Proposal of distribution system

A case of coordinated deliveries: Nacka Kommun

Soran Hama Sulaiman, Fen Zhao, Mario Contreras Torres

I. Table of contents

Table of Contents

1. Background

Nacka Kommun is located in the east of Stockholm with a population of around 90,000 inhabitants.

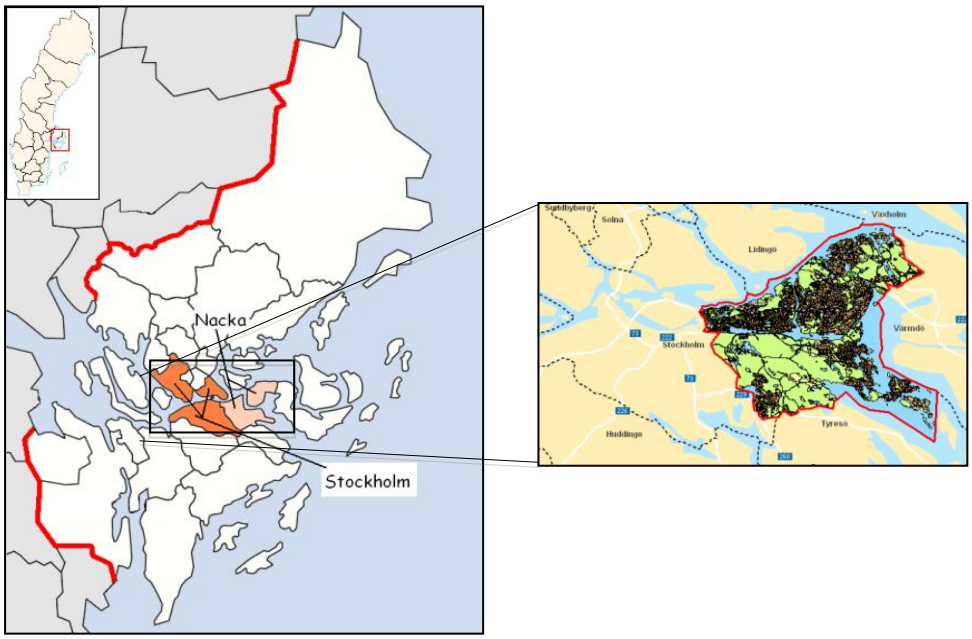


Figure 1. Nacka location

Due to the nature of its geography, Nacka Kommun can naturally be divided in four areas: Sicklaön (1), Älta (2), Saltsjöbaden (3) and Saltsjö Boo (4), as shown in Figure 2.

Figure 2. Regions within Nacka, Source: http://kartor.stockholm.se

Nacka tries to utilize modern organization and IT possibilities to improve services as well as taking their responsibility for the environment. Since a couple of years they have implemented a new ERP (Enterprise Resource Planning) system in order to have

better tools for their day-to-day activities. It is a tool they want to use to improve their processes, including more efficient supplies.

Nacka, as all municipalities, has a much decentralized organization with many and small delivery points. Examples of their services are schools, kindergarten, elderly care, libraries as well as technical departments taking care of roads, electricity, buildings, parks etc. These are naturally spread out over the city area and located more or less proportional to where people live. Figure 3 shows the distribution of these services.

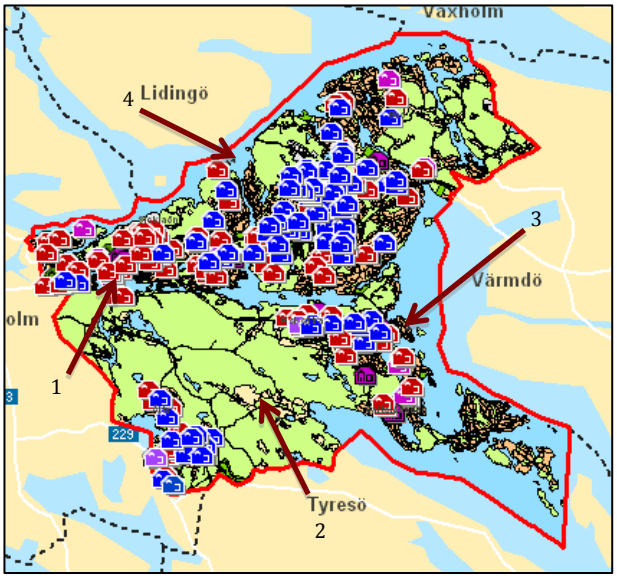


Figure 3. Distribution of services throughout Nacka Kommun
Source: https://www.infovisaren.se/projekt/nacka/

For this analysis, Sicklaön (1) is considered to have a very high population density, Älta (2) and Saltsjöbaden (3) and Saltsjö Boo (4) with low population density.

1.1 Basic data about the current freight distribution

Available data about deliveries in the current situation:

- There are 200+ suppliers
- 10% of these are local suppliers within Nacka
- 3-4 of them deliver food
- 33 000 deliveries to 167 delivery addresses every year
- Many invoices less than 1 KSEK, average is 3 KSEK
- Many freight companies involved, even to the same delivery point
- Suppliers include freight cost in their product prices (in existing contracts)

More facts:

- The average distance for a delivery is 12 km from the border between Nacka and Stockholm (more or less 100% of all transports arrive via terminals located in Stockholm)

- The distance between the Bring terminal and the Nacka border is 9 km
- 15% of all transports to Nacka kommun includes one delivery point
- 35% of all transports to Nacka kommun includes 2-5 delivery points
- 50% of all transports to Nacka kommun includes more than 5 delivery points
- Nacka kommun has an internal transport service with a VAN visiting all units every day
- In 75% of the deliveries there is only one package (15% 2 to 5 and only 10% more than 5)

2. Objective of this report

The objective of this report is to develop a new freight distribution system for Nacka Kommun considering the available information in order to accomplish the three main Kommun goals. The transport company "Bring Express" will have the duty of coordinate deliveries in Nacka.

2.1 Goals

The goals are prioritized from number one, the main goal, and two and three for the following goals, very important goals but with a lower hierarchy as follows:

1. To improve the environment and reduce impacts on climate change,
2. To increase traffic safety.
3. To reduce costs in the long term.

3. Undertaken actions

3.1 Classification

Taking into account all the previous data and the main goals, a number of measures are proposed in order to tackle each of the issues. These measures are divided in three groups according to their principle of operation as:

- Regulations and operation
- Physical needs (infrastructure and vehicles)
- Use of information technologies

The majority of measures are applied for outbound shipping from the distribution center. More detailed information will be described in the respective measure. These measures apply for both the suppliers and Bring Express, the transport company that will coordinate all deliveries within Nacka.

3.2 Proposed regulations and operation schemes

The proposed regulation aims to facilitate the rest of measures and make sure the overall planning fulfills the objectives. By applying regulations and establish operation schemes, the other two groups of measures will be more effectively applied.

Let us describe each of them. First our proposed regulations and operation schemes will be described as follows:

3.2.1 No direct shipping for less than 3 KSEK orders;

The fact that many invoices have a price lower than 1 KSEK with an average of 3 KSEK means that there are many trips with very light cargo and some of them even with a very small volume. Therefore, in order to reduce the number of carriers working under this scheme, the direct shipping will be limited to orders with higher price than 3 KSEK. With this measure, there will be two different ways for customer to get their commodities: first to pick it directly from one of the proposed picking centers (explained in point 3.3) and second to receive it when possible by one of the cooperative vehicles. To tackle down the problematic issue that arise with this measure, the concept of cooperative freight systems is implemented as explained further on.

3.2.2 No single package shipments will be allowed;

According to Nacka Kommun, 75% of the deliveries carry one single package. This, like the 1 KSEK orders, produces high traffic volume with the attached consequences. Once again, issues are expected to arise which can be dealt with the proposed cooperative freight system.

3.2.3 Implementing cooperative freight systems;

A new operation concept will be implemented for outbound shipping: Cooperative freight system with coopetition (*Coopetition* or *Co-opetition* is a neologism coined to describe cooperative competition) when a specific form of collaboration between private stakeholders, particularly when a carrier is unable to individually address an issue or is incited to do so by another regulation.

These are systems in which a number of shippers or freight carriers will jointly operate freight vehicles or the freight terminals (picking centers) or some of the available information systems to reduce their costs for collecting and delivering goods and provide higher level of services to their customers.

By this measure, road operators, infrastructure, vehicles, their drivers and other official road users will cooperate to deliver the most efficient way and safe service.

Usually these kinds of operations are run on a voluntary basis. Voluntary cooperation could be represented in activities such as joint collection at the picking centers and delivery points in Nacka, facilities for joint collection and delivery in a specific district such as Sicklaön, where is located our first picking center. These latter activities in the physical approach, however, a different approach is in the technological-virtual field with activities such as communication cooperation on the road vehicle-to-vehicle, vehicle-to-infrastructure, and vice versa, in which data available from vehicles are acquired and transmitted to a server for central fusion and processing. These data can be used to detect events such as rain (wiper activity) and congestion (frequent braking activities). The server processes a driving recommendation dedicated to a single or a specific group of drivers and transmits it

wirelessly to vehicles. In this approach, the goal of cooperative systems is to use and plan communication and sensor infrastructure to increase road safety.

For the Nacka project, this cooperative concept will be rather compulsory both in the physical approach and the technological approach.

3.2.4 Food deliveries will be shipped directly if required and no other policy affects them;

According to the available data, only 3 or 4 deliveries are food shipments. Food requires special facilities along with special vehicles. To try to involve these carriers in the proposed scheme will be less cost-effective. Besides, schools demand food deliveries unhindered.

3.3 Proposed measures related to physical needs: Infrastructure and vehicles

3.3.1 A new distribution route is proposed.

In order to fix the drawbacks of current distribution loop and achieve the three goals, we recommend the following tips.

1. Apart from the delivery service, we recommend another service means. Currently customers can choose to be serviced by home deliveries. Alternatively, they can choose to pick up their goods from the nearest Picking Centers by themselves.

   By adding the e-commerce to the ERP system, customers can opt to book their orders in the Internet and choose to be serviced by home delivery or pick up their orders from the nearest picking centers by themselves. In this regard, on the one hand, customers can receive their goods by the way which can help Transport Company save some cost. On the other hand, the time that receives goods tends to be more flexible and the service level can be enhanced.

2. Replace the current terminal by two new places. And one (point A) serves as the main distribution center and another one (point B) only has the function of picking up. These are called, in this report, Picking Centers.

   All suppliers will be requested to send their goods to point A. As the main distribution center, point A will have the following function:

   a) Acts as temporary storage or cross-docking location. All suppliers unload their products and then they can load their goods directly to the trucks of the transport company or store the goods at point A temporarily, until one truck is able to have a higher utilization. In this respect, there will be no requirement for warehouse.

   b) Serves as a place for customers nearby to pick up their goods ordered. Therefore, it needs a temporary storage area for picking up service. But this will not occupy so much area of the whole place.

   c) All goods that have been ordered near point B will be sent from point A.

By contrast with point A, B only has the function of providing customers to pick up their goods. There will be no temporary storage at this point. So there will be no special requirement of the construction or choice when consider point B as long as it is convenient for customers to access to.

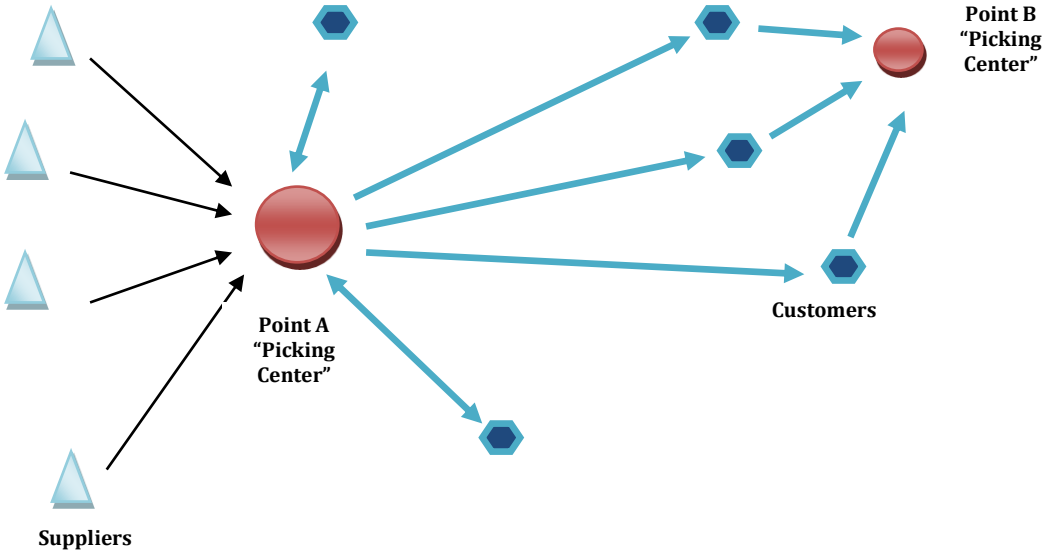


Figure 4. Proposed distribution scheme for Nacka Kommun

All in all, the whole distribution loop will run in the way below as the diagram. All suppliers send their goods to the point A. Then, all customers can choose pick up their goods from the nearest points or receive the goods.

3. The Picking Center A will be built in the center of Nacka kommun. Picking Center B will be built near the Boo (near Eknäs). See below figure.

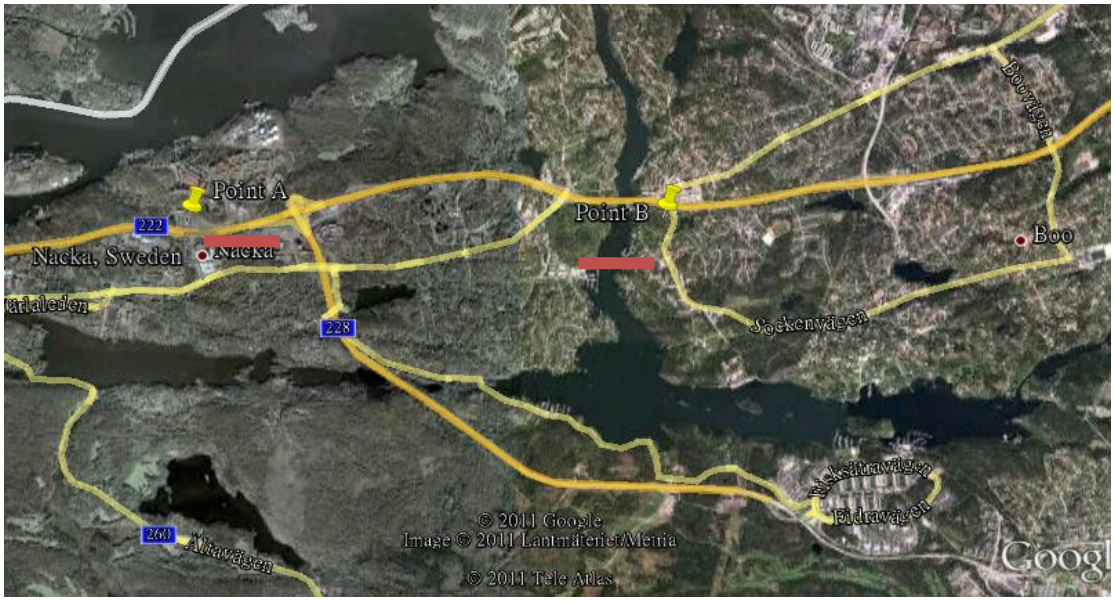


Figure 5. Location of picking centers

The main two criteria as for why we choose the center of Nacka as point A and Eknäs as point B : a) the transport convenience b) the density of demand spots.

According to a study visit of point A, we consider that the center of Nacka has a high demand. Besides, as a point for customers to pick up their goods, the Nacka center has easily access to the majority of customers. As for point B, it is located in the conjunction of three main roads. And the Boo area has a correspondingly high density of demand pots compared with Saltsjöbaden and Älta.

Concluding, point A serves as the main distribution center as well as the pick-up point the nearby area. Point B serves as the pick-up point for the Boo and Saltsjöbaden. Due to lack of enough data, it is difficult to give specific guidance for addresses of the two picking centers.

4. Cross-docking system in Picking Center A;

The cross-docking system will be the contact point between non-local and local transports. Inbound freight from out-Nacka will get to the distribution center. Only those trucks with high volume cargo will be allowed to ship directly to addresses in Nacka, otherwise their load will be received, sorted according to its destination, and shipped again on local vehicles. Bring Express will coordinate everything. Orders from customers willing to pick their commodities at the picking centers will be sorted and put in the warehouse temporarily as already described.

The sorting of freight packages will be performed with the aim of Radio Frequency Identification Systems (RFID) described in the next cluster of measures.

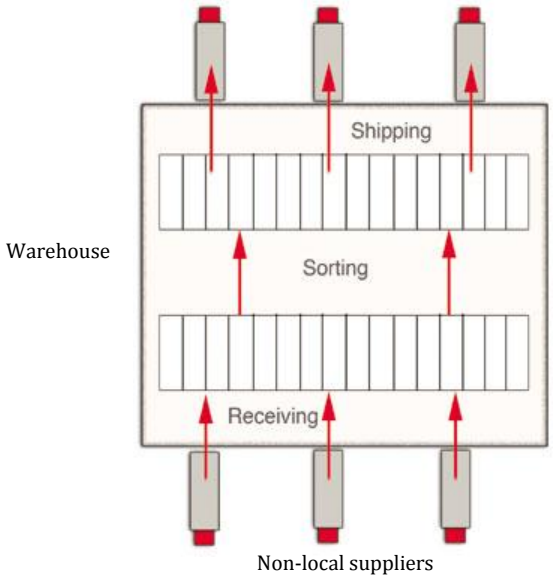


Figure 6. Cross-docking system in picking point 1

5. As for the delivery time, we take the safety problem into high consideration. We arrange the delivery time into two main time points. One will be at 11:00 and another at 16:00. Local suppliers will deliver goods at the picking points twice a day.

Nacka Kommun reports that 10% of the total number of suppliers is local companies. Thus, one Bring Express truck will have a picking route stopping twice a day at each supplier address and will take the goods into one of the two picking points. Customers

of these companies will need to pick their items in one of them. Therefore, suppliers will not run private transport anymore within Nacka unless its distribution is made by means of environmental friendly vehicles (bicycle, biofuel gas based trucks, etc.).

This measure aims to avoid school trip hours for shipping, when the traffic flow is in its peak hours, which lead to congestion, and safety is threatened. Besides, the reduction of congestion allows a decrease of exhaust gas as well.

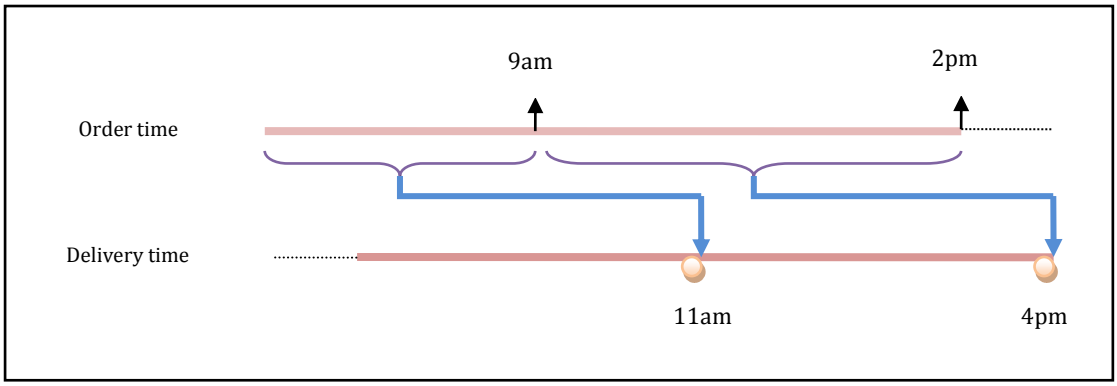


Figure 7. Proposed schedule for delivery time for local companies

3.3.2 The vehicle

The proposed vehicle for the outbound system (within Nacka) is a box truck running on biogas (as Mercedes Sprinter) and renewable electricity, also known as a cube truck, cube van, bob truck, box van, or straight truck. A box truck is a truck with a cuboid-shaped cargo area as shown in Figures 8 and 9. This vehicle is selected because its medium sized boxed which are neither very small nor extremely big.

Figure 8. Box Truck

Figure 9. Mercedes Sprinter running on biogas

3.3.3 Environmental restrictions

Restrictions for cars without catalytic converters and commuter routes, and also adding stricter environmental requirements to the existing ones will be implemented

i.e. if the freight vehicle does not run on biogas fuel, then it must fulfill with the Euro V class emission standards.

3.4 Proposed measures related to Information Technologies

3.4.1 Within the store the use of RFID will be implemented

Every supplier can join in the net and will be given special e-tag. Thus, every time when their products are ordered or transported to the picking points, all the info related to the goods will be scanned and then recorded into the computers. In this respect, the process in the picking point can be improved and more efficient because no other works like manual recording will be done.

RFID will jointly run with IT-based information processing at the reception of goods and data registration for the final shipment. This requires that there is an agreement between carriers on: which information is shared, how it should be done and when it should be done. This technical solution is based on the Internet and uses as standardized format for the transfer of information such as XML. This kind of transfer is called push-technology, meaning that anyone who has information, in this case the initial carrier or the customer initiates the information transmission to the logistics center.

This type of language was selected because of the simplicity of its principle of operation and because it does not require high-level software. The design goals of XML emphasize simplicity, generality, and usability over the Internet. It is a textual data format with strong support via Unicode for the languages of the world. Although the design of XML focuses on documents, it is widely used for the representation of arbitrary data structures, for example in web services. In other words, XML is a standard for structured information exchange between different platforms. It might be used in databases, text editors, spreadsheets, and almost anything imaginable, all of them, available in even very small companies.

XML and other formats can be used as described in the next measure: EDI system.

3.4.2 Implementing a new Electronic Data Interchange "EDI" system

The objective of using a new EDI system is to meet demands on time and minimize inventory. EDI is simulated by allowing the retailer/or buyer to inform the Distributor immediately of customer demands, in this case own demands, and their own stock situation.
Electronic Data Interchange (EDI) and internet-based technologies facilitate quick and accurate information transmission and sharing between suppliers, distributors and retailers/or buyers.

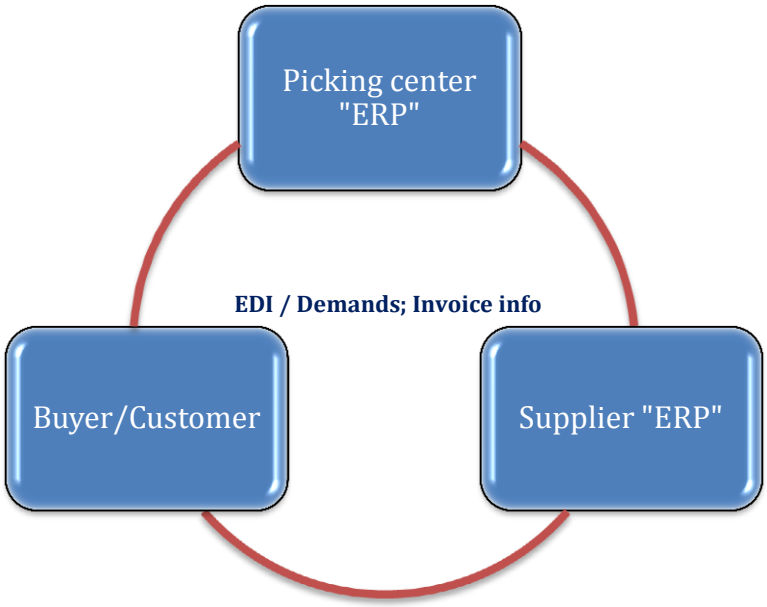


Figure 9. Representation of the Electronic Data Interchange (EDI)

For an "inbound" document the EDI solution will receive a file, take the received EDI file, validate that the trading partner who is sending the file is a valid trading partner, that the structure of the file meets the EDI standards, and that the individual fields of information conform to the agreed upon standards. Typically the translator will either create a file of either fixed length; variable length or XML tagged format or "print" the received EDI document (for non-integrated EDI environments).

The next step is to convert/transform the file that the translator creates into a format that can be imported into a company's back-end business systems or ERP. The final step is to import the transformed file (or database) into the company's back-end enterprise resource planning (ERP) system.

For an "outbound" document the process for integrated EDI is to export a file (or read a database) from a company's back-end ERP, transform the file to the appropriate format for the translator. The translation software will then "validate" the EDI file sent to ensure that it meets the standard agreed upon by the trading partners, convert the file into "EDI" format (adding in the appropriate identifiers and control structures) and send the file to the trading partner (using the appropriate communications protocol).

3.4.3 The use of an ERP system

As one can notice, the use of ERP systems will be essential. Each of the suppliers will be responsible of their own ERP system, though, leasing options are available which offer internet-based ERP. This option eases the access for every company into the information technologies and to interchange information smoothly with other stakeholders.

An Internet based ERP is a complete web based accounting and business management system that requires only a web-browser and PDF reader to use. It has a wide range of

features suitable for many businesses particularly distributed businesses in wholesale, distribution and manufacturing. It is developed as an open-source application and is available as a free download to use. The feature set is continually expanding as new businesses and developers adopt it.

The primary purpose of these packages is to improve information exchanges throughout organizations. The modular design of Electronic Resource Planning software allows companies to tailor it to their particular business practices and for the efficient running of the distribution system in Nacka, will be needed for every single company.

3.4.4 A web-based calendar will need to be created to prevent traffic congestion.

Each contractor who uses the same road will have their own community in the calendar where they scheduled their direct deliveries (which were not reloaded at the picking center). This enables all carriers to synchronize their orders and activities to other surrounding delivery places, which enhance the cooperation.

3.4.5 A traffic coordinator will be needed

The picking center will need a traffic coordinator who supports the area. In case of congestion, the traffic coordinator will have the possibility to send traffic info through SMS or other wireless system to concerned carriers. The aim with this procedure is to avoid serious congestion inside the area and in the surroundings. The traffic coordinator will belong to Bring Express.

4. Information handling

The new system of Nacka has built-in EDI capacity. It means as it is already described, that standard electronic documents, e.g. purchase orders and confirmations, can be sent directly between the systems of Nacka and a supplier at ordering moment by any means, which ensures both high efficiency and high data accuracy interchange.

Figure 10 shows how information will flow through stakeholders when a customer places an order in the system. All this is supposed to work automatically and practically instantly. A customer puts a service request, the supplier replies him or her with catalogues/services and at the same time will send an order response to alert the picking center if necessary, eventually will dispatch the order and will send an electronic invoice. The picking center, in turn, will send invoices/confirmation of orders to the customer. In that moment, the supplier in question will start the shipping process according to the characteristics of the order and always regarding the regulations.

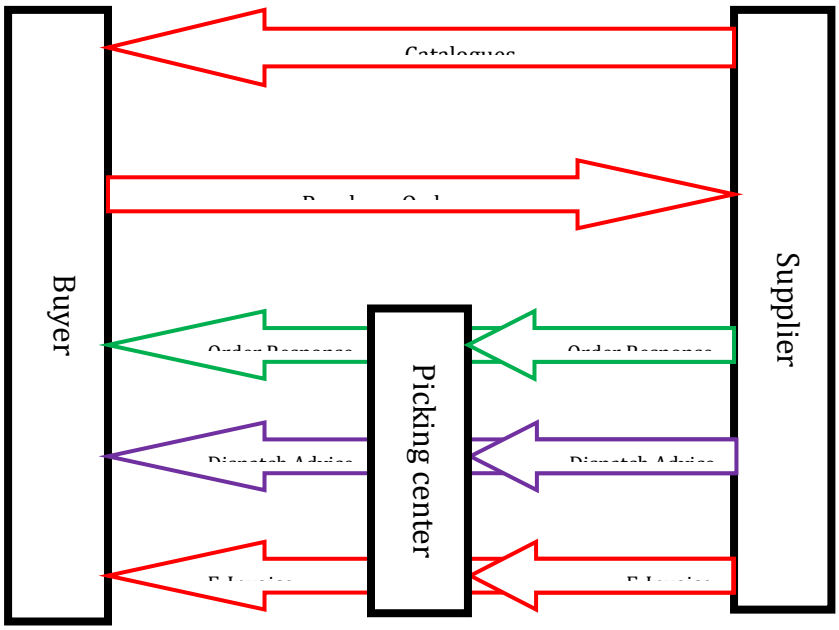


Figure 10.Information flow according to the presented proposals

5. Assessment

With the above-described measures, taking into consideration that more or less 100% of the distribution service will use Värmdövägen as the connecting road between picking centers and for other deliveries, the compute of expected reduction and comparison to current conditions are performed as follows.

5.1 Calculation of exhaust gases (CO and NO_2) and noise

Based on previous traffic study and available data for Nacka case, the following point is taken to calculate the noise and exhaust gas at Värmdövägen, which is considered to be used most of the time for delivery services under the current logistics and delivery system then under the new proposed delivery system.

Assumptions:

- Every delivery used Värmdövägen to reach the destination.
- Minimum number of trip per year for 33,000 delivery/year = 66,000 trip/year =181 vehicle/day
- 20 m width of Värmdövägen (close to Henriksdalsstation) constant
- 15 m distance constant from calculating point till center of the road and soft ground
- Some factors are taken from 2010 tables and studies

5.2 Exhaust emissions

For calculating the exhaust gas CO and NO_2;

Total exhaust gas CO contamination = CO contamination from the street + background CO contamination

CO contamination from the street = Initial value according to Number of cars * Correction factor for road width * Correction Factor for the calculating year

From Figure 11 and tables, the CO contamination from Street;

Initial value according to Number of cars = 0.5 mg/m³

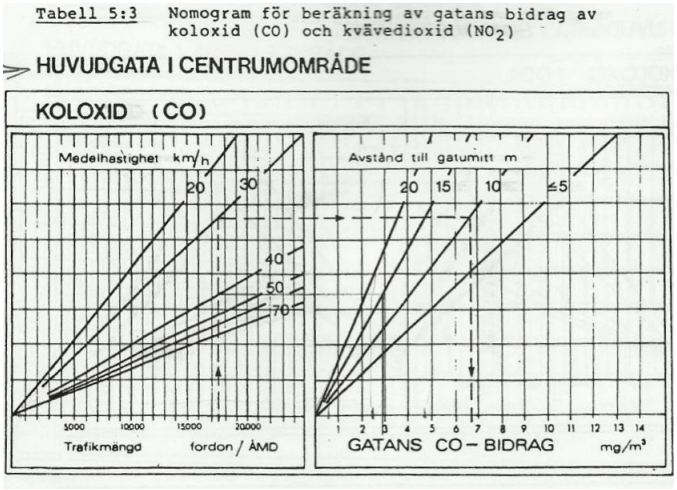


Figure 11. Nomogram for calculation of the street contribution of carbon (CO) and NO_2

From Table 1:
Correction factor for road width = 1.09

Table 1. Correction factor for lane width

Gatytyp	Avstånd till gatu-mitt m	Körbanebredd (inkl ev mittremsa) m							
		8	10	12	14	16	18	20	22
Infart/ genomfart	5	1.0	1.03	-	-	-	-	-	-
	10	1.0	1.02	1.04	1.07	1.10	1.13	1.16	-
	15	1.0	1.02	1.03	1.05	1.07	1.11	1.15	1.25
	20	1.0	1.01	1.02	1.03	1.04	1.07	1.10	1.15
Huvudgata i centrumområde	5	1.0	1.03	-	-	-	-	-	-
	10	1.0	1.02	1.04	1.05	1.07	1.10	1.15	-
	15	1.0	1.02	1.03	1.04	1.05	1.06	1.09	1.14
	20	1.0	1.01	1.01	1.02	1.03	1.04	1.07	1.09
Huvudgatan i bostadsområde	5	1.0	1.04	-	-	-	-	-	-
	10	1.0	1.03	1.07	1.11	1.16	1.20	1.26	-
	15	1.0	1.02	1.05	1.07	1.11	1.16	1.24	1.35
	20	1.0	1.01	1.03	1.05	1.07	1.11	1.15	1.20
Huvudgata i arbetsområde	5	1.0	1.04	-	-	-	-	-	-
	10	1.0	1.03	1.06	1.09	1.14	1.18	1.25	-
	15	1.0	1.02	1.04	1.07	1.10	1.16	1.23	-
	20	1.0	1.01	1.03	1.06	1.07	1.11	1.16	-
Bussgata	5	1.0	1.0	1.02	-				
	10	1.0	1.0	1.02	1.07				
	15	1.0	1.0	1.02	1.05				
	20	1.0	1.0	1.03	1.03				

From Table 2:
Correction Factor for the calculating year = 0.25

Table 2. Correction factor for contamination from street for different areas

Gatytyp	Korrektionsfaktor							
	CO Beräkningsår				NO_2 Beräkningsår			
	1995	2000	2005	2010	1995	2000	2005	2010
Infart/genomfart	0.55	0.35	0.25	0.25	0.8	0.7	0.7	0.7
Huvudgata i								
- centrumområde	0.55	0.35	0.25	0.25	0.7	0.6	0.6	0.6
- bostadsområde	0.55	0.35	0.25	0.25	0.7	0.55	0.5	0.5
- arbetsområde	0.55	0.35	0.25	0.25	0.85	0.75	0.75	0.75
Bussgata	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

CO from the street = 0.5 * 1.09 * 0.25 = 0.136 mg/m³

From Tables 3 and 4:
Background contamination at 99% mg/m³ CO = table value * Correction Factor for the calculating year
= 2 * 0.45 = 0.9 mg/m³

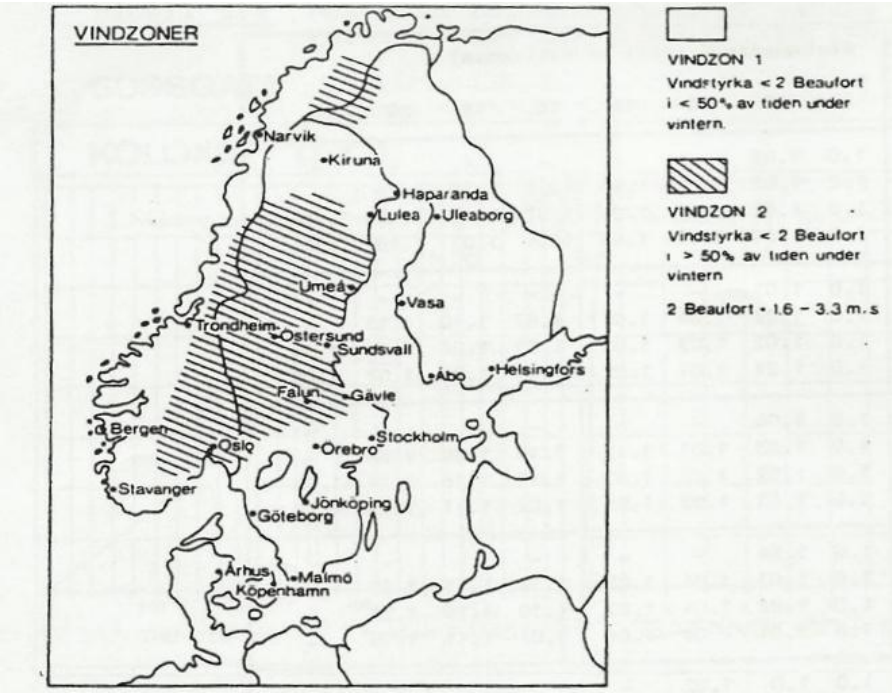


Figure 12. Calculation of background contamination

Table 3. Output values

Vindzon	Ortstorlek	Bakgrundshalt			
		CO, mg/m³		NO_2, µg/m³	
		inner-stad	ytter-område	inner-stad	ytter-område
1 enl karta	<50 000 inv	1.0	0.0	30	20
	50-200 000 inv	2.0	0.5	50	30
	>200 000 inv	3.0	1.5	100	75
2 enl karta	<50 000 inv	2.0	0.5	40	30
	50-200 000 inv	4.0	1.5	75	50
	>200 000 inv	6.0	3.0	150	100

Table 4. Correction factors for background contamination based on different years

Korrektionsfaktor							
CO Beräkningsår				NO_2 Beräkningsår			
1995	2000	2005	2010	1995	2000	2005	2010
0.7	0.55	0.45	0.45	0.9	0.8	0.8	0.85

Total CO contamination = 0.136 + 0.9 = 1.036 mg/m³

Total CO contamination = 1.036 mg/m³

Total NO_2 contamination = NO_2 Contamination from the street + Background NO_2 contamination

Same as calculating CO contamination, also see Figure 13;

Total NO_2 = (5 * 1.09 * 0.6) + (50 * 0.85) = 3.27 + 42.5 = 45.77 mg/m³

Total NO_2 = 45.77 mg/m³

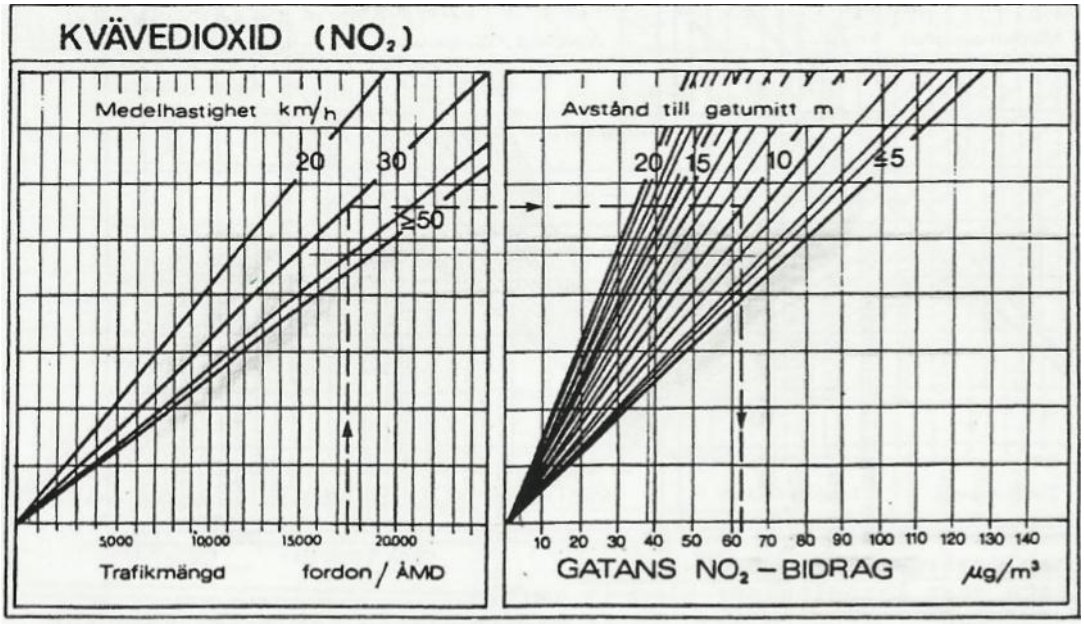


Figure 13. Output values

5.3 Noise generated by transportation

Point 1, Värmdövägen, near Hinriksdalsstation; Main Street in the centrum area.

Number of vehicles/day: 33,000 * 2 / 365 = 180.8 = **181 V/day**
30% Heavy vehicles = 55 V/day & 70% light vehicles = **126 V/day**

Speed = 50 km/hr — Average speed 40 km/hr
Road width = 20 m — Distance till mid road = 15 m

- For calculating the noise " $L_{A\,eq}$" at the current situation:

$$L_{A\,eq} = L_1 + \mathbf{\Delta}L_2 + \mathbf{\Delta}L_3 + \mathbf{\Delta}L_4$$

From Figure 14:

Difference in dB = Heavy dB– Light dB = 52 – 46 = 6

Correction factor = 0.9

$$L_1 = 52 + 0.9 = 52.9 \text{ dB}$$

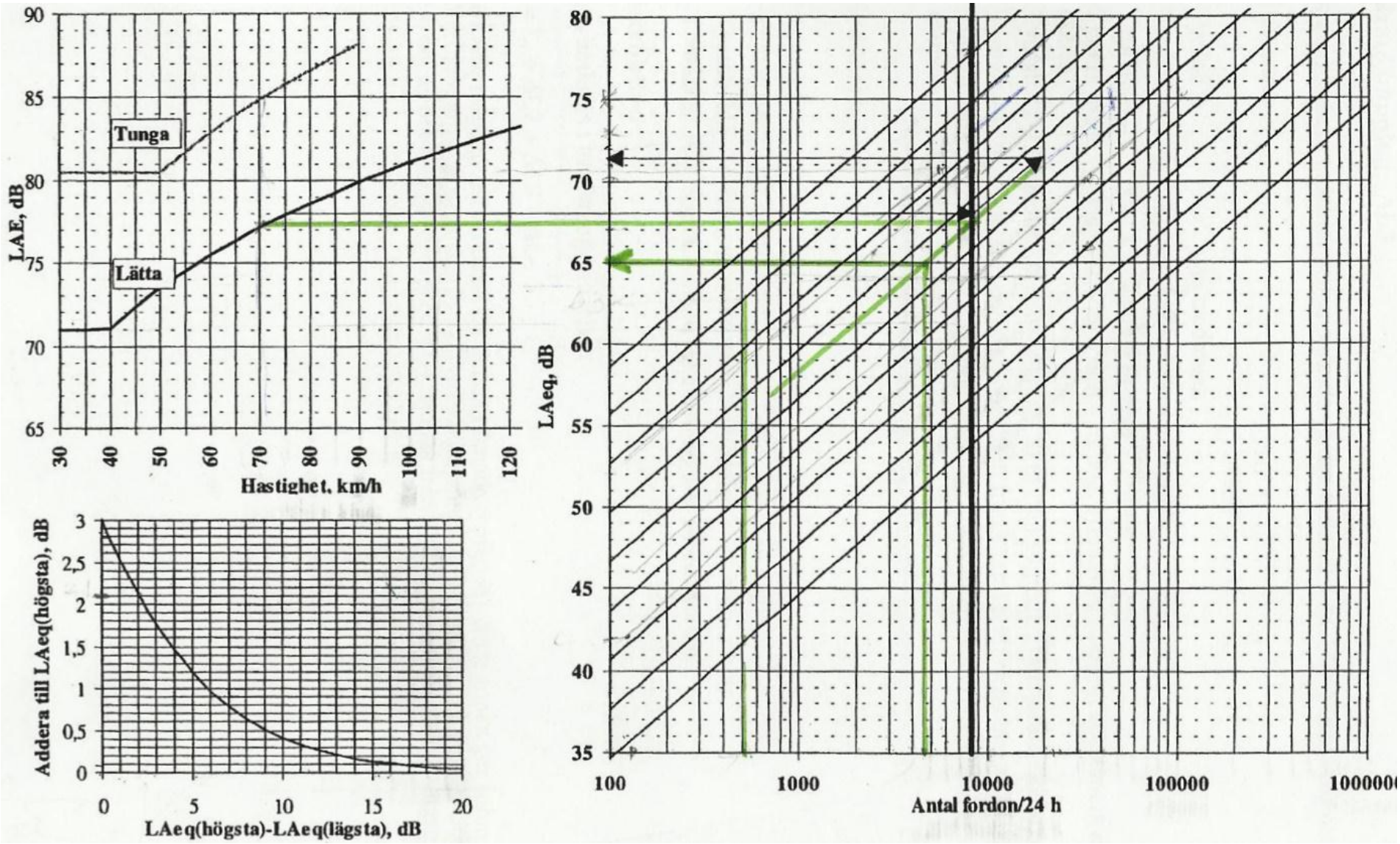


Figure 14. Monogram for calculating exhaust gas

For Smooth ground for the road sides at the same road level situation:
From Figure 15:

$$\mathbf{\Delta}L_2 + \mathbf{\Delta}L_3 = -4.5$$

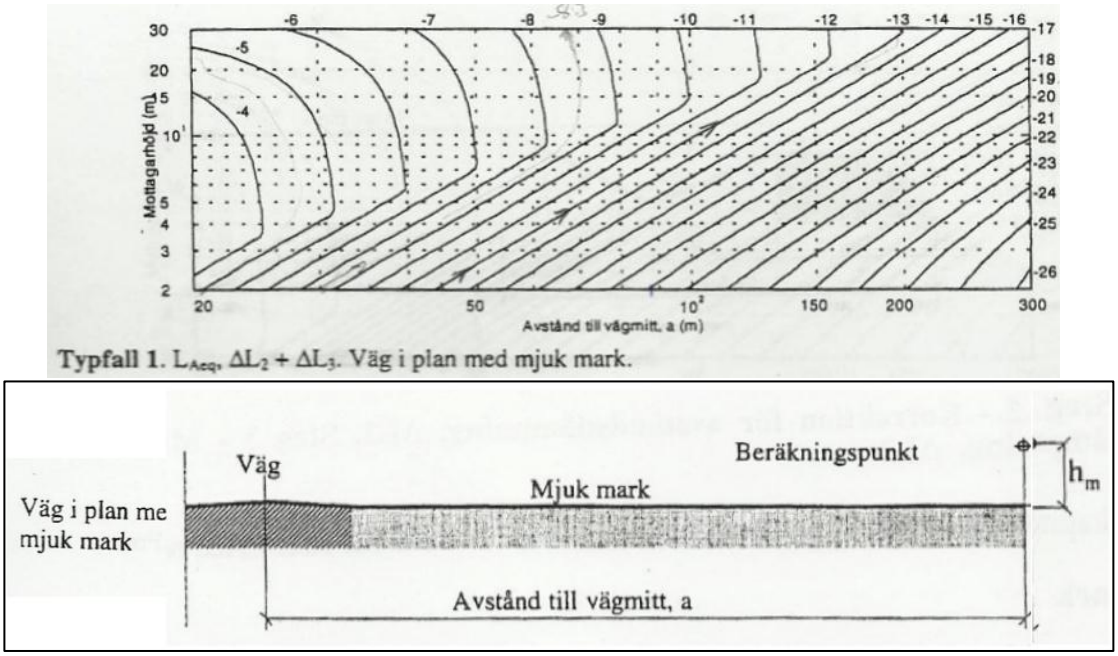


Figure 15. Output Values

From Figure 16:

$$\mathbf{\Delta}L_4 = -3$$

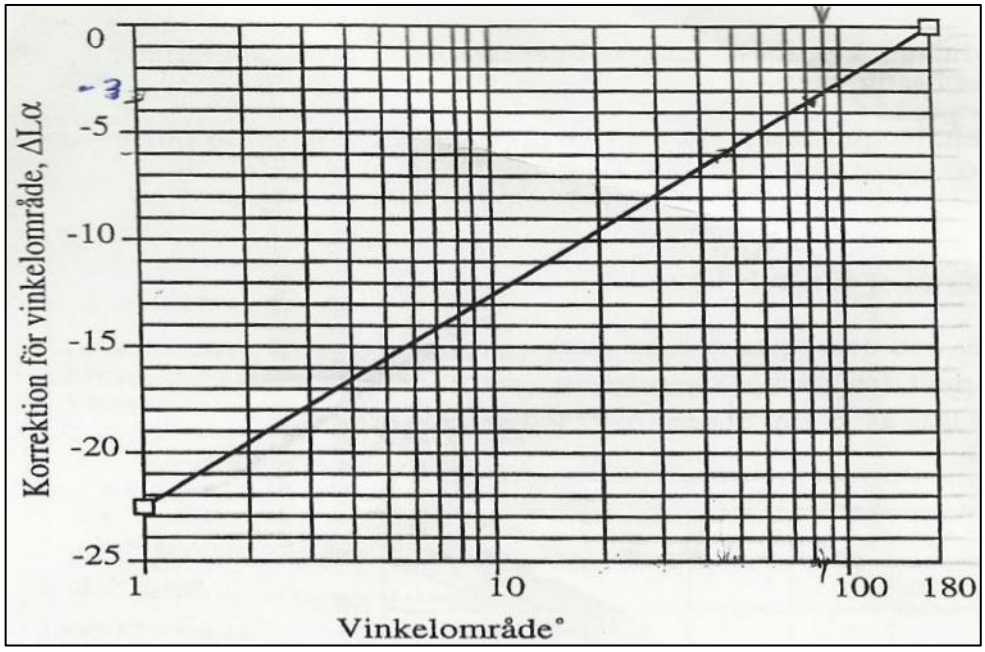


Figure 16. Correction ΔL_α

The noise $L_{A\,eq} = 52.9 - 4.5 - 3 =$ **45.4 dB**

The results, after applying our proposal, are:

Because of 60% reduction of vehicles' trips for delivery services in Nacka kommun, as explained in the risk bullet point in this report, will consequently have the following difference in Noise and Exhaust gases (CO & NO_2) for the delivery services:

Table 5. Comparison

Current situation	After proposal
Noise currently = 45.4 dB	**Noise after this proposal = 18.6 dB**
CO currently = 1.036 mg/m³	**CO after proposal = 0.415 mg/m³**
NO_2 currently = 45.77 mg/m³	**NO_2 after proposal = 18.31 mg/m³**

Key factor of success:

1. Road safety is an important factor that would help the new delivery system work out well because is a concern of everybody to have safer traffic and more secure movement. By reducing the delivery trips, the number of the vehicles will be reduced and thus, smoothing the traffic flow within the urban area which leads a safer sensation.
2. Customer willingness within Nacka Kommun will be essential to make the proposals succeed. Cooperative systems requires "team spirit" to succeed. The same applies for suppliers.

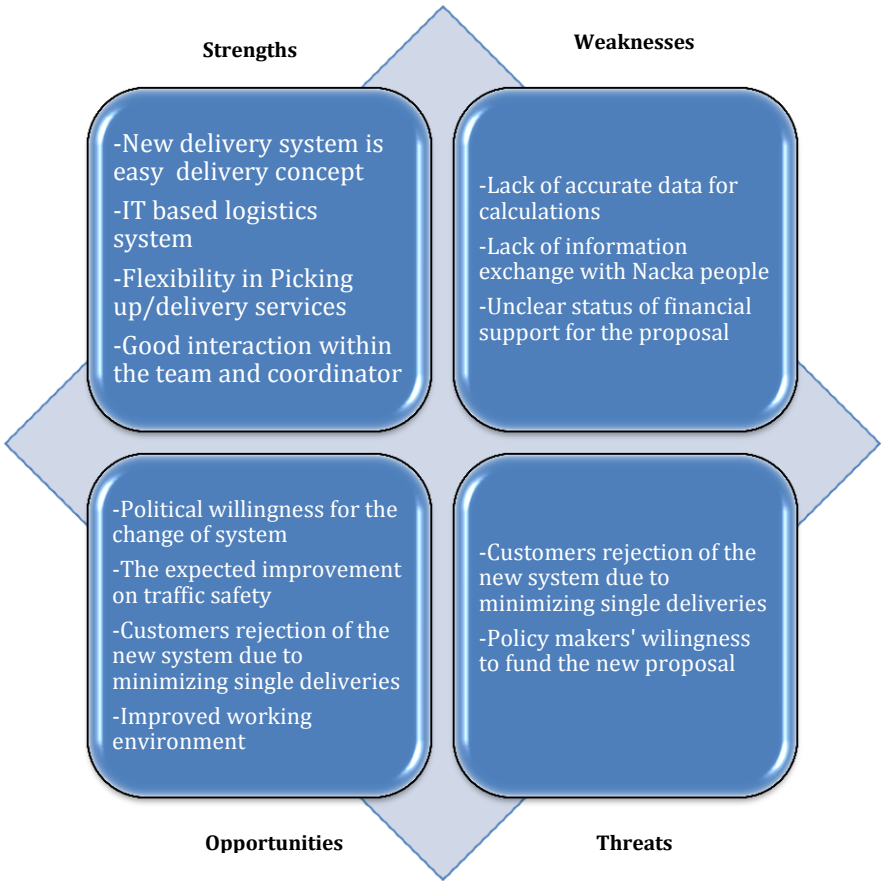
5.4 The Risk

The risk here, in this proposal, is the challenge of cancelling the single delivery services to the customers, these single orders might be liked by individuals as it is like a desire to have the order come to your home as soon as possible without taking the negative consequences that these single deliveries would create. Controlling this process might be a risk to our plan

5.5 Solution of the potential risk

To avoid the rejection of the new delivery system by the people, in terms of cancellation of single deliveries, we can accept some exceptional case as for aged and sick people that would help them in an emergency manner. So, the 75% of the entire deliveries that are single ones and we propose to cancel, might be about 60% cancellation of the entire single deliveries, and this will give a tolerance for the people to feel more flexibility to accept the new logistics and delivery system with less cost and better environment.

6. SWOT Analysis



7. References

Stockholms Stad site. Accessed at:
http://kartor.stockholm.se/bios/dpwebmap/cust_sth/sbk/tatort/DPWebMap.html

Nacka Kommun site. Accessed at:
https://www.infovisaren.se/projekt/nacka/InfoVisaren.asp?prodnr=5

Hållbar framtid in Nacka, Miljö – och hälsokonsekvensbeskrivning, 2010
Stads – och trafik planering kurs, 2010