure for external costs per vehicle-km. In addition, there have often been significant changes in the valuation of external costs and in tax levels in studies that take place in different years.

At a European level, INFRAS (2004) calculated that LGVs and HGVs imposed total external costs of 58.8 and 164.3 million euros in 2000 in the EU17 (INFRAS, 2004). Therefore, in these calculations by INFRAS, HGVs imposed total external costs that were approximately 2.8 times greater than those imposed by LGVs. Our calculations indicate that in Britain, the costs imposed by LGVs and HGVs were very similar in 2006.

The INFRAS study estimated that the total external costs of road freight transport (i.e. LGVs and HGVs) were equal to 69% of the total external costs of road passenger transport (cars, motorcycles and buses) in 2000 in the EU17.

The INFRAS study also estimated the external costs of rail freight, air freight and waterborne freight in the EU17 in 2000. It estimated that the external costs of rail freight, air freight and waterborne freight were 2.7%, 3.8% and 1.6% respectively of the external costs of road freight in 2000 (i.e. 4.5 million euros, 6.3 million euros, and 2.6 million euros respectively).

The UNITE project (Tweddle et al., 2003) estimated some of the external costs of road freight transport in the UK. In this study, it was estimated that road freight congestion (i.e. LGVs and HGVs) amounted to 4.5 billion euros in the UK in 1998. LGVs were estimated to incur 39% of these road freight congestion costs and HGVs 61% (According to our estimates, LGVs incur 64% of road freight congestion costs and HGVs only 36%). In the UNITE work road freight accounted for 23% of the total road transport congestion costs.

The UNITE project also estimated that the emissions costs of road freight transport (LGVs and HGVs) in the UK were 2.9 billion euros in 1998, and were 61% of road passenger emissions costs. In addition, rail freight emissions costs in the UK were estimated to be 61 million euros in 1998, which represented 2% of road freight emissions costs.

## **5. Conclusions**

This report has provided estimates of the total external costs of LGV operations in Britain. In 2006, total LGV activity imposed external costs of around £6.8 - 7.8 billion based on mid-range valuations. About 53 per cent of these costs were internalised

by duties and taxes paid by LGV operators. If congestion costs are excluded, taxes and duties paid by LGV operators are currently twice as much as LGVs' allocated infrastructural and environmental costs.

The total external costs of all LGV and HGV operations in Britain in 2006 have been estimated at £13.3-£14.5 billion using, respectively low, medium and high emission cost values. When using the medium emission cost values, HGVs accounted for 51% of these external costs and LGVs for 49%.

However, much LGV activity does not involve the delivery and collection of goods. Other important LGV trip types include commuting and performing services at customers' establishments. The total external cost of LGV commercial freight (i.e. commercial collection and delivery of goods) trips has been estimated to be £2.0 billion in 2006 (based on medium emission cost values). This compares with HGV external costs of £7.1 billion, giving a total external costs of road freight activity in Britain in 2006 of £9.1 billion. Therefore, when only goods delivery and collection is taken into account, HGVs are responsible for a far greater proportion of total road freight external costs than LGVs (77% of the total external costs of £9.1 billion).

The duties and taxes paid by British-registered LGV and HGV operators cover on average 53 per cent and 67 per cent respectively of the total external costs (i.e. environmental, noise, accidents, congestion and infrastructure costs) they impose in Britain. In total (i.e. LGVs and HGVs combined) road freight operators cover 59% of their total external costs.

If congestion costs are excluded, LGV operators pay almost twice as much in duties and taxes than their allocated infrastructural and environmental costs, while HGV operators paid 112% their allocated infrastructural and environmental costs in taxes and duties.

Although, the monetary estimates of external costs vary widely at an international level (Walter et al, 2000), it seems likely that in 2007 the UK is still much closer to fully internalising the total external costs of its domestic road freight sector than most other EU countries.

Even though duties and taxes on road freight traffic in the UK are very high by international standards. However, LGV and HGV duties and taxes would still need to

be increased by approximately 90% and 50% respectively to fully internalise all the externalities. It would clearly be very difficult and very unfair on road freight operators for the British government unilaterally to increase taxes by this margin. Moreover, British-registered LGVs and HGVs currently pay significantly more tax than required to cover their environmental costs and share of road infrastructure costs. It is only when congestion costs are factored into the calculation that a tax shortfall results. If the government were to provide additional road space and / or use other traffic management measures to relieve traffic congestion, congestion costs would be reduced and the degree of internalisation increased. Given the importance of road freight transport and service operations to the national economy, this would probably prove a more effective transport strategy than taxing LGVs and HGVs more heavily.

The gradual upgrading of the LGV and HGV fleet to higher Euro emission standards and steady improvements in fuel efficiency will reduce the total value of emission-related externalities. Increases in official estimates of the social cost of carbon and in the level of traffic congestion, however, will tend to counteract this downward pressure on external costs. It is difficult to predict what the net effect of these conflicting cost pressures will be on the future degree of internalisation. The issue would be further complicated by the inclusion of road freight operations in the European Emissions Trading Scheme as has been recently discussed by Raux and Alligier (2007).

Awareness of the full costs of freight transport and service operations should help businesses to plan and manage their requirements in a way that achieves longer term sustainability. This may involve greater use of alternative modes, more localised sourcing, improved vehicle utilisation and even some relaxation of current just-in-time scheduling. If the higher freight costs associated with greater internalisation are passed down the supply chain, the purchasing behaviour of final consumers should also become more sensitive to the environmental impact of the distribution operations that keep them supplied with goods and services.



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