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URBAN LOGISTICS SPACES: WHAT MODELS, WHAT USES, AND WHAT ROLE FOR PUBLIC AUTHORITIES?

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ABSTRACT

Despite the failure of initial attempts and still uncertain economic profitability, UCCs are continuing to develop in France and elsewhere in Europe. In this paper we show that there is no single solution but rather a whole range of urban logistics spaces between which local authorities must decide on the basis of the objectives assigned to these facilities. To do this, we propose the criteria to be taken into account and the institutional and regulatory measures that appear best adapted. We analyse the examples we consider the most innovative, efficient and in phase with the changes occurring in lifestyles.

INTRODUCTION

The most widespread solutions for reducing the impact of goods delivery vehicles in cities (environmental, noise, safety) affect several domains. The most common are the land available for logistics activities, the pooling-consolidation of flows, the implementation of restrictive regulations, the use of less pollutant vehicles better adapted for urban use, road-sharing through time and by type of use, and performing studies to obtain better knowledge of flows and to design tools to evaluate measures (OECD, 2003; Bestufs, 2007).

Among these solutions, the Urban Logistics Space (ULS), *"a facility intended to optimise the delivery of goods in cities, on the functional and environmental levels, by setting up break-in-bulk points"* (Boudouin, 2006), appears very interesting. It can be broken down

into 6 categories: the Urban Logistics Zone (ULZ), the Urban Distribution Centre (UDC), the Vehicle Reception Point (VRP), the Goods Reception Point (GRP), the Urban Logistics Box (ULB), and the "mobile" Urban Logistics Space (mULS). Each of these types of facility mirrors stakes based on land (surface areas dedicated to logistics) and constitutes a place for pooling (equipment, m² and transport capacities). Some ULSs permit better distribution of flows over the day by dissociating the delivery by the transporter from the collection by the client, and privilege the use of "clean" vehicles for last mile deliveries. ULSs thus allow optimising urban goods deliveries and pickups through better filling of vehicles, more efficient round organisation, fewer conflicts linked to infrastructure use regarding goods vehicle traffic and parking.

Thus it is clear why urban logistics spaces have given rise to a multitude of studies and experiments, especially in the form taken by the "urban distribution centre (UDC)". In order to avoid any misunderstanding, we underline here that according to the typology formulated by Boudouin, these UDCs also encompass "urban consolidation centre (UCC)". The aim of both the UDC and the UCC is to consolidate flows destined for the city. In the UDC, this is done by pooling by several actors, often with the involvement of the public authorities. In the case of UCCs, they are specific to a sector. Despite the large number of experiments, few have latched on to a working economic model, as most have been abandoned or subsist only thanks to public subsidies. Nonetheless, these failures do not appear to discourage initiatives and ULS projects continue to emerge. The objective of this paper is to classify the different types of ULS and, for each of the 6 categories identified, specify their scope of application, the elements regarding implementation and/or operating costs, and detail the appropriate accompanying measures needed to favour their success. Examples of successes and failures are presented to highlight the key factors underlying the former and the reasons for the latter.

LITERATURE REVIEW

The literature on ULSs can be divided into two categories. The most widely known is naturally that which focuses on the experiments carried out. It would be futile to try to provide a full panorama, thus emphasis will be placed on syntheses performed in the framework of projects aimed at proposing recommendations regarding good practices. The other category concerns theoretical documents, presenting models of logistics centres (Browne et al., 2005).

The concept of ULS

Between these two focal points, the French approach of categorising ULSs, performed in the framework of the National Urban Goods Programme (Ministry of Transport and the Agency for the Environment) is particularly singular. Indeed, it is both a conceptual and pragmatic perception that identifies models of facilities while providing an approach that uses a number of indicators to permit local actors to select those best adapted to the objectives desired. In addition, this classification of ULSs is based on taking into account the spatial dimension of the facility. By not setting a threshold on the surface area, the area of impact or the volume of goods handled, or applying rules regarding the institutional structure of these spaces, it is possible to group a whole array of facilities under the single denomination of ULS along with their respective scopes of application and between which urban actors can arbitrate to build their logistic framework. We obtain a typology of ULSs in 5 categories, now increased to 6 to integrate mobile ULSs (Boudouin, 2006; Boudouin et al., 2017), as a function of the

objectives desired, the modifications introduced in the supply chain, the level of public involvement required to favour their implementation, and their range of action.

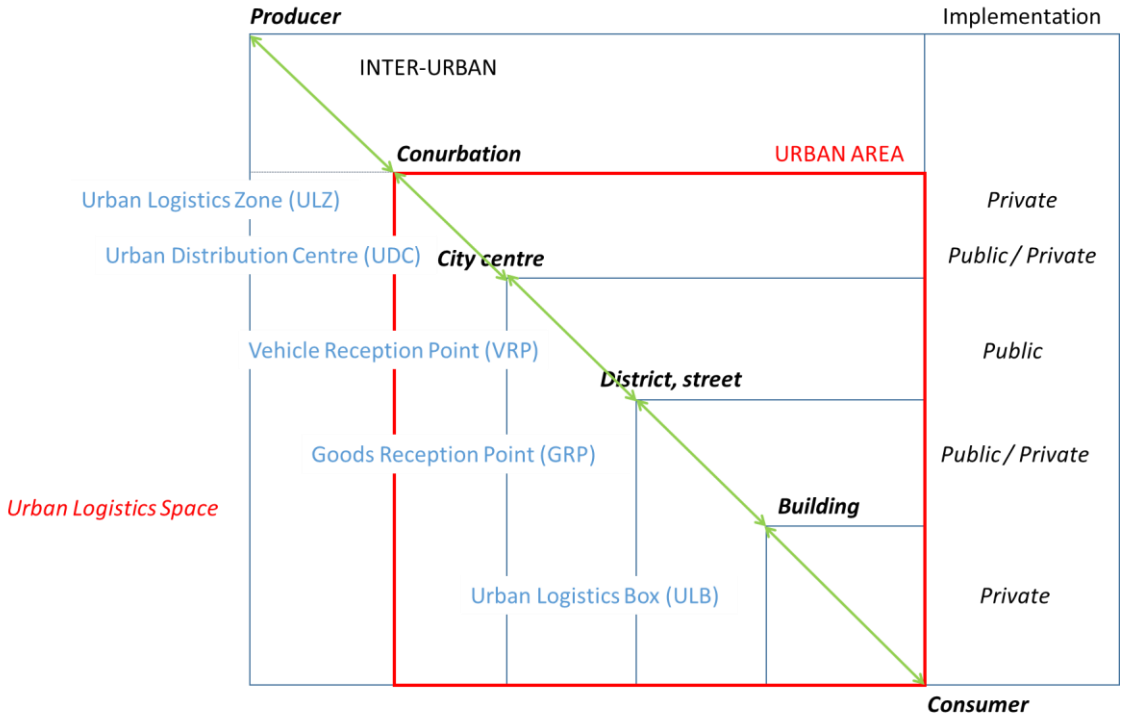


Figure 1. The typology of ULSs
Source: Boudouin, 2006

Questions of vocabulary

The literature has mainly focused on the concepts of UDC and UCC among the types of logistics spaces in this inventory. The generic term of ULS has essentially remained specific to France apart from a few exceptions (e.g., de Oliveira et al., 2014). As for other variations of the ULS, concepts of freight village have been observed in different countries although they do not necessarily cover an essentially urban dimension. For the most part the latter signifies areas enabling the intermodal transfer of goods at the national and international levels. However, the term "vehicle reception point" is used in several articles such as that of van Duin and Muñuzuri (2014) and, logically, in those who present French experiments on the topic (Zanni and Bristow, 2012). Likewise for the concept of "goods reception point" (Janjevic et al. 2013).

Many experiments though few have lasted

In Europe, the first experiments conducted to set up ULSs emerged in United Kingdom in the 1970s. They involved the construction of Urban Consolidation Centres (UCC) by transporters since the concept of ULS was deemed too expensive and likely to increase the volume of traffic linked to the use of large fleets of small vehicles to make last mile deliveries (OECD, 2003). Elsewhere in Europe, projects in this area were mainly carried out starting from the second half of the 1990s, mainly in the form of UDCs. About 150 were initiated though few are still operating (SUGAR, 2011). Mention can be made of the city of Padua whose Cityporto concept was adopted by other Italian cities: Modena, 2007, Como, 2009, Aosta, 2011, Brescia, 2012 (Leonardi et al., 2013). The United Kingdom, a pioneer regarding UCC, also focused on the most efficient models: Heathrow, Bristol, London.

In this brief panorama, France was no exception to the ebullience stimulated by the concept of UDC and more generally ULS. Since the 1990s, 44 ULSs (excluding Goods Reception Points) have been identified. But the evaluation of these realisations is harsh: 7 projects have been abandoned and 10 have closed. Only 17 are still in service. Nonetheless, the concept continues to attract attention since eight are currently in the project phase (Gerardin and Serouge, 2015).

ULS TYPOLOGY

These failures indicate that the Urban Logistic Space should not be an end in itself. It only has substance if considered in the framework of a global analysis of the urban context leading to the selection of the type of ULS best adapted to local stakes, independently of considerations of political leaning. Before making any decision as to the installation of a ULS, it is therefore advisable to perform a detailed diagnostic of needs, specify the objectives assigned to the equipment and the institutional framework necessary to achieve them, and stake out the perimeter of pertinence in order to finally chose the suitable site.

According to the size of the city, the needs identified and the objectives pursued, the installation may require integration in a logistics master plan and a full overhaul of the regulations relating to transport and town planning. Marked differences can also exist regarding the size of the tools considered, the financial implications of the actors involved and the regulatory measures taken to facilitate their operation.

The Urban Logistics Zone (ULZ) or freight village

The concept

The freight village ensures the transit of goods between the city and interurban areas and provides the interface between modes of transport: railway / river / maritime / road. According to case they can be:

- Enterprise zones comprising buildings or land made available for this purpose;
- Perishable wholesale markets (in French “Marché d’Intérêt National”, MIN), often freight terminals on railway or river port sites, that provide interfaces between urban and interurban areas;
- Logistic hotels, buildings with several floors accommodating simultaneously – to reduce land costs – production and service activities, and sometimes dwellings.

The localisation must be chosen as close as possible to the barycentre of activities generating flows of deliveries and pickups intended for dense areas.

The role of the local authority is to preserve zones capable of accommodating these activities, and ensure that the price asked is not dissuasive. It may pay for or subsidise equipping the land, and maintain the quality of the site and the safety of access to it.

The challenge

Our analysis focuses on the case of Perishable wholesale markets (MIN) which, year after year, are excluded from the borders of cities and relocated several tens of kilometres away on sites most often without rail or river links. This displacement of logistical activities is the result of pressure on land, and the drive to free space for major development projects, a situation that prevents bulking flows upstream and extends trips made daily downstream by all the clients that come to obtain their supplies from the MIN.

Case study: the MIN of Montpellier

Contrary to what has occurred in several French cities, Montpellier, a city in the south of France, decided to keep its MIN in the city by integrating it in an urban logistics master plan implemented at the scale of the greater city area.

The MIN is located on a 10 ha site and accommodates 40,000 m² of buildings, 220 companies, offset storage and producers. It delivers goods to the entire region. The City of Montpellier wanted to keep this facility as it is an "Instrument for developing the municipal area and an actor in local urban logistics". It reduces urban sprawl and land consumption and is a key element in local development. Its inclusion in the planning documents (master plan, Urban Mobility Plan) gave it a new status and new functions:

- UDC (pooling of distribution for certain sectors) and the use of clean vehicles.
- Rental, maintenance and charging of clean utility vehicles for last mile deliveries.
- Offset storage warehouses for retailers and SMEs in the city centre.
- Development of agro-foodstuff processing activities.
- Service functions linked to urban distribution: training, business "nursery" premises, etc.
- Supply of services for wholesalers, transporters, express delivery services.
- Installation of selective sorting: recycling or urban waste + waste removal.

These new functions lead to the creation of new jobs.

To strengthen the role of this MIN, the city has also implemented regulations to prohibit the most pollutant transport vehicles from delivering to the city centre.

The keys to success

The influence of the local authority in ensuring the success of the project is obvious and goes beyond expectations: synergy has been generated and there is strong demand from innovative companies to set up on the site.

The Urban Distribution Centre (UDC)

The concept

The transit of goods via a grouping platform before delivery or after picking up is attractive and has long been considered as a means of rationalising the urban supply chain. However, the additional cost linked to transit via this facility is often the cause for the failures observed, as the UDC is unable to generate a sufficiently large clientele to obtain the financial resources required for its survival. This is why, prior to setting up a UDC, it is vital to perform a diagnostic to evaluate the volumes that can be generated (not all types of product are eligible for transit via a UDC), the place of installation best-adapted, and specific local characteristics.

The objectives are variable: preservation of historic centres (clean vehicles and regulations aimed at encouraging or imposing transit via a UDC (Vicenza); dedicated to a sector of activity, such as the UDCs of Heathrow (UK) and Hammarby (Sweden); dedicated to pooling supplies to shopping centres (e.g., UDC of Bristol).

UDCs are adapted to areas for which supplying services is difficult (generally city centres, circumscribed according to the density of shops and the level of attendance). They are not intended for full batches, already bulked shipments, or certain categories of product (perishables, especially luxury products). However, some UDCs attempt to widen the list of receivable flows to improve their profitability. Thus the UDC of Padua has experimented since 2016 with the delivery of fresh products and express deliveries (Smartset project, 2016), and the UDC of Cordeliers in Lyon receives both luxury products and perishable fresh foods.

They must be installed close to the city centre, in accessible places, and with low rental costs, for example in multi-storey car-parks.

Starting up a pooled UDC in a city of more than 100,000 inhabitants generally requires action from the public authorities, since the service providers, which compete with each other, rarely take the initiative to join together and exploit such a facility. This involvement by the public authority is all the more logical as setting up a UDC generally requires restrictive measures aimed at encouraging its use.

Case study 1: UDC of Cordeliers (Lyon)

Covering a surface area of 300 m², this UDC is part of a space covering 1,200 m² dedicated to services linked to mobility (meeting place for car-sharers, station of self-service vehicles) on the ground floor of a public carpark belonging to the City of Lyon and managed by Lyon Parc Auto (LPA). It is located on the strip of land between the two rivers running through Lyon and forming the city centre, a district with a dense shopping area where space is rare and expensive.

Taking advantage of the reorganisation of the carpark in 2011, the City of Lyon launched the UDC project: LPA fitted the UDC and equipped it with a charging station for electric vehicles and then offered it for hire at a "logistic price". "Deret Transporteur", specialised in transporting luxury goods and which had been using electric trucks to serve Lyon city centre since 2009, won the call for offers aimed at finding a tenant for the UDC. It set up in the premises to deliver to Lyon and the shopping centres of the greater Lyon area. However, its activity only uses the surface area of the UDC between 3 a.m. and 1 p.m., 5 to 6 days a week, hence the idea of pooling with Ooshop, a logistics provider for e-commerce in food goods. LPA reorganised the space to permit the storage of refrigerated and frozen products, and Ooshop now uses the UDC to deliver to the homes of clients in the city centre between 8 a.m. and 10 p.m.

At the request of LPA the two tenants "pool upstream flows", a challenge for products with different added values, packaging and logistical organisation. On leaving their platform located 23 km from Lyon, the Deret vehicles serve the Ooshop platform to retrieve products (excluding fresh and frozen products).

The result of this pooling is that the UDC is used from Monday to Saturday, its organisation is optimised and its profitability is higher. In addition, the use of electric vehicles has led to Deret saving 14 tons of CO_2/year while the negative externalities and local pollutants have been divided by more than 50. As for Ooshop, it has saved 20% on the time it takes to serve its clients from the city centre due to easier parking for electric vehicles (which are smaller than traditional ones). The saving on fuel is 9%. These savings must be compared to the cost of bulk breaking of 23% and the fixed cost of occupying the UDC. Thus political will is necessary to permit the occupation of the site at low cost.

The keys to success

The UDC of Cordeliers shows an example of a "risky" experiment: pooling very different sectors regarding both their organisations and their respective clienteles. The success is due to the following combination of factors:

- A PPP with strong commitment from the public authorities.
- New regulations on the integration of logistic activities in carparks.
- Restrictive measures relating to circulation of pollutant vehicles.
- A supple and adjustable project in search of permanent improvement.
- Good knowledge of urban logistics by the actors involved.
- A genuine business plan.

An in-depth diagnostic upstream, with real time monitoring.

Carpark management by a semi-public company permits action on costs impossible to achieve with a private company.

A long term strategy to duplicate this type of UDC to other sites.

Case study 2: CityLogistics (Lyon)

The originality of the CityLogistics UDC installed in the suburbs of Lyon (France) stems from two reasons, it was conceived as a network of ULSs (one UDC and several GRP) which mesh the region, and it is financed wholly by private funds. It was in operation for nearly two years, but had to close down at the end of 2016, due to poor profitability and a stock burglary that had driven clients away. Despite the fact that it failed, this model is interesting in several ways.

This UDC, very close to the urban ring-road and the highways of Lyon, started operating at the beginning of 2015. Its objective was to serve two urban reception points (one located in the historic centre of Lyon, the other in the business district) intended to distribute and temporarily store parcels (for up to a week). The goods pooled in the UDC were then loaded in "clean" trucks (bioNGV) to be delivered to customers, either directly, or via one of the urban reception points. The project also planned to make deliveries to local ULBs.

The fleet of vehicles was composed of units of different sizes, making it possible to choose the vehicle best-adapted to the quantities of goods to be transported and the regulations allowing access to the area to be delivered.

The CityLogistics model aimed to incorporate a river distribution service to serve districts located between the rivers Rhône and Saône and thus eliminate heavy vehicles from the city (optimisation of urban deliveries in an approach to promote sustainable development). There was also a plan to set up a reverse logistics service for returned goods and waste collection aimed at the customers of the UDC.

The service, which started with a clientele of three delivery services (50 rounds a week) quickly grew in size: ten large operators and smaller transporters (a hundred rounds a week). The clientele was satisfied with the service provided (reliable information on the position of their deliveries, space saved on their bays, return management, etc).

Despite its good performance, the company went bankrupt since the CityLogistics project had been conceived with the assumption that a restricted traffic area would be applied to the city centre, which would have attracted to the UDC a large clientele of transporters and shippers unable to convert their fleets in order to be entitled to enter the city. The implementation of this restricted precinct never took place and the company's financial burdens (withdrawal of a partner) led it to raise its prices which drove away its clientele.

The reasons for failure

A partner which withdrew its funds whereas the company had not yet settled for a business model.

A bad anticipation of regulation measures' timing.

The service was too new to cultivate real customer loyalty and the burglary have scared the potential users of the service.

A clientele highly sensitive to prices.

The additional cost linked to bulk breaking overshadowed the system's ecological performance.

The Vehicle Reception Points (VRP)

The concept

The VRP is a space facilitating the parking of utility vehicles intended to reduce the nuisance caused by deliveries and pickups. There are two types:

- The On-street Loading Bay (or Proximity Logistics Space) is a point where the deliverer can leave their vehicle to end the last few meters of their delivery on foot, the mode best adapted to very dense zones. This space can be equipped with handling equipment or electric three-wheeled vehicles made available to the deliverer to travel the final distance. In certain cases, the services of an assistant are used. The latter is responsible for helping the deliverer over the last few meters or for watching over the vehicles. This space can be used by residents for parking outside the times specified for delivery vehicles, for example the Proximity Logistics Spaces of Bordeaux and Rouen.
- The road time-sharing space is a new type of VRP that facilitates better organisation of roads with large numbers of shops and where double parking is frequent due to the lack of available delivery spaces. According to the time of day, the road is dedicated either to the circulation of all vehicles or to the parking of delivery vehicles, whatever their size or mode of management, for a period generally limited to 30 minutes. No handling equipment or assistant is available. Barcelona was the first European city to implement this concept and an increasing number of cities are implementing it in view to ensuring that the road is shared between all its users without the need to make major investments.

Vehicle reception points subject to time-sharing occupy a whole segment of road and can receive several types of truck simultaneously. The suitable dimensions for a Proximity Logistics Space depend on the number of operations generated by the surrounding businesses and the configuration of the city. However, it is necessary to provide for angle parking (simplified manoeuvres) for 5 to 6 utility vehicles from 7 to 10 metres long. It is also necessary to provide premises (or a vehicle) intended to store handling equipment and receive the delivery assistant.

The role of the local authority consists in offering a space for accommodating these VRP and installing clear signalling indicating who can use the space and under what conditions. It must also change the regulations accordingly and can grant advantages to the users of the equipment. The financial involvement in this type of facility for the local authority is therefore low (simple road surface marking and upright signs) except in the case of a Proximity Logistics Space for which a delivery assistant has been hired and for which technical premises are available. This may require a significant cost although the gains expected in terms of improved service are considerable.

Case study: Multi-use road (Barcelona)

To reduce the effects of higher traffic levels in the commercial centre of Barcelona, the municipality introduced a new mode of road management. Five multifunctional lanes were created and signalled with variable message signs. These lanes are used from 8 to 10 a.m. in the morning and 5 to 9 p.m. in the evening for general traffic and buses, from 10 a.m. to 5 p.m. for deliveries, and from 9 p.m. to 8 a.m. for residential parking.

This multi-function lane system is intended to reduce illegal and double parking, reduce the time spent searching for a parking space, and optimise road space use. It has been designed by associating all the actors in urban goods delivery **(**municipality, transport operators, town planners, retailers and their representatives).

The quantification of goods movements performed by the City of Barcelona revealed the need for a large number of delivery areas. The multi-function lane provides a solution to the

problem of parking but requires major investment: €0.5 million per lane to which must be added the cost of controls by the police.

The Variable Message Signs provide information to users regarding their rights of passage in real time (driving, parking, deliveries/pick-ups). When the lane is dedicated to parking or deliveries/pick-ups, a message signals which users are concerned.

Stronger police control has been introduced to ensure that the residents who have parked their vehicles for the night have removed them in the morning so as not to impede the road traffic (especially bus traffic).

The implementation of these lanes has proven efficient for improving traffic. Travel time has been cut by 12 to 15% and the system has been deployed progressively for new lanes.

The keys to success

The role of the municipality was essential (studies, investment, regulation, control).

The police unit assigned to controlling adherence to the lane sharing rules was strengthened.

A sufficiently large road network to allow the introduction of this system without disturbing the rest of the traffic.

The Goods Reception Points (GRP)

The concept

The GRP is an establishment used as a local relay. The transporter no longer goes to the client (or the client to their supplier) but to this establishment (long opening times) where the packages are left by the transporter on its rounds.

Besides the relay points for e-commerce, the GRP can also be an establishment that offers a parcel reception service. This service can also include concierge services that provide a wide array of conveniences (for example, dropping off laundry bags, etc.). Lastly, GRP also include drive-through pick-up services where clients recover their products without entering the store.

This facility avoids the problem of a failed delivery made to an absent client. It can also be used as an offset storage point to eliminate storage spaces in stores and free them for selling goods or providing rest spaces.

Access to an GRP must be easy for both transporters and clients. In particular, it must be part of their clientele's programme of activities. One of the keys for their success is that they must form a network in the region.

Case study: Oxipio, a deported reserve

In 2006, the Oxipio company launched an innovative concept: a deported inventory in order to improve the convenience store's productivity with two complementary activities:

- A service of deported reserve in order to optimize the sales area of storekeepers of city center
- A last mile delivery to the end customer by electrically assisted cargocycles, with a trailer able to contain 3 m^3 in volume and to carry up to 250-300 kg.

In Lille, the company offers about 800 m^2 of warehousing in the city center for storekeepers who are lacking surface of storage. From this depot, the products are delivered "just in time" thanks to online restocking orders. The storekeeper therefore outsources its inventory which allows him to maximize the exploitable surface of his store while preserving a fast access to its goods.

The delivery takes place 1 hour after the order, which is not possible with a traditional delivery by truck from peripheral platform and allows operating 60 deliveries (average) per run. Collecting rounds can take place after noon. In Lille, 6 jobs were created and more than 100 shops are concerned by this service.

This offer of intelligent and sustainable urban logistics, which contributes to the protection of convenience stores, received the support of several local authorities and has already spread in Lyon and Annecy. The "Caisse Des Dépôts" (financial public institution, long-term investor for the general interest and economic development of territories) invested in the company Oxipio by subscribing to a € 1.2 million capital increase on September 2016 (44% of the capital). The company generated a revenue of € 155,000 last year.

The keys to success

A good analysis of shopkeepers needs in city centers.

The investment of the "Caisse Des Dépôts", motivated by the "smart urban logistics solutions" dimension of the project, contributing to faster energetic and digital transitions.

A support of local authorities and public investor which saw in this concept a tool adapted for a sustainable city in economic, social and environmental terms.

The Urban Logistics Box (ULB)

The concept

These "boxes" can be cubicles or containers that have been fitted and brought to a site where parcels can be deposited and then recovered after entering a previously assigned code (Homeport) or they can take the form of automatic systems that manage communication and item recovery directly (e-box, cityssimo). The ULB permits dissociating the delivery and the reception by the final recipient by doing away with the time constraints specific to Goods Reception Points. They are located in places of transit (railway stations, subway stations, shopping centres and underground carparks) to capture users within a range of 400 m (up to 20,000 people).

Case study: Electronic Concierge service of Sceaux (Sceaux.Shopping)

This is a new ULB concept, installed in Sceaux in the Paris suburbs, in 2013. The aim is to bolster local retailers threatened with disappearance due to the development of e-commerce and thus preserve the town's economic dynamism. Another aim is to help local retailers to changeover to digital technology.

This project is being carried out by the town of Sceaux, the representatives of the retailers and artisans (Chamber of Commerce and Industry and a local association) with recourse to a service provider to transport parcels, namely the Post Office during the initial phase, and now BlueDistrib.

The town ensures the promotion of the project (preliminary surveys, communication, rental of deposit boxes). The representatives of the retailers and artisans operate the system (development and maintenance of the site, management of receipts and redistribution to the retailers). The service provider delivers to a deposit point installed at the entrance of the train station used by 600 commuters a day. The ULB now has 16 lockers. All types of product can be deposited, including packaged fresh products in refrigerated containers.

The 270 retailers, artisans and services of Sceaux can join Sceaux.Shopping by signing an e-commerce quality and sustainable development charter. Initially free, the association now

invoices the retailers and artisans €100 a year to cover the management costs of the site and receipt collection, and the assistance provided to them (a part-time post).

The current service provider, BlueDistrib, is a subsidiary of the Bolloré Group which also manages the self-service car-share system, Autolib. The structure housing the deposit point is also equipped with Autolib reservation terminals. The retailer can choose between depositing the parcel in the deposit point or offering to deliver to the client's home, a service carried out by the personnel responsible for supplying the stations with self-service cars.

The deposit points made available to Sceaux.Shopping by BlueDistrib are pooled with the other clients of the Bolloré Group (Cdiscount). When a parcel is deposited in the deposit point a text message is sent to the client with a code that allows them to withdraw the parcel within a period of 3 days.

Although it took a long time to get the project going and ensure that the retailers became sufficiently competent (2 years), it has met with unarguable success (an increase in the number of members, loyal clients, the unexpected result of orders to be dispatched abroad). The withdrawal of the original service provider (La Poste) and its replacement by BlueDistrib led to a change in the deposit system and organisation, making it necessary to review the PPP.

The keys to success

The Sceaux.Shopping experiment satisfies both the economic profitability and the public concern.

Maintaining the number of shops in the town and the attractiveness of the latter confronted by competition from Paris and e-commerce was a genuine collective challenge.

The Logistic box fulfils a threefold function: territorial, economic and social development (shops are encouraged to stay and thus also the population and jobs). It becomes a kind of public service.

The actors no longer measure its profitability only in financial terms.

Concretising this concept revealed a strong political commitment which, given the stakes, requires incitory measures (not only financial, but training, information) to ensure it lasts through time.

The ULB manager is responsible for ensuring its financial profitability. That is why pooling a personal mobility service (Autolib) with that of urban logistics appears to be the key for success. It is also an example of optimising electric vehicles for hire by using them for last mile deliveries.

The mobile Urban Logistics Spaces (mULS)

The concept

The cost of land in dense urban areas often limits the potential for installing ULSs, which is why projects for mobile logistics centres have emerged.

The principle is to prepare rounds in the vehicle that transports goods and not in a costly logistics centre. The vehicle can be a wagon (tramfret) or boat (VCV-AFE) that becomes a mobile ULS carrying transport resources that will be used for last mile deliveries.

This organisation requires bulking the flows upstream for pooled collection by a single operator, organising rounds during the circuit, and carrying out rounds from each point reached. The gains expected include time saving and environmental effects linked to both logistics reorganisation and the use of sustainable modes of goods transport.

Case study "Vert chez vous au fil de l'eau" (VCV-AFE)

In 2011, Vertchezvous proposed an innovative concept: urban deliveries by barge intended for local shops in the districts of Paris through which the Seine and canals flow. The goods are loaded at the same time as electric powered three wheeled bikes used for last mile deliveries and deliverers that prepare their rounds during the journey from one port to another. Thus the barge is a floating logistics space that replaces the traditional urban logistics space so difficult to find at a logistic price in dense urban areas. In addition to this financial aspect, the objectives are ambitious:

- Zero CO_2 emissions for the distribution of goods weighing less than 30 kg (parcel delivery) in the city, transfer from road to river and electric vehicles for last mile deliveries;
- Obtain productivity at least equivalent to that obtained by a classical organisation with delivery by road transport from point of origin to destination while remaining economically competitive, so the project can be deployed in other regions;
- Set up a frequency (passage of shuttles at fixed times for delivering and picking up goods in the city based on the model of passenger transport) and measure the impact.

The project has mobilised a large number of partners in different areas of competence (prototype barge, on-board technologies, materials, data transmission).

Distribution is ensured through 3 links and 3 different modes of transport:

- Pre-carriage: Vertchezvous collects the packages from different transporters using electric vehicles and consolidates them on its platform. The packages are loaded onto electric trucks with volumes of 20 m^3 and unloaded onto the barge moored at Issy les Moulineaux.
- The approach and order preparation: the barge sails down the Seine and reaches the 1st port. During the journey the deliverers organise their rounds and place the packages in the containers of electric bicycles.
- Last mile deliveries: on reaching each port, the loaded three-wheeled vehicles are transferred to the wharf at the same time as the deliverers. The round starts and ends at the following port after having served 1 or 2 districts.

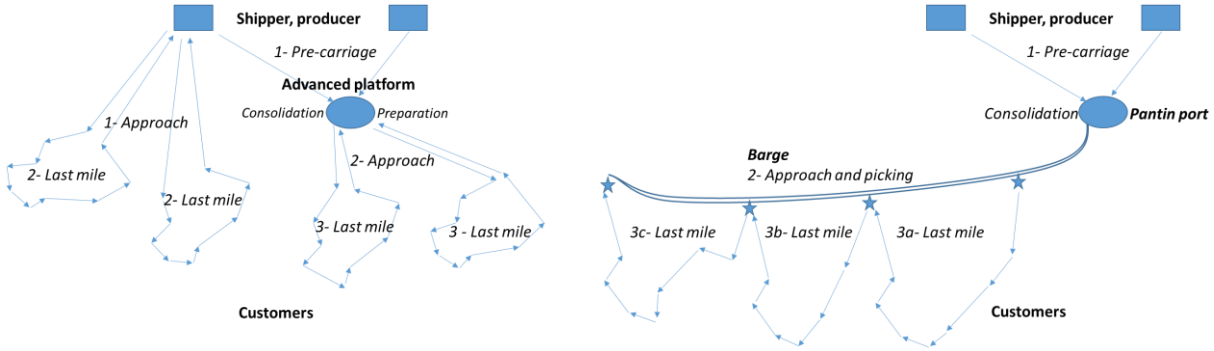
Interest of the trial

The experiment lasted one year and broke down prejudices regarding river transport: a mode dedicated to heavy items, bulk products, and low added value, over-long distances from one point to another. In this case, VCV-AFE targeted parcel delivery providers that transport products with high added value intended for shops in the city centre, packaged in parcels to be distributed to a large number of recipients. The project proved the feasibility of preparing rounds on a waterway.

The environmental balance when comparing organisations before and after the experiment (LET, 2015) revealed that road occupancy time was only a quarter of that of traditional delivery services: 84 hours PCU versus 20 hours PCU. The distances travelled were significantly lower (from 682 to 194 km travelled by vans). The freight transferred amounted to 3-4 tons a day, corresponding to 500 parcels and 390 recipients delivered.

The clients appreciated the frequency of the shuttles.

Although the initial project included the fabrication of an adapted electric prototype, the experiment was performed with an old, traditional barge. Thus the consumption of diesel fuel by the barge was higher than that consumed by van transport and the project was abandoned. However, this phase of the test has led to adjusting the tools to ensure greater efficiency and profitability. Extending the experiment to include an electric barge would require the undertaking of clients ready to commit themselves over a sufficiently long term to amortise such an investment.



Before After

Figure 2. Diagram of operation before and after.

RECOMMENDATIONS

Given the wide range of models falling within its scope, the ULS must be designed according to the urban context in which it must function, thereby requiring a global analysis of:

- the sector: the origin of the products, logistic organisations, the actors affected, the relevant perimeter for the final delivery service;
- its efficiency in comparison to existing logistics organisations (depending on the localisation of the platforms situated upstream and the costs and volumes affected);
- the capacity to take into account current and planned modifications of the urban fabric in order to prepare for future flows;
- the commitment to satisfy objectives for reducing environmental nuisances.

Thus there is no "turnkey" model for a ULS. The choice of the best-adapted type of facility relies on the diagnostic made of the existing situation and on proposing the principles of actions linked to the objectives targeted by public and/or private decision-makers.

At this stage it is also advisable to envisage procedures for monitoring and evaluating ULSs. The indicators chosen could include those used to establish the diagnostic to permit ex-ante/ex-post comparisons. Regular monitoring of these indicators will make it possible, if necessary, to adjust the principles underlying the ULS so that it satisfies the objectives set more efficiently.

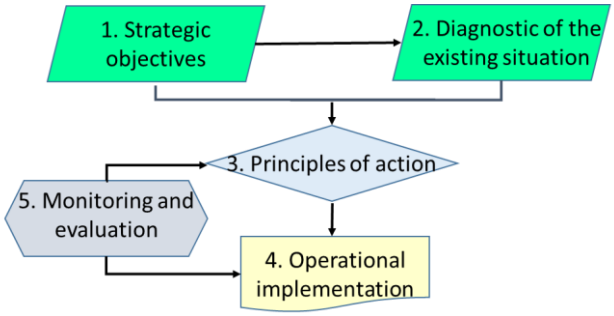


Figure 3. The approach to be followed

It should be noted that these indicators include taking into account the ULS's indirect advantages: improved traffic conditions, reduction of nuisances, better image of the city (Patier and Browne, 2010), all of which are elements difficult to monetize whereas the additional cost linked to bulk breaking can be identified immediately by the ULS's users (€1 per parcel and

from €6 to €8 for a pallet). This leads to the question of distributing the costs linked to transiting via a ULS. As a whole, companies are against making any financial contribution:

- retailers and other customers can see no reason to pay insofar as their delivery conditions are satisfactory – even if they are aware of the associated problems;
- service providers emphasise the productivity of their organisation to minimise the advantage gained by concentrating deliveries into a single point and underline the loss of direct commercial links with their clients.

Facilitating the success of a ULS therefore requires the provision of services paid for by its clients (offset storage, the collection and recycling of packaging are often proposed) and privileging flows that transit via this facility (in terms of traffic times, use of lanes reserved for public transport, etc.). This may also require tougher conditions for gaining access to the zone concerned by the ULS in such a way as to make bulk breaking more financially advantageous than direct delivery. The role of the local authority is therefore decisive for orienting behaviours towards more virtuous practices. Whatever the case, these measures must be chosen with perspicacity so as:

- not to penalise goods for which no advantage is gained by transit via a ULS (drinks, bulk deliveries to minimarkets, supermarkets, etc.)
- not to add to service costs in order to avoid penalising shops in the city centre vis a vis shops on the outskirts;
- not to impose counter-productive practices that could cause conflicts between actors.

CONCLUSION

The response to the challenges of sustainable urban logistics requires the development of practices based on sharing: sharing spaces, premises, uses, infrastructures, transport capacities, etc. Urban Logistics Spaces provide interesting solutions to this end.

The role of the local authority is vital for encouraging pooling. Firstly, from the standpoint of exemplarity: it is advisable to subject flows linked to public services to the same rules as those applicable to the flows of the private sector. Secondly, from the standpoint of stability: the policies implemented must be upheld in the long term to provide private actors with good visibility so they can invest without fear. Lastly, from the standpoint of stimulus: public action has to facilitate private initiatives, by bringing together the different actors involved, by preserving land for logistics, and by introducing adapted regulations.

This role of the local authority can in certain cases include reimbursable subsidies. However, the latter should be limited in time. Experience has shown that private initiatives are the most efficient and, therefore, should be privileged.

The term Urban Logistics Space covers a wide variety of facilities each of which has its use and scope of application in order to address pollution and congestion caused by urban goods movements. UDC is not the single model, as has been attempted in many European countries, with no success. The ULS-based approach widens the scope, and it is up to each city to select the best adapted to its context and the objectives pursued. As case studies have shown, each ULS corresponds to a specific need, is flexible, and is scalable. In a given territory, it is likely that this model will be an assembly of several types of ULS, organised in network to optimise urban goods deliveries by taking into account the strategies specific to the different districts of the city (cf. CityLogistics, MODUM project).

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