FREIGHT TRANSPORT FOR DEVELOPMENT TOOLKIT:

Urban Freight

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The Transport Research Support program is a joint World Bank/ DFID initiative focusing on emerging issues in the transport sector. Its goal is to generate knowledge in high priority areas of the transport sector and to disseminate to practitioners and decision-makers in developing countries.

Urban Freight

Freight Transport, a Key for the New Urban Economy

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EXECUTIVE SUMMARY

Cities need freight but they tend to ignore this specific category of urban transport. Freight transport, despite providing jobs and services to the urban economy, has been neglected in surveys and policies. Meanwhile, freight operators have carried on their business, which is to provide the goods required by the urban economy at the right place and the right time. In most cases, they succeed but not always in a sustainable manner.

In this document, we provide data on urban freight and its impact on local communities, and we describe current cities' policies in different regions of the world, with a specific focus on Mexico City in an Appendix. When comparing different cities worldwide, the diversity of urban freight can be vertiginous. How can one compare a Yamato employee in his/her small hybrid multitemperature truck delivering parcels to homes in Tokyo residential districts, to a farmer bringing his/her home-grown vegetables in a little pushcart to be sold on a street market in La Paz? Nevertheless, both of them contribute to a city's economy and quality of life. We point to major issues shared by all cities and freight stakeholders:

1. Urban freight is quite inefficient as the total number of vehicle-kilometers travelled to supply cities could be reduced and the quality of the service enhanced.
2. Urban freight is characterized by the "motor transition," where non-motorized modes of transport are loosing ground to vans and trucks. A marginal but growing share of new green delivery vehicles are appearing in some European and Japanese cities.
3. "Logistics sprawl" is a locational movement of warehouses and cross-docking terminals from the urban areas to suburban zones with some positive impacts (more modern terminals replace old ones) but also negative ones (more vehicle-kilometers are generated).
4. Labor issues are important in urban freight: many small operators (such as the Italian "padroncini") provide urban deliveries with very old trucks and face difficult working conditions, lack of training and poor revenues.
5. Many large cities in the world are port cities and gateways to international flows of goods, generating both opportunities and impacts for local communities.
6. Road transport remains dominant, and to supply cities with rail and waterway infrastructure requires expensive investments and faces strong opposition from local residents.

We draw on four recommendations for cities looking for a more efficient and climate friendly freight system. The underlying principle of all of them is that freight transport serves the local economy and accompanies urban economic transformations.

- Cities have to set up a realistic governance structure for urban freight: assessing the needs (by carrying out surveys), setting up a Freight Forum to negotiate with private stakeholders, and organizing a Freight Portal on the web to provide basic information to truck drivers. These may turn out to be low cost actions with great benefits to businesses.
- Serving urban growth by enhancing the *quality* and *added value* of goods' distribution is a very important objective for policy-makers: providing modern logistics facilities and training programs for freight workers, reintroducing urban logistics spaces and services are key priorities.
- Making urban freight more sustainable and cities safer and more liveable. This means that land use and planning policies have to integrate logistics activities. Cleaner and more silent modes of transport must be (re) introduced in city streets. Environmental standards for truck access contribute to

reducing emissions of particulates, nitrogen oxides and ozone that are so detrimental to the health of urban residents.

- Local and national governments can take decisive actions to enhance working conditions and skills in the urban freight sector, often the least regarded in the trucking industry. Guarantees must be required from all freight companies (including small ones) on their financial and professional capabilities. On-street delivery areas with ergonomic design must be provided to make urban deliveries easier and faster. Measures against theft and corruption should be enforced.

We should remember that cities can set examples: like any large company, a municipality receives all sorts of goods, from letters and documents to office items and furniture. Public procurement procedures can be efficient tools to achieve a more environmentally-friendly freight supply.

An urban freight system serving the urban economy and its environment is a necessity today: the task is not easy, and even in countries with strong local political entities, policy leverage is weak regarding urban freight. But margins of progress do exist, at low cost and with great benefits. In a complex environment such as an urban territory, where environmental, social and economic issues are competing and difficult trade-offs are involved, local intervention is necessary and possible.

INTRODUCTION

Cities need freight but they tend to ignore this specific category of urban transport. Freight transport, despite providing thousands of jobs and services to the urban economy, has been neglected by transport surveys and models, transport strategies and regional master planning.

In the meanwhile, freight operators have carried on their businesses, which is to provide the goods required by shops, companies and households at the right place and the right time. In most cases, they succeed, but not always in a good environmental or social manner. In large cities, one fourth of CO_2, one third of nitrate oxides and half of the particulates that are emitted by transport are generated by trucks and vans! Municipalities, today, have to target freight transport as one of their priorities in order to make it more efficient and sustainable.

What is urban freight? Let us start with a simple definition: urban freight transport is a segment of freight transport which takes place in an urban environment. Specifically, urban freight is *the transport of goods by or for commercial entities (as opposed to households) taking place in an urban area and serving this area*.

This definition includes all movements of goods generated by the economic needs of a local business unit, i.e. all deliveries and pick up of supplies, materials, parts, consumables, mail and refuse that a business needs to operate. It also includes home deliveries to households, as they are generally done by means of a commercial transaction.[1]

The above definition does not include private transport undertaken by people to acquire goods for themselves (shopping trips), nor does it include through traffic (trucks circulating in a city en route to another destination without serving any business or household of the city). These two kinds of transport are very important: in large European cities, shopping trips represent about half of the urban movement of goods and through traffic can constitute up to 15-20% of a city's freight transport traffic in vehicle-kilometers travelled. These activities are important for a city's transport organisation and ought to be policy targets,[2] but a city's priority is the accommodation and improved management of freight transport and logistics activities directly *serving the local economy*.

This is all the more important as urban economies are evolving rapidly. In cities of developed countries, major changes have been taking place. The size of stores' inventory stocks has shrunk as more and more businesses are supplied on a just in time basis. The number of products sold has considerably increased, and collections change several times a year. With the development of the service economy, the demand for express transport and courier services is soaring. All these features have made urban economies more dependant on transportation systems, with more frequent and customized deliveries. Developing countries have experienced similar changes (not always at the same pace), with additional transformations, such as a growth in very small manufacturing activities at home or in small high tech parks. This generates differentiated transport services, in residential areas not needing freight supply before.

One of urban freight's main characteristics is its phenomenal diversity. There are as many transport and logistics chains as there are different economic sectors. In a single city, vehicles, delivery times, size of

[1] Home deliveries result from distance selling (electronic commerce or mail orders, including consumer to consumer exchanges from websites such as eBay).

[2] Indeed, one of the most relevant freight transport policies a city can implement is a clearer organization of truck through routes. However, diverting all trucks in transit may be illusory, as long distance truck drivers also need cities, for their services and infrastructure.

shipments may even vary according to each business or customer. When comparing different cities worldwide, the diversity of urban freight can be vertiginous. How can one compare a Yamato employee in his/her small hybrid multi-temperature truck delivering parcels to homes in Tokyo residential districts, to a farmer bringing his/her home-grown vegetables in a little pushcart to be sold on a street market in La Paz? Nevertheless, both of them contribute to the city's economy and the well-being of its residents and businesses. And they actually share many issues. A common feature of all urban freight activities in the world is that they are a difficult task to perform. A recent survey among 1,650 Mexico City's truck drivers (Lozano, 2006) well demonstrates the challenges of urban freight operations common to all large cities: the congestion, the lack of space for loading and unloading, the complexity of legislation, the corruption of police, the risk of theft and the lack of safety are among the highest concerns raised by the drivers.

A methodological foreword will briefly present issues of urban freight data collection and comparison and show the diversity of urban freight situations in the world (Section 1). Major features of urban freight are then presented including its environmental impacts, followed by a description of policies undertaken by cities around the world (Section 2). Some selected issues are discussed in order to show the main challenges local governments face on urban freight (Section 3). Policy recommendations to local and regional governments are then provided as a conclusion, with examples of best practice (Section 4).

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1. 1. DATA ARE SCARCE ... BUT THE SITUATION IS IMPROVING

Data and sources of information regarding the urban movement of goods were quite abundant in the 1960s and 1970s, especially in the U.S. and Australia as well as in some European and Latin American cities. At that time, major metropolitan transport studies including truck traffic management were quite popular. Then, urban freight as a focus for data collection and modelling disappeared. Ken Ogden, in 1992, published the first comprehensive book on urban freight (Ogden, 1992). In his book, which is still a key resource for today's transport practitioners from any city in the world, Ken notes that urban passenger transport is better monitored than urban freight transport.

The good news today is that important steps have been taken in the last ten years in different parts of the world with respect to urban freight. In Europe, major programs have targeted urban freight and provide a set of statistics and impact assessments. In the U.S. and Japan, reliable data exist. For developing countries, data are more fragmented, usually made on a case by case basis. Still, many large cities have engaged in freight and logistics surveys. What is still missing from developing cities is a comparative basis, as surveys' methodologies are usually local and different from one another. In all cities, including those from developed countries, surveys are irregular overtime, making it difficult to draw historical analyses and projections.

1.1. RECENT ADVANCES IN URBAN FREIGHT SURVEYS AND METHODS

In the U.S., the annual National Urban Freight Conference monitors progresses on data collection and modelling. Large cities have carried out ambitious freight studies: Dallas/Fort Worth, Chicago, Portland, and Vancouver in Canada. The Administration has established the Freight Analysis Framework, a technical tool providing states and cities the means to analyse regional freight movements. However, FAF does not provide flows of commodities by local (intracounty) trucking and among sub-county units. The Urban Freight Committee of the Transportation Research Board promotes advances of urban freight transport.

Worldwide, an International Conference on City Logistics takes place every two years with academic researchers discussing recent findings. At the World Conference on Transport Research, every three years, a Special Interest Group on Urban Goods Movement sponsors dedicated sessions on urban freight.

The part of the world where surveys have been most developed is Europe, with experimental programs and networking activities supported by the European Union, as well as national urban freight programs. BESTUFS (BEST Urban Freight Solutions) is one of the best known European projects on urban freight. It included urban freight data harmonisation and published a *Good Practice Guide on Urban Freight* available in seventeen European languages (Bestufs, 2007). Other European programs target specific urban logistics experiments.[3] All these projects have helped organize and compare urban freight data and methodologies have started to converge. At a national level, in France the National Program 'Goods in Cities' was set up in 1993.[4] It has sponsored large scale urban freight surveys and provides an original and comprehensive multi city set of data on urban freight. The U.K. government has promoted "Freight Quality Partnerships" in all large British cities. The Dutch Administration has established the PIEK program on urban trucks' noise emissions and supports the

[3] See list of E.U. funded projects that provide results and data on urban freight experiments in references.

[4] www.transports-marchandises-en-ville.fr

public/private national "Committee for urban distribution."[5] In Padova, Italy, an annual City Logistics Fair brings together Italian municipalities, transport practitioners and providers of logistics solutions for an urban environment.

1.2. THE DIVERSITY OF URBAN FREIGHT SITUATIONS IN DIFFERENT WORLD'S REGIONS

Cities in the world are different… so are their freight transport and logistics activities. Historically, concerns have been several. Freight follows local economic, geographic and cultural specificities. For example, Chicago has been concerned with maintaining its role as a rail hub for North America, and is thus concerned about rail freight movements between the numerous rail terminals located within the city: Chicago must "preserve and promote [its] national and international freight prominence" (2030 Michigan Regional Transportation Plan, 2008). Los Angeles is concerned primarily with air pollution and targets urban trucking associated with activities in the ports of Long Beach and Los Angeles. Shanghai is becoming the largest cargo port in the world (port throughput was 443 million tons in 2005, out of a total of 678 going through the city). Shanghai's logistics added a value of $32 billion in 2005 (13% of its GDP), and explains the city's vocation as a logistics hub (Chin et al., 2007).

In large cities of poor countries, population growth and increasing urbanization have led to a very rapid urban growth, while the public supply of infrastructure and transport services has lagged behind. A significant proportion of roads are unpaved and poorly maintained. Air pollution has decreased with the gradual phasing out of leaded gasoline and with regulations on cleaner fuels in many countries (such as India and Mexico). However, diesel trucks remain an important source of particulate matters and NO_x.[6] In developing cities, traffic congestion is an important operational problem for the urban freight system. A major source of congestion is the important mix of transport modes, with slow traditional non motorized vehicles (including hand or animal pulled carts) merging with faster motorized traffic. In the poorest cities of Africa or Asia, young street vendors literally take over the streets selling everything from fresh fruits to electronics goods. Most run their business on foot, knocking on doors of houses and offices.[7] Slums are part of large cities' landscape and have specific supply needs and characteristics, very difficult to identify or quantify. In general, the share of urban freight depending on informal sectors is very difficult to evaluate, as are economic, environmental and social indicators of these underground activities.

In some countries such as China, Egypt or Morocco, the deregulation of a formerly very controlled truck market (with large state-owned truck companies organizing the freight distribution) has had important impacts on the urban operations of freight transport. In Egypt, today, co-operatives and to a lesser extent private sector hauliers are replacing state-controlled companies (Gray & al., 1997), generating a more abundant supply of freight capacity in cities (see discussion in Section 3.1).

[5] www.piek.org and www.stedelijkedistributie.nl

[6] Particulate matters (or PM) are suspended air-borne solid particles and/or droplets of various sizes. PM_{10} are particles of ten micrometres or less and $PM_{2.5}$ of 2.5 micrometres or less in diameter. NO_x stands for nitrogen oxide, a generic term for mono-nitrogen oxides (NO and NO_2), air pollutants produced during combustion.

[7] A New York Times article of 19 May 1905 describes the "Pushcart Evil", as peddlers clutter the sidewalks of Manhattan and generate nuisances to the residents in terms that, today, would be familiar to observers of many African, Latin American or South Asian cities.

2. 'ONE HUNDRED AND FIFTY SUPPLY CHAINS' - MAJOR FEATURES OF URBAN FREIGHT TRANSPORT AND POLICIES

Urban freight transport is complex and heterogeneous. There is a reason for that: urban freight is determined by the urban economy, and there is a very high number of different economic sectors in a city, from industrial to tertiary, from private to public, from major conglomerates to informal retail or manufacturing sectors. This diversity is what makes cities so unique and valuable, a place where thousands of activities converge... but in a limited and constrained environment.

2.1. ONE SUPPLY CHAIN FOR EACH ECONOMIC SECTOR

Urban freight transport is the result of logistics decisions, i.e. the processes required to organise the movement of goods in an efficient manner within a production and distribution system. These logistics decisions are based on the demands of economic agents and are not much influenced by the specific patterns of a single city (Dablanc, 2007).

A city is provisioned by hundreds of supply chains (at least "one hundred and fifty" as was monitored for European cities by LET (2000)), one for each economic sector. Whereas passenger transport can be roughly categorized into a handful of categories (usually by modes or trip purposes), freight transport is extremely fragmented. It can be classified by transport mode, type of operator, and origin of goods (the good can come from a long-distance supply chain, or be part of a very local exchange between a shipper and a receiver). The vehicles are very diverse: trucks and vans with all kinds of sizes and weights (and diverse names[8]), passenger cars, motorbikes, bicycles, bicycle trailers, three-wheelers,[9] pedestrian push-carts, animal-powered transport such as oxcarts, rail and waterborne transport... In developing cities, many vehicles are used for both passengers and freight. Freight can be handled on "own account" (the transport operated by manufacturers with their own employees and fleet, or the transport made by an independent retailer with his or her own vehicle to supply the store), or on "third account" (made by a professional carrier, a registered freight or logistics operator). In a typical European or North American city, both categories make an equal amount of deliveries. In developing countries, own account transport is more dominant, including transport serving informal sectors. Local companies typically own one or several (small-size) trucks. In Medan, Indonesia, 90% of local companies surveyed in 2004 owned their delivery truck(s) (Kato & Sato, 2006). This does not prevent major differences between cities from different regions: for example, there is a very low level of own account transport in Pakistan (Rizet & Hine, 1993).

2.1.1. Common indicators

Although collected for specific regions and specific situations (Bestufs, 2006; Ogden, 1992; LET, 2000; Figliozzi, 2007), some data on urban freight do converge. They are quite representative of the freight demand in cities from developed countries.

A city generates about:

- 0.1 delivery or pick-up per person per day

[8] Sedans, tuk-tuks, sudakos (a sort of minibus also used for freight in Indonesia) ...
[9] Also named trishaws, rickshaws...

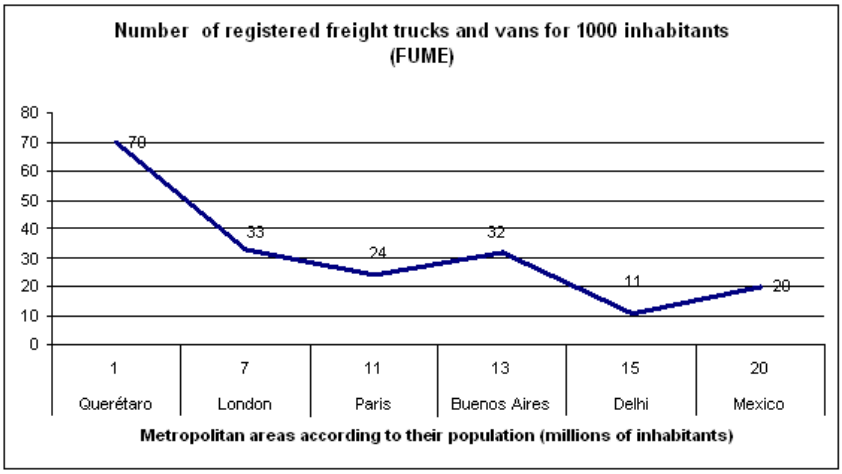
- 1 delivery or pick-up per job per week
- 300 to 400 truck trips per 1000 people per day, and
- 30 to 50 tons of goods per person per year.

Urban freight represents 10 to 15% of vehicle equivalent miles travelled in city streets and two to five percent of the employed urban workforce. Three to five percent of urban land is devoted to freight transport and logistics. A city does not only receive goods, but is also a place of shipping: 20 to 25% of all truck-km in urban areas are outgoing freight, while 40 to 50% is incoming freight and the rest originates from and is delivered within the city.

Transport companies providing urban freight services are generally very small. In Europe, 85% of short distance truck companies have less than five employees. In Italy, the "padroncini" (small individual entrepreneurs, usually owning one truck) carry 80% of all consignments delivered in urban areas. This is also observed in other continents: in Mexico City, 80% of private carriers with fleet of 100 vehicles or less have less than five vehicles (Lozano, 2006). 70% of these companies' vehicles are light commercial vehicles (less than 3.5 tons).

Trucks and vans make up the most visible (and best monitored) modes of transport. Some interesting indicators have emerged from the literature, such as the FUME, or Freight Urban Mobil Equipment, ratio (Betanzo & Romero, 2009), which is the number of freight vehicles for 1000 urban residents. All vehicles are included (trailers, trucks and vans). There were 70 registered trucks for 1000 people in Querétaro, Mexico in 2004, up from 60 in 2000 (Betanzo & Romero, 2009). Although registration methods may differ from one country to another, it seems that FUME is decreasing with the increase in the size of cities (see Figure 1) which indicates a sort of urban freight efficiency for very large cities. In Delhi, India, in 1997, there were 57,000 registered light commercial vehicles and 47,000 registered heavy commercial vehicles, meaning a "FUME" of eleven. Freight vehicles were expected to grow at 100% (trucks) and 200% (vans) by 2015 (Das & Parick, 2004). In Phnom Penh, Cambodia, in 2003, there were 27,830 registered trucks, an increase of 240% compared with 1992 (Ripert, 2006).

Fig. 1 – Freight Urban Mobile Equipment (FUME) and cities' size



Source: L.Dablanc

Table 1 – Number of registered freight vehicles in Buenos Aires (2004)

Own account transport	318,211
Light trucks	*289,120*
Medium and heavy trucks	*20,230*
Tractors	*2,172*
Trailers	*6,689*
Third account transport	108,168
Light trucks	*32,639*
Medium and heavy trucks	*37,712*
Tractors	*10,321*
Trailers	*27,496*

(Data from Universidad Tecnologica Nacional, 2005)

Registered vehicles in a city are not equivalent to vehicles delivering freight in that city. Also, in developing countries cities, registered trucks do not cover the reality of all trucks, and two and three wheelers, as well as other modes of transport, may account for a very large share of the urban freight task. In Medan, Indonesia, a cordon survey showed that motorbikes had a 20% freight transport modal share at the morning peak hour (Kato & Sato, 2006).

2.1.2. The urban cost burden of freight transport

The freight system has a strong urban freight component, although it is the one least monitored. Ogden (1992) mentions that 30% of all miles travelled by trucks (above 4.5 tons) in the United States are undertaken in large urban areas. In terms of costs, cities represent an important share of the freight system. Canadian studies showed that in city centers, transport costs are 2.6 times higher than in suburban areas (Ogden, 1992). In the 1990s, United Parcel Service, the largest express transport operator in the world, estimated that shipments to New York City cost 30% more on average compared to shipments in the rest of the country (IAURIF, 1999).

Recent references are scarce. Interviews with French decision-makers in the trucking industry indicate that the urban segment of a shipment costs about the same as the intercity trip.

2.1.3. A city's main logistics chains

A few large categories of urban logistics chains exist, for which common characteristics in the way freight transport is operated, can be identified.

- *Independent retailing, including informal sector, and local convenience stores*, is one such category. These sectors together can represent 30 to 40% of all daily deliveries in a city. These local stores are supplied between 3 to 10 times a week. Suppliers are diverse, with a predominant use of own

account vans (or bikes and three wheelers in poorer countries). Urban freight for these sectors is quite inefficient (see Section 3.1).

- *Chain retailing and commercial centres*. In European cities, large retailing brands with subsidiary or franchises are increasing their share of the urban space at the expense of independent local stores (this transition is already completed in the U.S.). This changes the way goods are supplied to these stores, with less frequent deliveries, a larger share of consolidated shipments, larger and better loaded vehicles.
- *Food markets*, particularly important in developing countries, have extremely diverse modes of supply, including bicycles, hand pushed carts or animal driven carts. Few data exist on the actual volume and freight flows generated. A survey made on 300 market vendors in Phnom Penh, Cambodia showed that 87% of markets' deliveries were made by the vendors themselves, and 13% by transport providers. Deliveries are quite frequent: 24% of the vendors are delivered everyday and 44% at least five times a month (Ripert, 2006).
- *Parcel transport (less than truck load) and express transport services* are one of the fastest growing transport businesses in cities. This industry uses large vans or small or medium size trucks, and is based on consolidated delivery tours departing from cross dock terminals located in close suburban areas. Express transport can count up to 70 to 90 delivery spots in one delivery tour, while a traditional parcel delivery tour serves about twenty receivers. Vehicles from the leading express transport companies (UPS, DHL, TNT, FedEx) now circulate through the streets of most cities in the world, with some geographic specializations (DHL in European cities, UPS in U.S. cities). This industry, in constant restructuring, is hit by the current economic crisis, as customers downgrade their demands from express to cheaper services.
- A sub sector of the parcel transport business is *home deliveries*. The home shopping market has rapidly increased worldwide since 2003. In Europe, it represents €80 billion (5% of all retailing). These markets are dominated by large postal operators but new players emerge. Japanese *takkyubins* (Yamato and Sagawa as the two leaders), or parcel transport companies specialised on home deliveries, represent an extremely original service and a specific feature of Japanese urban logistics.
- *Building sites* represent a key urban freight segment because of the important tonnage they generate. Building materials can make up to 30% of tons carried in cities, and vehicles to carry them are generally heavy lorries, generating much damage to the roads. Building sites' supply is notoriously inefficient. Multiple suppliers and poorly planned delivery schedules generate a high number of deliveries, queuing and a general disorganization. Some cities, such as London and Stockholm in Europe, have initiated consolidation schemes. The London Construction Consolidation Centre was implemented in 2006 with funding from Transport for London (£1.85m) and private investors (£1.35 million). A 2007 assessment showed that the scheme achieved a 68% reduction in the number of vehicles and a 75% reduction in CO_2 emissions.

Urban freight also varies according to a city's geographical area. Because of the concentration of activities, city centres are characterized by a high density of freight movements: 20,000 to 30,000 deliveries and pick-ups per km2 per week for European cities (LET, 2000). A majority is delivered by vans and motorbikes. Lorries have not disappeared from city centers but they access them very early in the morning, to supply supermarkets. In the first rings and inner suburbs, medium size trucks are in higher numbers. These areas do not concentrate many businesses (therefore they generate less deliveries), but they accommodate transhipment terminals and warehouses. Some truck companies are still located there, but are progressively relocating. In further suburban areas, commercial centres and malls are the dominant retail activity generating freight transport. Another major generator of freight movements is manufacturing activities, as well as large warehouses and

logistics facilities. Supply is done by large lorries. Access to these commercial and industrial centres, especially on highway exit and entrance ramps, can be quite congested.

2.1.4. Environmental impacts

Urban freight is more polluting than long distance freight transport, because of the average age of the vehicles and the high number of short trips and stops. Freight transport generates between 20% and 60% (according to the pollutants considered) of local transport-based pollution (Table 2). In the metropolitan area of Mexico, 71% of the 3,500 tons of $PM_{2.5}$ generated in 2002 by mobile sources were from freight vehicles (Lozano, 2006).

Greenhouse gas emissions and noise pollution are also among the most severe environmental impacts of freight in cities. Freight represents about one fourth of CO_2 emissions coming from transport activities in European cities. In Dijon, France, 26% of the total road traffic-related consumption of tons equivalent petrol (TEP) come from freight transport (this represents the equivalent of 67 TEP each day to supply Dijon). Calculations, during the morning rush hour in Bordeaux, France, indicate that the circulation of freight transport vehicles added five decibels (dB(A)) to the noise from the circulation of private cars (LET et al., 2006).

Table 2 - Pollutant emissions due to road traffic in Dijon, France

Emissions (kg/hour)	CO	NO_x	HC	PM10
All traffic	1124	312	166	15
Private cars	894	173	122	5
Urban freight transport	225	113	41	9
Freight in transit	5	26	3	1
Proportion of freight in urban transport emissions	20%	36%	25%	60%
Proportion of freight and transit in urban transport emissions	20%	45%	27%	67%

LET et al., 2006

Urban freight vehicles are quite old. In Dublin in 2004, a fourth of all vehicles were manufactured in or before 1994. Only 15% of the vehicles were new (one year or less). In the Milan region, 40% of trucks circulating are more than ten year old. The renewal of freight fleet is generally slow (slower than for non urban road freight traffic), due to the very specific entrepreneurial population that operates urban freight (see Section 3.1).

Another important issue is road safety. Lorries have a low share of accidents in cities but the accidents involving them are serious. In European cities, about 5 to 10% fatal accidents involve light commercial trucks and 10 to 15% involve heavy commercial trucks (Bestufs, 2006). In Australian cities, in the 1980s, 13% of fatal crashes involved trucks (Ogden, 1992). In 2005, studies indicate that 2,789 people were killed or seriously injured on London's roads, with 402 of these incidents involving freight vehicles. About 14 per cent of all collisions involving goods vehicles result in serious or fatal injuries, which is higher than for other road users (Transport for London, 2007).

The conciliation of truck traffic with bicycle use has been a recent target of policy concerns in Paris and London following much publicised fatal collisions.

2.2. CURRENT POLICIES AND PRACTICE

Involvement in urban freight, for the public sector, is manifold and exists at various levels. Cities are in charge of the urban road network, which is heavily impacted by urban commercial vehicle traffic. Cities are also interested in local economic development, and therefore have to make sure the provision of goods and logistics services is adequate. Cities control the use of land, including the land necessary for logistics activities (warehouses and terminals). And cities are in charge of local traffic and parking regulations, including all regulations that relate to delivery vehicles.

Despite these many objectives, local public policies regarding freight are scarce. In urban areas, with a growing population but constrained space, urban freight has little weight over people when choices of development are made. Most cities still view truck traffic as something they should ban or at least strictly regulate, and few of them consider freight activities as a service they should help organize in a more efficient manner. These policies are generally local and can be conflicting. In the Lyon metropolitan area, in France, as many as thirty different rules on trucks' weight and size exist, obliging truck drivers to decide which rules they will comply with, and which ones they will disregard.

Major events such as the Olympics or the World Cup, or major urban development projects such as the implementation of a tramway or a subway system, may provide opportunities to organise a change in urban freight operations citywide. The municipality of Athens has imposed a night deliveries' regulation during the 2004 Olympics. Today, this measure is being discussed as becoming permanent for some categories of vehicles. During the Olympics, Sidney prohibited deliveries after 8 am.

Some examples show that initiatives exist to bypass the inherent difficulties in managing urban freight activities.

2.2.1. Institutions involved

Tools involved in the definition of a freight policy can be found at various levels of public sector administration .

- Locally: street management, parking policy, building permits, land use and urban design are defined by municipalities or cooperative bodies at a metropolitan scale.
- Nationally: management of major road networks, vehicle standards and specifications, professional training, companies' licensing are defined by the state administration.
- Depending on the country organisation, intermediate levels may have an influence, such as regions (in Australia, there are different truck sizes and weight in each of the six regions of the country) or supranational institutions ("Euro" standards[10] applied to trucks in all member states are defined by the European Union).

Economic tools such as taxes and subsidies are also available at each institutional level.

[10] Euro standards are E.U. requirements defining the limits for exhaust emissions of new vehicles sold in all Member States. Progressively more stringent Euro classes have been defined by successive European Directives. For new diesel trucks, the current class level is Euro V.

2.2.2. Truck and van access restrictions

The easiest tool available to cities confronted with freight activities is truck access restriction, based on various criteria (used alone or combined): time windows, weight (total or per axle), size (length, height, surface), noise emission, air pollution, loading factor, type of goods (hazardous, voluminous, living animals). European cities have used this kind of regulation since... the Roman Empire. In recent history, the most famous truck ban in Europe is the London Lorry Ban, in place since 1975. Heavy goods vehicles over 18 tons cannot circulate at night and weekends within a delimited area. On the contrary, Paris has banned trucks (over 29 m2) during day time. In Tokyo, many geographical areas are not accessible to trucks over 3 tons. Truck bans are also in place in many U.S. cities. Similar to the ban in Paris, all trucks in Seoul have been banned of the central areas during working hours. This ban has been in place since 1979. The objective is to concentrate goods distribution during the night (Castro & Kuse, 2005). In Sao Paulo, to alleviate congestion, access is based on the plate number, with two days allowed per vehicle (including freight vehicles).

Restricting large trucks in cities has been one of the most popular measures in developing countries, due to road limitations. The policy in Manila is one of the earliest and well-known cases of large truck restrictions. It dates back to 1978: trucks with a gross weight of more than 4.5 tons cannot travel along eleven primary arterial roads from 6 in the morning until 9 in the evening. Ten other roads are prohibited during peak hours. Alternate routes are available to reach the port of Manila (Castro & Kuse, 2005). It is common in large Chinese cities to ban trucks above five tons from the city centre during peak hours.

According to studies quoted by Castro & Kuse (2005), these restrictions have decreased the productivity of trucks by 50 to 60%. In Seoul, light own-account trucks have become popular as a consequence of the truck restriction.

This kind of regulation requires enforcement and control. This means that criteria should be easy to control, and that there are sufficient and well trained staff, with good communication between services. In Medan, Indonesia, large-size trucks have been prohibited from entering the central business district since 2004 but interviews with truck drivers revealed that most of them were unaware of the ban (Kato & Sato, 2006).

The most recent trends in access restrictions are related to environmental criteria and road pricing (both can be combined, as is the case for the London congestion charge). Urban tolls are not specific to commercial vehicles, while many environmental zones (or “Low Emission Zones”) are. Environmental criteria are discussed in Section 2.2.6. In the case of urban tolls, vehicles are charged for the use of the street space according to the marginal costs they impose on others, including external costs. In the 1970s, when the first tolls appeared, external costs were mostly computed with regards to congestion whereas air pollution today is the most common target of tolls’ differentiation policies. Energy consumption and the related CO_2 emissions could well be targets for the future.

Let us notice, however, that freight demand is *not* very price sensitive. Even with substantial charges, operators may not change their organisational patterns. For example, since the congestion charge was implemented in 2003 in London, the number of vans and lorries in the restricted zone remained stable (while, at the same time, cars and minicabs decreased by 30%).

A recent innovation in European and Asian cities is that enforcement is ensured by using automatic control systems such as automatic number plate recognition cameras, mobile enforcement, vehicle positioning and on-board equipment.

2.2.3. Parking policies, provision of delivery spaces

Freight needs dedicated urban spaces, such as loading and unloading areas (be they public or private, on street or off street). Insufficient delivery spaces will transfer delivery operations on traffic lanes, and will lead to congestion. A Paris transport department's guideline imposes a minimum of one delivery bay every 100 meters in the city streets. In London and Paris, some bus lanes are shared with delivery vehicles. The Japanese central administration has recently subsidized nine Pilot Programs on urban freight, with a strong focus on the management of loading/unloading and parking spaces, both on-street and off-street. In Koriyama City (Fukushima prefecture), one lane of roadway has been converted into a loading space area. In Kashiwa City (Chiba prefecture), a joint parking space for delivery trucks has been created that is managed collectively by retailers. And in Nerima (Tokyo), the "pocket loading" system provides loading space that has been secured by converting a part of an existing parking lot into a reserved delivery space (Futumata, 2009).

In Buenos Aires, Argentina, a global policy on loading/unloading areas was implemented in February 2009. Only 750 on-street delivery areas have been laid out in downtown Buenos Aires, much less than in Paris (10,000) or Barcelona (8,000). Also, the new Buenos Aires delivery spaces seem insufficiently dimensioned, as they are limited to a length of 8 meters. Guidelines in Europe favour bigger spaces: in Paris, on-street delivery areas must be at least 10 meter long, to facilitate trucks' manoeuvres and the handling of goods.

Time sharing is a good way to improve the road network and parking capacity. In Seoul, in the four "Freight Districts" identified in the metropolitan area, different time windows have been allocated to trucks and passenger cars on on-street parking areas. In Barcelona, Spain, the municipality has created an innovative organisation on some of its main boulevards, by devoting the two lateral lanes to traffic in the peak hours, deliveries during off peak hours, and residential parking during the night. The city is also famous for its global policy on freight street management, which has led to interesting results. In the city's largest commercial area (the Ensanche), a "freight motor squad" consisting of forty agents circulating the areawith a motorbike has been organised to control all on-street loading/unloading zones. This has prevented illegal long term parking and made these zones available to delivery truck drivers.

Long term truck parking is a major issue for urban areas. Many trucks need to park during night time before the early opening of shops. These parking areas could also be a place for the transfer of goods into smaller lorries. Few municipalities have set up organised truck parking centres. In some cities, private truck parking yards have been provided.

2.2.4. Land use policies, zoning and building regulations for delivery activities

Many land use regulations can serve a local freight policy. Many cities impose the building of off-street delivery areas in new commercial or industrial developments. The Tokyo off-street parking ordinance of 2002 obliges all department stores, offices or warehouses to provide for loading/unloading facilities when they have a floor area of more than 2,000 m2. European cities' regulations are generally more strict, as buildings of 400 to 1000 m2 are subjected to the off-street loading zone regulations. Barcelona, Spain has a very original regulation, as it organises the inner distribution of space in a private business. Since the municipal building code of 1998, all new bars and restaurants were asked to build a storage area, with a minimal size of 5 m2 within their premises. The rationale behind this rule is that restaurants do not need a daily supply of bottles and beverages if they store sufficient volumes.

Some cities should also be careful in avoiding inadequate regulations in their building and planning codes. Access to underground parking, for example, whether in public parks or in private buildings, can be very difficult for commercial vehicles, even small ones, because of height and size limits. The Chicago Downtown Freight Study (January 2008) revealed that this is one of the most impacting problems for truck drivers. The municipality now works on a loading zone plan and inventory, parking violation fines during peak times, and an alley obstruction enforcement campaign.

Environmental concerns have led some cities into actually developing logistic facilities. Twenty-two freight facilities in Tokyo, and fourteen in other Japanese cities, have been implemented with the help of the national state in order to solve urban difficulties for truck companies. The Korean government is creating a network of forty logistics hubs located in the major metropolitan areas of the country. The municipality of Seoul is contributing to this policy by setting up goods' distribution centres to make urban truck operations more efficient.

Urban Consolidation Centers (UCC) provide a specific service of bundled and coordinated deliveries. A UCC is a logistics facility situated in close proximity to the geographic area that it serves (generally a city center but also any kind of dense commercial area), to which many logistics companies deliver goods destined for the area, from which consolidated deliveries are carried out within that area, in which a range of other value-added logistics and retail services can be provided (Bestufs, 2007). Up to 200 such terminals existed in European cities in the 1990s-early 2000. Due to operating costs and rental costs, most of them closed down when municipalities could not subsidize them. Today, a few UCCs are operating, mostly in medium-size cities: Bristol in the U.K., Modena, Padova and other Italian cities, La Rochelle in France, and Motomachi (Yokohama) in Japan.

Planning strategies taking freight into account are a recent interesting trend of large U.S. metropolitan areas. The Dallas Fort Worth region has set up "freight oriented developments." In the greater Toronto area, "freight supportive land use guidelines" have been defined. The South California Association of Governments (SCAG, Los Angeles) has recently identified "freight-supportive design strategies" in its regional transportation plan.

2.2.5. Consultation policies, private/public partnerships

The urban distribution of goods is organised by private stakeholders (producers, carriers, retailers, final consumers), operating in an environment (the urban space) which is managed by public authorities. In this regard, private/public partnerships (PPPs) represent a good option. Consultation processes with private stakeholders provide a better understanding of the constraints and obligations of each party, and allow the development of concerted action programs. In France, when a local transport plan is designed, consultation procedures provide, often for the first time, an opportunity for local authorities and transportation professionals to meet. In June 2006, the city of Paris and the most important carriers' and shippers' associations signed an urban freight transport 'charter', in which they commit to certain points which are favorable to the environment, to the drivers' working conditions, and to the productivity of urban delivery activities. In the United Kingdom, in many cities in general and in London in particular, it has been a common practice for years to discuss and negotiate with transport and logistics professional organizations, leading to compromises. For example, the level of the congestion tax assigned to delivery trucks (£5 a day, the same as for car drivers) was a result of a two year discussion: truck companies wanted no tax, as no alternative other than road transport was available for goods transport; the municipality wanted commercial vehicles to pay much more than cars because of the severe road damages caused by trucks.

Some stakeholders are not represented in local consultation processes. On the one hand, small operators usually do not have a representative organisation (professional syndicate). On the other hand, large transport and logistics companies or their organisations are not willing to participate in local consultations in cities other than in major or capital cities, because of a lack of interest or insufficient staff. Local shopkeepers' organisations find no interest in freight groups. However, consultation processes in urban freight can provide interesting and valuable collaborations between private companies that otherwise are not willing to work together.

2.2.6. Most recent trends: environmental zones, mixed use buildings, multi-story urban logistic buildings

Many European cities today apply truck access restrictions based on environmental criteria (**www.lowemissionzones.eu**). In these regulations, only recent trucks, or fully loaded trucks, are permitted to enter the city centre. In Amsterdam, in the Netherlands, a truck may make deliveries in limited access zones if it meets the following four conditions: it must be less than eight years old, meet the Euro II standard,[11] have a maximum length of ten meters, and load or unload at least 80 % of its merchandise in the central city. In London, the Low Emission Zone set up in 2008 prohibits trucks older than the Euro III standard to enter the metropolitan area (the area surrounded by the M25 highway totalling 1,580 km2). In Tokyo, since 2003, the most polluting diesel vehicles have been prohibited.

Space availability is scarce, and has to be used in the best way possible. Some municipalities do it by accepting the development of multi-activity buildings, with logistics on street levels and other activities on the upper levels. Some also do it with the development of multi-story warehouses. The U.S. based logistics developer ProLogis has built seven to nine story logistics terminals in Tokyo. These terminals are also common in Hong Kong. The acceptance of such projects is increasingly conditioned to environmental criteria and to a careful attention to the integration of the buildings in the neighborhood.

[11] See note 10.

3. KEY ISSUES, KEY MARKET ANALYSES

There are specific challenges associated with urban freight that challenge both a sustainable development of cities and the efficiency of urban economies. Both public and private stakeholders need to define strategies to address them.

3.1. THE INEFFICIENCY OF URBAN FREIGHT TRANSPORT

In most cities, including those from developed countries, urban freight transport is quite inefficient, i.e. the same amount of goods, with an equal or better quality of service, could be distributed with a smaller amount of vehicle-kilometers travelled. The inefficiency of urban freight can be especially important in own-account operations, as is demonstrated on Table 3. It reflects a very low load factor for small firms operating their own trucks.

Table 3 – Indicators for own account freight transport in Medan, Indonesia

Size of firm	Frequency of use of trucks (time per week)	Average load factor
Less than five employees	2.11	29%
Five or more employees	2.43	76%

Source: From data displayed in Sato & Kato (2006)

Own account transport operations are dominant in Africa, as both local small companies and large ones operate with their own in house fleet, and explain part of the high cost of transport and logistics. In South Africa, the inefficient use of commercial vehicles explains the high logistics costs of this country (Joubert & Axhausen, 2009). In European cities, the load factor, expressed in volume, is increasing. Today, it reaches 70% to 80% (Bestufs, 2006).

Other factors explain the low level of efficiency of urban freight. Urban freight is operated by numerous and competing small operators, ready to accept low prices. Clients request customized or just in time deliveries, generating costs that do not necessarily translate into higher prices. Public policies also add costs by being unpredictable. This is a major source of problems for truck manufacturers who hesitate in developing fuel efficient and ergonomically designed urban vehicles, because they do not know what the next regulations will be.

The use of advanced technologies in the urban freight market is still quite low, although it could help make operations much more efficient. An example in Tokyo is given by Geroliminis & Daganzo (2005). To delivery its product (milk), the company introduced a satellite-based information system to store historical data of the delivery truck operations, such as start, arrival and waiting times, speeds, and routes. After one year, the company analyzed these data and changed routes and schedules and succeeded in reducing the number of trucks from 37 to 32, and increased its average load factor from 60% to 70%.

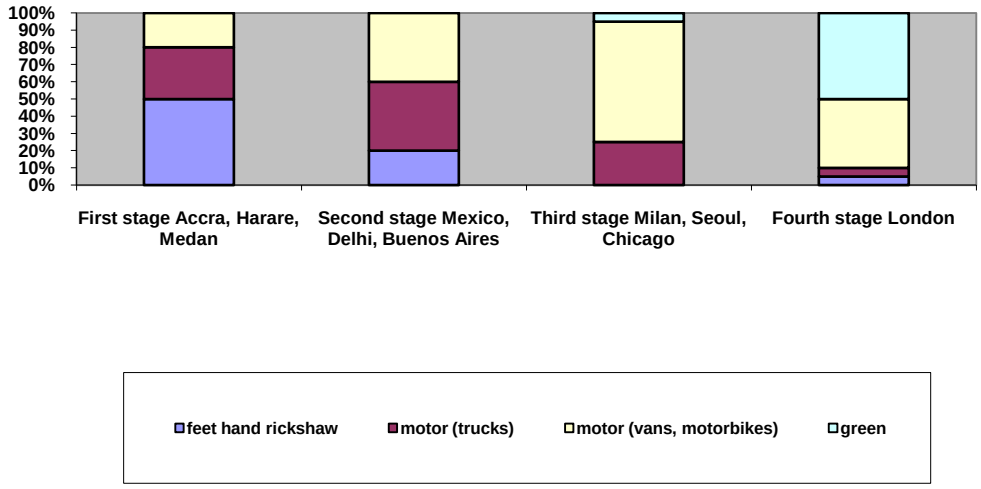
In a way, the inefficiencies of urban freight provide a competitive advantage for cities, as the very high number of operators carrying goods in cities capture the inefficiencies without raising prices, and improving the system's efficiency may lead to higher consumer prices. However, in the long run, more efficient transport

and logistics services are needed for all businesses, from manufacturing to retail and services, in order to compensate for major urban constraints such as congestion, high land prices, and safety. Efficiency of urban freight is also closely associated with a more sustainable urban environment.

3.2. 'MOTOR TRANSITION' AND EXTERNAL EFFECTS

What can be named the "motor transition" for urban freight is the change from predominantly pedestrian or animal powered transport of goods to motor vehicles, mostly diesel powered trucks and vans. Figure 2 illustrates (with imaginary data) this transition.

Fig. 2: The "Motor Transition" for freight distribution in cities



Source: L. Dablanc

In stage 1, the situation of some of today's cities in the poorest countries, a significant share of the urban movement of goods comes from non motorized traditional means of circulation. In stage 2, as in medium income countries with thriving large cities, diesel trucks and vans are dominant, with non motorized traffic still playing an important role. Stage 3 sees vans and motorbikes taking over the streets. A stage 4, where green modes of transport stand out (electric, natural gas or clean diesel vehicles, non motorized means of transport), this is the ideal situation envisioned in transport strategies of many large cities in the world. It has been partially implemented in London since a 2008 ban on lorries not meeting the Euro III standard (see Section 2.2). In Mexico City, already numerous trucks run on natural gas and some electric vehicles are used in the historical center.

The urban freight transition from stage 1 to stages 2 and 3 has important impact, both negative and positive. It makes freight more efficient and provides better service to the urban economy. All the while, pollution and energy consumption are dramatically increased due to the state of urban fleets of trucks and vans, which are generally very old. In Delhi, one of the most polluted cities in the world, general regulations were taken to promote cleaner fuels and the conversion to CNG vehicles. For trucks and vans, a recent incentive scheme to promote the conversion to CNG vehicles did not meet much success.

Stage 3 can have a positive impact on congestion as traffic becomes more homogeneous, even though more motorized vehicles are added into the city streets.

3.3. NEW LOGISTICS SERVICES IN LARGE URBAN AREAS

Urban logistics services are emerging, or consolidating, to accommodate new consumers and businesses' needs. Urban logistics can be defined as any service provision contributing to an optimised management of the movement of goods in cities.

Consumers' behaviours have changed rapidly in the past few years, and the way people travel for shopping has been transformed accordingly. People shop in a growing number of places, including local shops, local supermarkets, large supermarkets, malls and the internet at the same time (and in the same week). In Europe, Japan, Korea and North America, internet shopping for all kinds of goods has become mainstream. This generates a demand for new logistic and transport services, among them home deliveries or deliveries at the office or at pick up points. Businesses also have growing demands for new logistics services. Surveys have shown that many inner city retailers are interested in (and willing to pay for) new services such as the rental of storage space, dedicated areas for the reception of their deliveries, specialized services for the pick up of palettes, etc.

In response to these demands, the number of initiatives taken by the logistics sector has been surprisingly low and it is only since the mid 2000s that entrepreneurial initiatives can be noted (Dablanc, 2007). Companies such as Shurgard provide urban storage space for shopkeepers. Star' Services, a transport company with 1,500 truck drivers, is specialised on home deliveries of food products to urban households in French cities. The Deutsche Post has installed thousands of "PackStations," or automated locker banks, in German cities' public spaces so that ecommerce customers can be delivered at any time of the day. In the largest wholesale market of fresh products of Europe (Rungis, South of Paris), logisticians have proposed new delivery services to urban customers. In other regions of the world, small scale delivery services develop on niche markets (delivery of cooked meals at workplaces for example).

Consolidation schemes for urban deliveries can bring benefits to the local business communities (see the example of Motomachi Urban Consolidation Center in Japan below).

Motomachi UCC in Yokohama, Japan

The Urban Consolidation Centre of Motomachi, an upscale set of pedestrian shopping streets in the city of Yokohama, processes 85% of flows delivered to the neighborhood's shops. The remaining 15% concern fresh products, furniture and the goods of retail chains having their own logistics. Three CNG trucks make delivery tours from the Urban Consolidation Centre, located a few hundred metres away of the retail area.
The truck companies that use the UCC pay ¥150 (€1.25) by parcel delivered. Motomachi UCC was difficult to implement (it took seven years for the local retailers' association to find a sound business plan and efficient logistics organization). Today, the scheme provides a very good delivery service to shopkeepers, at a low environmental cost to the community.

Shanghai is an interesting example of the way logistics providers are evolving (Chin et al., 2007). Large traditional state-owned companies (5% of current companies), are still China's backbone logistics firms, but are not very efficient and in the process of restructuring. Private domestic logistics companies (37% of current companies) are medium sized companies. They are efficient but lack capital. Since the deregulation of transport in 2005 following the entry into the World Trade Organization, two new groups of logistics providers have appeared in China. Sino-foreign or foreign capital logistics providers represent 11% of current companies,

TNT and DHL being the first. And companies affiliated to large manufacturers which became separate profit centers or even independent third party logistics providers represent 47% of logistics companies. These firms make Shanghai one the most active places for global logistics services in Asia, providing packaging, labelling, logistics information systems, fleet management, product returns, inventory management, cross-docking, shipment consolidation, customs clearance, warehousing and transport, carrier selection, order processing.

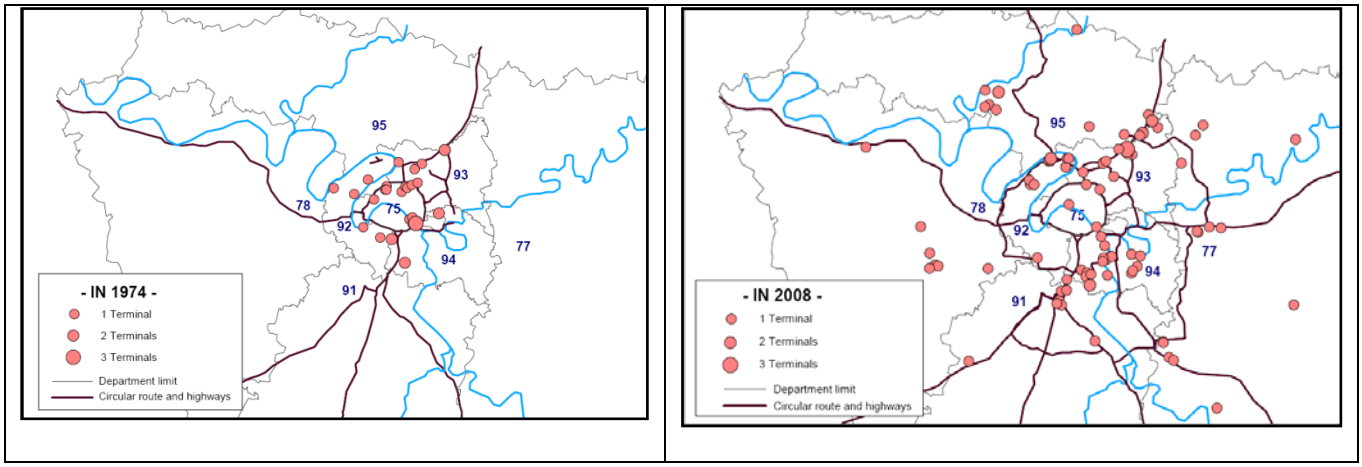
These services are key assets for metropolitan areas. Cities that do not provide them may have difficulties in serving businesses already in place and in attracting new companies. Antun et al. (2007) emphasize this point for Mexico City. In Medan, Indonesia, a city of two million people, logistics services are not developed. Most local companies use their own warehouses, due to low land prices and low needs. Logistics services are quite basic, as companies have only a few connections through which goods can be traded. A low level of trust in trading explains that there are very few large-scale wholesalers (Sako & Kato, 2006).

3.4. 'LOGISTICS SPRAWL': RELOCATION OF WAREHOUSES AND TERMINALS TO THE SUBURBS

Land use patterns determine many features of the urban movement of goods. The spatial distribution of industrial, commercial and logistics facilities has a direct impact on the number of vehicle-kilometers that will be necessary to reach the stores, industries and households that need to be supplied. A majority (more than two thirds in the case of European cities) of all shipments to and from urban areas are organized from terminals and distribution centers located in the close vicinity. These terminals are key elements of the urban freight system.

Logistics sprawl is the spatial deconcentration of logistics facilities in metropolitan areas. Historically, freight transport terminals tended to be close to the city centers, favoring a proximity to railway networks. Confronted with the severe land pressure in large cities, as well as with the large urban renewal projects that took place in the city during the 1960s and 1970s, logistics and transport companies began to follow a centrifugal locational pattern (Woudsma et al., 2007). The physical moves were done by small-scale changes in their spatial organisation, with the closing of urban terminals and the opening of new ones further away. Today, these terminals are located as close as possible to highway networks and suburban airport areas. The constraint of land availability remains as these new terminals are quite larger than they were before.

Fig. 3: Logistics sprawl of cross-dock terminals in the Paris region



Source: Dablanc & Rakotonarivo, 2009

The first consequence of terminals' deconcentration is the increase in distances travelled by trucks and vans to deliver the urban areas where jobs and households remain more concentrated. This is further reinforced by the general tendency to locate logistic facilities close to arterial road networks while reducing the total number of facilities. Terminals today are bigger than they were before, and each one serves more businesses and households than they used to. All this leads to more vehicle-miles travelled by trucks and vans in the metropolitan area. A recent study (Dablanc & Rakotonarivo, 2009) has estimated the CO2 emissions' impacts of the relocation of cross-dock facilities[12] serving the Paris region at 15,000 tons per year for the last 34 years (Fig. 3).

Very few companies have a strategy towards a minimization of distances travelled for their goods' supplies. The supply of transport services is considered as a given external factor, and it is generally considered sufficient despite increasing congestion. The issues of climate change, increasingly on the agenda for both private and public actors in large metropolitan areas, may well change these strategies. In this case, a new urban and regional planning approach will have to be taken into consideration, including perhaps the reintroduction of logistic spaces and logistic facilities within very urban areas of the metropolis. Atlanta, in the U.S., has recently identified a strategy of preserving and developing existing logistics zones and concentrating new developments in predefined "logistics nodes".

3.5. LABOR ISSUES, SUBCONTRACTING IN THE TRANSPORT SECTOR

Subcontracting is a key pattern of the organisation of urban deliveries. It means that the last mile and the actual delivery of a shipment are made by a different operator from the one formally hired by the shipper. The rate of subcontracting is proportionate to the size of a city. In French cities, up to 90 to 100% of urban freight operations in express parcel transport are subcontracted to small operators. Illegal practices, up to undeclared workers, are a common feature of this transport outsourcing. This segment of urban freight is often associated with the use of old (and thus more polluting and noisy) vehicles, and with drivers who exceed the authorized driving time (which leads to tiredness and a greater frequency of accidents).

Delivery workers are often the least regarded workers in the trucking industry. Wages are low, while the work is stressful. Lack of staff and difficulties in recruiting skilled employees have been a recent feature of urban transport markets. The turnover of staff can be high, leading to difficulties in providing a good service, and a high level of traffic penalties for companies. The share of urban deliveries done without a proper contract is probably high, leading to poor working conditions and social insurance problems in case of accidents.

The development of coursiers on motor bikes has also led to an increase in difficult working conditions. Drivers are often paid based on the number of deliveries they perform everyday, leading to risky behaviors such as fast driving and the neglect of basic safety rules in order to perform as many deliveries as possible in one day.

3.6. PORT AND AIRPORT CITIES (IMPACTS AND OPPORTUNITIES)

Many metropolitan areas have grown out of a port activity. Ports in major cities often have a national impact and represent gateways for a country's exchanges with the rest of the world. In general, the development of port activities does not have a direct impact on urban distribution, because imported goods are stored in warehouses before their final distribution (transformation, consolidation). But port cities face challenges in

[12] Cross dock facilities are the terminals used in the parcel (less than truck load) and express transport industries.

finding the best way to move goods in the metropolitan area (modes, routes, types of vehicles, time of the day). As world trade is increasing with the globalisation of supply chains, the use of larger vessels and the implementation of more efficient freight and logistic systems, the quantity of freight transported (and in particular the number of containers) is increasing, with a direct impact on urban road networks and congestion. Several kilometer long queues of lorries at the entrance of a port have become a noticeable feature of many urban landscapes. In Tokyo, the activities of the three major ports of the bay (Yokohama, Tokyo and Chiba) add a lot of truck traffic to the city roads. In Melbourne, Australia, the regional government developed the Victorian Transport Plan including a freight plan that targets the enhancement of the port's commercial efficiency and capacity supported by the development of information and communication technologies.

Being a maritime hub also brings economic opportunities for a city. Some coastal African cities try to develop as hubs, such as Accra/Tema in Ghana or, with more success despite capacity problems, Durban in South Africa (Pedersen, 2001). Even inland cities have developed as inland ports to provide solution for the insufficient capacity of African ports, such as Kampala, in Uganda (Pedersen, 2001). Cargo airports can play the same role, with even increased impacts: Dubai, Nairobi, Johannesburg and Abidjan have benefitted from their air cargo activities, at the expenses of other cities in the same regions.

3.7. ALTERNATIVES TO ROAD TRANSPORT IN CITIES

Cities are true kingdoms of road freight transport. Rail and inland waterway were very much a reality in the past, and many decision-makers and public opinion wish they become a new reality in the future. Other modes ("tube freight systems," pipelines, pneumatic conveying systems) have been imagined. However, very few experiments have succeeded, so far.

In the past, trains and barges were a common feature of goods' supply in the heart of cities. Rail together with waterborne transport even proved a valid combination in the Hudson Bay in New York City: up until the 1960s 300,000 wagons were carried on floating bridges across the Hudson every year (reported in IAURIF, 1999).

Today, barge transport maintained some importance in cities with waterways. About 7% of tons brought to or shipped from the city of Paris are carried on the Seine river. In Phnom Penh, Cambodia, the Mekong river still constitutes an important water way for goods' access (oil products, building materials, agricultural products and containers) (Ripert, 2006). Rail freight, due to its impacts, its cost and the lack of available capacity on the infrastructure because of a growing passenger rail traffic, has been ousted out of cities. Some opportunities exist to develop it, mainly because under-used rail freight facilities are still in place close to city centres. However, most observers agree that the difficulties and costs associated with rail services for the transport of goods in cities make this option unrealistic. Rail freight needs dedicated logistic facilities (tracks, sidings, yards, terminal) that are space consuming and therefore very expensive within central areas. Other problems arise such as land pressure (there are numerous development projects such as housing, parks, retail or offices on former rail facilities). There is often a strong local opposition to rail freight's perceived environmental impacts: old and noisy locomotives, poorly looking industrial areas and the generation of truck movements.

Recent years have seen some new projects. They fall into three categories: 1. The re-use of traditional rail freight terminals, such as in Rome, Munich and Paris (the Monoprix experiment - see under) 2. The use of underground rail facilities for freight (projected within the renovation of Les Halles commercial center in Paris, a "flower train" project in Amsterdam/Schiphol, and a mail train in London) but no project yet has been implemented. And 3. Cargo-tram services, using existing tramway infrastructure. Cargo-trams have been

experimented in Dresden, Germany, where a tram is in operation since 2000 for parts supplied to a Volkswagen plant, and in Zurich, Switzerland, for voluminous refuse. A major project, called Amsterdam City-Cargo project, went bankrupt in early 2009.

The Monoprix experiment, in Paris, has been in operation since November 2007. Monoprix is a chain of supermarkets with sixty stores located in Paris. These stores receive non food products and non alcoholic beverages by rail. A twenty wagon train arrives in Paris Bercy station (in the eastern part of Paris) every evening. Pallets are then transferred to CNG operated trucks which deliver goods to the stores early in the morning. The train, which was formed 30 kilometers South of Paris, uses regional and urban passenger train tracks to reach the Bercy terminal. 210,000 pallets per year are distributed this way, with a yearly saving of 10,000 diesel trucks, 280 tonnes of CO_2 and 19 tonnes of NO_x. The City of Paris has invested €11 millions in the project. The Monoprix rail project is technically satisfactory but its operation is quite expensive, with an additional cost of 25% compared to the former all road solution.

4. POLICY RECOMMENDATIONS

Faced with challenges and an inefficient and unsustainable freight system, cities have to take action. Serving the local economy and accompanying economic transformation is a priority. There are tools for policy-makers to better organize urban freight, although the task is not easy: even in countries with strong local political entities, policy leverage is weak regarding urban freight. Margins of progress do exist and a *realistic governance* for urban freight transport can be defined around a few principles and the adoption of best practice.

For the most part, policy recommendations identified in the following sections can be implemented in the short term and can lead to short to medium term impacts. Best practices illustrate each of the recommended policies and measures.

4.1. SETTING UP A GOVERNANCE STRUCTURE FOR A FREIGHT TRANSPORT POLICY

In a complex environment such as an urban territory, where environmental, social and economic issues are competing and difficult trade-offs are involved, some degree of government intervention is necessary.

4.1.1. Assessing the needs of the economy

Cities must act knowledgeably. They should take informed decisions on urban freight by collecting data at regular intervals. Data collection methods are manifolds. Guidelines are available to technicians and elected representatives, such as: Ogden, 1992, OECD, 2003, and Bestufs, 2007. To minimize costs and provide a comprehensive overview of goods' flows in a city, surveys should target local businesses and assess their freight demand patterns. These surveys give more detailed information about the different economic sectors' logistics chains than simple cordon surveys on vehicles (Ambrosini & Routhier, 2004).

4.1.2. Identifying tasks and responsibilities

Public authorities have different leeways to intervene on urban freight. They can *finance* or *regulate* activities. For example, they can spend some budgets on:

- surveys and data collection,
- subsidies to small operators who want to buy cleaner vans or trucks,
- investment in road or rail infrastructure to support freight flows, and
- hiring a "Mr" or "Ms Freight" to manage freight issues and set up consultation processes with private stakeholders (see Section 4.1.3).

Public local administrations can also regulate essential areas of freight activities, such as:

- truck and van access restrictions (see Section 4.3),
- land use: in a land use master plan, logistics activities must be identified, differentiating between logistic activities and other manufacturing activities. Areas for logistic facilities, logistic zones, truck service areas, long term truck parking areas must be identified and reserved (see Section 4.2).

A key issue in the governance of urban freight is that the urban planning department, the transport department and the economic development department work in coordination on all issues related to freight and logistics.

4.1.3. Organizing public private consultations on urban freight

No successful urban freight policy is possible without prior consultation with freight companies and their organisations, with local business groups and residents. A permanent Urban Freight Forum should be set up with all target groups and meet on a regular basis.

It is very important that:

- All stakeholders be included. Representatives of small transport operators should be identified (this is not an easy task) and invited. In case they do not participate to the Forum, some companies of this category should be interviewed on a regular basis.
- Shopkeepers' associations are convinced to come. These local organisations are generally not interested in freight and delivery issues, although they may greatly benefit from facilities such as an urban logistics space. Enhanced street attractiveness can be a major benefit for their customers.
- Specific proposals should be presented to the Forum's participants. Meetings are not only places for information and discussion but also places for negotiations on specific local policies such as the location of a logistics space or an access regulation.

A Freight Portal is an essential feature of a good communication with operators and other stakeholders. It provides information on truck access and delivery regulations, the provision of loading/unloading bays, and any other specific information on urban freight.

4.2. SERVING URBAN GROWTH

Unless under abnormal conditions (wars, natural disasters, or rationing in state controlled economies), very few cities in the world experience a rupture in goods' supplies. Goods always find ways to reach urban businesses and consumers. However, enhancing the *quality* and *added value* of goods' distribution is a very important objective for policy-makers.

4.2.1. Providing logistics parks

A higher quality of goods' distribution is closely related to the provision of logistics services. Making logistics services available means organising business opportunities, providing space at affordable price, and promoting training in logistics jobs. An interesting global solution is the development of logistics parks, partly with public investment. These logistics parks include common facilities and services for all companies located on the site, such as surveillance, catering, fuelling, cleaning station for trucks, overnight truck parking and night accommodation for drivers. These parks must be accessible by public transport at extended hours, as logistics jobs require untraditional working hours. To respond to local opposition, environmental standards set or promoted by the municipality should enhance the quality of the buildings (well maintained buildings, low noise road pavement, solar panels on roofs, protection against earthquake exposure). Appendix 2 shows the detailed map of a logistics park.

The use of former industrial areas can be helpful to develop specialised logistics areas. However, remediation efforts (for the removal of polluted soils for example) should not be too extended as programs for logistics spaces cannot sustain a high cost of land. Logistics facilities should always be located close to arterial roads and adequate access to these facilities has to be organised, with identified regional lorry routes to reach them. Access roads to nearby highways need to be well dimensioned and should avoid inadequate road geometry, including sharp bends, excessive or incorrect road camber, poor visibility at level crossings, sub standard clearances on overhead bridges, poles, signs, overhanging trees, etc. (Ogden, 1992).

4.2.2. Setting up training programs for logistics jobs

Bodies such as chambers of commerce should promote campaigns and training programs for logistics jobs, from warehouse workers to managers' positions. In Vilnius, Lithuania, in 2006, many logistics managers were missing and the logistics professional organisation together with the municipality and the chamber of commerce organised a cooperation with other countries to recruit trained staff. Discussing with local universities about new training programs (including Masters' programs) in logistics and supply chain management can also be an option. Georgia Tech has implemented a training program within the premises of Savannah's major Logistics Park.

Specific training for driving operations is discussed in Section 4.3.

4.2.3. Developing urban logistics spaces

In central areas, public authorities should promote the development of "urban logistics spaces," i.e. terminals of about 500 to 2,000 m2 located in dense urban areas where logistics services can be provided to neighborhood businesses and residents. These logistics spaces can be directly provided by public authorities in the facilities they control, such as underground parking. In that case, a bid for tender should be organised so that operators using the space, at affordable "logistics rent," can demonstrate best practices with regards to environmental, social and economic objectives.

Services that can be provided in "urban logistics spaces" may include:

- Receiving of parcels delivered to local businesses and residents. The service may also include final deliveries to the clients. These deliveries can be a paid service, or a free service (when provided to old or disabled people)
- Collection and sorting of palettes and cardboards from shops
- Short or medium term storage space
- Packaging and order processing for local manufacturing firms, and
- Provision of technologies that may not be affordable to individual firms (down to basic services such as access to the internet).

Depending on its size, an urban logistics space can accommodate pick up and delivery vehicles. In small facilities with no room for the parking of vehicles, adequate on-street delivery areas must be provided. If a storage service is provided, the minimum area for an urban logistics space is 1,800 to 2,000 m2. Such a center is generally associated with about 6 to 8 delivery vehicles and a dozen employees (Boudouin, 2006).

4.3. MAKING CITIES SAFER AND MORE LIVEABLE

Environmental concerns must influence local actions on freight transport. There are three main specific goals a city should target with regards to a more sustainable urban freight distribution: reduce CO_2 emissions, reduce NOx and particulate matters' emissions, and reduce noise. These objectives can be reached through a combination of the following policies.

4.3.1. Planning to prevent logistics sprawl

Metropolitan planning of logistics facilities is one of the key policies to reduce truck vehicle-kilometers (see Section 3.2). The final choice for the location of logistics terminals results from a bilateral relationship between a developer (logistic real estate companies, logistic providers) and a local community. Small municipalities can have large companies such as ProLogis, a firm managing 51 million square meters of logistics space worldwide, asking for a building permit. Sometimes, these cities find it hard to negotiate on equal terms with these companies. Other times, cities oppose logistic spaces systematically. This has been the case in St Mard close to Charles de Gaulle airport in the Paris region. For the last twenty years, St Mard's local government has opposed the development of a multimodal freight terminal on its territory despite a general consensus (region and nationwide) about the economic and environmental benefits for the region to develop such a terminal there. As a consequence of these local decisions, logistics activities do not have space in central areas anymore, and are spreading over suburban areas, generating a lot of additional truck-kms to deliver their clients.

This is why a metropolitan or regional Master Plan must include logistics land use provisions that can orientate local decisions. The recently adopted Schéma directeur de la région Ile-de-France (master plan for the Ile-de-France region) includes a Thematic Map on "Multimodal Sites and Freight Infrastructure," and identifies twenty-five specific areas where logistic terminals will have priority for development or redevelopment, in a concentrated manner and with adequate access infrastructure. This is a long term policy that can also have short and direct impacts on building permits.

4.3.2. Keeping/reintroducing non motorized and cleaner modes of transportation

The "motor transition" seen in section 3.2 can be addressed by promoting existing as well as future clean modes of deliveries.

Existing nonmotorized vehicles (bicycles, animal powered carts) must be better considered and promoted, by providing privileged access to the street space, such as reserved lanes on urban boulevards. A policy promoting bicycles targets passenger transport prioritization, but it can have an important impact for freight transport. In Paris, protected bus lanes have been made very wide (five meter wide) for permitting a mixed use of bikes and buses, buses being able to pass slower vehicles when necessary and at minimum risk. Additionally, 272 kilometers of bicycle lanes have been implemented since 1995. This makes it possible for new clean delivery vehicles such as the Petite Reine (see Figure 4), an electrically assisted three wheel delivery bike, to use them and enhance the productivity of delivery operations.

Fig. 4 La Petite Reine delivery tricycle in a Paris street

Photo City of Paris

Cities should also facilitate the use of CNG (compressed natural gas) or electric vans and trucks for urban deliveries when operators are willing to try them. Despite many experiments in the last twenty years, these two kinds of vehicles are not yet satisfactory, because of their high prices, difficult maintenance, small second hand market and insufficient number of refuelling facilities. In the absence of national or transnational initiatives, cities should not commit themselves in actively developing these specific markets, as the risks are high to spend a considerable amount of time and money for little positive impacts. However, whenever possible and if major players (shippers, truck operators) demand it, cities should encourage the development of refuelling facilities such as gas stations and access to plugs for electric vehicles in off street parking facilities.

One of the priorities of London's Freight Plan (Transport for London, 2007) is to provide detailed information about the use of alternative fuels and low-carbon vehicles accessible to all operators through a Freight Information Portal. This may be a very good first step to any municipality wishing to improve knowledge among freight operators without committing public finances into clean vehicles' schemes. Hybrid vans and trucks may actually be the most realistic clean delivery vehicles urban areas can accommodate. They are already quite common in Japanese cities.

4.3.3. Adopting environmental criteria for freight vehicles' access

Cities should adopt a delivery access regulation based on a simple combination of the size and the age of delivery vehicles. The following principles must apply in order to provide a harmonised, simple and easy to control access rule.

A ban on very large trucks, such as semi or double trailers, can be relevant in most city streets, as these trucks pose safety problems, can destroy elements of street space and pavement, block traffic and may have difficulties in manoeuvring. However, the size limit should not be too strict. Vehicle weight limits from 3.5 up to 10 or 15 tons are too low, i.e. only low capacity vehicles (small trucks and vans) can actually access a city. This generates a higher number of commercial vehicles in urban areas as, for example, several vans are needed to replace one medium size truck. A simple size limit based on the number of axles is a good alternative to regulations based on tonnage or on the surface of the truck. Two axle trucks are in the range of

17 to 20 tons and 25 to 30 m2, depending on the manufacturers and countries' regulations. A ban on three or more axle trucks has the important advantage of being easy to control.

A ban on the oldest commercial vehicles is also relevant. Because of increasingly severe regulatory standards and technical progress in manufacturing, today's trucks and vans are less polluting and fuel consuming than they were before. This is particularly true for NO_x and PM_{10}.[13] For CO_2 emissions, progress is more recent. A European Union initiative may soon impose a 120g limit for CO_2 emissions per kilometer for cars and light duty trucks sold in Europe. Some Swedish cities are ready to include a CO_2 emission criteria in their truck access regulation. In any case, setting access rules depending on age or the equivalent pollution category so that truck operators replace old vehicles with more recent and cleaner ones yields rapid results. Table 4 shows the impacts of a ban on trucks older than eight years on the emission of particulate matters in Gothenburg, Sweden. Impacts have been assessed after four years of implementation of the ban. Another important impact of age-based truck regulations is that they oblige small operators to organize their activities differently. Local or metropolitan authorities can help small operators comply with the new rules by providing subsidies to buy cleaner vehicles or by promoting schemes for the modernization of small trucking companies.

Table 4: Impacts of trucks' environmental regulation in Gothenburg, Sweden

	PM_{10} (kg/year)
Trucks < 16 tons with environmental zone	187
Trucks < 16 tons without environmental zone	566
Trucks > 16 tons with environmental zone	3312
Trucks > 16 tons without environmental zone	4531

Data from City of Gothenburg, May 2006

Harmonised rules on truck access and deliveries at the metropolitan level. One of the most important policies on urban freight is to provide a coherent set of regulations on such elements as delivery time windows and vehicles' technical limits (tonnage, size, age) in all municipalities within the same metropolitan area. It is important that truck drivers be given clear and simple rules (no truck older than eight years in all the metropolitan area, for example). Harmonised rules on trucks in cities also provide a more stable framework for vehicle manufacturers to develop products fitted to the specific needs of urban deliveries.

The reduction of noise generated by deliveries and the promotion of night deliveries. According to a survey made in New York City, businesses most likely to change to off peak deliveries are shippers doing their own transport (own account), and receivers open during extended hours such as restaurants (Holguin-Veras, 2005). This does not make a sufficient target group for the promotion of night deliveries, and cities should have a strong policy combining the promotion of silent equipments and some regulations. In the Netherlands, in twenty five pilot cities, the national government provides financial help for operators investing in silent delivery equipments (vehicles and handling equipments generating noise emissions below 65dB) for night deliveries at supermarkets. Tests have shown that companies save 30% in delivery cost and 25% in diesel consumption. This program is now duplicated in other European cities. The human factor remains a key

[13] See note 4.

element for noise abatement. Recent trials done in Paris have shown that the same equipment used by different truck drivers results in very different noise impacts.

4.3.4. Managing a more efficient access to ports

Efficient and simple measures can be taken to alleviate congestion to and from port areas. Results depend on the co-operation of economic interests. A good example is given by the recent state and local regulations applied to the ports of Los Angeles and Long Beach (Giuliano & O'Brien, 2008). In Los Angeles, impacts such as congestion and air pollution associated with increased ports' activity have led to a state regulation requiring appointments or extended hours at terminal gates and the implementation of the "Offpeak extended gate hours program" (2005) which established night and Saturday shifts at both ports. The program far exceeded expectations as more than an average of 60,000 truck moves per week have been diverted to the off-peak shifts. The program has had a notable impact on truck traffic congestion at the terminal gates.

4.3.5. Promoting the most sustainable practices among truck operators

Schemes that identify best urban freight operators can be set up by a municipality, as part of a Freight Forum for example. These schemes should be free, voluntary and open to any company operating bikes, vans or trucks. Being labelled provides advantages to an operator, such as extended delivery hours or the use of specific loading/unloading facilities. It may also provide a competitive advantage to an operator within a tendering process. Shippers increasingly commit themselves to select bidders offering the best guarantees in terms of transport environmental impacts.

A recent example of such an initiative is the FORS, or Freight Operator Recognition Scheme, in London. FORS provides a quality and performance benchmark for the trucking industry. A key project within the London Freight Plan (Transport for London, 2007), FORS gives a label (at bronze, silver or gold levels) to operators complying with a list of criteria such as efficiency, safety and environmental impact.

Another option to enhance sustainable urban freight is to facilitate the transition from individual shopping to home deliveries. In general, motorised shopping trips made by households (not a focus of this report) account for half of the vehicle-kilometers travelled for goods transport in urban areas (LET, 2000), and a significant share of CO_2 urban transport emissions. Any initiative promoting the substitution of individual shopping trips by professional deliveries brings benefits to the overall city's carbon impact. Among the best policies a city can take regarding urban freight is helping freight carriers enter the home delivery market and implement networks of pick up points (these pick up points make it unnecessary to deliver all the way to customers' homes, reducing vehicle-kilometers and costs- Augereau & Dablanc, 2009). German municipalities have agreed that the Deutsche Post implement its network of automated pick up points for parcel deliveries ('Packstations') on city streets and in other public places, contributing to the overall success of the scheme.

4.3.6. Adjusting public procurement to promote a sustainable urban freight

Public procurement procedures can be efficient tools to achieve a more environmentally-friendly freight supply. Organizing them likewise can set an example to private contractual relationships between shippers, clients and transport providers.

Like any large company, a municipality receives all sorts of goods every day or more occasionally: letters and documents, office items, furniture. It also controls many contractual markets for services under its jurisdiction such as food supplies and furniture for schools or local hospitals. It is not very usual for a receiver to look at

the way goods are supplied (transport matters usually fall under the shipper's responsibility). However, cities can influence transport patterns by introducing energy-efficient and sustainable transport provisions in the contractual requirements they ask of their suppliers. The municipality of Gothenburg, in Sweden, has established such provisions for some of its transport providers (taxi services and parcels transport companies).

4.4. PROVIDING BETTER TRAINING AND LABOR CONDITIONS TO FREIGHT WORKERS

Delivery persons are often the least regarded workers in the trucking industry (see section 3.5), leading to poor working conditions and a high turnover. Local and national governments can take decisive actions to enhance labor conditions and skills in the urban freight sector.

4.4.1. An enhanced regulatory framework

In many countries, trucking companies are subject to specific professional regulations. What is more uncommon and can be done with high social, environmental and economic benefits for the urban freight sector, is a specific regulation for the light transport market (transport services using light vehicles such as vans and motorbikes). In France, all third account freight providers using vans and bikes have to register to a "light transport register" that includes:

- Proof of professional skills: either a specialised transport degree or a ten day training period in a specialised training center is required.
- Proof of financial capacity: the company must detain 900€ per vehicle, and
- Proof of honorability: the head of the company must have a police record exempt of some specified offenses.

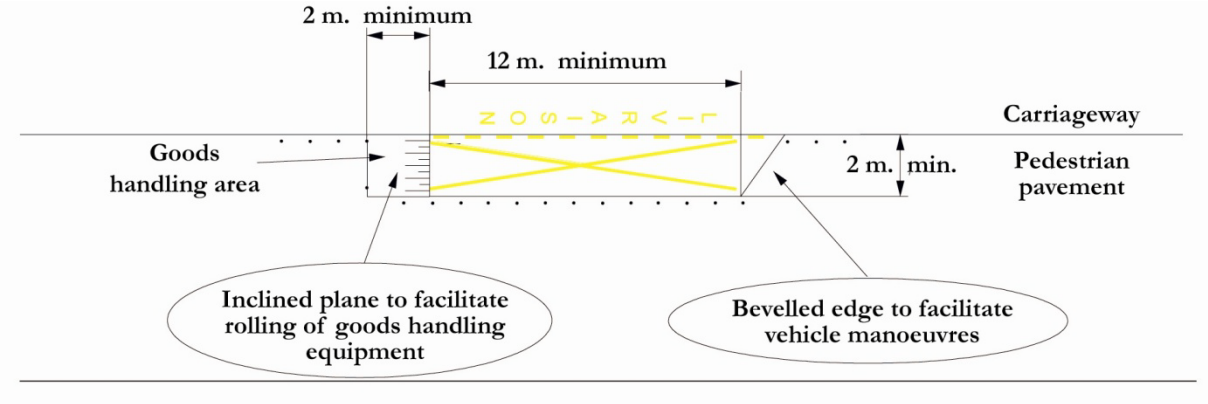
For employees of urban trucking companies, specific training programs can be set up and proposed by local authorities together with local chambers of commerce, professional organisations and labors' unions. These programs include safe driving, ecodriving, the use of new technologies (positioning systems), knowledge acquisition of the city's map, city's traffic and delivery regulations, and of basic commercial transport legislation.

4.4.2. A better design of street space for delivery activities

Delivery workers must have a good access to the points of deliveries and pick ups. In busy urban areas and city centers, this means the identification of adequate on-street loading and unloading bays.

Loading bays must be easily accessible to the driver. A minimal length of ten meters is necessary so that opening the rear doors of the vehicle and handling the goods is possible with ease. Figure 5 below shows a specific design of a delivery bay encroaching on the sidewalk. This design has provided good results in Paris. Alternative designs exist, such as loading bays positioned at an angle to the curb. A careful attention must be given to suppressing obstacles around the loading bay, such as humps and posts. Obstacles often prevent drivers to operate on board handling equipment, generating harder manual work. A sufficient number of loading bays must be provided. A good ratio is one delivery area for ten to twelve street level businesses. Other interesting lay outs are entire sections of a parking lane dedicated to deliveries during restricted time windows.

Fig. 5 Proposed design of an unloading/loading bay



City of Paris, 2005

In any case, these matters should be discussed with partners in the Urban Freight Forum if it exists (see Section 4.1).

4.4.3. Stricter controls and enforcement, less corruption

Local police must be assigned freight transport operations among their top enforcement targets. This means enforcing any existing regulation on emissions, age and size of vehicles as well as on delivery time windows. This also means more control on operators to verify their compliance with social and professional rules. This is a very important element of an urban freight policy, so that operators, especially the small ones, that do comply with the rules are not discouraged from working legally while they face unfair competition from other companies not adequately registered or circulating with non complying vehicles.

Other important issues for urban freight operators are theft and corruption. Corruption from street police or (in port areas) customs' employees is a reality for many urban freight operators worldwide, but policies to fight corruption are not limited to freight transport and must be organised globally. The safety issue can be more easily targeted as a specific urban freight policy. Many delivery workers are subject to theft while delivering within their clients' premises. Some local regulations absurdly reinforce the problem: in some cities, leaving truck doors open is the only way of proving that a vehicle is being loaded or unloaded in the absence of the driver. In Paris, the problem was solved very simply by distributing a delivery parking disk to all delivery operators. The time when unloading operations begins is marked on the disk and the vehicle can park thirty minutes on a delivery bay without being fined. Doors can be locked during operations and the goods are more secure.

More sophisticated systems of control exist such as cameras coupled with automated plate reading, but at a high operating cost for the city (in London, there is a cost of £30,000 –installation and control included- per camera). A special "freight brigade" of fifty police officers on motorbikes has been created in Barcelona, Spain. These policemen are dedicated to controlling freight traffic and deliveries in the city center, with a high benefit/cost ratio as additional collected fines pay for additional salaries, and a better availability of delivery areas is secured in most of the city center.

5. LIST OF KEY WORDS OR CONCEPTS

Key words to remember when identifying an urban freight transport policy:

Access restrictions

Cargo Tram

City Logistics

Clean vehicles

Consultation policies, public private partnerships

Delivery areas, unloading/loading bays

Education and training in urban freight

Efficiency of Urban Freight

Environmental impacts

Freight brigade

Freight data collection

Labor conditions

Land use control

Load factor

Logistics services

Logistics sprawl

Low Emission Zones

Mixed use buildings

Motor transition

Multi story logistics buildings

Multi Use Lanes

Night deliveries

Parcels' transport, express parcels' transport

Port access

Public procurement

Small transport operators

Urban Consolidation Center

Urban Freight Forum

Urban Logistics Space

Urban truck fleet

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The site **www.greenlogistics.org** on a major U.K. "Green Logistics" initiative provides an urban distribution chapter with valuable results of (sometimes on-going) studies.

List of E.U. funded projects that provide data and experiments' results on urban freight transport:

BESTUFS 'BEST Urban Freight Solutions' (2001-2008) **www.bestufs.net**

CITY PORTS 'A network of cities following a co-ordinated approach to develop feasible and sustainable city logistics solutions' (2003-2006) **www.cityports.net**

CITY- MOVE (starting 2009)

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FIDEUS, 'Freight Innovative Delivery in European Urban Space' (2005-2008)

FREILOT (2009-2012)

MOSCA 'Decision Support System For Integrated Door-To-Door Delivery:
Planning and Control in Logistic Chains' (completed in 2003) **www.idsia.ch/mosca/intro.phtml**

NICHES 'New and Innovative Concepts for Helping European transport Sustainability' (2004 – 2007) **www.niches-transport.org**

SMARTFREIGHT **http://www.smartfreight.info**

START 'Future solutions for goods distribution' (2006-2009) **www.start-project.org**

SUGAR 'Sustainable Urban Goods transport Attainable by Regional and local policies' (2009-2013)

APPENDIX 1 – CASE STUDY: URBAN FREIGHT IN MEXICO CITY

This appendix is a compendium of some documents on urban freight in Mexico City completed with phone interviews with experts.[14] Not much data had been collected on urban freight and logistics in Mexico City until the implementation of a major survey published in 2006, called "Estudio integral metropolitano de transporte de carga y medio ambiente para el Valle de México" (Metropolitan Comprehensive Study on Freight Transport and Environment in the Valley of Mexico) – (Lozano et al., 2006). Despite numerous surveys made on different items (transport demand, transport supply, logistic centers) for this study, the authors recommend that a comprehensive survey on urban freight in Mexico City be carried out. They also recommend the creation of a Freight Transport Observatory for the whole metropolitan area, that may also serve as a Freight Forum, a place where transport operators and local administrations can meet and discuss issues.

The Mexican trucking industry

With the deregulation of the Mexican trucking industry which took place in the 1980s and 1990s, the obligation to belong to "centrales de carga," or freight central organisations, was abandoned. The traditional organization of regular services on specified routes and products tend to disappear, and (with some exceptions) fixed freight rates have been abandoned (Ruiz Olmedo, 2007). Truck operators hold a permit to operate, whereas before deregulation they were "concesionarios" (private contracting parties with a delegation to run a public service). Permits to operate a cargo truck are still identified by the government as a "federal public service concession."

The main Mexican trucking association, CANACAR (Camara Nacional del Autotransporte de Carga), was founded in October 1989 to represent the interests of the 4,000 trucking companies that are from the federal "public service," i.e. primarily truck owners who carry cargo for third-party services. CANACAR was created in response to the policy of deregulation led at the time, in order to "avoid the dispersion and atomization of the sector" (CANACAR website). Competing with CANACAR are two other trucking organisations, the National Association of Private Transport (ANTP), and the Mexican Association of Courier and Messenger Companies (AMEPAC). ANTP is a newer organization that represents large companies who own their own fleets, as well as companies that do fleet leasing. AMEPAC represents courier service suppliers, including world integrators like DHL, FedEx and UPS, as well as many national companies such as Estafeta.

Most trucking companies in Mexico are very small. Table 1 shows the structure of the Mexican road transport sector.

Table 1 Number and size of truck companies in Mexico

Type of companies	Number of companies	%
Very small operators (1 to 5 vehicles)	79,254	83.5%
Small operators (6 to 30 vehicles)	13,413	14%

[14] Phone interviews with A. Lozano, UNAM, and with **S. Garcia Martinez,** Director of Proyectos y Mercadotecnia**.**

Medium size operators (31 to 100 vehicles)	1,619	2%
Large operators (more than 100 vehicles)	465	0.5%
Total	94,751	100%

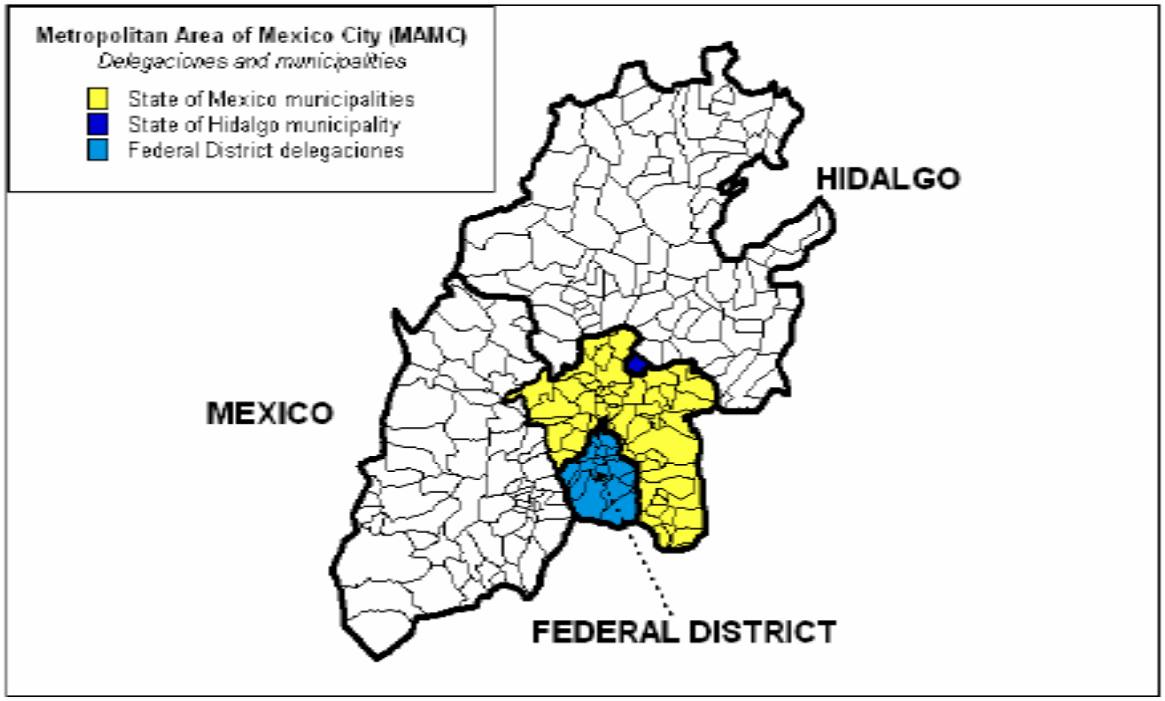
Data from Ruiz Olmedo (2007)

Mexico City's metropolitan area and its governance

Greater Mexico City (often named "Mexico City" below), with a population of more than 20 millions, refers to the Metropolitan Area of the Valley of Mexico (*Zona Metropolitana del Valle de México*), which includes:

- Mexico City (also called the Federal District, itself composed of 16 **boroughs** - delegaciones) with a population of 9 millions.
- The Metropolitan Area of Mexico City (MAMC) (*Zona Metropolitana de la Ciudad de México*) constituted by the Federal District and 59 adjacent **municipalities**: 58 from the State of **Mexico** and one from the State of **Hidalgo**.
- 18 additional municipalities.

Map 1: The institutional boundaries of Greater Mexico City (source: OECD, 2004)



As described in (OECD, 2004), this addition of different institutions and institutional levels makes for a difficult governance. Cross-jurisdictional cooperation is further complicated by a heterogeneous assignment of responsibilities between the Federal District and its delegaciones and between the states and their

municipalities (for example, municipalities have more financial power than delegaciones). There are many co-ordinating and planning bodies or agreements between the Federal District, the States of Mexico and Hidalgo and the Federal government. They have established specialised commissions, including one on transport and one on environment. The Metropolitan Environmental Committee (MEC) has been successful in achieving programs such as "Hoy no Circula" (one day without a car) and vehicles' technical control.

In the freight transport institutional and regulatory framework, Lozano et al. (2006) also point to the diversity and complexity of jurisdictions. It is difficult to distinguish between federal and local responsibilities for transport policies, transport laws and regulations, and enforcement and control. At the federal level, 190 out of the currently existing 1,255 "Official Mexican Norms" directly relate to the surface transport sector, such as the weight and size of trucks. Lozano et al. (2006) oppose federal rules to local legislation, the latter being quite different in the Federal District and in the State of Mexico, such as for technical controls. They note a high level of non-compliance of rules from freight transport companies.

Mexico City's economy

Mexico City is a logistic gateway to South America and a place with many regional headquarters of multinationals, with the associated advanced services that this can bring. Mexico City also accounts for a third of the country's manufacturing output (as compared to 50% in 1970). Among the successful industrial sectors are the pharmaceutical industry, the manufacturing of automotive parts, the printing and publishing industry (OECD, 2004).

Despite its weight in the national economy and the region, Mexico City had, in 2000, a GDP per capita of 13,500 USD, ranked 63 of all OECD large metropolitan regions: with a base of 100 for Mexico City, GDP per capita for New York City was 361, for the Paris region 289, for Naples 118 and for Seoul 103 (OECD, 2004). The city has a low rate of labour productivity, due to poor factors of production and also (but to a lesser extent) a concentration in low productivity activities.

The economic structure of Mexico City includes many "clusters," or spatial concentration of small firms working in the same or related sectors. However, these firms have little cooperation and interaction among them (OECD, 2004). There are no collective processes between the different companies of a cluster, despite the fact that some shared activities could be beneficial directly and at no cost, such as training programs, environmental actions, research and testing of new technologies (OECD, 2004).

As regards the spatial patterns of manufacturing in Mexico City, industries have started to shift away from traditional industrial areas in the center (in Federal District's boroughs) towards the West of the city in more recent industrial developments. In most parts of its territory, Mexico City is characterized by a high level of mixed land uses, with industrial clusters located very close to offices and residential areas.

Very important for the urban freight issue, a key feature of Mexico City's economy is its high number of very small firms. 42% of the active population is employed in micro-firms, of which only half are businesses which have an established workshop, while the rest are home-based or street-based (OECD, 2004). This makes for specific movements of goods, not always operated by regular trucking companies but by more informal means of transportation.

The OECD (2004) also points to inadequate transport infrastructure in Mexico City, leading to poor regional accessibility, which hinders market extension and international integration, maintaining high logistic costs. Congestion is a very acute issue. An indicator of the city's congestion is the following: more than 80% of the 4

million intra-metropolitan trips per day are undertaken in low capacity vehicles (minibuses, taxis and private cars) and less than 20% are made in trains, trolleys, metro systems and buses.

A recent survey among 1,650 truck drivers (Lozano et al., 2006) well demonstrates the challenges of urban freight operations in Mexico City: the congestion, the lack of space for loading and unloading, the complexity of legislation, the corruption of police, the risk of theft and the lack of safety are among the highest concerns raised by the drivers.

Freight transport demand in Mexico City

Lozano et al. (2006) identified four different groups of economic sectors with similar patterns of freight transport demand:

- Group 1 is made of local shops, cooperatives and supermarkets. They sell a very high variety of products and as a consequence they ask for a very high diversity of freight services.
- Group 2 is made of specialized shops, commercial centers and malls. These shops are very similar to the previous group in terms of products' diversity, with the exception of non processed food products. Truck companies serving this market are from the federal public service or local truck companies.
- Group 3 are markets and tianguis (an old Aztec word meaning street markets). These markets use the local freight transport public service, as they are supplied exclusively from the Central de Abasto, the wholesale centralised marketplace for fresh products (see Table 2), which only uses these transport services.
- Group 4 are hospitals and schools, which mostly need processed food. These sectors use only commercial (private) transport services, with pre-established routes.

Some specific generators of goods movements can also be identified because of the volumes involved, such as the Central de Abasto (the wholesale central market), located in the central southern part of the city. Table 2 presents some statistical indicators of the Central de Abasto.

Table 2: Main statistics from the Central de Abasto, Mexico City

Total area	304 hectares
Population served	20 million people
Trade specialty	30% of national production of flowers and fruits
Operated volume	30,000 tons of food and basic products
Warehousing capacity	122,000 tons
Vehicle traffic	52,000 vehicles/day
Number of visitors	300,000 per day
Direct employment	70,000 employees

Data from Central de Abasto website

Freight transport supply in Mexico City

The supply of freight to Mexico City can be done by informal means of transport and services (pedestrian transport, carriages). The share of this informal transport sector is not known, as surveys are missing (and would be difficult to do, although not impossible). Rail freight services do exist (there are two terminals, one in the North and one in the South of the metropolitan area) but volumes carried by rail to Mexico City are not important. As regards freight supplied by road freight vehicles, detailed statistics have been collected by Lozano et al. (2006). There are about 450,000 registered freight vehicles in the metropolitan area, as against more than four million private vehicles. 56% of the freight vehicles are light vehicles, 34% are medium size trucks (a medium size truck has a weight between 3.5 and 7 tons) and 10% are heavy lorries.

The detailed number of vehicles according to the different types of freight services is shown on Table 3.

Table 3 - Number of registered freight vehicles in metropolitan Mexico (2004)

Local freight public service (Federal District)	16,906	4%
Freight commercial and private services (Federal District)	194,149	44%
Freight commercial and private services (State of Mexico)	148,345	34%
Federal freight public service	81,260	18%
Total	440,680	100%

Source: Lozano et al. (2006)

Commercial and private services, i.e. own account transport services (transport made by manufacturers with their own fleet and employees), make up the majority of vehicles (78%). They mostly use small trucks or vans: 70% of their vehicles are two axle and 3.5 tons or less. For companies with 100 and more vehicles, the average number of deliveries a vehicle makes every day is 22, which indicates operations of collection and distribution and less than truck load activities. Small companies (the ones with less than 100 vehicles) carry products such as furniture and vegetables. The main products carried by large companies (with more than 100 vehicles) are processed food and hazardous goods.

Public service transport companies (which are third party transport service providers) mostly use trucks and lorries (90% of the fleet). In average, these vehicles serve only two delivery addresses a day, indicating a large share of full truck load activities. The products most carried are mineral products, construction materials, furniture, processed food and vegetables.

The boundaries between these rather competing truck markets are not clearly established. CANACAR, the national trucking organization representing public service operations, complains, for example, that private service fleet operators are breaching the law by providing third-party services although they were not issued federal licenses (Castillo Mireles, 2004). The legislation states that private fleet operators can provide service to third parties if the products are "linked or related to the operations of the fleet owner." (An example given in (Castillo Mireles, 2004) explains it: a baking company that owns its own fleet of trucks can haul refined sugar for a third party because sugar is a product used in the baking industry). According to R. Castillo Mireles (2004), the number of companies going back to operating their own fleets and not outsourcing to licensed carriers is increasing. Private transport operators such as the bottling company Femsa and baking company

Bimbo now operate huge fleets of multiple-use transports to fulfil their own supply needs. But in doing so, they have forced many trucking companies out of business.

The age of the freight vehicles registered in Mexico City is, in average, twelve years but it varies according to the trucks' categories: the average age of the vehicles from the local public service is 29 years, indicating that very old (therefore polluting) trucks are circulating in the city streets.

Surveys from Lozano et al. (2006) also indicate that only 25% of the vehicles have access to loading/unloading zones, while the vast majority of trucks and vans make their deliveries on-street, in most cases on illegal spaces (double parking).

Freight flows within Mexico City

"Logistic sprawl" (the relocation of freight terminals in suburban areas in an un-coordinated manner) is a growing reality in Mexico City. Faced with the growth of urbanization and fearing land use conflicts, many transport and logistic operators develop new terminals far away from the traditional industrial and logistics zones of the inner metropolitan area. Many of these logistic facilities have moved to small cities around the metropolitan area (Lozano et al., 2007), generating an increased number of truck trips to circulate and deliver in Mexico City.

Places for long term parking, including night parking, for trucks are mostly located in the central eastern and northern parts of the metropolitan area.

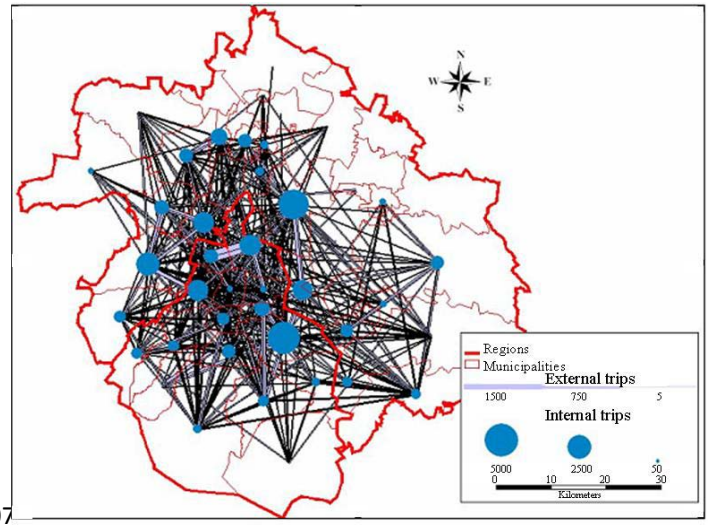
Within metropolitan Mexico City, the number of trips estimated at the peak hour (8 to 9 in the morning) is the following (Lozano et al., 2006):

- 242,623 van trips
- 123,179 medium size truck trips, and
- 42,077 heavy lorries.

Map 2 below shows the estimated truck flows (heavy trucks) on Mexico City's road network. Detailed maps are available in Lozano et al. (2006). Major freight generators have been identified and classified in three categories:

- Terminals generating industrial shipments (manufacturing plants)
- Terminals reorganizing shipments (transhipment and cross-dock terminals, large warehouses), and
- Major spots of final destination (wholesale markets, large retail centers).

Map 2: Heavy lorries' flows on Mexico City's road network



Lozano et al., 2007

According to A. Lozano (phone interview), there are some electric trucks circulating in the historic center of Mexico City, but in a very limited number. There are quite a large number of trucks running on natural gas. In general, freight traffic in Mexico City contributes to pollution (especially so as the city is at a very high altitude), but less so than private vehicles. More importantly, freight contributes to (and suffers from) congestion. Mexico City has no highway ring (however, one segment of a circular highway will be opened in a few months) and through traffic is important (more than 15% of total trucks). Freight vehicles, even large ones, have to travel through residential zones and use inadequate or narrow streets (Lozano et al., 2007).

An interesting scenario based analysis was made (Lozano et al., 2006) on the impact of truck access policies on congestion. The authors conclude that banning access of large lorries to the Mexico City metropolitan area did not bring much positive impact on the congested road network, while the elimination of both large lorries *and* medium size trucks would have a much greater impact, especially in areas with large freight generators. Congestion, in any case, remains high despite truck restrictions. "Banning heavy lorries may not be relevant for alleviating congestion in Mexico City." Such bans, however, have a more significant impact on local emissions, as shown on Table 4.

Table 4: Percentage of emissions reduction at freight peak hour (simulation)

	NOx	HC	CO
Scenario 1: all vehicles allowed	0	0	0
Scenario 2: ban on heavy lorries	3-7%	3-14%	3-14%
Scenario 3: ban on	9-23%	9-39%	9-40%

medium size and heavy lorries			

Source: Lozano et al. (2006)

Urban freight policies in Mexico City

According to A. Lozano (phone interview and Lozano et al., 2007), there is no coherent freight policy in Mexico City. Most local governments have only one priority, that is to ban trucks from the city streets. A pilot test was started by the State of Mexico to ban truck circulation during morning hours. Only voluntary companies were invited to test this measure. Very few companies agreed to enter the scheme as no provision was made to accommodate the trucks outside of the restricted zone waiting for the hour when the ban is lifted. The positive aspect of this test was that it resulted in a more permanent process of consultation and negotiation between Mexico City's public administrations and freight carriers.

Generally speaking, Mexico City's urban freight suffers from very fragmented policies on truck access and regulations due to the high number (more than 50) of local governments in the metropolitan area.

According to Lozano et al. (2007), only one institution has taken freight issues quite seriously: the Metropolitan Environmental Committee (MEC), which is interested in freight movements because of their impacts on air quality and pollutant emissions. This resulted in the MEC asking the Universidad Nacional Autonoma de Mexico (UNAM) to make a major freight survey (Lozano et al., 2006). A series of simulation works have led the authors to make the following recommendations to the MEC and other public institutions from Mexico City:

- Improving congested intersections, investing in bypasses in some key bottlenecks of the major road network
- Organizing freight transport corridors
- Reinforcing road pavement on major lorry routes, reinforcing signalling and road information for truck drivers, distribute brochures to freight organisations
- Testing congestion charging for trucks at peak hours, and
- Setting up the bases for a comprehensive planning of logistic facilities, making reservations for future logistic developments. These reservations are called "Reserve Areas for Logistic Activities" (or "RALAs"). Eight large "RALAs" were identified (see Map 3 in the next Section), based on various criteria: a RALA has to be close to industrial/manufacturing activities, far from residential areas, close to main roads, and preferably construction-free.

According to S. Garcia Martinez, a Mexican logistics consultant (interview), rail freight transport may also be an important issue for the future. The federal government wants to build intermodal terminals around Mexico City, adding one to the North and one to the West to the existing two terminals. The idea is that shippers and their transport providers will choose the best terminal according to their geographical location, in order to avoid unnecessary traffic in the metropolitan area. Freight rail development requires the cooperation of public and private parties but most of the key initiatives will have to come from the private side.

According to the OECD (OECD, 2004), Mexico City is also missing a dynamic Metropolitan Development Agency "to co-ordinate actions in the different fields relating to improving firms productivity, the quality of the workforce and the levels of investments." Logistics issues would represent a key target for such an agency.

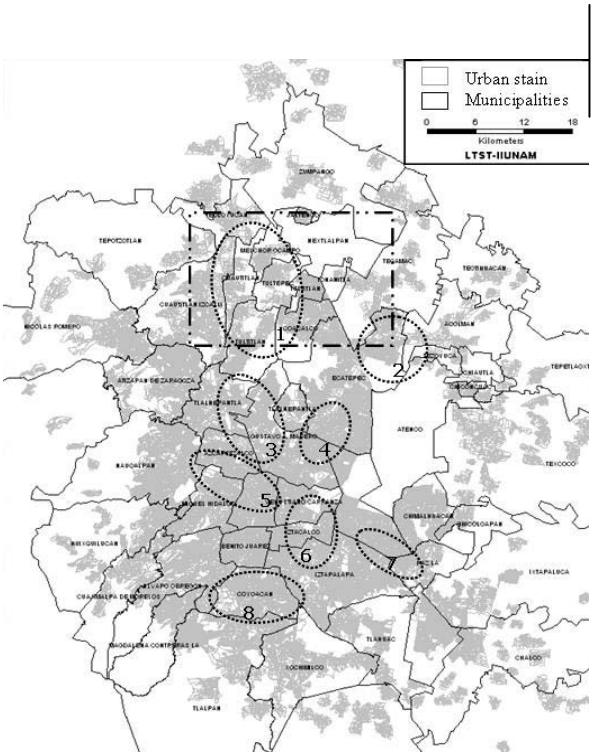
Logistic terminals and logistic services in Mexico City

After years of inadequate logistics service provisions in Mexico, Lozano et al. (2006) notice a surge in logistic real estate development in the country. Making use of former industrial areas, new logistics centers have appeared around the country's main cities, especially Mexico City. However, the authors' diagnostic is that there is a insufficient provision of logistics terminals in Mexican urban areas to serve the local and regional economies. For Mexico City, a prospective study (Lozano et al., 2006) identified a number of supply chains that require logistics terminals and services. Among these are, for example:

- the shoe making industry
- the pharmaceutical industry
- the wines and liquors retail sector
- regional distribution centers for supermarkets
- regional distribution centers for chains of franchised restaurants and cafeterias , and
- cross-docking terminals

The "RALA," or Reserve Area for Logistical Activity policy proposed by Lozano et al. (2006) (see previous Section) led to the identification of the best area where logistics facilities could be located. This ideal location is in the North of Mexico City, one close to the roads Circuito and Mexiquenses, and one close to the highway between Mexico and Querétaro (zone 1 on Map 3). According to A. Lozano (phone interview), the RALA proposal has been well understood by private companies and private investors. What is still lacking is a commitment from the local administrations. A follow up of the freight study made in 2006 is currently on-going with Federal government's financial support.

Map 3: Reserve Areas for Logistic Facilities ("RALAs") in Mexico City



Lozano et al., 2007

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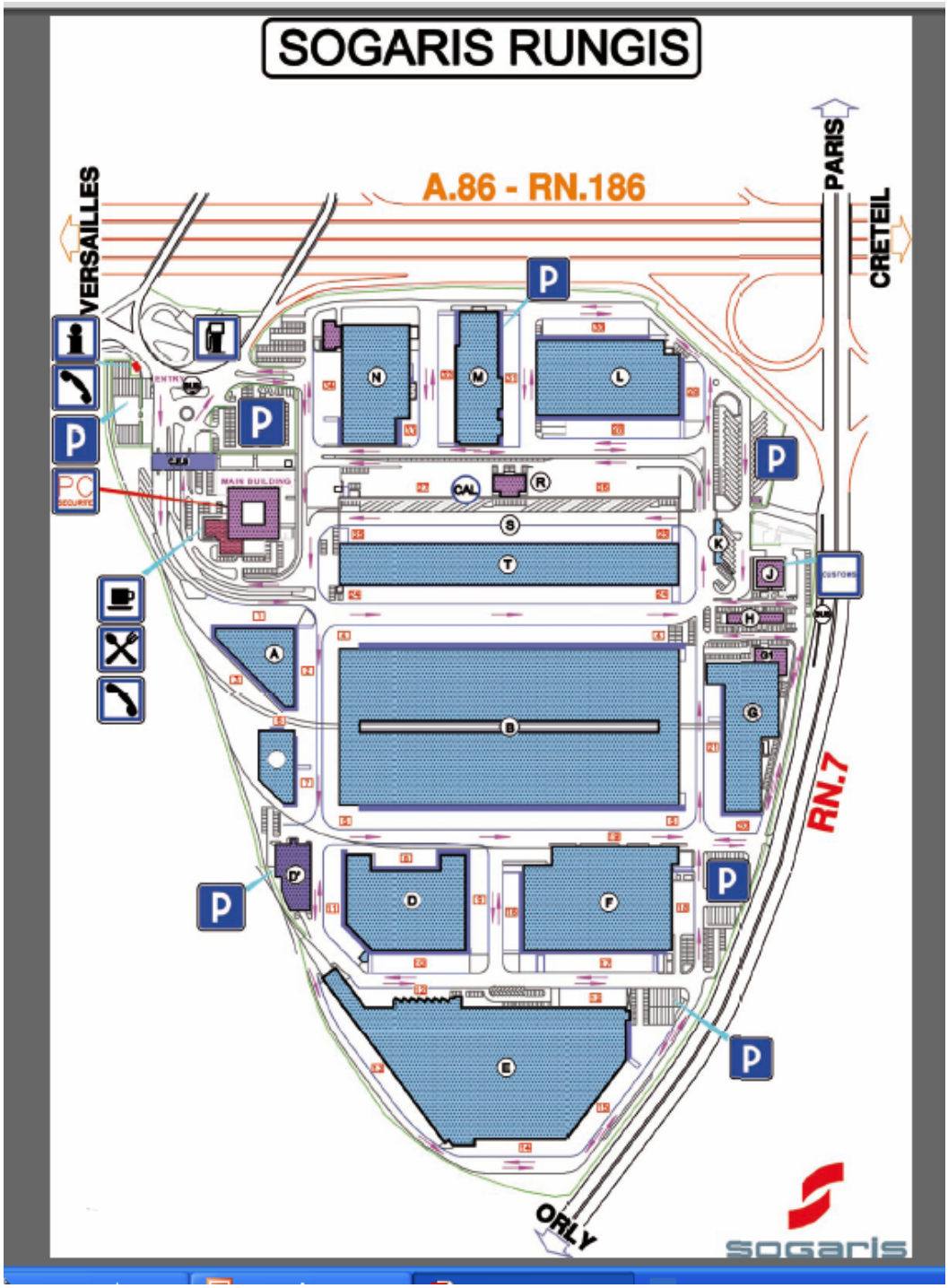
Appendix 2 - Lay out of a successful logistics park (Sogaris, South of Paris, France)



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