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No More Trouble: Driving a Sustainable City Logistics

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Abstract

The authors study the appearance of a sustainable city logistics, along with the issues it raises for the large retailers that have decided to develop an important network of stores in town. Unlike the large stores located in remote peripheral areas, the stores located in town face legal and operational constraints that complicate the supply. A case study carried out with a large French retailer (Gamma) is used to examine the implementation conditions of its sustainable strategy. This company is considered as one of the pioneers of a sustainable view of city logistics in France. The paper shows that the success of sustainable strategy is strongly dependent on both an upstream involvement of the company in the decision-making process introduced by the local authorities, and a regular scanning activity of best practices to integrate the most advanced technological innovations. The paper also underlines the importance of a narrow interaction between companies and local authorities to jointly improve the city logistics organisation. A company as a large retailer that wishes to develop its network of stores in town should not wait passively for new legal constraints to appear to start adapting to them. On the contrary, it should anticipate them and offer innovative solutions to the local authorities, which will create value for both parties.

JEL classification numbers: L82, L83, M30, Z12
Keywords: City logistics, innovation, local authorities, sustainable strategy.

1 Introduction

The congestion of the main roads has become a reality of everyday life for those driving in large European cities, like Marseilles, Seville or Roma, with its trail of environmental and noise pollution. Private cars are involved in the phenomenon, but one must admit that the urban distribution, to the consumers' home or to stores, is also greatly involved. If the project for the future is to make families come back to the cities, after a massive departure to the suburbs [4], the issue of a sustainable city logistics will become capital. Indeed, the massive return of families would imply a rapid development of stores in the cities, for which

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supply should be organised in the best way by avoiding the anarchical proliferation of delivery trucks. If it is not done, the families' living environment risks deterioration because of growing pollution and continuous congestion of roads. This could encourage an early return to the suburbs.

That is why leading sustainable city logistics is today a requirement recognised as a priority by many policy makers. In many countries, such as France, Japan or Germany, convenience stores have grown rapidly for several years in large cities, and the issue of supply is more acute. Therefore, according to different surveys, nearly a third of product deliveries or pick-ups are directly linked to the food and non-food retailing activities [16]. It is impossible to leave a kind of *laisser faire* settle, and wait for cities to be completely paralysed from dusk till dawn, for lack of sufficient coordination of deliveries. Before this dramatic situation occurs, it is very likely that the local authorities will, in the future, accept the opening of new stores only for the retailers having encouraged real sustainable organisation. The companies that are innovative in this field could then quickly develop a competitive advantage and massively take up the urban space.

The aim of the paper is to study the case of a large French retailer that has led a genuine sustainable strategy since the years 2000s. It was able to drastically expand the number of stores in Paris, even though the city decided to implement a very coercive policy defending the environment under the leadership of its former mayor, Bertrand Delanoë. "*No more trouble*" seems to have been the *leitmotiv* of the French local authorities for a decade. In order to carry out the study, an analysis of secondary data and several semi-structured interviews were conducted in 2013 and 2014. For confidentiality reasons, this famous large French retailer will be called Gamma. Following Yin [21], our case study does not aim at generalising. Its goal is only to base itself on a successful sustainable city logistics experience to make recommendations for action intended for large retailers wishing to set up a network of stores in the heart of the cities.

2 The City Logistics Faced With Legal Constraints

The theme of city logistics is a growing concern for policy makers, companies and researchers as the increasing delivery of products in cities has become problematic. The difficulties are emphasised by the fact that the interests of the stakeholders may differ (see Table 1), and that we have to take act to avoid the development of entropic phenomena [14]. So as to protect the living environment of city-dwellers, who are also electors, local authorities have numerous weapons at their disposal: imposing of very narrow time windows, charging of tolls at the entrance of the city, requirement of deliveries from out-of-city distribution centres, or regulating of the unloading times, etc. The aim is to limit the traffic and the negative externalities linked to the city logistics [9]. The intervention of local authorities can be summarised according to two legal constraints.

Table 1: The interests of various stakeholders involved in city logistics

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Stakeholders	*Interests*
Residents	Good living surroundings Minimal hindrance of vehicles and trucks, especially during night hours Timely availability of goods
Visitors	Attractiveness Good shopping environment Accessibility Parking space
Estate managers & developers	Profitability
Stores	Good shopping environment Profitability
Shippers, carriers & retail companies	Accessibility Attractive local working environment Adequate infrastructure for logistical operations Cost efficiency
Businesses	Accessibility Attractiveness

Source: Adapted from Macário et al. [14].

2.1 Out-of-City Location of the Distribution Centres

The distribution centres in charge of supplying the stores located in the city are constantly moving away from the suburbs [8]. This process can be explained by two reasons. On the one hand, the increase of real estate prices, in particular in cities like Paris, London or Amsterdam, makes the construction of several thousands of square meters equipment close to stores very costly. On the other hand, policy makers prefer giving priority to the construction of accommodations for families, to the detriment of industrial or logistical buildings some would not judge very aesthetic. The flight of regional centres towards more and more remote peri-urban areas is, consequently, a reality that strongly complicates the management of final deliveries. As an example, the French retailer Casino manages its city logistics of fresh products for Paris from a distribution centre located 150km away. To the extent that the stores have practically no stock, the deliveries must be done every day.

2.2 Regulated Supply Systems

The local authorities have remained very passive for many years regarding city logistics. They gave this responsibility to private operators (large retailers, wholesalers, logistics service providers, etc.). This is not the case anymore. Countries like Italy, United Kingdom, France, Spain and Germany have multiplied public initiatives (see Box 1). Their common point is to set up collective and regulated systems of supply organisation for stores located in cities. Russo & Comi [18] offer a classification of existing measures, as well as associated constraints. This illustrates that the operations initiated regarding city logistics affect many

points: a) physical infrastructures (areas reserved for the loading and unloading of products); b) intangible infrastructures (information systems); c) measures related to the equipment (establishment of new supports to optimise the handling operations or new less polluting vehicles); d) measures related to the governance of city logistics (time windows, urban tolls).

Box 1: Implementing sustainable mobility: the Burgos case

In Burgos (Spain), goods stored in numerous central warehouses outside the city were distributed daily using small vans that circulated through the city centre. This gave rise to a number of problems: delivery vehicles circulating throughout the city, including sensitive zones in the historic centre, aggravating congestion problems; pedestrian zones full of large, noisy delivery vehicles during working hours; double parking during loading and unloading due to the illegal occupancy of reserved delivery bays; and delivery vehicles entering the city's pedestrian zones. The measure was therefore aimed at more environmentally friendly goods delivery by limiting access to clean zones in the city centre. The activities included:

- *optimisation of goods distribution logistics in the "clean zone";*
- *designation of specific parking zones around the "clean zone" for loading and unloading;*
- *design of a new concept for distribution in the "clean zone";*
- *design of a new freight logistics centre;*
- *analysis of the situation and level of involvement of distributors, logistics services and industries;*
- *analysis of social and economic feasibility and satisfactory layout for the new goods distribution system;*
- *introduction of cleaner vehicles for goods delivery in the "clean zone";*
- *implementation of public information campaigns to promote new goods distribution strategies and win public acceptance;*
- *organisation of training workshops for police officers; - training for system operators.*

The measure was implemented in relation to the new access restriction scheme designed by Burgos city council to offer the public more open, pedestrianised spaces free from traffic, pollution and noise. It was also linked to the development of a new freight distribution centre using cleaner, electric vehicles. An agreement was signed with goods distribution companies to arrange delivery timetables, and entry into the restricted access area was limited to electric vehicles and bicycles belonging to the goods distribution system.

Source: Adapted from http://www.civitas.eu/ [retrieved May 26, 2014].

3 The City Logistics Faced With Operational Constraints

According to Capo & Chanut [5], the logistical costs linked to the delivery of stores located in town can reach as much as 12% of the turnover (against 4% for a suburban hypermarket). The problem arises especially for franchise networks, whose growing number of stores is essential in order to benefit from strong scale advantages [13]. If franchise networks

implemented in cities wish to reduce their logistical costs linked to their supply, they should multiply the number of their stores as soon as possible. This may accentuate the problem of urban congestion. As Valentin [20] underlines, the territorial strategy of each retailer needs to integrate internal parameters (as resource constraints and retail format) and external parameters (as technologies and political forces). In a general manner, it is possible to summarise the operational constraints associated to city logistics in four main points.

3.1 Maximisation of Scale Advantages

A general rule prevails over the organisation of city logistics: a direct delivery from the manufacturer's factory cannot be considered. Indeed, if each manufacturer supplied every store in a city, the result would be a boom in the number of vehicles and kilometre-long queues to unload them. In order to limit the logistical costs, and given the low daily delivery volumes at the scale of a store, it is necessary to resort to complex, multi-products and multi-stores logistical systems [2]. Concretely, it is a question of loading in a delivery vehicle the orders of different stores, with compatible technical constraints (for example, regarding the temperature). Grouping the products enables to benefit from scale advantages.

3.2 Product Diversity

Products offered to stores can be of diverse temperatures: dried goods (room temperature), fresh products (+2°C), frozen products (-18°C). The absence of storage areas in the store requires ordering very small quantities adapted to the estimated needs until the next delivery. Because of this, the large retailer is required to use delivery vehicles equipped to deliver many temperatures at the same time, which has an impact on the unloading operations productivity. Indeed, delivery supports are dispatched depending on the type of temperature, and it calls for some handling inside the vehicle from the deliveryman in order to reach the products of the given temperature; this requires a particular know-how to avoid a long stop of the vehicle [6], at the root of urban traffic.

3.3 Delivery Terms

The saturated urban space in which the stores are located often demands vehicles to double-park, or even, to block the street of small towns during the unloading. On average, stores are delivered every other day, with, most of the times, a delivery range of over 30mn, which complicates the smooth succession of time windows for many successive stores [12]. The strong complexity of a delivery process is also an important disadvantage. Unlike stores located on the outskirts of a city, equipped with platforms and delivery areas, the unloading, for stores located within the city, is traditionally done through a simple lift gate. This requires the deliveryman to handle each of the logistical supports in an artisanal manner from the vehicle to the store.

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3.4 Choice of Time Windows

The specificity of stores located within a city is to be of a small size (approximately 400 square meters, often less), possess a limited staff, and offer long opening hours, including late at night, in a *convenience* perspective [17]. These different parameters have the effect of encouraging the stores to call for time windows outside of their activity's rush hour [1]. This aims at an efficient unloading and layout of delivered products. Of course, a night delivery, or very early in the morning (before 7 a.m), would be ideal for the stores, but the noise is an issue that the residents, close to the store, would difficultly accept to endure. As indicated in Table 2, the time window constraint is generalised in a lot of cities, with vehicle weight restrictions and multimodal initiatives.

Table 2: Measures by city authorities to manage urban logistics (2005-2012)

City	Low Emission Zones	Time Windows	Vehicle Weight Restrictions	Pricing / Subsidies	Loading and unloading zones	Special Lanes	Urban Consolidation centers	Multimodal Initiatives
London	✓	✓	✓	✓	✓	✓	✓	✓
Barcelona	✓	✓	✓		✓		✓	✓
Berlin	✓	✓	✓		✓	✓	✓	✓
New York	✓	✓	✓		✓	✓		✓
Paris	✓	✓	✓		✓	✓	✓	✓
Tokyo		✓	✓	✓	✓	✓	✓	✓
Utrecht	✓	✓	✓		✓	✓	✓	✓
Beijing		✓	✓				✓	✓
Mexico City	✓	✓	✓				✓	✓
Mumbai		✓	✓		✓			✓
Seoul		✓	✓		✓		✓	✓

Highly Active / Implemented

Source: Frost & Sullivan report (2013).

4 Gamma: A Sustainable City Logistics Strategy

How does a large retailer, running a large number of stores located in French cities, managed to meet the challenge of legal and operation constraints of city logistics, while developing an efficient sustainable strategy? To answer this question, we chose to lead a case study with Gamma. The company has an important national coverage: it runs over 500 stores spread throughout over 200 cities. While many managers do not understand how they could make their company more sustainable, and while they endure a corporate culture less favourable to supporting sustainable strategies [3], this is not Gamma's case. Indeed, this large French retailer engaged at an early stage in a sustainable city logistics strategy, which competitive advantage it offers was rapidly understood. As Yusoff *et al.*
[22:1717] underline, "business corporations' involvement with environmental activities is a way to enhance values as well as their integrity to create a sustainable base for improved earnings and operations in the future".

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4.1 A Strong Commitment in the Eyes of Policy Makers

The implementation of a logistical tool is old at Gamma. Since the mid-1950s, the company created a logistical department whose mission is to organise the supply of stores in a joint manner. At the start, the logistical department was only concentrated on the delivery of non-perishable products. As the company developed, and after the acquisition of a competing large retailer in the 1990s, other products were added: convenience goods, general merchandise and perishable products. Gamma now owns approximately fifteen distribution centres throughout France, specialised per type of product, and they deliver nearly 200 million parcels per year to the stores located in the cities. Facing the appearance of a sustainable view of city logistics, Gamma's strength was to quickly understand that focusing on profitability goals in order to meet the shareholders' demands was not the only priority, meeting new demands of local authorities regarding sustainable city logistics is also of importance.

Morana [15] shows how sustainable supply chains are at the heart of the most advanced thoughts regarding logistics, because of various factors promoting their implementation: political pressure (decrees, laws, regulations), environmental pressure (pollution, oil depletion) and social pressure (reputation and image of companies). Most large retailers firstly seek to optimise the supply of their stores in terms of cost, service quality and reactivity, mostly to maximise profits. Conversely, Gamma benefits from its reputation, its logistical tool and its national coverage to create strong ties with policy makers. Thus, Gamma considers that the organisation of its supplies should simultaneously satisfy two types of stakeholders: on the one hand, its clients, offering a delivery of products at the best cost, and a high level of service quality; on the other hand, local authorities in charge of organising the city logistics in the best manner to avoid noise, pollution and congestion of roads, for instance with the use of multimodal initiatives (see Box 2).

Box 2: Gamma at the heart of Paris urban freight experiment

French supermarket chain Gamma has started delivering consumer goods to its Parisian supermarkets by rail at the end of the 2000s. The first Gamma train ran on November 25, 2008. Trains are running to Bercy station (centre of Paris) from Gamma's warehouses on the edge of the Paris conurbation. At Bercy, the trains are unloaded and their cargo is transferred to a fleet of vans powered by natural gas, which deliver to an initial total of Gamma stores in central Paris. Trains are operated by Fret SNCF, although it has subcontracted VFLI to undertake shunting and unloading at Bercy. Onward road transport is provided by Geodis. The retailer has made it clear that increasing congestion in the suburbs and centre of the city makes the introduction of an additional rail-borne stage in the supply chain an increasingly viable option. The French Ministry of Transport reminds that the successful launch of the Gamma initiative was dependent upon the availability of a suitable terminal close enough to the centre of the city. Seven other sites in the Paris region are being considered for potential urban freight terminals, while other cities, afflicted by severe traffic congestion, including Lyons, Bordeaux and Nice, are actively looking to replicate the Parisian example.

Source: Adapted from http://www.railwaygazette.com/ [retrieved March 11, 2014].

The reasoning is particularly relevant. Indeed, it is the local authorities that give their consent to the implementation of new stores in a city when the size is under 300 square meters. By communicating on its performance regarding sustainable strategy, Gamma favours the opening of new stores, vital for scale advantages in the field of its supply chain. In other words, Gamma understands that the expansion of its network of stores relies on its ability to be innovative facing policy makers, on two different levels: a) integration of new and more sustainable logistical technologies; b) the reorganisation of distribution patterns, in particular regarding the use of clean means of transport (waterway transport, electric vehicles, etc.). In this way, Gamma is strongly committed in the work carried out collectively in many French cities for the implementation of charters related to sustainable city logistics; this is the case in Paris, Toulouse, Lyons and Bordeaux. The aim is to make the logistics more sustainable by encouraging the use of *clean* delivery vehicles [7]. This commitment led Gamma to position itself as a dynamic actor alongside the local authorities. The company preserves the possibility of exerting direct influence during various reunions between public and private partners so that the final choice regarding city logistics is in coherence with its own business model.

4.2 The Various Actions

Obviously, Gamma's positive image with local authorities, and in particular with the city of Paris, is not only based on a communication and lobbying strategy. The company has developed a certain number of innovative approaches that directly impact the lives of city-dwellers, while taking into account legal and operation constraints presented previously. Three actions were mainly led to assert its position of French leader regarding sustainable city logistics:

- *Use of PIEK equipment*. Since 2010, Gamma has massively invested in an innovative type of transport equipment which considerably reduces noise pollution. This is the first step of a process aiming at making all city deliveries more silent by adopting the PIEK certification. The PIEK equipment contributes to reducing the noise caused by night deliveries, and respecting the city-dwellers living close to the stores. The PIEK certification thus guaranties that the equipment used observes a maximum sound level of 60 decibels for deliveries between 11 p.m. and 7 a.m. Table 3 lists events for a delivery realized in the 15th arrondissement of Paris in 2011.
- *Night deliveries*. Following on from the PIEK certification, Gamma's objective is to use new night-time windows, formerly unattainable. These time windows enable to overcome some of the operational constraints regarding the optimisation of vehicle unloading. Indeed, the unloading takes place when few city-dwellers are driving their vehicles, which improves delivery productivity. In addition, a significant advantage is achieved at the environmental level as a smoothly flowing traffic reduces fuel consumption.
- *Use of new engines*. In addition to initiatives taken to fight the level of sound with the PIEK equipment, Gamma chose to retain other types of engines for vehicles delivering its stores. Diesel engines, the most polluting, were progressively abandoned to the benefit of electric and natural gas motors. Concerning Paris in particular, the

distribution centre from which the stores are supplied is delivered by water transport; a similar reflection is in progress for the city of Lyons.

Table 3: The diversity of noise sources during a night delivery: an example in Paris

p.m. hour	*Event*	*Emergence*
9:23	Handling with the trolley	73 dB
9:30	Passing roll > tailgate > floor	57 dB
9:32	Rolling of the trolley	59 dB
9:35	Loading of a palette by the trolley against the wall	76 dB
9:40	Startup of the tractor trailer	50 dB
9:43	Shutting of the iron curtain	63 dB
9:49	Startup of the tractor	76 dB
9:49	Unlocking of the brakes	77 dB

Source: Adapted from Cemafroid report (2011).

As these three effective actions underline, Gamma implemented a certain number of operational initiatives to ensure its contribution to more sustainable city logistics in an efficient manner. Its pioneering experiences within the French professional association called *Club Demeter Environnement & Logistique* (http://www.club-demeter.fr/), whose objective is to promote effective and measurable actions regarding sustainable development in the supply chains. Gamma wishes to show that its sustainability action can have very favourable economic effects, which is in line with the works of Duës *et al.* [10] for whom a *green* vision and a *lean* vision of supply chains are perfectly compatible. Indeed, Gamma tries to ensure a high level of service quality to its stores, at the lowest cost, while reinforcing its image of a sustainable company with its various stakeholders. The actions taken have met with a favourable response from city-dwellers living close to the stores, who are potential clients.

5 Recommendations for Action

Gamma's success is based on several factors: a quality logistical tool, integrating the most recent innovations in the field of flow management; a perfect understanding of the complex constraints that bear weight on the city logistics; a will to lead effective (and profitable) actions capable of reinforcing the sustainable company image. Even if this success story cannot be generalised to all operators participating in the dynamics of city logistics (wholesaler, logistics service providers, etc.), we draw two main recommendations for action.

5.1 An Early Involvement in Decision-Making Processes

The logistical department of a large retailer involved in the city logistics, but in a more general manner, any company having delivered products within cities, should integrate, at

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an early stage, innovative approaches at the level of transport and storage. This is the case of Ikea and its project called “Ikea goes renewable” [19]. This requires to participate in think tanks, where best practices are shared, and to be in regular contact with local authorities in order to be associated with their thoughts and projects for a more sustainable city. The more the company is involved at an early stage in sustainable city logistics, the more it can change its own organisation to bring more satisfactory answers. The most serious mistake would be to wait for local authorities to enact new legal

constraints to adapt to them with difficulty. By actively participating in the decision-making processes linked to the formulation of a more sustainable city logistics, the company would be capable of anticipating the transformations it would have to undergo, or even to suggest innovative solutions retaining the local authorities' attention.

5.2 The Importance of a Scanning Activity

Following on from the previous recommendation, an environmental scanning activity, with regards to technology as well as institutions and regulations, should be introduced in a continuous manner by the logistical departments of large retailers. In accordance with Fabbe-Costes *et al.* [11:233], "environmental scanning is considered as a key to provide useful information to face strategic challenges". Two reasons particularly explain this scanning in the context of sustainable city logistics:

- On the one hand, the spreading of the sustainable city logistics adapts to the purely local consideration linked to the city's typology: presence or absence of a river, construction of the historical centre on the basis of concentric circles, presence of a more or less dense network of stores, etc. Thus, the medieval heritage of many European cities, characterised by narrow streets, requires the use of distribution vehicles with adapted dimensions. Each situation should be scanned and the adjustment of pre-existing models to the particular reality of this city should be constantly questioned.
- On the other hand, a scanning activity is essential to rapidly modify the distribution infrastructures at a lower cost. If local authorities decide to transform logistics zones into housing zones, there will rapidly be a need to relocate the distribution centres. For example, it is the case for Marseilles, in the south of France, where the local council's will to transform the historical port in a tourist site led to condemn a part of the product storage zone destined for the city's stores. In this case, it is the entire city logistics that is impacted, and only the companies having anticipated these major changes will have played their cards right.

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