Implementation of logistic service centres

In a nutshell

SUMMARY
It is best practice to involve the relevant stakeholders and support the implementation of a logistics service centre in the territory of the municipality. The logistics service centre can be situated in relatively close proximity to the geographical area that it serves, to allow consolidated deliveries to be carried out within that area.
Target group
Public administrations responsible for mobility and/or public transport in their territory
Applicability
This best practice is applicable to all local authorities responsible for mobility and specifically relevant for cities which receive a high volume of deliveries of goods and/or are subject to high traffic congestion and air pollution.
Environmental performance indicators
• Emissions of CO_2 from delivery vehicles over a specific timespan (e.g. yearly, monthly) in the area served by the logistics service centre (kg CO_{2eq}/year or kg CO_{2eq}/month) • Number of delivery trips per day in the service area (number/day)
Benchmarks of excellence
• 40 % reduction in CO_2 emissions from delivery vehicles in the service area compared to the situation before the implementation of the logistics service centre • 75 % reduction in the number of delivery trips per day to the service area compared to the situation before the implementation of the logistics service centre

Description

Urban freight logistics is a large yet often overlooked aspect of a city's sustainable urban mobility. Urban areas attract large quantities of goods and materials flows which originate from far beyond the city's borders. In the absence of measures to restrict or consolidate these flows at the local level, this invariably results in increased urban road freight traffic as deliveries reach the 'last mile' of their journeys (see Figure 1). Over the past two decades, freight deliveries to cities have tended towards more frequent, smaller deliveries which travel over longer distances, resulting in reduced load factors and an increase in the number of large delivery vehicles in urban areas (European Environment Agency, 2013; Karrer & Ruesch, 2004).

While this fragmented approach to deliveries satisfies individual customers' needs for reduced times between order and supply, its inefficiencies contribute significantly to a city's GHG emissions, air pollution and noise pollution. According to Behrends (2008), in the EU "goods movement represents between 20 and 30% of vehicle kilometres corresponding to 16-50% of the emissions of air pollutants, depending on the pollutant considered, by transport activities in a city". In order to address these environmental challenges, several cities have successfully implemented city logistics service centres (LSCs). This best practice posits that the more comprehensive LSC model which provides multiple urban freight services (in contrast with the single-purpose urban consolidation centres model) represents the best environmental management practices when it comes to urban logistics management. With the right physical and economic configuration, LSCs make the first and last mile for deliveries within a dense urban area more efficient and less intrusive environmentally and socially.

An LSC is “a logistics facility that is situated in relatively close proximity to the geographic area that it serves a city centre, an entire town or a specific site (e.g. shopping centre), from which consolidated deliveries are carried out within that area” (Huschebeck & Allen, 2005). LSCs are most often started to address the public authority’s aims to reduce CO_2 emissions resulting from freight transport, to alleviate traffic congestion and to reduce environmental problems such as air and noise pollution. Many LSCs make use of electric delivery vehicles to further reduce noise pollution and to make out of hours deliveries a viable option.

LSCs facilitate more efficient use of the existing transport infrastructure for goods distribution within and outside the city by promoting cooperation among local freight actors (freight forwarders, wholesalers, production companies, retailers, etc.). Hendriks (2014a) describes the resulting urban freight management operations as “dynamic, zero-emission, efficient distribution and collection on the ‘inside’ of the city”. In addition to delivery services, LSCs offer storage, waste and packaging material management which can attract new customers and therefore additional income for sustaining the LSC.

LSCs are created for a variety of purposes and can take various forms. Huschebeck & Allen (2005) identify three categories of LSCs:

1. Special project LSCs: used for non-retail purposes (e.g. construction material).
2. LSCs on single sites with one landlord: usually for retail areas and shopping centres.
3. LSCs serving a town/city: part of city logistics schemes, and can vary in terms of the geographic area they serve and the number of partners operating the LSC.

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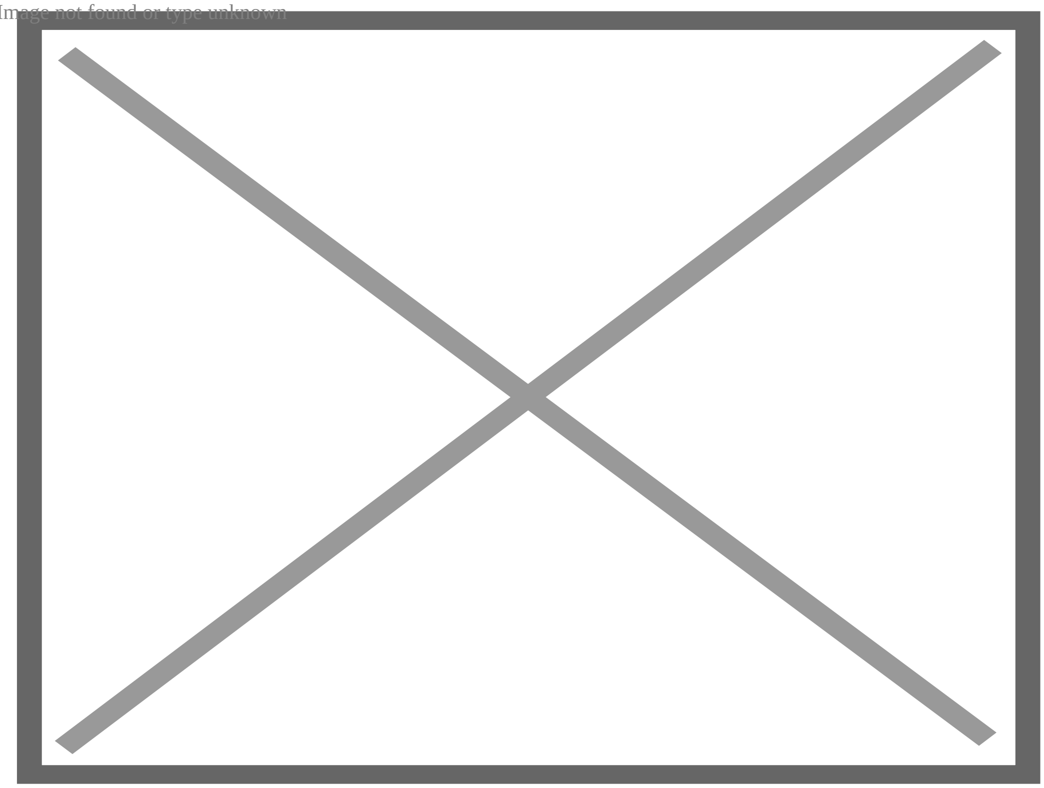

Figure 1: Flow with/without an urban freight consolidation scheme[1] ***Source: (Nord, 2013)***

Regardless of the type of LSC, the most successful ones have been initiated by public authorities which brought stakeholders together and financed the start-up phase; in fact, the central role of public authorities is often cited as essential during the start-up of an LSC, and is highly influential for its continuation (Campbell, MacPhail, & Cornelis, 2010; Danielis & Marcucci, 2007; Gonzalez-Feliu, 2011; Lewis, Fell, & Palmer, 2010; Ottosson, 2005). This BEMP looks at the implementation of city Logistics Service Centres (LSCs) and assess their environmental and transport-related benefits as well as highlight what public authorities can do to support successful measure implementation and facilitate good delivery for and with local freight actors. Three frontrunners in the implementation of LSCs are Stockholm (SE), Bristol (UK) and Växjö (SE). Each frontrunner represents one of the three categories of LSCs, and serves to illustrate the BEMP's elements while showcasing how both medium-sized and larger local authorities can encourage and assist in establishing freight distribution centres for various purposes. Table 1 provides an overview of each of the three frontrunners' LSCs and the public authorities' approaches to implementation.

Special project LSC

In 2001, the City of Stockholm (about 850,000 inhabitants) introduced a special project LSC for the construction site of the city's large-scale housing project "Hammarby Sjöstad". The high number of deliveries and heavy vehicle movements led to the idea of implementing a logistic centre where all goods were consolidated and stored (including consolidated transport of construction material, temporary storage, co-transportation of goods from the logistic centre to building sites and smart traffic control).

In addition to delivery services, the LSC offered temporary storage of material. There was also smart traffic control for vehicles entering the construction yard which included SMS-based variable smart traffic signs and a smart computer system was used for the distribution of goods.

It was reported that congestion levels decreased considerably and so did the number of trucks in the construction site area; CO_2 emissions were reduced by about 100 tons per year; noise levels were lowered significantly.

LSC on a single site with one landlord

The City of Bristol (about 400,000 inhabitants) introduced a city logistics service centre scheme in 2004 which is located about 11 km outside the city centre for its local retailers. Initially planned as a pilot project, the scheme was turned into a permanent logistic centre. It focused on the core retail area Broadmead having more than 300 retail stores. Before actual implementation, thorough analyses of freight distribution patterns and of retailers were made. As a result of the implementation of the urban consolidation centre, delivery trips to the 55 participating retail organisations were reduced by 76%, and significant emissions reductions were achieved. Due to the scheme's success it was extended to also including waste and packaging material management.

LSC serving a town/city

The City of Växjö, Sweden (about 85,000 inhabitants) implemented an LSC in 2010 which serves the city's 450 municipal units, which include local government owned buildings which house offices, schools and other public services. Following a thorough simulation study, the LSC's distribution started small-scale with office supplies but was soon up-scaled to including also food supplies. The centre established an e-purchasing system and introduced an optimised delivery plan on predetermined routes. The City of Växjö achieved a reduction of deliveries to the 450 municipal units by 82% per week (decrease from 1,900 deliveries to 350 deliveries per week).

Table 1: Overview of the Stockholm, Bristol and Växjö LSC schemes

	Stockholm	**Bristol**	**Växjö**
Name	Hammarby Sjöstad Logistics Centre	Broadmead Freight Consolidation Scheme	--
Date introduced	2001	2004	2010
LSC type	Special project LSC (construction site)	LSC on a single site with one landlord (retail area)	LSC serving a city buildings)
Initiated by	City of Stockholm	Bristol City Council	City of Växjö

	Stockholm	Bristol	Växjö
Operator	Subcontracted by the City of Stockholm	DHL	Alwex transport AB
Financing	2001: 95% public funds 2004: 40% public funds 2005: 0% public funds	2002-2006: 100% publicly funded (support from EC VIVALDI project), 2006-present: 45% public funds	100% publicly funded
Pilot study	3-year project (2001-2004), reopened in 2005 as fully self-sustaining	Initial survey and 8-month pilot study	Simulation only, bas survey results and data
No. customers	10 contractors of the housing project	55 retail organisations	450 municipal units
Technology used	SMS-based smart traffic signs, smart computer system for goods distribution	'Styleflow' freight consolidation tracking system	e-purchasing system
Distance from area served	Entrance of construction site	11 km	7 km

[1] In Figure 1, the commonly used acronym 'UCC' (urban consolidation centre) is used. UCCs typically serve the sole function of consolidating and distributing goods. For this BEMP, however, LSC is preferred because it encompasses a broader range of city logistic services.

Environmental benefits

The environmental benefits derived from implementing an LSC mostly come from a reduction in the number of heavy delivery vehicles entering the city. By consolidating goods and delivering them along more efficient routes, deliveries can make maximum use of smaller vehicles, thereby reducing emissions and noise pollution. LSCs which use electric delivery vehicles, such as Bristol's Broadmead Freight Consolidation Scheme, further reduce emissions and practically eliminate their contribution to noise pollution, making out of hours deliveries possible. This further reduces urban freight deliveries' contribution to traffic congestion during peak hours of the day.

Better coordination and efficiency of freight movement within urban areas leads directly to a number of environmental benefits that are typically associated with sustainable urban transport systems in general. Behrends et al. (2008) identify these environmental benefits as "reducing air pollution and noise emissions, greenhouse gas emissions and energy consumption (including contributing to meeting legislative requirements on air quality and environmental noise e.g. EU directive 2002/49/EC)".

Table 2 provides a summary of the environmental benefits achieved from the three frontrunner cities. All of the schemes resulted in a marked reduction in the number of delivery trips per day and, consequently, reductions in vehicles miles travelled and fuel usage. As a result, the LSCs contributed to the following environmental benefits:

- CO_2 emissions reductions, which reduces the city's contribution to climate change

- Reductions in the air pollutants NO_x and PM, which reduces the possible negative health impacts for people and animals
- Reductions in urban freight's contribution to noise levels exceeding the maximum levels of 55 dB(A), which also has impacts on humans' health and quality of life

Table 2: Summary of environmental benefits achieved from Stockholm, Bristol and Växjö LSCs[1]

Indicator	Stockholm[2]	Bristol[3]	Växjö[4]
Emission of CO_2	Reduced by 100 tonnes/year (90%)	Reduced by 70 tonnes	Reduced by 40%
Emission of NO_x	--	Reduced by 2,281 kg	--
Reduction of exceeded maximum noise levels of 55 dB(A)	Reduced by 62%	--	--
Number of delivery trips per day	Reduced by 20 trips per day	Reduced by 76%	Reduced by 82% (from 271 down to 50 per day)
Vehicle km (Vkm) by vehicles type (EV, conventionally fuelled)	Reduced by 38 km per day overall	Reduced by 264,000 Vkm	Reduced by 33%
Fuel usage	--	Reduced by 26,000 litres	Reduced by 68%

Combining LSCs with other measures

There is also the potential to link LSCs together with wider regulations and policy measures relating to emissions reduction and congestion management. For example, London's Low Emission Zone (LEZ) charges heavy diesel vehicles which enter the Greater London. This is done in an effort to encourage the most polluting vehicles to become cleaner (TfL, 2014). Schemes such as these are effective when paired with the creation of an LSC that is not mandatory for all delivery providers to use.

[1] Values are listed as provided in reports, therefore the units may vary. Some reports did not specify a time component.

[2] (Ottosson, 2005)

[3] (TRAILBLAZER, 2010)

[4] (Nord, 2013)

Side effects

A correctly implemented LSC should have no negative environmental impacts. However, if an LSC is not configured properly in terms of location, scope and organisation, it may not deliver sufficient environmental benefits, and may in fact create new problems and environmental challenges. Negative impacts could result from the following factors:

- **Inappropriate location:** The location of an LSC has a direct impact on the efficiency of delivery routes. Not only do existing (interested) customers need to be taken into account when choosing a spot for the LSC, but potential future customers should also be located.
- **Resource use of the LSC facility**: Factors such as energy use and packaging material recycling and/or disposal methods determine the LSC facility's related CO_2 emissions and overall environmental impact. These factors need to be considered with sustainability in mind so that their related effects are mitigated.
- **Land use impacts of the LSC facility**: Preferably, LSCs should be built on brownfield sites such as previously developed industrial areas. However, in cases where such land is unavailable or undesirable in terms of location, the LSC might be built partly or entirely on greenfield or undeveloped land. This has a direct impact on the habitats of plants and animals, which if planned incorrectly can have a ripple effect of negative consequences for the local ecosystem. In such cases the LSC facility should be designed to be compact and cognisant of the existing natural environment, particularly with regard to wetlands and forested areas.
- **Scope is too small:** If the scope of an LSC is too small, it will quickly run at full capacity and deliveries which might have otherwise been able to be serviced by the LSC are forced to be delivered. Wherever possible and desirable, the LSC should be scaled up to accommodate as many customers as it can attract. This may require moving the LSC to a new location.
- **Ineffective organisation:** Many companies already efficiently consolidate their freight themselves or with parcels carriers, so there are potentially negative consequences for trying to re-channel the flow of goods through an LSC. This is mostly relevant for regulations which require all deliveries coming into the city to use the LSC; however, public authorities which implement LSCs under such regulations are often unsuccessful and cease operations.

Applicability

Relatively few LSCs in the world have been implemented successfully. A large proportion of LSCs are not successful due to a lack of support from the private sector and consequently a lack of customer base and income to sustain operations. LSCs tend to be controversial among delivery service providers as well as the clients they would serve due to the additional fees and the need for them to relinquish control over merchandise and transport chain (Karrer & Ruesch, 2004). Therefore, it is important for public authorities to analyse the local context in which the LSC would operate.

LSCs are primarily implemented in cities which are already struggling with traffic congestion, and which receive a high volume of deliveries via heavy delivery vehicles. It has been found that LSCs are mostly beneficial for deliveries in areas which have physical constraints such as historic cities with narrow streets where access can be difficult and results in traffic congestion (Lewis et al., 2010). It also helps to a larger extent the small, independent retailers and operators making small deliveries to multiple stops.

As a starting point, a case study done on the Bristol frontrunner which states that the Bristol model can be implemented in almost any urban area stipulates that the following basic requirements are critical for implementing a successful LSC:

- Support from the stakeholder groups and willingness for the project to succeed – Local Authority, the Contractor, the Retailers and wider User Groups, Suppliers and the Public
- An electric / low emissions vehicle fleet
- A suitable secure warehousing facility located on the edge of the urban area
- A management team experienced in logistics consolidation.

According to Browne et al. (2007) "the likelihood of an LSC being successful depends considerably upon the legal and planning frameworks in the locality or country involved". Both the Stockholm and Växjö cases cited political support as essential to the project's success. LSCs can even find support across party lines, as demonstrated in Växjö's LSC, which was pushed by centre and right wing parties.

If the physical and political situations have been analysed and it is determined that a LSC is an appropriate and desirable solution, the next step is to identify willing customers. The public authority should investigate whether there is a large enough base of providers and customers who are interested in participating in the LSC to warrant the investment. Reports on both the Stockholm and Bristol frontrunner cases state that these models are highly transferrable, but that it will only work if the public authority is able to attract enough interest to do a large number of deliveries (Lewis et al., 2010; Ottosson, 2005). This ensures a more favourable cost-benefit ratio, and ultimately determines the ability of the LSC to be self-sustaining.

Finally, a pilot study or simulation can provide a public authority with further practical insights into the feasibility of sustaining an LSC in the local context. However, it should be noted that "most solutions have shown interesting results in the pilot and test phases but could not survive once the strong public funding support was stopped" (Gonzalez-Feliu, 2011). Therefore, the most important factor for successfully implementing an LSC is for the public authority to have adequate funds available to sponsor the scheme until enough effort and time has gone into helping all of its users realise the benefits so that they are more willing to pay for it themselves.

Economics

The allocation of an LSC's anticipated costs and benefits is a key economic consideration during planning and set-up. Potential LSC partners and customers are usually more acutely aware of potential costs and not as aware of the benefits in economic terms (Huschebeck & Allen, 2005). An LSC can be considered successful in economic terms if it manages to break even; typically these facilities do not make a profit. Gonzalez-Feliu (2011) identifies two categories of economic costs for LSCs: the project development costs (e.g. strategic planning, new investments and pilot studies) and the tactical and operational costs (e.g. daily operations and continuation of the LSC).

Initial questions such as where the funds will come from and who will directly organise the LSC and attract customers to use it are public authorities' primary concern (Huschebeck & Allen, 2005). BESTUFS points out that "without some initial funding from central or local government to pay for the research work and pilot studies, any form of LSC that is not related to a major new property / commercial development is unlikely to proceed" (Huschebeck & Allen, 2005). It also recommends keeping the initial cost base low so that the pilot studies can act as a 'dry run' with minimal investments needed. For example, a pilot study could be run using an existing building which has potential for expansion instead of paying to construct an entirely new building for the purpose.

Once the trial stage is completed and the LSC is up and running, "what has to be demonstrated to [retailers] is that the additional costs associated with an LSC operation may not have to be borne by the logistics company or retailer, or if they do have to be that there may be significant offsets elsewhere in the operation that can reduce if not eliminate them" (Huschebeck & Allen, 2005). Stockholm's tapered approach to sponsoring its LSC was highly successful. During the initial three-year project, the City of Stockholm reduced its funding for the centre from 95% to 40% of the operating costs. At the end of 2005, the LSC was reopened, this time with 100% of the operating costs covered by the users of the LSC. This was possible because of the positive experiences during the three-year project period which increased users' willingness to pay for the service.

Furthermore, results from a study on Stockholm's LSC found that it is important to visualise hidden costs so that customers are aware of how they will benefit from paying for these services (Ottosson, 2005). Overall, the challenge for public authorities wishing to implement an LSC is to clearly communicate the balance of costs and benefits to retailers and carriers. Once this is accomplished, an LSC's "success or failure is ultimately based on the ability of logistics companies to market and operate a freight transport service that meets the needs of its customers at a competitive price" (MDS Transmodal Limited, 2012).

Driving forces for implementation

Because LSCs depend not only on a willing public authority but also to an even greater extent on willing private investors and customers, the driving forces for implementation of an LSC can be divided into two parts: social and environmental goals which drive the public authority, and economic goals which drive private sector stakeholders.

Public authorities are the main initiators of LSC schemes. This was the case in all three of the frontrunners in this best practice. They are mainly driven by the need to reduce traffic congestion and CO_2, NOx and PM emissions. Quality of life for residents and visitors was also high on the list of priorities from the outset. The LSC was seen as a solution which would take many heavy delivery vehicles off the roads, thereby reducing conflicts on the road as well as noise pollution. Therefore, the environmental benefits of an LSC are the main driving force for public authorities. Växjö has a particularly ambitious goal of becoming a fossil fuel free city by 2030, and initial results show that the LSC is on track for helping them meet this goal (Nord, 2013).

Support from private sector stakeholders is an essential driving force for implementing a LSC. However, the business case for a LSC is more difficult to make. LSCs can help to save time across the supply chain and increase the quality of delivery services. Further, less trips and higher load factors result in more reliable deliveries. Once providers and customers experience these benefits first hand after an extended trial phase, they are more likely to be willing to pay for the service themselves, thereby ensuring the LSC's continuation. Stockholm's LSC is a good example of a public authority being the driving force for helping the relevant private stakeholders to realise the LSC's benefits. Ultimately, if the public authority can make the business case clear to private stakeholders, then the LSC will be in greater demand and will consequently attract more deliveries, resulting in greater environmental benefits.

Reference organisations

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- London Construction Consolidation Centre (UK)
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