Phase 5. Central and local legislative means

Legislative means, both central and local, aimed at decreasing travelling kilometres by optimising the transport flows in the city and by stimulating the use of smaller, lighter, quieter vehicles, thus improving the quality of life in the city.

target group: national and local authorities

Transporters and (to a lesser degree) transshippers and shopkeepers are also involved in legislative means - sometimes with input, but always as subject of the legislation.

Project: "Urban Distribution Amsterdam"

a project aimed at gradually limiting access to heavy freight traffic in the inner city of Amsterdam

One of those initiatives is the urban distribution project in the city of Amsterdam.

In consultation with transporters, the urban distribution project in the city of Amsterdam was initiated October 1, 1996; one of the first measures was to close off the inner city as much as possible to trucks heavier than 7.5 tons. This is expected to lead to an adjustment of the logistic concepts of the transporters and transshippers who make deliveries in the inner city.

Urban distribution Amsterdam is a project aimed at gradually limiting access to heavier freight traffic in the inner city of Amsterdam.

The goal of the project is:

n to improve the accessibility of the inner city of Amsterdam for goods transport

n to improve the quality of life in the inner city of Amsterdam

n to strengthen the economic position of the inner city of Amsterdam

Project-leader: G. Esselaar, dienst binnenstad, Wibauthuis kamer 5003, Wibautstraat 3,

P.O.box 202, 1000 AE AMSTERDAM, telephone + 31 20 596 3214; telefax + 31 20 596 3202.

Appendix 5 shows the UDP projects at a glance.

3.2. Models used

One of the objectives of the UDP is to estimate beforehand and determine afterward the effects of projects. The UDP has therefore developed the UD effect model (see appendix 6) to measure the effects of the projects. Indicators have been listed for each UDP objective. The essence of the UD effect model will be described in TIPPER, which will soon be published.

The steering committee of the UDP chose the projects on the basis of this UD effect model. According to this model, for every UDP objective (accessibility, quality of

life, transport efficiency, economic situation and development) per project, a sub-objective is determined. Then indicators, sources of information and a measuring method are selected. In conformity with this UD effect model, the contributions of the selected projects to the UDP objectives can be weighed and substantiated.
While these projects are being carried out, the steering committee will also measure the effects of the projects according to this UD effect model using a zero measurement (basic measurement) and a one measurement (effect measurement). With this plan, the steering committee hopes that the UD effect model of the UDP will become a standard for the evaluation of projects having to do with urban distribution.

3.3. Simulations

Manual "freight traffic in cities" from the Ministry of Housing, Regional Development and the Environment gives insight into:

- a picture of the most important routes for freight traffic in city area
- an estimate of the amount of freight traffic on the roads of these routes
- possible supplement of traffic calculations via "traffic environment cards" with the intensity of freight traffic
- burden on the environment resulting from freight traffic

4. Effects

4.1. Results of the projects

To distribute results, the already existing information channels of the participating partners are used as much as possible. The UDP will also:

- set up a data bank
- issue an internal quarterly newsletter
- organise a symposium once per year
- publish a brochure (TIPPER) every so often, also for the sake of uniformity and standardisation

By communicating proven successes, the UDP expects to contribute to a certain degree of standardisation. If the effects of projects become more widely known, it only follows that in similar situations the experiences gained in the UDP projects will be used.
Communication concerning the UDP is aimed at realising the following objectives:

- to stimulate existing and potential projects in order to arrive at good results within the framework of the UDP objective

- *to stimulate and inspire organisations themselves to carry out/take over various* (proven) successful projects within the priority areas
- to stimulate uniformity and standardisation in legislative and other means
- to further create and expand general familiarity with the problems and solutions to urban distribution (usefulness and necessity, vision, place in traffic and transport policy, approach, involved parties, etc.)
- to contribute to a good exchange of information within the UDP and with those directly involved

An independently executed primary task of the UDP is to stimulate uniformity and standardisation through legislative and other means. It will communicate its progress by:

- proclaiming the benefit and the need of uniformity and standardisation
- approaching involved organisations directly and indirectly and entering into discussion with them
- actively informing organisations about developments in this area
- asking organisations to answer
- stimulating projects having to do with uniformity and standardisation

4.2. Conclusions

The UDP itself only carries out limited projects, but acts as partner in most cases which are essentially carried out by others. This means that an organisational relationship is created with the different projects. One of the parties affiliated with the UDP assumes responsibility for the project and also appoints the UDP contact. Via its steering committee member, this organisation primarily oversees the goal and the desired effect of the project in relation to the UDP objective. As desired, this party will also request support and present standardisation to the other members of the UDP steering committee. As observer, the UDP contact participates in the meetings of the project in question. The UDP contact can but does not necessarily need to become a member of the UDP steering committee. If this is not the case, care must be taken to maintain good communication between the responsible UDP member and the UPD contact. The process manager also maintains operational contacts with the project managers of the different projects. The process manager sees to the monitoring/semi-annual reports (following the progress) and makes operational agreements on the UD effect measurement with the project managers.

Appendix 1 Overview of city measures with direct influence on goods transport:

overview of city measures with DIRECT influence on goods transport					
reference	measure	freq.	G/P	area of application	Desired main effect
time-related measures	set periods (selective accessibility system)	* **	G/P	pedestrian areas	Separation of - goods supply traffic - shoppers
	shop business hours (longer)	*	G	municipality	- increase shopping possibilities for consumer
vehicle-limiting measures	axle weight (B-roads)	**	G	inner city	- prevent physical damage
	environment - noise (driving/ engine) - noise loading/ unloading) - exhaust fumes	*	G	residential and shopping areas	- quality of life
	total train weight	*	G	inner city	- environment - safety
	length	*	G	old city centre	- less road maintenance of roads - safety
	width	* *	G	old city centre	- prevent traffic jams - prevent physical damage - safety
	height	*	G	pedestrian areas	- prevent physical damage

legend		
	* occurs seldom	G measure for goods transport
	** occurs regularly	P measure for passenger traffic
	*** occurs often	

Appendix 2 Overview of city measures with indirect influence on goods transport:

overview of city measures with

INDIRECT influence on goods transport

feature	measure	freq	G/P	area of application	desired main effect
physical infrastructural measures	ring road	* *	G/P	municipality	- accessibility - flow
	free public transport lanes	* *	P	municipality	- promote accessibility via public transport
	mini roundabouts	* *	P	municipality	- safety
	speed bumps	* *	P	municipality	- safety
	loading and unloading ports	* **	G	municipality	- safety - flow
	delivery roads	*	G	shopping areas	separation of - supplying traffic - shoppers
	closing off (e.g. with poles) - permanent - semi-permanent	* *	G/P	inner city	separation of - supplying traffic - shoppers
	parking places	* **	P	inner city	- accessibility - make limited traffic zones

overview of city measures with INDIRECT influence on goods transport					
feature	measure	freq	G/P	area of application	desired main effect
traffic measures	routing	* *	G/P	municipality	- more efficient traffic flow
	one-way traffic	* *	G/P	municipality	- flow - safety
	parking ban trucks	*	G	municipality	- accessibility - flow - safety - quality of life
	speed limit	*	G/P	municipality	- safety
price-related measures	entry free	*	G/P	inner city	- reduce goods supply traffic
	parking fees	* **	P	inner city	- accessibility - reduce traffic
policy measures	location policy	* *	G/P	municipality	- separation of functions
	transport management	* *	(G)/P	municipality	- reduce passenger-(goods) automobile traffic

Appendix 3. Grid: graphic presentation of the potential of solution areas

Grid: graphic presentation of the potential of solution areas

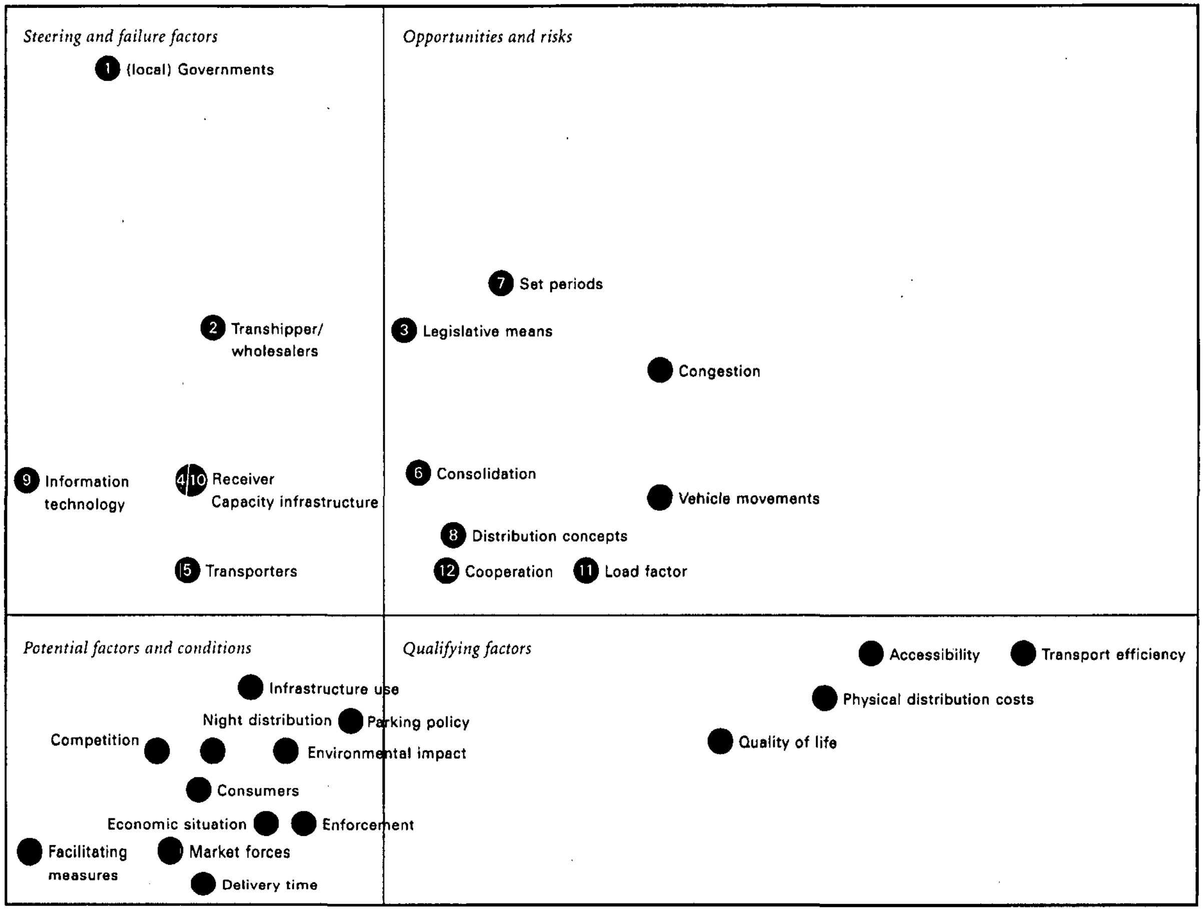
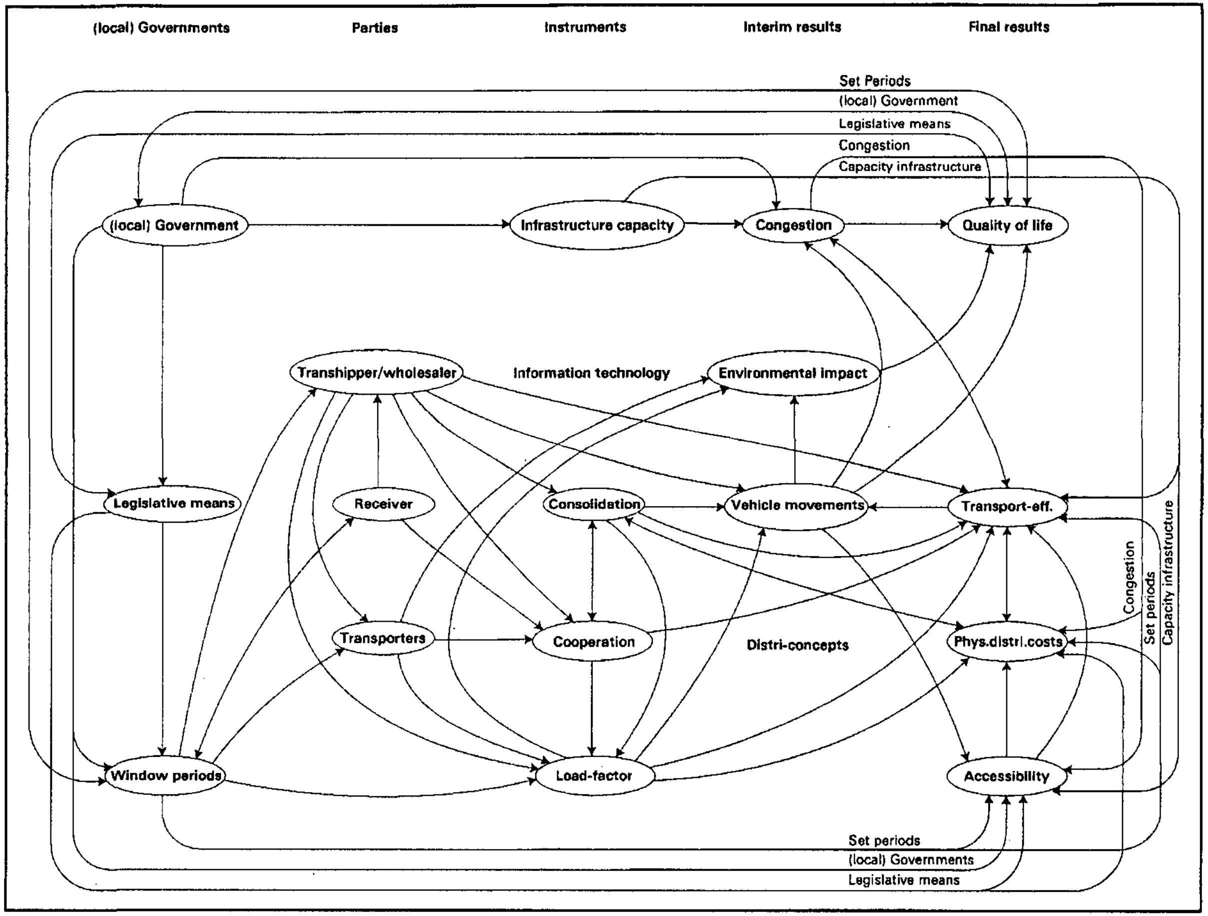


Diagram with influences



Appendix 5. UDP projects at a glance

	fashion shop chains	clothing shopkeepers	Shopping street distribution 2000	's-Hertogenbosch selective access	Amsterdam urban distribution
primary goal	higher load factor	reduce own transport	public transport (one vehicle for store chains in the same street)	selective accessibility	close inner city to vehicle weighing more than 7.5 tons
priority area	upstream consolidation	upstream consolidation	cooperation transporters; receiving after business hours	flexible set periods	local legislative means
primary target group	transshippers	shopkeeperswinkeliers	transporters; shopkeepers	local authorities	central and local authorities
desired effect	consolidate goods and reduce kilometres	reduce kilometres and vehicle movements	reduce kilometres and vehicle movements	reduce kilometres and vehicle movements	consolidate goods at edge of city and reduce kilometres and vehicle movements
state of affairs	start 1997	start 1997	set up schedule with various tranporters and store chains	introduction spring 1997 info/communication completed	started October 1 1996

Appendix 6. Urban Distribution Effect Mode

Criteria	Objective	Indicator	Source of information	Measuring method
Accessibility	improve accessibility vehicle kilometres and vehicle movements	1. number of vehicle kilometres number of vehicle ton kilometres 2. number of vehicle movements	statement transporters	questionnaire
	improve accessibility of inner cities	3. travelling time to reach destination 4. obstacles (bridges, speed bumps, roundabouts, narrow streets)	survey of loading and unloading drivers	
Quality of life	reduce 'inconvenience' in urban areas for residents and users (incl. reducing staying time vehicles)	5. noise dB(A)	(street survey)	noise survey
		6. air emissions (benzene, CO_2, lead, NOx, fine dust etc.)	(street survey), transporters reports (fuel consumption)	questionnaire
		7. number of vehicle movements	traffic intensities	cordon counts
		8. complaints from citizens	municipality or residents	registration of complaints, residents survey
		9. complaints from consumers (shoppers)	municipality of consumers	registration of complaints, survey
Transport efficiency	increase load factor distribution vehicles	10.average load factor per trip	transporters reports (weight, reverse logistics)	questionnaire
	reduce vehicle kilometres/ reduce fuel usage	11.fuel consumption		

Criteria	Objective	Indicator	Source of information	Measuring method
Economic situation and development	maintain or improve the economic health of inner cities	12.size of sales floor space in m^2 13.number of visitors shopping area per hour 14.number of retail outlets	municipality and brokers	desk inquiry
Justification	advantages for all involved	15.opinion of residents 16.opinion of consumers 17.opinion of transporters / transshippers 18.opinion of shopkeepers and businesses	residents consumers transporters / transshippers shopkeepers / business association	questionnaire

Appendix 7: Check list to describe the simulation method and the modelling toolkit

City: Amsterdam

Name of modelling toolkit
GENMOD (General Model)
Aim of the modelisation
To see the effects of measures in car-management
Model approach
Multimodal traffic model (car, bike, public transport)
Classification of the traffic calculation model/method
Disaggregated model
Structure of the model and elements of the modelling toolkit
car
bike
public transport
modal split
distribution assignment
sensitivity to congestion
Input parameters / adjustments of the model
inhabitants
family structure
employees
city structure (map)
costs
Required surveys to gain the model parameters
household interviews
street interviews
traffic counts (yearly)
public transport interviews
Output of the model
number of traffic (cars/hour; bikes; public transport)
safety (number of casualties)
pollution (NOx , CO2)
Specific and characteristic features of the model
Limits of the model and problems by using the model
Very detailed forecasts are not possible, trough to many questions there's an answer.

Check list to describe the simulation method and the modelling toolkit

City: 's Hertogenbosch

1 Name of modelling toolkit
TRANPLAN
2 Aim of the modelisation
road Estimation vehicles
day
peakhour
3 Model approach
Gravitation
4 Classification of the traffic calculation model/method
all-or-nothing
5 Structure of the model and elements of the modelling toolkit
Input parameters / adjustments of the model
inhabitants
employees
7 Required surveys to gain the model parameters
traffic counts / surveys (yearly)
O/D – survey licences based
8 Output of the model
vehicle / hour
vehicle / day
9 Specific and characteristic features of the model
noise- and air pollution forecasts
10 Limits of the model and problems by using the model
no simulations model
no modal split- effects on policy scenario's
no urban transport
no bicycles

Appendix 8: Check list to characterise and describe the model cities

city characteristics	level	unit	Amsterdam	Haarlem	's Hertogenbosch
Settlement structure					
importance of the city for the region					
number of inhabitants	city agglomeration		718.100 1.500.000	147.400	126.500
Gainfully employed individuals	city agglomeration		286.900	62.100	40.800
Employees	city agglomeration				
number of enterprises	city	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees			Total 6.384
	agglomeration	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees			
surface area	city agglomeration	[km²]	160,43	32,10	90,46 1469
Settlement density	city agglomeration	[inh./km²]	4.476	4.593	1.399
ratio between gainfully employed individuals and employees	city agglomeration				
Traffic infrastructure					
number of motor vehicles	cars (light vehicles)		229.100	55.000	79.600
(please fill in the national limits between cars and HGV)	trucks / HGV (heavy vehicles)		4.900	1.200	1.800
	traction engine				

city characteristics	level	unit	Amsterdam	Haarlem	's Hertogenbosch
Traffic infrastructure					
Percentage of diesel engine per kind of vehicle	cars (light vehicles) trucks / HGV (heavy vehicles) traction engine				
number of motor vehicles present in the road network					
number of cars per head of population		[cars per 1.000 inh.]	320	370	630
length of the road network Classified road network Urban road network		[km] [km] [km]	1.480	378	633
length of the road network per number of lanes	one-lane carriageway two-lane carriageway three-lane carriageway four-lane carriageway and more	[km] [km] [km] [km]			
length of the road network per head of population		[km per 1.000 inh.]	2.060	2.560	5.000
Integration in the highway and trunk road network			Yes	A4;A9	Yes
level of urban public transport service			High	Bus	City: high; region: low
Integration in the national railway network			Yes	IR und local train	Yes
Location on a waterway			Yes	-	Yes
Existence of a port/harbour			Yes	-	No
Existence of an airport	number of passengers per year volume of goods traffic per year	[Mio./a] [1.000 t/a]	25		No

city characteristics	level	unit	Amsterdam	Haarlem	's Hertogenbosch
Transport / Traffic demand structure					
total trip volume per day (without through traffic)	volume of person trips with public transport and private traffic				
	cars				
	trucks / HGV			4.400	
volume of goods traffic per year	road network	[1.000 t/a]		47.000	
	railway	[1.000 t/a]			
	inland navigation	[1.000 t/a]			
	ocean navigation	[1.000 t/a]			
	aircraft	[1.000 t/a]			
volume of consignments per day					
motor vehicle kilometres covered in the road network per day	car kilometres	[car*km/d]			
	truck (HGV) kilometres	[HGV*km/d]			
motor vehicle dwell time in the road network per day	dwell time of cars	[car*h/d]			
	dwell time of HGV	[HGV*h/d]			
fuel consumption due to motor vehicles per day		[kg/d]			
air pollutant emissions due to motor vehicles per day	CO	[kg/d]			
	Soot / Particles	[kg/d]			
	NOx	[kg/d]			
	CH	[kg/d]			
average mobility rate per day (trip rate)		[trip/d]			2.0 to 2.2
number of in-commuters per day					
number of out-commuters per day					
in-commuter / out-commuter ratio per day					

Appendix 9: Check list to describe the effects of the different measures

Name of the city: Haarlem	Effects of the measure or the project										
Measure or Project / case study	motor vehicle traffic load HGV	motor vehicle kilometres	motor vehicle dwell time	air pollutant emissions					noise emission	accessibility	CO2
				fuel consumption	CO	Soot / Particles	NOx	CH			
1. Encilog-concept, (simulations) city-logistics + reverse logistics											
1.1 Encilog Westergracht	-34,60%	-4,30%	-	-	-5,84%	-7,39%	-11,01%	-8,05%	-	-	-9,92%
1.2 Encilog Waarderpolder	-34,60%	-4,20%	-	-	-5,84%	-7,39%	-11,28%	-8,36%	-	-	-10,11%
1.3 Encilog West. Havengebied	-34,60%	0%	-	-	4,05%	0,00%	-6,81%	-1,13%	-	-	4,57%

	percentage changes	qualitative assessment		Simulation or Project / case study	
-1,23%	reduction to the baseline situation	++	very positive	Sim.	Simulation
1,23%	increase to the baseline situation	+	positive	Pro.	Project / case study
		0	neutral	Ass.	Assessment
		-	negative		
		--	very negative		

check list to describe the effects of the different measures

Measure or Project / case study	Effects of the measure or the project: motor vehicle traffic load	motor vehicle kilometres	motor vehicle dwell time	air pollutant emissions: energy consump-tion	CO	Soot / Particles	NOx	CH	noise emission	accessibility	...
City with 200.000 inhabitants in the year 2040 in the Netherlands											
small tube urban transport system (simulation)		-68%		-52%	-68%		-69%	-75%	-9%	+	
large tube urban transport system (simulation)		-87%		-76%	-88%		-88%	-88%	-17%	++	

The emissions only include the emissions within an urban area. Reductions in the interurban transport are not included

Source: Interdepartmental onderzoeksprogramma Duurzame Technologische Ontwikkeling, Netherlands

A small tube urban transport system consists of a network (mainly underground) for freight transport of tubes with a 1,0-1,2 metre diameter.

A large tube urban transport system consists of a network (mainly underground) for freight transport of tubes with a 2,0-2,2 metre diameter.

Both transport systems are fully automated and have terminals at shopping centres and within a certain range of neighbourhoods

	percentage changes	qualitative assessment		Simulation or Project / case study	
-1,23%	reduction to the baseline situation	++	very positive	Sim.	Simulation
1,23%	increase to the baseline situation	+	positive	Pro.	Project / case study
		0	neutral	Ass.	Assessment
		-	negative		
		--	very negative		

COST 321

National Report

SLOVENIA

December 1997

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Repar Miroslav, dipl.ing.
Institute of traffic and transport.
Ljubljana

Table of contents

1 Introduction

Slovenia, belonging to transit countries, is integrated in two important infrastructure corridors: in the east-west direction, it is Corridor V of the Pan-European infrastructure network (Venice-Triest(Koper)-Ljubljana-Budapest-Lvow)and the direct Slovenia-Hungary link, while in the Central Europe-south-east direction, it is Corridor X (Salzburg-Ljubljana-Beigrade-Skopje-Thessaloniki). By opening these corridors Slovenia expects the increase of freight transport in the period from 1995 to 2010 by over 100%. The greatest, i.e. the predominant part of this increase will be generated in road, freight transport.

Passenger vehicles represent the greatest transport volume in Slovenia. The motorization rate started to increase very fast after 1970. The number of registered passenger vehicles in 1996 was four-time higher than in 1970. Traffic is extremely dense, especially in the surroundings of the greatest centres of employment; the greatest volume, however, is represented by daily commuters - passengers going to and from work or school every day.

Beside car transport, which represents at present almost 92% of all registered vehicles in Slovenia, also freight transport is important with regard to its portion within the average annual daily traffic (AADT); this transport represents in total a little more than 7% (the rest is motor-cycles and buses). The greatest number of freight vehicles performs its work along a distance of 30 km; their portion is almost 90%. Their traffic is concentrated on regional and urban roads, especially in the area of the greatest Slovenian centres.

Goods transport - industrial raw materials, semi-finished products and products - is a kind of activity, which affects the successfulness of each national economy. A logistic process is started actually within the production process, i.e. by packing and preparation of goods for transport - their carrying to the final customer or shop, where the goods will be available for potential buyers. Due to specific needs of producers and customers, logistic channels and processes are extremely complicated and as a result of this, very often **irrational and non-profitable.** Having in mind the objective of limiting freight **transport flows in city centres and in their** closest neighbourhood with the purpose to reduce transport costs on one side, and the adverse impacts onto the environment on the other side, it is reasonable to use integral transport technology which comprises, among other things, collecting and gathering together of smaller freight units and aggregate transport and distribution of goods to customers. To achieve the objective it is necessary to promote the development of technical, technological, organisational and educational capacities of carriers.

Better transport connections have positive effects on the development of economic activities in Slovenia, for improved transport efficiency enables better accessibility, faster transport and more rational use of energy, which reduces costs and enables faster development.

2 Environment

2.1 National policy

The anticipated further increase of goods transport (in the period from 1998 to 2006 it is expected to reach the average annual rate of 4.4%, and about 4% after this period) will continue to influence the reduction of the portion of railway transport in comparison with road freight transport. In spite of technical improvements of transport means and taking into consideration the changes in the structure and quantity of emissions, further pollution of the environment can still be expected. The forecasts for Slovenia are as follows:

- *reduction of CO emissions into the air by approximately 40.000 kg/day*
- increase of HC emissions into the air by approximately 16.000 kg/day
- increase of NOx emissions into the air by approximately 42.000 kg/day
- due to technical changes there will be no more emissions of Pb into the air.

Reduced emissions into the environment due to traffic are expected also because of the planned reconstruction and modernisation of the existing railway lines and the construction of new railway lines, which will enable a gradual re-routing of road transport to the railways.

The noise impacts on the environment exceed the permitted levels already now and with further traffic growth the situation will aggravate.

In April 1993 the Agreement between the European Economic Community and the Republic of Slovenia was signed for the areas of road, railway and combined transport, which represents the fundamental formal framework for the Slovenian transport policy.

The Republic of Slovenia has signed also a series of international contracts, declarations, conventions and protocols in the field of environment protection; non - consideration of the provisions of these conventions and protocols would mean a non-fulfilment of the objectives set by Slovenia in this field.

The document 'Transport Policy of the Republic of Slovenia", which is under discussion, foresees long-term orientations and measures for rational land use, noise reduction and environment pollution. Because of their importance their implementation is foreseen already before the year 2005.

The regulative policy field encompasses above all:

- preparation of implementing regulations which will determine the contents and methodology for the solution of the problems of impacts on the environment due to the encroachments of transport infrastructure into it in accordance with the already adopted Law on Environment Protection;
- consideration of all ratified international conventions and protocols.

The important measures related to the reduction of the adverse impacts of traffic onto the environment refer above all to:

- re-routing of road traffic to railway and combined traffic
- consideration of all kinds of homology regulations
- regular checking of all kinds of emissions from vehicles
- more favourable purchase of energy-saving vehicles
- differentiated taxes for particular "clean" vehicles and fuels
- increased strictness of the decree on quality of fuels
- introduction of alternative fuels
- decree on determining of roads where dangerous goods may be transported, and on restrictions of transport of dangerous goods.

2.2 Local policy

Besides the measures for the reduction of impacts on the environment and the guidelines for more rational development of traffic flows, foreseen in the transport policy of the Republic of Slovenia, the major Slovenian city centres endeavour especially for the improvement of the present organisation of urban and suburban traffic flows. On the basis of the analysis of the entire logistic process the cities will establish a more efficient organisation and regulation of traffic flows, especially in centres, e.g. by introducing the regime of one-way streets, reservation of areas and time intervals for delivery vehicles. The measures refer also to speed restrictions. Some cities (e.g. Ljubljana, Maribor, Koper) have foreseen intermodal logistic centres and traffic junctions in their plans, with the purpose to rationalise the presently dispersed and unorganised work of individual carriers.

New railway connections are being planned also - industrial tracks to the .existing and new distribution centres and manufacturing companies.

The concept of the road network based on the connection of republic and municipal centres by means of long-distance roads has a positive effect on the development possibilities of the settlements; it increases the accessibility of settlements, working posts and supply and service activities. It has a positive effect also on traffic safety and quantity of emissions inside settlements, for the long-distance roads take over transit traffic which has been running through the settlements by now. The re-routing of a part of regional traffic to long-distance roads will have positive effects also on a reduction of the number of accidents.

3 Research work of the republic of Slovenia in the framework of COST 321 Programme

In the framework of Cost 321 Programme the Republic of Slovenia was included into the work of Group B which dealt with the questions of methodology and model procedures for the evaluation of local and global effects of measures selected for definite towns.

With regard to the fact, that Slovenia's representative was not in the position to finish his work in the time scheduled, due to objective reasons, the research work was taken over by another group. Due to the limited time for this work it will not be possible to present the results and measures for all the selected model cities, for the models set require huge data bases. Because the contents of Cost 321 Programme and the problems dealt with in this framework are very interesting for Slovenia, they attracted the attention and interests of a greater number of transport experts during the performance of the research work, so it will be continued and completed with a detailed analysis of the status and a proposal of measures for each of the selected cities.
In the continuation the paper presents the results of the model and the measures for Ljubljana, the greatest and the most problematic Slovenian city in respect of traffic. For the rest of the cities the obtained results of simulation models will be aggregated and resumed in aggregated measures.

3.1 Cities selected for model research

The picture presents the functional importance of settlements and city centres in the *urban system of the Republic' of Slovenia with regard to the volume of their* employment and supply activities. A settlement is determined as a centre only in the case, if it has the employment and supply function at a time. The supply function of the settlements and town centres was evaluated on the basis of actively employed inhabitants in a particular economic branch. Taking into account also other criteria, such as: number of inhabitants, number of daily commuters, number of active inhabitants, who perform their jobs in the place where they live, and the number of working posts, the following cities were selected for the needs of Cost 321 : **Ljubljana, Maribor, Celje, Kranj, Novo mesto and Koper.**

1. Ljubljana

Ljubljana is the capital of Slovenia and it belongs to the central Slovenian region which encompasses several municipalities and has 517.000 inhabitants.

Ljubljana, with its municipalities, stretches over an area of over 900 km2 and has 276.000 inhabitants. Due to its convenient geographic position the city became a cultural, economic and traffic centre of the Republic of Slovenia. Ljubljana is the predominant employment centre, far above the others in Slovenia, for it is the place of work and education for more than 100.000 daily commuters. All traffic is concentrated in the direction from the region into the centre of the city.

Ljubljana is crossed by the most important inland and international transport routes. The total transport volume shows, that Ljubljana is also the main traffic generator in Slovenia.

2. Maribor

Maribor is the second republic centre, belonging to the Drava region. The region encompasses several municipalities stretching over an area of 2179 km2 and having 320.000 inhabitants.

Maribor with its area of 357 km2 and with 133.000 inhabitants is a University City. With regard to the density of traffic flows running from the region into the city, it is in the second place in Slovenia, with its more than 27.000 daily commuters.

3. Celje

The Savinja region with several municipalities, among which Celje is the central city, stretches over an area of 2380 km2 and has 256.000 inhabitants. This region presents the transitional part between the central and north-eastern Slovenia and belongs to greater Slovenian regions with respect to its area as well as its number of inhabitants.

Today Celje is the third republic centre, after Ljubljana and Maribor, and has a little less than 50.000 inhabitants and an area of 230 km2. More than 16.000 daily commuters come to Celje every day.

4. Kranj

Kranj is the fourth Slovenian centre and belongs tot the Goranjska region encompassing several municipalities with a total number of 195.000 inhabitants. The area of the region is 2135 km2.

The gravitation area of the city Kranj, the area of which is 453 km2 and which has 52.000 inhabitants, is expressively asymmetric due to the vicinity of Lubljana. **However, the competition** of Lubljana does not reach as far as it would be expected in many respects with regard to the size ratio and a short distance between both centres. Also with respect to the flow of daily commuters, i.e. 13.500 persons, Kranj is in the fourth place among the Slovenian centres.

5. Novo mesto

Novo mesto belongs to a comparatively large Dolenjska region, the central part of which is the valley of the river Krka with its centre Novo mesto. The region encompasses several municipalities; its area is 1648 km2 and has 106.000 inhabitants.

Novo mesto occupies 760 km2 and has 51.000 inhabitants. It is the centre of a wider local importance - it is an important industrial and cultural centre of Dolenjska.

6. Koper

The central city of the coastal-Karst region is Koper. The region comprises several municipalities and its total area is 1044 km2. The total number of the inhabitants in the region is 103.000.

Koper stretches over an area of 311 km2 and has 48.000 inhabitants (half of this number lives in the city centre); the city is the administration and economic centre of the Slovenian part of Istra. Recently, besides industry, handicraft and services, the city sees also a fast development of trade and tourism.

Due to the strategically important role of Koper in this part of Slovenia, its importance will still increase, especially with the establishment of long-distance, regional and local traffic.

3.2 Investigation of measures

On the basis of the list of the proposed measures of the working group A, some measures were selected for the model research and simulation. These measures were quantified from the viewpoint of traffic and environmental impacts for the selected Slovenian cities in the framework of regions.

A great volume of data and information was needed for the quantitative analysis of the selected measures; besides, primary investigations were performed also in the field. The selection of the measures for the model analysis is as follows:

- goods distribution centres
- route/tour planning
- co-ordination of intermodal transport
- regional railway network in combination with urban distribution centres
- substantial expansion of railway network
- regulation of freight traffic
- truck routes/truck networks in cities
- speed limits and external speed control
- prohibition of truck traffic through cities
- transport co-ordination and co-operation of retailers
- reservation of loading areas
- reduction of package volumes
- use of urban transport containers/local service containers
- replacing large trucks by smaller trucks or vans
- establishment of distribution centres and cooperation of transport companies with

the supply of cities
- optimisation of distribution systems, including transport centres.

3.3 Models used

The tools used for modelling of traffic flows in the framework of the project were POLYDROM and POLYTOX programme.
POLDROM is an intermodal transport modelling toolkit offering all necessary tools for :

- the analysis and calculation of supply
- the analysis and calculation of demand
- the calibration and validation of trip matrices; the calculation of noise emissions
- the calculation of emissions and immissions of atmospheric pollutants.

The POLYTOX programme enables a detailed analysis of time expansion of atmospheric pollutants depending on the weather situation and relief of the area under study. *It gives possibilities to create various situations with regard tot the* development of changes and to obtain cumulative results of these changes.

In the appraisal of the influence of the measure under study on the traffic situation, the model gives the following possibilities:
- in case that the flows are only re-distributed over the network, the characteristics of the transport network have to be modified;
- if the measure affects the volume of the flows or their structure, the origin-destination matrix has to be modified and then the effect of this change on the network can be found out.

On this basis the tools enable the presentation of results also in a graphical way, i.e. various alternatives of traffic situations on the existing or on the modified network, as well as the presentation of environmental impacts with respect to noise and exhausts.

In the framework of the project task the following measures for Ljubljana were appraised and tested on the basis of the model:

- **prohibition or restriction of traffic of delivery vehicles at a selected time**
- **prohibition or restriction of traffic of delivery vehicles in selected streets**
- **regional railway network in combination with urban distribution centres**
- **substantial expansion of the railway network**
- **replacement of large trucks by smaller trucks or vans.**

The following parameters were evaluated within the model:

- **total length of streets, in which the relative volume of the total traffic flow is above the critical value (overload, saturation of streets)**
- **covered net tonne and gross tonne kilometres in delivery traffic - impacts on the environment: noise emissions and exhausts.**

1) **Name of modelling toolkit:**

POLYDROM, POLYTOX

2) **Aim of modelling**

To find the effects of the selected measures on the loads of streets in a selected city

3) **Model approach:**

Macroscopic model for defining the load of transport network from origin-destination flow matrix

4) ***Classification of traffic calculation method***

Classical transport model for the elaboration of O-D transport matrix and assignment of the transport matrix on the network;

The assignment of the trip matrix to a network is based on the calculus of paths by minimising generalised costs between the origin zone (0) and destination zone (D).

We used the assignment by "incremental reload" which is suited to heavy loaded and congested networks, because of its capability to delete and reassign increments of first assigned steps. This method satisfies Wardrop's criterion which assumes, that no user can diminish his generalised costs by modifying his decisions.

5) **Structure of the model:**

a) Selection of zones
b) Preparation of transport network among zones

c) Preparation of data or production and consumption of goods in zones

d) Preparation of data on traffic counting
Elaboration and calibration of O-D matrix for delivery traffic

e) Assignment of goods flows from the matrix to the transport network
Result: reference load of streets

f) Modification of data on transport network or O-D matrix with regard to the selected measure
Result: load of' streets in the case of the implementation of the measure

g) Comparison of the load from Item f) with the reference load of transport network
Result: improvement or deterioration of the state in selected indices expressed in %

6) Input parameters 1 adjustments of the model

- Structure of the transport network : capacity of connections, possible transfers
- Data on prohibition of traffic of certain vehicles
- Traffic development in time per definite types of vehicles
- Available parking places
- Data on traffic counting
- Data on transports of bigger distributors in the selected area
- Position of warehouses in a definite zone.

7) Required surveys to gain the model parameters

- Statutory regulations in the city area
- Field investigations
- Statistic data and studies in the area

8) Output of the model

- O-D matrices: per transport purpose and vehicle type, times of day
- Load situation in the road network: per vehicle type, links, nodes
- Effects: kilometres covered, stay time, noise emission, air pollutant emissions, accessibility

9) Limits of the model

The limit of the model is shown in the cases of solving the problems of circular trips, when a vehicle starts and ends its trip in the same point, which can not be described directly by means of a standard O-D matrix procedure.

4 Effects

4.1 Impacts of measures

As mentioned in § 3.3 the following parameters were used for the evaluation of the effects of the measures:

total length of streets, in which the relative volume of the total traffic flow is above the critical value (overload, saturation of streets)
covered net tonne and gross tonne kilometres in delivery traffic impacts on the environment: noise emissions and exhausts.

On the basis of the models used the effects of the foreseen measures for the Ljubljana city could be evaluated, while for the other model cities partial results for individual measures have been obtained by now. On the basis of these partial results it could be found, that each individual measure has different effects in a particular city and in the entire region.

On this basis the model cities were aggregated into the following groups with regard to the similarity of effects produced by the foreseen measures:

i. Ljubljana, Novo mesto
ii. Maribor, Celje, Kranj
iii. Koper

The results of the evaluated criteria with regard to each individual measure are different for each city, however, on the basis of ranking they are typical for the particular group. In the continuation the anticipated effects of the measures are presented, which are generally valid for ail the model cities.

Measure 1: Re-routing of a part of city freight traffic to long-distance roads and other Category 1 roads

Re-routing of a part of city freight traffic to long-distance roads and other Category 1 roads shows considerable effects in relieving the city streets. Besides a faster development of the total traffic there will be also reductions of noise impacts on the city inhabitants.

Measure 2: Truck routes - truck transport network

This measure which is partly connected with the implementation of the Measure No.1 will considerably contribute to the relief of the environment and better life conditions of inhabitants in these cities, namely, by means of better organisation of transport and especially by means of shorter stay of freight vehicles in the city.

Measure 3: Reservation of loading zones

The effects of this measure are connected with the Urban and Town Plan of the Republic of Slovenia and to Decrees on particular cities. By determining the zones for loading and unloading of freight vehicles the stay of these vehicles in cities would be shortened, which would contribute to the fluidity of the traffic throughout the city.

Measure 4: Speed restriction and control

The effect of the restriction of speed of freight vehicles in cities, which is related to the measure of the re-routing of these vehicles to long-distance roads and other ? Category roads, will be the reduction of the impacts of emissions and noise on the environment.,

Measure 5: Introduction of urban and suburban containers

This measure will contribute to a total time saving due to a shorter time of freight vehicle stay in the city.

Measure 6: Prohibition of traffic through city centres

This measure which has realistic possibilities for being implemented in several Slovenian cities will restrict freight vehicle flows in city centres and in their closest vicinity. Positive effects will be shown in better traffic fluidity and with this also in saving of costs.

Measure 7: Transport co-ordination and co-operation of retailers

Agreements on co-operation of retailers can have a considerable effect on a more rational distribution of individual types of goods and on the rationalisation of manufacturers' transports to particular trade centres. This can also mean a reduction of freight traffic in the city and positive effects on the environment.

Measure 8: Technical and technological development

The expected changes in traffic which are being realised in some countries in the, technical. and technological field, such as:

- development of new light road freight vehicles
- use of alternative (electric) power systems for trucks
- improvement and introduction of communication and information systems

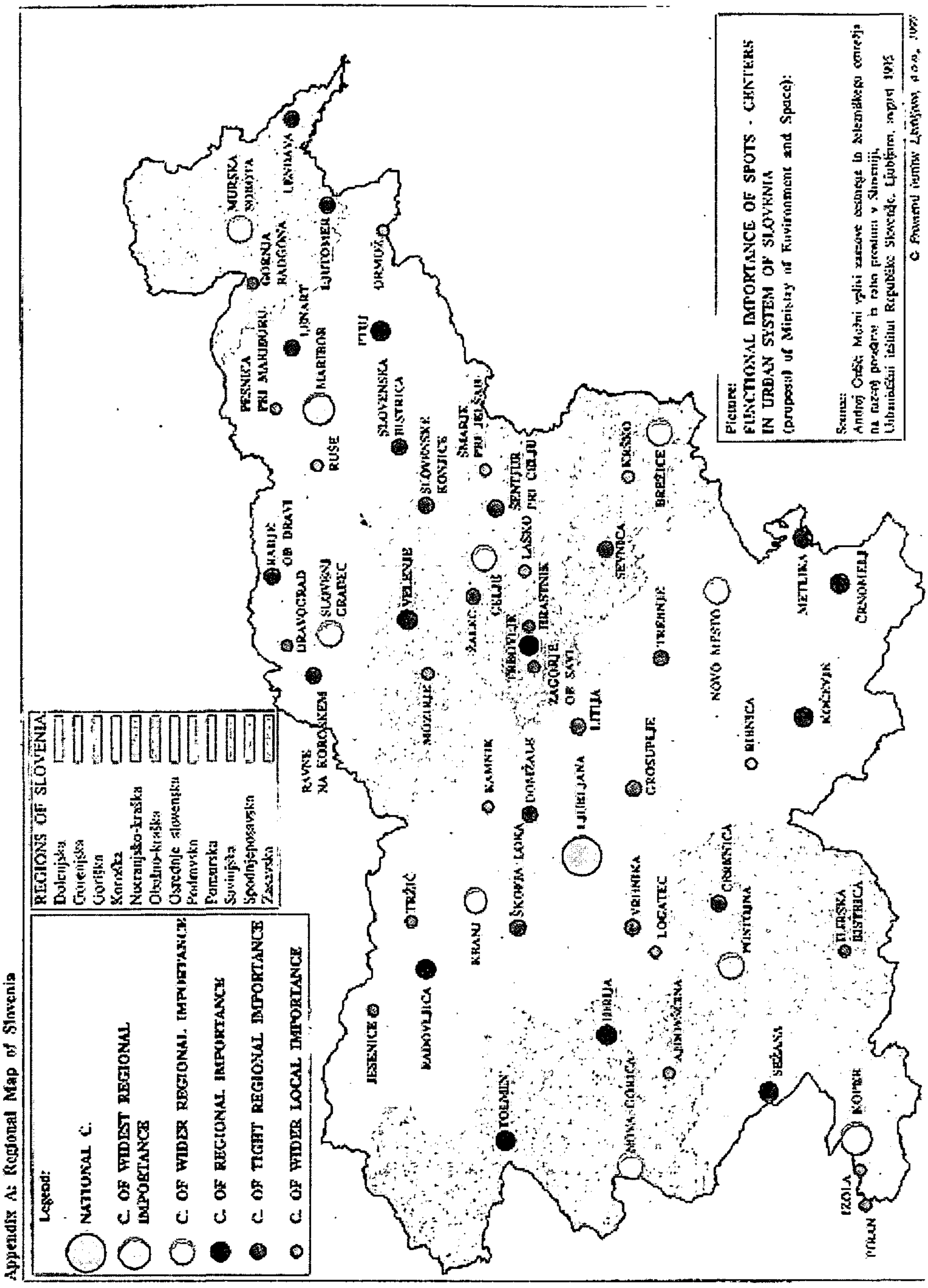
will have a great influence on the reduction of adverse impacts on the environment. All these changes are also the aim of the Slovenian transportpolicy which will be realised through the Law on the Environment Protection and the measures set for this purpose.

4.2 Conclusions

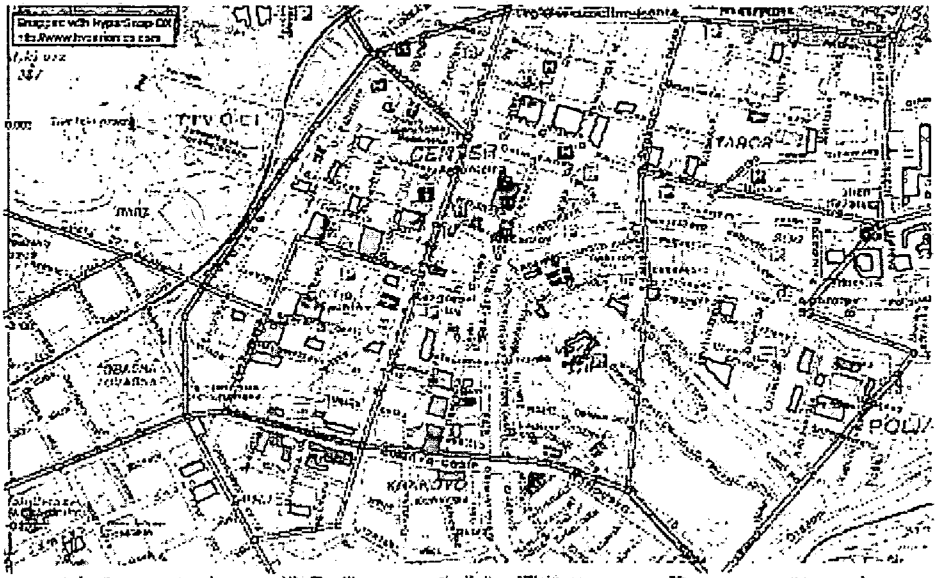
In spite of the fact, that this Report does not present all the evaluated effects for the proposed measures, it was possible to estimate on the basis of partially obtained results for all the model cities, that the realisation of these measures would be a substantial contribution to the environment protection. This is not true only for the model cities dealt with in here, but also for other Slovenian cities.

From the ecological point of view all the measures dealt with are not equally important, and they are also evaluated in a different way for particular cities. In fact, they are mutually complementary or interdependent, therefore their final effects are aggregated and reflected in the realisation of the set objective: to relieve the city of the unnecessary loads of emissions and noise caused by road freight vehicles. Last but not least this is also a contribution to better safety in urban traffic.

Appendix A : Regional map of Slovenia



Appendix B : Ljubljana model network


Snapped with HyperSnap-DX


Snapped with HyperSnap-DX

COST 321

National Report

SPAIN

Check list to characterise and describe the model cities

city characteristics	level	unit	name of the city
Settlement structure			
importance of the city for the region		Capital of the "Comunidad Autónoma de Madrid". (Spanish Capital)	*Madrid*
map of the agglomeration	agglomeration	On a scale 1:100.000	Comunidad Autónoma
number of inhabitants	city agglomeration	3.029.734 5.181.659	Madrid Comunidad Autónoma
gainfully employed individuals	city agglomeration	1.261.395 2.033.587	Madrid Comunidad Autónoma
employees	city agglomeration	903.300 1.623.200	Madrid Comunidad Autónoma
number of enterprises			
surface area (km2)	city agglomeration	605,8 8045,9	Madrid Comunidad Autónoma
settlement density (inh./km2)	city agglomeration	5001,21 644,01	Madrid Comunidad Autónoma
ratio between gainfully employed individuals and employees	city agglomeration	0,71 0,80	Madrid Comunidad Autónoma
Traffic infrastructure			
number of motor vehicles	city agglomeration - cars (light vehicles) - trucks/HGV (heavy vehicles) - traction engine - motorcycle - buses	1.725.594 2.729.669 2.232.131 316.566 7.618 140.509 8.111	Madrid Comunidad Autónoma
percentage of diesel engine per kind of vehicle	agglomeration	Trucks: 69% Buses: 98% Private cars: 14% Motorcycles: 0,20% Industrial tractors: 98% Other vehicles: 39% Total: 23%	Comunidad Autónoma

city characteristics	level	unit	name of the city
Traffic infrastructure			
number of motor vehicles present in the road network	city agglomeration	1.725.594 2.697.317	Madrid Comunidad Autónoma
number of cars per head of population (cars per 1000 inh.)	city agglomeration	570 527	Madrid Comunidad Autónoma
length of the road network (km) classified road network urban road network	city agglomeration	7.267 3.215 4.052	Madrid Comunidad Autónoma
length of the road network per number of lanes	agglomeration one-lane carriage two-lane carriage three-lane carriage four-lane carriage more than four-lane carriage city	3.188 Km 1.056 Km 1.592 Km 474 Km 66 Km unknown the number of lanes of the 4.052 kms of urban roads	Comunidad Autónoma Madrid
length of the road network per head of population (km/1000 inh.)	agglomeration	0,65	Comunidad Autónoma
integration in the highway and trunk road network			
level of urban public transport service	city agglomeration	underground, bus, train bus, train	Madrid Comunidad Autónoma
integration in the national railway network	city agglomeration	RENFE (AVE), and local train RENFE, and local train	Madrid Comunidad Autónoma

city characteristics	level	unit	name of the city
Traffic infrastructure			
location on a waterway	city agglomeration	Manzanares River Manzanares, Jarama, Guadalix, Lozoya, etc (rivers)	Madrid Comunidad Autónoma
existence of a port/harbour		NO	
existence of an airport (Madrid-Barajas)	number of passengers per year [Mio.) volume of goods traffic per year [1.000 t)	21,451 250,389	
Transport/Traffic demand structure			
total trip volume per day (without through traffic) - Volume of person trips with public transport and private traffic - cars - trucks/HGV	agglomeration (only bus public transport): (underground+Cercanías RENFE train)	1.715.616 1.475.616 4.786.848 1.764.350	Comunidad Autónoma
volume of goods traffic per year (1.000 t) - road network - railway - inland navigation - ocean navigation - aircraft	agglomeration	80.818 77.968 2.600 --------- --------- 250	Comunidad Autónoma
volume of consignements per day			

city characteristics	level	unit	name of the city
Transport/Traffic demand structure			
motor vehicle kilometres covered in the road network per day - car kilometres [car*km] - truck kilometres [HGV*km]	 city agglomeration city agglomeration	 37.963.068 59.340.974 65.047.808	 Madrid Comunidad Autónoma Comunidad Autónoma
motor vehicle dwell time in the road network per day [hours) - dwell time of cars - dwell time of HGV	city	2.109.059	Madrid
fuel consumption due to motor vehicles per day [kg/d)	city	2.180.000	Madrid
air pollutant emissions due to motor vehicles per day (Kg/d)	CO Soot/Particles Nox CH	263.407 676 80.900 36.416	Madrid
average mobility rate per day (trip rate)	agglomeration	2,39	Comunidad de Madrid
number of in-commuters per day			
number of out-commuters per day			
in-commuter/out-commuter ratio per day			

COST 321

National Report

SWEDEN

Anders Lindkvist - TFK.
Transport Research Institute.

Table of contents

1 Swedish participation in the COST321 action

Sweden joined the COST action 321 "Urban goods transport" from its start with the technical subcommittee in 1991. A work programme was then formed and approved for the activities within the management committee, established in early 1994.

During the course of the COST321 action, there has been a clear ambition in Sweden to actively participate and contribute to the common work in accordance with the decided work programme. Plans were early made to start a investigation of the goods transport patterns in one or two big cities and to develop a simulation model as an instrument for planning and analysis of measure consequences.

For several reasons the process of carrying out the different tasks were more time consuming than expected. Some pilot investigations were conducted within the scope of the COST321. They are briefly referred to in this national report. The main project including an extensive survey, the development of simulation model and using this tool for consequence started by the end of 1996 and will not render substantial results within the time-frame of the COST321 action

2 Swedish perspectives

2.1 National policies

National policies, sometimes defined and codified as multilateral agreements or as EU policies, aim at setting the limits for policy makers at regional and local levels, as well as to influence behaviour of industries and households. They could be classified as "selective" and "general". These two national policy categories are discussed for Sweden below, starting with "selective" policies.

Selective national policies on city goods transport
The national policy level has generally been reluctant to adopt dedicated policies in the area of urban goods transport. Two main arguments have been important for the choice of this line of action namely:

The fact that Swedish cities and municipalities traditionally and legally in many areas act independently from the national policy level. The field of urban goods transport is one such area of local/regional independence.

Industry and trade organisations including transport industry have generally opposed national policy interventions in the field of urban goods transport. National intervention through e.g. policies on city goods terminals, subventions and taxes have been turned down with the argument that long run efficiency is best attained by the undisturbed market processes.

Therefore there is presently no national policy "platform" on city goods transport for Sweden. The Government Commission on Transport and Communications whose task was to provide the principles and foundations for a new Swedish Communications policy, in its recently submitted final report did not propose any type of selective policies in the field of city goods transport except for government financial support for R&D for co-ordinated goods distribution.

Against the background given above, national selective policies have been concentrated to national R&D programs within the field of vehicles and alternative fuels. With government financial support tests have been carried out with city goods transport vehicles fuelled with biogas, natural gas, and alcohol. Tax exempts are also applied for alcohol and biogas fuels within the framework of the R&D-programs mentioned. However there is now also a growing interest from national research bodies to fund research on other urban goods transport topics in order to raise the level of knowledge and to develop and test measures.

General national policies with relevance for urban goods transport

The two major areas for general national policies influencing city goods transport are vehicle/fuel taxation and regulations.

As for vehicle regulations the Swedish policies have effectively converged with EU-policies (EURO 2, 3 etc). The present Swedish goods vehicle taxation has its focus on vehicle weight and axle configuration to reflect "wear and tear" properties of vehicles. For the environmental dimension vehicle regulation has been the main national policy line. However, following the work of the above mentioned Government Commission and also in line with EU directives and CTP, goods vehicle taxation is presently reconsidered by another Government Commission. The aim is to internalise in vehicle and fuel taxation the environmental dimension as far as possible within the framework of EU regulation also considering the competitive position of Swedish transport, industry and trade.

2.2 *Conditions for urban goods transport in Sweden*

Freight transports in city areas of large towns are subjected to different restrictions in Sweden. The maximum permitted length of vehicles is 12 meters in most large cities. Special transports can receive exemption. However through roads permitting full-length vehicles are normally available in order to access goods terminals and industrial areas, while hazardous goods vehicles are directed to dedicated roads.

In some very sensitive areas like the old town of Stockholm, goods distribution is only permitted with lorries having a gross weight of less than 7 Tonnes. Further night distribution is prohibited here. An extension of the night distribution restriction to other geographical areas is under discussion.

Goods distribution is only permitted within a limited time interval (typically before 11 am) on many inner-city streets.

In order to facilitate loading/unloading, many towns have established a large number of small loading zones along the street kerbstone, holding about two lorries. Stopping or parking private cars are prohibited here. When building new commercial areas in centre locations, special underground distribution tunnels are sometimes constructed. However these tunnels are not always designed to accommodate all types of distribution vehicles, which creates problems.

2.3 Urban goods transport handling at local administrations

Large and middle-size cities in Sweden normally develop a general city traffic plan and a majority also adopt an environmental policy. However goods transports are usually regarded as general traffic and therefore with exceptions for the largest towns not exclusively treated in the city administrative process. Still most cities have introduced loading zones, a special road net for hazardous goods transports and regulations for lorry distribution.

This was apparent from a questionnaire sent out to the 20 largest cities in Sweden as part of the COST 321 research programme. The purpose was to scan the present knowledge as well as on-going and planned activities concerning urban goods transports as a basis for focusing the problems and judging suitable strategy for the implementation and evaluation of different measures.

In the three largest urban areas in Sweden the debate concerning goods transport is more active than in smaller cities. The small ones are watching what is happening in the large areas and might follow their steps after a while. This is especially the case concerning environmental zones. A law change in 1992 made it possible to introduce such zones, where other than low-emission heavy diesel-powered vehicles are prohibited. All the three largest cities have decided to establish environmental zones in 1996, and more cities plan to follow.

Only the two largest cities claim to be in possession of recent statistics and investigations with regard to goods transports. However the knowledge concerning actual goods flows is almost blank since goods O-D investigations have not been carried out. Obviously there is a need for further studies and enquiries in many respects.

The ranking of goods transport related problems was not homogenous. In general, vehicles parked against the regulations cause the worst problems. However many cities ranked environmental problems first. Other problems stressed by the administrators are poor traffic performance and distribution vehicles hindering public transport while e.g. badly utilised loading capacity on the trucks is not considered to be of the same dignity. The ranking is shown in the table below.

Rank	Problem to administration	Dignity of ranking
1	Cars violating parking rules	2.7
2	Poor traffic performance	3
3	Lorries hindering Public Transport	3.4
4	Other obstacles to goods distribution	3.6
5	Lorry emissions	3.8
6	Noise from lorries	4.5
7	Lorries blocking roadways	4.6
8	General public negativee attitude	5
9	Badly utilised lorry capacity	5

In conclusion the survey demonstrated that urban goods transports is a low priority issue by the administrations especially in middle size and small cities. There is a lack of knowledge and statistics. However problems related to goods distribution is a growing concern which calls for measures not only in large metropolitan areas. Many cities introduce environmental policies with explicit objectives. However, without proper statistics and instruments to measure changed distribution patterns there will obviously be problems to follow up the outcome and plan for further steps.

3 Model cities

3.1 Stockholm

Stockholm is a model city for the development of a new simulation and analyses model regarding goods distribution. An extensive data collection is performed in the region in conjunction with this development.

Stockholm - a dynamic city

Stockholm is beautifully located on the east coast of Sweden surrounded by an numerous archipelago. The central area is built on 14 islands, linked together by some 50 bridges.

Stockholm is a dynamic city. The greater metropolitan Stockholm area has 1.5 Million inhabitants. It is the administrative centre of Sweden with important commercial, trade, cultural and industry activities. It also serves as the major transition point for all kinds of transport modes of goods and passengers.

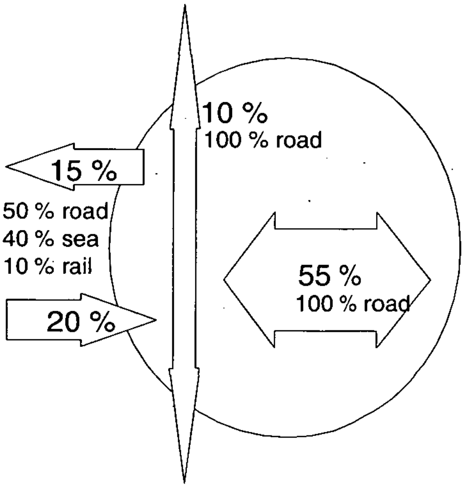
The main road net in the Stockholm county consists of 3000 km road, whereof 10% are motorways or similar. There is only one complete north-south motorway link passing the city of Stockholm (Essingeleden). The major part of this link was opened in the sixties with the aim of relieving the inner city streets from through traffic. From the eastern municipalities including the important harbour of Stockholm there are no complete high-capacity connection to the superior motorway network, why through traffic from these areas must use the city streets. This problem has been on the agenda for long. A new road net will hopefully soon become reality.

Lorries

There are about 55 000 lorries registered in the Stockholm County. The yearly growth is about 2%. Although modern lorries are becoming gradually cleaner, they are far less environmental friendly than passenger cars. With the current vehicle park, the heavy diesel lorries account for half the amount of the NOx-emissions coming from the road traffic. One way of dealing with this problem is *environmental zones* (see below).

Goods transports characteristics in Stockholm

Goods transports in Stockholm is dominated by "internal" trips with origin and destination points located within the region. Of all transported tonnage comprising 37 Million tonnes, 55% is internal, 10% passing through and 35% coming in/going out. See illustration below.

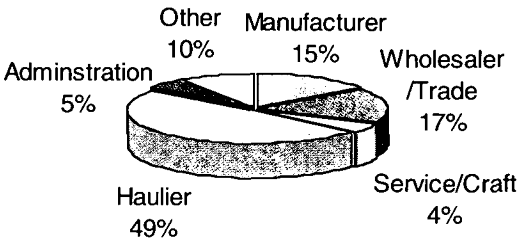


General commodities and food are the most common kinds of goods in tonnage entering and leaving the region, while internal goods transports are dominated be bulk products for building activities (45%). However bulk transports are usually performed by large trucks in short distance missions why wholesale trade, food and service activities generate a majority of the goods traffic load. Out of the whole traffic load on the road net in the region comprising 11 thousand Million vehicle km per year, some 10% is produced by lorries.

Due to the dense traffic in the city area, the availability to parking spaces has gradually decreased. One consequence is a higher degree of illegal parking. The situation affects all traffic but especially the 25000 goods distribution vehicles making 140000 delivery stops per day. This is serious since the lorries are responsible for much air pollution and a major part of the noise. Many streets in the inner city of Stockholm have noise levels far above the national guidelines.

Operator views on the goods distribution contributions in Stockholm

The major truck owners in the Stockholm region were asked about problems and views within the COST321 action. The respondents represented the following type of operators:



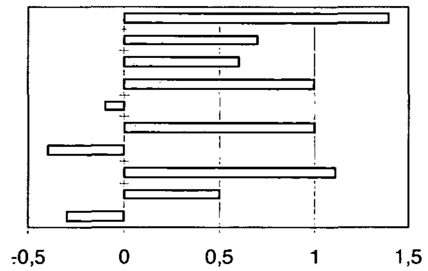
Experienced major traffic problems

Dense traffic	reported by 62 % causing a delay of 42 minutes per day
Unexpected obstructions	reported by 11 % causing a delay of 28 minutes per day
Wrongly parked cars	reported by 43 % causing a delay of 19 minutes per day
Blocked loading zones	reported by 19 % causing a delay of 28 minutes per day
Other	reported by 4 %

Judgement of possible measures

The operators were asked about their opinion to different measures within a scale from very negative (-2) to very positive (+2).

Organisational/competence development
Advanced telecommunications
Secure delivery vaults, electronically locked
Prolonged opening hours for goods delivery
Co-ordinated distribution
More city terminals
Road pricing within city and on ring road
Dedicated streets and passages for lorries
Further regulations concerning distribution
Environmental zones incl. strict emission rules



3.2 Gothenburg

Gothenburg is a model city for practical trials with co-ordinated transports. It is the second largest city in Sweden and a very important site for manufacturing, trading and shipping. The number of inhabitants in the region amounts to 750.000.

The most important trunk roads are the north-south oriented E6 passing the city and the eastbound main arterial E20 towards Stockholm. The four connections over the river Göta Älv together with the half circle ring road are also very important parts of the transport system.

4 Measures and effects

4.1 Measures already introduced in Sweden

4.1.1 Environmental Zones

In 1994 the three largest cities in Sweden (Stockholm, Gothenburg and Malmö) took the decision to introduce Environmental Zones in the city centre areas. The decisions is effective from April 1996.

An Environmental Zone is defined as an area sensitive to traffic pollution with special restrictions regarding emissions from diesel-powered busses and trucks. Three environmental classes for heavy vehicles (with a total weight over 3.5 tonnes) form the basis for the restrictions. These fully comply with the national and EU-regulations on emissions for new produced vehicles.

Vehicles not more than eight years old may operate in the zone as a general exception. The restrictions also permit up to 12 years old vehicles to use the restricted area during a transition period, provided they have extra mounted cleaning device meeting the regulations.

Calculated effects from Environmental Zones

The effects in the Stockholm region has been assessed. For the introduction year, 1996, 60% of the heavy vehicles comply with the regulations and the rest need to be either replaced by new vehicles or have an extra cleaning device mounted. In 1999 when the regulations are more strict and also include considerable noise limits according to the Euro 2 rules, the figures are turned around. 40% comply with the more strict regulations and for the rest there is a need to make special arrangements.

The calculated average gains with regard to the reductions in emissions during the period 1996-2001 are summarised in the table below:

	Heavy vehicles	All traffic	Total gain (tonnage) (within and outside the zone)
Particles	50 %	30 %	70 tonnes/year
Hydrocarbon	20 %	1 %	60 tonnes/year
Nitric Oxides	10 %	4 %	80 tonnes/year

The total extra costs for the transport operators in the Stockholm region due to the environmental zone is estimated at 1-3 % for the period 1996-2001.

4.2 Measures in trial

4.2.1 Coordinated city distribution in Gothenburg

In late 1996 a project including practical tests with coordinated distribution of everyday commodities started in Gothenburg. The aim of the project is to reduce the number of vehicles required for delivery based on the concept that a number of suppliers jointly contract a forwarding company to deliver goods to the right consignee at the right time. The shop managers are not directly involved but will be effected by the distribution change.

The motives to participate are for the suppliers and the forwarding companies mainly economical, for the local authority to reduce exhaust emissions, noise and crowding and for research purposes to get a better platform for developing methods and further measures.

The site

The test area is an inner-city area called Linnéstaden. It is a fairly old part of Gothenburg, containing both residents and commercial activities. There are about 65000 inhabitants in the area. It includes 40 shops (food and grocery) which are supplied by about 80 different suppliers.

Assessment

The trial has had a slow start due to difficulties in bringing together suppliers and other actors. Today six suppliers cooperate with one forwarder. With the results of the evaluation work, which is expected to be finalised by late 1997, it will possible to:

- identify the effects on the transport work, the energy consumption, the air pollution and the costs.
- assess the potential for enhancing the efficiency of inner-city distribution in terms of reduced traffic
- simulate various logistic alternatives.

The trial will also shed light on the tools the local authorities have at their disposal for planning a cleaner inner-city environment.

5 Simulation model

5.1 Objectives of the Swedish model project

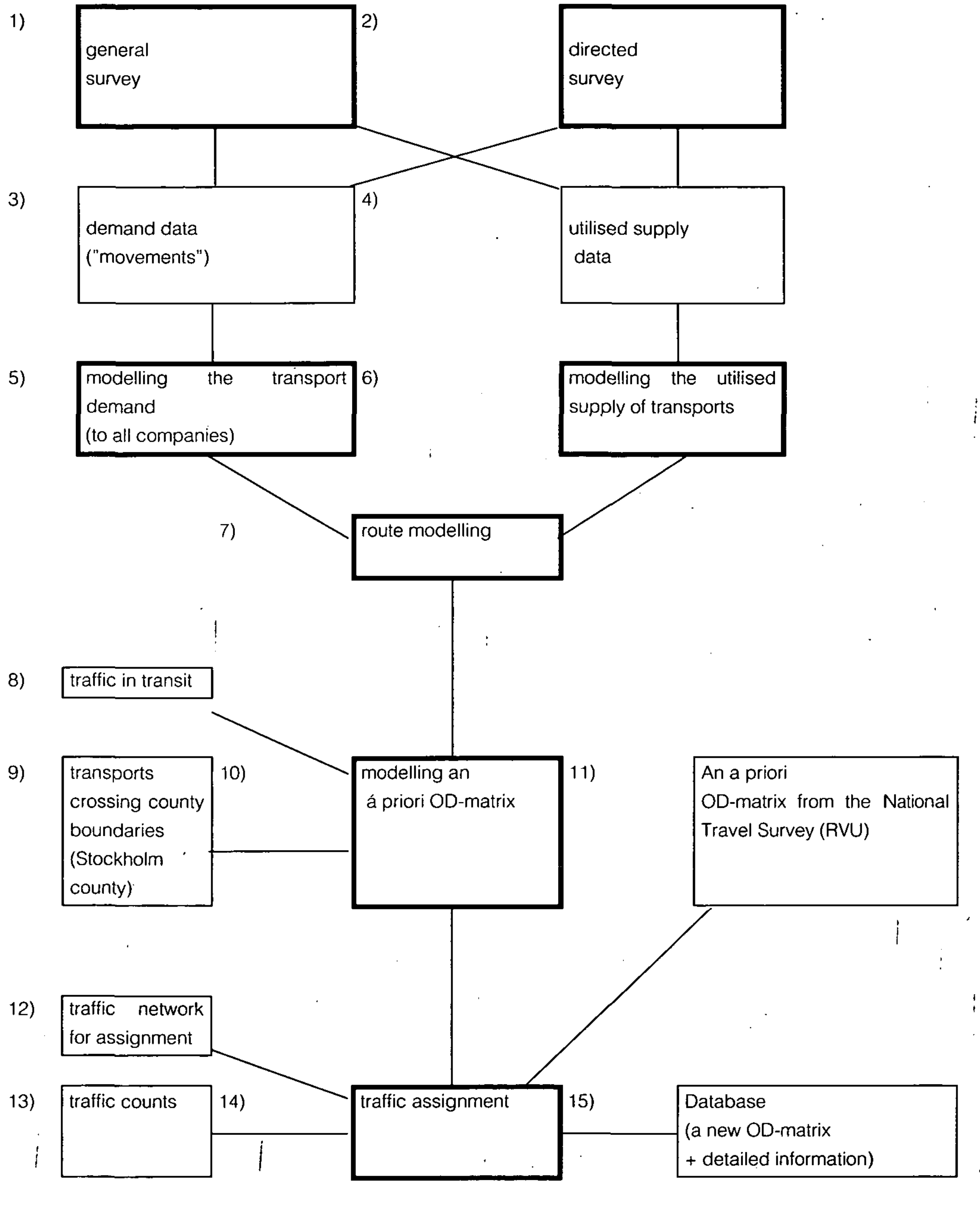
The knowledge of the regional trade and industry transports has for long been unsatisfactory. Hence the authorities in the Stockholm Region together with national bodies involved with traffic in 1995 jointly decided to conduct an in-depth survey of trade and industry transports and to develop a simulation model for the purpose of forecasting the demand for trade and industry transport and its distribution as well as analysing effects of the economical development, the use of different economical control instruments and changes in the logistics solutions and in the infrastructure. The possibilities of simulating measures identified within the COST321 action have influenced the specifications of the model. The work started late 1996.

The proposed model system and its construction can be subdivided into four basic components:

- Construction of sub models and data collection, which should give a description of how the present transport system within the region works.
- These models will be supported by other collected data for the calibration of the sum of the sub models.
- A database will be established together with methods for the calculation of data to get a complete data set at the transport system level (i.e., a breakdown of the calibrated model data to get consistent data at a sub model level).
- A model system for the analyses. The system will be usable for analyses of the present transport system, consequence analyses and forecasting.

A process chart of the conceptual model is shown in the figure below.

5.2 Conceptual model



Explanations to the figure

The target population is transports carried out in the county of Stockholm.

1. The general survey. In this survey the sample is stratified into very large, large, medium size and small companies (the size of a company is measured in terms of expected transport volumes). For *all* very large companies and for a subset of the large companies specifically designed surveys will be made. For the remaining companies, except the small ones, enquiries will be sent out to a randomly chosen sample. Simple enquiries and telephone interviews will be made among the small companies.
2. The directed survey. This survey deals with transports of a special character, in which demand and transport patterns are not modelled in the same manner as those concerned with in the general survey. Examples are the police vehicle movements and taxi.
3. Demand data. The transports surveyed from/to each company constitute a measure on the transport volumes for these companies.
4. Utilised supply data. This part describes how the demand has been satisfied, that is descriptions of the used routes (multi-delivery routes and return trips (with/without return loads)).
5. Modelling the transport demand. Regression models with explaining variables such as branch belonging, number of employees and total sales/employee will be used. Exogenous variables (for changes over time) are product portfolio, product development and developments of the logistics function. The purpose with the models is to model in-going and out-going transports for all companies.
6. Modelling the utilised supply of transports. This is modelled using for example branch belonging and number of company owned lorries/cars as explanatory variables. Output from the models are destination area size and type, but also the number of stops for delivering/loading for all routes.
7. Route modelling. With a geographic description of the delivery/loading-points along the routes (5) and a characterisation of the routes (6) we model all routes.
8. Traffic in transit. For traffic in transit within Sweden UVAV (national transport survey of truck transports) can be used for trucks registered in Sweden. The traffic in transit concerned are the transports to Finland and trucks registered outside Sweden driving to the areas north of Stockholm. Harbour statistics or recent surveys carried out will be used for the transport from/to Finland. Data on the traffic in transit are needed when adjusting the OD-matrices based on the traffic counts.

9. *Transports crossing county boundaries. Since either the origin- or destination* area is within the county of Stockholm, the surveys from (1) and (2) constitutes a start basis. A good complementary survey is UVAV. Dedicated surveys can possibly be made to achieve a higher accuracy.
10. Modelling an á priori OD-matrix. Given the geographic areas of the Stockholm county, we can disaggregate the routes into a number of OD-relations. To cope also with the transports crossing the county boundaries, the areas outside of Stockholm county are aggregated into a few large areas.
11. An á priori OD-matrix from the National Travel Survey (RVU). All transports use the same road network. This implies that beside the trade and industry transports also all other transports must be included when calibrating with respect to the traffic counts.
12. Traffic network for assignment. This includes to/from nodes and their co-ordinates for all directed links. Associated link attributes are lengths, volume-delay functions, number of lanes etc. Infrastructure changes are considered as exogenous network change variables.
13. Traffic counts. Various traffic counts have been carried out during a number of years. Older ones may be useful because they are so many and in particular they are useful when assigning traffic onto less congested links. Newer traffic counts made on the major links can be utilised in determining the level of the transports in Stockholm. Traffic counts must be used with great care since changes in road infrastructure and transport demand may have occurred.
14. Traffic assignment. A split of the á priori OD-matrix into one *fixed* part (with very reliable data obtained from (1) and (2) but possibly also from (11)), and into one *variable* part (mainly modelled data from (5) and (6) and less reliable data from (11)) is made. The reason is that we must not lose any information. After this partition the calibrations are made with respect to the traffic counts.
15. Database. The database will contain the estimated OD-matrix subdivided into its separate parts, but also data obtained from the steps (1) - (14). The modelled OD-routes from (14), originally from (7) and later disaggregated into sets of OD-relations in step (10), are subsequently put together into complete routes. Based on this result we obtain the vehicle usage.

5.3 Current status

By mid '97 a number of pilot surveys have been carried out. In parallel work has continued with the model construction. The first main survey will take place during the autumn 1997 followed by the second main survey next spring. The whole project will be concluded after summer in 1998.

ANNEX

Characteristics of the model cities

City characteristics	Level	Unit	Stockholm
Urban Structure			
Regional importance of the city			Swedish capital and the largest city in Sweden. Important administrative and trade centre.
Map of the agglomeration			-
Number of inhabitants	City Agglomeration		660 000 1 500 000
Employment	Agglomeration		
Surface area	City Agglomeration	km^2	186 3 462
Settlement density	City Agglomeration	Inh/km^2	3550 435
Number of firms (establishments of different localisations)	Agglomeration	one or more employee	61 000
Traffic Infrastructure			
Number of motor vehicles	cars (< 3.5 tonnes) Trucks/HGV		600 000 56 000
Percentage of diesel engines per vehicle type	cars (< 3.5 tonnes) Trucks/HGV	%	3 36
Number of motor vehicles present on the road network			?
Number of cars per head of population		cars per 1000 inhabitants	361
Length of road network (agglomeration)	classified roads urban roads	km km	2 990 11 150
Length of road network per head of population (agglom.)	classified roads urban roads	km per 1000 inhabitants	2.0 3.3
Integration in the highway and trunk road network			E4, E18, E20
Level of urban public transport service			Bus, Metro, commuter train (High service level)
Integration in the national railway network			Commuter train, close metro/bus connection
Location on a waterway			The Baltic sea
Existence of a port/harbour			Yes
Existence of an airport	Arlanda int´nal Airport Bromma Airport	mio pass/a 1 000 t goods/a mio pass/a 1 000 t goods/a	13.9 145 0.8 -

City characteristics	Level	Unit	Stockholm
Transport/ Traffic demand structure			
Total trip volume per day (without through traffic)	public trpt and cars	number	900 000
	cars		1 730 000
	trucks / HGV		
Volume of goods traffic/year	road network	1000 t/a	42 000
	railway		
	inland navigation		1500
	ocean navigation		2500
	aircraft		145
Volume of consignments/day			
Motor vehicle kilometres covered in the road network per day	cars	freq * km/day	
	trucks / HGV		
Motor vehicle dwell time/day			
Fuel consumption due to motor vehicles per day			
Air pollutant emissions due to motor vehicles per day			
Average mobility rate per day		trip/day	3.2
Number of in-commuters/day			
Number of out-commuters/day			
In-commuter / out-commuter ratio per day			

COST 321

National Report

SWITZERLAND

E. Basler & Partner, Zürich
W. Dietrich, Tiefbauamt Zürich (Traffic Planning)

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I. The Swiss context of the COST-Action 321

When the COST-Action 321 began in 1994, there were in Switzerland already several legal measures and programmes in application, designed to facilitate, at various levels, the development of goods transport in a more environmentally acceptable way. First should be noted the legislation for Environmental Protection and Regional Planning. The Confederation requires in the framework of this legislation that the Cantons establish an action programme for the reduction of impacts upon the environment. The principal feature of this programme is the Cantonal Air Quality Programme. This contains a series of measures which are designed to reduce the various harmful components which affect air quality.

In the framework of the cantonwide Air Protection Programmes, goods transportation has been identified as a significant and in future increasingly important source of air pollution. However, also in the Noise Reduction Programmes, goods transportation is listed among the relevant causes of this nuisance. Furthermore, goods traffic, and especially road goods traffic, always features in aspects of public financing. For example, the costs for noise insulation, accidents, congestion, and maintenance and new construction of infrastructure, as a rule not met by those causing them, but paid, independently of their causes, with public funds. Such social or external costs are, in the case of road goods traffic, according to the results of several generally consistent studies, comparatively very high. In addition, in the freight transportation market, a fierce competition leads to low load factors and a sub-optimal traffic volume (see chapter 5, ref. 1).

Freight transportation is a matter of concern at all three political levels in Swiss affairs. **The Federal government** is charged with foreign policy issues arising in the European negotiations about transportation, and internally with the implementation of the measures required by the Alpine Initiative, to encourage rail traffic and environmental protection, introducing them within the laid down period.

The Cantons are responsible for the application of the legislation on Environmental Protection and on Land Use Planning. Measures which feature prominently are the air quality protection programme, with its measures for freight transportation, (e.g. the optimisation of traffic around construction projects, including diversion to rail, the encouragement of private rail siding connections in industrial areas, and rail freight stations).

The cities are concerned with transportation of goods as an aspect of traffic and access planning. More recently in Guideline Plans and in City Development Plans there have been statements relating specifically to road transport of goods. In a few towns, as in Z9rich, the City administration has adopted a formal goods transport policy. In addition, the cities are generally pursuing measures to reduce their own far from negligible service vehicle fleets.

The COST 321 Action , together with the Energy 2000, and the National Research Fund Programme No. 41 Traffic and Environment, make up the three most important Swiss research and development programmes for the transport of goods.

1.1 Programme DIANE 6 Energy-saving and ecologically beneficial Goods Transport

DIANE 6 is part of the Swiss energy saving research and testing programme "Energy 2000". DIANE means: "Durchbruch innovativer Anwendungen neuer Energietechniken" (Break-through with innovative applications of new, energy-saving technologies). The DIANE 6 programme is required to implement and promote pilot and demonstration projects, in the field of goods transportation (See Annex, Illustration 3: DIANE 6 - network of the pilot projects).

The main projects within the network are:

- City Logistic project Basel (in operation since 1995) City Logistic project Zurich (1994-95)
- City Logistic project Berne (finalisation phase)
- Coordinated regional supply and distribution project in the canton of Tessin (in operation)
- Intermodal freight transport for mountain valleys in the canton of Graubünden (finalisation)
- Horizontal transhipment between rail and road in Zurich (prototype construction of equipment to be available and operational at the end of 1997)
- Intermodal freight transport by rail and road in the Swiss central plain (intended to start in 1997/98)

Some of these are included in the list of measures of COST 321. The **pilot projects of DIANE** 6 are basically independent of COST 321. However, some towns are involved in both the DIANE 6 and the COST 321 programmes, and co-ordinate their activities.

This is particularly true for the city of Berne, where, as part of COST 321, goods transport in the city is under investigation. The expected results will also be useful for the preparation of the City Logistic pilot project of that city, within the DIANE 6 programme. The two COST cities Basel and Zurich are also engaged in DIANE 6 activities.

1.2 The national research fund programme 41, transport and environment – interactions between Switzerland and Europe

This national research programme is intended to become a think-tank for sustainable transport policy. For an integrated, sustainable global transport policy in the future, further essential information is required, which must be supplied by research. Contributions are expected from all relevant disciplines towards the efficient and sustainable satisfaction of transport needs, according to four main, politically established goals. First of these is the protection of human health and the natural bases of human life. Second is the conservation of the social achievements of mobility. Third comes an economical use of public funds, while fourth is the co-ordination with European transport policy.

Elements of a transport policy which is focused on these aims are either already being realised, or are being prepared: Reform of the Swiss Railways, funding of major projects for public transport, completion of the Swiss motorway system, performance-related road freight taxation, implementation of the Alpine Initiative, bilateral negotiations, a Carbon Dioxide law, the guidelines to Swiss area planning, etc. This means that many very important decisions have to been taken almost simultaneously.

1.3 The COST Action 321

The COST Action 321 is being supported by the Federal government and by six representative cities. The partners, in this case the Confederation and the cities concerned, each carry half the costs of financing of the project. In the framework of the Action, four research projects have been pursued. The management and co-ordination of the research programme has been in the hands of a Working Group with representatives of the cities and of the Federal Transport Department. The Working Group is chaired by the National Delegate for COST 321.

In a first phase the problem situations in the cities were identified. This first review was subsequently compared with the questionnaire of the Memorandum of Understanding of the COST 321 Action. Finally, four projects were defined, which address questions arising from the viewpoint of Swiss cities, and which propose suitable approaches for treating them further. In content, these four projects correspond each to different questioning areas of the Memorandum of Understanding (see Chapter 3).

2. Urban development plans, including Goods transport

The Swiss urban network extends in full from Geneva in the south-west to St. Gallen in the north-east (See Annex, Illustration 1: Economically active persons by industry or dominant sector, 1990).

The biggest towns are the cities of: Zurich, with approx. 360.000 inhabitants, Basel (180.000), Berne (130.000), Geneva (180.000) and Lausanne (120.000). Lucerne has approx. 60.000 inhabitants.

Though these are relatively small compared with large cities in other European countries, the population density in the Swiss central plain is high, resulting in its often being referred to as "the town of Switzerland", or as the "Mittelland (central plain)-Town". The consequence is that, with regard to goods transport in urban areas, we have to take into account this whole network of Swiss cities **and towns when planning** goods transportation.

Furthermore, when conducting research into, and planning for, goods transportation, we have to be aware of the Swiss political system which accords considerable decision making independence to each canton.

Therefore, little exchange exists between cities and the Swiss government. However, things are going to change and COST 321 is one example of cooperation between the Swiss Federation and selected cities (See Annex, Illustration 2: COST 321 in Switzerland).

The six cities shown in this illustration are all taking part in the Swiss group of COST 321: Basel, Berne, Geneva, Lausanne, Lucerne and Zurich. Each of these bigger Swiss cities has its own, quite specific character, is particularly located and has a functional speciality in the Swiss urban network:

- Basel: chemical and transportation industry.
- Berne: government sector.
- Geneva: international organisations and services sector.
- Lausanne: services sector and centre of the surrounding vineyards.
- Lucerne: centre of the tourist industry and of culture.
- Zurich: economic capital, important in banking and insurance sector, services for industrial production, inter-regional road carriers .

It follows that these Swiss COST cities also differ substantially concerning demand for goods traffic. Such details must be taken in account when dealing with projects for analysing, optimising and planning goods transport systems.

From the transport system, in the transportation of goods, there arise the negative influences already mentioned earlier, affecting business, population and the environment itself. As a direct result of goods traffic in the densely built up urban areas being carried to over 90% by road vehicles, there is a need for measures in the sectors of local collection and delivery of goods. These measures relate mostly to specific districts and quarters, and are designed to reflect the **individual characteristics of each city** (see chapter 5, ref. 2).

With a Concept for goods transportation, measures can be co-ordinated. Urban goods transportation concepts may be understood as an extension of preordained planning dispositions. They complement the national rail and road transport networks, make an active contribution to Cantonal development of infrastructure for goods transportation, and facilitate the improvement of economic efficiency.

This explains why, increasingly, goods transportation is regarded as an integral part of urban development. Various focal points of political interest such as trade and business policy, transport, environmental and infrastructure policy, are now directing their attention to collection and distribution services which are compatible with urban values. In the cities described, alongside their passenger transport services, goods transportation is increasingly being discovered to be of local political interest. In the guideline plans of Zurich and Bern, for example, goods traffic by road is now also taken into account. This explains also why these cities have a particular interest in the COST topic of assessment of the effectiveness of measures introduced.

3. Research topics

3.1 Project 1: Structure of goods transport in Swiss conurbations and economic centres

Bruno Albrecht, dipl. Ing. ETH/ SVI, Albrecht & Partner

The terms of reference ask for analysis of the structure of goods traffic in the Swiss conurbations and economic centres, based on GTS 93. The project identfies characteristic data for comparing urban goods transport and traffic between the participating cities, i.e. urban agglomerations (s. chapter 4, ref. 4). There will be supplementary data concerning pick-up's, commercial and own account haulage, empty vehicle kilometrages

3.2 Project 2 - Freight Transport in the Lausanne Metropolitan Area

Philippe BLANC, & Sylvain GUILLAUME-GENTIL, ing. dipl. EPFL (Swiss Federal Institute of Technology, Lausanne), TRANSITEC Ing. Cons. SA, CH-Lausanne.

André ROBERT-GRANDPIERRE, ing. dipl. EPFZ (Swiss Federal Institute of Technology, Zurich), ***ROBERT-GRANDPIERRE+RAPP*** Ing. Cons. SA, CH-Lausanne

For several decades the transportation of persons has been the subject of numerous studies, surveys and research. They have led to the implementation of major projects which incorporate all modes of passenger transportation. To date, the area of freight transport, however, has been largely ignored.

The ramifications and impact of freight traffic in general and freight road traffic in particular on an urban area's overall transport setup may be broken down in three main categories:

- traffic,
- economy,
- environment.

In essence, this study aimed to explore the complex and largely ignored area of freight transport on the basis of available data and succinct investigation (see chapter 4, ref. 5). Our pragmatic and original approach allowed us to:

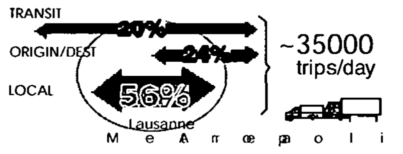
- reveal the principal characteristics of the various transport providers;
- evaluate the major trends from a demand perspective;

- draw the main conclusions in terms of current distribution systems and how they have evolved;
- outline a course of action to improve the efficiency and integration of the freight transport system in the Lausanne Metropolitan Area.

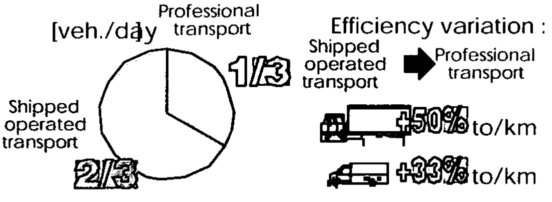
The main findings

Our study of available data allowed us to examine the following :

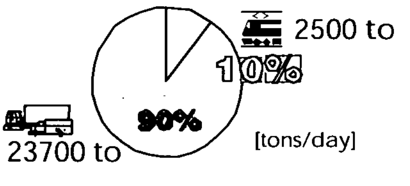
- Current status and evolution of the number of utility vehicles on the road today : 78% vans, 22% trucks. Vans saw their numbers multiply by more than 2 in less than twenty years.
- Traffic structure: very regional since more than 60% of all movements occur within the Lausanne Metropolitan Area.



- Vehicle load: even though vans account for 78% of all utility vehicles, they only haul 21% of the area's tonnage. Any course of action is further complicated by the fact that the categories of freight vary enormously.
- Transport service providers: shipper-operated transport or professional freight transport. It is interesting to note that shipper-operated transport (which accounts for 2/3 of freight transport) is also dramatically less efficient (30- 50% tons/km less).



- Modal split : only 10% of the Lausanne Metropolitan Area's tonnage is transported by rail. This number continues to drop.



Major conclusions and proposed course of action

- Despite - or perhaps thanks to - the quantity and wealth of our findings (which may prove to be most valuable for other studies), it is obvious that we have found urban freight transport to be complex and very diverse.
- A comparison between freight transport and passenger transport in terms of course of action (vehicle-to-vehicle transfer, restricted access, etc.) is not realistic.
- Today's economic demands are not always conducive to rationalization and lead to transport dispersion. If the objective is to consolidate the transport of freight, any course of action is to encourage the shift to professional freight transport, cooperation between truck operators, etc. In this perspective, the removal of the 28-ton limit is also desirable in conjunction with measures for long-distance haulage (see next item).
- It is imperative to take into account the external costs of land transport (through a per-kilometer user fee, for example) to allow rail to compete favorably on medium and long-distance hauls.
- On the local level, rail is not expected to play an important role (any longer). However, improved interfaces (for the transfer of containers, for example) need to be developed in the Lausanne Metropolitan Area.

The local authorities have little latitude when it comes to a course of action. The couple of promising measures derive above all from "natural" market forces and the responsibilities of federal and European authorities.

3.3 Project 3: Survey of Goods Transport in the City of Berne

Klaus Dörnenburg, dipl. Bauing. ETH/SVI, Raumplaner ETH NDS, SIGMAPLAN

Peter Blättler, dipl. Bauing. ETH, SIGMAPLAN

The aim of the survey in the medieval centre of Berne was to provide detailed information about the goods transport (s. chapter 4, ref. 6). The survey consisted of two separate parts: the observation of the vehicles driving into the survey area and the following questioning of a random sample of the vehicle owners about the transported goods and the route of the vehicle. The results show that 88 % of the vehicles transporting goods are vans, which carry 58 % of the in- and outgoing goods (Fig. 1).

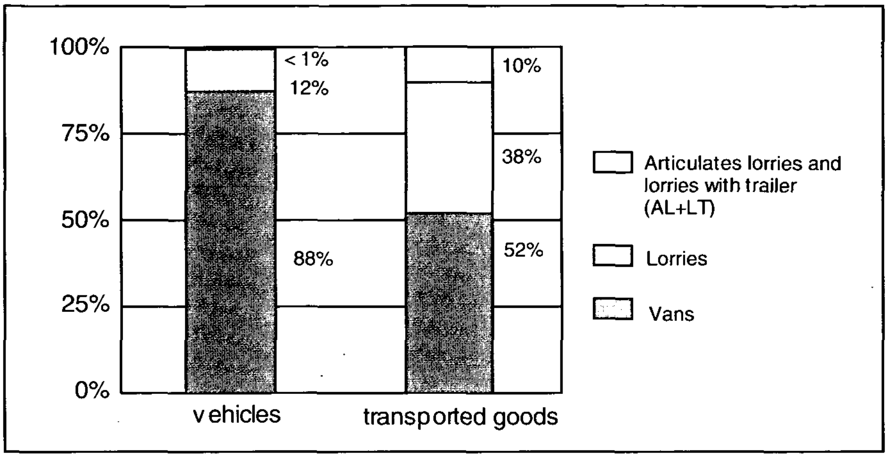


Fig. 1: Distribution of the vehicles and the transported goods

30 % of the vehicles deliver their whole loading inside the survey area. The characteristics of the tours of the vehicles are shown in the Fig. 2.

Number of vehicles					Delivery stops in:			
Total		Vans	Lorries	AL + LT	Higher old town	Lower old town	Other parts of Berne	Outside the city of Berne
2519	30 %	2268	202	49	O			
447	5 %	390	55	2	O	O		
588	7 %	527	47	14				
232	3 %	203	29	0				
861	10 %	730	131	0				
146	2 %	95	51	0				
699	8 %	589	104	6				
2307	27 %	2030	269	8				
684	8 %	596	88	0	Other			
8482	100 %	7428	976	79				

: at least one stop

Fig. 2: Characteristics of the tours of the vehicles

The average number of delivery stops inside the city of Berne is 5.1. Considering the whole route including the stops outside the survey area, it is more than 20 stops per vehicle.

The delivered goods belong to the following categories:

Fresh products	30 %
Beverages	13 %
Refrigerated goods	7 %
Other Foodstuff	6 %
Books, Newspaper, Stationery	8 %
Household articles	8 %
Furniture and furnishing	4 %
Building materials	6 %
Other goods	18 %

Foodstuff (including beverages) makes more than half of the delivered goods (56 %). Based on the results of the survey, the city of Berne will decide, if and how they will support the implementation of a project of city-logistics for goods. Beside this, the authorities will consider the shortening of the already existing time windows for deliveries.

3.4 Project 4: Vehicles park — the effects from future transformation in urban areas

Martin Ruesch, dipl. Ing. ETH/SIA/SVI, RAPP AG INGENIEURE + PLANER
Patrick Ruggli, dipl. Ing. ETH/SVI, ERNST BASLER + PARTNER AG

The assessment of the measure "urban lorry" is part of the project 4 "Assessing of the effectiveness of goods transportation measures suitable for cities“ (Prüfung der Wirksamkeit von stadtverträglichen Massnahmen im Güterverkehr - s. chapter 4, ref. 7).

Collection and distribution traffic in cities suffers from low transportation efficiency and poor environmental quality, due primarily to the high proportion of company traffic and the low ratio of useful load to vehicle weight. The current Swiss legal framework (night and Sunday driving prohibitions, driving licence regulations and permitted driving and rest times) favours the use of delivery vans (< 3.5 t) over lorries (> 3.5 t) so that in many cases vehicles operate with excessively low useful loads. This situation, which is unsatisfactory on both ecological and economic counts, can be improved by the introduction of specially designed urban lorries.

Basic type	Drive	Useful load optimisation	Transhipment
Delivery van < 3.5 t (loose packages)	Hybrid drive *(electric/diesel)*	Increase of useful load to a total weight of 5 to 6 t (Increase of vehicle weight by 10%)	Direct access from driver's cabin to stowing area, lowered loading area and access height (small tyres, slanting engine, lowered chassis)
Lorry > 3.5 t (paletted goods)	Natural gas drive	*negligible* (low improvement potential from lightweight construction)	*Reduced chassis height* and slanting engine for low floor height and loading area.

Fig. 1: Definition of urban lorry for the effects analysis

The main elements of such urban lorries are alternative drives (hybrid, natural gas) with reduced air pollution, an increase in useful load (vehicles < 3.5 t) and faster transhipment by ensuring direct access from the driver's cabin to the loading area (vehicles < 3.5 t) as well as reducing the loading area and access height (Fig. 1).

Effects on transport and environmental efficiency (Fig. 2 and 3)

The following effect factors are valid for the segment of the urban goods transports in the conurbation.

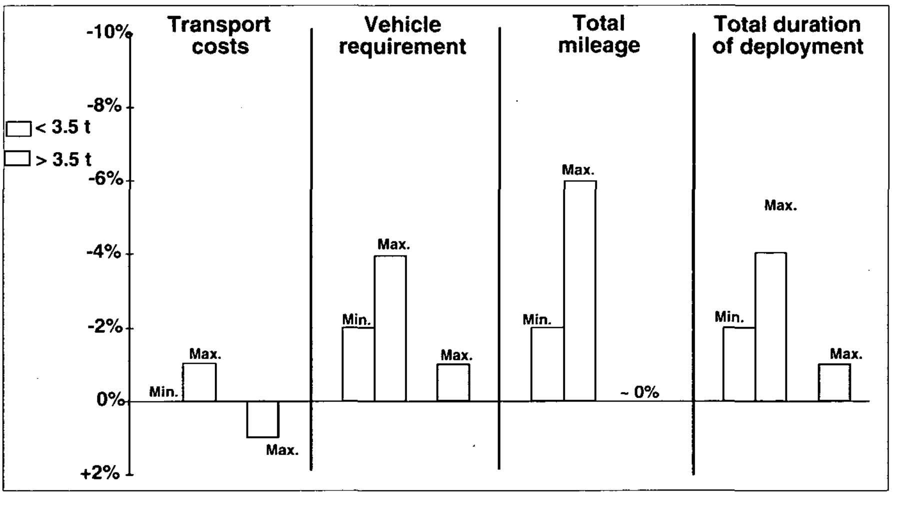


Fig. 2: Results on city level (Transport efficiency, provisional values for Zurich)

- The increase in the useful load of delivery vans and faster transhipment increase both the transportation efficiency (lower costs per tonne-kilometre, lower vehicle requirement) and has a positive ecological effect (lower mileage, air pollutants, etc.).

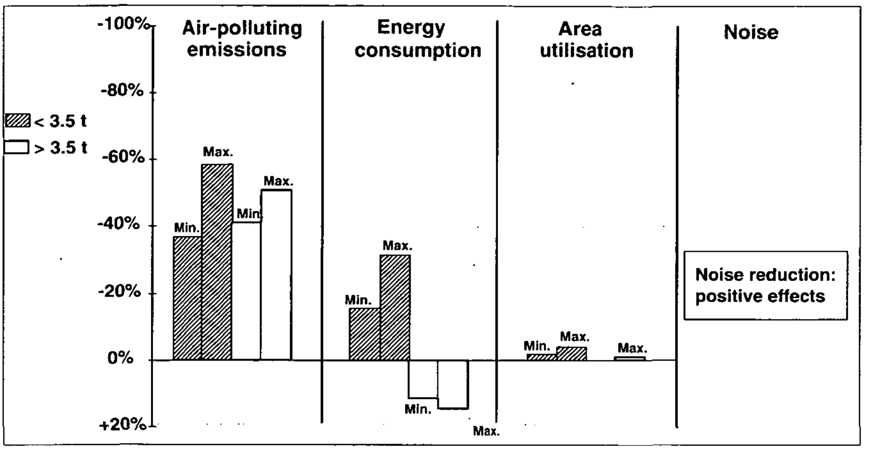


Fig. 3: Results on city level (Environmental efficiency, provisional values for Zurich)

- Alternative drives lead to a significant reduction in air pollutants with relatively low extra costs. The environmental effects are primarily caused by the alternative drive (e.g. air-polluting emissions, energy consumption). The gas drive consumes more energy.

The extra costs due to the use of alternative drives can be compensated by the efficiency increases resulting from optimising the useful load and the speed-up in transhipment for delivery vans. Such a compensation is hardly possible for lorries, as the improvement potentials with respect to useful load and transhipment are significantly smaller here than for delivery vans.

Favourable preconditions and supporting measures implementing the urban lorry

- Specific urban lorries for professional service providers
- Urban lorry concept as a part of city logistics
- Use of traffic telematics
- Urban lorry concept must permit a major improvement in the performance of inner-city transport
- Temporal and spatial access regulations for urban lorries

- Increase in the total weight of delivery vans from 3.5 to 5 or 6 tonnes
- Extend the heavy vehicle fee on lorries (needs more investigations)
- Encouragement of collection and distribution platforms close to city centres
- Economic incentives.

Conclusions

- Urban lorry can make a contribution to improving the quality of the environment and the efficiency of transportation
- Successful implementation of the urban lorry concept demands reliability and practical suitability at least as good as those of conventional vehicles together with no increased costs.
- The extra costs for alternative drives can be compensated not for all companies
- Range limitations are of very secondary importance
- Ecological and economical improvements can be expected by increasing the limit from 3.5 to 5 or 6 tonnes (needs more investigations)
- The effects of the urban lorry concept on the environmental side are significantly greater than those of other measures (transport co-ordination, route planning systems etc.).

The benefits were confirmed at both operator and city levels. It is planned to consolidate these still provisional results by an analysis of additional operators and cities.

4. Measure assessment for use of city trucks

The object of the study is to assess the effectiveness of a particular measure, considered to be realistic, involving restructuring of vehicle fleets. Environmentally sensitive effects are quantified in respect of a variety of implementation conditions. The implementation conditions are specified with the aid of a case study embracing 2-3 companies, and by making use of available statistics.

The Goal of the study is to analyse potential improvement of the economic and the ecological efficiency of intra city freight flows. A critical dimension within the project is the effect to be obtained by a realistic modification of the vehicle fleet used for city traffic. Can such a measure, or alternatively a mix of measures in association with it, lead to a sustainable traffic system optimisation? In which segments of **the**

transportation markets could, under today's prevailing conditions, such far-reaching modifications in the constitution of vehicle fleets be undertaken? How long would it take? To answer these questions, a Simple Effectiveness Analysis Model (Abbreviation: EWM) has been created with COST 321, Project 4. This is divided, in its methodology, into two parts.

First, the effectiveness of the City Truck is to be researched based upon its intrinsic technical characteristics. Load factor parameters for the City Truck are to be established. This allows as a consequence the impact which is relevant to COST 321 to be assessed in linear relationship to the proportion of City Trucks in the total vehicle fleet (see Annex , **illustration 6:** frames of the system investigated).

The more detailed description of the City Truck takes into account the following design criteria:

- The Truck should be able to carry safely different kinds of goods: it should be equipped to carry light and small consignments as well as heavy and large ones, without causing damage to goods. This will allow more individual consignments to be loaded for a tour, and will thus reduce mileage and cost per consignment.
- The Truck should be easily manoeuvrable in narrow streets and locations, and it should be easy to load and unload, in order to save time per destination and to give the driver the possibility to reach more delivery points per tour.
- The Truck should be light and hybrid-powered (two-energy system). This should reduce consumption of non-renewable energy, and reduce C02 emissions and air pollution.

Secondly, various determinant factors relating to the feasibility of the proposal have been incorporated in the model. The essence and the innovative aspect of the EWM are constituted by the analysis of the feasibility of introduction of the City Truck. The EWM differentiates these introduction factors for example by type of operation (delivery tour, load consolidation) and area of use (transport market sector). In this heuristic part of the EWM, 2-3 companies will be studied in depth. The study of the factors affecting introduction permits us to determine the realistic potential for effective substitution, i.e. vehicle fleet transformation. With the load factor values established in the first part, the impact will be quantified (see Annex, illustration 7: working method for modelling effects of measures).

The description of the factors affecting introduction of the City Truck permits, finally, the formulation of recommendations for realistic measures to promote a transformation of the vehicle park, and to set aside barriers to corespondent innovations. These second-line measures, which create conditions which facilitate the modification of vehicle fleets, lead to results which will be quantified in the framework of the overall project.

5. Further references

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4. Responsible for the project: B. Albrecht & Partner, Murbacherstrasse 19, CH-6003 Luzern, Fx ++4141210 90 92
5. A. Robert-Grandpierre, RGR, r. du simplon 8, CH-1006 Lausanne, Fx ++41 21 616 36 88
   P. Blanc / S. Guillaume-Gentil, TRANSITEC, av. Boveresses 17, CH-1010 Lausanne Fx ++41 21 652 32 22
6. K. Dornenburg, Sigmaplan AG, Thunstrasse 91, CH-3006 Bern, Fx ++41 31 356 65 60
7. L. Raymann/P. Ruggli, Ernst Basler & Partner, Mühlebachstrasse 11, CH-8032 Zürich, Fx ++41 1 395 17 87
   M. Ruesch, RAPP AG Ingenieure + Planer, Örlikonerstrasse 38, CH-8057 Zürich, Fx ++41 312 32 13

Annex 1

Figure 1:
Economically active persons by industry or dominant sector, 1990

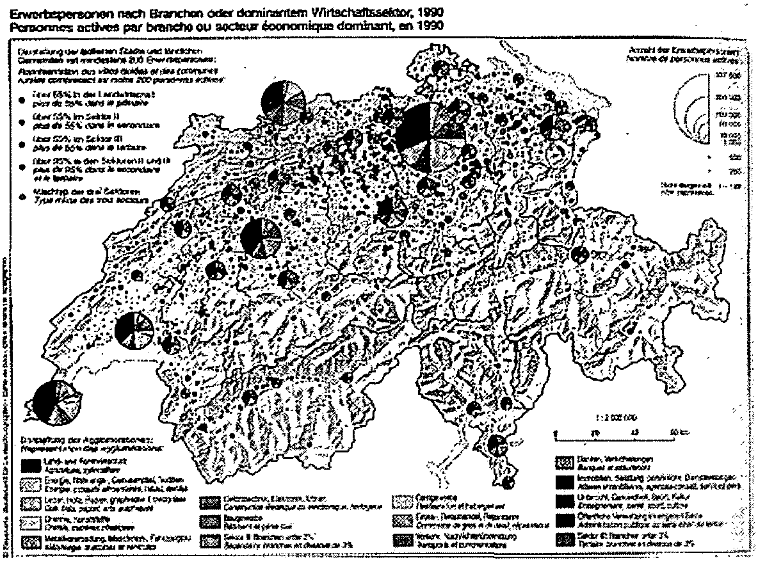


Figure 2: COST 321 in Switzerland

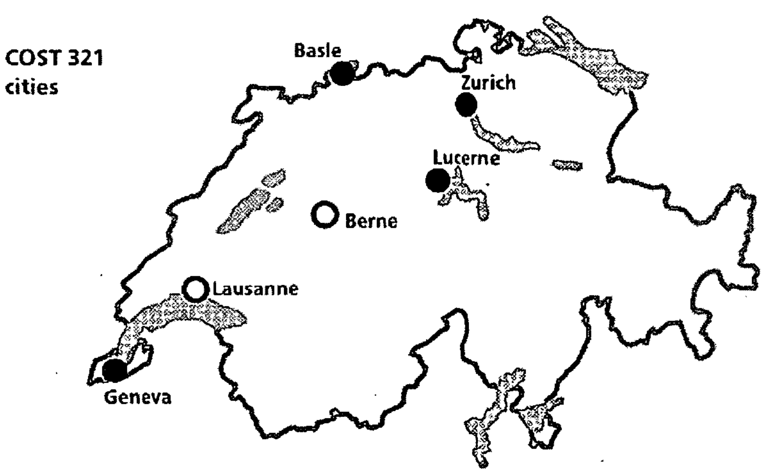
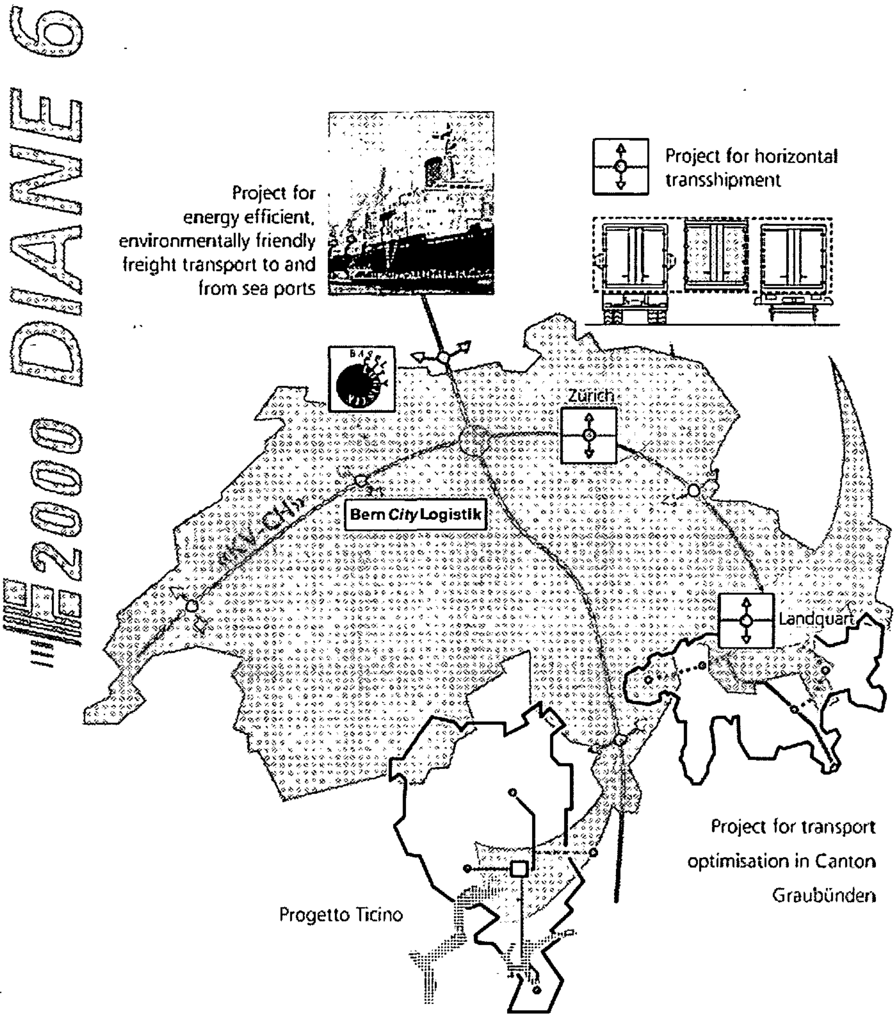


Figure 3: DIANE 6



Responsible for Project	**Project management**
Bundesamt für Energiewirtschaft (BEW)	Ernst Basler + Partner AG
Urs Näf	Lorenz Raymann
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Figure 4

data needed for computer-simulation	available data in Swiss COST 321 cities
urban structur	✓
road network	✓
traffic load in the network	○ / (✓)
diurnal variation	○ / (✓)
goods traffic demand	●

Figure 5: COST 321 in Switzerland

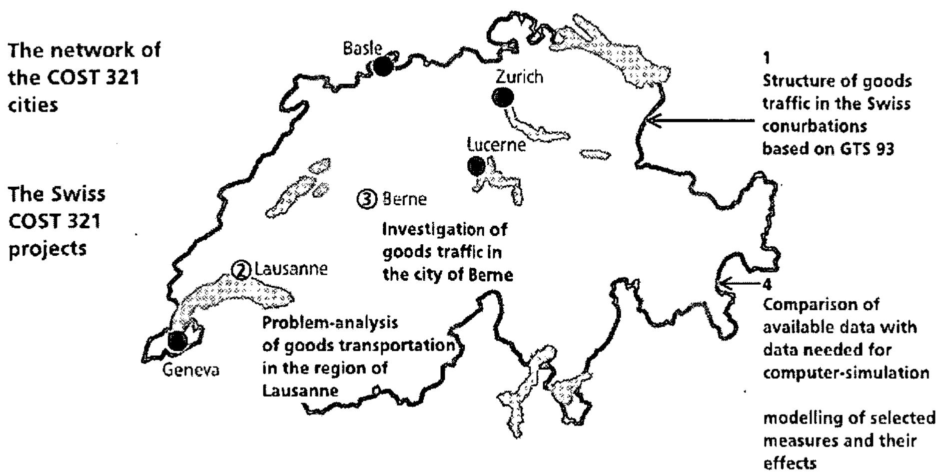


Figure 6

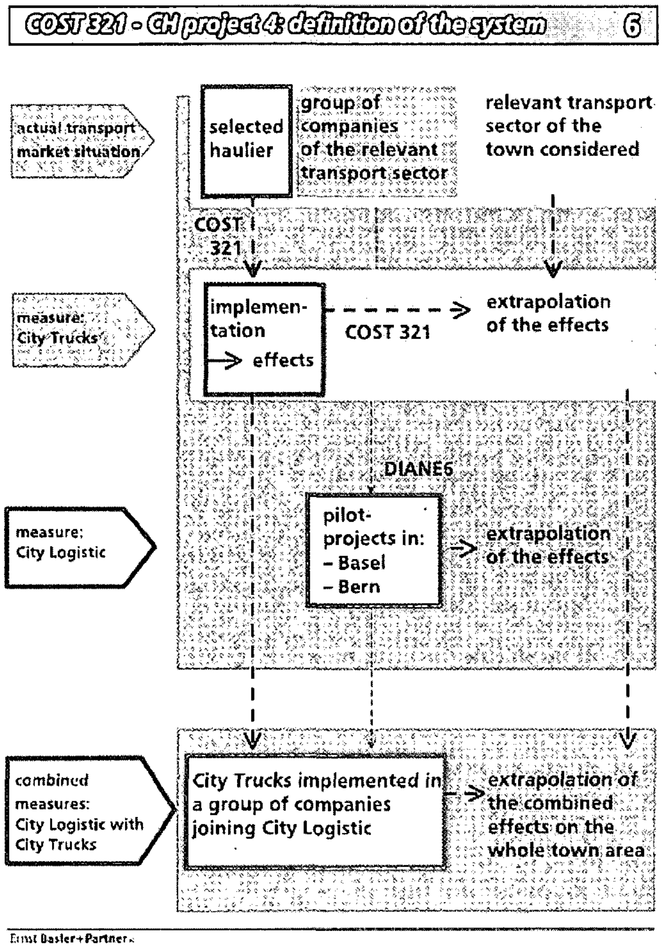
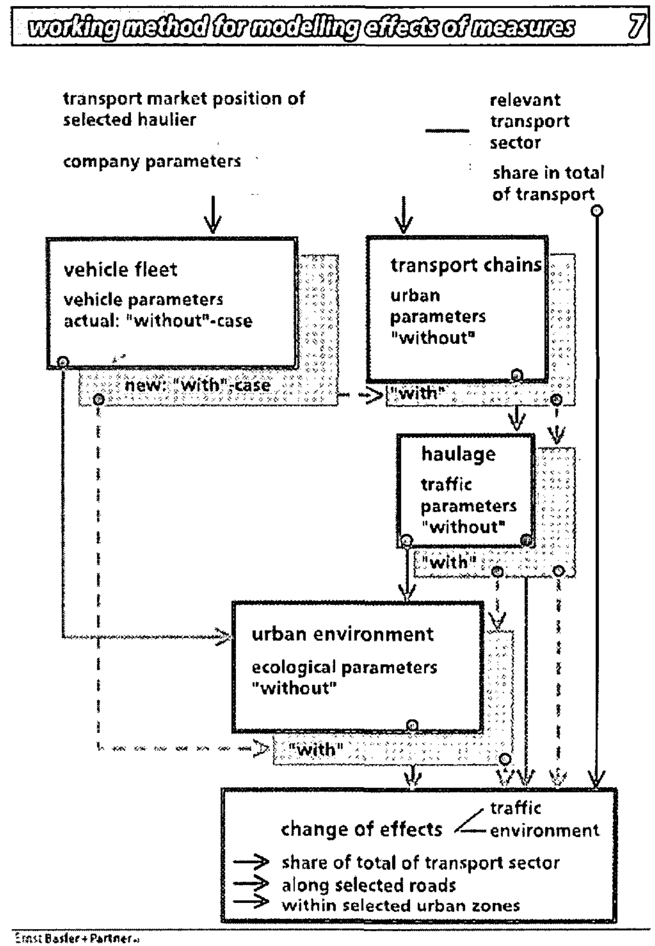


Figure 7



Annex 2

Simple method for effect analysis (draft)

1 Name of modelling toolkit

EWM: Einfaches Wirkungsanalyse-Modell (in German) which means Simple method for effect analysis
Due to the limited data available in Switzerland, no computer simulation is intended in COST 321.

2. Aim of the modelisation

Modelling the effects of optimisation measures on goods transport in towns on a limited data base. In order to apply and test the modelling by sequences of impact, the measure "City Lorry" was chosen.

3 Classification of the model and its elements

- Analysis based on effect-chains and key figures, which are influenced by the measure
- Rough effect estimations by comparing the without/with cases
- Calculation "by hand" with simple algorithms (Excel sheets)

4 Structure of the model

4.1 Effect hypothesis and key figures
- Detailed description of the measure
- Analysing the transport segment, which is influenced by the measure
- Hypothesis of effects and determination of key figures
- Selection of a "typical" haulier in the relevant transport segment, its share of the total, share of the chosen hauliers

4.2 Without Case
- Inquiry of the base data and key figures of the chosen hauliers
- Estimation of the relevant indicators (transport, environment, economy)

4.3 With case
- Development of assumptions about the changes by the measure (difference of key figures / parameters between without and with case)
- Verification and determination of assumptions (together with the haulier/ consignee)
- Estimation of the relevant indicators (transport, environment, economy)

4.4 Effects and Extrapolation
- Expected Effects chosen hauliers(comparison between without/with case)
- Extrapolation to the total hauliers in the relevant transport segment
- Plausibility and sensitivity tests

5 Input parameters

- Structural data: vehicle park, employees per branch,
- Vehicle fleet parameters (number of vehicles per kind of vehicle, fuel consumption, emission factors,)
- Transport chain parameters (daily number and type of consignments, average time of unloading/loading, number of stops per vehicle, number of tours, level of occupation)
- Haulage / trip parameters (level of road traffic, speed)

6 Required Surveys

- specific driver-deliverer survey

The specific survey depends on the investigated measure.

7 Output of the model

- Base figures of transport (number of trips, number vehicles needed, number of tours, number of stops, transhipment times, transport times, occupation)
- effects on environment (air pollution, noise emission...) and economy (transport costs).

8 Specific features

- Behaviour-Sensitivity: Taking into account the expected behaviour of the hauliers consignee (Determination of changes)
- Real-world orientated

9 Limits of the model and problems by using the model

- Uncertainties by extrapolation of behaviour (depending on sample)
- related to specific measure (difficulties in comparing effects of different measures possible)
- no direct link to passenger transport
- taking not into account feedback loops (secondary / structural effects)

Annex 3

Check list to characterise and describe the model cities

City characteristics	Level	Unit	Basel	Zurich	Geneva
Settlement structure					
importance of the city for the region			important supra regional centre	very important supra- regional centre	supra-regional centre
number of inhabitants	city agglomeration		174.007 404.262	343.869 938.696	173.549 446.464
gainfully employed individuals	city agglomeration		90.805	201.094 527.083	90.641
employees	city agglomeration		127.345	311.897 642.736	123.993
number of enterprises	city agglomeration	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees 1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees			
surface area	city agglomeration	[kM2)	24	88	16
settlement density	city agglomeration	[inh/km2]	7.250,00	3.908,00	2.499,00
ratio between gainfully employed individuals and employees	city agglomeration		0.71	0.64	0.55
Traffic infrastructure					
number of motor vehicles (please fill in the national limits between cars and HGV)	cars (light vehicles) trucks 1 HGV (heavy vehicles) traction engine		63.735 4.927 1.148	133.3134 9.832 1.765	78.584 4.030 383
Percentage of diesel engine per kind of vehicle	cars (light vehicles) trucks 1 HGV (heavy vehicles) traction engine			2.2	
number of motor vehicles present in the road network			76.276	158.885	
number of cars per head of population		[cars per 1.000 inh.]	366	388	453
length of the road network • classified road network • urban road network		[km] [km] [km)	314	897	182
length of the road network per number of lanes	one-lane carriageway two-lane carriageway three-lane carriageway four-lane carriageway and more	[km] [km] [km] [km)			
length of the road network per head of population		[km per 1.000 inh.]	1.8	2.58	1.05
integration in the highway and trunk road network			not completed	not completed	completed
level of urban public transport service			high	very high	medium
integration in the national railway network			good	very good	good
location on a waterway			Rhine	no	no
existence of a port/harbour			Rhine port	no	no
existence of an airport	number of passengers per year volume of goods traffic per year	[Mio.1a] [1.000 tla]	2.5	15.3 380	6
Transport/Traffic demand structure					
total trip volume per day (without through traffic)	volume of person trips with public transport and private traffic care trucks 1 HGV		1.050.000 287.000 63.200	 84.000	
volume of goods traffic per year	road network railway inland navigation ocean navigation aircraft	[1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a]		14.000 1.002 380	
volume of consignments per day					
motor vehicle kilometres covered in the road network per day	car kilometres truck (HGV) kilometres	[car*km/d] [HGV'knildl			
motor vehicle dwell time in the road network per day	dwell time of cars dwell time of HGV	[car*hld] [HiGWhldl			
fuel consumption due to motor vehicles per day		[kg/d]			
air pollutant emissions due to motor vehicles per day	CO Soot 1 Particles NOx CH	[kg/d] [kg/d] [kg/d] [kg/d]			
average mobility rate per day (trip rate)		[trip/d]	3.5		
number of in-commuters per day			62.671	160.284	63.170
number of out-commuters per day			15.005	28.439	21.130
in-commuter 1 out-commuter ratio per day			4.2	5.6	3

City characteristics	Level	Unit	Bern	Luzern	Lausanne
Settlement structure					
importance of the city for the region			Supra-regional centre	Regional centre	Supra-regional centre
number of inhabitants s	city agglomeration		127.469	58.847 181.039	115.878 285.011
gainfully employed individuals	city agglomeration		72.475	31.830	65.348
employees	city agglomeration		132.177	49.003	87.887
number of enterprises	city agglomeration	1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees 1 to 10 employees 11 to 50 employees 51 to 100 employees more than 100 employees			
surface area	city agglomeration	[kM2)	51	16	41
settlement density	city agglomeration	[inh/km2]	2.499,00	3.678,00	2.826,00
ratio between gainfully employed individuals and employees	city agglomeration		0.55	0.65	0.74
Traffic infrastructure					
number of motor vehicles (please fill in the national limits between cars and HGV)	cars (light vehicles) trucks 1 HGV (heavy vehicles) traction engine		46.244 3.635 737	22.268 1.460 556	50.838 2.729 407
Percentage of diesel engine per kind of vehicle	cars (light vehicles) trucks 1 HGV (heavy vehicles) traction engine				
number of motor vehicles present in the road network			55.690	26.903	59.071
number of cars per head of population		[cars per 1.000 inh.]	363	378	439
length of the road network • classified road network • urban road network		[km] [km] [km)	376	152	172
length of the road network per number of lanes	one-lane carriageway two-lane carriageway three-lane carriageway four-lane carriageway and more	[km] [km] [km] [km)			
length of the road network per head of population		[km per 1.000 inh.]	2.95	2.58	1.48
integration in the highway and trunk road network			completed	completed	completed
level of urban public transport service			High	High	Medium
integration in the national railway network			Good	Good	good
location on a waterway			No	No	no
existence of a port/harbour			No	No	no
existence of an airport	number of passengers per year volume of goods traffic per year	[Mio.1a] [1.000 t/a]	Regional airport	No	no
Transport/Traffic demand structure					
total trip volume per day (without through traffic)	volume of person trips with public transport and private traffic care trucks 1 HGV		640.000 375.000		
volume of goods traffic per year	road network railway inland navigation ocean navigation aircraft	[1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a] [1.000 t/a]			
volume of consignments per day					
motor vehicle kilometres covered in the road network per day	car kilometres truck (HGV) kilometres	[car*km/d] [HGV'knild]	2.080.000		
motor vehicle dwell time in the road network per day	dwell time of cars dwell time of HGV	[car*hld] [HiGWhldl			
fuel consumption due to motor vehicles per day		[kg/d]			
air pollutant emissions due to motor vehicles per day	CO Soot 1 Particles NOx CH	[kg/d] [kg/d] [kg/d] [kg/d]			
average mobility rate per day (trip rate)		[trip/d]			
number of in-commuters per day			77.132	28.125	43.175
number of out-commuters per day			10.799	10.056	18.444
in-commuter 1 out-commuter ratio per day			7.1	2.8	2.3

Annex 4
Check list to describe the effects of the different measures

Name of the city: Basel Measure or Project/case study	Effects of the measure or the project Motor vehicle Traffic load HGV	Motor vehicle Kilometres	Motor vehicle Dwell time	Air pollutant Emissions Fuel Consumption	CO	Soot/Particles	NOx	CH	Noise emission	Accessibility	
Pilot Projekt (with/without analysis, no simulation) City Logistik	+	- 1 to 9 %	+	- 1 to 9 %	+	0 %	- 1 to 5 %	- 1 to 6 %	0	0	
				100 % = Emissions of all vehicles transporting goods (without case)							

Percentage changes	qualitative assessment		simulation or Project/case study	
-1,23 % reduction to the baseline situation	++	very positive	Sim.	Simulation
1,23 % increase to the baseline situation	+	positive	Pro.	Project/case study
	0	neutral	Ass.	Assessment
	-	negative		
	--	very negative		

Check list to describe the effects of the different measures

Name of the city: Zurich Measure or Project/case study	Effects of the measure or the project										
	Motor vehicle Traffic load HGV	Motor vehicle Kilometres	Motor vehicle Dwell time	Air pollutant Emissions: Fuel Consumption	CO	Soot/Particles	NOx	CH	Noise emission	Accessibility	
Pilot Projekt "Örlike Cargo" (with/without analysis, no simulation) City Logistik	+	- 1 to 2 %	+	+	+		+	+	0		

100 % = Emissions of all vehicles transporting goods (without case)

Percentage changes

-1,23 % reduction to the baseline situation
1,23 % increase to the baseline situation

qualitative assessment

++	very positive
+	positive
0	neutral
-	negative
--	very negative

simulation or Project/case study

Sim.	Simulation
Pro.	Project/case study
Ass.	Assessment

Check list to describe the effects of the different measures

Name of the city:	Effects of the measure or the project										
Measure or Project/case study	Motor vehicle Traffic load HGV	Motor vehicle Kilometres	Motor vehicle Dwell time	Air pollutant Emissions					Noise emission	Accessibility	
				Fuel Consumption	CO	Soot/Particles	NOx	CH			
Measure "Use of city lorries" in Zurich, Basel, Luzern, Bern, Lausanne, Geneva)			**Results not yet available. Data Collection in progress (selected hauliers)**								

Percentage changes

-1,23 % reduction to the baseline situation
1,23 % increase to the baseline situation

qualitative assessment

++ very positive
\+ positive
0 neutral
\- negative
-- very negative

simulation or Project/case study

Sim. Simulation
Pro. Project/case study
Ass. Assessment

Check list to describe the effects of the different measures

Name of the city: Bern Measure or Project/case study	**Effects of the measure or the project**										
	Motor vehicle Traffic load HGV	Motor vehicle Kilometres	Motor vehicle Dwell time	Air pollutant Emissions					Noise emission	Accessibility	
				Fuel Consumption	CO	Soot/Particles	NOx	CH			
Projekt "City Logistics Bern"			**Analysis actual situation terminated. Assessment of city logistics potential in progress**								

Percentage changes	qualitative assessment		simulation or Project/case study	
-1,23 % reduction to the baseline situation	++	very positive	Sim.	Simulation
1,23 % increase to the baseline situation	+	positive	Pro.	Project/case study
	0	neutral	Ass.	Assessment
	-	negative		
	--	very negative		

COST 321

National Report

UNITED KINGDOM

The National Report of the United Kingdom is a part of the report on :

"Alternative Urban Freight Strategies"

Part 1. Key Issues Related to Urban Freight Transport
A Review of Urban Freight Movements

C.A. Lewis
ETSU, AEA Technology

Table of Contents

1. The UK Situation

1.1. UK Freight Movements

This section explores some of the statistics that describe the movement of freight in the UK as a whole. The figures are used to describe the breakdown of goods movements by mode of transport used. For the two main modes used – road and rail- the figures are split in terms of length of journey and goods type. An estimate of energy use and emissions due to road freight is made.

Modal Split

Table 3.1 shows the percentage modal split for freight movements in the UK. This confirms the dominance of road transport within the freight sector.

Table 3.1. Modal split of UK freight by tonne km, 1994.

Road	Coastal Shipping	Rail	Pipeline
65%	24%	6%	5%

Total: 220.5 billion tonne kilometres
(Source: Transport Statistics Great Britain 1995)

1.1.1. Road Transport

Table 3.2 shows the distribution of goods vehicles by size, the amount of goods carried by vehicle type, and the distances over which they were moved. The figures show that the larger articulated vehicles dominate goods movements, in terms of tonne km, although they make up only a quarter of the total number of goods vehicles. This is because smaller vehicles tend to be used on short distance journeys and of course carry smaller loads. A large proportion of vehicle miles are travelled when vehicles are empty, which represents the difficulty experienced in getting return loads, as well as distances between haulage companies and their clients.

In the ten years from 1984 to 1994 there was an increase of approximately 43% in the movement of road freight as measured in tonne kilometres (Transport Statistics Great Britain 1995), although in the same period there was a five percent decrease in the number of goods vehicles registered in the UK, in spite of the increasing importance of road transport (Transport Statistics Great Britain 1995). This represents an increase in the size of gross vehicle weights, an increase in the average length of haul and a greater efficiency in their use as logistics control systems have developed.

From table 3.2 it can be inferred that a large proportion of goods are transported over short distances, with a large proportion of this being moved in rigid bodied vehicles. This is confirmed by the data contained within table 3.3, which shows the distribution of the goods moved as a function of the distance travelled.

Table 3.2. Characteristics of the UK Lorry Fleet and its Usage, 1995.

	Rigid Bodied				Articulated Vehicles		Overall
Gross vehicle weight (tonnes)	3.5-7.5	7.5-17	17-25	>25	3.5-33	>33	
Number of vehicles	150404	116127	22942	27281	31991	78688	427433
Goods transported (million tonnes)	77	221	162	373	139	637	1609
Goods transported (billion tonne kilometres)	4	14	6	13	16	90	144
Total vehicle kilometres (billion km)	4.2	5.1	1.0	1. 6	2.6	7.7	22.2
Average vehicle km	28000	44000	44000	57000	82000	98000	52000
Average load (tonnes)	1.33	3.77	9.78	13.62	8.55	16.36	9.12
Average length of journey (km)	57	65	34	36	115	142	89
Average percentage of distance travelled empty	28.6%	27.3%	38.6%	40.4%	28.1%	28.6%	28.9%

(Source: Transport of Goods by Road in Great Britain 1995)

Table 3.3. Distance Travelled by Goods on Roads in 1995.

Distance Travelled (km)	25	26-50	51-100	101-150	151-200	201-300	>300
billion Tonne km	7.0	11.2	20.4	17.6	17.3	30.3	39.8
Tonnes Moved %	35	19	18	9	6	8	6

(Source: Transport of Goods by Road in Great Britain 1995)

Table 3.4. Goods Moved by Road 1995.

Commodity	Goods Moved (million Tonnes)	Goods Moved (billion Tonne km)	Average Length of Journey (km)
Food, Drink & Tobacco	308	37.5	122
Wood, Timber & Cork	24	3.2	133
Fertiliser	11	1.4	127
Crude Minerals	319	12.5	39
Ores	18	1.5	83
Crude Materials	16	1.9	119
Coal & Coke	34	2.7	79
Petrol / Petroleum Products	71	5.7	80
Chemicals	50	7.4	148
Building Materials	161	10.7	66
Iron & Steel Products	54	7.8	144
Other Metal Products	17	1.7	100
Machinery / Transport Equipment	61	7.4	121

(Source: Transport of Goods by Road in Great Britain 1995)

Energy and Emissions for Road Freight

An estimate of the fuel used by goods vehicles can be made by combining the data in table 3.2 with the average fuel consumption of each class of vehicle. The fuel consumption data and the resultant figures for fuel used are shown in table 3.5. Over the last few years, the average annual distance travelled by goods vehicles has increased, whilst the total number of vehicles has decreased. These effects have to a large degree cancelled each other out, so that this estimate of the overall amount of fuel consumed has remained roughly constant.

Table 3.5. Characteristics of the UK lorry fleet fuel use, 1995.

	Rigid Bodied				Articulated Vehicles		Overall
Gross Vehicle Weight (tonnes)	3.5-7.5	7.5-17	17-25	>25	3.5-33	>33	
Fuel Consumption (litres per 100 km)	23.7	29.2	40.9	44.8	38.6	42.7	35.6
Average Vehicle km	28000	44000	44000	57000	82000	98000	52000
Fuel Consumed per Vehicle (litres)	6677	12938	18094	25673	31873	42133	18616
Number of Vehicles	150404	116127	22942	27281	31991	78688	427433
Total Fuel Used (million litres)	998	1493	413	696	1013	3295	7908

(Source: Transport of Goods by Road in Great Britain 1995)

Quantifying the energy used by urban freight movements would require a knowledge of the total distance travelled within urban areas by the various categories of goods vehicle, as opposed to long distance hauls. This calculation was performed in the USA for data in the early 1970's. The result indicated that fuel consumption by urban delivery vehicles represented approximately 4.5% of transport fuel. It should be borne in mind that this figure represented the situation before the advent of just in time deliveries and the current complex logistics systems (Ogden, 1992). A calculation of this kind has been carried out in section four in order to quantify the current situation in London.

An order of magnitude calculation has be made for the emissions produced by all road goods traffic in the UK using the data in table 3.6. The data for emissions in terms of g per vehicle kilometre is representative of the emissions from vehicles conforming to 'EURO I' technology on an average (mixed urban/rural/highway) UK drive cycle. Such vehicles are representative of new vehicles that have entered the market in the past few years, although there will be some vehicles that are older than this technology, and so the actual total figure will be greater than that shown.

There have been considerable reductions in the level of pollutant emissions as engine technology has improved over the last few years. However, for a given diesel engine technology there tends to a trade off between particulate levels and NOx emissions – because tuning a diesel engine to reduce one pollutant may increase the level of another. As emissions standards become tighter, so it becomes increasingly difficult to achieve the new standards. This may become a problem in the future. New standards are likely to be applied only to new vehicles, and very stringent controls with associated increases in price may only serve to delay the purchase of new vehicles, so leading to higher emissions levels than are necessary. Other methods of reducing pollutants involve alternative fuels and fuel formulations and the use of particulate traps, as mentioned in section 2.

Table 3.6. An estimate of the emissions from the UK lorry fleet in 1995.

Gross Vehicle Weight (tonnes)	3.5-7.5	7.5-17	>17	Overall
Average Vehicle km	28000	44000	80173	
Number of Vehicles	150404	116127	160902	
Pollutant (g/km)				
CO2	476	572	796	
CO	2.17	3.63	3.15	

Gross Vehicle Weight (tonnes)	3.5-7.5	7.5-17	>17	Overall
HC	0.26	0.21	0.14	
NOx	3.86	5.28	6.90	
Particulate	0.64	0.49	0.42	
SO2	0.45	0.78	1.30	
Pollutant (Tonnes/year)				
CO2	2004585	2922684	10268400	15195669
CO	9139	18548	40635	68321
HC	1095	1073	1806	3974
NOx	16256	26979	89010	132244
Particulate	2695	2504	5418	10617
SO2	1895	3985	16770	22651

(Source of emissions data;Transport Research Laboratory, 1994)

1.1.2. Rail Transport

Within the UK railway freight services are generally split into two distinct categories, representing the separate business structures that operate in this market and their different characteristics. The majority of rail transport is for bulk freight, where a whole trainload consists of a single product such as coal or bulk aggregates. The alternative to this, in which neighbouring trailers may carry different cargoes is organised in the UK by a separate division called Railfreight Distribution. (The latter classification includes container freight passing through ports.)

Table 3.7. Goods Moved by Rail 1994/95.

Million Tonnes	Coal	Metals	Construction	Oil Products	Total
Trainload Freight	42.5	16.9	16.8	8.1	84.3
Railfreight Distribution	-	-	-	-	13.0

(Source: Transport Statistics Great Britain 1995)

Trainload Freight

The economy of scale associated with trainload freight make it viable to transfer large quantities of material relatively short distances – 60% of trainload journeys are said to be of less than 50 miles. Typically these journeys transfer material direct from the producer to the end user (e.g. from coal mine to power station). The figures in table 3.7 confirm the predominance of bulk freight as a proportion of overall rail freight. However, the figures have dropped by approximately 30%

between 1991/1992 and 1993/1994, mainly due to a dramatic decrease in the amount of coal produced in the UK.

Alternatives to Trainload Freight Movement (Railfreight Distribution)

The market for making up trainloads from individual producers which supply goods in quantities which are insufficient for distribution by the complete trainload has declined over recent years due to the complex charging mechanisms imposed by the railways and the wide variety of cheap road-based services which are available. Typically rail transport makes up only part of the distribution chain for this type of freight, with goods arriving at, and being transferred on from, rail terminals by road or ferry. The majority of goods transported by railfreight distribution (approximately 62% by volume) consists of container traffic which is transported between the major sea-ports and eight inland terminals for onward distribution, mainly by road.

Table 3.8. Goods moved by rail 1992.

	UK	France	Germany
Goods moved / Million Tonnes	122.4	145.7	338.2
Goods Moved / Billion Tonne kilometres	15.5	51.5	69.6
Proportion of Goods Moved	7%	25.4%	21.8%
Average distance travelled / km	127	353	208

(Source: Transport Statistics Great Britain 1994)

The figures show that rail transport is used less than in France or Germany in terms of tonne km, indicating that for longer distance journeys there might be a greater degree of freight transfer to rail on the continent than in the UK.

Energy and Emissions for Rail Freight

It is difficult to separate the energy used and emissions from for rail freight from the overall energy used by all rail services. However, the Department of Transport does produce estimates of carbon dioxide production per freight tonne-kilometre for various modes of transport and vehicle types (Transport Statistics Great Britain 1994). This shows that rail transport produces least CO2 per tonne km. Long distance road freight using larger articulated vehicles produces roughly twice as much CO2 per tonne kilometre, whereas distribution journeys, which typically use 7.5 tonne vehicles and light vans produce between 6 and 30 times more CO2 than rail for each tonne km moved.

1.2. Current Attitudes to Freight Transport

This section contains a brief study of some published literature relating to urban freight movement in the UK. The current situation in the UK is that the freight distribution industry acts within a deregulated market, and responds directly to pressures from retailers, by finding the most cost effective solution to the demands made upon it. The current low cost offered by road transport, and the flexibility which enables road transport to meet demands for frequent deliveries to warehouses and retailers have resulted in the majority of freight being transported by road.

The use of lorries to deliver goods to town centre destinations on a regular basis has led to demands from shoppers, local residents and pressure groups for alternative distribution practices which could reduce inner city vehicle emissions, noise, energy use and congestion. Many of the measures listed in section two, which are aimed at achieving these objectives, are likely to involve changes to the current low cost road distribution system. The distributors perceive that this will involve extra costs, which will inevitably have to be passed onto the consumer, and are reluctant to take steps along this route. This reluctance to move from road distribution is especially evident when the subject of modal shift to rail distribution is discussed. The current availability of infrastructure and the charging system used mean that the use of rail transport is only financially viable for non-bulk goods movements of greater than 200 miles.

The environmental agenda for improvement in urban freight distribution has not changed significantly over the last 20 years. In 1974 the Transport Research Laboratory published a report (MacKie, 1974), which identified the main methods for solving the problems of urban freight as:

- a modal shift from road to rail transport;
- redesign of urban areas;
- improvements in vehicle technologies;
- and an improvement to the existing transport system.

A recent survey of local government, distribution companies and academics with interests in freight transport confirmed that similar subjects are still seen as the way forward to reduce the effects of urban goods transport (Edwards, 1995).

The latter report is a useful summary of current attitudes of the various organisations interested in urban freight issues in the UK (Edwards, 1995). It identifies the perceived need to compromise between the consumer demand for a wide range of goods to be readily available, and the public demand for a clean environment. This conflict has been intensified over recent years, as improvements in information systems have increased the ability to monitor the location of goods in transit, which has facilitated goods movements to occur virtually on demand – a trend which is perceived to have increased both the number of vehicle movements, and the proportion of trips which are made by vehicles which have spare capacity as the average delivery quantity has decreased.

In terms of attitudes to urban freight, which is primarily moved by trucks, the major environmental considerations are generally perceived to be emissions, congestion and noise. Following his survey, Edwards quantified the main problems associated with urban freight which were perceived by the respondents as follows:

Table 3.9. Major problems associated with urban goods transport in the UK.

Adverse Effect	% of respondents who recognise the problem
Accessibility	53%
Air Pollution	42%
Congestion	42%
Noise	39%
Pedestrian Safety	37%
Damage to Buildings	31%

(Source: Edwards, 1995)

Although energy use is not specifically mentioned in this list, congestion will increase energy use, and so introducing measures which reduce congestion will increase efficiency. Similarly, a reduction in the number of road vehicles will reduce emissions, energy use, congestion and noise.

Complementary information to that contained in table 3.9 is shown in table 3.10. This shows the results of a survey carried out as part of a feasibility study for an underground urban distribution network in Tokyo. This data shows the concerns raised by manufacturers, wholesalers, retailers and distribution companies regarding the current problems of urban goods distribution within Tokyo (Koshi, 1993). This puts into perspective the commercial demands of those dealing with urban transportation systems.

Table 3.10. Problems for commercial users of urban goods distribution facilities in Tokyo.

Problem	Order of Importance	Type of Business Most Affected
Increased Transport Costs	1	Manufacturers, Wholesalers and Retailers
Road Congestion	2	Distributors
Specific Time Delivery	3	Manufacturers
Fluctuations in Volume of Goods to be Transported	4	Manufacturers and Distributors
Availability of Staff	5	Distributors

(Source: Koshi, 1993)

As part of his recent survey of attitudes to urban freight issues, Edwards categorised the potential solutions to freight related problems according to the type of organisation suggesting each solution. The results are shown in table 3.11.

Not surprisingly these results show wide variations in the solutions which are deemed appropriate by the various categories of interested party. For example, the most popular option proposed by companies was road construction, which represents their commitment to the use of road as the most efficient and flexible mode of urban delivery. Company respondents were also relatively keen on the idea of night time deliveries, as this would allow their vehicles to access town centres when there was little other traffic to cause congestion. This is in contrast to the priorities of local councils which must take note of local residents' concerns regarding night time noise levels. The view of pressure groups seems to be that traffic management, and a reduction in the number of large vehicles on the roads, form a major part of the solution. Other proposed solutions included the traditional suggestions of land use planning and improved vehicle technology.

Table 3.11. The number of respondents in each category which recognise potential solutions to problems associated with urban goods transport.

	Respondent Categories							
Possible Solution:	1	2	3	4	5	6	7	8
Traffic Management	80	18	16	4	5	1	4	1
Night time deliveries	32	6	7	5	7	3	0	1
Road Construction	37	6	4	12	9	2	0	1
More Use of Rail	73	18	16	13	5	2	4	0
Transhipment Depots	49	16	12	11	4	0	2	0
Load Consolidation	18	10	7	5	4	2	2	0
Smaller Vehicles	43	7	10	9	3	0	3	0
Larger Vehicles	7	0	2	1	4	0	0	1

Respondent Categories: 1.District Councils; 2.Metropolitan and London Boroughs; 3.City Councils; 4.County Councils; 5.Companies; 6.Academics; 7.Pressure Groups; 8.Professional Bodies.

Source: (Edwards, 1995)

How willing a particular organisation is to accept a compromise between a commercial and an environmental basis for decision making on urban distribution initiatives is an interesting area. Undoubtedly distribution companies are driven by commercial factors when considering such matters, although it can be argued that decisions which have a beneficial environmental effect may also have an associated commercial benefit. An example of the thought process of a European grocery retailer on matters relating to urban distribution of goods to its stores confirms their demand for free access to an uncongested road system, while showing how they are willing to accept environmental advantages which come from improvements in commercial practice (Postma, 1991).

The position of local councils is more difficult, since the electorate frequently demands a better environment without necessarily understanding the full consequences of its wishes. By imposing stringent limits on the ability of companies to service the business area of a district, the economic viability of the area may be threatened, and so a careful balance must be struck between these factors. As part of his survey, Edwards asked the basis on which decisions would be made. Approximately 50% of respondents chose purely environmental factors, 16% chose purely commercial factors, and 33% chose a balance between commercial and environmental factors. When asked how willing they would be to compromise on the basis on which such decisions were made, local councils, which made up the majority of respondents, claimed to be willing to compromise, whereas businesses seemed much less flexible, due to the financial implications to their business.

2. Overview of Goods Movements in London

The population of Greater London was estimated to be approximately 6.97 million in 1994, with 2.66 million of those people living in the inner sections of the Metropolitan area. The areas covered by Greater London and inner London are 199 and 782 square miles respectively.

As part of its study of the life the Capital, the UK Government publishes a document called Transport Statistics for London. This document concentrates on passenger transport statistics, but does contain some very general information on the total amount of freight moved which is shown below:

Table 4.1. Goods transported to, from and within London by mode and weight.

Mode	Location	Million Tonnes in 1994
Road	Origin London	80
	Destination London	91
	Within London	48
Rail+	Origin London	1.6
	Destination London	4.4
	Within London	0.3
Air	-	1.3
River	Within London	2.8
	Seagoing	21.3
All	Within London (3+6+8)	51.1
	To rest of UK (1+4)	81.6
	From rest of UK (2+5)	95.4
	Import & Export (7+9)	22.6
	Total	250.7

(Source: Transport Statistics for London 1995) + Data is for 1993

The above data shows that the predominant mode for goods movements is road transport. In terms of the weight of goods moved, 95% of the goods moved within London are transported by road, and this proportion only increases to 96.8% and 95.1% for goods travelling from and to London from other parts of the UK respectively.

Vehicle licensing statistics are published by the UK Government in the publication 'Vehicle licensing Statistics '. These show the distribution of goods vehicles by type and location, and yield the following data for the Greater London area:

Table 4.2. Goods Vehicles Registered in London by type.

	Rigid Trucks	Articulated Trucks	Total
3.5-7.5	28930	6250	35180

The UK Government conducts an annual survey of operators of Goods vehicles called the Continuing Survey of Road Goods Transport. This survey data covers approximately 4% of the vehicles registered in the UK, and is used by Government statisticians to produce an annual report called 'The Transport of Goods by Road in Great Britain'. The data in the published report is not disaggregated to any local level. However, this data has been obtained from the UK Department of Transport, and is discussed in the following sections.

The data in terms of tonne kilometres corresponding to the road transport of goods moved displayed earlier is shown below:

Table 4.3. Goods Transport in the London Area by Vehicle Size

	Tonne kilometres ('000)		
Gross Vehicle Weight (T)	Within London	Origin London	Destination London
Rigid trucks			
up to 7.5	212411	119764	187305
7.5-17	465302	276593	332668
17-25	64526	47898	116889
over 25	305377	343486	283944
all rigid trucks	1047616	787740	920807
Articulated trucks			
up to 33	181284	541587	847958
over 33	234702	2753711	3454747
all articulated trucks	415987	3295298	4302705
All trucks			
up to 25	746283	453436	652382
25-35	486026	903813	1130151
over 35	231294	2725789	3440979
Total	1463603	4083038	5223512

A breakdown by commodity of the goods moving to and from London was also available by type of goods.

Table 4.4. Goods Transported in the London Area by Type.

	Tonne kilometres ('000)								
	Rigids			Artics			Total		
	Within London	Origin London	To London	Within London	Origin London	To London	Within London	Origin London	To London
Product Type:									
Agricultural	21233	43466	42569	13926	367301	182753	35160	410767	225322
Beverages	54919	10449	6155	28352	277068	329017	83271	287517	335172
Foodstuffs	67149	38717	43564	83933	402290	733136	151082	441008	776700
Wood etc	10376	6084	2549	2564	58723	99702	12940	64807	102251
Fertiliser	-	870	2281	42	6689	27329	42	7558	29610
Sand & gravel	34945	7953	80257	-	8817	14824	34945	16771	95080
Other minerals	90497	115383	65698	20567	6507	159664	111064	121891	25362
Ores	12905	23867	35103	1574	125982	13722	14479	149850	48825
Crude materials	9653	2068	5941	3738	32448	8824	13391	34515	14765
Coal & coke	-	-	1969	1657	15977	23829	1657	15977	25798
Petroleum products	27583	8280	12049	4962	34137	260068	32545	42418	272117
Chemicals	11933	13842	11993	16244	114447	219482	28177	128289	231475
Cement	45692	2744	6461	4946	4960	120423	50638	7704	126884
Building materials	88637	11890	128985	5640	53629	247444	94278	65520	386430
Iron & steel	37106	11614	23906	8761	161258	163914	45867	172872	187819
Other metals	27390	20430	19509	13414	58881	40846	40804	79311	60356
Machinery and transport equipment	22640	49952	107242	35579	178705	220290	58219	228657	327532
Other manufactured goods	112747	71972	137935	66890	320558	582866	179637	392530	720802
Other miscellaneous	372209	348157	176639	103198	1066921	854571	475407	1415078	1031210
Total	1047616	787740	920807	415987	3295298	4302705	1463603	4083038	5223512

Several points are worth noting from the above figures:

goods movements within London are made predominantly using rigid vehicles (71.6%) as opposed to articulated trucks.

Within the rigid category 64.7% of the tonne-km are by the two smallest categories (<7.5 T and 7.5-17.5T which are more suited to urban delivery conditions).

There is a relatively high proportion of goods (32.5%) transported, both within and to and from London, that does not fall into any of the more detailed categories. This compares with a national value of 16.6% for 1993.

Using the data for trips within London, and emissions factors for urban journeys shown below, it is possible to estimate the emissions generated by road goods transport within London as follows.

Table 4.5. Total Emissions and Fuel Consumed by Road Goods Transport for Journeys Contained Within the London Area.

	Gross Vehicle Weight			
Emissions factors: (g/km)	3.5-7.5	7.5-17	>17	
CO2	496	630	997	
CO	2.85	4.92	5.89	
HC	0.47	0.34	0.39	
NOx	3.82	5.36	8.23	
Particulates	0.87	0.7	0.7	
SO2	0.57	0.93	1.5	
Average Fuel Consumption (l/100km)	23.7	29.2	42.1	
Total pollutant emissions ('000 T)	3.5-7.5	7.5-17	>17	Total
CO2	79017	77663	64363	221043
CO	454	607	380	1441
HC	75	42	25	142
NOx	609	661	531	1801
Particulates	139	86	45	270
SO2	91	115	97	302
Fuel consumed (million litres)	38	36	27	100

An estimate of the emissions within the greater London area from road freight movements to and from London has been made, and the results are shown in table 4.6. The accuracy of these data is lower than those shown above, as they depend on the assumption that for journeys to and from London, the vehicle spends 15km on average within the metropolitan area when leaving the origin or on its way to the final destination. These figures show a lower total level of emissions from than the journeys contained solely within London, although the proportion of the emissions from vehicles over 17 T gross vehicle weight is greater due to the greater number of vehicle kilometres travelled by such vehicles on long distance routes.

Table 4.6. Total Emissions and Fuel Consumed by Road Goods Transport on the London sections of Journeys to and from the London Area.

Total pollutant emissions ('000 T)	3.5-7.5	7.5-17	>17	Total
CO2	3006.0	2346.7	87633.6	92986.3
CO	172.7	183.3	517.7	873.7
HC	28.5	12.7	34.3	75.4
NOx	231.5	199.7	723.4	1154.6
Particulates	52.7	26.1	61.5	140.3
SO2	34.5	34.6	131.8	201.0
Fuel consumed (million litres)	14.4	10.9	36.9	62.2

The emissions factors used in tables 4.5 and 4.6 are similar to those used in table 3.6 on page 10, in that they represent the emissions from vehicles conforming to 'EURO I' technology. However, in this case they are solely for urban driving conditions.

ANNEX 3: COST 321 DOCUMENTS

List of all the COST 321 documents.

Reference	Title	EN	FR	DE
COST/221/94	Memorandum of Understanding	x	x	x
PREP-COST/321/1/93	Transport de Marchandises en ville - Programme français		x	
PREP-COST/321/2/93	Urban goods transport planning - Zürich city planning office	x		x
PREP-COST/321/1/94	National Contribution and Progress Charts	x		
PREP-COST/321/2/94	Working paper n°1 from Slovenia	x		
PREP-COST/321/4/94	"Improving freight transport in cities" OCDE survey	x		
PREP-COST/321/5/94	"Good Transport in Danish town" study on Vejle	x		
PREP-COST/321/6/94	Analysis of the effects of planning and regulatory measures on freight transport in towns and municipalities. Workshop Bonn-Bad Goderberg. October 1993	x		x
PREP-COST/321/7/94	COST 321 progress report	x		x
PREP-COST/321/8/94	Mesures envisagées par la France		x	
COST/224/94	Minutes of 8th meeting of the COST 321 Subtechnical Committee	x	x	x
EUCO-COST/321/1/94	Draft rules of procedure of the Management Committee	x	x	x
EUCO-COST/321/2/94	Short term scientific mission in the COST framework	x		
EUCO-COST/321/3/94	Proposal for projects linked to COST 321 to be included in the 4FP	x	x	x
EUCO-COST/321/4/94	Minutes of the 1rst meeting of the Management Committee held in Brussels	x	x	
EUCO-COST/321/5/94	Rules of procedure of the Management Committee	x	x	
EUCO-COST/321/6b/94	Dutch study on a distribution centre in Maastricht	x		
EUCO-COST/321/7/94	Guideline to the questionnaire submitted by WGA. Annexe: Questionnaire	X		
EUCO-COST/321/8/94	Overview of measures out of COST-documents	X		
EUCO-COST/321/8/94.Add1	Overview of measures out of COST-documents Addendum - December 1994	X		
EUCO-COST/321/9/94	Extended information on the implementation of the scheme for Short-Term Scientific Missions.	X		
EUCO-COST/321/10/94	Information related to the COST interaction Conference in Basel 9-11 October 1995	X		
EUCO-COST/321/1/95	Minutes of the Management Committee held in Brussels on 24/11/94.	X		
EUCO- COST/321/2/95	Summary records of the 2nd meeting of the WGA	X		

Reference	Title	EN	FR	DE
	held on 13th December 1994.			
EUCO-COST/321/3/95	Draft report of the WGA "State of the art" - description of selected measures (revision of EUCO-COST/321/8/94)	X		
EUCO-COST/321/4/95	Draft minutes of the 3rd meeting of the Management Committee held in Brussels on 24th February 1995.	X		
EUCO-COST/321/5/95	Minutes of the fourth meeting of the Management Committee held in Vitoria (Spain) on 7th April 1995.	X		
EUCO-COST/321/6/95	Dutch brochure on overview of the experience with Urban Distribution Centre - transmitted by Mrs de Gooijer.	X		
EUCO-COST/321/7/95	Report of the meeting of Working Group B on 19 July 1995 in Aachen.	X	X	X
EUCO-COST/321/7/95 Rev.1	Report of the meeting of Working Group B on 19th July 1995 in Aachen.	X	X	X
EUCO-COST/321/8/95	Status Report of the Working Group B - 1st Draft	X		
EUCO-COST/321/9/95	Dutch Work Programme. Urban distribution platform. (The Hague, 20th Sept. 1995). NL + EN vers.	X		
EUCO-COST/321/10/95	Minutes of the 5th meeting of the Management Committee held in Basel on 12th October 1995.	X	X	X
EUCO-COST/321/11/95	List of COST 321 Participants.	X		
EUCO-COST/321/1/96	Urban Goods Transport in Düsseldorf.			X
EUCO-COST/321/2/96	Development of a freight matrix for Düsseldorf			X
EUCO-COST/321/3/96	Minutes of the 6th meeting of the Management Committee held in Brussels on 14th March 1996.	X		
EUCO-COST/321/4/96	Status Report of the Working Group B, by W. Dietrich.	X		
EUCO-COST/321/5/96	"Survey and Modelling in Urban Freight Transport" - a French contribution to simulation tools - LET.	X		
EUCO-COST/321/6/96	Minutes of the 7th meeting of the Management Committee held in Brussels on 31st October 1996.	X		
EUCO-COST/321/7/96	An attempt at modilisation of goods transport in urban area.	X		
EUCO-COST/321/8/96	Rationalisation of Urban Goods Transport, COWI, NTU.	X		
EUCO-COST/321/9/96	The development programme of goods transport in Helsinki. 1995.	X		
EUCO-COST/321/1/97	Minutes of the 8th Management Committee held in Brussels on the 17th February 1997.	X		
EUCO-COST/321/2/97	Minutes of the 9th Management Committee held in	X		

Reference	Title	EN	FR	DE
	Brussels on the 23rd May 1997.			
EUCO-COST/321/3/97	Structure of the national founded programme "Logistic Austria".	X		
EUCO-COST/321/4/97	National report May 1997 - The Netherlands – Ms. de Gooijer, Ministry of Transport.	X		
EUCO-COST/321/5/97	Interim report - ETSU	X		
EUCO-COST/321/6/97	Brief report of the German contribution - IVV.	X		
	Modelling freight transport in cities -J.G.S.N. Visser, Delft University of Technology	X		

Reports

- Proceedings of the Seminar organised at Vitoria, 6-7 April 1995 "Goods Transport in the Sustainable City",1996 Brussels, CEC/DG VII, 148 p.
- State of the Art, Description of Measures and First Assessment of Selected Measures, CEC/DG VII, November 1995.
- Interim Report of Working Group A: "Urban Freight Transport, State of the art COST 321 of innovative measures planned or experimented in Europe", January 1997.

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ANNEX 5 – GLOSSARY

Abbreviation / Technical term	Explanation
Car	(here used as passenger car) Road motor vehicle, other than a motor cycle, intended for the carriage of passengers and designed to seat no more than nine persons (including the driver). *The term "passenger car" therefore covers microcars (need no permit to be driven), taxis and hired passenger cars, provided that they have fewer than ten seats. This category may also include pick-ups.*
Carriageway	Part of the road intended for the movement of road motor vehicles; the parts of the road which form a shoulder for the lower or upper layers of the road surface are not part of the roadway, nor are those parts of the road intended for the circulation of road vehicles which are not self-propelled or for the parking of vehicles even if, in case of danger, they may occasionally be used for the passage of motor vehicles. The width of a carriageway is measured perpendicularly to the axis of the road.
Category of road	Classification of the road network according to a) administration responsible for its construction, maintenance and/or operation; b) according to design standards or, c) according to the users allowed to have access on the road.
Gross vehicle weight Legally permissible maximum weight	Total of the weight of the vehicle (or combination of vehicles) including its load when stationary and ready for the road declared permissible by the competent authority of the country of registration. *This includes the weight of the driver and of all persons carried at the same time.*
GTC Goods Traffic Centre	Industrial park where enterprises of transportation (e.g. carriers) are located with an integrated goods station for combined traffic (at least two traffic modes). For example the GVZ Bremen.
HGV Heavy goods vehicle	Road vehicle with a weight over 2,8 tonnes
Lane	One of the longitudinal strips into which a carriageway is divisible, whether or not defined by longitudinal road markings, which is wide enough for one moving line of motor vehicles other than motor cycles.
Load capacity	Maximum weight of goods declared permissible by the competent authority of the country of registration of the vehicle.

Abbreviation / Technical term	Explanation
Local traffic	Traffic witch journey begins and ends in the specific area (e.g. traffic zone)
Modal Split	Share of the traffic modes in the whole traffic
O-D Matrix Origin - Destination Matrix (Trip Matrix)	Matrix witch contains the number of trips from any traffic zone to any another.
Originating Traffic	Traffic witch begins it's journey in the specific area (traffic zone)
Road	Line of communication (travelled way) using a stabilised base other than rails or air strips open to public traffic, primarily for the use of road motor vehicles running on their own wheels. *Included are bridges, tunnels, supporting structures, junctions, crossings and interchanges. Toll roads are also included. Excluded are dedicated cycle paths.*
Road journey	A movement of a road vehicle from a specified point of origin to a specified point of destination. *A journey can be divided into a number of sections or stages.*
Road network	All roads in a given area
Road tractor	Road motor vehicle designed, exclusively or primarily, to haul other road vehicles which are not power-driven (mainly semi-trailers). *Agricultural tractors are excluded.*
Road traffic	Any movement of a road vehicle on a given network. When a road vehicle is being carried on another vehicle, only the movement of the carrying vehicle (active mode) is considered.
Semi-trailer	Goods road vehicle with no front axle designed in such way that part of the vehicle and a substantial part of its loaded weight rests on the road tractor.
Terminating Traffic	Traffic witch has it's destination in the specific area (traffic zone).
Through traffic transit	Any loaded or empty road motor vehicle, which enters and leaves a specific area (e.g. traffic zone) at different points by whatever means of transport, provided the total journey within the area is by road and that there is no loading or unloading in the country. *Road motor vehicles loaded/unloaded at the frontier of that area onto/from another mode of transport are included.*
Traffic mode	Traffic modes are for example: Road traffic, rail traffic, air traffic, waterway traffic

Traffic zone	Based on urban planning, economics, urban statistical areas etc. defined area with a focal point on witch all the real characteristics can be focussed.
Trailer	Goods road vehicle designed to be hauled by a road motor vehicle.
UDC Urban Distribution Centre	Place of transhipment from long distance traffic to short distance (urban) traffic. Here the consignments can be sorted and bundled.
UDP	A forum where specialists from the business world and local, provincial and national governments are represented. It wants to assist cities to solve problems in urban goods transport.
Vehicle-kilometre	Unit of measurement representing the movement of a road motor vehicle over one kilometre. *The distance to be considered is the distance actually run. It includes movements of empty road motor vehicles. Units made up of a tractor and a semi-trailer or a lorry and a trailer are counted as one vehicle.*

COST TRANSPORT OVERVIEW

COST Transport is one of 17 domains existing in COST at the present time.

It was to be one of the seven areas seen as best suited for this new form of collaboration, which was officially set up by a Ministerial Conference in November 1971.

The Transport area lends itself particularly well to the COST framework, both because it combines aspects from a number of disciplines, and because of the need for harmonisation at European level. Liaison with the Transport Ministries and Administrations in the various countries is a key element of these COST Actions.

The COST Transport Secretariat is located within the Directorate General for Transport of the European Commission. The location with the staff managing the Fourth Framework Transport RTD Programme, as well as the proximity with the Common Transport Policy Directorates, enables close collaboration between Transport Research activities and serves as a basis for further political action.

COST Transport Actions are authorised and supervised by the COST Technical Committee on Transport which, in turn, reports to the COST Committee of Senior Officials. Both of these decision-making bodies comprise representatives of the national governments of the COST countries.

By the end of September 1998, the COST Transport domain comprised 14 ongoing Actions, with a total estimated cost of ECU 30 Million. 26 Actions have been completed, and a further 8 Actions have been selected by the COST Technical Committee on Transport and are under preparation.

Actions Underway

COST 319:	Estimation of pollutant emissions from transport
COST 323:	Weigh in motion of road vehicles
COST 326:	Electronic marine chart display
COST 327:	Motorcycle safety helmets
COST 329:	Models for traffic and safety development and interventions
COST 331:	Requirements for pavement markings
COST 332:	Transport and Land-Use policies
COST 333:	Development of new bituminous pavement design method
COST 334:	Effects of wide single tyres and dual tyres
COST 335:	Passengers accessibility of heavy rail systems
COST 336:	Falling weight deflectometer
COST 337:	Unbound granular materials for road pavements
COST 339:	Small containers

Actions in preparation

COST 338:	Information overload in the field of traffic signs
COST 340:	Towards an intermodal transport network: Lessons from history
COST 341:	Habitat fragmentation due to transportation infrastructure
COST 342:	Parking policy : Effects on Mobility and the Local Economy
COST 343:	Reduction in Road Closures by Improved Maintenance Procedures
COST 344:	Improvements to Snow and Ice Control on European Roads
COST 345:	Procedures Required for Assessing Highway Structures
COST 346:	Instantaneous Energy Consumption and Emissions of Road Vehicles, especially of Heavy Duty Vehicles

Completed Actions

COST 30:	Electronic aids to traffic on major roads
COST 30 bis:	Same aim as COST 30 but with demonstration action
COST 33:	Forward study of passenger transport requirements between major European conurbations
COST 301:	Shore based marine navigation aid systems
COST 302:	Technical & economic conditions of the utilization of electric road vehicles in Europe
COST 303:	Technical and economic evaluation of dual-mode trolleybus national programmes
COST 304:	Alternative fuels for road vehicles
COST 305:	Data system for the study of demand for interregional passenger transport
COST 306:	Automatic transmission of data relating to transport
COST 307:	Rational use of energy in interregional transport
COST 308:	Maintenance of ships
COST 309:	Road weather conditions
COST 310:	Freight transport logistics
COST 311:	Simulation of maritime traffic
COST 312:	Effects of the Channel Tunnel on traffic flows
COST 313:	Socio-economic cost of road accidents
COST 314:	Express delivery services
COST 315:	Large containers
COST 317	Socio-economic effects of the Channel Tunnel
COST 318:	Interactions between high speed rail and air passenger transport
COST 320:	Effects of E.D.I. on transport
COST 321:	Urban goods transport
COST 322:	Low Floor Buses
COST 324:	Long term performance of road pavements
COST 325:	New pavement monitoring equipment and methods
COST 328:	Integrated Strategic Infrastructure Networks in Europe
COST 330:	Teleinformatics links between ports and their partners

Up to date information on COST Transport can be found on the World Wide Web, at the following address: http//www.cordis.lu/COST-Transport/home.html

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From 1994 to 1998, 12 countries (Denmark, France, Finland, Germany, Greece, Italy, The Netherlands, Slovenia, Spain, Sweden, Switzerland and United Kingdom) have studied the design and operation of innovative measures to improve the environmental performance of freight transport in urban areas.

This report examines the reduction of air pollution, noise and energy consumption by optimising the use of trucks in city traffic through the application of modern logistical devices and appropriate administrative measures. Economic effects have also been taken into consideration.