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# Light goods vehicles in urban areas

Michael Browne [a*], Julian Allen [a], Toshinori Nemoto[b], Johan Visser[c]

[a]*University of Westminster, London, UK*
[b]*Hitotsubashi University, Tokyo, Japan*
[c] *Ministry of Economic Affairs, The Netherlands*

**Abstract**

The paper provides a review of the light goods vehicle (LGV) fleet and its activity, with specific reference to operations in urban areas, and sustainability issues associated with the ever-growing use of LGVs. Traditionally these vehicles have received little attention but are becoming an ever-more important element of urban freight transport both for goods collection and delivery and for the provision of a wide range of critical services. Relevant literature from the UK and elsewhere pertaining to LGV operations and their impacts has been identified and utilised. The paper identifies the impacts of LGV operations in terms of economic, social and environmental impacts and presents the range of measures being taken by policy makers and companies to address negative impacts.


*Keywords*: Light goods vehicles; urban areas; congestion; environmental impacts

## 1. Introduction

The total volume of commodity flow that light goods vehicles (LGVs) move is often relatively small compared with large rigid and articulated heavy goods vehicles. 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 critical support services.
- There are many of these vehicles (fare more than the number of HGVs licensed).
- In addition, the LGV fleet in many countries is growing at a faster rate than the fleet of HGVs.
- The LGV fleet tends to travel further in total than the HGV fleet (although average journey lengths are shorter than for HGVs).
- LGVs typically perform a far greater proportion of their distance travelled in urban areas than HGVs.
- The LGV fleet consumes a large amount of fossil fuel (and therefore is responsible for an important proportion of the $CO_2$ produced by motorised vehicles).

* Corresponding author. Tel.: +44-20-7911-5154; fax: +44-20-7911-5057.
*E-mail address*: M.Browne@westminster.ac.uk.


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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 couple of years, with research carried out as part of the Review of Freight Modelling project for the UK Department for Transport (Allen, Browne and Wigan, 2002), the UK Department for Transport's Privately-owned and Company Van surveys (DfT, 2004a; DfT, 2004b; DfT, 2005; DfT, 2006a), survey work at Nottingham Trent University (Cooke, 2003; and 2004) and work for the AA Motoring Trust as part of the Living with the Van project (AA Motoring Trust, 2006; Lang and Rehm, 2006; Lang, 2006).

This paper reviews key issues concerning the use of LGVs in urban areas including: factors influencing the use of LGVs, transport policy for LGVs, LGV operations in urban areas, the impacts of LGV operations, and approaches being taken by policy makers and companies to reduce these negative impacts.

## 2. Terminology

We have referred to commercial vehicles up to 3.5 tonnes gross weight as "LGVs" (light goods vehicles). There are several different terms used by different organisations in different countries to describe these vehicles (including vans, light vans, light goods vehicles, light commercial vehicles, small trucks etc).

It is important to note that in Europe there are also goods vehicles with gross weights over 3.5 tonnes that also have van-type bodies (typically these vehicles have gross weight between 3.5 and 7.5 tonnes) but which fall into a different licensing class than the LGVs described above, and are therefore treated as heavy goods vehicles. However in other countries the weight distinction between LGVs and HGVs can vary according to national legislation. In Japan, for instance, the distinction between LGVs and HGVs is 5.0 tonnes gross weight, and a 350 kg loading weight distinguishes between "small trucks" (which are the lightest LGVs) and other LGVs.

## 3. Factors Influencing the Use of LGVs

There are a number of factors that are likely to be partly responsible for the growth in the size of LGV fleets and the total vehicle kilometres they travel in many countries including the UK, the Netherlands and Japan in recent years. In terms of transporting goods the following are likely to have encouraged the use of LGVs (Allen et al., 2002):

- Reduction in stockholding levels/move to JIT distribution systems – as companies have moved towards logistics systems which aim for stock reduction there have been reductions in delivery quantity and therefore encourages the use of smaller vehicles;
- These frequent deliveries of small quantities using LGVs have become common not only for goods movement from wholesalers to retailers, but also from vendors or suppliers to manufacturers (particularly in Japan);
- Increase in same day and time-critical parcel deliveries – in the parcels sector the demand for faster services has resulted in greater use of LGVs;
- Shortage of heavy goods vehicles (HGV) drivers/Changes in driving licence legislation requiring drivers to pass additional driving tests for HGVs – companies are finding it increasingly difficult to recruit HGV drivers and some are therefore opting instead for LGVs which can be driven on standard car driving licences, thereby significantly expanding the potential driver base to select from;
- Increase in operating restrictions on HGVs in urban areas – restrictions imposed by local authorities on the routes available to HGVs may be having an effect on companies' vehicle selection policies;
- Growth of home delivery sales – home shopping and delivery has become increasingly popular in the last few years and the majority of these deliveries that involve groceries and parcels are made by LGVs which are ideally suited to the products and residential driving conditions (E-commerce and other remote sales are rising rapidly each year in many European countries. Mintel estimate the total home shopping market in Europe was worth €67.2 billion in 2003 (Mintel, 2005). Home shopping market is expected to continue to grow rapidly in the coming years);
- Growth in number of households - reduction in average household size (due to people living longer, changes in family composition and people choosing to live alone) is resulting in more households and hence more residential delivery addresses for home deliveries;

- Growth in use of LGV by services, like repair and home improvements – the increase in home extension and improvement is resulting in greater flows of building products to homes with many builders using LGVs;
- Increase in value density, especially of consumer goods will emphasise small vehicles at the ends of the supply chain.
- Low investment and operating costs of LGVs compared to HGVs.

Laws governing maximum vehicles weights have also played a part in the level of LGV use in some countries. For instance, in Japan, the use of LGVs has also been encouraged by the relatively low maximum permissible weight of HGVs on public roads (which is only 20 tonnes in normal circumstances). This results in a lack of incentive for many operators to use HGVs instead of LGVs. If the distance between the origin and the destination is not very far, operators and their customers are not typically very keen to consolidate their cargos from several LGVs into one HGV, but instead directly transport them by LGVs to the final destination.

In terms of service operations the following are likely to have encouraged the use of LGVs (Allen et al., 2002):

- Outsourcing of service functions to specialist companies during the last decade - this has tended to result in a wide range of services provided to buildings and to homes that require vehicle trips;
- Increase in rapid response servicing (e.g. computer repairs etc.) – this has resulted in increases in LGV trip making in order to rectify such problems;
- Development and use of more technological and communications equipment that requires installation, planned servicing and emergency repairs – these sectors primarily use LGVs for their engineers and servicing staff;
- The installation and maintenance of new telecommunication networks (e.g. cable networks);
- Growth in the number of households has led to greater trip-making in order to meet these servicing needs many of which will take place in LGVs.

In addition, LGVs have become popular due to their flexibility, allowing them to be used for a range of tasks (both work and leisure), and in some countries their use may have also been encouraged by tax incentives.

## 4. LGVs and Transport Policy

Existing policy measures for LGVs and HGVs differ in many ways in most countries including speed limits, operator and driver licensing requirements, drivers' hours regulations, and operating restrictions. Table 1 provides details of these differences in the case of the UK.

Table 1 Differences in policy measures for LGVs and HGVs in the UK

| Policy area | Difference in treatment between LGVs and HGVs |
|---|---|
| Driving licence requirements | LGVs up to 3.5 tonnes can be driven with a standard car driving licence (Category B vehicle licence). Rules differ for driving vehicles over 3.5 tonnes gvw depending on when the category B driving licence was acquired. |
| Drivers' hours legislation | Drivers of LGVs are not subject to EU Drivers' Hours Regulations. As part of British Domestic legislation in the Transport Act 1968 the driver of an LGV when engaged in most professional activities should not drive for more than 10 hours per day and should not be on duty for more than 11 hours on driving days. Tachographs are not fitted in LGVs, thereby making the legislation difficult to enforce. |
| Operator licences | No requirement for an operators' licence (O-licence) for LGV (and therefore no need to demonstrate good repute, appropriate financial standing or professionally competent) |
| Speed limits | There are different speed limits for car derived vans up to 2 tonnes gvw, other LGVs and vehicles up to 7.5 tonnes gvw, and goods vehicles over 7.5 tonnes gvw |
| Operating restrictions (especially in urban areas) | LGVs not always subject to same time and access restrictions as imposed on HGVs. |

(Source: Allen et al., 2003)

By comparison, in Japan LGVs are owned and operated by commercial freight carriers including parcel delivery companies or shippers (manufactures, wholesalers, retailers and repair companies and so on). The commercial freight carriers require operators' licences and they are subject to government regulations including driving-hour restrictions. However, "small trucks" (which have an engine capacity of less than 660cc and a maximum loading weight of less than 350 kg) are treated differently (in terms of taxes and other regulations) from other LGVs.

Some of the differences in transport policy between LGVs and HGVs may have actively encouraged the acquisition of LGVs. Policy makers have tended to pay very little attention to LGVs in comparison with HGVs.

However, with the growth in LGV traffic and the relative inefficiency of LGVs compared with HGVs when used to carry goods (in terms of road space and energy requirements per unit of product) it may be necessary for policy makers in many countries to reconsider whether such policy differences need to be reconsidered.

Because of the types of activities that LGVs are used for (including final delivery legs, home deliveries, and wide-ranging servicing activities), they perform a far greater proportion of their vehicle kilometres in urban areas than is the case for HGVs. For example, in the UK in 2005, LGVs performed 37% of their total distance travelled on urban roads. This compared with 15% on urban roads for HGVs (DfT, 2008).

## 5. Impacts of LGV Operations

LGV operations are responsible for economic, social and environmental impacts in the same way as HGV activity. Negative impacts include contributions to congestion, involvement in traffic accidents, and a cause of noise disturbance, fossil fuel consumption, and pollutant emissions.

### *5.1. Economic impacts*

LGVs in the Netherlands transported 62 million tonnes in 2005, which represents 8.7 percent of a total of 710 million tonnes transported on Dutch territory by road goods vehicles. However LGVs accounted for 110 billion vehicle kilometres in the Netherlands in 2005, which is approximately the same as by HGVs. Forecasting work in the Netherlands for the period 2005 to 2020 estimated that LGV vehicle kilometres would grow more than HGV vehicle kilometres (Policy Research Corporation & NEA, 2007). In the UK, LGV vehicle kilometres were more than twice those performed by HGVs in 2007 (DfT, 2008).

As LGVs perform a greater proportion of their vehicle trips and vehicle kilometres in urban areas than HGVs, they make a greater contribution to urban congestion than HGVs. Operations involving de-consolidation from a few HGVs to many LGVs at urban distribution centres because of traffic restriction on HGVs may result in worsening urban congestion.

However, there are also positive economic impacts of LGV operations. These vehicle activities provide both goods and service flows that are fundamental to the economic vitality and competitiveness of industrial, trade and leisure activities. These vehicles play a key role in the successful functioning of a wide range of urban premises (both commercial and residential). In addition, a large number of people are employed in the operating, manufacturing, and maintenance of LGVs, as well as in various other support roles.

### *5.2. Social impacts*

An LGV is less responsible than an HGV for noise disturbance, road damage and vibrations leading to building damage due to the lower gross weight of an LGV. These impacts increase in a geometric progression of gross weight, so that de-consolidation from HGVs to LGVs has a positive effect even if the number of vehicles increases.

LGVs are less frequently involved in collisions resulting in fatal and other injuries than other motorised vehicle types including HGVs in many countries.

Many LGVs are involved in urban collections and deliveries that require short distances between stopping points. As a result, up until March 2005, several EU Member States including the UK had introduced exemptions to seat belt use requirements for LGV occupants to assist the efficiency of their operations. However, since March 2005 these exemptions are only available for LGV drivers who are travelling less than 50 metres between stopping points.

### *5.3. Environmental impacts*

The overwhelming majority of LGVs in the EU, USA and Japan run on either diesel or petrol. Over the last twenty years, diesel engines have become far more common in LGVs than petrol engines in the EU and Japan. In some other countries such as the USA petrol-powered LGVs are still far more common than diesel ones. As well as consuming large quantities of fossil fuel, LGV use also results in the release of significant quantities of pollutant emissions at the point of vehicle use. Table 2 shows the range of pollutants emitted and the relative quantity of each pollutant emitted per kilometre travelled in urban conditions by age of LGV in the UK. Table 2 also reflects the impact that Euro engine emission standards are having on LGV pollutant emission rates.

Table 2 Emissions for LGVs (per vehicle kilometre) in urban conditions in the UK

(Index: car without three-way catalyst pre 1993 = 100)

| Type of LGV & Year | Carbon monoxide | Hydro-carbons | Oxides of nitrogen | Particulates | Carbon dioxide |
|---|---|---|---|---|---|
| *Petrol LGV* | | | | | |
| pre 1994 | 136 | 96 | 94 | 19 | 111 |
| 1994-1997 | 20 | 3 | 19 | 2 | 140 |
| 1998-2000 | 5 | 2 | 16 | 1 | 143 |
| 2001-2005 | 4 | 1 | 7 | 1 | 136 |
| 2006- | 3 | 1 | 5 | 1 | 128 |
| *Diesel LGV* | | | | | |
| pre 1994 | 10 | 19 | 81 | 187 | 143 |
| 1994-1997 | 5 | 9 | 63 | 51 | 143 |
| 1998-2001 | 5 | 9 | 60 | 53 | 143 |
| 2002-2005 | 3 | 7 | 45 | 37 | 131 |
| 2006- | 3 | 4 | 23 | 24 | 122 |

Note: Petrol LGVs pre 1994 were without three way catalysts. Petrol LGVs have had three way catalysts since 1994.
(Source: DfT, 2008)

In some countries outside Europe, emissions standards are also being applied to new LGVs over time. For instance in Japan, emissions standards are similar and in some respects even tighter for LGVs than in Europe.

$CO_2$ emissions have not been part of these Euro emission standards to date. However this is about to change with the European Commission planning to impose limits on the amount of $CO_2$ emitted by new vans, restricting it to 175 g/km $CO_2$ by 2012 and 160 g/km $CO_2$ by 2015 (European Commission, 2008).

Estimates of the external costs of goods vehicle activity in the Netherlands suggest that LGVs accounted for 37 percent of the external costs of $CO_2$ emissions, 32 percent of the external costs of air pollution, and 42 percent of the external costs of noise nuisance by all goods vehicles in the country in 2005 (Policy Research Corporation & NEA, 2007). LGV use is also responsible for the consumption of large quantities of materials in the manufacture, maintenance and disposal of the vehicles.

## 6. Approaches to Reducing the Negative Impact of LGV Operations

There has been relatively little research into LGV driver behaviour and company attitudes and actions towards driver behaviour.

A recent study has been carried out that involved in-depth interviews with four categories of LGV drivers to find out about how they operate and their attitudes towards road safety. (Lang, 2006). The four categories of LGV driver were:

- Employed dedicated LGVs drivers

- Employed tradesmen driving LGVs
- Self-employed dedicated LGVs drivers
- Self-employed tradesmen driving LGVs

The survey worked comprised detailed, qualitative interviews with a total of 18 LGV drivers. The results for the employed drivers and tradesmen interviewed indicate that most were unaware or uncertain of the existence of a written safety policy in their company. Employed drivers from smaller companies tended to feel that "they were not up to date with current legislation and guidance on driving and were not provided with information by their managers." Driver training was not provided in any of the companies. The self-employed LGV drivers and tradesmen interviewed did not have written safety policies and did not carry out driving risk assessments.

A 2001 survey of 103 LGV drivers showed that they rated their driving behaviour as better than both HGV and car drivers (Lex, 2001).

### *6.1. LGV driver training*

In terms of their driving behaviour, one study has found that LGV drivers tend to think of their driving skills as good and non-aggressive, but 'assertive'. The same study also found that approximately 10% of LGV drivers "confess to the odd motoring misdemeanour" (such as driving through red traffic lights, exceeding the speed limit, especially in urban areas (Social Issues Research Centre, 1998).

In terms of LGV drivers' views of other road users, one study found that almost half felt that other motorists deliberately obstruct them or behave in an anti-social way towards them because they are driving an LGV (Social Issues Research Centre, 1998). LGV drivers felt that they received "better treatment from lorry drivers….but taxi drivers are perceived as a particular menace" (Social Issues Research Centre, 1998).

A 1998 study found that only approximately 5% of LGV drivers have received advanced driving instruction. These LGV drivers "were proud of their certificates…took their job more seriously and were more likely to distance themselves from other van drivers as a result (Social Issues Research Centre, 1998).

Survey work suggests that the majority of LGV drivers do not receive driver training from their companies (Lex, 2001; Cooke, 2004; Berg et al., 2004)

To help address this lack of LGV driver training, the UK Department for Transport has established "SAFED for Vans". This is a driver training course that is "aimed at improving the safe and fuel efficient driving techniques of LGV drivers…It provides training and development for existing LCV drivers through instruction relating to vehicle craft and road craft" (DfT, 2006b). The proposed training course was also piloted with 25 LGV drivers in November 2005 to check the content and record its achievements. The results from this pilot study showed that "on average, the fuel economy improved by 9%, the drivers felt in more control of their vehicles and less stressed. The time the route took to complete was the same or shorter and the wear and tear on the vehicle reduced as a result of fewer stops and less gear changing (DfT, 2006b).

### *6.2. Company strategies to reduce the impacts of LGV operation*

A 2006 research study has indicated that there are some major differences between the views of LGV drivers and managers on LGV safety and training issues. Differences included the existence and communication of company driving safety policies, over which aspects of driving records were regularly monitored by the company (such as time, fuel consumption, accidents/incidents, penalty points and parking tickets), about whether time pressures were imposed on drivers by managers, and over driver induction and training (Lang, 2006). This is reiterated by the survey results presented in the previous section about driver training.

A 2004 survey of LGV operators showed that only 31% of responding companies had a strategy in place to reduce LGV mileage. The two most common approaches to achieving this were route planning and the use of telematics. At the time of the survey only 13% of the respondents used a telematics system in their LGVs, with higher penetration rates among larger fleets (Cooke, 2004).

### 6.3. Good practice material

Good Practice Material has been produced by the UK Government and freight transport trade associations to assist LGV (and HGV) operators and drivers with issues concerning: vehicle selection, fleet management, fuel management, driving behaviour, parking and loading, theft prevention, and the use of IT. Similar good practice literature has been developed in other countries. A specific Van Best Practice Programme has recently been launched by the UK Government (DfT, 2006b).

However, survey work among LGV operators in two London boroughs in 2004/5 suggests that the vast majority of LGV operators are not aware of, and do not make use of, such good practice material related to freight transport. Therefore, although there are national programmes that address good practice it would seem they were not reaching many LGV operators participating in the survey (Browne et al., 2005).

Research has been conducted into the operational efficiency of LGV operations of participating companies in three urban areas (Allen et al., 2003). This work studied the efficiency of current operations of both LGVs and HGVs in several supply chains in different parts of the urban area, and then estimated the effects of potential policy measures on these operations.

### 6.4. Environmentally friendly vehicles

Most European cities are confronted with problems of air- and noise-pollution caused by road traffic. Air pollution is linked to a range of health problems including premature mortality, aggravation of respiratory and cardiovascular disease, asthma, bronchitis, and decreased lung function. Many studies also link exhaust gases to increased incidence of lung cancer. Noise is also becoming a major problem in urban areas (BESTUFS, 2005).

The promotion and usage of EFV in urban freight transport has been encouraged by several urban authorities and national governments. Many municipal and national activities have started to encourage the use of EFV in urban freight transport. National programmes like the PIEK-programme (PIEK, 2003) or the French "National Programme on Goods in Cities" (Gerardin, 2005) have shown that national programmes and support measures can lead to successful results.

Euro engine emission standards have played an important role in reducing the emissions of LGVs per kilometres travelled since the early 1990s. As already discussed, future Euro standards for LGVs will help to continue to reduce emissions per kilometres travelled.

Alternative fuels that are less polluting than diesel are available for specially-designed or adapted LGVs. These include liquefied petroleum gas (LPG), natural gas (CNG/LNG) and electricity. Examples of two UK companies that have adopted these fuels for LGVs are provided below.

Joynson Bruvvers Ltd (JBL) is a family-owned independent office supply company based near Oxford. They acquired three LPG-fuelled LGVs out of a fleet of six LGVs, which was used for multi-drop work around Oxfordshire, with a typical route involving 40 drops per day and a total monthly mileage of around 1,500 miles per vehicle. The LPG vehicles emitted 9% less $CO_2$, 46% less CO and 57% less HC and NOx than the comparable petrol vehicle. There was a small loss in payload volume and weight due to the additional LPG tanks. The total running costs of the LPG vehicles were similar to those of the diesel vehicles (DfT, 2002).

Sutton and East Surrey Water operated 21 bi-fuelled LPG/petrol-powered vehicles (3 cars and 18 LGVs) in their fleet of 156 vehicles. The 18 LPG/petrol LGVs traveled approximately 270,000 miles per year in total and it was estimated that using LPG would result in a total emission saving of nearly eight tonnes of $CO_2$ when compared to the petrol-fuelled vehicles. The LPG vans emitted 11% less $CO_2$, 39% less CO and 33% less HC and NOx than the comparable petrol vehicle. The fleet manager, estimated that the annual fuel cost savings were £17,000. The total additional purchase cost for the fleet of 21 LPG vehicles was £21,150 (compared to the petrol version). (DfT, 2003).

While some EFV initiatives have addressed LGVs, the majority have focussed on HGVs to date. A 2004 survey of LGV operators showed that only 23% of responding companies had a policy towards alternative fuels. Respondents with larger LGV fleets were more likely to have such a policy than those with smaller fleets. In addition, of those companies with no policy on alternative fuels, one third have not even considered the alternatives (Cooke, 2004).

### *6.5. Traffic restriction on HGVs and congestion charging*

One factor that can encourage the use of LGVs is traffic policy restrictions of HGVs. The relaxation of such restrictions could reduce the level of use of, and hence negative impacts of, LGVs. In Amsterdam, there is an interesting traffic restriction. HGVs with high load factors are exempted and allowed to enter the restricted zone, thereby taking into account the overall negative effects of de-consolidation.

Congestion charging could potentially influence the management and use of the goods vehicle fleet. In principle, such charging could discourage frequent, small-sized deliveries by LGVs. However charges would have to be set sufficiently high to have such an effect and would need to reflect the number vehicle movements. Experience with congestion charging in London does not indicate a switch in use from LGVs to HGVs, but given the current charges in force and the fact that a single payment allows the vehicle to enter and leave the charging zone as many times as desired in a day this is not unexpected.

## 7. Conclusion

The LGV fleet and its activity has increased substantially over time. This has come about as a result of the suitability and versatility of LGVs for a wide range of goods and servicing tasks, which have developed as a result of economic developments and management innovation as well as due to changes in household behaviour and composition. Traffic restrictions on HGVs have also affected LGV use to some extent.

It can be argued that LGVs are less intimidating than HGVs in urban areas as their size is more suited to the urban environment and street layouts. However the activity levels of LGVs in urban areas (which has partly resulted from urban de-consolidation where many LGVs replace a few HGVs) is of concern, as this use is associated with a range of negative impacts,

Forecasting work in the Netherlands in 2007 estimated that the use of LGVs would grow by approximately 35-50% in tonnes and tonne-kilometres within the country by 2020, with the number of vehicle kilometres increasing by approximately 20-35%. The lower estimated growth in vehicle kilometres than in tonnes or tonne-kilometres is a reflection that larger, more efficiently loaded LGVs are expected to be used in future (Policy Research Corporation & NEA, 2007).

Given the likely increase in the absolute and relative importance of LGVs in urban freight transport in future it is important for policy makers and operators to focus on ways to achieve greater efficiency in use, and other approaches such as vehicle and engine design, vehicle maintenance, driver training, and good practice dissemination to limit their social and environmental impacts. These efforts need to be planned in conjunction with other urban freight transport policy initiatives such as traffic restriction on HGVs and urban consolidation to ensure that these other factors are not encouraging ever-greater LGV use.

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