

Summary

Collection and use of establishment data to understand commercial traffic in urban areas. Examples from Groruddalen in Oslo, Norway

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Urban planners often lack information about commercial traffic in the area of interest. This was the case for the Norwegian Public Road Administration (NPRÅ) who in the beginning of 2016 requested figures on commercial traffic in Groruddalen, an urban area in Oslo. The figures would provide input to a system analysis aimed at clarifying the future road system in the area. The NPRÅ also calls for knowledge on how to acquire new and more information on freight and service traffic in urban areas in general. In order to respond to these challenges, we conducted an analysis of commercial traffic in Groruddalen.

The analysis consists of an establishment survey and a compilation of new and existing data over commercial traffic and activity in Groruddalen. The purpose of the survey was to retrieve information about commercial traffic that is not included in existing public statistics, such as the number of vehicles to and from establishments, the vehicles' last and next stop, and the distribution of vehicles by day and vehicle type. The data from the survey are input to NPRÅ's analysis to clarify the future road system in Groruddalen. They also provides input to research on freight trip generation models within the NORSULP project.

Furthermore, the survey data are compiled with public statistics on commercial traffic and activity in Groruddalen. The purpose was to get an overview of the commercial traffic in the area as well as provide an example on how new and old data can be combined to increase our knowledge of commercial traffic in an urban area. The latter can be utilized in planning processes, for instance by the NPRÅ, or as input to sustainable urban logistics plans, which is a subject in the NORSULP project.

The work is carried out on behalf of the NPRÅ and within the research project NORSULP.

Introduction

The Institute of Transport Economics Norwegian Centre for Transport Research has carried out a survey of commercial traffic in Groruddalen. The research is conducted on behalf of the Norwegian Public Road Administration (NPRÅ) and within the research project NORSULP funded by the Research Council of Norway. The background is two-fold: the NPRÅ requested information on commercial traffic to and from establishments in Groruddalen¹ to be used as input in an analysis that will clarify the necessary future road transport system in Groruddalen. They also requested knowledge about how new and existing data for freight and commercial transport can be utilized to better grasp the role of freight traffic in urban areas. The latter coincides with parts of the objectives of the

¹ Groruddalen is a valley in the eastern part of the Norwegian capital Oslo. Groruddalen covers four of Oslo's boroughs and a wide spectre of commercial and private activity, including industries, offices, retailers, private housing, schools, commercial premises, warehouses and the national railway terminal Alnabru.

research project NORSULP, which develops sustainable urban logistics plans (SULPs) based on experiences from nine Norwegian cities.

As a result of coherent objectives, the parties have worked together to develop and distribute an establishment survey inquiring about commercial traffic to and from establishments in Groruddalen. The survey data provides input to the NRPA analysis of commercial traffic in Groruddalen, and to the research on freight trip generation models within the NORSULP project. The data has also been compiled with other existing and relevant statistics on commercial traffic and activity to acquire more knowledge of commercial traffic in an urban area. Such knowledge is relevant both for NRPA and urban planning as well as input to sustainable urban logistics plans.

By commercial traffic we mean traffic to and from establishments resulting from goods delivery or other services regardless of the vehicle type used. Traffic due to passenger transport, such as commuting or shopping trips, are excluded.

Data sources

The establishment survey

Based on a literature review and user requirements we perceived that the best way to collect necessary data was through a self-completion online establishment survey. The aim of the establishment survey was to collect information about establishments' commercial activity including whether the establishment belongs to a business chain, their storage area (in m²), importance of real-time delivery, requirements with respect to collection and distribution of freight, the number of freight transporting vehicles and service vehicles attracted and/or produced in a typical week, these vehicles' origin/destination and type, use of carriers and the establishment's possibility to impact the freight transport. The survey was distributed to all establishments in Groruddalen with an identified and active e-mail address using e-mail and a survey link. Each business received a unique link to the survey, but the survey information and e-mail design were identical. The recipients were asked to complete the survey online without any assistance from analysts/interviewers.

The Registry of Establishments in Norway includes 2 531 businesses with visiting address in Groruddalen. We succeeded in finding contact information (e-mail address) to 2 184 respondents, who were sent an e-mail. The data collection period was from Tuesday 30th of August 2016 through Thursday 23rd of September 2016. Due to problems with recipient failures we have reasons to believe that only 1 963 businesses received the survey. Of these we received 385 responses.

Due to privacy reasons, information about one-man firms was excluded from data processing and analysis. However, we chose to include companies registered with only one employee in the Registry of Establishments in Norway when distributing the survey as the employment information dates back to November 2014. After the data collection period was completed, all respondents reporting only one employee (employee data per September 2016) or establishments who had not completed the survey and was registered with one employee in the Registry of Establishments in (employee data per November 2014) were deleted. Excluding on-man firms results in 1 766 businesses that we believe received the survey, of whom 369 respondents completed it. Out of these, 6 answered that they have no activity requiring commercial traffic.

The sample size is sufficient for the results to be representative of the population in Groruddalen. Nevertheless, as establishments in Groruddalen are heterogenous, we find that special consideration should be given to the respondents' distribution over business

size, industry group and geographical location if the sample is to represent all establishments in Groruddalen.

Other sources of data

The survey was designed so that it could be combined with other relevant and publicly available data sources for freight and commercial traffic and activity. In addition to the establishment survey (from 2016), we have used data from the road traffic counting system (2016), the Registry of Establishments in Norway (2015), the survey of Road Goods Transport by Norwegian Lorries (2016) and the Commodity Flow Survey (2014). The first is provided by the NPRA and the rest from Statistics Norway. The Registry of Establishments in Norway was used to retrieve information about businesses in Groruddalen, while the traffic counts and the Road Goods Transport by Norwegian Lorries survey were used to validate the collected data and the approximate amount of commercial traffic in Groruddalen. The Commodity Flow Survey was used to investigate the relation between freight traffic and freight shipments in Groruddalen.

Descriptive statistics from the survey

Freight vehicles

In total, 309 establishments out of 369 respondents answered that they have activities that generate freight traffic and reported a total of 34 257 vehicles to and from their establishments a typical week. Of these, 19 263 deliver goods and 14 994 do a pick-up of goods from the business. The traffic is highest on weekdays between 06-09 and 09-15 (see Figure S 1).

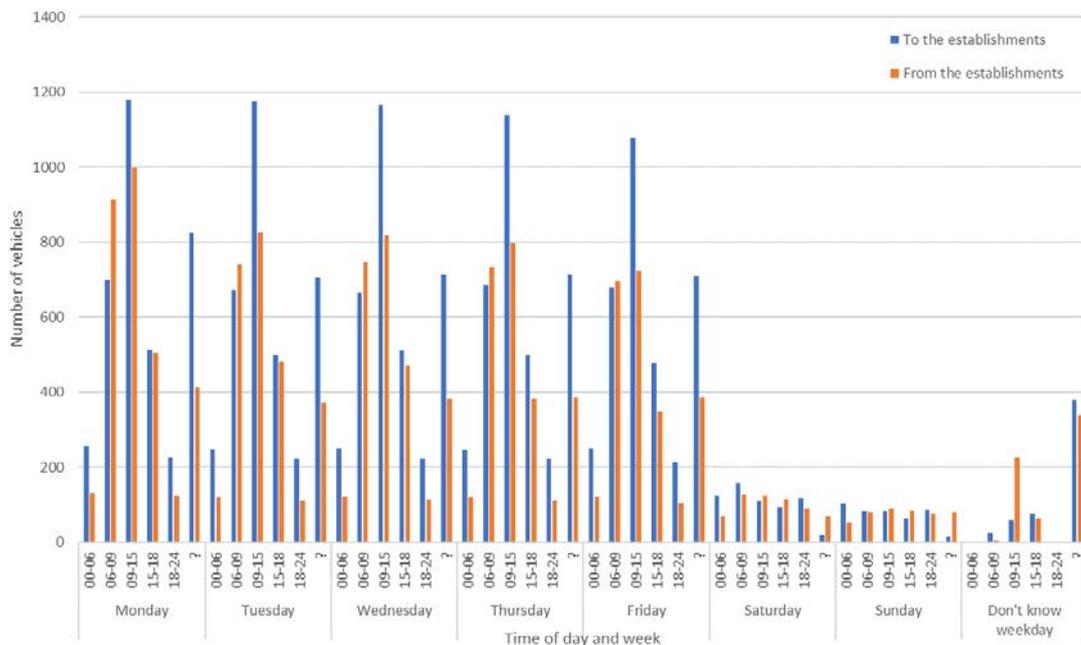


Figure S 1: Number of freight vehicles that run to or from businesses in Groruddalen by time of day and day of the week. The numbers are from establishments with more than one employee who completed the establishment survey in Groruddalen. $N = 309$.

Not all respondents answered the questions about where the vehicles came from or where they were driving to after they visited the establishments, nor type of vehicle used. Only 23

350 vehicles were distributed on geographical areas and 22 200 on vehicle type. However, this told us that Oslo city center is the main sender and receiver area of freight vehicles, and that vans and lorries dominate freight deliveries to businesses, whereas passenger cars and vans account for the majority of the freight deliveries from the businesses.

Service vehicles

Of the 369 respondents, 199 establishments reported that they either supply or demand services and hence service trips. Based on other information provided in the survey, we think this number is too low. These 199 companies report almost 7 200 service vehicles a typical week, of which 2 105 are to the businesses and 5 067 from. Figure S 2 shows how these vehicles are distributed in a typical week.

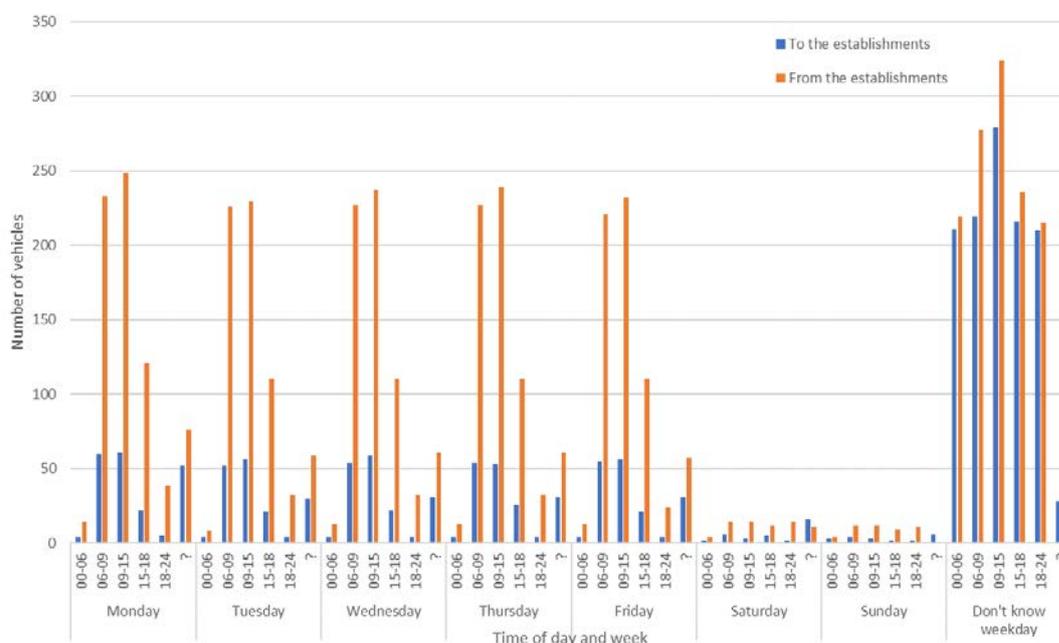


Figure S 2: Number of service vehicles that run to or from businesses in Groruddalen by time of day and day of the week. The numbers are from establishments with more than one employee who completed the establishment survey in Groruddalen. N = 199.

Comparing Figure S 1 and S 2 indicates that the respondents have less knowledge of service traffic than freight traffic. Looking at service traffic alone, it seems as they have better knowledge of trips from the business than to. Nearly 4 000 vehicles are distributed on geographical areas and almost 3 800 on vehicle type. This reveals that a large part of service traffic is internal traffic in Groruddalen, and that vans and passenger cars are the most used vehicle type for service trips.

Freight trip generation

In addition to descriptive statistics we have calculated the average number of cars per company and per employee. We distinguish between aggregated industry groups and businesses with less than or equal to 50 employees or more than 50 employees.

Looking at the average number of cars per business, we find that companies with more than 50 employees have at least as many car visits as the smaller companies a typical week, and that the differences are greater for freight deliveries than for services, with the exception of “health care services”. Freight traffic dominates the commercial traffic to

freight-intensive industries such as “transportation and warehousing”, “manufacturing” and “wholesale and retail trade”.

For the average number of vehicles per employee we find more cars per employee for small businesses than for large companies. This may indicate that businesses generate a certain amount of traffic irrespective of size, and that an increase in business size (and production) does not necessarily mean more traffic, but higher load factor or the use of larger vehicles. This relation is identified by Holguín-Veras et al. (2011).

Analyzing commercial traffic in Groruddalen

Comparing traffic volume from different data sources

This analysis is based on several data sources. The establishment survey data provides traffic per establishments a typical week in 2016 by vehicle type and the vehicles last/next destination. The data are weighted on business size and industry and scaled up to provide average annual daily traffic (AADT) to and from all establishments in Groruddalen. The AADT is compiled with road traffic counts and data from the survey of Road Goods Transport by Norwegian Lorries. The two latter are corrected for traffic in the area that are not stopping in Groruddalen, only transiting. The compilation is shown in Table S.1. The numbers include both commodity and service traffic.

The analysis distinguish between vehicles longer than or equal to 5.6 meters and vehicles longer than or equal to 7.6 meters. The reasons are that road traffic counts distinguish between vehicles according to their length not vehicle type or weight, and that vehicles between 5.6 and 7.6 meters are not included in the survey of Road Goods Transport by Norwegian Lorries. Hence, the latter should not be included in the compilation of these two data sources. All vehicles longer than or equal to 7.6 meters are included when speaking of vehicles longer than or equal to 5.6 meters, but the opposite is not true. In the establishment survey in Groruddalen we have however distinguished vehicles by length, but vehicle type. Hence, vehicles longer than or equal to 5.6 meters includes vans (permissible gross weight less than 3.5 tonnes), lorries (permissible gross weight over 3.5 tonnes) and trailer/semi-trailers. Vans are omitted from the group of vehicles that are at least 7.6 meters long. Freight and service traffic using passenger cars and vehicles that are not categorized as reported in the establishment survey come in addition to the numbers presented in Table S 1. This accounts for a total of 3 950 vehicles to the establishments and 6 325 vehicles from the establishments.

Table S 1: Compilation of traffic to or from establishments in Groruddalen from different data sources including road traffic counts, Road Goods Transport by Norwegian Lorries and the establishment survey in Groruddalen. The numbers exclude traffic transiting Groruddalen.

		Vehicles longer than or equal to 5.6 meters	Vehicles longer than or equal to 7.6 meters
Road traffic counts	To Groruddalen	6 689	4 390
	From Groruddalen	7 599	5 209
Road Goods Transport by Norwegian Lorries	To Groruddalen		3 154
	From Groruddalen		3 207
Establishment survey in Groruddalen	To Groruddalen	10 185	6 071
	From Groruddalen	8 071	3 534

From Table S 2 we see that data from the establishment survey provides an AADT of 18 256 vehicles longer than or equal to 5.6 meters, while the road traffic counts include 14 228 vehicles. The latter includes buses and other heavy vehicles that are not commercial traffic as the road traffic counts distinguish on vehicle length not weight or vehicle type.

Controlling for known data weaknesses we find that the average annual daily traffic by vehicles longer than or equal to 5.6 meters to and from establishments in Groruddalen is approximately 15-16,000 vehicles. For vehicles longer than 7.6 meters, total AADT to and from Groruddalen is around 9 600 vehicles. This is true for both the road traffic counts and the survey, but the direction of the traffic is again quite different. The low traffic volumes from the survey of Road Goods Transport by Norwegian Lorries can be partly due to the fact that it includes a smaller part of freight traffic than the other data sources.

Compiling number of freight shipments, freight quantity, and traffic volumes

The last part of the analysis consists of a compilation of traffic from the establishment survey and freight quantities and number of shipments from the Commodity Flow Survey (CFS). Even though the CFS is from 2014 and the establishment survey from 2016, we consider a compilation appropriate for our purpose.

Because of missing information in the CFS we focus on freight quantities, freight shipments and AADT *from* establishments in Groruddalen. The AADT is estimated from the number of freight vehicles reported in the establishment survey. As before, the number of vehicles are weighted on business size and industry and scaled up to represent freight and service traffic from all establishments in Groruddalen. Using the information listed above we calculate average number of shipments and quantity per freight vehicle for a set of aggregated industry groups. The result is given in Table S 2.

Table S 2: Freight traffic, number of shipments and freight volume per vehicle an average annual day. Data: The establishment survey in Groruddalen and the Commodity Flow Survey.

Industry group	Traffic	Shipments	Freight quantity (kg)	Shipments per vehicle	Freight quantity (kg) per vehicle
Construction and sanitation	838	49	409 671	0,1	489
Other services	245	823	19 981	3,4	82
Wholesale and retail trade	3 883	18 158	8 163 962	4,7	2 103
Health care services	1 116	100	567	0,1	1
Manufacturing	457	3 293	1 306 489	7,2	2 861
Information	24	1 080	5 329	45,5	224
Offices and commercial services	150	329	142 011	2,2	946
Public services and education	8	54	266	6,6	32
Accommodation and eating places	772	2	458	0,0	1
Transportation and warehousing	2 817	3 422	152 839	1,2	54
Total	10 310	27 311	10 201 572	2,6	990

Table S 2 shows that, on average, 2.6 shipments and 990 kg are transported per freight vehicle in Groruddalen. If we break it down on industry, we find most shipments per vehicle to industries within the group “information” followed by “manufacturing”, “public services and education” and “wholesale and retail trade”. “Manufacturing” and “wholesale

and retail trade” have quite heavy shipments on average, but also the highest amount of freight per vehicle. The industry group “information” and “public services and education” generally have smaller shipments on average, and therefore less freight per vehicle.

The groups “accommodation and eating places” and “transportation and warehousing” stand out with quite few shipments and low quantities per vehicle while we would expect the opposite. For the former, this may be due to few respondents in the establishment survey. The establishment characteristics for those who replied implies that these are likely to have many food deliveries (take-away), which provide lots of traffic without being included in the CFS. For “transportation and warehousing”, the survey includes bus companies, moving agents and taxi company, which also generates commercial traffic but few shipments to report into the commodity flow survey. Table S 2 presents average number of shipments and freight quantities per vehicle for aggregated industry groups. Hence, the underlying industry groups will probably have different structures than those presented above.

Conclusion and final reflections

This report document how data collection can be combined with existing statistics for freight traffic and freight activity to increase our knowledge of commercial traffic in an urban area. Based on this analysis we have reasons to believe that there are between 15-16 000 commercial vehicles visiting establishments in Groruddalen an average annual day, and that the industry groups “wholesale and retail trade” and “transportation and warehousing” produce most traffic and shipments, while businesses engaged with “information” produce most shipments per vehicle. “Manufacturing” is the aggregated industry group that produce the largest quantity of freight (in kilograms) per vehicle.

Even though we present concrete figures for freight traffic and freight shipments in Groruddalen, it should be noted that they can’t be read as final or permanent traffic figures, but as an estimate. In addition, it should be noted that traffic figures and shipments are presented per annual day. The numbers will therefore be too low for weekdays and too high for holidays. Although an analysis is no better than its input and the estimated measures might not be transferable to other areas, the methodology might be repeated to get similar estimates for other urban areas.