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The impacts of logistics sprawl: How does the location of parcel transport terminals affect the energy efficiency of goods' movements in Paris and what can we do about it?

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Abstract

In this paper, we propose to identify the location of parcel transport terminals in the Paris region (the "Ile-de-France"), and discuss its impacts on Paris urban goods' movements and their carbon footprint.
We present the gradual relocation of parcel transport's terminals from the urban cores in the 1970s to the outer suburban today. We evaluate whether this movement of "logistics sprawl" (the historical trend towards spatial deconcentration of logistics terminals in metropolitan areas) has an environmental and CO_2 impact on the Paris region. Representations of these gradual relocations are shown on maps using MapInfo and a centrographic analysis was conducted to evaluate an average of the deconcentration of terminal locations over the period 1974-2008. A centrographic analysis is a spatial analysis of geographic data using central tendency indicators. We, then, analyze the increased mileage resulting from these more distant terminals and we translate it into net added CO_2 emissions. The main results of our research are that a net addition of 15,000 tonnes per year of CO_2 emissions resulted from the change in location patterns of parcel and express transport terminals since the 1970s.
In this paper, we discuss the methodology chosen to evaluate freight transport's CO_2 impacts in Paris. The net CO_2 impacts of teminals' relocation is also compared to the savings of CO_2 emissions resulting from the city logistics' experimental schemes that have received much attention in the last few years in Paris.
The last part of our paper explores potential strategies for preventing further logistics sprawl in the coming years and mitigating the congestion and CO_2 impacts of logistics in urban areas.

Keywords: Logistics sprawl; parcel transport; terminal; energy efficiency; urban logistics; CO2 impact

1. Introduction

The issue of freight transport in Paris is recurrent. With a flow of 32 tonnes of goods per inhabitant per year, freight transport is necessary to the well functioning of the city. The Paris administration has developed an ambitious freight transport strategy since 2002 (Ripert, 2008). Aiming at a combination of objectives, from the

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mitigation of environmental impacts to city and regional planning, this policy is generally regarded as successful. However, with a strong emphasis on specific city logistics experiments, especially on "urban logistic spaces" (see the definition in section 2), the municipality of Paris has tended to neglect one important dimension of the issues of urban goods' movement in the Paris region: the "flight" to the suburbs of many logistics facilities.

Our communication aims at identifying the historical evolution (from the 1970s to the present) of the location of logistic facilities serving the city of Paris, as well as the impacts of these spatial movements on the distribution of goods to Paris. We have chosen to study the specific case of parcel and express transport and their logistics facilities (generally called cross-dock facilities), because parcel transport (also known as less than truck load transport) and express transport activities represent an important share of goods' transport in large Western cities such as Paris. Parcel and express transport activities are dominant in the city core where jobs, especially tertiary and service jobs are concentrated (Crocis, 2008). These activities also contribute significantly to the negative impacts associated with freight transport in Paris.

Our paper is organised in three parts. In the first section, we identify the location of all cross-dock terminals in and around Paris for four specific periods (1974, 1984, 2004, 2008, although the maps provided are restricted to 1974 and 2008 only). We then calculate the additional distance needed to deliver in Paris resulting from the change of terminals' location between 1974 and 2008. In section 2, we estimate the environmental impact (in terms of the number of tonnes of CO_2 generated) of the logistics sprawl we have identified in the first section. In the final section, we present some local and national policy issues related to the location of logistics terminals in the Paris region.

2. Logistics sprawl: The Change of the Location of Cross-Dock Terminals in the Paris Region between 1974 and 2008

We call "logistics sprawl" the movement of logistics facilities (warehouses, cross-dock facilities, intermodal terminals...) outside of the city of Paris' boundaries towards suburban areas (see Figure 1 for a description of the geographical and institutional situation of the Paris region). We have focused our research on cross-dock facilities used by the parcel and express transport industries. In order to make a clear case of the way terminals' spatial organisation has evolved historically, we have chosen to identify all specific locations of all terminals over a long period of time, ie. more than thirty years (1974-2008).

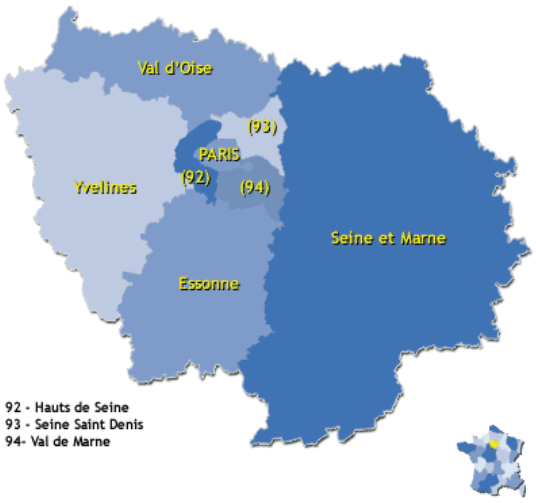

Figure 1 The Ile-de-France region's eight departments

2.1. Methodology

We have used different but interconnected methods for our research, working in three successive steps:

- An analysis of parcel transport companies' strategies regarding their location patterns. These strategies are very similar among companies. Historically, logistic terminals tended to be close to the city cores, favouring a proximity to railway networks. Today, these terminals tend to locate as close as possible to highway networks and suburban airport areas (Rodrigue, 2004; Woudsma et al., 2007), with an added constraint of land availability (bigger areas are needed than before). A literature review was done, including an analysis of studies focused on warehouses and logistic facilities and the way they have been located in the Paris region.
- First hand processing of statistical data bases on warehouses and logistic terminals in the Paris region. We have looked at the SIRENE data base. SIRENE is a database of all "establishments" (a single physical facility where business is operated by a company or an administration) on the French territory, on a regional or infra regional basis. It is managed by INSEE, the French national statistics' administration. We have also looked at the SITADEL database, a database of all building permits, as well as the database provided by the Paris chamber of commerce and industry. But the most comprehensive and useful database we have used was that of the yellow pages of the French postal company (La Poste). We found all the addresses of terminals for the past 34 years at the La Poste's archives in Paris.
- Interviews with managers of main parcel transport companies operating in Paris, including Chronopost and Geodis-Calberson. They have provided general information on the parcel transport industry, as well as specific information for their own companies. They have explained to us the main historical trends regarding the location and displacement of cross-dock terminals around Paris.

2.2. Context

The issue of urban sprawl for economic activities, especially logistics activities, is not new. In 1965, the Paris region's Land Use Master Plan (schéma directeur d'aménagement et d'urbanisme de la région de Paris) was designed with the stated objective to alleviate the congestion resulting from the expected rapid growth of households and businesses in the region (Murard and Fourquet, 2004). One of the outcomes of this Plan was the development of "new towns" around Paris, favouring the relocation of activities from the centre of the region to the suburban areas. Specifically to logistics activities, two large terminals were developed as "gateways" for the distribution of goods in Paris, located at the outskirts of Paris. One (Garonor) was developed in the North, while the other (Sogaris) was developed in the South. These two logistics platforms still exist today, serving the city and the region as a whole, although with quite different functions from what was originally planned (Dablanc, 1997).

Confronted with severe land pressure in Paris, as well as large urban renewal projects that took place in the city during the 1960s and 1970s, logistics and transport companies began to follow a centrifugal location pattern. This was not done through rapid and brusque movements, but with step by step small-scale changes in their spatial organisation, with the closing of urban terminals and the opening of new ones further away.

The first consequence of terminals' deconcentration is the increase in distances travelled by trucks and vans to deliver to the city core, where jobs and households remain concentrated. This is further reinforced by the general tendency to locate logistics facilities close to arterial road networks while reducing the total number of facilities (Savy, 2006). Terminals today are bigger than they were before, and each one serves more businesses and households than they used to do.

At the same time, within the city of Paris' boundaries, the cost of land has prevented the development of modern logistic facilities. These facilities have developed in the outer suburbs (Seine et Marne, Essone, Val d'Oise, Oise – see Figure 1) as early as the 1980s. This was well evidenced by a report from the Social and Economic Council (CESR) of the Ile-de-France region in 2000, through an analysis of warehouses and logistic facilities' building permits delivered in the region (CESR, 2000).

Another author (Graille, 2000) also demonstrated that in 1995 most logistic developments were taking place in the outer departments of Ile-de-France: Seine-et-Marne, Essonne and Val d'Oise (see Figure 1). Graille based his analysis on the study of the "agréments d'utilisateurs", or users' agreements, a specific authorisation scheme for logistics facilities in the Paris region. The report from CESR (CESR, 2000) on logistic real estate (between 1975 and

1999) showed that logistics sprawl was paralleled with the near absence of available warehousing space within Paris and very little new space for warehousing in the inner departments (Hauts-de-Seine, Seine-St-Denis and Val de Marne – see Figure 1).

By focusing on one sector only (parcel and express transport), we were able to be comprehensive. We could identify all parcel transport terminals in the Paris region over a period of 34 years (1974-2008).

2.3. Location patterns for parcel and express transport terminals since 1974

In the following sections of our paper, we consider the 17 largest (classified by their turnover) parcel and express transport companies distributing goods in Paris. Among them are the ten largest parcel transport companies and the ten largest express transport companies. Some companies are specialised both in traditional parcel activities and in express transport: this is notably the case of Geodis Calberson, DHL, Mory Team and Sernam (L'Officiel des Transporteurs, 6 juin 2008).

La Poste's yellow pages (official records of businesses' addresses) provided the exact addresses of all terminals for each year between 1974 and 2008. These addresses were then transformed into geographic coordinates (longitudes and latitudes in decimal degrees on World Geodetic System 1984) and used in MapInfo in order to achieve a mapping representation (see below).

Figures 2 and 3 show the location of cross-docking facilities in 1974 (Figure 2) and 2008 (Figure 3). We have represented on the figures the highway networks available at both times.

These figures show a concentration of parcel transport terminals in Paris or very close to Paris in 1974, while terminals tend to proliferate in the suburban areas (specifically in the outer suburbs) in 2008.

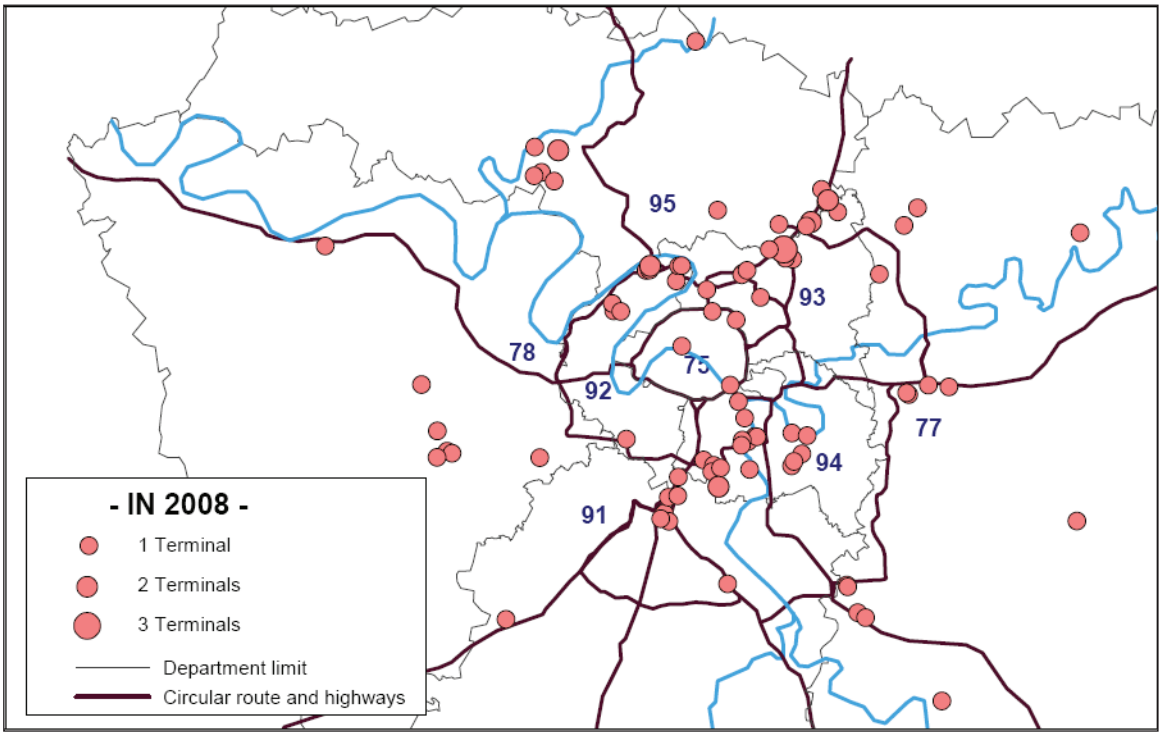

Figure 2 Location of terminals of large parcel and express transport companies in the Paris region in 1974

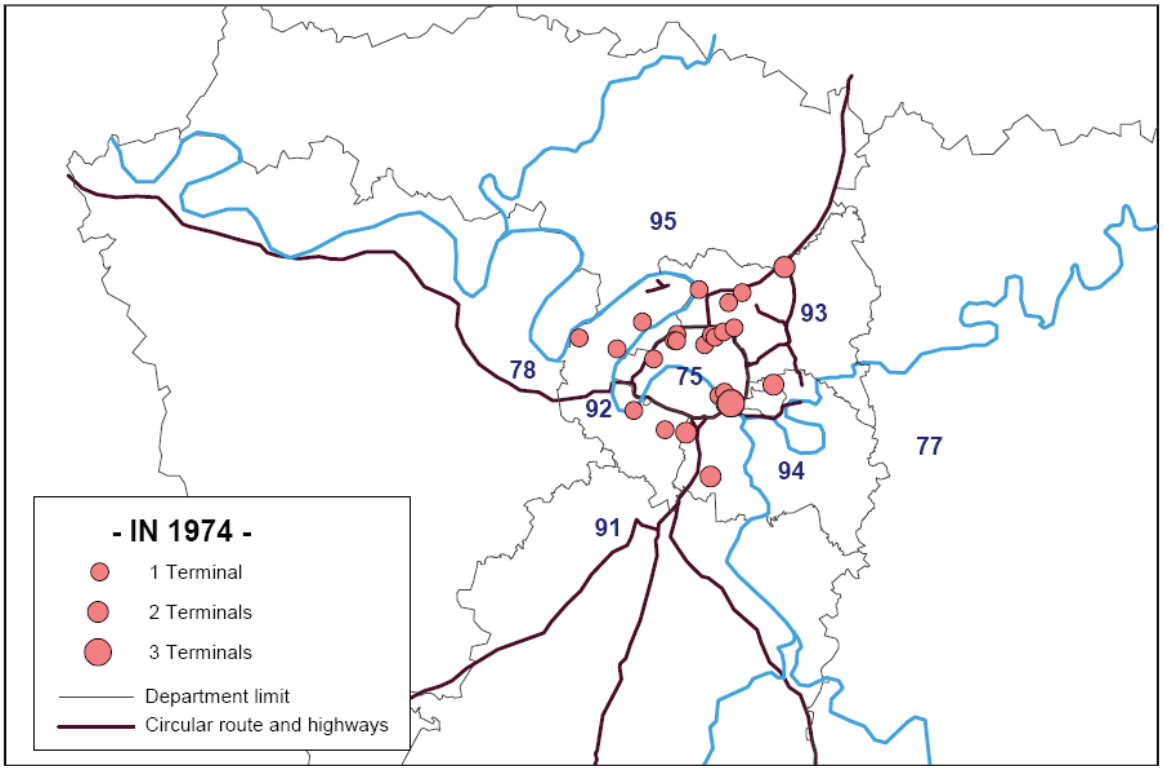

Figure 3 Location of terminals of large parcel and express transport companies in the Paris region in 2008

2.4. A centrographic analysis

In order to quantify then represent graphically the dispersion of terminals around the centre of the Ile-de-France region (i.e. the city of Paris), we have done a spatial analysis of geographical data (longitudes and latitudes) of these terminals' locations. This centrographic analysis is based on descriptive spatial statistics. It aims at identifying the geometric centre of a set of points representing locations and the dispersion around this centre (Zaninetti, 2005). For that, we have chosen to use the barycentre as the geometric centre because it is more sensitive to isolated locations.

We calculated the barycentre of the set of points representing the location of the terminals in 1974 and in 2008. The graphic representation of these two barycentres will provide the value of the distance between them, i.e. the additional distance to travel in order to deliver goods in Paris.

We have found that the barycentre has moved a distance of 1.78 km to the East and 2.19 km to the South (Figure 4).

The standard distance of terminals to their barycentre went from 6 km in 1974 to 16 km in 2008. We have also calculated the distance of the terminals to the centre of Paris (1st arrondissement). This has gone from 5 km in 1974 to 16 km in 2008.

Therefore, between 1974 and 2008, it can be said that the relocation of parcel and express transport companies' terminals has generated approximately an average of ten additional kilometres per terminal to deliver goods inside Paris.

Obviously, one must be cautious here. Locating a terminal in a suburban area can be relevant to serve suburban jobs and households, therefore reducing the total net distance travelled by trucks to their final destinations. However, our hypothesis is that the dispersion of transport terminals within the Paris region has been greater than the dispersion of jobs and households during the same period of time. This hypothesis is being verified in on-going work (Rakotonarivo, 2009).

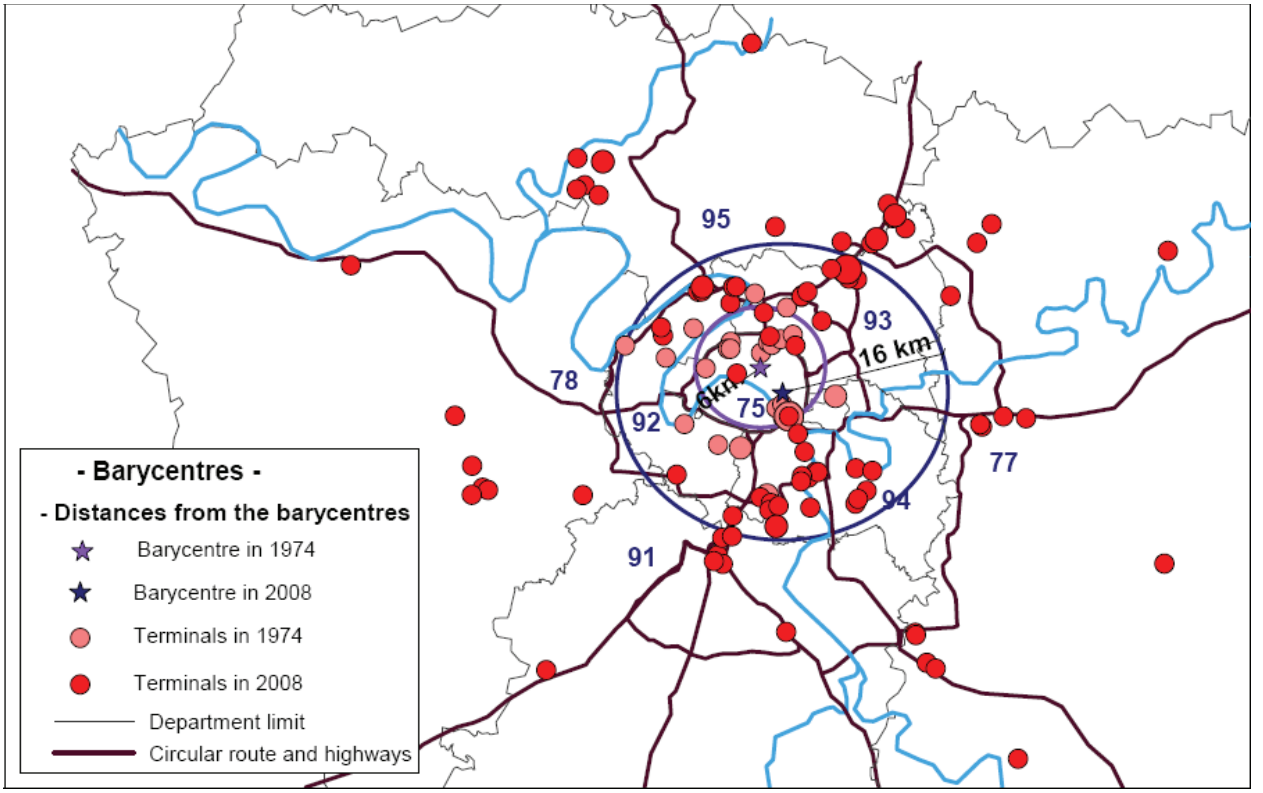

Figure 4 Displacement of barycentre and distance around barycentre

3. CO_2 Impact Assessment of Logistics Sprawl

Ten additional kilometres to deliver the city of Paris represent a net addition of CO_2 emissions. In this section, we evaluate the increase of CO_2 emissions generated by the suburban sprawl of parcel transport terminals over the 34 years considered. This computation is based on unitary emissions (in grams per tonne-km or g/tkm) of trucks and vans provided by ADEME, the French Agency for the Environment and Energy.

Table 1 Unitary emissions of CO2 for different kinds of freight vehicles (Source: EPE/ADEME, 2005)

	Unitary emission of CO2 (en g/tkm)
Light commercial vehicles (1.5 to 3.5 t)	1,103
Trucks (6.1 to 10.9 t)	435
Trucks (11 to 21 t)	221
Trucks (21 to 32.6 t)	196

We lacked information on the average tonnage of parcel transport activities for the year 1974. Therefore, we have considered a constant average tonnage of 193 tonnes per day generated by each terminal for both 1974 and 2008. This value is an average made from different statistical sources (Becker, 2003; Ministère de l'équipement, 2000; MEEDDAT/SESP, 2008).

According to the people we have interviewed, a classical situation for a parcel transport company is the following: about 30% of freight flows exiting from a regional Ile-de-France terminal goes to the city of Paris. We

also know (Mairie de Paris/Observatoire des déplacements) that 82% of the parcel delivery vehicles supplying Paris are light commercial vehicles, and 18% are trucks. By applying ADEME's unitary emissions, we can calculate, for the 93 terminals owned by the 17 largest companies that we have identified, that ten more additional kilometres travelled from each terminal to Paris final destinations generate 14,700 additional tonnes of CO_2 each year.

As a first approximation, therefore, we consider that for the last 34 years the relocation of parcel transport terminals supplying Paris has generated about 15,000 tonnes of CO_2 per year.

Let us now compare this result to the global amount of CO_2 emissions generated by all freight activities in Paris. The city of Paris has recently calculated its "Bilan Carbone", or Carbon Balance (Mairie de Paris, 2007). The result presented for freight transport is 6.45 million tonnes of CO_2 emitted each year in Paris. Compared to this amount, our specific result of 15,000 tonnes generated by logistics sprawl seems quite marginal. It can be interesting to analyse the methodology chosen by the city of Paris to calculate their CO2 emissions, especially the different activities of transport they have chosen to take into account.

Our own computation was only focused on the direct consequence of logistics sprawl, i.e. the additional distance that the delivery vehicles have to run to reach their Parisian destinations. Other indirect consequences such as the congestion created by additional vehicle-kilometres, as well as the additional employees' work trips towards the terminals, have not been considered. We have found that logistics sprawl for parcel and express transport terminals in Paris has generated an addition of about 400 vehicle-km per day for each terminal.

The freight Carbon Balance calculated by the city of Paris, on the contrary, includes all elements of the urban freight mobility generated by the city's population, businesses and administration. All goods imported from abroad are included in the computation, from their point of origin to their final destination. When air travel is concerned, this adds a lot of CO_2 emissions to the balance (nearly half of the 6 million tonnes generated). A closer examination of the methodologies for freight CO_2 emissions' calculation is being carried out (Rakotonarivo, 2009).

Another comparison provides interesting insights. It focuses on CO_2 emissions that have been avoided as a result of the implementation of "urban logistic spaces" in Paris. An urban logistic space is a physical facility located in an urban space that provides services to consolidate, optimise or reorganise the distribution of goods (Boudouin, 2006). Although there is no official figure, it can be said that these experiments (see under) have saved an average of 500 tonnes of CO_2 each year, or 30 times less than the additional amount of CO_2 generated by the suburban sprawling of parcel transport terminals. These urban logistic experiments are projects implemented with a strong commitment by the municipality of Paris. They have drawn a lot of media attention for the past few years, with the main ones being (Ripert, 2008):

- The implementation of a cross-dock terminal of 950 m² in a parking lot under the Place de la Concorde (Paris, 1st arrondissement). This consolidation terminal is used by Chronopost to organise its delivery rounds in the prestigious 7th and 8th arrondissements of Paris using electric delivery vehicles. This reorganisation has generated a saving of 31 tonnes of CO_2 yearly, according to the assessment studies made by the city of Paris (2007, 2008).
- The reorganisation of the logistic scheme of Monoprix (a large company of urban supermakets), to deliver to its Parisian stores. For the supply of dry goods, general products and non alcoholic beverages, Monoprix has opted for a combination of regional rail services and urban deliveries with CNG trucks. This new supply chain generates a saving of 290 tonnes of CO_2 yearly.
- The Petite Reine's last mile delivery service with electrically powered tricycles. This small operator is a sub contractor for major express transport companies such as DHL to serve some of their Parisian delivery routes.
- Consignity's automated locker boxes, implemented in underground municipal parking lots. These drop-off/pick-up-points are reserved for business uses (such as repair parts for Schindler elevators). They have alleviated the total vehicle-kilometres travelled by Schindler's employees to organise their repair routes within Paris.

The environmental results of these last two experiments (Petite Reine and Consignity) are not available yet. However, based on interviews with managers of the city of Paris, we estimate that about 100 tonnes of CO_2 per year have been avoided with these two projects.

In brief, we have analysed some of the negative environmental impacts of the changing location patterns of parcel transport and express companies' terminals over the past 34 years. These impacts, in terms of CO_2 emissions, are about 30 times higher than the positive impacts of urban logistic spaces developed by the city of Paris as

experimental schemes. Both impacts are marginal compared to the overall emissions of CO_2 generated by freight transport in Paris each year.

We also note that parcel and express transport terminals tend to locate increasingly close to airport areas and highway interchanges. The proximity to potential clients (zones with a high concentration of jobs and business parks) is not a specific target of location. This demonstrates that the strategy of parcel transport firms is not, as a priority, to minimize the number of vehicle-kilometres travelled by their trucks and vans to make the final kilometres. This was also confirmed to us by the interviews we conducted with parcel transport companies' managers. This situation requires some attention over planning and policy issues associated with logistics sprawl.

4. Logistic Planning and Public Policy Issues

Land use planning in French metropolitan areas is a very local affair. Municipalities and in some cases metropolitan authorities, decide on zoning and land use regulations and give out building permits according to land use master plans. There are more than 36,000 municipalities in France, representing 37.5% of all municipalities of the European Union. In the Paris region itself, there are more than 1,200 communes, with an average area of 10 km^2. Accordingly, decisions on land use and building permits are quite fragmented. In one metropolitan area, dozens of land use ordinances can coexist, making it difficult to promote a coherent regional development strategy.

Regarding logistics terminals, two kinds of local attitudes can be identified. On the one hand, some municipalities favour logistic activities, considering that they provide industrial jobs requiring little qualifications when more traditional manufacturing jobs have disappeared from metropolitan areas. On the other hand, many municipalities reject logistics activities, because they generate noise, truck traffic and safety problems. They are also accused of consuming space, with a low ratio of jobs per hectare (around 50).

On the whole, the final choice for the location of logistics terminals results from a bilateral relationship between a developer (logistic real estate companies and logistic providers) and a local community. Municipalities with less than a thousand inhabitants can have large companies such as ProLogis (a US firm managing 51 million square meters of logistic space worldwide) asking for a building permit. Sometimes, these cities find it hard to negotiate on equal terms with these companies. Other times, they oppose to the development of logistic spaces systematically. This has been the case in the North-East of Paris around the city of St Mard (close to Charles de Gaulle airport). For the last twenty years, St Mard's local government has opposed the development of a multimodal terminal on its territory despite a general consensus (region and nationwide) about the economic and environmental necessity for the region and the country to develop such a terminal there.

The region's Master Plans have started to integrate logistic activities. However, they tend to focus on specific issues, especially the issue of modal shift (promoting the shift from road to rail and waterborne freight transport within the region), and they take little account of the day-to-day issues of logistics, land use and building permits. A clear example of this lack of global vision is the recently adopted SDRIF, or schéma directeur de la région Ile-de-France (master plan for the Ile-de-France region). The new SDRIF was adopted by the Regional Council on 25 September 2008. The Thematic Map "Multimodal Sites and Freight Infrastructure" page 88 of the Plan describes all the freight facilities that have to be preserved or developed over the next twenty years. This map locates: "large port terminals; multimodal terminals; rail/road intermodal terminals; 'rail highway' terminals; freight TGV stations; urban ports; urban freight rail stations". There is no mention of road terminals and warehouses. The thematic map "Renew and organise the supply of spaces and facilities for businesses" on page 66 of the document identifies 25 specific areas where logistic terminals will have priority for development or redevelopment. None of these areas are in the inner suburbs (departments 75, 92, 93 and 95 – see Figure 1).

Therefore, the identification of areas for common logistic activities has not been considered in the inner suburban part of Ile-de-France, and not considered much in the outer suburban areas. Even when locations for such activities have been identified (such as in Thematic Map page 66), it is not sure whether municipalities will follow the regional Plan. Legally, target land use development classes identified by the SDRIF have to be taken into account by municipalities but in a quite relaxed manner: local land use ordinances "have to be compatible with" SDRIF maps, meaning they have to take them into account "to a reasonable extent". In French legal terms, "to be compatible with" is a much looser formulation than "to conform to", which is the case for other types of land use plans. In fact, few municipalities in the past have linked their specific land use planning and building permit decisions on SDRIF recommendations.

This discrepancy between local and regional land use planning decisions on logistic activities in Ile-de-France results in a fragmented landscape of logistic development. A more integrated planning approach could be adopted by allocating the decisions on logistic land uses to a regional authority. Such a system exists in France for the implementation of large surpermarkets. All building permit decisions for stores over 3,000 m^2 have to be decided by a department wide authority composed of various stakeholders including the local municipality involved in the development project, as well as other local and departmental governments and representatives from the chambers of commerce and industry. This authorisation is based on the compliance of the project with a list of criteria including the mitigation of transport impacts (such as the generation of truck and car movements). A similar organisation could be identified for logistic activities, considering the impact of their location patterns over added vehicle-kilometres and CO_2 emissions.

Another land use issue related to logistics terminals in urban areas is more closely related to parcel transport and express transport terminals. Some architectural solutions exist today to reintroduce freight terminals within very urban zones of a metropolitan area, especially when they have a footprint size between 1,000 to 10,000 m^2. Carefully designed multiple story terminals can accommodate a wide range of vehicles, types of goods and logistics activities while being located close to office, commercial or even residential areas. Although quite common in Japanese cities and other Asian urban conurbations (Hong Kong), these solutions have not yet been adopted by European cities. Some specialised developers (Sogaris, ProLogis Europe) have identified opportunities and some new buildings are being tested (such as in Brussels and in Marseille by Sogaris). Municipalities should better examine these types of logistic facilities and try ways of promoting them while minimising their potential environmental impacts.

5. Conclusion

In this article we have identified and mapped the detailed location patterns of the 17 largest parcel and express transport companies supplying the city of Paris during the period 1974-2008. Over the years, these companies' terminals have left the urban core (the city of Paris itself) then the inner suburban ring (departments Val-de-Marne, Hauts-de-Seine and Seine-St-Denis). Their most common location today is in the greater metropolitan area (the outer suburbs of the Ile-de-France region). In average, between 1974 and 2008, these terminals have moved ten kilometres away from their barycentre. We made the hypothesis (which still needs to be specifically verified) that the dispersion of terminals in the region has been far greater and faster than the dispersion of jobs and households, especially the types of jobs and households that demand parcel and express transport (tertiary activities, office jobs and e-commerce activities). We then calculated the net additional emissions of CO_2 generated by the increased distances travelled by trucks and vans to reach their final destinations. In this case, our computation has been quite general and a more detailed calculation taking the specific transport organisation and its change overtime for each company is needed.

This research is on-going (Rakotonarivo, 2009). For the moment, we reached a general conclusion as of the approximate amount of CO_2 generated by what we have called "logistics sprawl". These impacts can be approximated to 15,000 tonnes per year. They are quite marginal compared to the overall emissions of CO_2 generated by freight transport in Paris each year. However, they are about 30 times higher than the positive impacts of urban logistic spaces developed by the city of Paris as experimental schemes. We noticed that while urban logistic spaces' pilot experiments have received a lot of media attention, the dispersion of logistic terminals out of Paris and their relocation further and further away in Ile-de-France has not been taken into account by local governments, nor the regional council. We have examined some land use planning issues related to this lack of consideration for logistics activities at municipal or regional levels in the Paris region. We have proposed two kinds of solutions: a region-wide authority looking at building permits for logistics developments could be created; and at city levels (whether in Paris or in other large municipalities in the inner suburbs), more consideration should be taken towards new architectural solutions integrating logistic buildings within the urban core.

More detailed research is needed regarding the issue of logistics sprawling in metropolitan areas and its impacts on vehicle-kilometres travelled. The location patterns of logistics facilities and their change overtime should be closely compared to parallel location patterns for businesses and households. We have made the hypothesis (sustained by results from authors such as Veltz, 2005 or Aguilera, 2002) that the economy in metropolitan areas generates an ever increasing mobility of goods and people, not the contrary. There are yet very few economic agents

who have a strategy towards a minimization of distances travelled, be it for work trips, leisure trips or 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 logistics spaces and logistics facilities within inner urban areas of the metropolis.

References

Aguiléra, A. (2002). Services aux entreprises, centralité et multipolarisation. Le cas de Lyon. *Revue d'Economie Régionale et Urbaine*, 3, 397-422.

Becker, D. (2003). *Le développement des implantations logistiques en France et ses enjeux pour les politiques d'aménagement*. Rapport du CGPC.

Boudouin, D. (2006). *Guide des espaces logistiques urbains*. Paris: La Documentation française.

Conseil Economique et Social de la Région Ile-de-France (2000). *L'immobilier d'entreprise et l'aménagement du territoire en Ile-de-France Tome2: les locaux et les zones d'activités*. Synthèse de rapport, mai.

CROCIS, Centre Régional d'Observation du Commerce de l'Industrie et des Services (2008). Comment se porte l'économie du centre de l'agglomération parisienne ? Principaux indicateurs économiques et recompositions géographiques de l'emploi. Les Cahiers du CROCIS. N° 30.

Dablanc, L. (1997). *Entre police et service : l'action publique sur le transport de marchandises en ville. Le cas des métropoles de Paris et New York*. PhD Thesis, Ecole nationale des Ponts et Chaussées.

EPE, Entreprise pour l'environnement/ADEME (2005). *Module GES transports: Quantification des émissions de gaz à effet de serr*. Dossier de presse, octobre.

Graille, F. (2000). *Analyse du mode d'organisation de la logistique en Ile-de-France*. Rapport d'études pour la DREIF.

Mairie de Paris (2007). Le bilan carbone de Paris. www.paris.fr.

MEEDDAT/SESP (2008). www.insee.fr. Accessed on 27 January 2009.

Ministère de l'équipement, (2000). www2.equipement.gouv.fr/rapports/themes_rapports/amenagement/logistique/2001-0104-01_ann125-142.pdf. Accessed on 27 January 2009.

Murard, L., & Fourquet, F. (2004). *La naissance des villes nouvelles. Anatomie d'une décision (1961 – 1969)*. Presses de l'Ecole nationale des ponts et chaussées. Paris.

Rakotonarivo, D. (2009). Bilan carbone du desserrement logistique des agences de messagerie en Ile-de-France. Proposition d'optimisation de l'efficacité énergétique de la livraison urbaine à Paris. PhD proposal, INRETS.

Ripert, C. (2008). Le transport de marchandises en ville. La politique menée par Paris de 2002 à 2007. *Transports*, 450, 225-238.

Rodrigue, JP. (2004). Freight, gateways and MEGA-URBAN regions: The logistical integration of the BostWash corridor. *Tijdschrift voor economische en sociale geografie*, 95(2), 147-161.

Savy, M. (2006). *Logistique et territoire*. Paris: La documentation française.

Veltz, P. (2005). *Mondialisation, villes et territoires : L'économie d'archipel*. Paris: Presses Unviersitaires de France.

Woudsma, C., Jensen, J., Karoglou, P., & Maoh, H. (2007). Logistics land use and the city: A spatial-temporal modelling approach. *Transportation Research Part E*, 44, 277-297.

Zaninetti, JM. (2005). *Statistique spatiale. Méthodes et applications géomatiques*. Paris: Lavoisier.