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Cities and Freight

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Abstract

Since the industrial revolutions of the 19th and 20th centuries the development of urban and transport planning has been shaped - in both capitalist and communist societies - by the parallel utopianism of modernism and garden cities, accelerated in Europe by post war reconstruction. The development of first rail and then road has allowed cities to break free from the concentration on local resources. In this chapter, freight in cities is placed in this context. Sustainability is strongly affected by transport and therefore a strong relationship exists between freight planning and the development of urban freight strategies that have been promoted across the developed world. Freight partnerships, urban 'distribution' centres, delivery windows, freight and urban citizens, receiver-led initiatives, clean vehicle initiatives, low emission zones and road pricing are all discussed to contextualise the current challenges facing urban freight in the developed urban setting. The chapter argues that, unlike passenger travel, freight is the lifeblood of a modern city, with the

challenge being how freight should balance social, economic and environmental issues, in order to realise an agreed level of sustainability.

1. Introduction

“Une maison est une machine-à-habiter” (A house is a machine for living in) was the vision introduced by the Swiss-French architect Charles-Édouard Jeanneret-Gris, better known as Le Corbusier (1887-1965), to kick off the era of *modernist* architecture and urban planning (1923). In his words:

..suppose we are entering the city by way of the Great Park. Our fast car takes the special elevated motor track between the majestic skyscrapers: as we approach nearer there is seen the repetition against the sky of the twenty-four skyscrapers; to our left and right on the outskirts of each particular area are the municipal and administrative buildings; and enclosing the space are the museums and university buildings. The whole city is a Park.

(Le Corbusier, 1923, cited from Jacobs, 1961, p.31)

Le Corbusier's vertical 'dream' city integrated the car as part of the scheme, where great arterial roads for express, one-way traffic were introduced to cut the number of streets; in addition, underground streets for heavy vehicles and delivery were proposed (Jacobs, 1961, p.33).

Not long before Le Corbusier promoted the Charter of Athens in 1933 - which was to shape much of the city planning for many cities across Europe, North America and Australia - another utopian, Sir Ebenezer Howard (1850-1928), advocated a different utopia: the “Garden City”. In response to the poor living and consequent public health conditions of British cities in the late 19th century, Howard and others looked to introduce a new kind of living space that synergised town and country advantages and disadvantages (1898). Howard promoted the role of self-contained city functions (zonal planning), with focus on the physical qualities of the suburban and the social

qualities of the small-town, while the commercial concept was a standardized supply of goods with a self-limited market (Jacobs, 1961, p.29).

The street patterns and urban layout of modern cities in the developed world - especially during the post WW2 rebuilding of Europe - were influenced by the city utopias of Le Corbusier and Howard, in both capitalist and communist societies (Diefendorf, 1989); city centres were characterised by high rise development in the inner city and the radial mushrooming of residential, suburban housing to connect city to region and then city to city, forming a polycentric conurbation development pattern. Before then the development patterns of urban form were quite organic, with the energy source (coal, water) the growth trigger that tended to concentrate industry and thus form a town. Further suburban growth was then enabled by the introduction of rail technology in the 1830s (Hall & Twedwr-Jones, 2011, p.13) and onwards from there, as first railways and then long distance road highways, were built across the world.

While cities across the developed world grew to accommodate industrial growth, as well as housing needs, the transport system - notably roads, for cars, to support door-to-door mobility - became well planned and played an important role in accessibility, connecting people to jobs, services and facilities. In Britain, the period between WWI and WWII was one of suburban growth and decentralization, with significant population growth and a tripling of the extended built-up urban area (Hall & Twedwr-Jones, 2011, p.21). While street planning in British cities during that period was determined by health considerations, European cities (e.g. Paris, Vienna, Berlin) were modelled on civic design, with new boulevards, squares and parks that also maintained a reimagined past (e.g. baroque streets and historic market square designs) (Hass-klau, 1990). The USA was the country most committed to establishing a comprehensive road highway (interstate) network – the largest public works project in history (Glaeser, 2011, p.173). Elsewhere, in West Germany, prefabricated multi-story buildings were the new symbols of urbanisation in the post-war era (Schneider, Achilles, & Merbitz, 2014). In the Communist East, a modernist and mass-produced

approach delivered boulevards of high-rise concrete towers, with some stunning reproductions of past icons lost to the depredation of war. In the East, the UK and North America, the centres of cities were often neglected in the closing decades of the 20th century, whereas in Western and Southern Europe, historic cities continued to be mixed use and living centres (Diefendorf, 1989).

Perhaps the most influential critic of the issues and dis-benefits arising from contemporary city planning is Jane Jacobs (1916-2006), who criticised the overemphasising of urban form in shaping local communities (Jacobs, 1961; Banister, 2012). Jacobs argued that, contrary to the common wisdom of the 1960s, streets are safer when more people are on them and when people are able and willing to watch the street, from windows. She observed that traffic arteries, along with parking lots, filling stations, and drive-in-movies, are powerful and insistent instruments of city destruction, that consistently devalue cities. In her words:

... city streets are broken down into loose sprawls, incoherent and... City character is blurred until every place becomes more like every other place, all adding up to Noplace (Jacobs, 1961, p.18).

Road hierarchies were introduced in the Buchanan report to Britain's Ministry of Transport (1963), to provide the rationale for managing urban traffic and congestion via economic evaluation, within a capacity, at an environmentally acceptable level. Sir Colin Buchanan (1907-2001) drew attention to the idea that transport is a function of land uses and that urban traffic can be postulated into three main variables: the standard of accessibility (degree of usage of motor vehicles), environment (degree of freedom from the adverse effects of traffic i.e. danger, accidents, noise, fumes), and the extent of physical alterations (and hence of capital expenditure) for the purpose of accommodating traffic (Bianconi & Tewdwr-Jones, 2013). While the report led to the integration of urban and transport planning, and provided a framework for incorporating environmental factors into decisions on transport investments (including pedestrianisation in town centres), the "*predict and provide*" paradigm has emerged to shape the city and region transport system, to lift economic growth, and to continue development of the car-friendly city.

Since the negative impact of car oriented development became obvious - via increased pollution and congestion, the relatively higher level of accidents resulting in fatalities and injuries, and the health impact of the automobile - city planning has been revisited; the movements of 'compact city' planning in Europe and 'new urbanism' in the US have emerged, to revitalise cities into being more human scaled. The impact of pedestrianisation and traffic calming schemes, in cities across Britain and Germany, demonstrated a positive effect on city centre retailing (Hass-klau, 1993). Certainly the advancing age of the internet and the development of new communication technologies has changed daily life and space (Schneider et al., 2014); still cities are envisaged as havens of pleasure, as well as productivity, that can share the fixed cost of infrastructure such as museums and theatres, that promote innovation and entrepreneurship, via face-to-face interaction (Glaeser, 2011). Aestheticization and medialization have taken the place of identity and history as the pillars of urbanity (Schneider et al., 2014). The current urban form, with its gap between the urban centre and the peri-urban (suburb) is at the centre of discussion; the dynamic of how future cities should look is questioned, and the mobility behaviour of inhabitants (driven largely by the cost of energy to move) – is observed (Rouge, Gay, Landrieu, Lefranc-Morin, & Nicolas, 2013). In addition, the fragile balance of energy cost contests the resilience of a city or region. For example, the Ile-de France region produces only 1% of the products it consumes (Jourdan, 2013). The birth of smart cities is imagined and the ubiquitous rise of smart technologies is expected to shape the 'compact city' / 'new urbanism' movement, to revitalise cities across the developed world.

As cities once more reshape, to become smarter and more human in scale, freight emerges as a problem: how can modern cities cope with this most important aspect of life? The objective of this chapter is to describe the current situation with regard to urban freight distribution in cities, in the developed world, and to give a general overview of the promoted strategies to address the issues arising. The patchwork of urban form across Europe, discussed above, makes the subject of urban freight both interesting and challenging. Section 2 discusses freight in cities; Section 3

discusses the way the sustainability issue can be linked to freight; Section 4 describes a list of recent urban freight strategies to address the sustainability agenda; and Section 5 provides a conclusion.

2. Freight in cities

Freight in cities includes the provision of both physical goods and services: everything from the delivery of perishable goods (e.g. food) and deliveries to retail outlets, schools, housing and manufacturing plants, to the services of the boiler repair engineer. Freight is delivered in 3.5t¹ vans, in trucks from 7.5t to 10t and upward², by train, river barge, bicycle, aeroplane, by car and, of course, on foot. The most dominant mode is road and, over time, the use of vans has increased - in both absolute and relative quantity - due to, among other factors, reduced accessibility caused by the characteristics of the urban built environment, increased home deliveries, changes to licensing regulations and a lack of a career path for Heavy Goods Vehicles (HGV) drivers (from driver's mate to driver) (Lodovici et al., 2009). In most developed countries, freight in cities constitutes between 10-20% of traffic (European Commission, 2006; Woudsma, 2001), with a tendency for it to avoid the private vehicle and public transport peaks, as despatch managers and drivers plan to avoid congestion. Freight has a greater impact on traffic and the environment than numbers suggest; it contributes more significantly to particulate emissions than do cars (Dablanc, 2008). In most traffic planning systems a freight vehicle is considered to have a value about 2.5 times that of a car, with respect to road usage and congestion effects at junctions.

Freight is deeply unpopular; in a survey of the public in South Yorkshire, UK, at the turn of the millennium, freight was judged to have the lowest priority or right to access the roads (SYITA, 2001). Goods vehicles are routinely restricted in their access to cities (Dablanc, 2007), in a pattern which is patchwork and often contradictory. In Ancient Rome goods could only be delivered at night

¹ often known as Light Delivery Vans (LDV) in Europe and Light Goods Vehicles (LGV) in the UK, the terminology is not quite equivalent.

² often known as Heavy Delivery Vans (HDV) in Europe and Heavy Good Vehicles (HGV) in the UK, again the terminology is not quite equivalent.

- a tradition still continued in many Mediterranean cities. In modern day London, a lorry ban restricts truck movements throughout the night³; in other cities time windows restrict access during morning shopping hours, whilst in many historical city centres, in Italy and elsewhere, the size of vehicles or the type of engine is restricted by time, or by location.

The delivery of goods is the lifeblood of cities; without it the 65% of EU citizens who live in urbanised areas (European Commission, 2007) would have little or no food, clothes, buildings, power, office supplies, raw materials, entertainment or any of the other necessities and luxuries of modern life. Whilst planners imagine self-sufficient cities (Flint & Raco, 2012; Lehmann, 2011), the reality of early 21st century urban life is that it is largely dependent on the driver of a truck and his - since it is a predominantly male profession - deliveries to our shops, homes, workplaces and leisure spots. Logistics is a multi spatial activity; within the Single European Market of the EU, or the huge single market that is North America⁴, goods travel long - sometimes global - distances, to regional distribution centres, and are then distributed, not just to single cities, but multiple urban centres. A distribution centre in Benelux will routinely supply cities in Belgium, The Netherlands, Northern France and Western Germany. Depending on the economic footprint of the product concerned, valuable goods with very time sensitive demand may be distributed across whole regions, from one hub, overnight. Freight is a global, regional and transnational business, and yet it is perceived, by citizens and planners, as a primarily local one. This mismatch in perception continues to the democratic process, since freight companies are often located externally to the cities they serve, leaving voters, local government representatives and city bureaucrats with little or no liaison with, or links to, freight companies and their managers and employees.⁵

³ The London Lorry Control Scheme has become increasingly loosened over the decades and currently an extensive "Excluded Route Network" runs through the city as night time arteries.

⁴ Primarily the USA and Canada with the new addition of Mexico.

⁵ This trend may be exacerbated by the recent tendency of logistics centres to migrate away from city centres due to planning and land price issues, known as logistics sprawl and observed in North America and Europe (see for example: Dablanc & Rakotonarivo, 2010).

It is in this complex intertwining of regional freight logistics and local urban concerns that, since the 1970s, citizens, companies and planners have struggled to develop strategies to reach sustainable solutions to allow cities to flourish and for deliveries to support this in a sustainable fashion (Allen & Browne, 2010; McKinnon, 2010). Three major trends have been observed in recent decades that have fundamentally changed the warehousing land-use patterns in UK urban areas, namely: de-industrialisation; spatial concentration of stockholding; and rapidly rising land prices and increasing traffic congestion (Allen, Browne, & Cherrett, 2012). New supply chain organisation and logistics network design form modern logistics and shape the current urban development and land use, including the transformation of land value for housing, retail and business services alike (Hesse, 2008).

3. Sustainable freight in cities

We indicated in the previous section that freight in cities is unpopular due to its negative impacts on citizens, such as congestion, emissions, safety and noise. Transport in general, and road freight transport in particular, is a major generator of emissions, including CO₂, PM₁₀, and NO_x. Also, despite many technical and operational improvements, transport is one of the most rapidly rising sources of GHG emissions (Schipper, Marie-Lilliu, & Gorham, 2000). For example in London, in 2008, road freight transport was the source of a quarter of all road transport related CO₂ emissions, of which 14% derived from Heavy Goods Vehicles (HGVs) and 11% from Light Goods Vehicles (LGVs) (University of Westminster, 2011). In addition, three quarters of all transport-related emissions come from road traffic (Woodcock et al., 2009). Road freight transport was responsible for 41% of total road transport NO_x emissions, with HGVs accounting for 31% and LGVs for 10%; it was also responsible for 38% of the road transport PM₁₀ emissions (HGVs 17%; LGVs 21%) (University of Westminster, 2011). Figure 1 shows the peak daily hours in London and Figure 2 demonstrates projected freight vehicle growth.

Figure 1 Freight vehicles crossing at the Greater London Boundary Cordon by time of day in 2009 (University of Westminster, 2011)

Sustainability can briefly be described as the reconciliation of environmental, economic, and social objectives (McKinnon, 2010) and, in the business world, is often expressed as ‘triple bottom line’ (see for example: (Elkington, 2004; Norman & MacDonald, 2004)). The origin of the sustainable development concept can be traced back to the Brundtland report (1987) that suggested we have the ability to make the necessary development sustainable, to ensure that it meets the needs of the present, without compromising the ability of future generations to meet their own needs. This report led to the United Nations pursuing the Rio Earth summit in 1992 and the Kyoto Protocol agreement in 1994, which target nations to reduce CO₂ emissions. Making logistics ‘sustainable’ in the longer term will, however, involve more than simply cutting CO₂ emissions (McKinnon, 2010). Within the urban setting, the roles of policy makers, business retailers, freight shippers and citizens are being considered, to contribute to the success of achieving the sustainability agenda (Anderson, Allen, & Browne, 2005; Behrends, Lindholm, & Woxenius, 2008; Quak & Koster, 2007; Stathopoulos, Valeri, & Marcucci, 2012).

Figure 2 Trend of Light Goods Vehicle (LGV) vs Heavy Goods Vehicle (HGV) in London (Evanson, 2014)

In the previous section we have discussed that freight in modern cities is a reality, an economic necessity and an essential part of our modern livelihood. So how can we make it sustainable? The starting point is for citizens, city authorities, private businesses receiving freight deliveries and - above all - freight service providers, to be aware of sustainability and to recognise the importance of taking it into consideration in all urban planning and development activities (Holguín-Veras & Jaller, 2014). At a micro-level, the solution package may consist of technical (e.g. improvement of truck engines; alternative fuel vehicles), operational (e.g. LGVs, instead of HGVs; entering the city centre through consolidation centres), regulatory (e.g. restricting high-polluting vehicles entering city centres), management (e.g. London congestion charge) and cooperation initiatives (e.g. building platforms to discuss the concurrent urban freight related problems and potential solutions). A health based study suggests that an achievement of reductions in particulate matters and CO₂ emissions through technology is less certain than through reductions in distances travelled in motor vehicles (Woodcock et al., 2009). Higher utilisation of available assets, with higher load factors, is an important step towards reducing road mileages for freight. To optimise the operation of the road fleet, an advanced information system is vital. A Japanese study suggested three important functions: allowing drivers and control centres to communicate with each other; real-time traffic condition information; and utilisation of historic data on pick/delivery services (Taniguchi & Heijden, 2000). They reported that a milk-producing company improved its load factor

from 60% to 70% and achieved 13.5% reduction in pick/delivery truck numbers in one year, following the introduction of a satellite based information system. Another important aspect of urban freight (also true for freight in general) is that the operation is performed by private companies - increasingly third party logistics service providers - on infrastructure (road) regulated by government bodies (in the UK: city authorities for urban areas and the Highways Agency for non-urban roads). To achieve a sustainable urban freight system, it is vital that the private operators are involved in urban planning and development activities (Lindholm & Browne, 2013; Lindholm, 2013). A focus on 'organisational and management' approaches, alongside the traditional 'optimisation' approach to addressing urban freight issues is needed, to meet the sustainability agenda. The marriage of such approaches has determined the way we look at describing the current urban freight strategies and is discussed next.

4. Urban freight strategies – theory and practices

4.1. Freight Partnerships

Urban freight transport involves many different stakeholders, both those within the urban area, who are not directly involved in freight transport movements, and the actors in the supply chain. City authorities, residents and visitors can be counted in the former category, in the sense that they do not perform actual transport operations, as freight shippers. However, city authorities, are attempting to affect freight movement in urban areas through regulations and policies, although the evidence of success to date is discouraging (Dablanc, 2007; Muñuzuri, Cortés, Guadix, & Onieva, 2012). Organisational issues was identified as the key aspect to look at, to address the research gap (Gonzalez-feliu, Semet, & Routhier, 2014). The main issue has been the complex interaction between different stakeholders in addressing the sustainability agenda. This is especially true because, for cost reasons, logistics decisions are usually taken on the basis of commercial and operational factors,

rather than considering the wider sustainability issues that are the concern of city authorities acting on behalf of residents and visitors.

Urban freight partnership is a recently promoted transport policy to address cooperation between urban freight stakeholders – whether public or private entities – to achieve sustainable urban freight. The partnership is meant to include consultation and dialogue in public decision making (Browne, Nemoto, Visser, & Whiteing, 2003). A number of European city authorities have used the urban freight partnership term as ‘freight partnership’ or ‘freight network’ or ‘freight charter’ to emphasise a legal relationship being engaged among urban freight stakeholders (Lindholm & Browne, 2013). Freight Quality Partnerships (FQP) have been promoted in the UK since the mid-1990s, following a joint industry and local authority initiative, led by the Freight Transport Association (FTA) (Allen & Browne, 2010). This was supported at national level by the publication of guidance and case studies (FTA - Freight Transport Association, 1997; DETR - Department of the Environment Transport and the Regions, 1999; Department for Transport, 2003, 2006). A recent survey reported that a total of 87 FQPs had been identified in the UK, with 38 of those having an urban focus; however only 58 of those FQPs were found to be still in operation (Allen, Browne, Piotrowska, & Woodburn, 2010). A comprehensive study of urban freight partnership between urban freight stakeholders, taking examples from a number of European cities, concluded that a core set of engaged and interested participants are the most important factors to support the ongoing activities of a partnership (Lindholm & Browne, 2013). Some of the main FQP outputs are evident, including quarterly meetings among freight stakeholders who aim to address freight issues; lorry parking and traffic information; best practice; a multi-modal carbon calculator; and Fleet Operator Recognition Schemes (FORS).

Recent urban freight partnership studies highlighted the importance of urban freight stakeholder engagement in the transport (freight) planning process (Ballantyne, Lindholm, &

Whiteing, 2013). A model of the engagement process is currently being promoted to support the clean urban freight policy promoted by EU government (see for example: Zunder et al., 2014).

4.2. Urban Distribution Centres

Logistics is usually executed through “hubs” and “spokes”, with distribution centres being the hubs between the transport legs. A key mantra of supply chain management is that the fewer times goods are touched, the better - reducing damage, misdirection, theft and delays. Based on this theory, logistics networks have expanded, as regulation and national border barriers have receded, with goods moving further between hubs. Often these hubs are co-located with other logistics providers and services, in formal locations such as ‘freight villages’, or in organic clusters at industrial parks. From the 1970s onwards, starting in the UK and France, interest emerged in ‘transshipment centres’ as a way of reducing the numbers of HGVs operating in urban centres not so concerned with the proliferation of smaller vehicles this would generate. None of these feasibility studies in the 1970s were initiated, due to concerns over viability.

Cities often state that urban distribution centres are created and operated by, or with, local governmental support in order to:

- Reduce the number of delivery vehicles (especially dirty trucks and other vehicles using fossil fuels) operating in the central areas of cities;
- Reduce emissions and noise from freight transport and improve quality of life;
- Facilitate the operations with freight vehicles in loading/unloading areas within cities;
- Reduce the conflict over resources on city streets;
- Improve delivery services to retailers (on time deliveries);
- Provide opportunities for added – value services to customers (stock holding, bundling, acceptance of goods out of hours);
- Improve the quality of the entire logistics service provided.

The original intent to remove HGVs from city centres suggests a certain strategy: breaking the bulk of full truck loads into smaller vehicles. This could in itself generate a greater volume of trips in smaller vehicles and increase congestion and emissions. As concerns grew about air quality and carbon emissions, a different goal emerged: increasing the load factor and efficiency of freight vehicles in cities, often to a load factor around the 50% mark.⁶

In the 1990s, however, German cities embarked on an ambitious programme of “city logistics”⁷ trials, with the deployment of transshipment centres, backed by the rise of the Green Party in German politics and funded by public money (Flaemig, 2003).

The term ‘urban consolidation centre’ (UCC) is often used from this period onwards, not as a way to break bulk, but rather to concentrate it. The archetypal UCC is a shared user platform that receives goods as a proxy for the final customer in a city, collects a van load and then delivers to the city addresses, often in a light or clean powered vehicle, sometimes by cycle or even on foot. Sometimes, as in a trial by TNT, the UCC is itself a mobile vehicle that accesses the city and then acts as a hub for smaller vehicles throughout the day (STRAIGHTSOL, 2012). Most such schemes fail, since they are at variance with the liberal economy adopted throughout Europe, the USA and most modern capitalist economies.

A review of such schemes in a number of countries demonstrated that in France (11) and the UK (38) - a total of 49 schemes for both countries - approximately two-thirds of the schemes reviewed did not proceed beyond a research project or feasibility study, while by comparison, in Germany (14), Italy (14) and the Netherlands (14) the vast majority of UCC studies proceeded to a trial or to a fully operational scheme (Allen, Browne, Woodburn, & Leonardi, 2012). High set-up costs, difficulties in handling a wide range of goods increased delivery costs, route diversions, and

⁶ This statement that load factors are low is one that is rarely challenged, it is comparable to global freight load factors, long haul load factors etc. However it does offer a potential target, and we shall not enter into debates about the relative ‘virtue’ of different load factors versus freight types or even between public transport and freight.

⁷ “City Logistics” is not quite a synonym for “Urban Freight” or “Urban Logistics”, but it implies a higher level of city wide integration of logistics, usually local government led, than the broader titles above.

loss of direct interface between suppliers and customers were identified as some of the main disadvantages of the scheme (Allen & Browne, 2010). Indeed, the major barrier concerned with making UCCs financially sustainable is the extent to which the various participants (carriers, receivers and local authorities) are willing and able to meet the financial costs of the UCC in return for the benefits that they receive (Allen, Browne, Woodburn, et al., 2012). From the late 1990s and into the 21st century a new wave of urban transshipment centres emerged and the terminology began to adapt, as the lessons of the earlier period were partially digested and imperfectly implemented.

A successful example is at Heathrow airport, where a consolidation centre accepts all deliveries to the franchises around the airport and then delivers to the shops. This works because the franchisee is also the airport owner, and effectively controls the entire supply chain, from door to counter. A delivery reduction of 66% of trips was achieved and the logistics provider is now trialing the scheme in other shopping malls, around the UK (Zunder & Marinov, 2011).

The current research and literature supports the view that the current models of UCC are most likely to succeed in the following situations (source: Allen, Browne, Woodburn, et al., 2012; Browne, Sweet, Woodburn, & Allen, 2005):

- Specific and clearly defined geographical areas where there are delivery-related problems;
- Town centres that are undergoing a “retailing renaissance”;
- Historic town centres and districts that are suffering from delivery traffic congestion;
- New and large retail or commercial developments (both in and out of town);
- Major construction sites.

This is a statement based on the status quo and we believe that the analysis shows that opportunities exist to develop new norms of planning, based on the relative success of private enterprise versus state intervention.

4.3. Delivery windows and time restrictions

Delivery windows and time restrictions force distribution activities to take place within a specified period of the day (or night) to improve the shopping climate in shopping areas by reducing freight's visual intrusion, intimidation, safety infringement, vibration and noise (OECD, 2003). From Figure 1 we find that the movement of heavy goods vehicles in London increases between 4.30am and 7.00am and decreases from 2.00pm and remains low onwards. Another example of the application of time windows is in Utrecht, Netherlands, which has a medieval inner city centre with narrow streets. Different types of freight vehicles, including LGVs and HGVs, deliver cargo to businesses in the city centre areas, but regular vehicle movement risks causing damage to ancient buildings and pavements, thereby threatening the historical and cultural heritage of the city, whilst causing a nuisance in the form of accidents, noise and air pollution. As a solution, the city council has introduced time windows for freight traffic to deliver goods and a low emission zone (discussed in more detail in another section) (BESTFACT, 2013). Despite the popularity of this strategy among other European cities and municipalities, increasing environmental and financial pressures are evident within the Dutch retail case (Quak & Koster, 2007).

City authorities and municipalities in different European countries have been trying to solve urban freight movement by using different measures to manage urban freight delivery operations, for example, regulation (Ville, Gonzalez-Feliu, & Dablanc, 2012). There is no certainty that a particular solution that is proved successful in one city will yield the same or similar result in another. Even within a single city, the authorities may deem it necessary to change policy, from time to time. For example, in Vicenza, Italy, the authorities gradually introduced a limited traffic zone (LTZ), with 'limited time access', by applying five consecutive municipal ordinances between 2005 and 2006. When the intended results were not achieved, they adopted other, complementary solutions, such as a consolidation terminal and a logistics centre, a maximum number of permits for 'air carriers' and a move from low-environmental impact vehicles to a restriction of non-electric

vehicles. Such incremental progression of policy implementation provided the participants space to adapt to the changes and regulations (Ville et al., 2012).

Looking at the historical data (e.g. see Figure 1 and Figure 2) of LGVs and HGVs in urban areas, some may suggest an off-peak delivery window policy for goods movement. For example, deliveries to supermarkets in Brussels are shifted from daytime to late evening, or night, to reduce the environmental impact, such as noise, and to maintain good relations with local residents. For such freight movements, CNG trucks and Euro 6⁸ diesel trucks, silent trailers, silent pallet trucks and covered unloading docks are used (STRAIGHTSOL, 2014). A side effect of such deliveries is that someone at the consignee premises has to be present to open and close the shop or warehouse where the cargo will be delivered. This may not however be costly, since many supermarkets are 24/7 operations, many small shops routinely work late and - even in Manhattan - the advantages of concentrating deliveries before normal working hours can achieve actual cost savings (Holguín-Veras, 2008). Such problems can be solved by close cooperation and long-term agreement between operators and receivers.

4.4. Freight and urban citizens

One of the oldest known measures to protect urban citizens from freight traffic is the separation of pedestrians from goods traffic. In ancient times, goods were transported by pack animals or on foot and later by wheeled carriages. Pavements were introduced by the Romans to protect pedestrians from wheeled traffic, but were forgotten until after the Great Fire of London in 1666, with the trend moving across to France and Germany, some 100 years later (Hass-klau, 1990, p.10). During that period, in certain London streets, the transport of merchandise was not allowed during most hours of the day, while in Chicago commercial and other wheeled traffic was restricted on most weekdays along the main boulevards, until 1920 (Hass-klau, 1990, p.23).

⁸ Level type of engine, the higher is the newest and the cleanest

In Britain (also similarly in Germany) increasing traffic motorization raised the number of motor vehicle related road deaths to 1700, in 1909. With that figure doubled by 1924 and quadrupled by 1934, road safety was becoming the most important issue (Hass-klau, 1990, p.40). Measures such as driving licences, speed limits and speed humps (or similar devices) were then introduced and consequently reduced motor vehicle related fatalities. Furthermore, the introduction of a system of arterial and ring roads, to separate precincts for residential, business and industrial areas during and post war, reduced the number of accidents while freeing urban residents from noise, dust, danger, etc. (Hass-klau, 1990, p.153). However, the growth of the road network - with its extended urban development that also had benefited retailers (e.g. through heavier, faster lorries) - maintained a relatively high road casualty rate. This peaked in Germany at 19,200 casualties (1970) and in Britain at 8000 casualties (1966) (Hass-klau, 1990, p.185). The figure in the US was even more staggering, with almost 50,000 casualties in 1960 (Hakim, Shefer, Hakkert, & Hocherman, 1991, p.381). It was during the 1970s that the environmental impact on logistics, motivated by the growth of lorry traffic, was rationalized and an investigation of 'Lorries, people and the environment' was commissioned by the UK Government, that was also followed up at international level via the Organization for Economic Co-operation and Development (OECD), with the introductory report on the effect of heavy trucks on the environment, published in 1982 (McKinnon, 2010, p.9). Advances in vehicle technology and tightening regulations on emission levels gradually reduced freight transport externalities.

One of the recent issues between freight and urban citizens is the reshaping/regenerating/revitalizing of city/town centres, which are becoming less car-friendly and attracting more walking and cycling. Walking and cycling in urban areas alleviate vehicle traffic congestion, as well as providing health and environmental benefits to its citizens, but poor road design, with rising levels of pedestrian and cyclist concern, created the opportunity to address safety issues at the very local level. The redesigning of road intersections; truck modifications; and training

for cyclists, road managers and drivers aimed at behavioural change, are some of the promoted solutions (Pattinson & Thompson, 2013).

Another trend is the (reverse) logistics of waste management that can be linked to the reuse, recycling and disposal of products from citizens' homes. The logistics activities include the return of damaged, unsold or returned consumer products, back up the supply chain, and thus also touch on the home delivery service – or actually 'home return' activity - induced by citizens. Models of sustainable reverse logistics can be classified into two types: local collection points, coordinated by a local collection authority and the use of the existing delivery mechanism; a number of criteria should be considered including delivery capacity, material characteristics, the equipment to collect, and frequency (Cherrett, Maynard, McLeod, & Hickford, 2010). Citizen and retailer behaviour plays a major role in these activities, although a growth in sustainability concerns may introduce strategic interventions or policies that might change this.

4.5. Receiver led initiatives

The UCC concept, described in a previous section, helped suppliers, carriers and retailers to consolidate freight in ways that are cost-efficient for them, but for cities this cost-driven consolidation is not necessarily advantageous, as trucks are still entering city-centres half-empty and, in many cases, the UCC concept alone is not enough to sustain an independent business model (Allen, Browne, Woodburn, et al., 2012; Zunder & Marinov, 2011). In order to avoid the unnecessary nuisance caused to the user of the urban living environment by this inefficient mode of operation, a number of initiatives were drawn up to improve the feasibility of UCCs. An additional transshipment point, adapted behaviour by receivers and carriers, and consultation/collaboration between carriers and retailers, were all identified to address this call (Verlinde, Macharis, & Witlox, 2012). This section discusses the role of the receiver in urban freight strategy.

Adjusting the conventional working methods of urban freight stakeholders, such as receivers, recently gained the attention of policy makers in European cities, following the introduction of a

scheme named 'Delivery and Servicing Plan', or 'DSP'. The scheme was promoted by Transport for London, in the London Freight Plan 'Sustainable freight distribution', published in 2007. DSP strategy is centred on the receiver within the supply chain, as opposed to traditional urban freight strategies that have focused on the transport operator. DSP can be defined as the management and organisation of multiple operations of last mile deliveries, that can be optimised by efficient freight planning in an organisation (Zunder, Aditjandra, & Carnaby, 2014). DSP in London looks to assist retailers and other companies to consider steps they can take to reduce the freight activity associated with their deliveries and collections that may benefit both the reliability and the cost of these operations. A UK based study, over 15 years, demonstrates that an average of 10 core goods and 7.6 service visits per week could be expected to high street retailers, in non-peak trading periods, and that 42% of delivery activity was made by vans or LGVs, with a mean dwell time of 10 minutes (Cherrett et al., 2012). The figure for a public sector organisation/institution, such as a large University with multiple on-site buildings, counted 600 unique vehicles per day, of which 82% were LGVs, with 55% of the traffic dwell time lying between 5 and 35 minutes (Zunder, Aditjandra, & Carnaby, 2014). In both studies, DSP was promoted as a receiver-led initiative, to improve freight operations.

The DSP pilot case for Transport for London (TfL) involved the relocation of a portion of TfL's own offices and reported that, with DSP intervention, overall deliveries were reduced by 20% (Transport for London, 2009). Best practices in facilities management were highlighted, including central management of consumables (including paper, ink, tea, coffee, milk, sugar, etc.), consolidation of deliveries, and increased out-of-hours delivery activity. Responsible purchasing, via the evaluation of contracts with suppliers using vehicles registered to the Fleet Operator Recognition Scheme (FORS), was also highlighted. FORS is a subsidized certification scheme, promoted in the UK, aimed at ensuring fleet operators are aware of a range of exclusive, economically sound benefits to improve safety and reduce environmental impact. Similar scheme also exist at the European level, named ECOSTARS (2014), funded by the EU. Other DSP schemes, for sectors such as hotels and

hospitals, were also reported via TfL, though due to data availability issues there is no clear evidence of its effectiveness (Transport for London, 2014).

4.6. Clean vehicle initiatives

Many of the initiatives described in previous sections aim at reducing the number of freight vehicles on the road in urban areas, or at reducing their impact. However, in terms of congestion and safety concerns, there is also a number of ways in which the characteristics of vehicles can be modified to benefit society by reducing emissions of greenhouse gases (GHG's), pollutants and noise. The vast majority of freight vehicles operating within the road mode are still powered by an internal combustion engine (ICE) fuelled by diesel. For example, in the UK this figure, for LGVs, stands at 96% (NAEI, 2014). However, alternatives do exist and the following section will discuss their merits, limitations and examples. Different scenarios arise from a variety of combinations, depending on the energy source, energy carrier and vehicle powertrain technology.

The alternatives to diesel or petrol (gasoline) can be divided into two major groups: other fuels for ICE (including those powered by petroleum gases, biofuels and hydrogen) and electricity used to power the electric motor, drawn from a battery or converted from another energy carrier such as petrol (using a so-called range extender) or hydrogen (using a fuel cell – a promising but prohibitively expensive technology).

Virtually all of the internal combustion alternatives are dual-fuel solutions, with the possibility to switch back from the alternative to one of the dominant fossil fuels, when needed. The technology for the most popular varieties of gas-powered vehicles (LPG, CNG or bio-methane) is already mature and their share of the freight market mostly depends on a mixture of economic (conversion cost, fuel price and availability) and fiscal (excise duties, tax relief) parameters. Compared to petrol and diesel, these fuels generate fewer CO₂ emissions and perform substantially better on NO_x and particulates (PM₁₀). They play a major role in a variety of Asian and South

American markets (such as Iran and Brazil) but their sales are stagnating or declining in the US & Japan (Sierzchula, Bakker, Maat, & van Wee, 2012).

Cleaner vehicle alternatives based on electricity present a more dynamic picture. Their market share is still very small but it is steadily increasing and the technologies involved are still developing, increasing the energy efficiency and decreasing the cost of key components; yet no single solution appears to be dominant enough to be expected to replace diesel. On the whole, vehicles powered by an electric motor are much quieter and - in the case of purely electric drive - emit neither pollutants nor GHG's locally or - in the case of hybrids - pollute substantially less. However, their operations do have a wider environmental impact that partly depends on the vehicle itself, but more on the electricity production and storage set-up. On the economy side, the vehicles themselves are substantially more expensive than diesel (from dozens to hundreds of percentage points more, mostly depending on the size of the battery) but their maintenance and fuelling is considerably cheaper, with electricity being taxed much less than fossil fuels, by most governments around the world. The environmental profile of these vehicles makes them particularly suitable for urban freight distribution, offering emissions and noise advantage, and their operational qualities (sufficient range and high energy efficiency at low speed, stop-and-go traffic) also suit such an application, which is quite the opposite for long distance freight movements. The vehicles' high purchasing cost is often offset by public funds that support their market introduction, as a means to fight pollution in cities. It has also to be mentioned that hybrid solutions do exist - combining a diesel/petrol powertrain with an electric motor in a single vehicle - allowing for cleaner electric operations when required (for instance in a historic city centre) and 'dirtier' ICE operations elsewhere (e.g. on the way to an out-of-town logistics centre).

A number of trials are ongoing, using freight vehicles powered entirely or partially by an electric motor. They are often combined with a modification of the logistics system, such as the introduction of a UCC, in order to take advantage of both cleaner vehicles and optimised load factors

and routing. For example, in 2009, in London, a micro-consolidation centre, together with a fleet of electric vans and tri-cycles, served a city centre location. The outcomes of the trial show that, despite their lower payload, using cleaner vehicles resulted in an overall GHG emissions reduction of more than 50% (Browne, Allen, & Leonardi, 2011).

4.7. Low emission zones

In recent years there have been many initiatives, trials and projects, in many European cities, to use electric vehicles (EVs) for goods movement in urban areas, to achieve near zero emissions and lower noise levels. Newcastle upon Tyne (UK) is one of the pioneers in this regard, with a Low Emission Zones (LEZ) policy that was introduced in the Local Transport Plan during its first inception in 2005 (Local Transport Plan Core Team, 2007). However, despite the fact that this has improved air quality and reduced car traffic congestion, there is still no evidence of enforcement, to date. Consider the example of London, one of Europe's largest urban centres, with significant movement of people and goods. Around 280,000 daily freight trips lead to congestion, noise pollution and poor air quality (Evanson, 2014). In Figure 1 we have seen the variation in movement of freight vehicles over a 24-hour time window. Over 4000 premature deaths annually are linked to London's poor air quality (Mulholland, 2010). Approximately 25% of Particulate Matter of less than ten microns in diameter (PM_{10}) and 57% of NO_x from road transport emissions, come from heavy vehicles in London (Transport for London, 2008). Prior to the LEZ introduction, a study on the likely response to the policy intervention demonstrated that purchase of new vehicles, to meet the required standards, and a redistribution of non-compliant vehicles to outside the boundaries of the LEZ, were envisaged (Browne, Allen, & Anderson, 2005). Recent impact analysis of the scheme, after 5 years, shows that the LEZ increases the replacement rate for older vehicles, notably on light commercial vehicles, and also increases their use, at the expense of rigid vehicles (Ellison, Greaves, & Hensher, 2013). London's air quality also appeared to have slightly improved, with reductions in concentrations of PM_{10} and NO_x , despite an increase in the number of heavy vehicles (Ellison et al., 2013).

Recently, in the framework of the FREVUE project, part-funded under the European Commission's FP7, the London demonstrator integrated optimised logistics operations, using urban micro-consolidation centres and zero emission EVs. The aim was to significantly reduce CO₂ emissions and other harmful pollutants, in Central London. The demonstration finds that, although the EV significantly reduces emissions, there are still some technical issues of using EVs, such as reliability, charging times, battery cost and vehicle range, that deter many operators from adopting such vehicles for their deliveries (Evanson, 2014). The operational issues with EVs include connecting suburban distribution centres, located outside or near the M25, with central London, due to EV range limitations. Many of these technological and operational issues have been lessened over the years, but the biggest challenge for mass usage of EVs by freight operators is the high initial capital cost, due to premium prices but, once procured, EVs become comparable in cost to traditional diesel vehicles, after five years of operation (MacAndrew, 2014).

In Como, Italy, the Smartfuion project (also part-funded under FP7) conducted an EV trial for deliveries to commercial operations in a Limited Traffic Zone (similar to LEZ concept but aimed at particular traffic, such as freight) under real business conditions. The trial found that the battery charge level observed at the end of each day was never below 85%. The price of the delivery followed the standard market rate, again to reflect the real-life business situation, as with all other logistics and delivery indicators (Leonardi, Browne, Kipp, Vaghi, & Tola, 2014). A further way of addressing an LEZ is by the use of hybrid (diesel + electric) vehicles, supported by a route planning 'geo fencing' system that can help the driver to avoid congestion and adapt to local transport issues (e.g. speed limit, limited zones, etc.) in real time. For example, the Smartfusion project is scheduled to conduct a trial for the operation of a hybrid vehicle in Berlin, Germany, in September 2014, where electric power will be switched on while the vehicle is operated in sensitive urban areas, while the remaining operation will be carried out using diesel power.

4.8. Home delivery and e-commerce

Over the last 5 years, e-commerce and internet shopping have shown a remarkable growth, with rates exceeding 14% year-on-year (European Commission, 2014). In the UK in 2012, online retail sales accounted for £28.9 billion (Mintel Group Ltd, 2013). At the same time the role of the high street has dramatically changed, from predominantly a place where people went to purchase goods, to a place where people now go to collect goods and to obtain customer services (ExperienceLab, 2013; Wallop, 2013).

IMRG (2012) estimates that, annually, “the UK creates 1.05 billion deliveries made up of 1.1 billion packets and parcels”. The customer delivery experience is critical to the success of online shopping and the same source estimates the overall cost to the UK e-retail sector, of failed 1st time delivery, as £851m per annum. The 6 most common scenarios to deal with this failure are broken down in Figure 3. There is some debate as to whether online shopping is good for the environment (see for example: (Browne, Allen, Anderson, & Jackson, 2001; Edwards, McKinnon, Cherrett, McLeod, & Song, 2009)). Hypothetical simulation, using data from Lyon (France), showed that a scenario combining home deliveries and local access (proximity) to reception points would reduce road occupancy rates by about 13%, in urban areas (Gonzalez-Feliu, Ambrosini, & Routhier, 2012). Some analyses show consideration needs to be given to the frequency and treatment of failed deliveries (Browne et al., 2001; IMRG, 2012).

Unsuccessful deliveries are costly and time-consuming (IMRG, 2012) for both retailers and carriers and inconvenient for the consumer; they also have a detrimental effect on the environment (The Institution of Engineering and Technology, 2010), with wasted trips to empty properties made when, increasingly, many people are not at home to receive deliveries during the working day, which is when most home delivery companies operate (Edwards et al., 2009). Previous research estimated that half of UK households are unoccupied between 09:00 and 16:00 on weekdays (Fernie & Sparks, 2009), hence it is no surprise that a significant majority of consumers have experienced failed

delivery, of one kind or another. Ultimately it is the duty of the parcel carriers/couriers to successfully delivery the package/parcel.

Figure 3 - Cost of Home Delivery Failure – (Source: IMRG, 2012)

With delivery failure becoming more of an issue as e-commerce continues to grow (European Commission, 2014), the cost of this traditional delivery approach - both financial (IMRG, 2012) and environmental (McLeod & Cherrett, 2009) - is being addressed by a series of strategies to mitigate the effects of failed deliveries. The three most common are: Secure locker boxes (e.g. DHL, 2014), Pick-Up-Points (or 'Click & Collect') (e.g. CollectPlus, 2014) and Improved information visibility and greater consumer choice. All of these are aimed at improving the environmental impact of deliveries, with the single principle of a better first time delivery success rate, through consumer choice.

4.9. Road pricing and freight

Urban road use is one of the few utilities not paid for on a variable basis, in most developed countries. Gas, water, electricity and telecoms are paid for on a largely variable basis, as are rail, air and sea transport modes. Road use is usually charged via an annual vehicle licensing tax, plus a fuel tax, which is by nature variable. There are a variety of reasons why road pricing is a valid tool for

urban freight management; there are different choices for implementation, which can lead to quite varied and sometimes opposing effects.

The free market economics argument for road pricing is based on the precept that roads are a limited resource, best provided for using a pricing mechanism. To that end roads are not being sold in a monopolistic or oligopolistic market and as such would be best sold, bought, allocated and invested in through normal market mechanisms (Rolle, 1994). This argument, whilst popular in deregulatory circles, may need reconsidering for urban freight, where there may well be no alternative mode, and pricing in purely economic theory may well be monopolistic and distorting.

Operators have started to move freight over greater distances, especially since the introduction of the Single European Market, in 1993, and the North American Free Trade Agreement, of 1994. This now means that costs incurred by a haulier - e.g. pavement damage - can lie in a different fiduciary jurisdiction than the home location and tax point of the vehicle. There is also a view that the way that infrastructure is charged on a wholly variable basis for rail and water - as opposed to fixed and variable for road - militates against modal shift to more sustainable modes of transport. To that end there has been an interest in making infrastructure charging, at the point of use, an EU policy. This has not been particularly successful, despite being a key policy in the EU 2001 White Paper on Transport (Zunder, Aditjandra, & Islam, 2012).

On the other hand, the use of road tolls to pay for specific road infrastructure, such as bridges, auto routes and so on, is very common and many inter urban roads are tolled in this way. The tolled primary network around Paris is close enough to the conurbation that choices between tolled and non-tolled roads can be made by road users and often this leads to freight vehicles on non-tolled road where, in a wider context, they may not be best placed. Another important example are the cordon tolls around some Norwegian cities (Ieromonachou, Potter, & Warren, 2006) which recover road building costs and, in doing so, generate direct effects on urban road use. In New York and New Jersey, along with other US states, tolls on roads between ports and city centres have

effects on freight that merit study (Holguín-Veras et al., 2006). The use of infrastructure charging as a revenue generation tool leads to different pricing approaches and produces different effects on traffic.

Implementations of urban road pricing have been sparse, probably due to the disfavour shown by electorates, in referenda or opinion polls (e.g. Edinburgh, Manchester). The key examples to date have been the London Congestion Charge (Givoni, 2012; Santos, 2008), where a Mayor independent of party implemented a successful scheme; Singapore, which is an effective autocracy (Chin, 1996); and Stockholm (Eliasson, 2008) where the political highs and lows played out for over a decade. The key issue with congestion charging schemes is that they are demand management schemes that look to reduce congestion and accompanying air quality problems through the shift of traffic from road to other modes. Finally, it is important to recognize that in urban areas, freight operators rarely have viable alternatives, so discussion about pricing - and especially about equity - is irrelevant, since the charge is a tax and indeed may have no effect on freight behaviour.

5. Conclusion

The use of the term 'transport and urban planning in the developed world' strongly implies that certain parts of the world have characteristics in common which give them a distinctiveness that sets them apart from the developing world, or the newly developed BRIC countries. It is a paradox that, in large part, this distinctiveness is a result of the variety of historical experiences which have contributed to the physical fabric in which citizens live, work and play. In many cases it is the history of the nation (or occasionally nations) in which a particular town or city has been situated, that has shaped its development through the ages (Burtenshaw, Bateman, & Ashworth, 1991). In this chapter we have addressed how freight in cities has adapted to different periods of time and we have described the current problems and measures adopted in cities across the developed world, within the context of urban freight theory and practice.

Passenger and freight movements in urban areas are very different in nature. While passenger movements are determined by various criteria (e.g. socio-economic issues, mode choices, attitudes, etc.), freight movements have only the single purpose of transporting goods from one point in the supply chain to another. Conversely, while passenger decisions are generally individual, for freight a number of stakeholders (owners, customers, carriers, government) are involved in decisions about how goods are moved. Cities have been generally planned to accommodate people, rather than freight, yet some key differences between the two have been drawn (Allen, Browne, & Cherrett, 2012) including:

- Fewer modal options exist for freight than for passengers (with the vast majority of urban freight transported by road);
- The demand for freight transport is more inelastic with respect to price than passenger and therefore less likely to alter or stop than passenger movements, when transport prices change;
- Most goods are transported along major roads, rather than through residential neighbourhoods.

For freight in general, an efficient system is the objective of successful operation and urban freight is no different, due to the mechanistic pattern of movement. To revisit Le Corbusier's (1933) idea that "a house is a machine for living in" - outlined at the beginning of this chapter and which has been criticised for its unsuitability to address people's space realm – we can say that it is actually a much more suitable definition for freight, because freight *is* a machine for living.

This chapter contributes to freight within the context of urban planning history, as well as recent best practice. It can be concluded that the progress of attention given to freight in cities began with economic issues (e.g. Button & Pearman, 1981), following concerns about urban goods distribution (e.g. Ogden, 1977); this was then followed by planning issues, that touch on environmental and social aspects (e.g. (Hesse, 2008; Ogden, 1992) while maintaining the aspect of economic optimisation (e.g. Crainic, Ricciardi, & Storchi, 2004; Taniguchi, 2001) and, most recently, the focus has turned to the sustainability agenda (e.g. McKinnon, Cullinane, Browne, & Whiteing,

2010). Sustainability in transport cannot be complete unless it considers the aspect of freight and - most critically – unless the needs of freight stakeholders are taken into account within the city planning process.

References

- Allen, J., & Browne, M. (2010). Sustainability strategies in city logistics. In A. McKinnon, S. Cullinane, M. Browne, & A. Whiteing (Eds.), *Green Logistics - Improving the environmental sustainability of logistics* (pp. 282–305). CILT (UK). Kogan Page.
- Allen, J., Browne, M., & Cherrett, T. (2012). Investigating relationships between road freight transport, facility location, logistics management and urban form. *Journal of Transport Geography*, 24, 45–57. doi:10.1016/j.jtrangeo.2012.06.010
- Allen, J., Browne, M., Piotrowska, M., & Woodburn, A. (2010). *Freight Quality Partnerships in the UK - an analysis of their work and achievements*. London.
- Allen, J., Browne, M., Woodburn, A., & Leonardi, J. (2012). The Role of Urban Consolidation Centres in Sustainable Freight Transport. *Transport Reviews*, 32(4), 473–490. doi:10.1080/01441647.2012.688074
- Anderson, S., Allen, J., & Browne, M. (2005). Urban logistics how can it meet policy makers sustainability objectives? *Journal of Transport Geography*, 13(1), 71–81. doi:10.1016/j.jtrangeo.2004.11.002
- Ballantyne, E. E. F., Lindholm, M., & Whiteing, A. (2013). A comparative study of urban freight transport planning: addressing stakeholder needs. *Journal of Transport Geography*, 32, 93–101. doi:10.1016/j.jtrangeo.2013.08.013
- Banister, D. (2012). Viewpoint: Assessing the reality—Transport and land use planning to achieve sustainability. *Journal of Transport and Land Use*, 5(3), 1–14. doi:10.5198/jtlu.v5i3.388
- Behrends, S., Lindholm, M., & Woxenius, J. (2008). The Impact of Urban Freight Transport: A Definition of Sustainability from an Actor's Perspective. *Transportation Planning Technology*, 31(6), 693–713. doi:10.1080/03081060802493247
- BESTFACT. (2013). *Best Practice Handbook 1, Deliverable 2.2*. Retrieved from http://www.bestfact.net/wp-content/uploads/2014/01/BESTFACT_BPH.pdf
- Bianconi, M., & Tewdwr-Jones, M. (2013). The form and organisation of urban areas: Colin Buchanan and *Traffic in Towns* 50 years on. *Town Planning Review*, 84(3), 313–336. doi:10.3828/tpr.2013.18
- Browne, M., Allen, J., & Anderson, S. (2005). Low emission zones: the likely effects on the freight transport sector. *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, 8(4), 269–281. doi:10.1080/13675560500405899

- Browne, M., Allen, J., Anderson, S., & Jackson, M. (2001). *Overview of home deliveries in the UK*. London.
- Browne, M., Allen, J., & Leonardi, J. (2011). Evaluating the use of an urban consolidation centre and electric vehicles in central London. *IATSS Research*, 35(1), 1–6. doi:10.1016/j.iatssr.2011.06.002
- Browne, M., Nemoto, T., Visser, J., & Whiteing, T. (2003). Urban Freight Movements and Public-Private Partnerships Meaning of Public-Private Partnership. In *Third International Conference on City Logistics 25-27 June*. Madeira: Institute of City Logistics. Retrieved from <http://westminsterresearch.wmin.ac.uk/34/>
- Browne, M., Sweet, M., Woodburn, A., & Allen, J. (2005). Urban Freight Consolidation Centres Final Report by University of Westminster Department for Transport.
- Brundtland, H. (1987). *Report of the world commission on environment and development: Our Common Future*. United Nations.
- Buchanan, C. (1963). *Traffic in Towns*. London: HMSO: HMSO.
- Burtenshaw, D., Bateman, M., & Ashworth, G. (1991). *The European city: a Western perspective* (Second.). London: David Fulton Publishers.
- Button, K. J., & Pearman, A. D. (1981). *The economics of urban freight transport*. 1981. London and Basingstoke: The Macmillan Press Ltd. Retrieved from http://openlibrary.org/books/OL20929747M/The_economics_of_urban_freight_transport
- Cherrett, T., Allen, J., McLeod, F., Maynard, S., Hickford, A., & Browne, M. (2012). Understanding urban freight activity – key issues for freight planning. *Journal of Transport Geography*, 24, 22–32. doi:10.1016/j.jtrangeo.2012.05.008
- Cherrett, T., Maynard, S., McLeod, F., & Hickford, A. (2010). Reverse logistics for the management of waste. In A. McKinnon, S. Cullinane, M. Browne, & A. Whiteing (Eds.), *Green Logistics - Improving the environmental sustainability of logistics* (pp. 242–262). London: Kogan Page.
- Chin, A. T. H. (1996). Containing air pollution and traffic congestion: Transport policy and the environment in Singapore. *Atmospheric Environment*, 30(5), 787–801. doi:10.1016/1352-2310(95)00173-5
- CollectPlus. (2014). Drop and Collect Ltd (UK). Retrieved July 01, 2014, from <http://www.collectplus.co.uk/about-us>
- Crainic, T. G., Ricciardi, N., & Storchi, G. (2004). Advanced freight transportation systems for congested urban areas. *Transportation Research Part C: Emerging Technologies*, 12(2), 119–137. doi:10.1016/j.trc.2004.07.002
- Dablanc, L. (2007). Goods transport in large European cities: Difficult to organize, difficult to modernize. *Transportation Research Part A: Policy and Practice*, 41(3), 280–285. doi:10.1016/j.tra.2006.05.005
- Dablanc, L. (2008). Urban Goods Movement and Air Quality Policy and Regulation Issues in European Cities. *Journal of Environmental Law*, 20(2), 245–266. doi:10.1093/jel/eqn005

- Dablanc, L., & Rakotonarivo, D. (2010). The impacts of logistics sprawl: How does the location of parcel transport terminals affect the energy efficiency of goods' movements in Paris and what can we do about it? *Procedia - Social and Behavioral Sciences*, 2(3), 6087–6096. doi:10.1016/j.sbspro.2010.04.021
- Department for Transport. (2003). *A guide on how to set up and run Freight Quality Partnerships*. London, UK.
- Department for Transport. (2006). *Freight Quality Partnerships Case Studies*. London, UK.
- DETR - Department of the Environment Transport and the Regions. (1999). *Sustainable Distribution : A Strategy*. London, UK.
- DHL. (2014). Packstations. Retrieved July 01, 2014, from <http://www.dhl.de/en/paket/pakete-empfangen/packstation.html>
- Diefendorf, J. (1989). Urban Reconstruction in Europe after World War II. *Urban Studies*, 26(1), 128–143. doi:10.1080/00420988920080101
- Edwards, J., McKinnon, A., Cherrett, T., McLeod, F., & Song, L. (2009). The impact of failed home deliveries on carbon emissions: Are collection/delivery points environmentally-friendly alternatives? In *Proceedings of the 14th Annual Logistics Research Network, 9-11 September* (pp. 102–108). Cardiff. Retrieved from http://www.greenlogistics.org.uk/SiteResources/6b9d9c59-edbd-4b86-b1a5-65c9f8b11d1d_Edwards - Home Deliveries.pdf
- Eliasson, J. (2008). Lessons from the Stockholm congestion charging trial. *Transport Policy*, 15(6), 395–404. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0967070X0800053X>
- Elkington, J. (2004). Enter the Triple Bottom Line. In A. Henriques & J. Richardson (Eds.), *The Triple Bottom Line: Does It All Add Up?* (Vol. 1, pp. 1–16). London: Earthscan. Retrieved from [http://kmhassociates.ca/resources/1/Triple Bottom Line a history 1961-2001.pdf](http://kmhassociates.ca/resources/1/Triple%20Bottom%20Line%20a%20history%201961-2001.pdf)
- Ellison, R. B., Greaves, S. P., & Hensher, D. A. (2013). Five years of London's low emission zone: Effects on vehicle fleet composition and air quality. *Transportation Research Part D: Transport and Environment*, 23, 25–33. doi:10.1016/j.trd.2013.03.010
- European Commission. (2006). *Urban freight transport and logistics - An overview of the European research and policy*. Brussels: European Commission. Retrieved from http://www.transport-research.info/Upload/Documents/200608/20060831_105348_30339_Urban_freight.pdf
- European Commission. (2007). *GREEN PAPER Towards a new culture for urban mobility*. Brussels. Retrieved from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0551:EN:HTML:NOT>
- European Commission. (2014). *E-commerce statistics* (Vol. 28). Retrieved from <http://epp.eurostat.ec.europa.eu/>

- Evanson, D. (2014). FREVUE – Towards zero emission deliveries at your doorstep. In *Smart Urban Freight Conference*. Newcastle upon Tyne: Newcastle University. Retrieved from <http://smartfusion.eu/conference-2014>
- ExperienceLab. (2013). *Click & Collect Customer Experience*. London.
- Fernie, J., & Sparks, L. (2009). Retail logistics: changes and challenges. In J. Fernie & L. Sparks (Eds.), *Logistics and retail management* (3rd ed., pp. 3–37). Kogan Page.
- Fioretto, M. (2014). *ECOSTARS Guide Handbook for local authorities*. Rome: Institute of Studies for the Integration of Systems: www.ecostars-europe.eu.
- Flaemig, H. (2003). Wirtschaftsverkehr in Staedten - "vergessener" Planungsgegenstand? *Internationales Verkehrswesen*, 55(10), 489–490. Retrieved from <http://trid.trb.org/view.aspx?id=954526>
- Flint, J., & Raco, M. (2012). *The Future of Sustainable Cities: Critical Reflections*. (J. Flint & M. Raco, Eds.) (p. 261). Bristol: Policy Press. Retrieved from <http://books.google.com/books?hl=en&lr=&id=3vsYrHvFnxC&pgis=1>
- FTA - Freight Transport Association. (1997). *Delivering the Goods: Best practice in urban distribution*. Tunbridge Wells.
- Givoni, M. (2012). Re-assessing the Results of the London Congestion Charging Scheme. *Urban Studies*, 49(5), 1089–1105. doi:10.1177/0042098011417017
- Glaeser, E. L. (2011). *Triumph of the city* (First.). Croydon: Macmillan.
- Gonzalez-Feliu, J., Ambrosini, C., & Routhier, J. (2012). New trends on urban goods movement : modelling and simulation of e-commerce distribution. *European Transport \ Trasporti Europei*, (50), 1–23.
- Gonzalez-feliu, J., Semet, F., & Routhier, J. (2014). Preface. In J. Gonzalez-feliu, F. Semet, & J. Routhier (Eds.), *Sustainable Urban Logistics: Concepts, Methods and Information Systems* (pp. v–ix). Springer.
- Hakim, S., Shefer, D., Hakkert, A. S., & Hocherman, I. (1991). A critical review of macro models for road accidents. *Accident; Analysis and Prevention*, 23(5), 379–400.
- Hall, P., & Tewdwr-Jones, M. (2011). *Urban and regional planning* (Fifth.). Abingdon: Routledge Taylor & Francis Group.
- Hass-klau, C. (1990). *The Pedestrian and City Traffic*. London: Belhaven Press.
- Hass-klau, C. (1993). Impact of pedestrianization and traffic calming on retailing A review of the evidence from Germany and the UK. *Transport Policy*, 1(1), 21–31.
- Hesse, M. (2008). *The City as a Terminal: The Urban Context of Logistics and Freight Transport* (p. 224). Ashgate Publishing Ltd, Farnham.

- Holguín-Veras, J. (2008). Necessary conditions for off-hour deliveries and the effectiveness of urban freight road pricing and alternative financial policies in competitive markets. *Transportation Research Part A: Policy and Practice*, 42(2), 392–413. doi:10.1016/j.tra.2007.10.008
- Holguín-Veras, J., & Jaller, M. (2014). Comprehensive Freight demand Data Collection Framework for Large Urban Areas. In J. Gonzalez-Feliu, F. Semet, & J.-L. Routhier (Eds.), *Sustainable Urban Logistics: Concepts, Methods and Information Systems* (pp. 91–112). Berlin, Heidelberg: Springer Berlin Heidelberg. doi:10.1007/978-3-642-31788-0
- Holguín-Veras, J., Wang, Q., Xu, N., Ozbay, K., Cetin, M., & Polimeni, J. (2006). The impacts of time of day pricing on the behavior of freight carriers in a congested urban area: Implications to road pricing. *Transportation Research Part A: Policy and Practice*, 40(9), 744–766. doi:10.1016/j.tra.2005.12.011
- Howard, E. (1898). *Garden Cities of To-morrow* (first published as *To-morrow: A Peaceful Path to Realm Reform*) (New revise.). Attic Books.
- Ieromonachou, P., Potter, S., & Warren, J. P. (2006). Norway's urban toll rings: Evolving towards congestion charging? *Transport Policy*, 13(5), 367–378. doi:10.1016/j.tranpol.2006.01.003
- IMRG. (2012). *Valuing Home Delivery Review 2012*. London.
- Jacobs, J. (1961). *The Death and Life of great American Cities*. London, Reading and Fakeham: Penguin Books.
- Jourdan, J.-L. (2013). Interview: SNCF Jean-Louis Jourdan. In L. Rouge, C. Gay, S. Landrieu, A. Lefranc-Morin, & C. Nicolas (Eds.), *Rehabilitating the peri-urban. How to live and move sustainably in these areas?* (pp. 102–105).
- Le Corbusier. (1923). *Towards an architecture* (originally published as *Vers une architecture*) (New 2008.). London: Frances Lincoln.
- Le Corbusier. (1933). *Le Corbusier The Athens Charter*. New Tork: Grossman Publishers.
- Lehmann, S. (2011). *Principles of Green Urbanism*. Newcastle: Earthscan. Retrieved from <http://www.publish.csiro.au/nid/17/pid/6705.htm>
- Leonardi, J., Browne, M., Kipp, W., Vaghi, C., & Tola, R. (2014). SMARTFUSION Electric Vehicle Trial in Como An electric van for clean urban deliveries from an Urban Distribution Centre. In *Smart Urban Freight Conference - 12th June 2014*. Newcastle upon Tyne: Newcastle University. Retrieved from <http://smartfusion.eu/conference-2014>
- Lindholm, M. (2013). Urban freight transport from a local authority perspective – a literature review. *European Transport / Trasporti Europei*, (54), 1–37.
- Lindholm, M., & Browne, M. (2013). Local Authority Cooperation with Urban Freight Stakeholders: A Comparison of Partnership Approaches. *European Journal of Transport and Infrastructure Research*, 13(1), 20–38.
- Local Transport Plan Core Team. (2007). *Local Transport Plan Tyne and Wear 2006-2011*. Newcastle upon Tyne. Retrieved from

- http://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/planning-and-buildings/planning/09.22a_tw_ltp2_2006-2011_main.pdf
- Lodovici, M. S., Pastori, E., Corrias, C., Sitran, A., Tajani, C., Torchio, N., & Appetecchia, A. (2009). *Shortage of Qualified Personnel In Road Freight Transport* (p. 198). Brussels. Retrieved from <http://is.gd/RLOLi4>
- MacAndrew, D. (2014). Low Emission Vehicle Technologies: Accelerating Electrification. In *Smart Urban Freight Conference*. Newcastle upon Tyne: Newcastle University. Retrieved from <http://smartfusion.eu/conference-2014>
- McKinnon, A. (2010). Environmental sustainability A new priority for logistics managers. In A. McKinnon, S. Cullinane, M. Browne, & A. Whiteing (Eds.), *Green Logistics - Improving the environmental sustainability of logistics* (1st ed.). Kogan Page.
- McKinnon, A., Cullinane, S., Browne, M., & Whiteing, A. (Eds.). (2010). *Green Logistics Improving the environmental sustainability of logistics*. Kogan Page.
- McLeod, F. N., & Cherrett, T. J. (2009). Quantifying the environmental benefits of collection/delivery points. *OR Insight*, 22(3), 127–139. doi:10.1057/ori.2009.2
- Mintel Group Ltd. (2013). *E-Commerce Executive Summary July 2013*. www.mintel.com.
- Mulholland, H. (2010, June). Air pollution leads to premature deaths of more than 2,000 Londoners a year. *The Guardian*. Retrieved July 01, 2014, from <http://www.theguardian.com/environment/2010/jun/30/london-air-quality-premature-deaths/print>
- Muñuzuri, J., Cortés, P., Guadix, J., & Onieva, L. (2012). City logistics in Spain: Why it might never work. *Cities*, 29(2), 133–141. doi:10.1016/j.cities.2011.03.004
- National Atmospheric Emissions Inventory (NAEI). (2014). *A review of data and methods to calculate greenhouse gas emissions from alternative fuel transport*. London: HMSO. Retrieved from http://uk-air.defra.gov.uk/assets/documents/reports/cat07/1404301317_AFV_Final_Report_11April14_FINAL.pdf
- Norman, W., & MacDonald, C. (2004). Getting to the bottom of “triple bottom line.” *Business Ethics Quarterly*, 14(2), 243–262.
- OECD. (2003). *Delivering the Goods 21st Century Challenges to Urban Goods Transport*. Paris: OECD.
- Ogden, K. W. (1977). An analysis of urban commodity flow. *Transportation Planning and Technology*, 4, 1–9.
- Ogden, K. W. (1992). *Urban goods movement*. Aldershot: Ashgate.
- Pattinson, W., & Thompson, R. G. (2013). Trucks and Bikes: Sharing The Roads. In *The Eight International Conference on City Logistics* (pp. 547–559). Bali: Institute for City Logistics.

- Quak, H. J., & Koster, M. B. M. De. (2007). Exploring retailers' sensitivity to local sustainability policies. *Journal of Operations Management*, 25(6), 1103–1122. doi:10.1016/j.jom.2007.01.020
- Rolle, C. (1994). Road Pricing: The Case For and Against. *Student Economic Review, Welfare Ec*, 1–5. Retrieved from <http://www.tcd.ie/Economics/SER/sql/download.php?key=129>
- Rouge, L., Gay, C., Landrieve, S., Lefranc-Morin, A., & Nicolas, C. (2013). *Rehabilitating the peri-urban. How to live and move sustainably in these areas?* (L. Rouge, C. Gay, S. Landrieve, A. Lefranc-Morin, & C. Nicolas, Eds.). IAtelier d-edition-Loco.
- Santos, G. (2008). London Congestion Charging. In *Brookings-Wharton Papers on Urban Affairs* (pp. 177–207). Retrieved from http://muse.jhu.edu/login?uri=/journals/brookings-wharton_papers_on_urban_affairs/v2008/2008.santos.pdf
- Schipper, L., Marie-Lilliu, C., & Gorham, R. (2000). *Flexing the Link between Transport and Greenhouse Gas Emissions A Path for the World Bank*.
- Schneider, C., Achilles, B., & Merbitz, H. (2014). Urbanity and Urbanization: An Interdisciplinary Review Combining Cultural and Physical Approaches. *Land*, 3(1), 105–130. doi:10.3390/land3010105
- Sierzchula, W., Bakker, S., Maat, K., & van Wee, B. (2012). Technological diversity of emerging eco-innovations: a case study of the automobile industry. *Journal of Cleaner Production*, 37, 211–220. doi:10.1016/j.jclepro.2012.07.011
- Stathopoulos, A., Valeri, E., & Marcucci, E. (2012). Stakeholder reactions to urban freight policy innovation. *Journal of Transport Geography*, 22, 34–45. doi:10.1016/j.jtrangeo.2011.11.017
- STRAIGHTSOL. (2012). *Deliverable 3.1. Description and set up of demonstrations*. OSLO.
- STRAIGHTSOL. (2014). Policy and business initiatives for improved urban logistics. In *Smart Urban Freight Conf*. Newcastle upon Tyne. Retrieved from <http://smartfusion.eu/conference-2014>
- SYITA. (2001). *The 1st South Yorkshire Local Transport Plan (2001-2006)*. Barnsley, UK. Retrieved from <http://www.southyorks.gov.uk/index.asp?id=509#1st>.
- Taniguchi, E. (2001). City Logistics. *Infrastructure Planning Review*, 18(1), 34–45.
- Taniguchi, E., & Heijden, R. E. C. M. Van Der. (2000). An evaluation methodology for city logistics. *Transport Reviews: A Transnational Transdisciplinary Journal*, 20(1), 65–90.
- The Institution of Engineering and Technology. (2010). *Rebound: unintended consequences of transport policy and technology innovations*. Stevenage. Retrieved from www.theiet.org/factfiles
- Transport for London. (2007). Transport for London London Freight Plan sustainable freight distribution : a plan for London Foreword by Mayor. *Transport*. London. Retrieved from <http://www.tfl.gov.uk/microsites/freight/documents/London-Freight-Plan.pdf>

- Transport for London. (2008). *London Low Emission Zone: Impacts Monitoring Baseline Report*. London. Retrieved from <http://www.tfl.gov.uk/cdn/static/cms/documents/lez-impacts-monitoring-baseline-report-2008-07.pdf>
- Transport for London. (2009). A Pilot Delivery Servicing Plan for TfL's Palestra Offices in Southwark: A Case Study. London: Transport for London. Retrieved from <http://www.tfl.gov.uk/microsites/freight/documents/London-Freight-Plan.pdf>
- Transport for London. (2014). Personal Communications with Paulus T Aditjandra, 7 July, 2014. Newcastle upon Tyne.
- University of Westminster. (2011). *London Freight Data Report 2010*. London.
- Verlinde, S., Macharis, C., & Witlox, F. (2012). How to Consolidate Urban Flows of Goods Without Setting up an Urban Consolidation Centre? In *The Seventh International Conference on City Logistics* (Vol. 39, pp. 687–701). doi:10.1016/j.sbspro.2012.03.140
- Ville, S., Gonzalez-Feliu, J., & Dablanc, L. (2012). The Limits of Public Policy Intervention in Urban Logistics: Lessons from Vicenza (Italy). *European Planning Studies*, (November 2012), 1–14. doi:10.1080/09654313.2012.722954
- Wallop, H. (2013). Click and collect – the new way to go shopping. *The Telegraph*. Retrieved July 01, 2014, from <http://www.telegraph.co.uk/finance/newsbysector/retailandconsumer/9785532/Click-and-collect-the-new-way-to-go-shopping.html>
- Woodcock, J., Edwards, P., Tonne, C., Armstrong, B. G., Ashiru, O., Banister, D., ... Roberts, I. (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. *Lancet*, 374(9705), 1930–43. doi:10.1016/S0140-6736(09)61714-1
- Woudsma, C. (2001). Understanding the Movement of Goods, Not People: Issues, Evidence and Potential. *Urban Studies*, 38(13), 2439–2455. doi:10.1080/00420980120094605
- Zunder, T. H., Aditjandra, P. T., & Carnaby, B. (2014). Developing a local research strategy for city logistics on an academic campus. *International Journal of Urban Sciences*. doi:10.1080/12265934.2014.926830
- Zunder, T. H., Aditjandra, P. T., & Islam, D. M. Z. (2012). Europe's freight transport policy White Paper 2001 to White Paper 2011. In *Proceedings of the 91st Annual Meeting of the Transportation Research Board*. Washington, DC: Transportation Research Board. doi:10.1007/1-4020-0613-6_21178
- Zunder, T. H., Aditjandra, P. T., Schoemaker, J. T., Vaghi, C., Laparidou, K., & Österle, I. (2014). Engaging city stakeholders to achieve efficient and environmentally friendly urban freight movements. In *TRA*. Paris: IFFSTAR. Retrieved from http://www.traconference.eu/papers/pdfs/TRA2014_Fpaper_20028.pdf
- Zunder, T. H., & Marinov, M. (2011). Urban freight concepts and practice: would a traditional UCC scheme work? *Transport Problems \ Problemy Transportu*, 6(1), 87–95.