A scenario based vehicle route planning for Swedish Match’s own road carriers has been carried out. Different scenarios have been developed and compared with the help of Plan LogiX. The purpose of this master thesis was to determine optimal routes for Swedish Match’s own road carriers and examine which geographical areas are interesting to supply from a cost perspective. Additionally the possibilities to use alternative vehicles are considered.

**Introduction**

During the later years the optimizations of distribution operations have become more important to companies. They have started to realize that a well planned distribution system can save money and diminish the damages on the environment.

Swedish Match distribution, distributes 97% of the tobacco consumed in Sweden. There are two distribution centres in Sweden, one in Gothenburg and one in Solna. Gothenburg supplies the southern parts of Sweden while Solna supplies the northern part. Swedish Match has five own road carriers that supply the current area with a week’s time horizon. The delivery is a free service for Swedish Match’s customers. The remaining areas are supplied with subcontractors.

The company wonders if their own road carriers supply the right geographical area. It seems that their vehicles often return before the working shifts are over and rarely use full loading capacity. Hence Swedish Match expects that it could be possible to supply a larger area and more customers.

This master thesis will analyse new distribution systems for Swedish Match. The main aim is to define the geographical and customers’ constraints that can be supplied by the delivery vehicles owned by Swedish Match.

This study only takes costs’ factors into consideration. The present basic distribution system with five cars and delivery frequency to customer (once a week) will be kept unchanged. Moreover the following factors will not be considered:

- If it’s economical to keep their own road carriers.
- The cost of double personal in the cars

**Method**

The master thesis is built on the systematic approach and is a particularistic, quantitative study with qualitative elements. Numerical primary data have been taken from Swedish Match’s business system (Movex). Open participating observations as well as unstructured interviews have been carried out. The study has been carried out with a
modelling and simulation program specially suited for Vehicle Route Planning called Plan LogiX. By means of that different scenarios have been developed and compared in order to find the solution best suited for Swedish Match. The study was carried out in accordance with the model shown below.

**Theory**

Vehicle route planning is a known problem in Operational Research (VRP problem) that seeks to find optimal solutions to supply a set of customers in a specific geographical area. The variables that are optimized are often the driving distance, delivery times or a cost function. Another peculiarity of the VRP problem is that the vehicles have to return to the depot where the tours start.

In the Swedish Match case the tobacco is distributed from one or more terminals with vehicles driving specific routes to customers’ facilities.

**Analysis**

The analysis is based on results achieved by using a program called Plan LogiX a software program from DPS international. The main purpose of the program is to plan and optimize transports.

Two parameters whose effects were estimated as relevant were identified: the first parameter was which customers to supply and the second which vehicles should be used.

The variation of the first parameter resulted in six different geographical areas and 6 scenarios that were numbered from 1 to 6. The variation of the second parameter, vehicles, resulted in two scenarios, the first assuming the company using its current road carriers (A) and the second purchasing alternative vehicles (B). More specifically the parameters considered are the following:

1: The entire geographical area (see map) (Grand Stockholm, Uppsala, Norrtälje).
2: The entire geographical area is supplied with the exception of Norrtälje.
3: The entire geographical area is supplied with the exception of Enköping.
4: The entire geographical area is supplied with the exception of Uppsala.
5: The entire geographical area is supplied with the exception of Nynäshamn.
6: All above mentioned outer surroundings are supplied by subcontractors.

A: The present vehicles which means one Volvo FM with a loading weight on 8720 kg and four Volvo FL with a loading weight of 5510 kg.
B: Alternative vehicles: one Volvo FL with a loading weight on 5510 kg and four Mercedes Sprinter Chassi with a loading weight of 2960 - 3030 kg.

The combination of the six geographical areas with the two sets of vehicles allowed the identification of twelve scenarios. All scenarios were found feasible apart from scenario 1B due to limited vehicle capacity.
The feasible scenarios were analyzed and two were selected as optimal solutions. The choice was mainly based on cost per supplied customer. However other factors as distance, resource movement and capacity degree were also taken into consideration.

If Swedish Match wants to keep operating with its present vehicles' fleet, then scenario 1A should be selected. This means that the entire described geographical area should be supplied. This scenario has the lowest cost per supplied customer and highest capacity utilization degree.

If alternative vehicles are used, the capacity of the fleet decreases strongly and as a consequence it is no longer possible to supply the entire geographical area (scenario 1). Scenarios 2B and 3B have the lowest cost per supplied customer. Since the Norrtälje area (scenario 2) is today supplied by subcontractors, the scenario 2B is believed to be a suitable alternative.

**Conclusion**

As described above there are two different solutions that are feasible, either to supply the entire geographical area with the present vehicles or to let subcontractors supply Norrtälje and change to smaller vehicles.

The entire area around Uppsala should be supplied by Swedish Match’s own road carriers, independently from which fleet of vehicles is adopted (A or B). If Uppsala is not supplied the cost per customer increases significant.

**Implementation**

Swedish Match should start a new project with the main purpose to implement the new routes. However to be able to do this, it is crucial to involve drivers in the process and get their consent. The will to change has to be present throughout the organization.

The routes developed in this master thesis could function as a base for decision making analyses within Swedish Match. However it is suggested to perform more detailed investigations and data collection about travel times and routes’ feasibility with customers’ delivery time windows.

![Figure 1: Tobacco customers; the entire geographical area, scenario 1](image)

**Reference**