Pre-study: Coordinated Distribution of Municipal Goods in Stockholm

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Abstract

The pre-study on Coordinated Distribution of Municipal Goods in Stockholm was carried out in autumn 2017. The City of Stockholm's budget for 2017 stated that "The City Council, in consultation with the Traffic Board, the Service Board and the Development Board, will carry out a pre-study for coordinated distribution of municipal goods. The purpose is more efficient handling of goods, fewer transport movements, and thus increased accessibility with lower environmental impact. The goal is for the project to start by 2018 ". The purpose of the pre-study was to provide a sufficient basis for decision on the establishment of an implementation project for the consolidation of the City of Stockholm's own deliveries.

In this report the concept *coordinated distribution of municipal goods* is used. This means that, suppliers leave their goods at a joint distribution centre for cooperative transportation covering the last mile to the municipal recipients. The report will also use *coordinated distribution* as a short form. The purpose of the pre-study is to answer the question of whether introducing coordinated distribution leads to:

- A more effective management of goods
- Fewer transport movements
- Lower environmental impact
- Increased accessibility

The pre-study has been conducted with both quantitative and qualitative analyses and is based on data collection from site visits, interviews and meetings with stakeholders within the City of Stockholm. Data collection has also been done through interviews with external parties such as municipalities that have introduced coordinated distribution of goods, the relevant suppliers for the City of Stockholm and carriers established in Stockholm.

Analysis of information collected by the pre-study shows that driving forces behind the introduction of coordinated distribution in other municipalities have been to reduce environmental impact, improve road safety, reduce the number of transports and make it possible for smaller suppliers to join. Several municipalities expect that prices can be lowered in the case of future procurement, corresponding to the amount that the procured distribution centre and the logistics partner cost. The analysed municipalities have stated that the cost of coordinated goods distribution is around 5-7 percent of the total value of goods. For the City of Stockholm, it would involve a cost of SEK 32-45 million.

From interviews with various operations within the City of Stockholm, other municipalities, suppliers and carriers, the common view is that coordinated distribution has both advantages and disadvantages.. Upon

closer analysis of the comments that emerged, it is possible to see several logistics solutions. There are more measures that can be introduced to increase the efficiency of freight handling and the degree of load consolidation. The measures can be introduced independently of each other and with different timescales. Therefore, it is possible to see a gradual development towards coordinated distribution.

A staircase can illustrate the alternative logistics solutions For each step, the degree of coordination and load consolidation increases, as well as the City of Stockholm's responsibility in the logistics solution. The bottom step means that the City of Stockholm has little responsibility and receives uncoordinated supplies from its suppliers, that is, the suppliers of goods decide and are responsible for the logistics. The top step involves full municipal control over organization for load consolidation and coordination. Between these extreme points there are three additional steps, “Uncoordinated Deliveries with Extended Requirements”, “Load consolidation with Cooperation from Suppliers” and “Municipal Load Consolidation”.

Today, the City of Stockholm is deemed to be on the step of Uncoordinated Deliveries with Extended Requirements, as the City of Stockholm already has high environmental requirements for food suppliers (60 percent of deliveries to be carried out with fossil-free fuels) and the suppliers and carriers have a proportion of Euro VI trucks.

The pre-study proposes three possible options for the implementation of coordinated deliveries. (A) Gradual introduction of load consolidation in cooperation with suppliers , (B) immediate deployment of municipal load consolidation and (C) continuing current aspirations . Option A means that the City of Stockholm takes increased responsibility for load consolidation within existing logistics solution (A1). The City of Stockholm's responsibility and degree of coordination and load consolidation thus increases. Thereafter, the City of Stockholm performs a thorough evaluation of the measures implemented and decides on continued work (A2).

Based on the preliminary analysis, the recommendation is that the City of Stockholm gradually implements coordinated distribution according to option A - Gradual introduction of load consolidation in cooperation with suppliers. This is motivated by the expected benefits in relation to the relatively low risks in improving existing plans. The time aspect also promotes a step-by-step introduction, as several benefits can be achieved before a complete coordinated distribution is established. A step-by-step introduction also provides an opportunity to establish logistics competence within the City of Stockholm. As part of step A1, the study has identified and analysed several different activities that can be carried out without disturbing existing plans:

- Increase competence in goods logistics
- Set targets and setup a measurement scheme
- Investigate and test new delivery patterns
- Develop procurement requirements
- Take control of small deliveries
- Utilize commercial initiatives

The pre-study recommends that a logistics development function be established to push the work with load consolidation forward. The work within logistics development is expected to be driven by two full-time resources proficient in transportation and environmental studies. Furthermore, coordination and process review will also be necessary. The function is expected to have multiple internal interfaces with other administrations and units within the City of Stockholm, as well as external interfaces to implement the initiatives that the pre-study proposes. Initial consultancy support is also recommended for an estimated six months. The consultancy support is expected to contribute to:

- Setting up a logistics development function encompassing and stretching beyond the City of Stockholm's operations
- Implementation of operational logistics changes
- Introduction of a structured supplier review

The work is expected to last for four years, with the main costs being salaries for the proposed logistics development resources and consultancy support during the first year. The costs are estimated to be SEK 4 million in 2018 and SEK 2 million per year thereafter.

1 Introduction

1.1 Background

In 2016, the Stockholm Transport Administration, together with the Service Board, conducted a progress report on the coordinated distribution of municipal goods in the City of Stockholm. The progress report contains an external analysis and describes previous initiatives in coordinated distribution in the City of Stockholm and a review of the aspects that should be considered for the introduction of coordinated distribution. The Stockholm Transport Administration's conclusion was that the introduction of coordinated distribution of municipal goods in 2018 was unrealistic and decided to recommend an in-depth pre-study.

The City of Stockholm's budget for 2017 stated that "The City Council, in consultation with the Traffic Board, the Service Board and the Development Board, will carry out a pre-study for coordinated distribution of municipal goods. The purpose is more efficient handling of goods, fewer transport movements, and thus increased accessibility with lower environmental impact. The goal is for the project to start by 2018"

The City of Stockholm procure goods, services and contracts for approximately SEK 32 billion each year.

1.1.1 City council's targeting objectives

Based on Vision 2040, "A Stockholm for everyone", the Stockholm city departments, administrations and companies, have formulated four overall targeting objectives:

- A Stockholm that stands united
- Eco-smart Stockholm
- Financially sustainable Stockholm
- Democratically sustainable city

The objective to carry out a pre-study for coordinated distribution of municipal goods primarily meets two of the targeting objectives:

Eco-smart Stockholm

The City of Stockholm has high environmental and climate goals. The budget in 2017 states, among other things, that one of the most important environmental priorities is that the City of Stockholm transports will have less climate impact while the city is growing.

Financially sustainable Stockholm

The 2017 budget states that the starting point for economic policy is the goal of creating an equal and sustainable city. A sound economy is a prerequisite for strengthening the welfare. Therefore, Stockholm must always have a budget in good economic balance.

1.2 Project goals

The purpose of the pre-study is to provide a sufficient basis for deciding on the establishment of an implementation project for the coordinated distribution of municipal goods in the City of Stockholm and responding to the question of whether an introduction leads to:

- More efficient handling of goods
- Less transport
- Lower environmental impact
- Increased accessibility

The pre-study should deliver the following:

- Project plan
- Provide a basis for decision concerning the establishment of a project for the introduction of a coordinated distribution of municipal goods in the City of Stockholm. The basis will describe the main features of how it should be carried out and provide a more detailed description of:
    - Benefits
    - Consequences and risks
    - Cost
    - Organization and resources
    - Schedule

1.3 Scope

Based on experience from other municipalities, this pre-study focuses primarily on the major product categories and suppliers. The product categories include:

- Foodstuff
- Consumables
- Office Supplies
- Play & teaching materials
- IT and AV products
- Hardware
- Kitchen and household products

These are product categories consisting essentially of goods and exclude services. The largest suppliers of goods are Menigo, Martin & Servera, OneMed, Staples and LäroMedia. See chapter 4.2.2 for more information.

The pre-study includes only operations that the City of Stockholm conducts on its own and does not include contracts or private activities.

The City of Stockholm has activities in a wide range of areas, and all has not been covered by this pre-study. The focus has been on providing an understanding of goods relating to healthcare and care housing for the elderly, preschool and school, which are areas that purchase large

quantities in selected product categories, such as food, consumables and office supplies. Activities relating to social services, have briefly been mentioned, but is not covered at the same depth as the above-mentioned activities. Nor have deliveries to managerial and central administration been dealt with in detail.

2 Method

The pre-study has been run by the Finance Department at the City of Stockholm, supported by members of the Stockholm Transport Administration, Service Board, Environmental Board, Development Board, and the consultancy Deloitte AB. The pre-study is based on information gathered from site visits, interviews and meetings with stakeholders in the City of Stockholm, as well as interviews and meetings with other municipalities, suppliers, carriers and an industry organization. Information from reading existing literature and studies has also been used.

2.1 Implementation

The pre-study has had both quantitative and qualitative elements. The quantitative part has focused on analysis of procurement data from the City of Stockholm’s e-commerce system Agresso. Additional quantitative analysis has focused on traffic data. Most of the implementation has been characterized by more qualitative surveys, with the basis of reading previous reports and studies, followed by a series of meetings, site visits, surveys and interviews.

To create a broader understanding of the City of Stockholm's current situation and view of municipal coordinated goods distribution, site visits, interviews and meetings were conducted with a wide range of stakeholders. Initially, site visits were carried out at units currently receiving deliveries within the product categories included in this pre-study. Interviews were conducted to understand how ordering and deliveries works today, and to collate views on coordinated distribution and how it would work at their unit. Interviews were conducted with units linked to pre-school, elementary school, and healthcare and care housing for the elderly. Additional information from meetings with stakeholders below has been used as a basis for the pre-study:

- Reference groups concerning procurement of food, office supplies and consumables
- Staff at Procurement and Contracts within Service Administration
- Real Estate Companies (SISAB and Micasa)
- Key people with relevant positions and experiences within the City of Stockholm (e.g. unit managers, facility management and curators)

The market analysis and external outlook has focused on what other municipalities have done and what lessons that were learned from those initiatives. Suppliers and carriers have also been interviewed to get their views on coordinated distribution of municipal goods and what improvements they can see at present.

3 Coordinated distribution of municipal goods

Coordinated distribution of municipal goods is about the last step of the logistics chain, see Figure 1 below. In traditional distribution, suppliers will deliver directly to the City of Stockholm's recipient after an order has been submitted. This results in a variety of deliveries, for example, if a unit orders goods from three different suppliers, it can involve three individual deliveries on different occasions. In coordinated distribution, suppliers leave their goods at a joint transport distribution centre for a joint transport between the distribution centre and the City of Stockholm's recipients.[1]

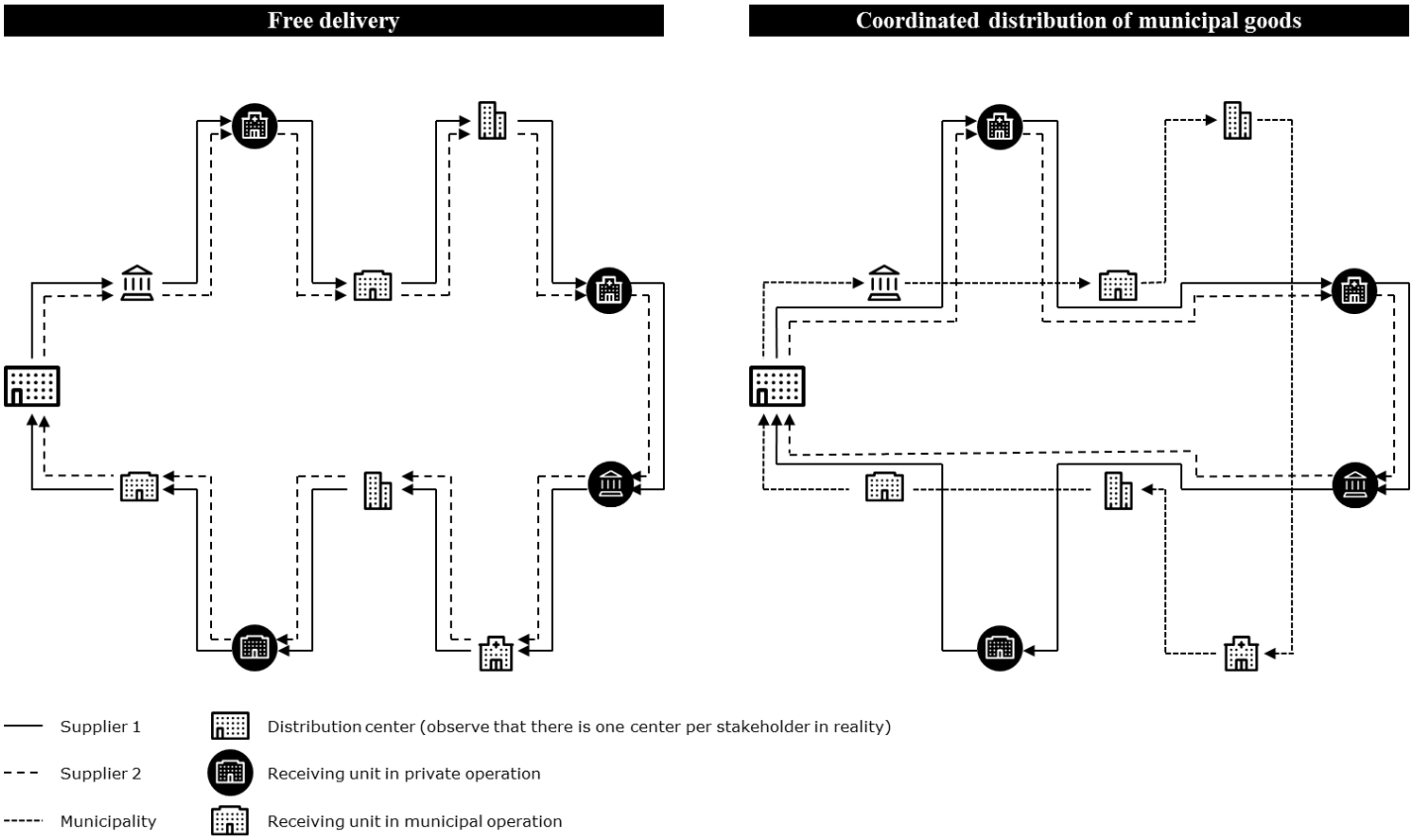


Figure 1: Schematic view of transport utilizing uncoordinated and coordinated distribution

The starting point is that the distribution centre enables reduced deliveries and thus achieves more efficient freight transport.

3.1 Benefits and Challenges

General experiences from other municipalities that have introduced coordinated distribution demonstrate that several benefits and challenges

[1] Moen, O. (2013) Samordnad varudistribution 2.0 Logistik i kommunens varuförsörjningskedja

can be expected. Detailed descriptions of specific benefits and challenges are presented in Chapter 5.

3.1.1 Benefits

- **Environment**. Through increased transport efficiency, higher vehicle utilization and shorter total distance travelled, the goal is to reduce environmental impact. The ability to stipulate certain vehicles and fuels during procurement contributes to reduced environmental impact
- **Traffic**. Fewer vehicles and deliveries help reduce congestion and noise pollution.
- **Competition**. Increased competition facilitates that local suppliers without distribution capacity can bid for contracts. It helps to develop the local business community
- **Working environment**. Fewer deliveries within a limited, desired timeframe contribute to simplified staff planning and working environment.
- **Economy**. The goal is to reduce commodity prices and total transport costs

3.1.2 Challenges

- **Economy**. The distribution cost previously included in the price of the product must be reallocated to ordering units or a central account. This could affect, for example, the present school reimbursement model. It is also a challenge to negotiate retail prices without taking account of distribution
- **Environment**. In theory coordinated distribution of municipal goods includes only the City of Stockholm's goods deliveries and therefore there is a risk that the City of Stockholm cannot affect the overall environmental situation in Stockholm due to a limited proportion of deliveries in the city.
- **Internal conditions**. Coordinated distribution is an area where municipalities usually have limited knowledge because it is not part of their core business. Therefore, liability and ownership can be unclear.
- **Effects**. It is difficult to measure and see the effect, usually due to limited input and follow-up capabilities

3.2 Previous attempts to coordinate distribution of municipal goods in Stockholm

Previously, coordinated distribution in Stockholm has been attempted at the initiative of both the City of Stockholm and the private sector. Between 2004-2008, the co-development project "Environmentally efficient goods deliveries" was running. The purpose of the project was to distinguish between the cost of goods and transport by coordinating the

local distribution of goods, as well as setting environmental requirements for vehicles and improved planning[2]. The aim of the project was to reduce total delivery costs and increase the vehicle utilization. During the preparatory stage, a logistics partner was procured that provided distribution centres, terminal functions, vehicles, third party logistics, and customer service[3]. The project was in operation for less than one and a half years with coordinated distribution of consumables by Simonsen before the project was closed in 2008. At the time of introduction, there was also no necessary IT support between the City of Stockholm, the warehouse suppliers and the logistics partner to accommodate the process from ordering to billing.

In addition to the project "Environmentally efficient goods deliveries", coordinated goods distribution has been used at several other occasions in Stockholm. During 2001-2004, transportation of building materials to Hammarby Sjöstad was coordinated. The project was considered successful and a similar arrangement was established in the Royal Seaport (Norra Djurgårdsstaden in Swedish). The Royal Seaport Building Logistics Centre is owned by the City of Stockholm and is run by a contracted operator and logistics partner. With the Royal Seaport Building Logistics Centre, more efficient delivery planning with fewer unplanned transports to construction sites and smaller volumes has been achieved, which also contributed to increased safety, reduced waste and property damage[4].

In 2004, the O-Centre was established for the consolidation of goods to restaurants, shops and hotels in Stockholm Old Town. Incoming deliveries were collected in a smaller terminal on Söder Mälarstrand and were exported with biogas lorries by the company Home2You, which also operated the O-centre. The biogas vehicles had permission from the Stockholm Transport Administration to deliver after 11 AM on some streets in Stockholm Old town, where loading is only allowed before 11 AM. The O-centre carried out coordinated deliveries to Stockholm Old Town for just over ten years. The environmental administration was involved in the evaluation of the O-centre, which showed:

- Fewer number of delivery vehicles and thus fewer deliveries in Stockholm Old Town
- Recipients received their deliveries on time once per day, simplifying the receival

[2] Atkins (2016) Sammanställning av erfarenheter från samordnad varudistribution

[3] Moen, O. (2013) Samordnad varudistribution 2.0 Logistik i kommunens varuförsörjningskedja

[4] Brolinson, M. (2016) Bilaga 1 – underlag till tjänsteutlåtande ”Förutsättningarna för samlastning av Stadens egna varuleveranser. Lägesrapport”

- The same staff delivered every day which created confidence
- Timely delivery within narrow time span is possible

In early 2017, a distribution centre was opened in the Klara Zenit property, which is in central Stockholm. This is a commercial investment where the City of Stockholm, together with the owner of the property and the central operator, has developed a concept that fits Stockholm city. The carrier leaves goods at the distribution centre where the operator collects and distributes the goods to the recipients by electric vehicles. The operator also collects waste in connection to the delivery. The City of Stockholm's driving forces behind this initiative are reduced traffic, increased accessibility and reduced noise, air pollution and climate impact. Since there is private investment, the probable main driving force of the operation is that it will be a viable commercial investment.

3.3 Coordinated distribution of municipal goods

There are several denotations of what the literature normally defines as *coordinated distribution of municipal goods*. Both coordinated distribution of goods and load consolidation appear as concepts in other municipalities and in the literature. In this report it has been decided to use the concept *coordinated distribution of municipal goods*. A short form of *coordinated distribution* will also be used.

4 The City of Stockholm's current situation and needs

4.1 Stockholm's goals

The Traffic Board's budget for 2017 states that Stockholm should have a well-functioning transport system with minimal climate impact. As road space is limited, walking, cycling and public transport should be prioritized. Car traffic should decrease to achieve the goals of the environmental program 2016-2019. In April 2016, the City Council adopted an environmental program for the 2016-2019 period, which contains six environmental objectives and 30 goals to be met by the City of Stockholm.

Stockholm is growing rapidly and is in a positive development phase, where many new people, especially young people, are looking towards Stockholm as the place to be, see Figure 2 below. New residents need housing, workplaces, commercial services and public services, such as schools and preschools. The City of Stockholm also needs to expand, develop and maintain all infrastructure such as streets and utilities. The high ambitions in the climate and environmental area must be combined with efforts for a socially cohesive city. For Stockholm to function services must be carried out, waste shipped away, and goods delivered. It is estimated that 160,000 deliveries are carried out in the county every day[5]. One of the six environmental goals in the environmental program is "Environmentally-friendly transport".

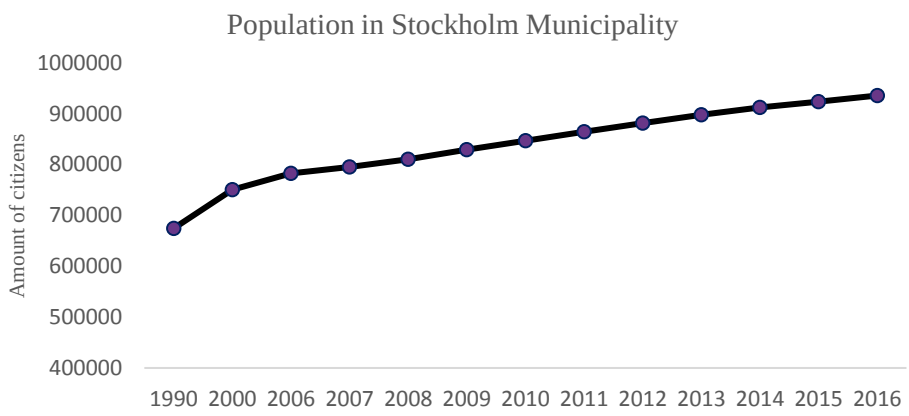


Figure 2: Number of residents continues to increase in the city. In 2020, Stockholm is estimated to have more than one million inhabitants. Source: SCB / Sweco

[5] City of Stockholm's Environmental Program 2016-2019

Prerequisites for efficient, safe and environmentally-adapted delivery of goods in and out of the city and transfer points need to be included early in the implementation of a coordinated delivery system and seen as a tool for a long-term sustainable and attractive transport system. The environmental program also proposes that the councils experience of coordinated building logistics should be utilized and further developed when Stockholm is densified. Furthermore, the environmental programme describes that city streets can become more attractive walking and living environments through changing delivery patterns in time and space for freight transport.

The environmental program describes the increase in light goods vehicle traffic, such as workmen's vans, the transportation of minor goods, office services and e-commerce as a challenge in the work towards environmental goals.

Strategy for fossil free fuel Stockholm 2040

Strategy for fossil free fuel Stockholm 2040 is a strategy that describes how the City of Stockholm will work to counter climate change, one of the biggest challenges of the day. The strategy sets out measures to achieve the target of no more than 2.3 tones CO_2e (CO_2) per inhabitant by 2020. This corresponds to a total reduction requirement of 228,000 tones CO_2e in the transport sector by 2020. The City of Stockholm will therefore work to reduce fossil energy used in the road sector equivalent to at least 140,000 tones CO_2e.

The City of Stockholm will also act to achieve climate-efficient transport in the municipal organization, representing a reduction of at least 8,000 tons of CO_2.

4.2 Traffic situation

Within the city there is a general ban on heavy goods traffic between 22:00 and 06:00 (except for a few designated roads for heavy goods traffic). Heavy goods vehicles (HGV's) weigh over 3 500 kg and require at least a C1 or C driving license. They also require Driver Certificate of professional Competence (Driver CPC). Light goods vehicles (LGV's) are cars with a maximum weight of 3 500 kg and may be run on a regular B license.

In the project "Off Peak City Distribution", conducted in collaboration with KTH, the City of Stockholm has given permits to two lorries delivering food at night in the inner city. The purpose has been to test silent and clean vehicles and to evaluate the results. The project has been successful so far and by 2018 the project will be expanded with another vehicle. The aim is to use the traffic system more efficiently by controlling traffic to the time of the day offering a lot of available capacity[6]. When comparing vehicles that pass the tolls and suppliers' delivery windows, goods are typically shipped when the number of vehicles in the city is high, see Figure3.

[6] Project Off Peak City Distribution

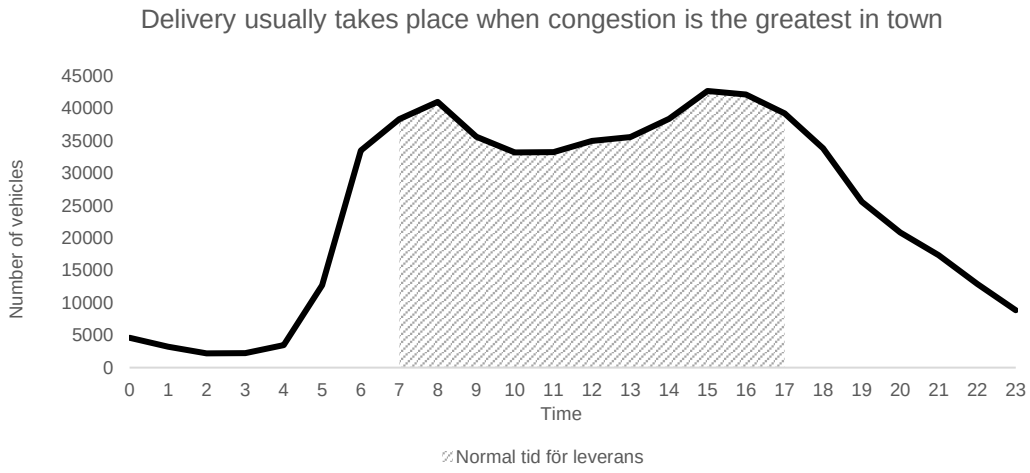


Figure 3: Average number of vehicles passing tolls per hour during weekday life compared to normal delivery time. Striped section illustrates normal time of delivery. Source: Transport Agency

Lorries dominate urban transport and in recent years, the use of LGV's has increased significantly in Sweden. Swedish-registered LGV have increased from 79,000 in 1999 to just over 581,000 in 2014. That year the LGV's were six times as many as the HGV's. The HGV's have also had a more stable development over time, see Figure 4. Since 1999, LGV traffic has almost doubled from approximately 4,220 million kilometres to 8,300 million kilometres in 2014. This is almost exclusively due to the increased number of vehicles, as the average mileage per vehicle only increased by six percent from 13,300 kilometres in 1999 to 14,100 kilometres in 2014. A large proportion of LGV's are found in the most populated counties, such as Stockholm. The number of LGV's in 2013 accounted for nine percent of greenhouse gas emissions from domestic transport[7].

[7] Trafikanalys (PM 2016:5) Urbana godstransporter

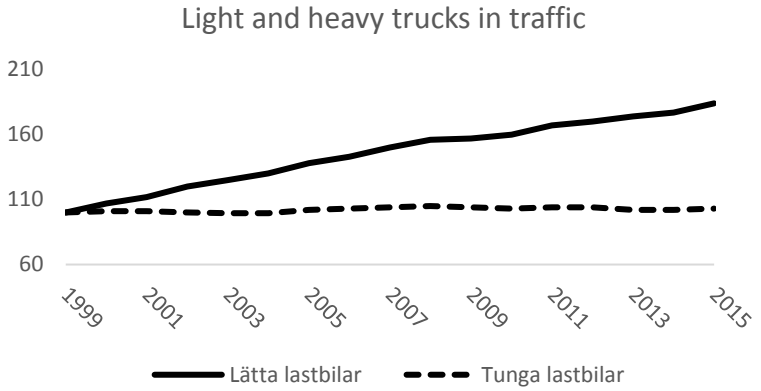


Figure 4: Number of light trucks (solid line) and heavy trucks (dashed line) in traffic. Index (1999 = 100). Source: Traffic Analysis (2015a)

4.3 Supply of goods in The City of Stockholm

The City of Stockholm's supply chain can generally be described as: the procurement of different product categories, to ordering and physical deliveries. Billing, which is the last step in the Supply Chain Process, is not included in this description.

4.3.1 Procurement

The City of Stockholm's procurement can be divided into central, joint, and local procurement. The municipal council decides which areas of procurement that should be done centrally. Joint procurement is when several administrations and / or companies have similar needs and carry out procurements in cooperation. Local procurement is carried out by individual administrations / companies to meet a special need.

The Service Administration is currently commissioned by the City Council to procure and manage key contracts in 40 different areas. Service administration also conducts joint and local procurement on behalf of other administrations and companies within the City of Stockholm. For a few contract areas, such as furniture, the City of Stockholm used framework agreements signed by SKL Kommentus Inköpscentral (SKI).

The department for procurement within Service Administration is organized into three units.

- **The procurement unit** currently consists of 18 employees operating in accordance with the municipal council's decision on central procurement on behalf of the City of Stockholm. The unit is also responsible for contract management and provides advice and support to units within the City of Stockholm in procurement, contractual, and purchasing issues.
- **The contracting unit** currently has eight employees (three assistants and five contract managers) and is responsible for

contract management in central procurement areas and for administrative support within the department.

- **The e-commerce unit** currently consists of 15 employees and works with e-commerce coordination for municipal administrations and companies. In addition, the unit provides information about new applications such as connections, stock providers, and events in Agresso. This unit also provides support to municipal users regarding questions about phone and email purchases. The unit also manage access for suppliers to the e-commerce system.

The central contracts include all boards within the municipality and the companies and institutes that choose to join. Some of the central procurement areas include a large amount of goods and therefore a large amount of transport, which is why they are interested in the pre-study of coordinated distribution.

Table 1 lists the central procurement areas of this pre-study. The time for the contract areas is two years with a possible extension of one plus one year. Within foodstuffs, there are a total of 11 stock suppliers, consumables have six stock suppliers and teaching materials have one supplier.

Table 1: Summary of the central procurement area and area of agreement that this pre-study focuses on.

Central Procurement area	Contract area	Supplier	Revenue 2016 (MKR)
Food (one procurer and one contract administrator)	• Vegetables & fruit	• Menigo	• Total for Menigo: 278
	• Food preparation	• Nutricia, Techno Medica, MediCarrier, Navamedic och Nestlé	• 3,3
	• Frozen food	• Menigo	• Total for Menigo: 278
	• Dried food, Canned food, dairy (small volumes)	• Menigo	• Total for Menigo: 278
	• Refrigerated/ Fresh and cured meats/ poultry/ fresh fish (small volumes)	• Martin & Servera	• 48
	• Brewery goods	• Menigo	• Total for Menigo: 278
	• Fresh bread and pastries	• Europabagaren	• 4
	• Dairy (large volumes)	• Arla	• 13,8.
	• Fresh fish (large volumes)	• Bröderna Hansson	• 5,9
Supplies (Two procurers and one Contract administrator)	• Lamps and luminaires	• Auralight	• 3
	• Hardware products	• Tools AB	• 3
	• Healthcare and incontinence products, nutrition pumps	• OneMed Sverige AB	• 32,4
	• Kitchen and household products	• Martin & Servera	• 7,7
	• Consumables	• OneMed Sverige AB	• 52,7
	• Art and sculpting material	• Lekolar AB	• 6,5
	• Office material and copying paper	• Staples Sweden AB	• 19
Teaching materials (not central) (one procurer)		• Läromedia i Örebro AB	• 70,5
Literature (one procurer)	• Seven contract areas. New framework agreement from 171101. Four suppliers in earlier contract		• Total around 30

Within the City of Stockholm, work is underway to review methods within procurement, which mean that the city will gradually implement category control. Category control involves establishing a team

responsible for one or more categories of procurement, where the responsibility covers not only the procurement process.

Environmental requirements

For some time, the City of Stockholm has set environmental requirements for its own vehicles and parts that it has influence over. During the latest environmental program 2014-2017, the city also began setting higher environmental requirements for procurement of goods and services. The City of Stockholm Environmental Administration has developed a form that serves as a reference tool when setting environmental requirements on vehicles and fuel, as well as vehicle monitoring.

Requirements regarding the environment in procurement vary a lot and are usually due to market maturity, economic incentives, profitability in industry and education.

The city has established three models for demands on vehicles and fuels:

- **CO_2 reduction**. Usually called CO_2 bubble and is written in the contract. This model requires a set base line.
- **Environmental staircase**. Here, demands on contractors with more vehicles increase according to a set scale.
- **Time x Environment**. These are contractual terms linked to time, i.e. the contractor will have 100% of the vehicle fleet using renewable fuel six months into the contract. The advantage is that the supplier does not need to meet the requirement when signing the contract and thus the risk exposure is reduced.

The requirements placed can be divided into three general categories, minimum requirements, maximum requirements and other requirements:

• **Minimum requirements.** Stockholm is an environmental zone for HGV's and within the congestion charging zone, Euro V vehicles or better are required. The City of Stockholm uses this as an argument for applying the same standard throughout the council area. For LGV's the average emissions must not exceed 205 grams of CO_2 per kilometre

• **Maximum requirements**. All HGV's meet Euro V standard and a proportion Euro VI. In addition, a certain proportion of the vehicle fleet must be categorized as environmental cars or driven on at least 80% renewable fuel. LGV's shall be Euro VI compliant and not older than seven years

The City of Stockholm has not come as far in other contract areas, framework agreements dictate that 1-2 vehicles must run on renewable fuels, which correspond to 5-10 percent of the delivery vehicles.

4.3.2 Order Placement

From January 2017, all administrations are connected to the City of Stockholm's common e-commerce system, Agresso. Management and development of the financial system is carried out by the system development unit at the Finance Department.

The dedicated e-commerce unit is staffed by system administrators administering supplier’s access to Agresso. The unit also handles access to Svefaktura (invoicing) and manages supplier’s price lists and base data. The unit also offers support to those who use the e-commerce system of the City of Stockholm's administrations.

The e-commerce system collates procured goods and services and allow for a “one-stop-shop” solution. The ordering process can be briefly described as: The buyer seeks out the product, creates a requisition, that is sent for approval by management, a purchase order is created and sent to the supplier, the supplier sends an order receipt, ordered goods, and a delivery notification. The buyer then carries out an electronic delivery approval when the goods have been delivered. If the invoice is in accordance with the purchase order, the invoice will be automatically acknowledged and paid. If there are deviations, the invoice will be sent for manual approval in Agresso.

Although all units in the council have access to the e-commerce system, the utilization rate varies. The unit with the highest utilization rate in September 2017 used the system for 76 percent of its purchases, while the total utilization rate among all units was only 40 percent.

During the period January 2016 - August 2017, a total of 264,840 orders were placed in the e-commerce system, amounting to a total of SEK 6 billion. However, the utilization rate is 70-80 percent among suppliers in categories that are suitable for coordinated distribution of municipal goods. Figure 5 below illustrates the categories in the e-commerce system, and those that are suitable for coordinated distribution.

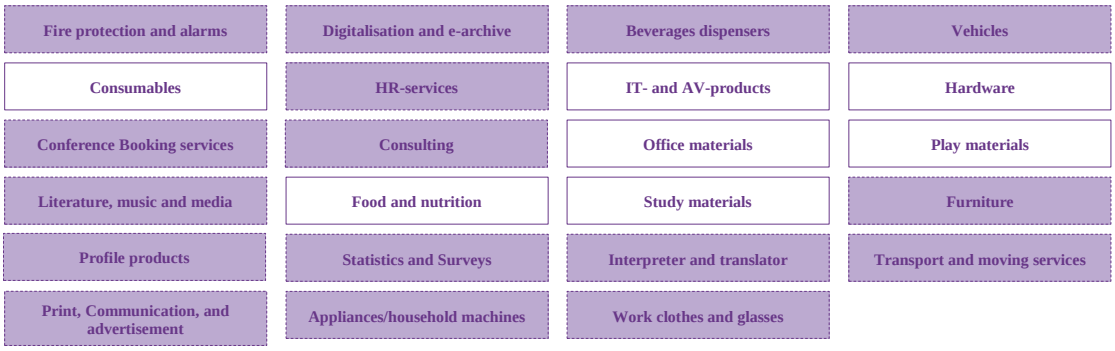


Figure 5: Product categories in the municipality’s e-commerce system. The white boxes illustrate categories that are suitable for coordinated distribution.

Generally, the following products are suitable for coordinated distribution: Products that have low or no service content, goods ordered more frequently, and products of low value compared to order frequency. Seven categories of goods are suitable (the categories in the e-commerce system were used as starting point): foodstuff, consumables, office supplies, teaching materials, IT and media products, hardware products, and household products. In addition, the number of orders and the amount ordered for the 1,000 largest commodity suppliers was plotted in a graph, see Figure 6 below.

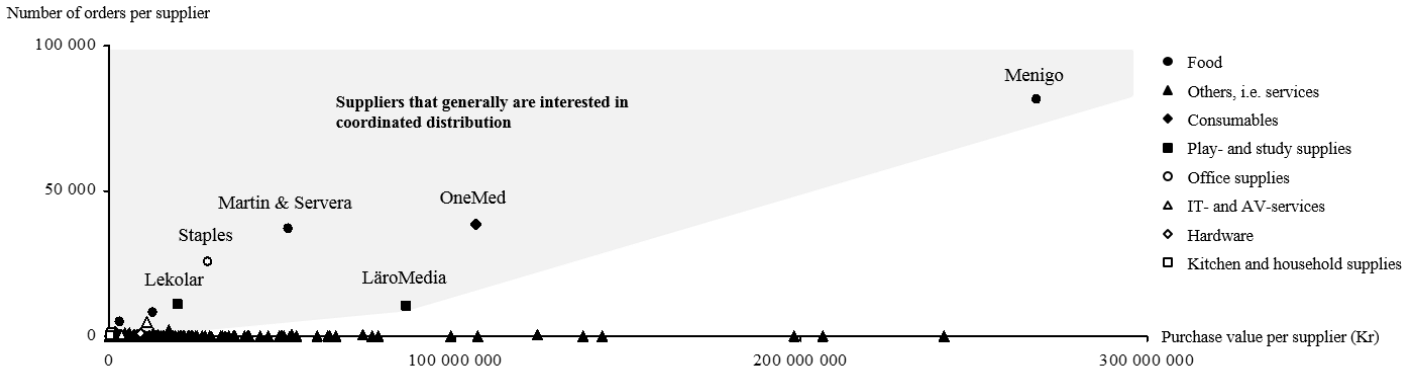


Figure 6: The number of orders and purchase value of the 1,000 largest suppliers by product category during the period January 2016 - August 2017.

During the surveyed period January 2016 - August 2017, the seven selected categories accounted for 86 percent of the orders and 10 percent of the total purchase value of 600 million. Table 2 below lists the selected product categories, their associated suppliers, total value and number of orders during the survey period.

Table 2: A summary of purchases in the City of Stockholm's e-commerce system during the period January 2016 - August 2017 for each selected product category.

Product category	Supplier	Order value (SEK)	Number of orders
Foodstuff	• Menigo Foodservice AB • Martin & Servera AB • Arla Foods AB • Bröderna Hanssons • Europabagaren AB	339 306 480	132 190
Consumables	• OneMed Sverige AB • Aura Light AB	108 102 050	40 000
Play & teaching material	• Lekolar AB • LäroMedia AB	106 110 510	21 050
Office material	• Staples Sweden AB • Office Depot Svenska AB • Lyreco Sverige AB	28 709 260	25 570
IT and media-products	• Supplies Team Sverige AB • AV Syd AB	14 695 720	5 490
Hardware	• Tools Sverige AB	8 922 480	850
Kitchen and household products	• Martin & Servera Aktiebolag • Elgiganten AB • Siba AB • NetOnNet AB	1 355 840	1 330
	Total	**607 202 350**	**226 480**

According to the councils data, a total of 14 700 tons of foodstuff was ordered in 2016. Corresponding figures for other product categories are not available.

Ordering is carried out by the various units at the City of Stockholm's, depending on the product category. For example, food is normally ordered by a person from the kitchen. In the e-commerce system, the customer may choose to place orders in the supplier's own online store, alternatively through the City of Stockholm Search Engine. Not all suppliers are connected with the "punchout" solution, which means that it is not possible to be directed to their online store. Instead, the customer gets referred to the search engine. An important difference between online store and search engine is that the customer can see the current stock balance in the online store. Being able to view inventory reduces the risk of placing orders on an item that is out of stock.

4.3.3 Deliveries

Within the city there are about 1,500 recipients of foodstuff and 1,700 recipients of consumables using the e-commerce system. The actual

number of recipients may be greater as the current e-commerce system utilization rate is not 100 percent. A summary of the number of delivery points is given in Table 3 below.

Table 3: The number of destination for each product category based on the number of unique GLN codes. Currently, about 13 percent of all orders lack a GLN code, so the number of actual delivery points is probably greater.

Product Category	Number of destinations
Foodstuff	1 510
Consumables	1 670
Play & study material	1 140
Office material	1 620
IT and media products	940
Hardware	110
Kitchen and household products	620
Unique destinations	**1 910**

Deliveries are now carried out without coordination as described in Section 3.1. Suppliers choose the mode of distribution and carrier meeting the requirements of the framework agreement. The contract price is based on the specific terms of delivery for the respective contractual areas. The product price includes transport costs and the contract also specify the number of delivery days.

Some suppliers have allocated certain delivery days for some units. These days are determined by the supplier, and the number of days depends on volume each unit order. Menigo, Martin & Servera, Arla and OneMed are suppliers who have allocated delivery days. Other suppliers deliver within a certain number of days, often two business days from the date of ordering.

According to the contracts, foodstuff suppliers must deliver within a specific two-hour interval between 7 AM and 2 PM. If delivery occur more than one hour after the agreed time, the responsible contract manager is to be contacted. Other stock suppliers deliver some time during office hours.

Table 4 describes delivery frequency for several different suppliers (some suppliers have so few deliveries that no relevant results can be presented). The proportion has been calculated based on the entities that have placed orders with each supplier. The delivery frequency has then been rounded up to the nearest integer and has been based on orders placed in e-commerce systems during the period January-May 2017.

Table 4: Delivery frequency for suppliers during Jan-May 2017

Supplier	**Frequency**			
Proportion of units getting deliveries [%]	***≤ 1 time/w***	***2 times/w***	***3 times/w***	***≥ 4 times/w***
Martin & Servera AB	93	6	1	0
Menigo Foodservice AB	82	14	3	1
Proportion of units getting deliveries [%]	***≤ 1 time/m***	***2 times/m***	***3 times/m***	***≥ 4 times/m***
Arla Foods AB	66	4	2	28
Bröderna Hanssons i Göteborg AB	71	15	7	7
Europabagaren AB	70	11	5	14
Lekolar AB	80	11	5	4
LäroMedia AB	35	17	16	32
OneMed AB	38	31	17	14
Staples Sweden AB	64	21	5	10
Supplies Team AB	84	10	5	1
Tools AB	88	4	3	5

Conclusions from the delivery frequency are:

- Martin & Servera (food) and Menigo (food) are the suppliers of goods that deliver at least once a week to most of the City of Stockholm’s receiving units
- Suppliers coordinate their deliveries, but it is possible for the council to influence delivery patterns to increase coordination further.

As mentioned earlier, an estimated 160,000 deliveries per day are carried out in Stockholm County. Of these 160,000, more than 1,000 deliveries are made to the receiving units within the City of Stockholm. Note, however, that the figures are not directly comparable. Municipal deliveries only include product categories in the pre-study, and the total figure of 160,000 is general. In any event, the City of Stockholm's share of deliveries is estimated to be low.

To provide a further description of the City of Stockholm's share of the total, a summary of operations within Stockholm is presented, see Table 5 on the next page. The information has been obtained from "jämför service" at Stockholm.se.

Table 5: Distribution of Stockholm municipal preschools, elementary schools, upper secondary schools and health and social care homes within the elderly care.

Organization type (amounts)	Municipal	Private	Parent cooperative	Employee cooperative	Contract delegation	Municipal share
Preschools (1 048)	582	346	95	25	-	56 %
Compulsory schools (257)	140	117	-	-	-	54 %
Upper secondary school (95t)	27	68	-	-	-	28 %
Health and social care facilities (153)	30	91	-	-	32	20 %

4.4 The operations view

To map the current situation within the city, several site visits have been made at Council units. In addition, numerous interviews and presentations have been conducted at the central level to capture additional views from people in more strategic positions. This section presents the main views that have emerged. A full description and interview list can be found in the appendix.

From visits and interviews with local units, the following overall views have been presented:

- **The e-commerce system has an improvement potential**. Buyers prefer to see current stock balance, they find it difficult to search for goods in the search engine, the management approval process requires that orders are delayed, and that discount prices are not always included in the system
- **Buyers are generally satisfied with the foodstuff deliveries**. The ordering units are streamlined and designed based on current deliveries.
- **Consumables and office supplies can be delivered in joint transports.** Buyers believe that deliveries of different product categories can be coordinated more. This is particularly relevant to consumables and office supplies
- **Many small deliveries**. In addition to the larger scheduled deliveries, smaller deliveries such as messengers, backorders, mail, newspapers, etc. Based on sampling, it is indicated that up to half of the contract deliveries consist of so-called small deliveries. This is perceived as detrimental to the environment and inefficient and create interruptions.
- **Lack of sorting from some stock suppliers.** The units want the goods to be sorted by departmental receiver. At present, some deliveries are unsorted, and sorting take time for the staff handling the goods at the various units.

- **Facilities for receiving and storing goods vary between units.** Generally, larger units, regardless of the type of business, have better prerequisites for managing and storing larger volumes of goods. The age of the buildings may affect the conditions.
- **Increased competition among stock suppliers is largely positive**. For instance, the range of goods will be bigger, additional choice allows for greater chance of satisfaction.
- **Delivery outside working hours is considered difficult**. The possibilities for delivery outside working hours are considered small both from a resource and storage perspective. Food is the product category considered to be most challenging due to the management requirements that exist.

From interviews with people at central level, the following comments have been highlighted in connection to coordinated distribution of municipal goods and a possible implementation project:

- **There is an opportunity to increase coordination at units**. The person that manages the orders at the units differs. In schools, it is common to be organized in teams, where each team is responsible for their own orders.
- **Some units have limited space**. This mainly relate to limited space in kitchens.
- **Foodstuff delivery frequencies need to be maintained.** The delivery frequency has been optimized according to the needs of the units.
- **Units may need to change their way of working**. An implementation project will most likely be met with some resistance from the units. People at a central level believe that coordinated distribution is possible, and that it is a matter of the units having to change their way of working. For example, if they would get bigger deliveries, the units could instead plan to have more resources in place to enable pickup
- **Foodstuff is the critical product category**. Food need to be kept fresh, which lead to the most frequent delivery pattern. Central level management believe that it would be best to focus coordinated distribution efforts on other product categories before food is considered.
- **Food is the only goods that need to be handled directly upon delivery**. Receiving more product categories at the same time is no major concern. The important thing is that the goods are sorted so that all food can be taken care of immediately. Letting the non-food items remain for a while is no problem if space is available.
- **Delivery date is not the most important thing, knowing what time the delivery will take place is**. According to the Education Administration, the units do not have views concerning delivery

dates and times. The important thing is that the units know when delivery will take place so that they can plan accordingly

- **It is important to consider the working environment**. The work environment of the units must not deteriorate with coordinated distribution
- **Each unit needs to be mapped out before introducing coordinated distribution of municipal goods**. It is challenging to draw general plans that suit all parts of organisation. The size of the unit, when the premises were built can be a possible way to draw up a comprehensive plan, but more in-depth analysis of each units is required before introducing coordinated distribution.
- **The division of responsibility between stakeholders needs to be clarified**. The units need to know who to contact. The responsibility of the parties must be clarified so that the units are not affected when any errors occur.
- **Interested parties need to be involved early when introducing coordinated distribution**. This simplifies the change to management and the concept can be adapted to suit different parties.
- **Contracts need to be harmonized prior to introduction**. It is difficult to change the current contracts, and it is therefore important that the contracts consider coordinated distribution before implementation.
- **To allow delivery when staff are not in place is largely a liability issue**. Kitchens would probably be the most likely candidates for an unmanned reception as thesurface space is limited. Installing card readers or similar is possible but involves an increased cost. Basically, this is a question of clarifying responsibility between the supplier the buyer.
- **It is important that the units have the necessary control**. For example, the principals need to participate in the project and be in charge of operation and management at the schools. Without local support and anchoring, it will be a challenge to successfully introduce coordinated distribution.
- **Important with a gradual implementation roll-out**. In this way, the concept can be tested. In addition, it creates a better opportunity for the Education Administration to handle the implementation

4.5 Opportunities and challenges

It is important to emphasize the conditions offered by City of Stockholm for the implementation of coordinated distribution. In addition to previous work and projects that have been implemented, which contributed to a basis for coordinated distribution, there are conditions that need to be considered. Listed below are opportunities and challenges for the council:

- Established e-commerce - The City of Stockholm has an established e-commerce system that many units use
- Environmental requirements - Vehicles with renewable fuels are chosen for the City of Stockholm's own fleet of vehicles and for the procurement of transport services and other services involving vehicles. This includes environmental requirements for deliveries of the product categories covered by this pre-study
- Foodstuff handling - How foodstuff is handled is governed by EU regulation and legislation such as labelling. According to the Environmental Board, it is primarily about common sense. Importantly there is no regulation that prevent different product categories from being co-loaded or that suppliers are banned from doing temperature controls.
- Support systems - A distribution / inventory management system is necessary if coordinated distribution is to be introduced. In addition, a supplier portal is necessary to enable small suppliers to carry out delivery notification electronically.
- Geography - Stockholm has a unique city centre consisting of islands that contribute to traffic density. Many council operations are centrally located, which also contributes to traffic congestion
- Procurement - Traditionally goods and transport are procured together, i.e. the price for the transport is included in the retail price
- Land development and construction - Within the City of Stockholm there is a large variation in space provided for deliveries. The geographical situation as well as the size and age of the properties contribute to this variation. The physical conditions for receiving and storing goods are an important aspect to take into consideration as it may affect what is possible regarding coordinated distribution. It is an area that needs to be analysed in more detail through an implementation project. Table 6 describes general features of existing properties, as well as some of the trends in new construction and renovation that emerged during the pre-study. The general trend is to allow less space rather than more space for deliveries. This conflicts with the prerequisite of coordinated distribution which may lead to larger quantities of goods at each delivery or fewer deliveries.

Table 6: Overall summary of trends in new construction and development of properties for units covered by the pre- study. The table focuses on kitchens as foodstuff as the largest product category.

	Preschool	Schools	Health and social care centres
Existing facilities	• Generally crowded with limited opportunities for goods reception and storage • Kitchens that cook food from scratch are present in existing premises • 300 of preschools were built during the same period around the 80's. Work environment and goods reception were not a priority	• Attempts to increase the number of students in existing schools, which adds demands on kitchens and can affect storage space as more students require more facilities e.g. toilets • Kitchens that cook food from scratch are present in existing premises • Governing documents specify that premises should have sufficient space for different types of storage and that loading docks are provided.	• Are often located in independent properties with relatively good facilities for deliveries • However, in half of the cases several activities share loading docks • Usually cooked food is delivered.
Trends new development	• Newly-built preschools are space efficient, with no storage space • SISAB has developed concept preschools with better conditions for goods reception than the older schools • Kitchens are being built in new preschools	• Generally, larger units are built for approximately 900 students. Large schools are said to have better opportunity to receive larger deliveries	• Urban development common to integrate health care and social housing • Assumes that cooking is done off site.
Trends Redevelopment	• Goal to add more kitchens	• If reconstruction occur, an analysis must be done to see if a kitchen can be built • The trend for kitchens increases at schools	• Loading docks have been removed when operations share buildings

5 Market and external analysis

Experiences and opinions from other municipalities, suppliers and carriers indicate that the main benefit of coordinated distribution of municipal goods is reduced congestion and increased road safety near the delivery location. However, some challenges with coordinated distribution have been highlighted. It mainly concerns the failure to reduce supplier prices and increased administration both at the council and supplier side. Suppliers note that additional costs in the form of system support and planning offset reduced transportation costs to the distribution centre. In coordinated distribution, a logistics partner is introduced, which requires a clear division of responsibility and information exchange. The municipalities have had difficulties measuring the impact of coordinated distribution of municipal goods on the entire transport system, particularly the environmental impact and congestion.

Today all deliveries to the City of Stockholm are coordinated, mainly with deliveries to other customers. The City of Stockholm's demands will thus affect other, less demanding, actor’s environmental impact.

Current suppliers, carriers and the trade association Swedish hauliers (in Swedish, *Sveriges Åkeriföretag*) see several areas where the council can initiate improvement projects to achieve similar effects like those sought by coordinated distribution. The main improvement is to allow more flexible delivery times and preferably deliveries outside of congested hours. This is an area that other municipalities introducing coordinated distribution also investigate.

In addition to the effects that can be achieved in dialogue and cooperation with current suppliers, a coordinated distribution can enable fewer deliveries. Though there is a risk that the vehicles will remain on the road to other customers but with a poorer utilization rate, thus cancelling the positive impact. All experience shows that a coordinated distribution requires a plan to handle increased costs in the municipal budget.

5.1 Coordinated distribution in other municipalities

The description and experience from other municipalities that have introduced coordinated distribution has been obtained from interviews, as well as reading reports and studies. Interviews have been conducted with Södertörn Municipality, Widriksson's Åkeri, the logistics partner in Södertörn Municipality, Nacka Municipality and Malmö Municipality. These are municipalities adjacent to Stockholm, or of similar size or design. Information about Växjö and Eskilstuna municipality has been obtained through reading.

Based on analysed municipalities, the following conclusions have been drawn:

- **Municipalities are primarily experiencing local benefits**. Reduced congestion and increased road safety around schools are the main experienced benefits.
- **Reduced environmental impact, improved road safety, fewer transports and the possibility for more suppliers** to tender for contracts are recurring driving forces behind coordinated distribution. However, the study has not seen any quantifiable data to support that those goals have been achieved. Nor has there been evidence showing the benefit on the transport network.
- **It takes at least two years from start-up to first delivery**
- **In terms of total cost, coordinated distribution has resulted in a price increase** for most municipalities, as they at best managed to reduce the price of goods by 0.5-2 percent. Several municipalities estimate the cost of coordination to between 5-7 percent of the goods price.
- **Clear division of responsibility** between suppliers and the logistics partners is required to avoid ambiguity in the case of damaged or missing goods
- **The introduction of product categories usually happens gradually,** and it differs between municipalities which categories are first included in coordinated distribution. Foodstuff is the most challenging product category as it depends on lead time and cooling.
- **There are different ways of procurement**. Some municipalities procure the entire solution with distribution centre and transport from one logistics partner. Others have two partners, and some manage distribution centres inhouse and procure transport services only
- **The agreements should be harmonized upon introduction**. This means that the contract support coordinated distribution when renewed. There are difficulties in changing existing contracts.

The municipalities in the pre-study have been analysed based on background, purpose / desired effects, product categories, mode of operation, payment model, effects achieved, and lessons learned. See Table 7 for a compilation across the municipalities.

Table 7: Summary of analyzed municipalities

	Nacka municipality
Background	• coordinated distribution began in 2008 when an agreement was signed with Bring as a logistics partner. In 2013 a new agreement was signed with Bring, including Bring Frigo.
Purpose/desired effects	• The reasons for coordinated distribution were improved safety in terms of reduced number of trucks at the units, optimized transport routes for lower environmental impact and broader supplier base.
Supply categories	• Initially included consumables, office supplies and literature. • In the second agreement with Bring Frigo, foodstuff was also included.
Form of operation	• Nacka has two different streams within its coordinated distribution,:foodstuff and other goods. • Bring Frigo is responsible for foodstuff from their distribution centre in Jordbro. They drive 3 different routes supplying 150 units twice a week. About 70% of the units receive delivery only one day a week. • Bring Express is responsible for goods from their warehouse in Västberga. They drive 2 different routes supplying 200 units once a week. • Bring is responsible for the customer service for foodstuff and other goods. This has been challenging for the business since Bring Frigo and Bring Express have different customer services
Payment model	• Payment is based on the number of routes as well as the number of cages and packages being transported. The number of trucks that Bring runs per route may vary depending on how many units are to be delivered. • Nacka estimates the external cost of the distribution centre and logistics partner to 5% of the total product value • The cost of a roll cage and pallet is 200 kr., The cost of a package is lower • The cost billed each unit
Achieved effects	• Bring is required to use Euro VI trucks and 80% renewable fuel • The units are positive about the reduced number of food deliveries • Some food prices have been reduced a percentage point
Lessons learned	• Initiate logistics partner procurement and connect existing suppliers early in the process. • Ensure that the technical conditions are available (eg delivery notification files) • It is important to setup a management group responsible implementation including City of Stockholm and the suppliers

	Södertörn municipalities	Malmö municipality
Background	• Pre-study began in late 2011. The project started in 2013 and in mid-2014 a contract was signed with a logistics partner. In March 2015, the first deliveries were made	• Work is underway to reduce the councils environmental impact while preparing logistics operations for the expected population increase • SamCity was a pilot project that ran between March 2015 and May 2016
Purpose/desired effects	• Political driving forces behind the project were reduced environmental impact and promotion of locally produced products • Marketed as a cost-neutral environmental program	• Reducing the environmental impact and improved air quality and road safety in Malmö city centre through coordinated deliveries. • Improve service to shops and municipalities
Product categories	• Initial pilot with the supplier Papyrus (office paper, etc.) • Started coordinated distribution with foodstuff. A year later all foodstuff products were available through the programme. • Remaining product groups are now being introduced	• During the pilot project, all product categories except foodstuff were included
Form of operation	• Widriksson's Åkeri AB has been procured as a logistics partner and is responsible for the distribution centre and delivery. The contract also includes customer service • Coordinated distribution is divided into two different systems: food and other goods • 800 points of foodstuff delivery of which a majority receive two deliveries a week • In total, all other goods have 2 000 points of delivery averaging twice a month	• Goods were delivered to a distribution centre located seven kilometres from central Malmö. At the distribution centre, the goods were sorted and then transporte in to the city. • In the centre of Malmö there was a "Micro-terminal" where goods from the large distribution centre were delivered. The "Micro Terminal" would serve the shops along the pedestrian street in a similar way to a mall. The goods were delivered by electric vehicles or electric bicycles. • Both private and municipal deliveries were included
Payment model	• The external cost is estimated at 6-7% of the product value • The logistics partner is payed per kilo and number of stops (163 SEK / stop and 0,91 SEK / kilo)	• Funded by the council with support from VINNOVA • The budget for the project between 2014-2016 was SEK 8 million, with large parts being allocated to the operational pilot project
Achieved effects	• IVL conducted an independent survey of the effects achieved in 2017 • IVL's preliminary results show that the amount of non-renewable CO2 fell by 73%, the total travel distance dropped 4% and the number of trips increased by 30% • Increased use of renewable diesel is deemed to be the primary factor for the positive environmental impacts • The units experience reduced traffic and congestion around their operations, and that it is easier to plan operations with fixed delivery days • The project has not been cost neutral as expected. The council has not succeeded in reducing supply costs	• Benefits noted during the pilot were of a local nature. • Businesses experienced reduced congestion and noise, improved traffic safety and air quality at schools.
Lessons learned	• The suppliers' procedures and order systems do not follow the governing method of coordinated distribution of municipal goods • To facilitate division of responsibilities and monitoring, delivery notification files must be sent from the supplier to the logistics partner. The logistics partner requests a central support system	• A comprehensive study of what it means to separate logistics from goods. Coordinated distribution om municipal goods require commitment from the council • The economic benefits of coordinated distribution are dependent on reduction of supplier prices, which is difficult to achieve in practice.

	Eskilstuna municipality[8]	Växjö municipality
Background	• The pre-study began in 2010 • Coordinated deliveries began in September 2014 with foodstuff • Eskilstuna has a well-developed infrastructure that facilitates the flow of goods	• Carried out a survey in 2009 that showed that coordinated distribution could reduce transport by 50 percent • Coordinated deliveries of municipal goods were launched in October 2010
Purpose/desired effects	• Reduced emissions and increased safety mainly around school buildings • The ambition was to halve 24,480 stops done by delivery vehicles prior to the introduction and thereby reduce CO2 emissions.	• Better and more efficient deliveries to the 470 council units. • The aim was to improve the environment and increase traffic safety at schools, through reduced number of deliveries and the possibility for smaller suppliers to submit tenders
Product categories	• Foodstuff deliveries have been coordinated since September 2014 • Gradual introduction of office equipment and tools in 2016	• Initially, only consumables were included • Half a year after start-up, foodstuff was also included • In total, it took 2.5 years for all product categories to be introduced
Form of operation	• Coordination is governed by the council and does not include route optimization programs as kitchens have fixed deliveries that are the same every week • Logistics partner was required to use biogas and deliver route history • Investigates the possibility of introducing deliveries outside regular working hours	• In 2009 an external coordination centre and carrier was procured • In parallel with the procurement, the council also introduced an e-commerce system
Payment model	• To start and run the central office (including new staff), SEK 3.88 million was required • The council expected a 2% reduction in transport prices for food stuff and 5% reduction on other goods due to increased efficiency, i.e., fewer vehicle kilometers.	• The cost of the distribution centre and the logistics partner is estimated at 7% of the total value • The council's goal is to reduce supply prices by 8-12%. In 2013, prices had fallen by 2% among the major suppliers and 10% among the smaller ones
Achieved effects	• The previous 24,480 stops done by delivery vehicles have been reduced to 9,000	• The number of deliveries has decreased from 98,000 to 18,200 per year • CO_2 emissions have decreased by approximately 73% • Reception staff experience fewer interruptions
Lessons learned	• Employ people with warehouse and logistics skills	• E-commerce systems should be introduced around half a year before commencement of coordinated distribution • Labelling of goods is an important part of coordination • Goods to be coordinated should be delivered to the logistics centre by midnight the day before packing

[8] Atkins (2016) Sammanställning av erfarenheter från samordnad varudistribution

5.1.1 Introduction of coordinated distribution within the Södertörn municipalities

In autumn 2017, IVL (Swedish environment institute) conducted an independent review of the effects achieved within the Södertörn municipalities (an association formed for eighth councils in southern Stockholm). The analysis compared operations in 2014 before coordinated distribution, with 2017. The situation in 2014 was established through interviews and limited amount of data from suppliers. The analysis included all deliveries in Södertörn municipality including both private and municipal customers.

According to preliminary data from IVL's analysis, the biggest effect was the reduction of non-renewable CO_2 amounting to 73 percent. The total mileage decreased by 4 percent. Without coordinated distribution of goods, the mileage is expected to have increased by 3 percent, thus the cumulative effect corresponds to 7 percentage points. The number of trips has increased by about 30 percent, partly because Widriksson has chosen to drive two shorter trips per vehicle per day instead of one longer. This is probably due to a combination of delivery time restrictions, size of vehicle and trying to avoid congestion.

According to IVL, there were three factors that contributed to the positive environmental impacts where the transition from diesel to renewable diesel has had the greatest effect:

- Increased use of renewable fuels
- Coordinated distribution
- Updated fleet of vehicles due to technological advances

5.2 Suppliers

The city procures goods from several different suppliers. Interviews have been conducted with four major suppliers and one minor to capture different perspectives. The major stock suppliers were Menigo (Foodstuff), Martin & Servera (Foodstuff and Kitchen & Household Products), OneMed (Consumables) and Staples (Office Supplies). The smaller commodity supplier was Europabagaren (Foodstuff). Additional information has also been obtained from the supplier websites and annual reports.

Figure 7 illustrates where the interviewed suppliers have their warehouses and distribution centres used to supply Stockholm with goods.

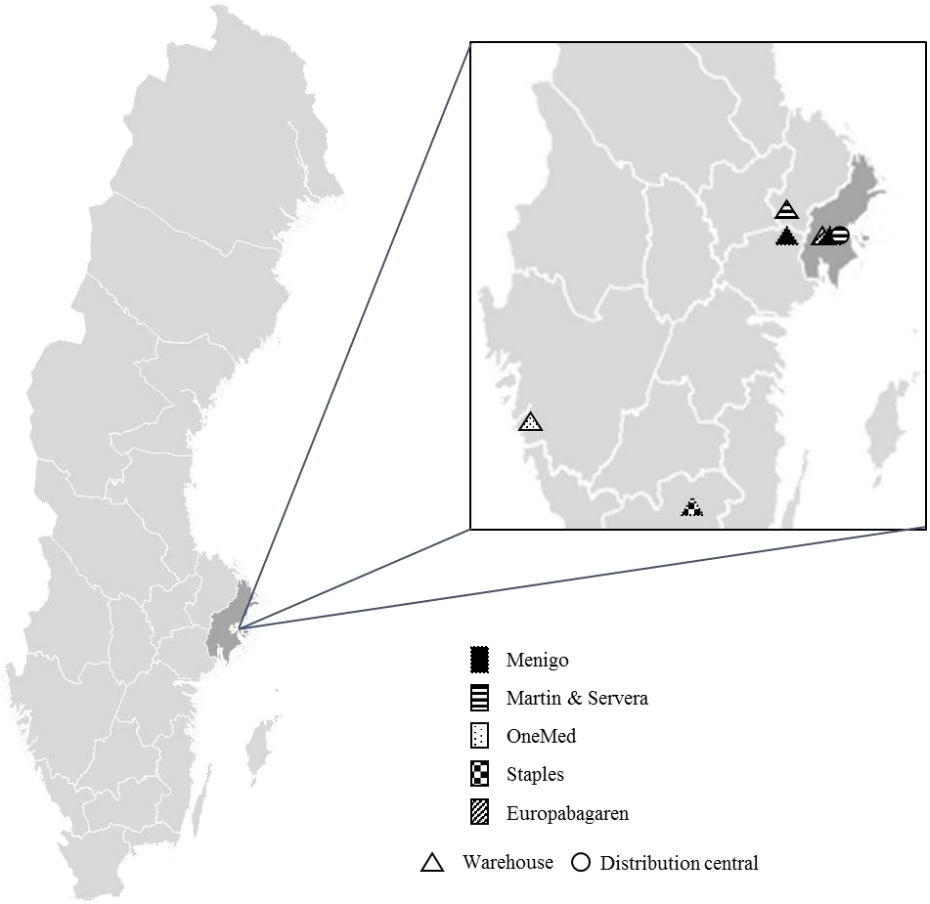


Figure 7: An illustration of the location of warehouse suppliers (rectangular) and distribution centres (circles) used to supply Stockholm with goods. Note that there is an illustration and that, in certain cases, suppliers have operations in the same cities.

Some suppliers pack and ship goods directly from their warehouse, while others use distribution centres to coordinate orders. How the suppliers choose to design their logistics operation differ. A compilation of their respective logistics operation is described in Table 8 on the next page.

Table 8: Summary of the respective supplier's logistics operation.

Supplier	Delivery	Handling
Menigo	• Goods to Stockholm's inner city are transported from Årsta, while goods sent to Stockholm's outskirts are sent from Strängnäs. There is also a constant flow between Årsta and Strängnäs for restocking.	• Menigo manages all packaging and sorting of goods • Transport is carried out using their own vehicles or carriers
Martin & Servera	• Goods sent to the city come from Årsta. The goods are stored in Årsta and / or in Enköping, necessitating transport between the two terminals	• Martin & Servera manages all packaging and sorting of goods • Carriers are contracted to carry out transport
OneMed	• Goods are shipped from OneMed's warehouse in Gothenburg to Bring's distribution centre in the Stockholm area. Then the goods are transported to their destinations.	• OneMed manage packaging in the warehouse in Gothenburg, and have contracted Bring to manage sorting and transport services
Staples	• Goods are shipped from Staple warehouse in Växjö. From there it is transported to Postnord's distribution centre in Segeltorp, Stockholm. Postnord caters for the last leg in the delivery.	• Staples manage packaging and have contracted sorting and transport services by Postnord
Europabagaren	• Goods sent directly from the bakery (warehouse) in Solna	• Europabagaren manages all packaging, sorting and transportation

From the interviews with suppliers, the following conclusions have been drawn:

- **There are improvement opportunities within the current setup**. For example, if the council would reduce time restrictions and / or allow increased delivery intervals, it would have a positive effect on traffic congestion and the environment. The suppliers emphasize that preferably deliveries should take place at night. Europabagaren currently deliver at eleven schools at times when they are unstaffed, something that could be expanded to more schools.
- **The suppliers are neutral to the introduction of coordinated distribution of municipal goods**. The important thing is that the City of Stockholm does it for the right reason, that is, has a clear purpose. To do it from an environmental point of view is better than cost perspective. The stock suppliers agree that it is difficult to achieve a cost reduction through coordinated distribution.

- **Suppliers consider it important to carry out a proper pre-study**. A pre-study helps to map out the conditions and determine the current situation. It is important to be able to review the results if coordinated distribution is introduced. Thus, the present operations need to be surveyed for comparison purposes.
- **It is important to involve the suppliers early in the process**. By involving the suppliers early in the process, they are given the opportunity to express their opinions and ideas. In this way, better cooperation is also made possible.
- **The areas of responsibility must be reviewed and clarified upon an introduction**. It must be clarified which party is responsible for each parts of the process. Experience has shown that unclear division of responsibility creates questions and parties blame on each other
- **Support systems need to be reviewed and established upon introduction**. Support systems must be established to allow smooth running of coordinated delivery, such as delivery notifications. There is no common standard and therefore suppliers are forced to investment in new systems each time a municipality introduce coordinated distribution.
- **Coordinated distribution imposes additional requirements increasing costs**. Removing the last section from the distribution link affects the supplier's routing plan. Thus, the total shipping cost of the supplier does not automatically decrease with coordinated distribution. Furthermore, there is the added cost of the support systems to consider.
- **Foodstuff is the most challenging product category as it needs to be kept fresh**. If coordinated distribution is introduced, it must be efficient from day one for food to not be adversely affected
- **At present, suppliers have contracted different types of logistics services**. OneMed and Staples procure standardized parcel services, while Menigo and Martin & Servera procure transport and, in some cases, roll cage trolleys maintaining constant cooling.

5.2.1 Menigo Foodservice AB

According to Menigo, they offer one of the market's widest range of food, beverage and restaurant equipment. They offer daily deliveries to restaurants, catering, and service industries. In 2016, sales amounted to SEK 5.9 billion. By 2015, the profit margin, indicating the efficiency of the supplier, was 3 percent.

The City of Stockholm depend on Menigo for the majority of its foodstuff. In 2016, the total purchase value was over SEK 135 million across 43,000 orders. Corresponding figures for the period January 2017-Aug 2017 were SEK 133 million across 38,000 orders. This increase was partly due to the increased utilization rate of the e-commerce system.

5.2.1 Martin & Servera AB

Martin & Servera claims to be the leading restaurant and catering specialist in Sweden supplying food, beverages and catering on a daily basis. The customer base consists of private and public customers. In 2016, sales amounted to SEK 13.3 billion. The same year, the profit margin was 3 percent.

Martin & Servera provide The City of Stockholm with foodstuff and kitchen and household products. In 2016, the total purchase value was over SEK 26 million across 20,000 orders. Corresponding figures for the period January 2017-Aug 2017 were SEK 26 million across 17,000 orders. This increase was partly due to the increased utilization rate of the e-commerce system.

5.2.2 OneMed Sverige AB

According to OneMed, they are the leading supplier of medical supplies in Sweden. The main customers are public and private health and social care. In 2016, sales amounted to approximately SEK 2.4 billion. The same year, the profit margin, was 1 percent.

The City of Stockholm procure consumables from OneMed. In 2016, the total purchase value was over SEK 57 million across 20,000 orders. Corresponding figures for the period January 2017-Aug 2017 were SEK 49 million across 18,000 orders. This increase was partly due to the increased utilization rate of the e-commerce system.

5.2.3 Staples Sweden AB

Staples states that they are the leading supplier of office supplies in Sweden. They have three different sales channels: direct (mail order and web), advantage (contract customers) and through stores. During 2016/2017, sales amounted to SEK 1.5 billion. During the same period, the profit margin was 8 percent.

In 2016, the City of Stockholm placed 14,000 orders amounting to SEK 15 million across. Corresponding figures for the period January 2017-Aug 2017 were SEK 14 million across 12,000 orders. This increase was partly due to the increased utilization rate of the e-commerce system.

5.2.4 Europabagaren AB

Europabagaren delivers fresh bread and pastries from its bakery in Solna. Delivery are done daily to municipalities, schools, care facilities,

restaurants, shops, and more. Deliveries to the City of Stockholm are done five days a week. In 2016, sales amounted to approximately SEK 51 million. The same year, the profit margin, was 16 percent.

In 2016, the City of Stockholm placed 3,000 orders amounting to SEK 1.7 million. Corresponding figures for the period January 2017-Aug 2017 were SEK 1.6 million across 2,000 orders. This increase was partly due to the increased utilization rate of the e-commerce system.

5.3 Carriers

Carriers are contracted by suppliers to transport goods. Interviews have been carried out with the trade association Sveriges åkeriföretag, as well as with Carrier Transport and Svebol Logistics. Additional information has also been obtained from websites and annual reports.

The carrier business is currently characterized by tough price competition and a shortage of drivers, particularly with a category C driver's license. The category C driver's license is required to operate heavy goods vehicles. Drivers in turn demand a good employer with a high profitability. To be profitable, the carrier needs to achieve an appropriate price point with its customer.

From the interviews with the trade association and carriers, the following conclusions have been drawn:

- **Stockholm is the council that has the best prerequisites for coordinated distribution.** Due to the large volume of goods transported, there are good conditions for coordinated distribution of municipal goods
- **If the City of Stockholm would allow deliveries outside of congested hours, positive effects would be achieved on the environment, traffic, drivers' working environment and transport operators.** If deliveries avoid congestion, they are more efficient crating positive effects for several parties. Night-time deliveries would be the most efficient according to carriers
- **Coordinated distribution does not necessarily decrease the total number of vehicles.** The carriers still need to deliver goods to their other customers, so it is not certain that the total number of vehicles will decrease overall.
- **Coordinated distribution should not extend lead times.** The carriers believe that suppliers can deliver directly to a municipal distribution centre just as they do to their own distribution centres. However, this does not apply to foodstuff which currently is delivered directly to customers.
- **It is challenging for carriers to optimize the number of vehicles.** The carriers do not know in advance what shipments

customers will order. Therefore, they need vehicles on stand-by to handle an increased transport request

- **Transporters prefer to plan their deliveries and suggest that municipal involvement would lead to sub optimal solution.** Carrier plan deliveries and optimize routes for a living and consider the entire customer base.
- **Responsibilities of each party involved in coordinated distribution must be clarified before introduction.** The parties need to know who is responsible for what to avoid problems and issues
- **The relevant system support need to be established when introducing coordinated distribution.** System support is important to facilitate cooperation between all involved parties.
- **The council sets high environmental requirements, which the carriers consider positive.** The requirements are not an issue as the environment is important to the carriers. They often consider themselves to be ahead of customers' requirements.

5.4 Trendspotting

During interviews with different stakeholders, the following trends have been highlighted that need to be considered before an introduction.

5.4.1 Environmental zones

The government is considering the proposal for new environmental zones in autumn 2017 and announced in its declaration that municipalities will be given the right to introduce new environmental zones. This means that municipalities can introduce environmental zones Classes 2 and 3.

Environmental zone 2 stipulate that cars and light LGV’s must meet Euro VI if powered by diesel, and Euro V if powered by petrol. Environmental Zone 3 includes cars, LGV’s and HGV’s. LGV’s must be powered by electricity or hydrogen, HGV’s must be powered by hydrogen or electricity, or be an electric hybrid that meets the requirements of Euro VI.

The new environmental zones could affect what demands that can be set for transports.

5.4.2 Lack of drivers

The lack of educated HGV drivers contributes to increased use of LGV’s. Company vehicle traffic accounts for the largest LGV increase in the Swedish fleet. Company vehicles refers to vehicles owned by a company for the primary task of carrying out transports for that company. Professional transportation is when transportation is performed as a service to another party, then a professional license is required. The supervision of professional licenses is non-existent, which means that statistics can be misleading. HGV drivers performing professional

transportation must also undergo a YKB class (professional driver competency license) that in some respects impedes the development of professional services and increases the cost.

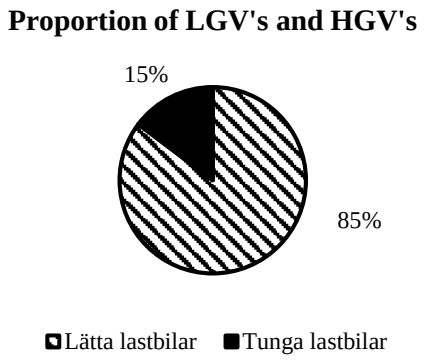


Figure 8: Proportion of LGV's (striped) and HGV's (black) in Sweden in 2011

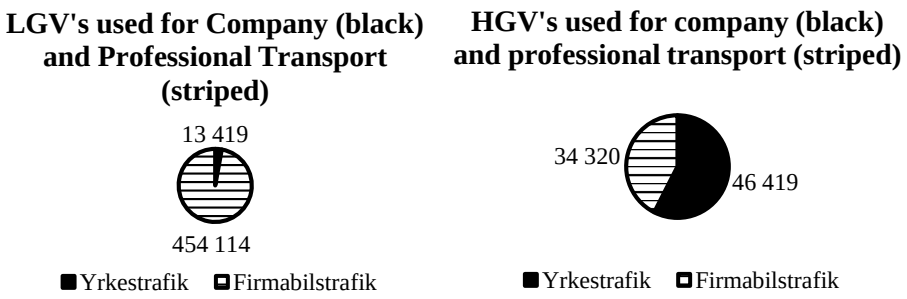


Figure 9: Distribution of lorries in Sweden in 2011

Since LGV’s are primarily registered as company vehicles, it is a commercial advantage that the driver does not need a C driver’s license and no YKB training. This is probably the way the transport industry tries to overcome the problem of driver shortages for HGV’s. This introduces a major risk - LGV drivers potentially have poorer working conditions as they subject to regulation concerning driving and resting periods and have poor training in freight handling and securing cargo.

5.4.3 EU Commission

The EU Commission proposes that, starting 2025, public authorities should not buy / lease biogas or ethanol-driven cars or LGV’s. Starting 2030, only electric vehicles are allowed. For HGV’s, electric, hydrogen, natural gas / biogas drive trains are allowed but not renewable diesel or ethanol.

5.4.4 Internet of Things

"Internet of Things" is considered one of the latest trends in technological advancement. Household appliances, accessories, machines, vehicles and buildings are just a few examples of items that are equipped with built-in electronic components such as sensors and internet connectivity. Thus,

these objects can be interconnected via wireless networks and exchange data.

Inkjet printers and laser printers are examples of connected devices. When the print cartridges start to run out, the printer initiates an order, in municipality's case, to Volvo IT. It generates single orders delivered with short lead time without coordination or co-loading. With increasing connectivity and auto-generated orders, this is an area when introducing coordinated deliveries.

6 Analysis and recommendations

From interviews with various units within the City of Stockholm, other municipalities, suppliers and carriers, the common view is that coordinated distribution has both advantages and disadvantages.

Based on the comments that have emerged, it is possible to see several logistics solutions. There are more measures that can be introduced to increase the efficiency of freight handling and the degree of coordination. The measures can be introduced independently of each other and with different timescales. Therefore, it is possible to see a gradual development towards coordinated distribution.

Table 9 presents a summary of chapters 4 and 5, highlighting the views expressed during the pre-study.

Table 9: Summary of views and observations from current situation analysis as well as market analysis

Current situation in the City of Stockholm	Market analysis
• Units experience **shortcomings in existing deliveries and sorting** • **The prerequisites of the units differ,** which is why each unit needs to be surveyed to be successful when launching coordinated distribution of municipal goods. • The delivery analysis shows that deliveries are somewhat coordinated, **but that better coordination can be achieved** • About **1,000 shipments of the county 160,000 shipments per day** are to the City of Stockholm's (only for included product categories) • Deliveries in the Stockholm occur during **congested times.** • The proportion of **LGV's increases** while the amount of goods does not increase at the same rate, which means that, delivery efficiency decreases contributing to a greater environmental impact • Important with a **gradual introduction roll-out**, among other things, to create better conditions for the Education Administration • From a procurement perspective, the contracts need to be **harmonized** before an introduction. The time of contract renewal dictates how fast coordinated distribution can be implemented • Operations at both local and central levels agree that foodstuff deliveries are relatively optimized today but there is opportunity for the **coordination of remaining product categories**	• According to municipalities, suppliers and carriers, other municipalities have had difficulty in **achieving objectives** with coordinated distribution of municipal goods. To achieve this, you need: – **A clear purpose and goals** – **Involvement of stakeholders** early in the process – **Determine performance indicators** before introduction – **Logistics competence** at the City of Stockholm – **System support** for transportation management • Supplier contracts need to be **harmonized** before an introduction • Suppliers and carriers state that there is room for **improvement within existing operations** (time window, off-peak delivery, etc.)

Based on the introduction of other municipalities, and that identified actions can be grouped depending on how soon they can be introduced, a set of steps leading to coordinated deliveries of municipal goods is formed, see Figure 10. For each step, the degree of coordination and co-loading increases, as well as the City of Stockholm's responsibility within the logistics solution. The bottom step means that the City of Stockholm has little responsibility and receives uncoordinated deliveries from its suppliers, that is, the suppliers of goods decide and are responsible for the deliveries. Full municipal control involves a co-ordination and co-storage organization. Between extreme points there are three additional steps, Delivery with extended requirements, Load consolidation in cooperation

with suppliers and Municipal load consolidation. The pre-study describes mainly step three and four as they are relevant to Coordinated distribution of municipal goods

6.1 Uncoordinated delivery

Most municipalities analysed were in the “Uncoordinated deliveries” stap before commencing work on coordinated distribution. As described in Chapter 3, traditional delivery means that the City of Stockholm purchases goods where the distribution is included as part of the price of the product. The supplier delivers to the City of Stockholm's operations with their own trucks or through carriers / transporters. The City of Stockholm can make certain demands on distribution, but when the product is procured there are limitations in which requirements can be imposed on vehicles.

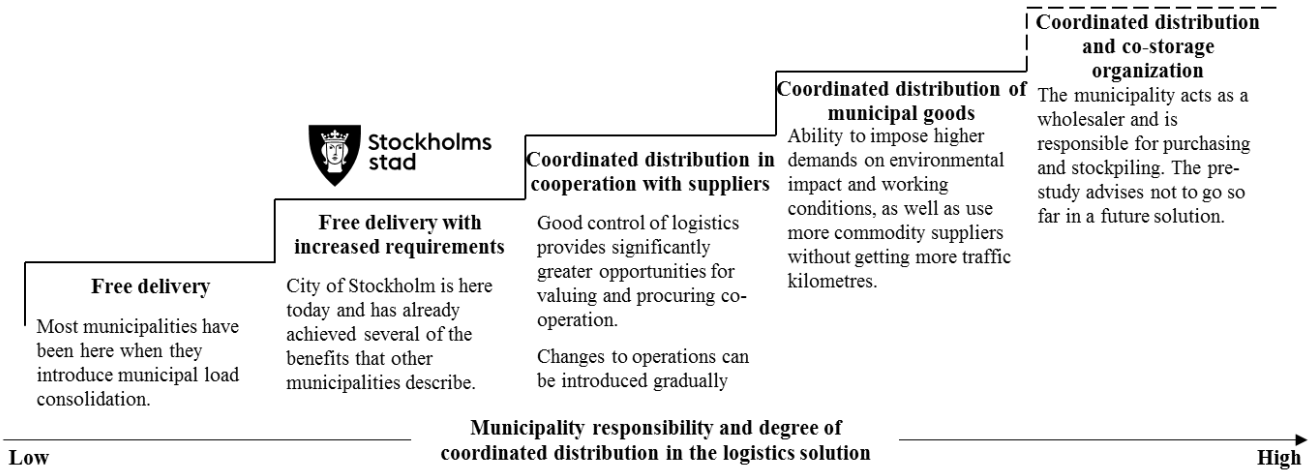


Figure 10: Illustration of the steps towards coordinated deliveries

Södertörn Municipality and Nacka Municipality are examples of municipalities that procured goods with uncoordinated delivery before they started working on coordinated deliveries as part of their sustainability efforts. Both municipalities state that they have had difficulty in realizing the benefits and effects expected by coordinated deliveries, such as costs. However, Södertörn Municipality has managed to reduce its carbon dioxide emissions by 73 percent according to IVL's review. Implementing coordinated deliveries of municipal goods has been more extensive and complex than expected and the municipalities highlight a lack of logistics and distribution experience within the council organization.

6.2 Free delivery with extended requirements

The City of Stockholm has made clear demands on suppliers relating to environmental performance indicating that they are in the step "Deliveries with Extended Requirements". In this step, the City of Stockholm receives deliveries in the same way as the previous step but has imposed higher

and more detailed requirements on the suppliers. In the City of Stockholm's case, this means:

- The city already has established e-commerce with high contract compliance
- The City of Stockholm has high environmental requirements for food suppliers, where about 60 percent of deliveries are conducted using renewable fuels. As described in Chapter 4, the foodstuff suppliers' CO_2 emissions were halved between 2014-2017
- Suppliers and carriers have a share of Euro VI trucks
- The City of Stockholm has reduced delivery frequency (e.g. 80% of units only receive delivery once a week from Menigo).

The City of Stockholm has already achieved several of the effects normally linked to coordinated deliveries of municipal goods.

6.3 Load consolidation in cooperation with suppliers

Collaboration in cooperation with suppliers means that the council gets better control of the logistics operation. Control of logistics operations provides greater opportunities for valuing and procuring coordination. Changes affecting the units in the council can also be introduced gradually.

The pre-study suggests that Load consolidation in cooperation with suppliers, enables the City of Stockholm to take greater responsibility, test solutions, clearly measure the impact on freight handling, traffic and the environment, as well as building expertise in the organization.

6.3.1 Improvement proposals and main activities

Most areas of development and improvement proposals have been presented in chapters 4 and 5. When the City of Stockholm move from delivery with increased requirements to Load consolidation in cooperation with suppliers, cooperation with suppliers is enhanced. The pre-study advocates active dialogue with stakeholders to achieve the best outcome. The main improvement proposals and main activities proposed by the pre-study are as follows:

- **Expanding experience in freight logistics.** Knowledge already exist within the City of Stockholm, but there is need for further advancement. Further knowledge can be obtained through new employees and consultancy support. Extended skills sets enable expected benefits to be reached and the work to be carried out.
- **Define goals and performance indicators**. It is necessary to monitor the effects of introducing new systems and relate to defined goals. This also includes supplier tracking with scorecards to correct current deficiencies and collect useful statistics.

- **Investigate and test new delivery schemes**. The purpose is to streamline deliveries for both suppliers, carriers and recipients, as well as reducing the number of vehicles in use, reducing congestion and reducing negative environmental impacts. New delivery schemes can be created through fixed delivery days, optimizing delivery frequency and arrival time, and allowing delivery outside of school and rush hours. Suppliers and carriers agree that deliveries outside congested times would create the most positive impact for them. The City of Stockholm's local units are more cautious and see the risk of theft and difficulties with creating spaces with limited access for deliveries . At a central level, division of responsibility is the key issue.
- **Develop procurement requirements**. The City of Stockholm should challenge established procurement patterns for transport services. In addition, environmental requirements can be extended, such as setting functional requirements instead of technical requirements. Thus, the supplier's flexibility increases, and promote them to find solution to achieve carbon dioxide reduction, etc. Procurement requirements can also be extended with incentives to further motivate suppliers to contribute to increased efficiency, fewer vehicles, reduced congestion and reduced environmental impact.
- **Take control of small deliveries**. Based on sampling, it is indicated that small deliveries account for up to half of all deliveries, depending on the receiving unit. For example, small deliveries include single toners for printers, coffee for coffee machines, back-orders and mail. Through the coordination of these small deliveries, receiving units may reduce the number of disruptions in operations and plan human resources more efficiently. The aim is also to achieve positive effects on the number of vehicles in use and environmental impact.
- **Use commercial initiatives**. The City of Stockholm should monitor and investigate commercial initiatives to see if there is a possibility of including the City of Stockholm's deliveries to achieve further positive effects. Commercial initiatives are a way of creating synergies and reducing sub optimization. #ÄLSKADESTAD (beloved city) is an example of a commercial initiative that the City of Stockholm should monitor, investigate and possibly use.

6.3.2 Benefits

As described in step 2, Stockholm has come a long way. Though, it is possible to achieve additional benefits using load consolidation in cooperation with suppliers. The pre-study has identified the following overall benefits:

- **More efficient freight handling, less transport, lower environmental impact and increased accessibility**. How much efficiency will increase, how many vehicles be obsolete and how environmental will change has not been estimated in the pre-study
- **Increased cooperation and coordination internally and externally**. All parties work closer to each other and have an open dialogue.
- **Increased logistics knowledge within the council**. The council gets a better understanding of its logistics. It is important that the necessary logistics skills are in place when work starts to achieve desired effects and benefits.
- **Improved working environment for involved parties**. The council units would experience less interruption and deliveries consider the staff working environment (e.g. times, frequency and volume). Drivers' work environment is improved, e.g. by delivering outside of congested times, thus eliminating stress normally experienced unpredictable travel times.
- **Increased road safety, especially around the receiving units**. Traffic safety increases if deliveries happen when staff, children, students, elderly etc. are not located outside the premises. In addition, the risk of traffic accidents is reduced through a reduction of vehicles in operation.
- **Prepares activities and stakeholders for coordinated deliveries**. The council receives knowledge of what works, what may need to be changed and what must be prioritized when introducing coordinated deliveries.

6.3.3 Risks and consequences

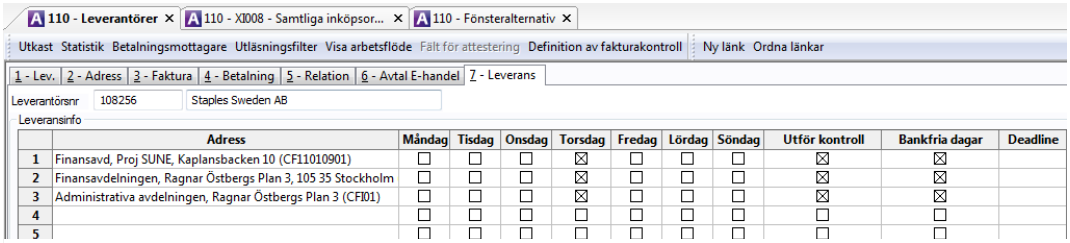
The following overall risks and consequences with Load consolidation in cooperation with suppliers have been identified:

- **Procurement risks**
    - The City of Stockholm already sets high environmental requirements. Higher requirements may pose a risk that the requirements may be considered disproportionate, and thus incompatible with LOU (Public Procurement Act).
    - High requirements can lead to fewer tenders and higher tender prices.
    - The LOU limits how the contracts can be renegotiated
- **Changes in the business routines**. Changed logistics operations may require businesses to modify their routines. In connection with routine changes, discontentment may occur. It is important to work with management and have an educational and active dialogue with the various council units.

6.3.4 System aspects

Load consolidation in cooperation with suppliers is necessarily not associated with additional investments in IT systems. However, there is a wish from council units to develop the existing purchasing system, for example, so that the current inventory balance becomes available. In the City of Stockholm's e-commerce system, Agresso, it is not possible to offer current stock balance. Neither is it possible to develop such functionality. To display current inventory, for example regarding foodstuff, the City of Stockholm has connected suppliers via PunchOut (e-commerce via the supplier’s online store). By connecting more merchants via PunchOut, the buyer can review current stock balance. Generally, larger suppliers have better prerequisites for offering e-commerce via PunchOut, which means that the solution does not promote the connection of small suppliers.

It is possible to control which delivery dates will apply to the respective delivery address for each supplier in Agresso. The solution is available by default, but the City of Stockholm has chosen not to use the functionality due to the required maintenance.



	Adress	Måndag	Tisdag	Onsdag	Torsdag	Fredag	Lördag	Söndag	Utför kontroll	Bankfria dagar	Deadline
1	Finansavd, Proj SUNE, Kaplansbacken 10 (CF11010901)	☐	☐	☐	☒	☐	☐	☐	☒	☒	
2	Finansavdelningen, Ragnar Östbergs Plan 3, 105 35 Stockholm	☐	☐	☐	☒	☐	☐	☐	☒	☒	
3	Administrativa avdelningen, Ragnar Östbergs Plan 3 (CFI01)	☐	☐	☐	☒	☐	☐	☐	☒	☒	
4		☐	☐	☐	☐	☐	☐	☐	☐	☐	
5		☐	☐	☐	☐	☐	☐	☐	☐	☐	

Figure 11: Delivery date specification in Agresso

The solution is that an administrator submits fixed delivery dates for all shipping addresses for one supplier. All contracts connected to the supplier are affected, which means that it is not possible adjust the times for one single contract.

Based on the current set-up, buyers are requested to choose the fixed delivery date. However, it is possible for the buyer to choose a different day than the fixed delivery date. This allows for flexibility for urgent orders. Despite system support, it is not certain that orders are created with the correct delivery date, which is a disadvantage. The system is prepared for Bank Holidays. If a Thursday is a fixed delivery date according to the set-up, a buyer will asked to choose the following Thursday in case Thursday in the current week occur on a bank holiday. There is no system support to offer delivery on the next day (in this caseFriday).

The standard Agresso setup would probably make it easier for the buyer to choose the right delivery date. Unfortunately, the system is not flexible in the sense of enabling bulk updates when necessary, such as Bank

Holidays, which means that it involves a lot of maintenance. When new shipping addresses are added, these must be added manually in the supplier register, see Figure 11 above. A solution to facilitate the setup of new shipping addresses is to generate a script that updates delivery dates automatically. Such a solution would, however, can be associated with a cost.

An alternative to a system solution is to educate and inform clients about which ordering dates for purchases within the different categories, as is already done today.

6.3.5 Organization

The pre-study recommends that the implementation of load consolidation in cooperation with suppliers is carried out by two full time resources, where the following skills are necessary:

- Transport and environmental analysis
- Coordination and process review

The proposed resources will work close to the product category team, but responsibility for requirements within each product category lies with the product category team. In addition, resources will work close to other supporting units, such as the Environment Administration and the Transport Administration.

In addition to full-time resources, the pre-study recommends consultancy support for a six-month introduction. The consultancy support consists of two full-time resources, one senior and one junior.

6.3.6 Costs

The costs incurred in connection with the introduction are personnel costs for the two full-time resources as well as a cost of the recommended consultancy support during the first six months.

6.3.7 Schedule

The project launching the new logistics operation is planned to be going on 2-6 years depending on when existing contracts expire and can be renewed. The initial evaluation is planned after two years. The scheme will be evaluated based on the goals and performance indicators defined at the start of the project.

6.4 Municipal load consolidation

Municipal load consolidation is the fourth step in which the City of Stockholm takes an active decision to involve itself in the distribution of its activities. In municipal load consolidation, the City of Stockholm can put higher requirements on distribution. Before this step this aspect is part of the goods procured, not a standalone distribution service.

6.4.1 Initial Components

The introduction of municipal load consolidation requires several considerations and decisions. The City of Stockholm needs to form a view on the areas below.

Operational management

Most of the analysed municipalities that have introduced municipal load consolidation have procured distribution centres and transport from the same logistics partner. The municipalities have also included customer service, route optimization and planning as part of the logistics partner's responsibility so that they do not have to acquire that competence themselves. Minimizing the number of parties involved is believed to contribute to higher efficiency and reduced complexity. Eskilstuna is an example of a municipality that operate municipal load consolidation on its own. It is run out of council premises and they have not procured any route optimization service but have decided when and how deliveries should take place.

The location of the distribution centre for the City of Stockholm is a more complex question than for the analysed municipalities due to the size and geography (consisting of many islands connected by bridges and tunnels). Before introducing coordinated deliveries, the City of Stockholm should investigate whether more distribution centres are required, such as one to accommodate the northern parts of the city and one to accommodate the southern parts. Experience from other municipalities is that food and other goods can be handled in the same distribution centre but delivered separately. The flow of goods needs to be analysed through simulation tools to establish suitable distribution centre locations. Below are a few factors that should be considered when evaluating the distribution centre:

- Proximity to the distribution area
- Proximity to major traffic routes
- Capacity to handle the planned quantity of goods at full implementation
- Number of loading docks
- Sufficient area for manoeuvring and vehicle parking

The City of Stockholm needs to take a stand on the above areas before a procurement. The procurement requirements need to consider the types of services and handling that should be included, such as roll cage trolleys, packaging, sorting, scanning, storage, returns of goods and cargo carriers, as well as customer service and route optimization. Since there are no standardisation relating to IT-structure and electronic messaging, a clear structure need to be established before any attempt at coordinated deliveries in Stockholm.

Pricing model and cost

Experience from other municipalities that introduced municipal load consolidation indicates that the annual cost of the procured logistics partner and distribution centre is around 5-7 percent of the total product value. The pricing model differs depending on council and logistics partner. Some municipalities pay per stop and shipped weight, others per predetermined route and per roll cage trolley or package.

For the product categories included in the pre-study, the annual value is around SEK 650 million. Applying the above cost rate, the distribution centre cost would amount to SEK 32-45 million in Stockholm. In addition to the external costs of the procured distribution centre and the logistics partner, costs for the management organization including a procurer and contract manager.

When introducing coordinated deliveries, a one-time expense will also be incurred for staff supporting the introduction and consultancy support. The costs are reported separately in Chapter 7.

Reduction of prices

Most of the analysed municipalities assumed that prices would drop in forthcoming procurements corresponding to the cost of running the distribution centre. In reality, prices have been reduced by 0.5-2 percent. It has been found that suppliers are faced with other costs meaning that price of goods has not dropped as expected. According to supplier's annual reports their distribution costs amount to just over four percent of sales, which further justifies the difficulty in negotiating the price of goods by more than two percent.

If the City of Stockholm can negotiate a reduction in the price of commodities by one percent due to the introduction of coordinated distribution, the net operating cost of the scheme will be SEK 26-39 million per year.

Product categories

The choice of product categories included in coordinated deliveries of municipal goods is important and several aspects need to be considered. Most of the municipalities that the pre-study has analysed commenced with office supplies, some commenced in the form of a pilot project. Office supplies were considered most suitable, because they not depend on refrigeration or the short delivery time of food.

When the distribution centre is running and routines and processes work, usually parts of the foodstuff deliveries are included. The range of foodstuff and the number of connected units are increased gradually. Foodstuff are often of such volumes that municipalities as well as receiving units prefer it delivered outside co-loading. Other municipalities that introduced coordinated deliveries say that foodstuff should be included to have any chance of achieving economic gain.

6.4.2 System aspects

To fully deploy coordinated deliveries of municipal goods, several system aspects need to be investigated. Firstly, it is required that the City of Stockholm decides whether the logistics partner should be responsible for a distribution / inventory management system, or if the City of Stockholm is to procure such a system separately to have full control over the flows between suppliers, distribution centres and Agresso e-commerce.

When commissioning coordinated distribution of municipal goods, the City of Stockholm should require that a distribution / storage management system is accessible to all parties. If all parties have access to the system, suppliers, logistics partners and municipality can search where a delivery is at that moment and what the delivery contains. The purpose of this is partly to allow buyers to investigate when they can expect delivery of ordered goods, but equally important to enable traceability in the event of missing or damaged goods.

In addition, the City of Stockholm needs to enable all suppliers to send electronic e-commerce. A developed supplier portal with the possibility of sending order information would be necessary to enable all suppliers to deliver goods to a distribution centre with electronic traceability.

To establish a coordinated distribution centre it is also recommended to investigate if other systems need to be integrated in order to ensure that electronic messages function between Agresso e-commerce, suppliers and distribution centres.

6.4.3 Benefits

When evaluating potential utilities with coordinated distribution of municipal goods, the pre-study has focused on what can be achieved in addition to the benefits identified in Step 3 (Load consolidation in cooperation with suppliers). Coordinated distribution is expected to contribute to the following overall benefits:

- **More efficient handling of goods, fewer transports, reduced congestion and lower environmental impact compared to** load consolidation in cooperation with suppliers, as the City of Stockholm is more likely to set requirements and become involved in the distribution.
- **The City of Stockholm can impose higher environmental requirements on a procured logistics partner**. The service administration believes they cannot apply higher environmental requirements than currently because of LOU (Public Procurement Act). However, higher environmental requirements can be achieved when the distribution is procured separately. In the IVL review of the Södertörn municipalities, they estimate that non-renewable CO2 emissions have fallen by 73 percent. Between

2014 and 2017, the City of Stockholm's CO2 emissions for food deliveries decreased by 45 percent and about 10 percent for other goods. If it is assumed that the City of Stockholm can achieve a 73 percent reduction for all deliveries, the cost of reduced CO2 is estimated to be approximately SEK 19,000 per ton assuming coordinated deliveries correspond to 5% of the total product value.

- **The City of Stockholm can decide if they want more responsibility and ownership of their supplies and goods**
- **Provides the opportunity for suppliers** to submit tenders that currently do not have the distribution capacity to participate.

6.4.4 Risks and consequences

The pre-study has identified several potential risks and consequences that may arise when introducing municipal load consolidation. The overall risks and consequences identified by the pre-study are as follows:

- **Municipal load consolidation is a long-term initiative and the City of Stockholm becomes dependent on the logistics partner.**
- **Requires businesses to adapt** as new routines for ordering, receiving and customer service need to be established. Operations may also be affected by system support adaptations
- **Maintenance costs** increase when the City of Stockholm needs to manage the new contract with the logistics partner that is not currently needed. Managing such a contract may require skills that the Service Administration does not possess today.
- **High risk of increased costs for the council,** as an annual cost of 5-7 percent of total product value is estimated to be attributable to distribution centres and logistics partners, while reduced commodity prices has proved difficult to achieve. If the estimated cost of SEK 19,000 to reduce a ton of CO_2 is compared with the Swedish Transport Agency carbon dioxide emissions cost of SEK 1 140 per ton[9], coordinated deliveries appear. Other benefits such as reduced congestion, are difficult to quantify, and it is therefore difficult to say if coordinated deliveries are good value for money.
- **Requires a new IT system**, which can lead to increased costs for the City of Stockholm and suppliers
- **Risk of sub-optimal solution** as the City of Stockholm's flow of goods are isolated from the existing systems and form a separate limited size logistics system that is optimized without considering other flows. Suppliers still need to deliver goods to other customers, so it is not certain that the total number of vehicles can

[9] Trafikverket - Analysmetod och samhällsekonomiska kalkylvärden för transportsektorn: ASEK 6.0 (Version 2016-04-01)

be reduced. As presented in Chapter 4, the City of Stockholm's share of the total volume of goods is relatively small, and there is therefore a risk of sub-optimal solutions. By including only product categories suited for coordinated deliveries may lead to sub-optimal solutions because the City of Stockholm does not consider the whole system comprised of all product categories.

6.5 Co-ordination and co-storage organization

Through the co-ordination and co-storage organization, the City of Stockholm acts as a wholesaler and is responsible for purchasing and stockpiling. This kind of solution has been in operation under council management before. The pre-study advises against applying such a solution, thus no further description is presented.

7 Recommendation

7.1 Description of options

The pre-study proposes three possible options for the implementation of coordinated deliveries. (A) Gradual introduction of load consolidation in cooperation with suppliers, (B)immediate deployment of municipal load consolidation and (C) continuing current aspirations. Each option is illustrated in Figure 12 below.

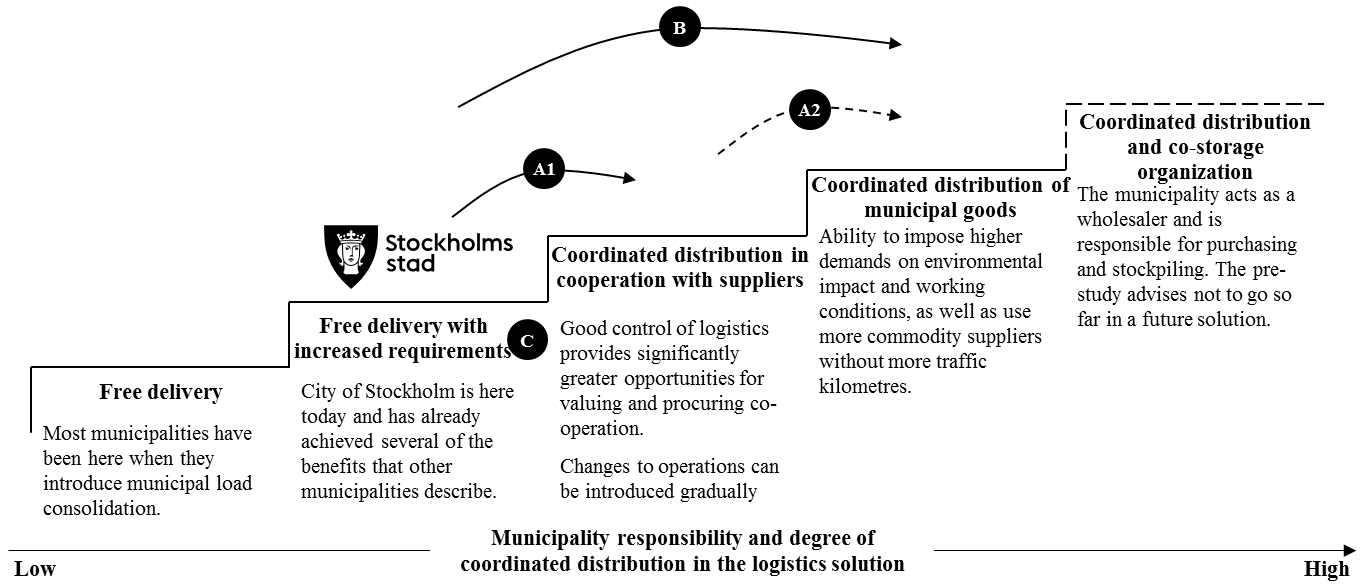


Figure 12: Illustration av alternative A-C

Option A, gradual introduction of load consolidation in cooperation with suppliers, means that the City of Stockholm takes increased responsibility for load consolidation within existing logistics solution (A1). The City of Stockholm's responsibility and degree of coordination and load consolidation increase. Thereafter, the City of Stockholm performs a thorough evaluation of the measures implemented and decides on continued work (A2). This includes the possibility of moving towards municipal load consolidation, but also continuing with the existing logistics solutions or implementing a different solution altogether. The City of Stockholm's situation and surroundings factors will influence the decision.

Option B, Immediate deployment of municipal load consolidation, means that the City of Stockholm skip intermediary steps and directly to municipal load consolidation.

Option C means that the City of Stockholm chooses to continue with today's logistics setup. This means that the City of Stockholm places

increased demands on the suppliers of goods, such as environmental requirements, and the goods suppliers are responsible for the logistics.

7.2 Comparison of options

If the City of Stockholm wants to increase the degree of co-loading, two options are appropriate: a gradual introduction of load consolidation in cooperation with suppliers and; Immediate deployment of municipal load consolidation. The pre-study therefore makes an in-depth comparison of these two options.

7.2.1 Advantages of the options

Both gradual introduction of load consolidation in cooperation with suppliers and immediate deployment of municipal load consolidation are expected to achieve more efficient freight handling, less transport, lower environmental impact and increased accessibility. Since immediate deployment of municipal load consolidation imply a more extensive coordination of deliveries, these four benefits are likely to be achieved at an earlier stage.

By taking a more piecemeal approach starting with gradual introduction of load consolidation in cooperation with suppliers (option A), the City of Stockholm can develop logistics skills and expand supplier cooperation. It is expected that this approach will create a better foundation and understanding for a possible future introduction of municipal load consolidation. Since geographical conditions in Stockholm differ from other municipalities, the introduction of coordinated distribution may be different.

Regardless of whether option A or B is chosen changes in the logistics solution will affect the City of Stockholm's organization. However, a gradual implementation of load consolidation in cooperation with suppliers means that improvement initiatives can be implemented within the existing organization although some change in management may still be required at the outset. In addition, there are opportunities to find better and more cost-effective solutions if the implementation takes the two-step solution. The two-step introduction is also expected to contribute to a reduced risk of sub-optimal solutions.

7.2.2 Risks and consequences of the options

If the City of Stockholm chooses to implement gradual introduction of load consolidation in cooperation with suppliers, there is a risk that the City of Stockholm will stop after the first step (A1) in the event that significant effects have been achieved and that the next step (A2) requires additional effort. Thus, the City of Stockholm settles for a proportion of potential effects, though additional positive effects have potential to be

achieved. The opposite risk exists in the immediate introduction of municipal load consolidation, that is, the City of Stockholm overreaches itself by taking too big a step from the outset. This means that the City of Stockholm would make major changes and extensive work only to return to the previous logistics solution if municipal load consolidation does not prove effective. Other municipalities have announced that the introduction of municipal load consolidation can be challenging.

Regardless what option the City of Stockholm choose to implement, some preparations are required. The choice is likely to impact deliveries, routines, etc., for which the businesses need to prepare. As opposed to Gradual introduction load consolidation in cooperation with suppliers, it is also likely that major change in management is required if immediate deployment of municipal load consolidation is introduced. In immediate introduction of municipal load consolidation, both deliveries, routines and organization changes, while gradual introduction of load consolidation in cooperation with suppliers only initially involves changes in deliveries and routines.

Other municipalities, suppliers and transporters have stated that the City of Stockholm needs to make system and contractual changes before coordinated deliveries of municipal goods is introduced. The work therefore needs to be carried out regardless of whether coordinated deliveries is reached through gradual introduction of load consolidation in cooperation with suppliers or immediate deployment of municipal load consolidation is implemented, but that some actions can be postponed in the former, since the work does not initially encompass all aspects of coordinated deliveries.

7.2.3 Organization

The pre-study recommends that two full-time resources proficient in transportation and environmental studies, coordination and process review are employed regardless of which option is chosen. The same applies to consultancy support. Direct deployment of municipal load consolidation will be estimated to require additional six resources at the start, while gradual implementation of co-load in cooperation with suppliers does not require any additional resources until the second step is taken (A2).

7.2.4 Cost of options

Both gradual introduction of co-load in cooperation with suppliers and direct deployment of municipal load consolidation means costs in the form of staff and consultancy support. Immediate deployment of municipal load consolidation will also introduce the cost of system support and procured logistics partner. These costs will also occur once the City of Stockholm chooses to extend beyond step one (A1) and proceed with the second step (A2).

Immediate deployment of municipal load consolidation would lead to a greater initial cost for the City of Stockholm compared with gradual introduction of co-load in cooperation with suppliers. The cost of these options is estimated to be similar once the second step in gradual introduction of load consolidation in cooperation with suppliers is taken. That is, provided that the City of Stockholm's conditions have not changed significantly over time, which would mean that another solution is better suited. This means that the cost of reducing carbon dioxide emissions is greater in the immediate deployment of municipal load consolidation, at least initially. The pre-study has previously indicated that the cost is currently estimated at approximately SEK 19,000 per ton. Since the cost of gradual introduction of load consolidation in cooperation with suppliers is initially low, the cost of reduced carbon dioxide should also be low compared with the immediate deployment of municipal load consolidation. To achieve an even lower environmental impact, the City of Stockholm probably needs to further improve the transport efficiency by a higher degree of load consolidation, which can, be implemented regardless of which option is chosen.

7.2.5 Schedule

A gradual introduction of load consolidation in cooperation with suppliers is estimated to take at least 2-6 years to implement. Immediate deployment of municipal load consolidation is estimated to take six years for a full implementation. The first delivery can take place after two years at the earliest because current contracts need to be harmonized before an introduction. If the second step in gradual implementation of load consolidation in cooperation with suppliers is introduced and follows the logistics solution described by immediate introduction of municipal load consolidation, it is reasonable to assume that end results will be delayed. How long will be depend on efforts made during the first step (A1) and when the second step (A2) is introduced.

7.3 The Pre-study recommendation

Based on the preliminary analysis, the recommendation is that the City of Stockholm choose option A - gradual introduction of load consolidation in cooperation with suppliers. This is motivated by the expected benefits in relation to the relatively low risks in improving existing plans. The time aspect also promotes a step-by-step introduction, as several benefits can be achieved before a complete coordinated distribution is established. A step-by-step introduction also provide an opportunity to establish logistics competence within the City of Stockholm. Option C is not relevant because the City of Stockholm's operations and stakeholders have identified most improvement areas.

Suppliers have well-developed logistics that work to optimize product flows and coordinated deliveries. The City of Stockholm has come a long way in its existing work and the advantage of municipal load consolidation is not necessarily as great as traditional theory suggests. Working closer to the suppliers is expected to contribute to most of the defined benefits.

The recommendation has been established by assessing the benefits and risks associated with gradual introduction of load consolidation in cooperation with suppliers and immediate deployment of municipal load consolidation. The conclusion is that gradual introduction of load consolidation in cooperation with suppliers can provide many positive effects with less risk. Moreover, the risk of introducing coordinated deliveries that fall short of expatiations will be reduced through a two-step process (A1 and A2) instead of one step (B). During step A1 it is possible to identify and minimize certain risks that exist with the immediate deployment of municipal load consolidation and allows the City of Stockholm to increase knowhow in the meantime. Note that Stage A2 and immediate deployment of municipal load consolidation doesn’t need to be the same after the City of Stockholm has evaluated the work in step A1. The City of Stockholm's expanded logistics competence and relation to goods suppliers are two examples of changes that can modify prerequisites.

There are three major risks that eliminate immediate deployment of municipal load consolidation:

- Prior to an introduction, the City of Stockholm needs to undertake several preparations internally, contractually and to systems to facilitate identified benefits
- Increased municipal costs by 5-7 percent of total product value. The same cost can occur in option A, but only when the City of Stockholm choose to commit to coordinated deliveries
- The City of Stockholm becomes dependent on the procured logistics partner and it is difficult to return to previous operations should the new scheme prove unsuccessful.

The recommendation means that the City of Stockholm starts with A1 and after two years, make an initial evaluation. Thereafter A1 can continue or the council can progress to step A2. The pre-study wishes to emphasize that the importance of a proper evaluation before deciding how to move forward. For example, the City of Stockholm assess profitability, what effects have been achieved and what remains to be done? It is possible that the City of Stockholm's situation and the outside world have changed to such an extent that municipal load consolidation is not the most appropriate next step.

The pre-study has identified different alternative scenarios for step A2 as presented below:

- Introduce coordinated deliveries based on the description in the Immediate deployment of municipal load consolidation
- Introduce coordinated deliveries but with some deviations from the description of Immediate introduction of municipal load consolidation
- Procure a distribution solution that enables other parties to be involved, that is, a commercial logistics solution
- Extends initiatives undertaken during step A1 without the need for a logistics partner and establish one or more distribution centres

7.3.1 Plan for a gradual introduction of load consolidation in cooperation with suppliers

The pre-study has identified and analysed several different activities that can be implemented in existing plans. These activities can be categorized within six different initiatives. The initiatives are presented in this section and have been ranked in the order of biggest positive effect. Most of the initiatives can be executed parallel.

Expand skills in freight logistics

A first step forward, is that the City of Stockholm needs to expand its freight logistics skills. The additional skills can be obtained either through new employers or consultancy support. Because the work is long-term and crucial success, the recommendation is that the City of Stockholm employs a person with logistics skills.

With an established competence in freight logistics, the City of Stockholm gains more impact with other recommended initiatives, as well as facilitating the evaluation of step A1. If to the City of Stockholm move forward to step A2 and involves municipal consolidation according to the description contained in option B, the logistics competence would be used to establish procurement and contractual conditions.

Targets and assessment

A common conclusion from the interviews with the external parties is that performance indicators and targets are needed to evaluate and achieve the desired effects. The initiative should define performance indicators and targets, assess them and evaluate the impact of the improvement efforts implemented. This initiative is crucial for the evaluation of step A1, and to subsequently decide on the way forward.

The performance indicators that should be defined and assessed are as follows:

- More efficient handling of goods

    - Number of delivery times
- Fewer transports and decreased congestion
    - Number of kilometres driven
    - Number of driven routes
    - Proportion of deliveries outside school hours and traffic congestion
- Lower environmental impact
    - CO2 emissions
    - Emissions of non-renewable CO2
    - NOx emissions and particles

At present there is no structured assessment and feedback with the suppliers, despite the City of Stockholm units experiencing shortcomings in deliveries and sorting. These shortcomings can be remedied through scorecard meetings. These meetings would be conducted to identify potential improvement opportunities and to provide better feedback to suppliers. With structured assessments, the City of Stockholm can also provide statistics that can be used to evaluate performance and goals. In addition, the suppliers get a greater understanding of the City of Stockholm's aspirations and needs. By committing to providing crucial information the suppliers can, in turn, make appropriate demands on the contracted carriers.

The scorecards can capture the above defined performance indicators as well as data on refrigeration, sorting, damaged goods, missing goods, time of delivery, number of deliveries and type of delivery to the suppliers' customer service. Additional parameters can be added to enable and / or simplify the evaluation of defined performance indicators and goals.

Investigate and test new delivery patterns

The purpose of testing new delivery patterns is to achieve benefits such as more efficient freight handling, less transport, lower environmental impact and increased accessibility. In addition, the effect is increased co-ordination and cooperation within the City of Stockholm's operations and with the suppliers of goods. The work will also affect other parties involved, such as carriers.

Developing forms of cooperation has been emphasized primarily by the suppliers. They believe that most improvements can be made within the existing scheme, primarily through active dialogue between stakeholders. Operations in the City of Stockholm have also talked about the possibility of increased cooperation and the possibility of positive effects. It is primarily about minimizing the risk of sub-optimal solutions, coordinating communication between the City of Stockholm's operations and increased efficiency.

Both suppliers and carriers have stated that the possibility for deliveries outside of congested times would give the greatest effect within the

existing setup. The analyses presented by the pre-study also show that deliveries mainly occur during congested times and that the proportion of light vehicles in traffic increases.

“Europabagaren” has already begun work on deliveries outside congested times to eleven schools within the city. Therefore, the City of Stockholm should investigate the possibilities for expanding the work of “Europabagaren”.

The hypothesis of the pre-study is that the greatest effect of the initiative would be obtained when inner city schools are involved in the scheme, due to traffic being most affected by congestion in the inner city compared with the outskirts. In addition, these schools are used outside school hours, so some staff will probably be in the building. In interviews with the City of Stockholm's operations, suppliers and carriers, it has been reported that larger units and those who have freezers, and coolers should be best suited to receive deliveries outside normal hours. Exactly what units should be involved in the initiative needs to be mapped and investigated in more detail.

Initiating fixed delivery dates for office supplies is another way to test new delivery patterns. The pre-study has found that office supplies are not time critical goods and orders are rarely added. This is further supported by the frequency analysis presented earlier. Through fixed delivery days, the City of Stockholm can ensure that the suppliers need to increase their coordination so that transport volumes can decrease. In this manner deliveries to a specific geographical area can be performed on the same day. Fixed delivery days can be established through dialogue with suppliers and by information to buyers. It is also possible to use system support for this purpose, although it will incur costs for set-up and maintenance.

The frequency analysis presented in Chapter 4 also shows that present deliveries are coordinated, but that it is possible to increase coordination. For example, reducing the delivery frequency is assumed to lead to increased coordination.

Develop procurement requirements

In dialogue with the City of Stockholm's operations, especially the Service Administration, the Transport Administration and the Environment Administration, the pre-study has found that it is possible to develop procurement requirements in existing plans. Primarily, it is about challenging established procurement patterns that drive transport. By reducing the number of transports, both congestion and the environment are positively affected. Procurement requirements can also be developed to generate positive effects on goods handling efficiency and affect the environment and congestion, without the sole purpose of reducing the number of transports.

It is important that the work on procurement requirements is done in dialogue with the suppliers and the City of Stockholm's own operations. Dialogue can also be made with other contracting authorities. The reason is to promote cooperation to achieve more efficient coordination and load consolidation.

During interviews with suppliers and municipality operations, as well as questionnaires answered by foodstuff buyers, the pre-study has identified that there is a desire to establish different contracts. More specifically, it would be advantageous if differently sized units belonged to different agreements. If so, smaller units, such as libraries, may order smaller food packages that meet their needs, while large schools can order large food packaging. At present, the agreements have been adapted to the larger units, which means, for example, that smaller units order more than they need or that some purchases are made outside existing contracts. In addition to the unnecessary loss and lack of contractual integrity, these purchasing behaviours also drive an unnecessary number of transport.

The needs must be mapped out in more detail to establish what contracts that are required. According to suppliers, a unit is classified as a small buyer when the order amount is less than SEK 1,000. This benchmark should be further investigated but can be used initially to identify units who’s needs must be mapped. This should include regular order amounts, order volumes and what supply of goods is requested.

The City of Stockholm's units have on several occasions mentioned that it would be possible to develop today's environmental requirements in procurements. Currently, requirements are primarily technical, meaning that suppliers must embrace technical solutions. Functional requirements, would increase flexibility because the supplier may choose the method and technology.

A common view within the council is that they should work to create incentives. This can be done by including various incentives in procurement that relate to traffic and environment.

Additional procurement requirements presented by the City of Stockholm's own operations are as follows:

- Vehicle Requirements
- Fuel Requirements
- Tire Requirements
- Driver skills Requirements (for example, training in sustainable driving)
- Emission volumes per kilometre
- Delivery patterns (for example, transports supply different geographical areas and / or on different days, as well as delivery time requirements)

- Volume requirements that delay deliveries until a certain order volume is reached
- Product restrictions (for example, procurement of specific products rather than suppliers)

Control small deliveries

The pre-study has identified that there is an indication that up to half of the deliveries are so-called small deliveries. For example, there may be occasional deliveries of toners to printers, coffee to coffee machines, outlets and mail. By coordinating these small deliveries with other deliveries, the number of vehicles should decrease, and the units experience less interruptions.

One possible solution is to coordinate small deliveries with the City of Stockholm's own postal deliveries as the item needs to be delivered anyway. This would involve internal mail and possibly external mail as well as newspapers. Another option would be to limit delivery days.

Further questions that affect small deliveries are as follows:

- Are there legal restrictions for coordinating small deliveries with municipality mail deliveries?
- Is it feasible controlling delivery days?
- Do the suppliers have any suggestions on how coordination can be done?
- What needs, and conditions do the units have?
- Is there a risk that lead time will be affected?
    - If yes, how critical is the lead time for the small deliveries?
- If several options are possible, which has the greatest positive effects on freight handling efficiency, the work environment of the units and carriers, traffic, environmental impact and cost for the City of Stockholm? In addition, the time and complexity of the options affect the introduction

Use commercial initiatives

There are benefits to monitor, review and, if possible, utilize commercial initiatives. #ÄLSKADESTAD is an example of a project currently being conducted, where the City of Stockholm is one of the parties and discussions about development are ongoing.

The main purpose of monitoring commercial initiatives is to review which synergies can be achieved and where the City of Stockholm's own product deliveries can be involved. It is likely that the effects and benefits will be greater from an overall perspective and the risk of sub-optimal solutions will decrease.

As previously announced, 50 percent of the number of pre-schools, elementary schools, upper secondary schools, and health and social care centres are managed by the City of Stockholm. Further positive effects can be achieved if operations in the private sector are involved.

7.3.2 Short-term recommendation

The pre-study recommends that the City of Stockholm should include information in ongoing procurements to initiate the work with coordinated deliveries in cooperation with suppliers. The proposal for information is presented below.

The City of Stockholm intends to develop coordinated deliveries in cooperation with suppliers to streamline freight logistics, with fewer transports, lower environmental impact and increased accessibility. The development of cooperation may involve, but is not limited to, that:

- The City of Stockholm asks for information about the quality of the delivered service. Such information is, for example, detailed information about arrival times, missing and damaged goods, as well as information on cases where the suppliers' customer service handles the City of Stockholm's operations in Stockholm.
- The City of Stockholm together with the suppliers attempt to change delivery times and delivery slots to achieve mutual positive effects
- Stockholm City, introduce incentives to achieve targets

7.4 Project Organization

7.4.1 Load consolidation in coordination with suppliers

As described in chapter 6, the pre-study recommends that logistics development can be driven by two full-time resources proficient in transportation and environmental studies, coordination and process review is necessary.

Regardless of organizational affiliation, the logistics development roles are expected to have many internal interfaces with other administrations and units, as well as external interfaces to implement the initiatives. Listed below are the larger expected interfaces.

- Suppliers
- Service management (Including category team and category council)
- Receiving devices (Client)
- Property
- Strategic traffic planning
- The Environment administration

- E-commerce unit and system unit

In addition to full-time resources for logistics development, the pre-study recommends consultancy support in an introduction for an estimated six months. The consultancy support consists of two full-time resources, one junior and one senior. The senior consultant needs experienced in:

- Setting up a logistics development functions within and outside the City of Stockholm's operations
- Implement operational logistics changes
- Introduce structured product assessment

7.4.2 Municipal load consolidation

If the City of Stockholm chooses to proceed and introduce municipal load consolidation after evaluating step A1, the pre-study proposes a project organization consisting of a steering group, project management and five project streams, see Figure 13. The project management consists of a central project manager, logistics development resource and consultancy support.

The proposed streams represent the areas that the pre-study estimates are mainly affected by municipal load consolidation. The respective stream is led by a full-time resource. The procurement stream is expected to involve resources for procurement of logistics partners.

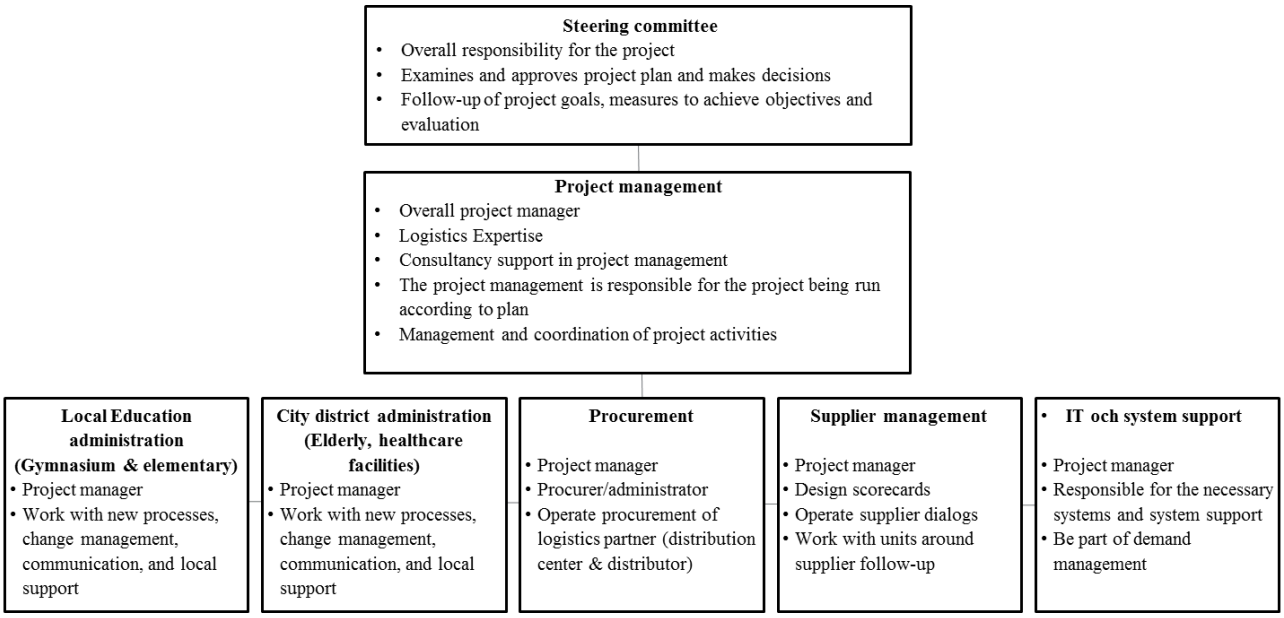


Figure 13: Proposed project organization for step A2 and option B

7.5 Costs

7.5.1 Project Expenses

The identified costs for implementation of A1 are two full-time resources and consultancy support for six months. The cost of two full-time resources is estimated annually at approximately SEK 2 million. The cost of consultancy support during A1 is also estimated at SEK 2 million based on a senior and a junior consultant.

The project organization for A2 (municipal load consolidation) according to figure 6 is estimated at eight full-time resources. The annual cost of the implementation project is estimated at SEK 8 million. The cost of consultancy support is estimated at SEK 2 million based on a senior consultant and a junior consultant. In addition to the cost of resources, system costs may arise which need to be estimated by an implementation project.

7.5.2 Summary

When and if costs for load consolidation in cooperation with suppliers (A1) and municipal load consolidation (A2 / B) arise depends on what decision the City of Stockholm takes as the next step. The pre-study below presents an attempt to illustrate estimated costs over an eight-year period for the introduction of load consolidation in cooperation with suppliers (A1) and municipal load consolidation (B).

Stage A1 is expected to last for four years, with the main costs being personnel costs for the proposed logistics development resources, as well as consultancy support. There may also be costs for involving people at council units and IT related costs for adaptations to existing systems.

The implementation project for A2 / B is expected to run during years 5-6 of the eight-year period, where the main costs are personnel costs for the proposed project organization in Figure 6. Several people from the project organization are expected to continue working with municipal load consolidation after start-up. The pre-study also assumes that consultancy support is required for two years for expertise in logistics, procurement and project management. When municipal load consolidation is in operation in year 7, an external cost will arise for a procured logistics partner and distribution centre amounting to SEK 32-45 million based on 5-7 percent of the City of Stockholm's total product value. The pre-study also estimates that the City of Stockholm can achieve a one percent cost reduction of goods costs. There is also a cost to the management organization for managing the contract with the logistics partner. Any system costs that may arise when introducing municipal load consolidation have not been estimated as they depend on how the City chooses to design the logistics solution and which existing systems are available.

7.6 Timetable

Below is an overall timetable for the pre-study recommendation. All initiatives described in Step A1 will begin during the first six months using consultancy support. After six months, the City of Stockholm needs to review whether further consultancy support is required and, if so, to what extent. An extensive evaluation of load consolidation in cooperation with suppliers against set goals is expected to be implemented after two years.

If the City of Stockholm decides to introduce municipal load consolidation as step A2, it is estimated that work will take about two years based on information from other municipalities.

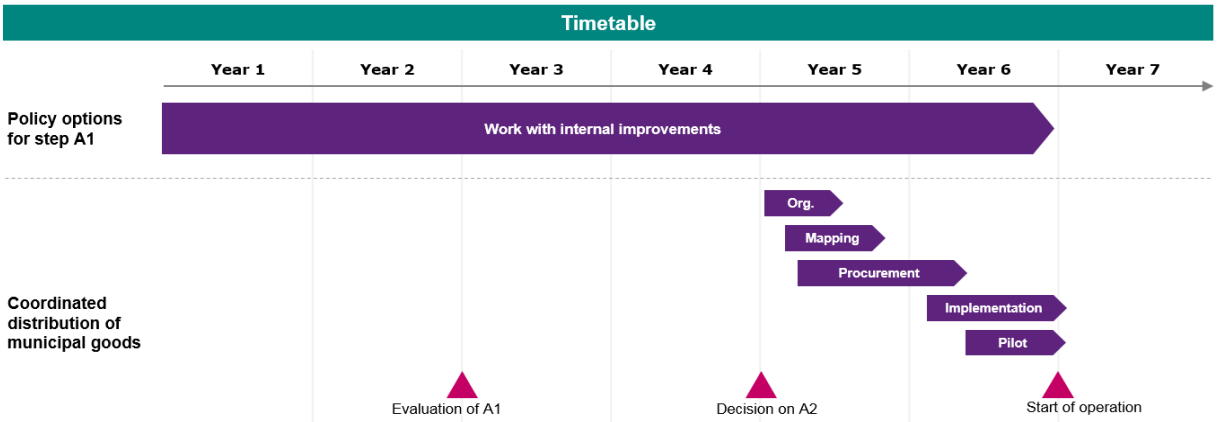
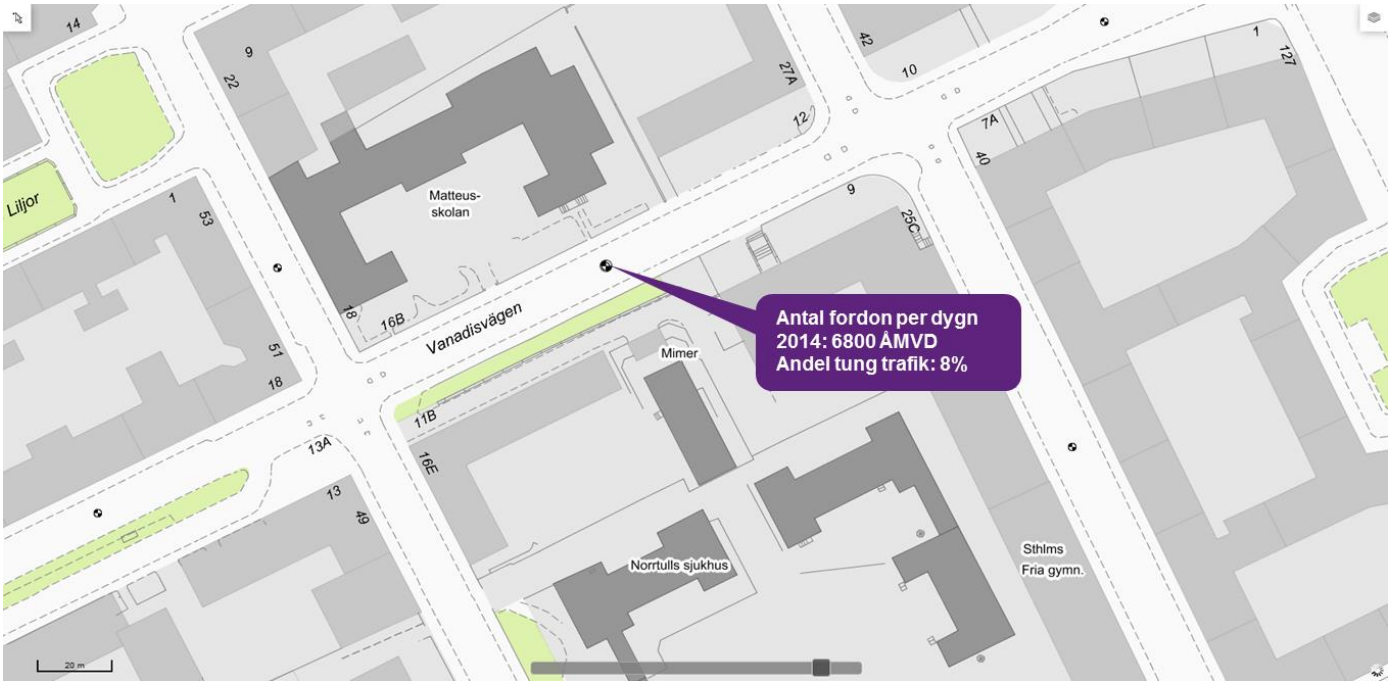


Figure 14: Indicative time scale option A

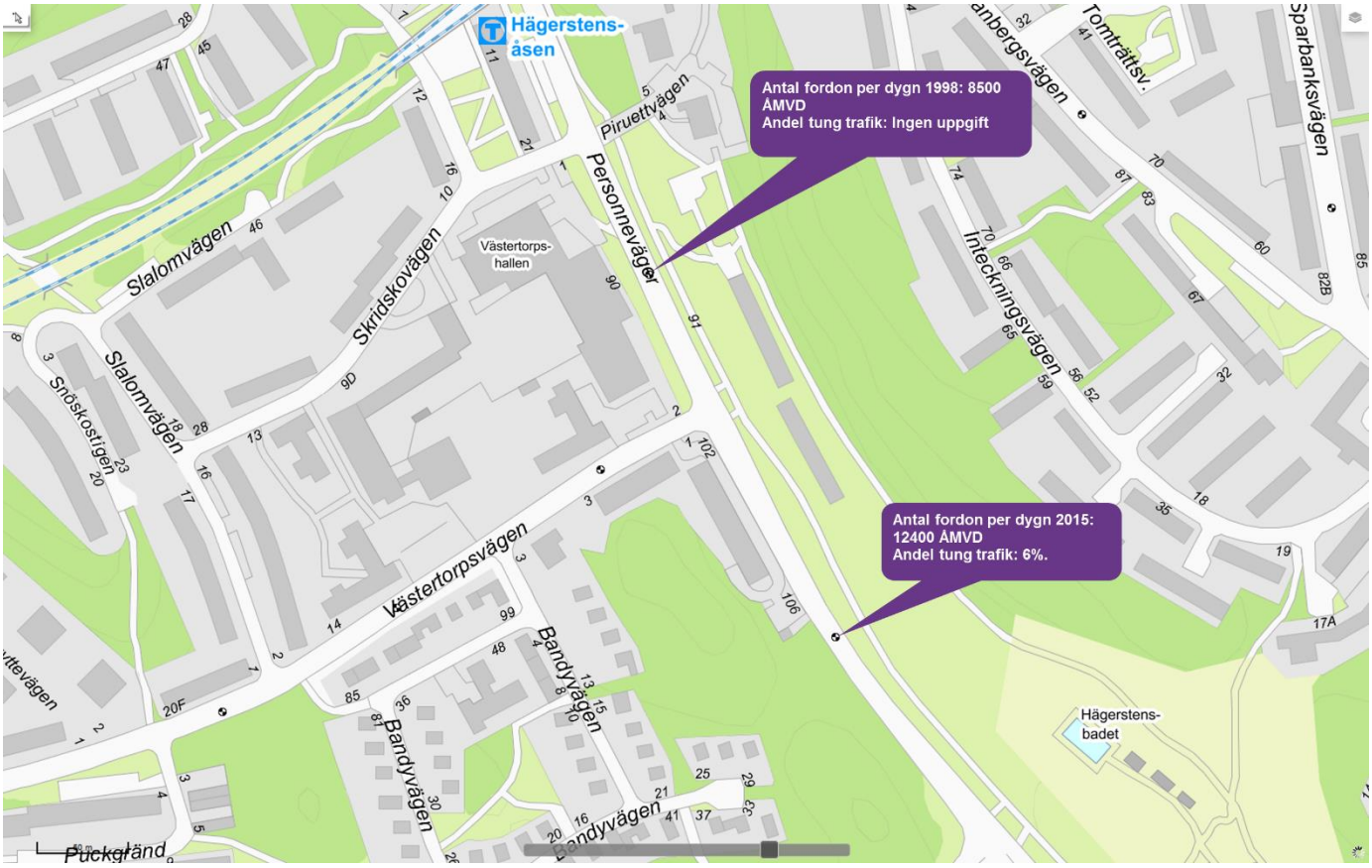
Table 10: Table of costs during the 8-year introduction

	Step A1				Step A2/B			
Cost (m SEK)	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**	**Yr 8**
External cost	-	-	-	-	-	-	32-45	32-45
Reduced goods cost	-	-	-	-	-	-	-6,5	-6,5
Maintenance	-	-	-	-	-	-	2	2
Project organisation	2	2	2	2	8	8	2	2
Consultant support	2	-	-	-	3	3	-	-
Total (m SEK)	**4**	**2**	**2**	**2**	**11**	**11**	**29,5-42,5**	**29,5-42,5**

8 Appendix – local traffic situation



Traffic volumes at Matteus school. AAWT: annual average weekday traffic



Traffic volumes at Mellanbergets pre-school. AAWT: annual average weekday traffic

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