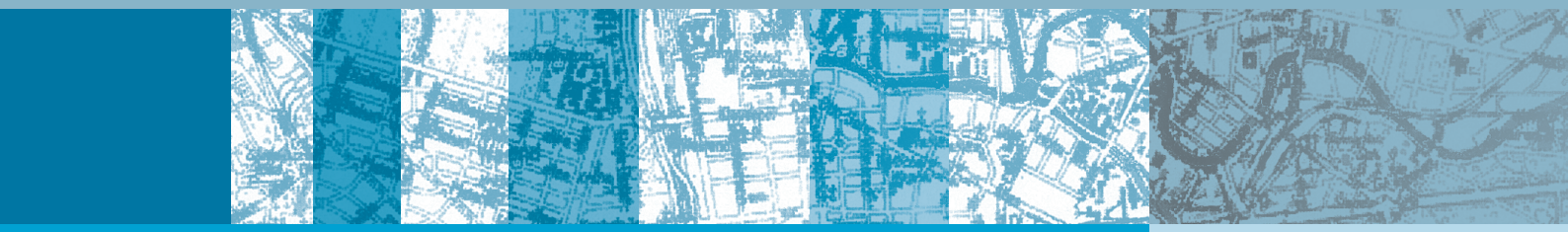
Commercial Transport in Urban Areas



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Commercial Transport in Urban Areas

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Content

Introduction

Commercial transport has an immense importance in our cities - especially downtown areas – to ensure supplies reach the local population, to organize waste removal, and to promote processes of economic exchange. Just like the society and national economies are subject to constant (including structural) change, commercial transport, too, is changing incessantly – today, any-time delivery, timeliness and speed of deliveries are top priorities.

A comparison between various cities shows that commercial transport accounts on average for 20 to 60 percent of all workday urban journeys. In particular in the inner city areas this proportion is very high, e.g. estimated in the Berlin inner city as 50 percent of workday traffic volume (IÖW 1996). Given its large proportion of total urban traffic, commercial transport is also considered responsible for a substantial amount of the negative consequences of road traffic. The one-sided concentration on road traffic and the use of heavy vehicle types (trucks, articulated semi-trailers, etc.) make an over-proportionate contribution to such traffic consequences.

The impact of commercial transport on the urban environment is mainly due to exhaust gases (particle emissions, CO_2, NO_x). Trucks additionally make a super proportionate contribution to the noise emissions caused by road transport. These large vehicles are also a particular burden in terms of traffic safety, especially in inner-city areas with limited availability of space. Solutions need to be found for this which are targeted at logistic optimisation and compatible traffic management.

For everyone concerned with urban policy, planning and transport operations it is therefore essential to gain a better understanding of these activities. However, it is complicated – commercial transport is often defined by goods traffic, service movements and business trips. Urban goods movements also include business to business flows, end-consumer's movements (including household shopping trips and business to consumer services), postal and courier services and the activities necessary for city management such as waste collection. Transport operations responsible for much of this freight activity are divided into two broad groups: own account (i.e. artisans and some retailers carrying their own products) and transport operators or carriers working for other businesses.

Many of these activities have different characteristics in terms of type and size of the vehicles used, the products carried, and the patterns of operations including origins and destinations. This complexity explains why they are often poorly integrated in the tools and approaches used in urban planning.

European cities need to find solutions to the ambitious aims set in the EU White Paper on Urban Mobility concerning air pollution, noise and emissions of CO_2. Because of the increasing support for these goals by legislation, it is now essential to find better solutions for the planning and management of commercial transport and urban goods movements. The recent Climate Protection Plan 2050 of the German government contains a specific target for CO_2 reduction for the transport sector. This target can meet only by realisation of resolute emission reduction strategies in commercial transport. This publication will give a short view on selected approaches in Germany.

Dr.-Ing. Wulf-Holger Arndt

1. Environmentally friendly commercial transport in urban areas

1.1 Introduction

Commercial transport is defined as all changes of place by persons and goods that serve commercial or service purposes. Commercial transport is consequently not necessarily equivalent to commercial goods transport. Commercial transport also includes commercial passenger transport and service transport. The latter may be interpreted as an intermediate segment relating to the transport of both persons and goods, as, for instance, in the case of craftsmen's trips

Figure 1: Categorisation of commercial transport

<table>
<tr><td rowspan="2">Intangible transport</td><td colspan="4">Physical transport</td></tr>
<tr><td colspan="2">Passenger transport</td><td colspan="2">Goods transport</td></tr>
<tr><td rowspan="2">Telephone and data traffic</td><td>Private passenger transport</td><td colspan="3" rowspan="2">Commercial transport</td><td>Private goods transport</td></tr>
<tr><td>Commuting, shopping, leisure transport, …</td><td>Commercial passenger transport</td><td>Service transport</td><td>Commercial goods transport</td><td>Private relocation/ waste disposal transport</td></tr>
</table>

Source: Arndt 2010: 22.

1.2 Developments in urban transport

On aggregate, commercial transport, i.e. goods transport as well as service and business trips, accounts for one third of all traffic in urban areas. The current trends of labour division in the national economy, online retailing, rising customer expectations like delivery on the day of ordering ("same-day delivery") or narrower time windows have entailed growth in the number of shipments and journeys, augmenting delivery and service transport operations in particular. The customer becomes a "stage director of his/her consignment", raising the bar for the provision of logistics services.

Demographic change, too, has repercussions on the way supply transport operations are schemed. Service concepts for the senior generation offering special service functions, for example, are gaining importance. At the same time, the retailing sales channels ("multi-channel retailing") are transforming in response to changing shopping patterns (and vice versa). Beyond the "classic delivery concepts" of address delivery, these changes in retailing come with new ways of putting goods on show and alternative delivery concepts. Inner-city spaces are hence increasingly becoming experiential spaces and showcases of online retailing with alternatives to delivery to addresses, including pick-up stores, show rooms and further e-commerce applications, e.g. in the field of perishable goods (e.g. food). The share of goods bought in physical stores and taken home may decline as a result.

On average, city dwellers generate 0.1 deliveries per day, with the trend heading upwards. The "Internet of things"[1], too, may generate traffic as transport costs continue to be relatively low. The "Internet of things" and the needs of business-to-business retailing are compounded by growing

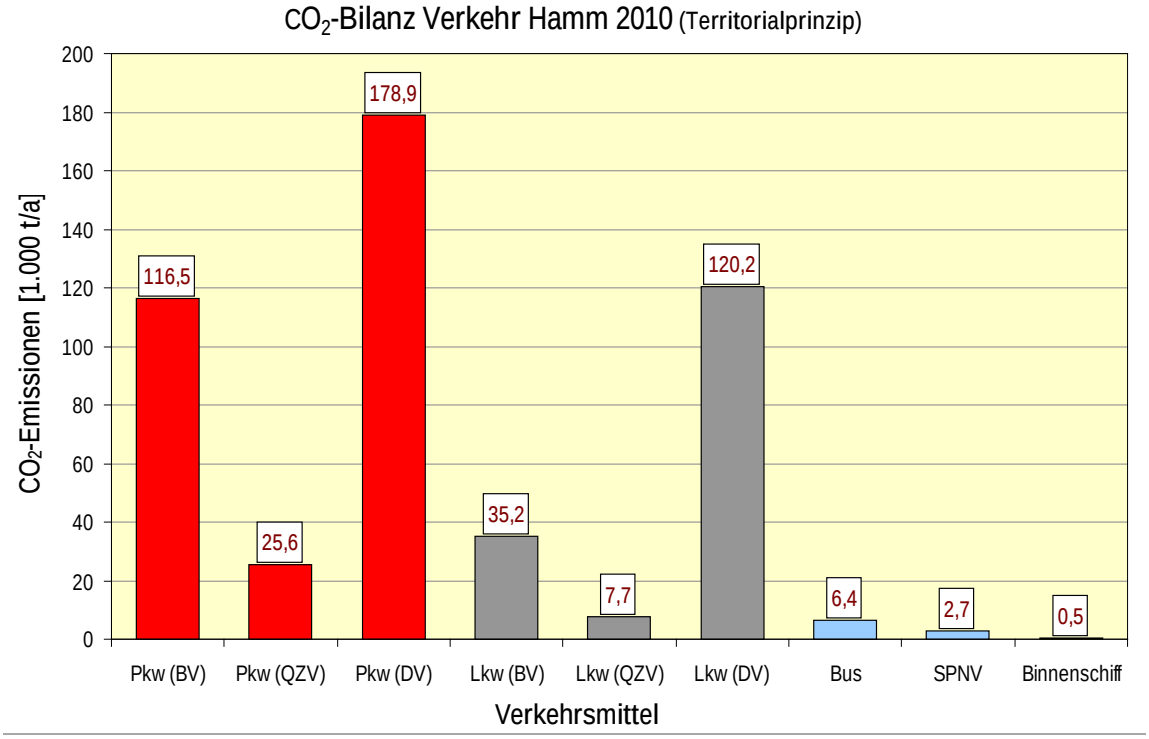
1 Autonomous exchange of information between objects via internet.

demands made on commercial passenger transport, too. Commercial passenger and service transport have come to account for over 50% of the journeys in commercial transport. Dispersing traffic volumes and a growing complexity of tour design (CEP service tours often comprise 140 to 150 shipments) trigger a considerable further differentiation of the problematic areas in traffic, posing growing challenges for planners and strategists dealing with commercial transport.

1.3 Ecological and transport challenges

The above-sketched increase in truck trips in the field of goods transport has led to exacerbating problems in urban spaces. Typical municipal problems with commercial traffic include double parking of delivery vehicles, intrusive noise and air pollutant emissions emanating from trucks in residential areas, major space requirements, separation effects and road accidents. The light commercial vehicles alone account for slightly 21% of particulate matter (PM10) inside towns and cities. The social acceptance of visible and audible logistics is shrinking, not least as a result of its environmental impact. And the commercial transport is significate for decarbonisation of the national economy. In particular trucks have a high share on traffic-related CO_2 emission.

Figure 2: Yearly traffic related CO_2 emission in urban areas in example city of Hamm



Source: Planungsbüro Richter-Richard: Stadt Hamm – Klimaschutz und Verkehr, 2010.

On the other hand, the provision of goods and services as well as waste disposal are important functions taken on by commercial transport. Securing performance of these functions while managing urban commercial transport in a way that is compatible with the city's functions represents one of the central challenges (not only) for municipal players.

Environmental objectives in commercial transport have so far enjoyed little effective promotion at state and regional planning levels. To date, state and municipal governments have not made clear sufficient requirements so that commercial transport is not regarded as a compulsory task, and municipal planning practitioners sometimes tend to lose sight of them. However, municipalities

must be afforded greater flexibility within the legal framework, e.g. to facilitate setting up traffic controls (loading zones, user benefits for cleaner vehicles etc.).

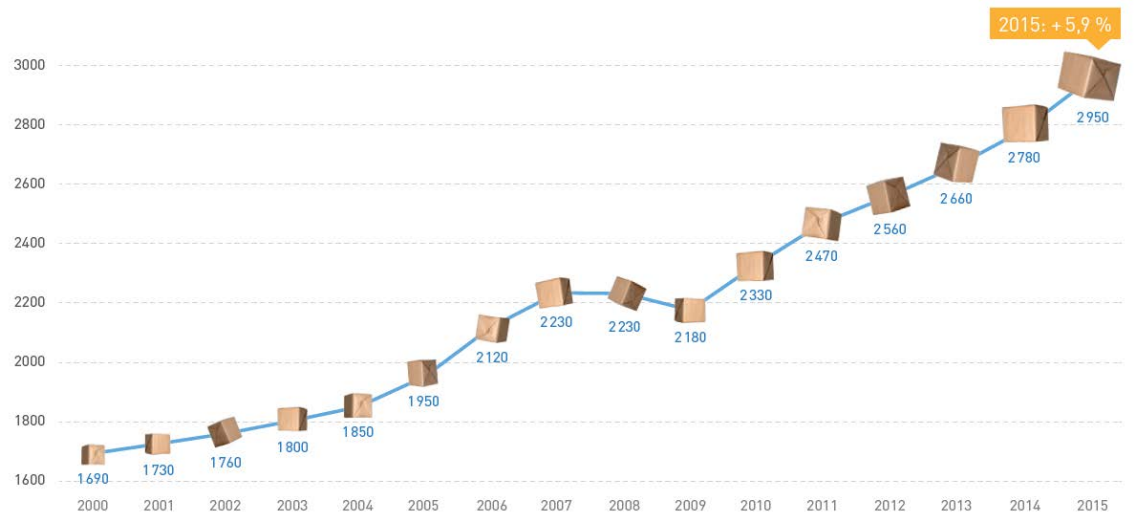
1.4 Concepts and cooperation ventures

In many places, commercial transport has rarely been the subject of systematic planning at municipal level. The Hannover Region is one of the few exceptions. The regional concept for "Climate-friendly commercial transport" in Hannover Region prioritises analysing the opportunities for integrating this transport mode into planning routines and planning branches.

The booming CEP[2] market has in many places led to bottlenecks in urban traffic. As no dedicated parking space can be reserved for CEP services, the vehicles of CEP services frequently double park, obstructing vision and causing risks of road accidents. On the other hand, the "last mile" is a principal cost factor for logistics providers. It often accounts for 50 percent of the costs of CEP service providers. The city of Berlin developed a concept geared to securing space as part of the "Integrated Berlin Commercial Transport Concept". This concept, on the one hand, secures space for freight villages and logistics close to railway lines, ports and the motorway to segregate long-distance and urban traffic, and additionally reserves space for logistics sub-centres, for example, along the Berlin's circular metropolitan light rail line, the "Ringbahn".

1.5 Volume of shipments in the German CEP market, 2000 – 2015 (in million shipments)

Figure 3:



Source: Biek 2016.

Most journeys in commercial urban transport are made in passenger cars, many of them in vans and small trucks, while only about 5% use trucks of 7.5t or above. Nevertheless, the expanse of land used by commercial transport is immense. Roads are used for delivery, sale, storage and construction. The road also is a logistics space for goods transport and craftspeople. Of all delivery and pick-up operations, 36% take place in the public space.

2 CEP: Courier, express and parcel services.

Analyses must focus on trucks when it comes to both mitigating emissions and the usage of roads and bridges. While individual measures tend to be less expedient in enhancing the efficiency of municipal action towards conformity with the EU Air Quality and Environmental Noise Directive, agreed packages of measures need to be conceived, and the highest mitigation effects can be achieved by action in the field of commercial transport.

1.6 Technology solutions

Many different approaches have already been practised beyond embedding urban commercial transport into transport management concepts. In the city of London, for example, entering the inner city makes economic sense mainly with locally emission-free engines like those of electrical vehicles as the city toll is particularly expensive for polluting vehicles. Using e-mobility for delivery is an option in Germany, too, as evidenced by a project of DHL for zero-carbon delivery using a fleet of over 100 e-vehicles in Bonn.

A central step to advancing e-mobility resides in procuring environmentally compatible municipal fleets. Related procurement concepts should be put on the broadest possible basis and even comprise cargo bikes. These green vehicles could be vested with privileges for inner-city delivery.

In this respect the outcomes of an EU project titled "Cycle Logistics" shows that 50% of all motorised journeys (for both private and business purposes) having to do with goods transport can be shifted to bicycles or cargo bikes in urban environments. In commercial delivery transport, the potential for transfer is no less than 38%. The aim of transferring motorised traffic to e-cargo bikes could be distinctly promoted this way. Delivery service employees appear to display increasing levels of acceptance of this mode of transport, one contributor being the "wellness factor" of bicycle use as the weather is not much of an issue for many employees. The postman in the city is not that handicapped with a bicycle as with car, and a cycling makes the body feel better. Cargo bikes, pedelecs and e-bikes are therefore a suitable option for delivery and courier services. Furthermore, there is a whole range of different service and sales vehicles available, for example for purposes like street cleaning and waste disposal. User benefits arise from the opportunity of delivery parking on bicycle parking space, the possibility of circumventing traffic jams, and as a result of the lower unit costs of e-cargo bikes.

Increased proliferation of cargo bikes should be accompanied, or flanked, by standards for this traffic mode and measures to adjust the streetscape as well as the logistic concepts. Initial approaches like the BentoBox point into this direction, a solution in a Berliner project Citylog[3]. It involves a cross-company point of consolidation between delivery vans and bicycle couriers for the last mile. If electrically assisted, cargo bikes can increase the trip lengths and cargo weight. As opposed to the passenger car market, the market for electrically assisted bicycles today offers a large range of products covering nearly all segments.

Electrically powered vehicles can mitigate at least part of the environmental impact of road freight transport. Commercial transport is a field which is more suitable for using plug-in vehicles than private transport. This, however, presupposes some considerable technical developments. With batteries reducing the payload by 20%, using such vehicles may not be economically viable. But besides on-board solutions and planning approaches to managing urban logistics, the demand side and customers' consumption patterns also play a crucial role. Supply and disposal are important urban functions, which, of course, have to be managed in an environmentally compatible way.

3 www.bentobox-berlin.de/citylog-projekt.

1.7 Integration of commercial transport in spatial planning

One important action area in municipalities involves integrating the earmarking of space for commercial urban transport into municipal land-use planning. Suitable logistics siting compatible with urban life – freight villages and peri-urban transshipment points – must be found and secured to minimise the number of truck journeys or redirect them to less sensitive routes. From a municipal perspective, it therefore appears meaningful to develop transshipment space for consolidating deliveries to craftspeople, retailers/wholesalers and households as well as concepts for last-mile transshipment.

Additional last-mile logistics space should be located in places close to inner cities and densely populated areas. Microhubs might be set up there as decentralised storage sites for deliveries, as well as automatic parcel delivery systems, delivery boxes and parcel shops to simplify door-to-door delivery to customers. Especially in road alteration schemes, land for delivery vehicle parking must be taken into account.

Redistributing city space will pose major challenges to commercial transport in the next few years. On the one hand, there is a lot of demand for attractive sites, e.g. riverside or downtown areas, to be used for residential purposes. On the other hand, many municipalities support the idea of reserving land to facilitate transshipment towards the inner cities.

Besides managing the space requirements of goods transport, another meaningful solution for spatial integration of commercial transport appears to involve using clean hybrid trucks that would run under fully electric power in sensitive inner-city areas, thus reducing local pollution. Offsetting the extra costs of electric vehicles in commercial transport would be a promising field of funding effective action in the national electric mobility programme of the German Federal government.

Further potential initiatives include setting up delivery zones and opportunities for night-time delivery with low-noise vehicles (electric vehicles). On the one hand, this raises the question of the specific on-site requirements, and on the other, of harmonisation of certain rules and regulations, e.g. parking cards for craftspeople and tradespersons, or regarding the compliance with noise limits during night-time delivery. In view of competing land uses in streetscapes a regional road haulier interest group, pronounced himself in favour of giving commercial transport the same attention paid to local public transport or garbage disposal.

At the end of the day, commercial transport requires developing complex concepts based on a combination of core, flanking and supporting activities. There is hence no simple answer to the question “Who and what is really helpful?”. An unequivocal finding is, however, that city-compatible management of urban commercial transport must reunite all political levels, along with loading as well as transport operators in cooperating towards developing and implementing a locally tailored and effective combination of activities.

1.8 Evaluation and financing

The 2011 EU White Paper on Transport envisions nearly zero-carbon city logistics in large centres and switching distribution transport over to hydrogen, electric and hybrid vehicles by 2030. Such political signals are likely to accelerate the replacement of fleets and trigger a generation change to lower-emission vehicles. Other political requirements like tightened consent limits for air pollutants and traffic noise or the EU Environmental Noise Directive illustrate the necessity of integrating commercial transport into planning processes.

Besides basic policies, this also requires adapting data collection methods and models, and especially communicating hands-on examples of strategies, activities and legal opportunities of implementation. Another important element consists in assessing and evaluating the implemented activi-

ties. Besides verifying goal achievement by evaluating the impact, the process evaluation accompanying the entire planning procedure must be analysed to identify inhibiting and conducive factors in planning implementation. But the missing appropriated data to describe urban commercial transport is a serious statistics issue. This might be mitigated by standardising data collection methods in commercial transport to improve comparisons between data gathered in different collection campaigns and tap into synergies. It might as well be imaginable to conduct a network survey comparable with the System of Representative Traffic Surveys (SrV). An improved data basis allows better recording of the issues and high-precision solution development.

Specific programmes promoting activities in the field of urban commercial transport are rare. A recommendation would be resorting to the programme for promoting road alterations of arterial roads as these were also the focus of grievances in the field of urban commercial transport. Unfortunately, hardly any preventive activities - even for foreseeable upcoming problems - have enjoyed such promotion. The network CIVINET Deutscher Sprachraum[4] provides a the support in disseminating knowledge and in assisting in – sometimes highly complex – applications for EU funding programmes in the field of urban commercial transport.

4 www.civitas.eu/civinet/civinet-german

2. Commercial transport and the public space

2.1 Dealing with commercial transport issues requires area-based measures

While big cities have become increasingly successful in shifting motorised private transport to public means of transport and bicycles, there is a mounting need for action in commercial transport. Commercial vehicles block streets, cycle paths and pavements while they park and deliver goods; they cause noise, airborne pollution and accidents; and heavy goods trucks wear down roads and bridges. There are, however, ways for municipalities to take countermeasures - one of them being area-based policies.

Of urban motor traffic, around 30% involves journeys in exercise of one's occupation or profession, i.e. commercial transport. Most of the journeys in commercial transport are made with passenger cars, delivery vans and small trucks. Trucks of 7.5 tons or larger account for only 5% of the journeys (goods transport).

The smaller, quieter and slower a vehicle is, the easier it can be integrated into the public streetscape. Shifting transport to small vehicles compatible with the urban environment and featuring climate-friendly drivetrains has for years been on the political agenda. The EU 2011 White Paper on Transport envisages approximately zero-carbon city logistics in larger conurbations and changing the last-mile distribution over to vehicles with hydrogen, electric or hybrid drives by the year 2030.

In most municipalities, commercial transport has as yet failed to play a major role in traffic planning and management. The hopes pinned on cross-company “City Logistics” as discussed a few decades ago have faded. As logistics processes are highly competitive, dynamic and complex, and the providers are eager to distinguish themselves by different concepts, their readiness to cooperate encounters natural limits.

The hopes for broad distribution of electric vehicles have so far not been realised. The electric vehicle market today consists nearly exclusively of research and test fleets and some niches. The number of cargo bikes and bicycles with electric pedal assistance (pedelecs), for example, is rising. According to the outcomes of the EU Cycle Logistics project, half of all motorised journeys connected to goods transport in urban environments could be moved to bicycles or cargo bikes.

2.2 Dynamics

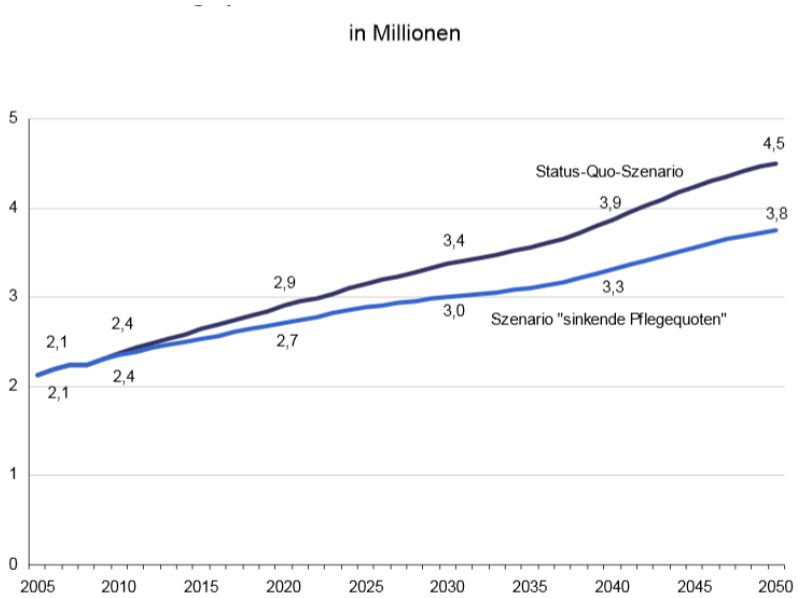
Unfortunately, some observed societal trends suggest that this need for action will become more urgent. Courier, express and parcel services report continuous growth as a result of mounting Internet ordering (see Figure 3). Their industry association holds the view that courier, express and parcel services are as important as public transport and garbage collection for the cities and towns (according to Marten Bosselmann of BIEK, the German Association for Parcel and Express Logistics, at an industry conference in Dessau on 19 June 2015).

Figure 4: Cargo transport by bike

Photo: Martina Hertel.

With the average age in our society rising, the need for delivery and care services ("Meals on Wheels") to the older generation is very rapidly expanding, too, as is the concept of services. According to calculations of the German Federal Statistical Office, the number of persons requiring care in 2007 (2.25 million) may roughly double by 2050. In residential areas - with the exception of supported residences - the demand for close-to-home parking spots is mounting. Parking offenders block fire lanes, obstruct tractrix curves and pose visual obstacles creating road accident risks.

Figure 5: Total number of persons in need of care in Germany between 2005 and 2050; comparison of status quo scenario and reducing care services scenario



Source: Destatis.

The public streetscape is used by many sectors of the economy: Streets are used to deliver, sell and store goods and to build. At the same time, the street is a logistics space for goods transport and crafts businesses. According to Wulf-Holger Arndt (in his presentation given in Dessau on "Municipal challenges in commercial transport" on 18 June 2015), 36% of delivery and collection operations are performed in the public space. Many building sites, too, use the streetscape, sometimes around the clock.

At the same time, retail trade is undergoing a transformation. Inner cities are becoming experiential spaces and showcases. Shopping habits are changing: Home delivery, pick-up stores, show rooms, parcel shops and delivery services are on the rise; even in the fresh food segment, the share of goods bought in shops and taken home by consumers is on the decline.

As the logistics concepts in trade and industry often provide for night-time delivery with large vehicles, handling and transshipment centres outside the populated city are needed. Since the extent of wear caused by a 40-ton truck is identical to that of 60,000 passenger cars, the routes used by heavy-duty trucks are costly to maintain. As the truck toll is extended from motorways to include national highways, municipalities expect more toll-evasion traffic as the trucks' navigation and routing systems will direct them through small towns, villages and hamlets. It will hence be a priority for municipalities to actively avoid transit traffic.

2.3 Reappraisal of the public space – challenge for urban development

"Who owns the public space?" This was the title of a well-attended public event held at the Berlin Stadtforum on 22 June 2015. Traffic infrastructure has put its stamp on the cityscape: cars occupy large parts of the public space. They compete with uses of green spaces, visual axes, dwelling areas, street-crossing opportunities and the objectives of pedestrians, public transport and cyclists.

Traffic volumes and traffic problems are results of local land use and the ensuing distribution of the targets and sources of traffic. The renaissance of the "public space" will be successful only if the transport-related burdens caused by small businesses, trade and residential uses are mitigated step by step - including, and in particular, in the field of commercial transport.

An urban planning approach that considers the traffic consequences of several spatial planning options when developing its strategic plans and devising land reservation policies can contribute to avoiding traffic in the long run. In many cities, valuable inner-city transshipment areas by riversides or in the vicinity of railway stations are converted to residential or retail space without taking the resulting additional traffic into account. Municipalities need appropriate sites for operations of the transport industry and logistics.

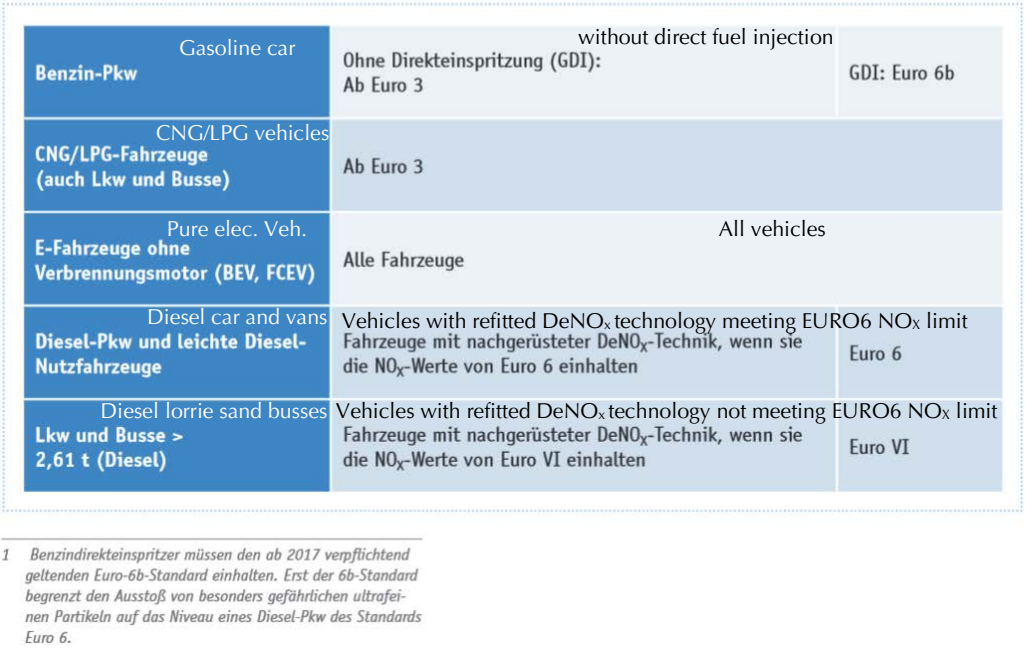
To make sure inner-city areas can be serviced with smaller vehicles or cargo bikes, transshipment space is needed to consolidate the deliveries to businesses, retailers and households. This includes concepts for last-mile transshipment. Transshipment areas include freight transport hubs and logistics areas close to railway lines, ports and the motor highway to split long-distance and urban traffic flows, as well as so-called freight distribution sub-centres (Berlin) along the inner-city metropolitan railway ring, and inner-city logistics space.

Delivery to shops and businesses located in streets should, where possible, be made from the rear or underground. Where this is impossible, parking space will be sought - either permissible spots or in the no-stopping zone. Where no delivery or loading zones are available or usable, illegal stopping and parking are resorted to - which is not surprising in Germany bearing in mind its comparably low on-the-spot cautionary fines and administration fines.

In planning road reconstruction works, it is crucial to take into account the street space required for delivery vehicles to park or stand. The streets themselves have increasingly become sized on the basis of urban development needs rather than on transport technology requirements: there are more green spaces, visual axes, dwelling areas, street crossings and cycle spaces.

To allow for integrated street use, managing traffic will play a growing role: parking-space management, access restrictions, additional speed limits, traffic monitoring and green zone cordons. These actions should be complemented by the proactive approaches of traffic calming, traffic-calmed high streets and residential quarters, and night-time road use restrictions.

Figure 6: Vehicles slated to receive blue stickers



Gasoline car **Benzin-Pkw**	without direct fuel injection Ohne Direkteinspritzung (GDI): Ab Euro 3	GDI: Euro 6b
CNG/LPG vehicles **CNG/LPG-Fahrzeuge (auch Lkw und Busse)**	Ab Euro 3	
Pure elec. Veh. **E-Fahrzeuge ohne Verbrennungsmotor (BEV, FCEV)**	All vehicles Alle Fahrzeuge	
Diesel car and vans **Diesel-Pkw und leichte Diesel-Nutzfahrzeuge**	Vehicles with refitted DeNO$_x$ technology meeting EURO6 NO$_X$ limit Fahrzeuge mit nachgerüsteter DeNO$_x$-Technik, wenn sie die NO$_X$-Werte von Euro 6 einhalten	Euro 6
Diesel lorrie sand busses **Lkw und Busse > 2,61 t (Diesel)**	Vehicles with refitted DeNO$_x$ technology not meeting EURO6 NO$_X$ limit Fahrzeuge mit nachgerüsteter DeNO$_x$-Technik, wenn sie die NO$_X$-Werte von Euro VI einhalten	Euro VI

1 *Benzindirekteinspritzer müssen den ab 2017 verpflichtend geltenden Euro-6b-Standard einhalten. Erst der 6b-Standard begrenzt den Ausstoß von besonders gefährlichen ultrafeinen Partikeln auf das Niveau eines Diesel-Pkw des Standards Euro 6.*

Source: Background paper of Deutsche Umwelthilfe [environmental NGO] on introducing a blue sticker to mitigate urban NO_2 pollution.

Last-mile delivery requires space for transshipment and delivery, including micro-hubs for decentralised storage and, close to the end user, automatic parcel delivery systems, delivery boxes and parcel shops to simplify door-to-door delivery to customers.

Furthermore, delivery zones, traffic monitoring and night-time delivery opportunities need to be addressed. Questions arise concerning, on the one hand, the specific local requirements and, on the other, the harmonisation of certain rules and regulations, e.g. regarding parking permits for crafts and business people or the question of night-time delivery.

Zone-based schemes allowed under road traffic law offer effective chances for traffic restrictions across entire areas and serve as incentives for renewal of vehicle fleets: examples include the “green zones”, 20-mph zones and parking-space management zones. (According to the German Road Traffic Act, there are zones with speed limits [20 mph], restricted no-stopping zones [traffic signs 290.1 and 290.2], parking-space management zones [traffic signs 314.1 and 314.2], pedestrian zones [traffic signs 242.1 and 242.2], traffic-prohibition zones designed to mitigate harmful air pollution in a zone [green zone, traffic signs 270.1 and 270.2.], and traffic-calmed zones [325.1 and 325.2]).

Exemptions from the respective zone scheme – posted with the help of supplementary signs – generate user advantages for certain types of traffic or hazardous substance groups, either permanently, on certain days of the week or during certain hours of the day. Examples include delivery times in pedestrian zones, admission of vehicles with green stickers to green zones, stopping prohibitions, as well as speed limits over certain lengths of streets and night-time driving bans for trucks.

As the EU consent limits for noise and fine-particle emissions have successfully been implemented in many places while still too much nitrous oxide is emitted, the debate about tightening the previous green zone scheme ("blue environment sticker") by marking vehicles with particularly low nitrous oxide emissions is intensifying. As this would, above all, affect the diesel vehicles used in commercial transport, such a policy would be a strong incentive for rapid fleet renewal.

2.4 Conclusion

Cities live off, and with, commercial transport. They can benefit from integrated logistics concepts and digital innovation – this includes state-of-the-art vehicles, dynamic communication, optimised siting of consolidation and transshipment places for the last mile, cargo bikes and bicycle logistics.

Following the successful shifting of traffic loads in private passenger transport, the conflicts with commercial transport have increasingly come into focus. However, municipalities have less leverage here than over passenger transport.

In the inner cities, competition for space has assumed new significance. As inner cities have not enough space to meet all needs, the restrictions imposed on even city-compatible commercial transport tend to increase rather than decrease.

2.5 What the cities can do

The cities can become active by identifying sites for logistic facilities, from parcel boxes to near-motorway handling and transshipment space for consolidating shipments.

They can and must find solutions for competing uses in the street. Restrictions on vehicles with high emissions and large dimensions, and user advantages for small and low-carbon vehicles will continue to be applicable.

Many towns and cities have already looked into procuring low-carbon vehicles for their municipal carpools, including cargo bikes.

The parties involved should - facilitated by the municipalities - establish regular meeting cycles to discuss and understand their interests, launch cooperation ventures, talk about plans and grievances, and find good solutions.

3. Electric commercial vehicles in urban commercial transport

3.1 Introduction

After many years of neglect, commercial transport has recently garnered new attention, not least because of the massive increase in online retailing. The considerable burdens caused by commercial vehicles in urban as well as rural regions have also returned to the spotlight, which explains the mounting pressure in many places to look for ways of creating an equilibrium of economic viability, attractiveness for business and quality of life.

New scope for action in this field might open up with the increasing use of electric vehicles, which are, in principle, well placed for use under the conditions of urban commercial transport as the related trips are mostly short and regular. However, there are some obstacles, such as the limited availability of vehicles and the frequently arising business necessity of matching the trips with operational workflows.

As demonstrated by successful showcase examples in Germany and beyond, it is nevertheless possible for municipalities and organisations to take effective action towards managing commercial transport and in this context tap here and now into the potential offered by electric vehicles.

3.2 Manifold impacts caused by urban commercial transport

A high-capacity traffic system is indispensable for supplying the population and exchanging commodities and services between enterprises. Conducive use of commercial traffic, however, comes with a range of adverse traffic consequences that are felt particularly frequently in cities, towns and villages.

Fewer than 70% of the ton kilometers measured in Germany are accounted for by road traffic (Federal Environment Agency [Umweltbundesamt] 2012). On business days commercial transport accounts for around 40% of all motor vehicle trips or approximately one third of all motor vehicle miles travelled (Arndt 2015).

The consequence for emissions is that around 28% of CO_2 emissions in road traffic are attributable to light and heavy commercial vehicles (Gebhart-Graf et al. 2012), in urban environments even up to 50% (Savy 2013). Furthermore, some 40% of urban hazardous substance and noise emissions can be ascribed to commercial transport (Wittlöv 2013).

But the spectrum of impacts is even larger. In cities and towns, trucks are time and again involved in particularly serious accidents affecting pedestrians and cyclists –often with lethal outcomes. Furthermore, super-proportionately high wear of the infrastructure (roads surfaces, bridges) represents a growing issue in times of scarcely filled public coffers. Moreover, commercial transport is one of the competitors for limited inner-city space as around one third of all delivery operations have already moved into the public space (Arndt 2015).

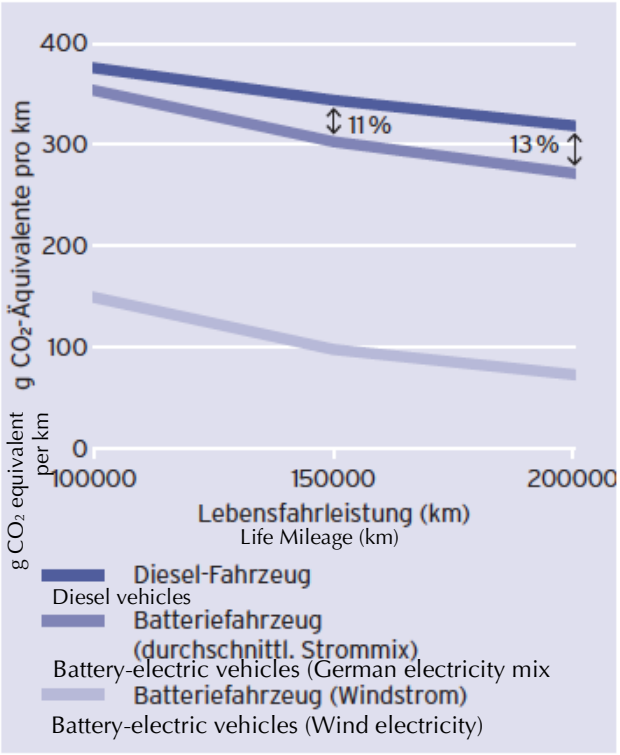
A further aggravation of these burdens seems imminent as the trend toward strong growth in the logistics industry appears firm. Between 1995 and 2010 goods transport (in ton kilometers) in German road traffic increased by slightly under 55% (Umweltbundesamt 2012). Since 2000, the number of shipments delivered by so-called CEP service providers has seen an increase of 51% (Esser/Kurte 2013). According to a forecast ventured by the German Ministry of Transport and Digital Infrastructure (BMVI), another 39% increase of ton kilometers in road-freight transport has to be expected by 2030 (Schubert 2014).

3.3 Opportunities and limits of electric commercial vehicles

In view of this development, innovative solutions meeting the needs and enhancing the local quality of life in both urban and rural environments while supporting business requirements are urgently sought. In this context, the deployment of electric vehicles in urban commercial transport appears attractive for several reasons.

A positive point from the angle of climate protection is that, according to calculations of the Heidelberg-based Institut für Energie- und Umweltforschung (ifeu – Institute for Energy and Environmental Research), use of electric vehicles makes lower CO_2 emissions possible, even against the backdrop of the electricity mix typical in Germany today. For example, savings of around 4% of CO_2 can be generated for light commercial vehicles with 100,000 km lifetime vehicle miles travelled by using electric instead of diesel vehicles. This advantage of electric commercial vehicles over diesel rises to 13% for 200,000 kilometers travelled as the percentage of CO_2 emissions attributable to production and disposal of the vehicle and battery will drop per kilometer driven (ifeu 2014).

Figure 7: Climate impact of light commercial vehicles in urban delivery traffic



Source: BMVI 2014.

A practical effect directly noticeable at the local level involves the mitigation of hazardous substance and noise emissions, which can be expected to result from the use of electric commercial vehicles. In view of the high nitrous oxide emissions of diesel vehicles, reduction of hazardous emissions is becoming ever more important. However, this claim needs to be qualified: with an electric engine, only the impacts caused by the drivetrain can be reduced. Traffic-related particle emissions, for example, are only 50% caused by the combustion engine while the rest is due to abrasion of the tires and brakes (Umweltbundesamt 2009).

Noise emissions, which are high in many cities and towns, are another reason why electric vehicles cannot ease the full burden. While electric drives do not cause any engine noise, the noise caused by the rolling and driving of passenger cars and comparable vehicles is predominant at a speed of as little as approximately 25 km/hr. Even in heavy goods transport, the drivetrain forms the largest source of noise only up to speeds of approximately 50 km/hr (Raiber 2014). Transport noise is compounded by loading and unloading noises that are particularly frequent contributors to disturbing noise emissions.

Operational aspects, too, speak in favor of using electric vehicles for commercial and industrial purposes. Their range and loading operations are easy to plan as the daily time travelled is usually low, the starting and end points are fixed, and the trips often recur regularly. Efficiency is additionally supported by central vehicle routing.

Despite their high suitability for commercial transport, the range of plug-in vehicles for commercial transport available in series in the current market is nearly exclusively limited to passenger cars and light commercial vehicles of class N1 (total maximum permissible weight up to 3.5 tons). Some enterprises like the German mail service Deutsche Post have therefore come to rely on developing their own vehicles tuned to the company's needs and the requirements of dense urban traffic.

Above the so-called Sprinter segment (i.e. 3.5 tons or more), electric vehicles appear technically and economically less attractive, even into the next few years. This is because automotive manufacturers have conducted comprehensive research into electrification of passenger cars, so that numerous components are now at hand that can also be installed in lightweight commercial vehicles. Development activities in the field of heavier vehicles, on the other hand, have so far made little progress (Roland Berger 2014).

3.4 Innovative concepts have highlighted practical uses for e-cars

The following examples demonstrate how electric vehicles can here and now be used in meaningful ways in the context of urban delivery concepts. All projects described have in common that they go way beyond simply exchanging a drivetrain. Rather, one of their most prominent objectives is to reduce unnecessary truck trips into the city centers. While this creates new business models, on the one hand, it also provides a more potent reduction of the adverse impacts of commercial traffic in the cities.

3.4.1 City logistics with e-cars

At the moment, we are witnessing a surge of interest in urban logistics concepts. In addition to the high likelihood of aggravated limitations to inner-city access, this trend has been promoted by research and development work on the use of electric vehicles in commercial transport. The underlying assumption is that city logistics is geared to avoiding motor vehicle traffic in urban areas. The remaining journeys can be performed along limited and predictable routes in a compatible way, with electric vehicles being well-placed for such applications.

Since 2009 in the Dutch city of Utrecht, an established local transport provider has successfully deployed two electric “Cargohoppers“ to deliver to central retail stores (Civitas 2013a). Starting out from a transshipment point, the narrow and maneuverable e-vehicles are allowed access to all alleys of the historical city center on their way to 40 to 50 delivery targets per day. As an additional incentive, the city government has allowed an exemption from the fixed delivery periods and the

use of bus lanes against the backdrop of the urban air pollution abatement targets. This model works without any expenditure of public funds.

Figure 8: A Cargohopper in action in Amsterdam

Source: TransMission.

Thanks to their capacity of five delivery vans, use of the two Cargohoppers has already saved the Utrecht inner city 100,000 vehicle kilometers travelled. Green electricity is used for this concept: it is generated by solar panels on the vehicle roofs. The Cargohopper concept has more recently been adopted by other municipalities, including Amsterdam.

Similar experience has been gathered in two neighbouring English towns, Bath and Bristol, since 2011. DHL there operates a successful city logistics concept featuring two electric delivery vehicles of the Smith Newton type, in which over 100 enterprises participate (DHL 2013). Originally established in the scope of an EU project scheduled to last one and a half years, the concept has in the interim become well-established and now operates assisted by a municipal allowance of around EUR 140,000 p.a. (Civitas 2013b).

The energy expenditure for these delivery journeys decreased 56% solely as a result of the electric vehicles being used (Civitas 2013c). Experience has shown that around 80% of conventional truck access to city centers can be avoided based on an average electric range of 120 kilometers. This results in savings of 380,000 truck kilometers and 102 tons of CO_2 emissions (Bristol City Council 2015).

3.4.2 Interim conclusion

As demonstrated by both examples, City Logistics represents a promising approach to avoiding unnecessary truck journeys and the accompanying impacts on urban environments.

The regularly recurring routes within delimited areas offer a meaningful application for commercial electric vehicles, and the ranges of today's plug-in vehicles have turned out to be sufficient.

In order to achieve the described benefits (lower carbon emissions, higher quality of living, …), municipalities should assume an active role. From a business perspective, setting up a city logistics concept is risky and costly, especially at the beginning. This was confirmed by both examples where close cooperation between businesses, retailers and municipalities was crucial to the success of the City Logistics concepts. Through networking and carefully selected incentives (exemptions from access restrictions, financial allowances …), cities and towns can provide well-targeted stimuli for setting up City Logistics concepts.

3.4.3 Inner-urban deliveries with cargo bikes

Just a few years ago, (e-) cargo bikes had hardly any noticeable presence in Germany, neither in road traffic nor in the public perception. Within a short period of time, the spectrum of available designs and innovative applications has become highly differentiated. The number of small entrepreneurs basing their concepts on cargo bikes is growing constantly, and even established service providers like DHL increasingly rely on two- and three-wheelers in individual cities. Besides low costs and operating advantages in the cities, the high visibility of the cargo bikes speaks in favour of their application (VCD [Verkehrsclub Deutschland] 2015).

This is also reflected in a major echo in the media, businesses and the population, which affords the chance of re-enhancing the general awareness of commercial transport.

UPS began as early as 2012 to use a mobile container in Hamburg, in the immediate vicinity of the shopping street Neuer Wall. It is used as a point of transshipment for two cargo bikes. These are used for last mile distribution of the shipments. By expanding this operation to four container sites and nine cargo bikes (five large e-cargo bikes and four smaller conventional cargo bikes), this company now wants to cut its Hamburg fleet by up to 12 delivery vans (Hamburg Senate 2015).

In addition to a reduction of emissions, the city government and participating retailers expect, above all, an increase in the quality of urban life that is currently negatively impacted by a high number of loading and unloading operations.

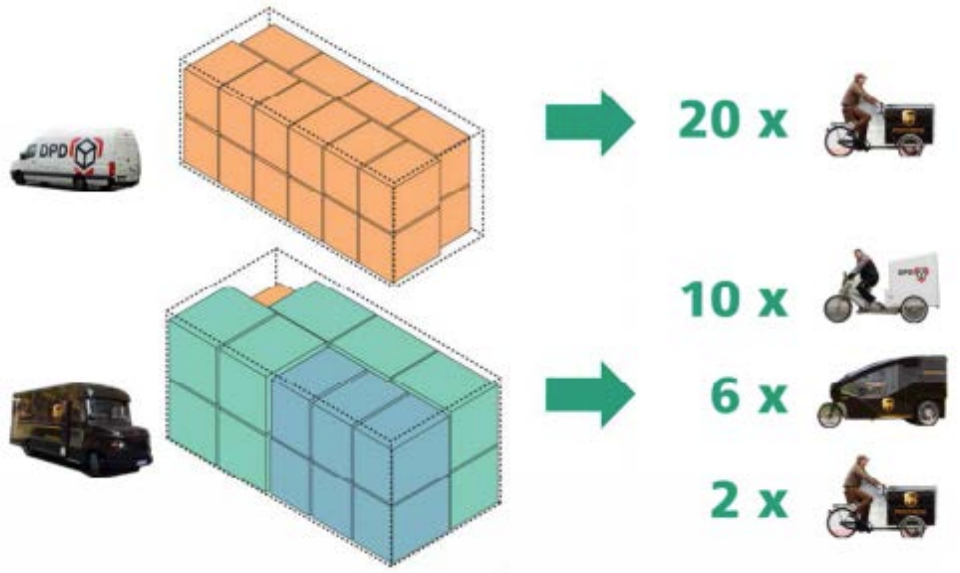
Figure 9: The use of e-cargo bikes is becoming more and more widespread

Source: Aleksander Slota/VCD.

This approach is likely to expand in Germany in the next few years. The Stuttgart Working Party City Logistics, for example, recently presented a study on the use of cargo bikes (Stuttgarter Zeitung 2015). Based on real data of businesses and organisations, and of traffic flows, it was shown how, ideally, three out of four 7.5-ton delivery vehicles of a delivery service in inner-city areas can be replaced by cargo bikes (Stuttgart Chamber of Industry and Commerce, 2015).

The Stuttgart proposal – similarly to the Hamburg solution – centres on siting one or several loaded containers in the inner city from where parcel delivery can be handled by delivery assistants using hand trucks, conventional cargo bikes and e-cargo bikes.

Figure 10: Illustration of the potential for shifting from delivery vans to cargo bikes



Source: Steffen Raiber/Fraunhofer IAO.

3.4.4 Interim conclusion

As illustrated by these examples, using (electrically assisted) cargo bikes has great potential for inner-city delivery and can markedly reduce the number of delivery vehicles accessing inner-city areas and the related adverse impacts.

What is of importance here is having practical depot solutions that enable simple handover of shipments to the cargo bike. From the viewpoint of the delivery agent, the mobile parcel depots should be deposited in places as central as possible and at ground level, which may of course detract from the visual impression of the physical environment and involve disadvantages for passers-by. Besides the repercussions of the containers on the built environment, however, there is another factor that has been often discussed and repeatedly criticised: opening pedestrian zones to cargo bikes.

Across the board, the use of cargo bikes nevertheless appears promising in many places and is viewed with great openness by both municipalities and businesses.

3.5 Scope available to municipalities

3.5.1 Establish commercial transport on the municipal agenda

As commercial transport does not figure among the obligatory duties of municipalities, there is often no clear distribution of responsibilities and important resources in municipal practice. As a result, municipalities have usually no meaningful data on commercial vehicle traffic loads or the daily routes and goods flows. Creating a data base is a helpful first step to developing appropriate measures. Frequently, there are no direct contacts between key players like the administration, logistics service providers and retailers. The municipalities can create these through targeted networking. Networking makes it easier to build trust and develop ideas on cooperation. Stuttgart with its above-mentioned City Logistics Working Party can serve as a successful example.

3.5.2 Set a framework

Innovation in commercial transport depends on an encouraging regulatory framework. At local and regional levels, incentives for city-compatible and environmentally friendly delivery can be devised, which will usually also benefit e-mobility.

Defining environmental cordons restricting access to certain emission classes or time windows for inner city delivery, for example, has frequently been practised. Low-carbon vehicles are hereby given a superior position. This promotes innovation in terms of both organisation (e.g. innovative forms of inner city logistics) and the deployed fleets. At the international level, it has been observed that the conditions for use of diesel vehicles in particular will be drastically tightened in the next few years (Frankfurter Allgemeine 2015). This trend is supported by the European Union that strives for carbon-free city logistics on the horizon 2030 (European Commission 2011).

At the same time, regulatory schemes must be consistently monitored and implemented. Today, for example, conventional delivery vans access many pedestrian zones way beyond the permissible delivery periods. In the absence of adequate sanctions, the time- and cost benefits of cargo bikes or vehicles like the Cargohopper that may, unlike trucks, be legally used during the whole day will shrink.

3.5.3 Infrastructure and vehicles

Making a publicly accessible charging infrastructure available is of merely minor importance for urban commercial transport. There is usually no need for it as the range of the electric batteries is sufficient for the distances covered, and the battery can be charged on the company's premises.

Larger obstacles are in practice posed by the limited availability and high cost of acquisition of electric commercial vehicles. An important impetus towards strengthening the sales market for electric commercial vehicles and cargo pedelecs may come from public procurement of vehicles for municipal fleets. For example, certain emission levels can be stipulated in specifications for tender procedures. Based on the funding regulation of BMVI published in summer 2015, municipalities may apply for subsidies for the procurement of municipal vehicles. An action guideline published by the Federal government additionally provides a summary of the approach to procuring electric and hybrid vehicles (Federal German government 2013). The National Climate Protection Initiative, too, supports projects switching municipal fleets over to e-mobility (BMUB, Federal German Ministry of the Environment, Nature Conservation, Construction and Reactor Safety, 2015).

A complementary tool discussed in many places involves municipal purchasing incentives. The city of Munich recently enacted its own €30-million funding programme for crafts, small commercial and industrial businesses. Grant funds supporting the acquisition of electric passenger cars and small trucks up to 7.5 tons are planned to be awarded in amounts ranging from € 2,500 to € 4,000. Such subsidies are targeted to, and only available for, businesses since commercial and industrial uses, as explained above, offer a favourable field for the utilisation of electric vehicles (Süddeutsche Zeitung 2015).

This initiative certainly represents an exceptional approach. Only a few municipalities are likely to be in a position to make cash grants of a similar magnitude available. Even if the funds were fully exploited by businesses, this would bring a maximum 12,000 electric vehicles to Munich's streets. Their influence on the air quality and other challenges would be marginal in the face of slightly under one million registered vehicles in Greater Munich.

On the whole, it must therefore be regarded as more important to use sufficient municipal resources to produce comprehensive concepts for urban commercial transport and consistently implement these.

3.6 Conclusions

E-mobility offers the opportunity to rethink urban commercial transport. From both municipal and entrepreneurial angles, the aim in urban commercial transport must be to avoid motorised journeys whenever possible. The remaining journeys should be effected in a way that offers the highest possible compatibility with traffic-reduction goals. Up-to-date city logistics concepts employing electric commercial vehicles and the growing use of e-cargo bikes have already proven that this is possible and economically viable, and comes with favourable effects for the urban environment.

Simply switching away from internal combustion engines to electric drives, in contrast, will fall short of meeting the present challenges in urban commercial transport. Municipal promotional schemes should hence be targeted at concepts that reduce truck traffic and its adverse impacts in cities and towns. As practice has shown, cities, towns and villages can achieve the greatest effectiveness in promoting innovation in urban commercial transport by engaging in networking, creating a sound data base and supporting well-targeted regulation.

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