PUBLICATION ON TRAFFIC IN HELSINKI

CITY PLANNING OFFICE
TRAFFICPLANNING DEPARTMENT

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Foreword

This publication consists of a general description of Helsinki City's current traffic system and its development principles. It has been compiled by the traffic planning department of the City Planning Office. The description of the metro's first part has been drawn up by the Metro Office and the description of the managementorganisation of the public transport by the Transport Authority.
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1
HELSINKI REGION

The Helsinki region consists of four towns (Helsinki, Vantaa, Espoo and Kauniainen). On account of a high level of migration, the number of inhabitants and the number of jobs have grown rapidly in the region during the last ten years. The following table illustrates the developments in the numbers of inhabitants and jobs in the region.

Table 1.
Numbers of inhabitants and jobs

	Population in thousands			Jobs in thousands		
	1960	1970	1975	1960	1970	1975
Helsinki	448.3	523.7	503.0	273.4	327.0	345.1
Espoo	53.0	92.7	117.1	9.7	23.3	34.1
Vantaa	41.9	72.2	113.2	10.9	23.7	36.3
Kauniainen	2.6	6.1	6.6	0.8	1.6	1.8
Total	545.8	694.7	739.9	294.8	375.6	417.3

People have been moving into the Helsinki region from elsewhere in Finland, mainly from the development areas of the country's northern and eastern parts. In very recent years the migration has declined substantially, and Helsinki, for instance, was a commune of population loss by 1975 owing to migration. The populations of Espoo, Vantaa and Kauniainen - the other communes in the region - were still growing. The number of jobs is rising in all the communes of the Helsinki region. One of the reasons for the slow-down in the growth of population and number of jobs in the region is the development-area policy implemented by the Finnish government. The Government endeavours to restrict the growth of the cities in the south of Finland through legislative and fiscal measures.

2
ORGANIZATION OF TRAFFIC PLANNING IN THE HELSINKI REGION

General planning on the Helsinki region level is carried out at the offices of the Helsinki Regional Planning Federation and by the Co-operation Council

of the Metropolitan area of Helsinki. Such planning comprises land use and traffic plans as well as the co-ordination of studies and projects. All the communes of the Helsinki region are represented on these planning organs. The decisions made by these co-operating bodies are in the nature of recommendations which the communes attempt to comply with when making decisions at the communal level. However, on account of the high degree of autonomy enjoyed by the communes in Finland, these recommendations are of little significance in practise.

In the city of Helsinki, traffic planning is carried out under three different city managers.

The City Planning Office is responsible for the traffic planning involved in physical planning, and draws up plans for the development of the transport system, from overall to detailed planning. The plans are implemented by the City Construction Bureau.

The Helsinki Transport Authority is responsible for the management of public transport, and puts forward proposals on new traffic arrangements for the improvement of the operating conditions of such transport.

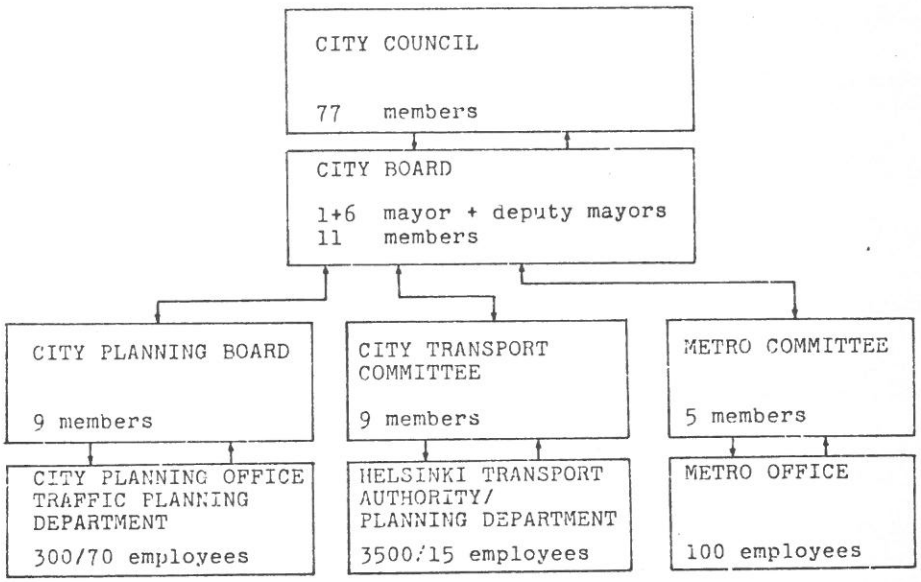
The Metro Office is responsible for the planning and construction of the underground (subway) railway.

In addition to the above city offices, traffic planning work in the city area is also carried out by the State Railways and the Public Roads and Waterways Administration, which are national planning bodies. The co-ordination between the various city offices engaged in traffic planning and those of the State has been provided for at many different planning levels. In addition to permanent co-ordination groups, there are numerous project working groups for the implementation of certain given tasks.

The following diagramme shows the organization of traffic planning and its decision making in Helsinki.

FIGURE 1.

ORGANISATION OF TRAFFIC PLANNING AND ITS DECISION MAKING IN HELSINKI



3 TRAFFIC FINANCING POLICY

The programme for the development of traffic for five year periods is drawn up in Helsinki in connection with the economic plan and the annual budget as a co-operative effort between the city transport administration, the street construction department of the Construction Bureau, the Metro Office and the City Planning Bureau.

The development programme for the transport sector includes investment plans for public transport, for vehicular traffic and for light traffic, and calculations on the operating economy of public transport, i.e. the policy on fares.

The investments in the traffic sector under the Budget for 1976, and the proposed economic plan for 1977-1981, are of the following order of magnitude:

Table 2.
The Investments

	Budget for 1976		Five-year plan 1977-1981	
The Transport Authority	26 mill.mk	11 %	180 mill.mk	11 %
Construction of Metro	105 mill.mk	43 %	900 mill.mk	56 %
Streets, roads and bridges	83 mill.mk	34 %	440 mill.mk	27 %
Docks	30 mill.mk	12 %	110 mill.mk	6 %
Total	244 mill.mk	100 %	1650 mill.mk	100 %

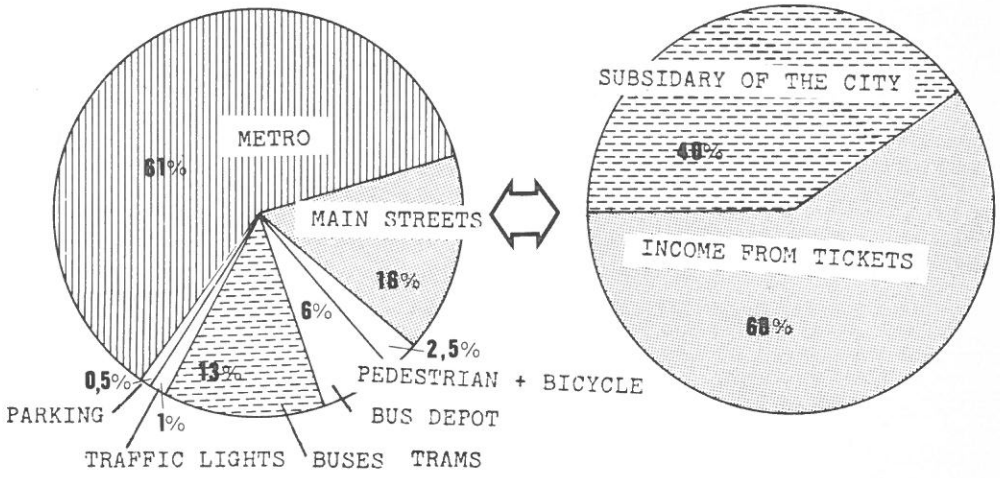
The investments in the traffic sector during the next five years amount roughly to 500-600 marks per inhabitant in tax funds. The biggest investment item within the traffic sector is the construction of the Metro section between Kamppi and Puotinharju.

On the basis of the present financing and fares policy of public transport, the income of the Transport Authority amounts to about 60 per cent of the expenditure. The tax expended on covering this deficit amounts to revenue equalling about 1,5 per cent of the taxable income (ca 160 mill.fmk/1976) each year. The money expended through the Transport Authority includes that spent on the Authority's own bus and tram traffic, the expenditure on traffic under contract (common fare pool) and, from 1980 onwards, also the expenditure on the underground traffic.

The traffic development programme is adopted by the City Council in connection with the annual budget.

FIGURE 2.

INVESTMENTS IN THE TRAFFIC SECTOR 1977-1981
FINANCING POLICY OF PUBLIC TRANSPORT 1976



4
HELSINKI TRAFFIC POLICY

During the last decade, the region of the capital has undergone vigorous development. The population has increased by 50 per cent, and there has been increase and diversification in the number of jobs and services.

Past and present developments provide the urban community with opportunities of diversified and lively contact. Uncontrolled, such developments also bring problems, of which the transportation of people and goods is perhaps the most serious. For this reason, the most important object in traffic policy for Helsinki and for the entire region of the capital is the concurrent development of land use and traffic system in such a way that the inhabitants are provided with the best possible transportation facilities, without allowing the detrimental effects of traffic to grow to unreasonable proportions.

In big cities, the planning of the downtown traffic system and the solutions reached in connection therewith have an effect on the traffic arrangements over the whole area of the city. The geographic location of the downtown section of Helsinki, the great number of jobs downtown and in the downtown fringes, and the complete city structure of the downtown area have prompted the selection of a system based on public transport, and especially transportation by rail, for the Helsinki traffic system.

In Helsinki, the trunk of the suburban lines consists of the railway and the Metro (underground), with their service levels being developed by station facilities and by increasing the number of trips. The service level having become adequate, feeder traffic will be introduced in the suburbs in the catchment area of the rail lines. The trunk of the downtown lines consists of the tramway network, the service level of which will be improved through the construction of new tramlines and through reserving tramway lanes separated from the rest of the traffic.

The objective with the planning of the road and street network in Helsinki is to direct vehicular traffic on to routes classified as motor roads or main streets, and to remove or restrict the through traffic of the streets of residential areas. The aim with the parking policy is to meet parking requirements among residents and customers and to restrict parking by persons at work, both downtown and in suburban centres.

The aim of the planning of light traffic[1)] is the construction of a network of light traffic separated from other traffic throughout the area of the city. In the central areas of the city, adequate space will be reserved for pedestrian traffics, as far as is possible at street level.

5
DEVELOPMENT OF TRAFFIC AND LAND USE

5.1
Development in the numbers of inhabitants and jobs in Helsinki

The changes that have occurred in the physical environment have mostly stood in direct inter-relationship with the developments occurring in traffic. Essential background factors to the development of traffic are the changes in the population and job numbers.

Until 1970, a strong migratory movement flowed in towards Helsinki, raising the population to 523 000

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1) light traffic = pedestrian and bicycle traffic

inhabitants at its maximum. Subsequently, the flow of migration has been reversed from Helsinki towards its neighbouring communes. The outmigration has been particularly marked in the core area of Helsinki. The working population resident in Helsinki increased between 1960 and 1970 from 240 000 to 272 000, while the number of jobs in Helsinki increased concurrently from 273 400 to 327 000, i.e. much above the city's own needs. The increased job self-sufficiency has contributed to a growth in the proportion of that part of the population working in Helsinki which resides in the neighbouring communes. This has also meant lengthened travel to work and increased travel requirements.

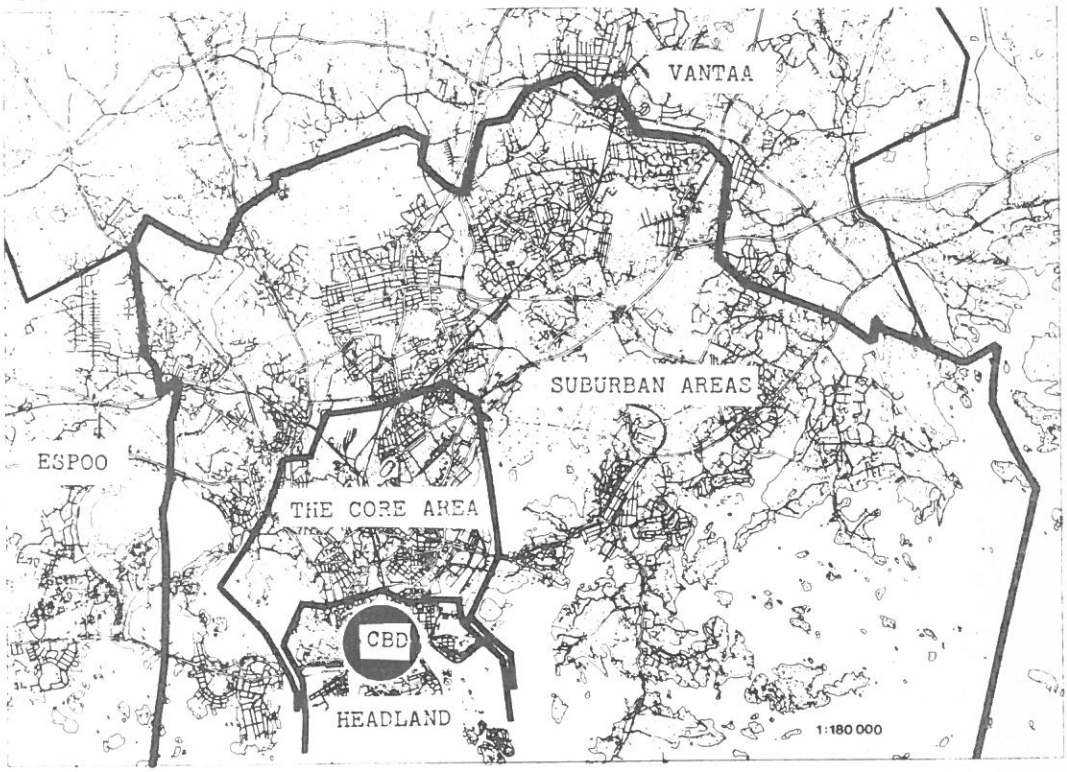
Table 3.
Numbers of inhabitants and jobs in Helsinki

Area	Population in thousands			Jobs in thousands		
	1960	1970	1975	1960[1)]	1970[1)]	1975[1)]
Headland	110.9	86.2	72.1	125.9	140.3	143.0
Rest of the core area	157.8	134.8	120.3	66.4	72.9	76.0
The core area, total	268.7	221.0	192.4	192.3	213.2	219.0
Suburban areas	164.8	286.1	296.8	33.7	59.4	77.0
City of Helsinki	448.3	523.7	503.0	273.4	327.0	345.1

1) About 17 per cent of the jobs in the whole city of Helsinki are either mobile or of unknown location.

FIGURE 3.

DISTRIC DIVISION OF HELSINKI



5.2
Development of the vehicular traffic

Motor vehicle stock

One of the background factors affecting the development of traffic in Helsinki is the number of registered vehicles. Since 1965 the motor vehicle stock in Helsinki has grown by about 40 000 vehicles, i.e. by about 50 per cent. By the end of 1975, Helsinki had 121 000 registered motor vehicles, 99 000 of which were cars. The number of motor vehicles registered in the neighbouring communes has also materially affected the development of traffic in Helsinki. With the population development, the number of vehicles has grown more rapidly in its neighbouring communes than in Helsinki. The motor vehicle stock in the whole Helsinki region has grown at roughly the same speed as the traffic at the borders of Helsinki.

Table 4.
Number of registered motor vehicles in Helsinki

Year	Cars	Vans and lorries (trucks)	Buses	Other	Total
1965	64 635	11 074	1 184	4 716	81 609
1970	86 989	14 147	1 429	3 968	106 533
1975	99 420	15 361	1 231	5 178	121 190

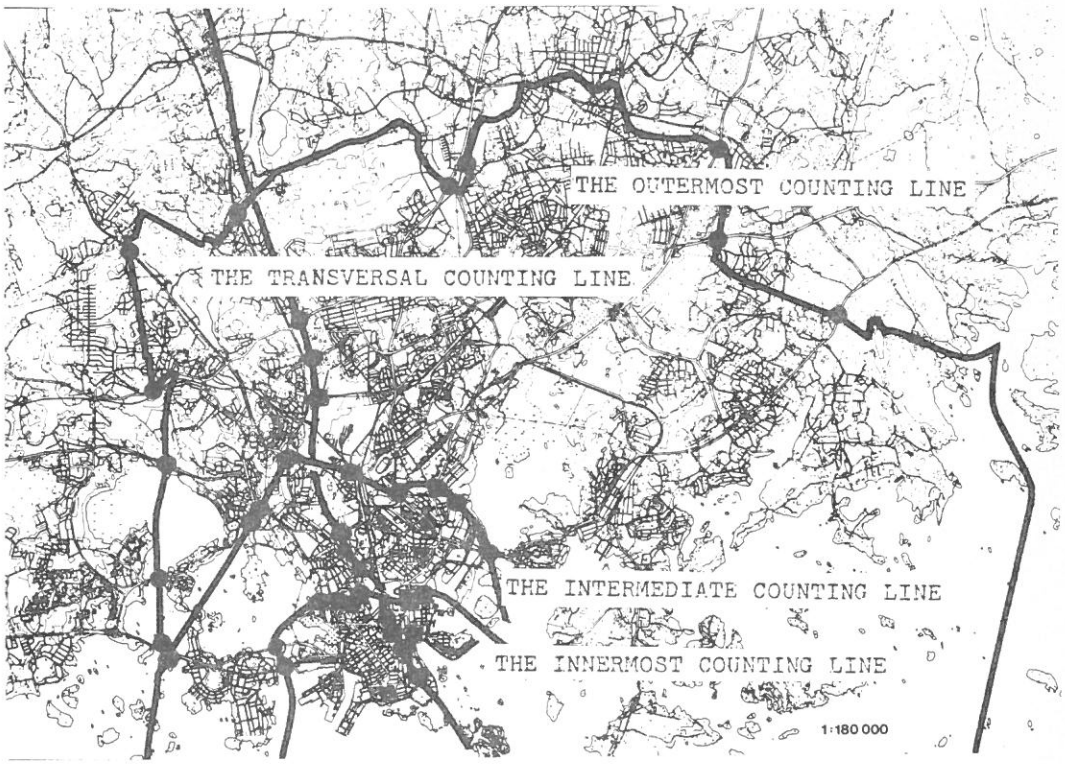
The number of registered motor vehicles in the entire Helsinki region increased from 94 000 to 173 000 in the period between 1965 and 1975.

Motor vehicle traffic at counting lines

The development of the motor vehicle traffic in Helsinki has been surveyed annually at four counting lines which are located at the border of the headland, the border of the core area, the border of the city, and at a transversal counting line running in the direction of the street called Mannerheimintie.

FIGURE 4.

COUNTING LINES OF THE CITY OF HELSINKI 1976



The development of the traffic crossing the innermost counting line (the border of the headland) is followed with particular interest, because this counting line measures the direction of the development of the traffic in that part of Helsinki where the traffic rush is greatest. The general development at the border of the headland indicates that the number of vehicles increased in the 1960s at an annual rate of above 8 000 vehicles until the growth came to halt at the turn of the decade. With the exception of a single year, the total amount of traffic varied between 203 000 and 206 000 vehicles. The index employed is the aggregate number of vehicles in both directions between 6 a.m. and 8 p.m. on a weekday in September. The car traffic to the peninsula, however, increased during 1975, raising the amount of traffic to close on 211 000 vehicles.

In connection with the counts at the peripheries that are utilized in follow-up studies, information was concurrently obtained on the traffic along the main routes of Helsinki. In 1975 the most heavily trafficked of the routes leading to the headland were those along Hakaniemi Bridge and Mannerheimintie Street, on both of which the daytime traffic volume was roughly 35 000 vehicles. Prior to the closing down of Pitkäsilta Bridge[1] to private vehicles during rush hours, it was that route which conveyed the greatest number of vehicles to the headland (app. 40 000 vehicles between 6 a.m. and 8 p.m.).

In 1975, the innermost counting line showed a figure exceeding 20 800 vehicles for the morning peak hour of 7.30 to 8.30 a.m., both directions included. The evening peak hour fell between 3.45 and 4.45 p.m., the number of vehicles then being 22 300.

The traffic crossing the intermediate counting line (the city core border) increased until 1972 at an average rate of 8 000 vehicles a year, since which time the daytime traffic volume has remained at a level of about 230 000 vehicles. During 1975 the traffic increased to peak levels, i.e. to 233 000 vehicles, which resulted from a marked increase in car traffic. Since 1971 the volume of goods vehicles has shown a steady increase.

The biggest traffic volumes at the intermediate counting line occurred on Kulosaari Bridge, which conveys the entire traffic between the centre and the east of Helsinki. The daytime traffic on Kulosaari Bridge amounted to 44 000 vehicles in 1975.

The traffic volumes of the morning and the evening peak hour across the intermediate counting line were roughly 25 000 vehicles in 1975, both directions included.

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1) Part of the public transport experiment carried out in the Helsinki region in 1974.

The development in the traffic volume across the outermost counting line (the city limits) involves the most substantial change across any counting line. The increase in the daytime volume of traffic has been fairly linear, at about 10 000 vehicles a year. Between 1965 and 1975 the traffic across the line doubled, the daytime traffic in 1975 amounting to about 172 000 vehicles. By 1975 no signs had yet occurred to indicate any halt in this growth. A partial reason for this growth in traffic between Helsinki and its neighbouring communes is the increase in the traffic flow between jobs centred in Helsinki and the residential targets located in those communes.

On the transversal line the volume of traffic has increased unevenly from one year to another. The general development, however, indicates that growth has occurred. The trend relates equally to all groups of vehicles, and the structure of the traffic has remained unchanged, at least during the 1970s.

The following table shows in summary the traffic volumes across the various counting lines in 1965, 1970 and 1975.

Table 5.
Number of vehicles crossing the counting line on a weekday in September from 6 a.m. to 8 p.m.

Year	Innermost counting line	Intermediate counting line	Outermost counting line	Transversal counting line
1965	169 700	-	86 500	-
1970	203 600	210 900	131 400	154 000
1975	210 700	233 100	171 900	160 600

Quantitative development of bus and tram traffic

The number of public transport vehicles at the innermost counting line remained relatively constant between 1965 and 1974. The number of buses and trams was at its amximum in 1972, when the counting line was crossed by 26 280 public transport vehicles in a single day. By 1975, however, public transport had decline to 23 000 vehicles, which is clearly below the figures for the preceding years. At the border of the city core, the development has complied fairly

closely with the same tendencies. The decline in internal public transport in Helsinki is assumed to be due partly to a shortage of drivers and partly to the increased role of the State Railways in local transportation in Helsinki.

Table 6.
Number of buses and trams diurnally

Year	Innermost counting line	Intermediate counting line	Outermost counting line	Transversal counting line
1965	23 900	-	6 400	-
1970	25 300	20 800	7 500	7 900
1975	23 000	19 800	7 800	9 000

The public transport between Helsinki and the neighbouring communes has grown during the 1970s, which indicates a trend conforming to that in the car traffic.

Quantitative development of goods transport vehicles

The development in the goods transport was measured in connection with follow-up counts, in terms of changes in the numbers of vans, lorries (trucks) and semi-trailers. At the innermost counting line a peak in goods traffic was attained in 1973, when the diurnal (24-hour-day) volume of goods vehicles amounted to some 40 000 vehicles. Since that time, goods transports to the centre have declined sharply. In 1975 the innermost counting line was crossed by 32 500 goods vehicles a day, a decrease of 19 per cent within two years. The reasons for this decline were a) the economic recession, b) rationalization of goods transportation, and c) changes in land use.

At the intermediate counting line, a decline in goods traffic has been occurring ever since 1971. In the period 1971-75 the number of goods vehicles declined at this line by about 10 000, i.e. by 19 per cent.

Table 7.
Aggregate diurnal number of goods vehicles

Year	Innermost counting line	Intermediate counting line	Outermost counting line	Transversal counting line
1967	34 200	41 700	21 100	-
1970	37 100	42 400	30 600	33 500
1975	32 600	38 700	27 900	30 600

5.3 Development of passanger traffic

The role of the public transport media as a conveyor of passanger traffic remained roughly unchanged at the innermost counting line from 1966, the year in which the follow-up began. A structural cahnge has taken place within public transport, with trains supplanting buses in passenger traffic.

Table 8.
Percentage distribution of passengers crossing the innermost counting lines in vehicles of various types

Year	Bus and tram	Train	Car	Other	Total
1966	56 %	6 %	28 %	10 %	100 %
1975	53 %	10 %	30 %	7 %	100 %

The structure of passenger traffic is undergoing a geographic change, in the sense that the relative proportion of cars in the transportation of passengers rises from the innermost to the outermost line, while the proportion of public transport decreases respectively.

The estimates of the numbers of passengers in public transport at the different counting lines are still very inadequate. The most accurate data on the number of passengers in public transport crossing the innermost counting line are from the year 1972. In that year, the innermost counting line was crossed by

about 502 000 passengers conveyed in public transport, both directions included, in a space of 24 hours. In a count carried out in 1966 the number of passengers obtained was about 410 000, and the passenger volume in public transport must have grown by about 90 000 persons between 1966 and 1972. The structure of passenger traffic in 1970-75 has changed, with the number of passengers conveyed by the railways growing by some 30 000, i.e. by 65 per cent. The proportion of the railway traffic in the total number of passengers entering the centre by means of public transportation was about 16 per cent in 1975.

The following table shows the distribution of passengers in public transport crossing the innermost counting line in Helsinki among different forms of transport in 1972.

Table 9.
Distribution of passengers in public transport crossing the innermost counting line 1972

Bus	Tram	Train	Total
333 000	119 000	50 000	502 000

5.4 Speeds of vehicular traffic

Speeds of traffic in Helsinki have been studied systematically since 1970. Measurements have been kept during peak traffic hours in the morning and evening in the direction of the traffic rush, and, in daytime traffic, on the traffic in both directions.

The average speeds (km/h) of bus and private traffic during spring 1975, as measured from the centre to the ends of the buslines are shown in the following table. The measurements on the private traffic were made along roughly the same routes.

Table 10.
Speeds of vehicular traffic

Route	Morning rush	Day traffic	Evening rush	Morning rush	Day traffic	Evening rush
Länsiväylä (west)	33	-	33	43	64	50
Vihdintie (north)	30	32	26	23	39	22
Nurmijärventie (north)	26	30	30	25	44	21
Mäkelänkatu Pakilantie (north)	21	26	23	25	38	21
Itäväylä (east)	31	37	34	26	50	34

According to the measurements, the speeds of the bus traffic and the private traffic differ rather little during the rush hours. In the day traffic, however, the private vehicles clearly move with greater rapidity. During rush hours, the bus traffic has attained slightly higher speeds than the private traffic in the northerly direction and, during the morning rush, in the easterly direction. Private traffic, however, was clearly faster in directions west.

Where the entire route network is concerned, no distinct and general trend towards increase or towards decline can be discerned in bus speeds during the 1970s, but improvements have been brought about in bus lanes and through other similar traffic arrangements in the core area and its fringes in very recent years. The speeds of buses are now higher than the speeds of private vehicles in the core area during rush hours. The situation has consequently become a more favourable one for public transport, as compared with the situation in 1970, when the speeds of private vehicles were distinctly higher than those of buses even in the core area during rush hours.

6
MAIN ROAD NETWORK OF HELSINKI

6.1
Radial access roads

Nine radial main routes lead into Helsinki, five of which are national highways and four routes chiefly serving regional transport. Seven of the access roads were built in the 1960s and 1970s as motor roads with link-ups at traffic interchanges, and extend out from Helsinki at that standard for a distance of between 15 and 45 kilometres. In the Helsinki area, three of these have 3 plus 3 lanes and the others 2 plus 2 lanes. On two of the access roads the outer lanes are reserved for buses. Public traffic lanes have also been built into the street networks at junction roads.

The traffic volumes of the access roads vary along the different routes from 15 000 to 50 000 vehicles a day. The eastern and the western motor road are the routes bearing the heaviest loads (45 000 to 50 000 vehicles a day), and are congested in parts. The two still unimproved regional access roads, which have 1 plus 1 lanes, are likewise congested. Along the others, the level of service has remained relatively good, in contrast.

The radial roads link up with the city main street network at distances of from one to five kilometres from the centre. The main city street network, being of a lower quality, is partially congested.

In the next few years, two of the access roads of one plus one lanes will be improved and have 2 plus 2 lanes. However, there is no intention to construct new radial motor roads, for the intention is to restrict the car traffic entering the centre. The aim is to intensify the use of the present motor roads in short distance and local traffic, by inserting new junctions along them. When necessary, separate lanes will be reserved for public transport.

6.2
Ring routes

An extreme scatter of residential areas far out into the surrounding environs occurred in the region of the city in the 1960s and 1970s. A marked growth of peripheral traffic is a consequence of this development.

The region now has two ring roads connecting the radial roads. Ring I is between 7 and 9 kilometres from the centre, and Ring III 13 to 15 kilometres.

They were built in the 1950s and 1960s and are in parts of fairly modest standards. The number of lanes varies from one plus one to two plus two. Of the junctions, it is only those with the radial roads which are at split levels. The present traffic conveying capacity of the ring roads is insufficient. This results in the traffic becoming congested in the crowded centre, and in its drifting into the residential areas of the suburbs. The most importing road construction project in the next few years will be precisely an improvement in the present ring routes and the building of new ones.

In the northern section of the city core, approximately four kilometres from the centre, Metsämäentie Road is under process of construction to link up radial roads. This main street will be important also for traffic connections for Pasila, the area into which the centre of Helsinki is expanding.

The Public Roads and Waterways Administration has made initial plans for the construction of two peripheral motor roads for Helsinki. One of these will connect the nationally important northeastern and western motor roads. The other ring road that is projected by the Public Roads and Waterways Administration would be Ring II. This would be located between Rings I and III and would connect all the radial roads of the region, as does Ring III. In terms of location, it would be central and would provide good service for traffic, say, between Esppo and Vantaa.

6.3 Traffic network in the centre

The traffic network in the centre of Helsinki was lasgely constructed durin periods when account could not be taken of the present requirements of motor vehicle traffic. The old town structure on the one hand, and the geographic location of the centre - a headland fringed by the sea - on the other, impose substantial restrictions on the construction of new routes. Almost all the main streets are also important shopping streets, which causes disturbances in the functions of the centre. The through traffic also puts a strain on the residential areas surrounding the centre.

Some of the main streets were re-arranged in the 1960s and early 1970s so as better to meet present-day requirements. Particular emphasis has been placed on improving the working preconditions for public transport, by reserving separate lanes for buses and trams. The introduction of extensive one-way traffic has been made among the streets of the grid pattern.

The absence of good concentric street connections is a problem in the city centre too. The through traffic is consequently a strain on the already crowded street network. The construction of a centre ring-route and of a new main street to be called Vapaudenkatu which will feed traffic to it from the north has long been among the city plans.

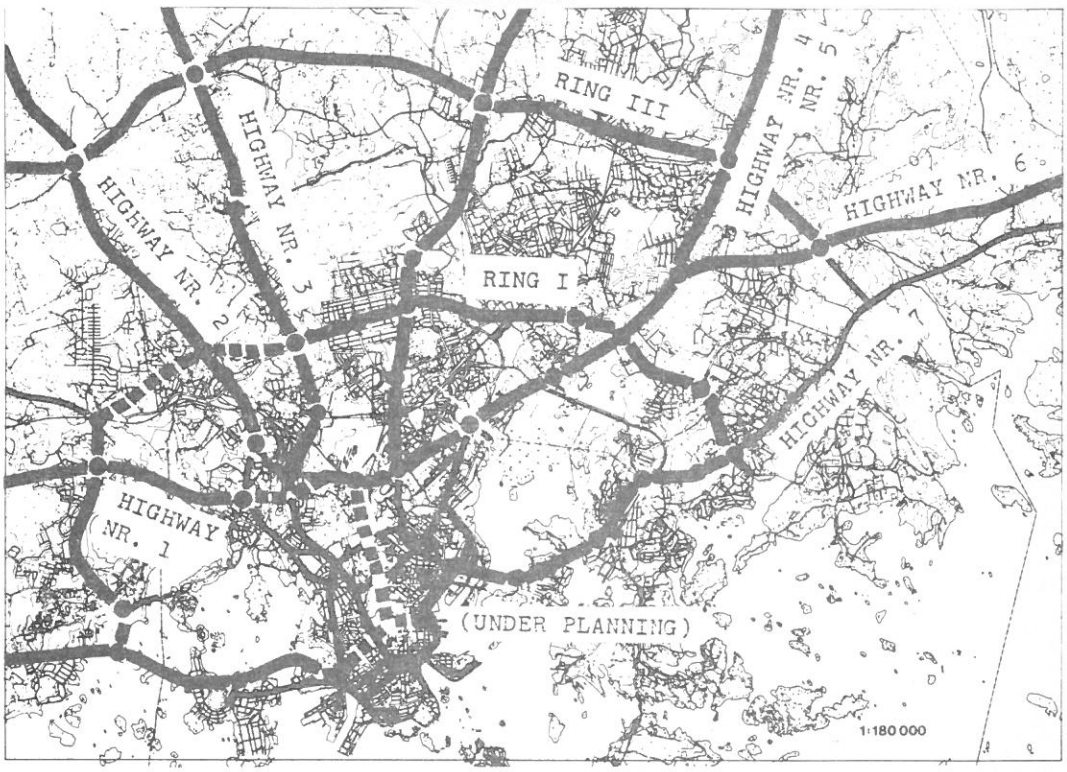
There is space for the western part of this central ring route adjacent to the dockyard railway that runs at the north of the city centre. In contrast, the eastern part presents a problem, as it would have to run underneath the railway yard and along the edge of the centrally located Kaisaniemi Park. The route would run in a cutting or a tunnel for almost entire length there.

Vapaudenkatu, the street that is to lead northwards, has been planned tu run right by the railway along its western side. It would act as a link for the radial roads and the Pasila area, leading in to the centre.

The purpose of the construction of the centre ring route and Vapaudenkatu St. would not be to increase the volume of car traffic entering the centre. It is the intention to free the centre and the surrounding residential areas of through traffic simultaneously with the completion of the route. The construction projects, however, require a great amount of financing. Because of their central location, they are also a great challenge to planning in general. In any event, the intention is to commence construction of these two large routes during the present decade.

FIGURE 5.

MAIN ROAD NETWORK OF HELSINKI



Altogether, the main road network of Helsinki comprises 39 kilometres of motorways and motor streets and 153 kilometres of main streets.

7
TRAFFIC LIGHT SYSTEM IN HELSINKI

At the end of 1975, Helsinki had 178 intersections controlled by traffic lights, most of which - a total of 129 - were connected to a computer. The remaining 39 intersections were either completely separate, vehicle-controlled intersections or small "green wave" groups. The traffic light system is expanding, with between 15 and 25 other extensions being equipped with traffic lights every year.

7.1
Computer controlled traffic lights

Helsinki was one of the first cities in Europe in which a computer was adopted for the control of traffic lights. The acquisition of computer-controlled traffic lights was decided upon in 1965, and the system was put into operation in 1967. The computer system is made by Siemens and is of type VSR 16013T. The system has subsequently been expanded to contain two more computers. In 1974, the Vallila subsidiary station was put into use, the computer there being a Siemens VSR 16004. At the end of 1975, a computer system FTC 12000 supplied by Fiskars, Finlans, was put into use at the Ruoholahti subsidiary station.

The computer controlled traffic lights in Helsinki function on the programme selection system. At any one time, the computer memory has 16 fixed-time programmes, of which the most suitable programme is selected for each traffic situation. The changeover from one traffic-light programme to another does not occur simultaneously over the entire computer-controlled area, but does so within the scope of smaller trafficwise-integrated intersection groups. Numerous varied traffic light programmes are usually in use in the whole area. The changing of programme may occur in three different ways. During the first years in which the computer system was used, the programme change was chiefly effected automatically at certain hours according to a weekly automation of the computer. In exceptional traffic situations, the programmes can be changed manually upon a control order issued by the duty officer at the central control station for traffic lights. The duty officer receives information of any exceptional traffic situation primarily by means of telephone or police closed-circuit radio, but the duty officer has the further aid of four television cameras through which

the flow of traffic can be observed at four of the liveliest intersections in the centre. In 1975 a programme-selection system was taken into use in which the change of programme occurs automatically with the variations in traffic volume. The first trial area contains five groups of intersections, with a total of 46 intersections. The area has 19 measuring points, providing traffic data that aid the computer when it selects the most suitable programme for any traffic situation. It is the intention further to develop the use of the programme selection system.

The traffic-light programmes have been so prepared as to form green waves along main routes in order to increase the conveying capasity and to make driving attractive. During rush hours, the length of a phase is 90 seconds. During quieter periods, the length of phases is 75, 60 or 45 seconds. In addition, some special programmes have been prepared, for instance for "alarm" vehicles, so as to provide a "green wave" along the route of the vehicle for the necessary period.

At night, and at other times when the traffic is sparse, the traffic lights are switched to "amber blinker". The functioning period of the traffic light is determined according to traffic volume at the various crossings, and according to safety aspects.

7.2 Targets for the traffic light system

The traffic light programmes in Helsinki were originally prepared manually, and adjustments are continuously been made in them with changing traffic conditions. For the optimation of the timing of the traffic lights, Helsinki has acquired a TRANSYT set of computer programmes by which the timings of the traffic lights of certain street sections have been tested. The possibilities of the transit programmes are still being examined. In addition, certain computer programmes associated with the timings of the traffic lights are being developed locally.

Particular attention has been paid in Helsinki to the smooth flow of public traffic when setting traffic-light timings. On certain streets, a green wave for public transport has been created to take account of the average delays caused by stopping. The intention is further to favour public transport by experimenting at certain points with the fine adjustment of the length of green wave, in which a separate light stage is reserved for public transport by means of vehicle indicators, or in which the "green" intervals are longer for public traffic.

The pedestrian traffic frequently imposes restrictions upon the favouring of public transport through the timing of traffic lights. There are very few pedestrian underpasses or overpasses separated from motor vehicle traffic in the centre of Helsinki, and the passage of pedestrians across the routes of the motor vehicle traffic must consequently be made safe by means of traffic lights. Attention has actually been paid to pedestrians in the timing of traffic lights, for instance in the sense that at pedestrian crossings with traffic refuges (islands) the pedestrians do not usually have to halt at the refuge. The principle imposes restrictions on the formation of "green waves" for public or other vehicular transport.

In planning the traffic lights in Helsinki, the objective is to make the timing of the traffic lights fit the variations on traffic volume as well as possible, without, however, risking the co-ordination of lights which creates the "green wave". It is the intention to increase the number of vehicle indicators measuring the variations in traffic volume in areas where traffic-guided programme selection will be applied. Indicators will also be installed in places in which fine adjustment of the period for which the green light shines is applied. Increasing the number of television cameras has also been given consideration. In the adjustment of the timing of the traffic lights, ever-increasing attention is devoted to the smooth flow of pedestrians and public transport.

FIGURE 6.

JUNCTIONS CONTROLLED BY TRAFFIC LIGHTS IN HELSINKI 1976

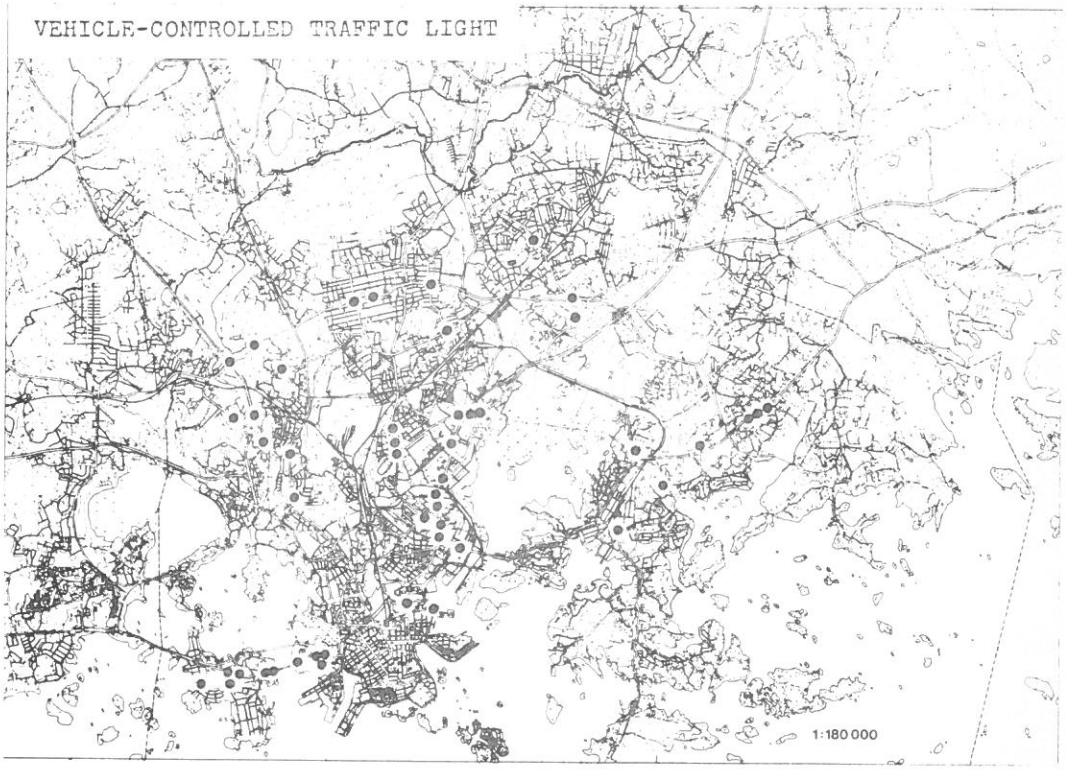
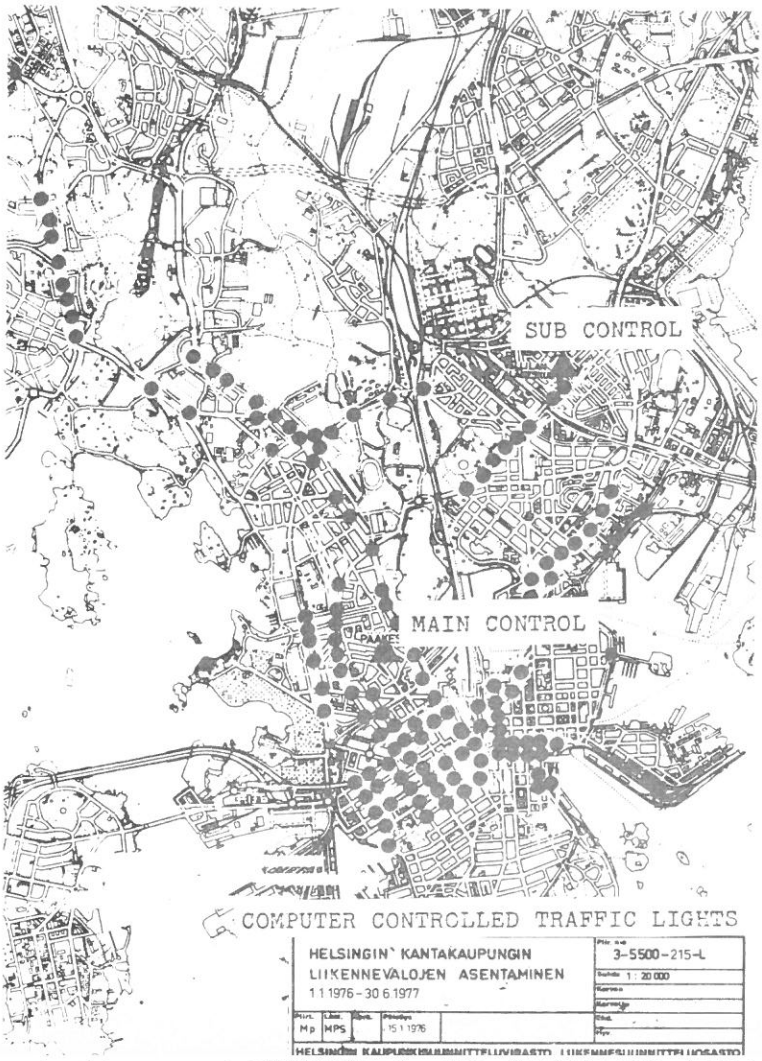


FIGURE 6.A

JUNCTIONS CONTROLLED BY TRAFFIC LIGHTS IN HELSINKI 1976



8
PLANNING OF PARKING FACILITIES IN HELSINKI

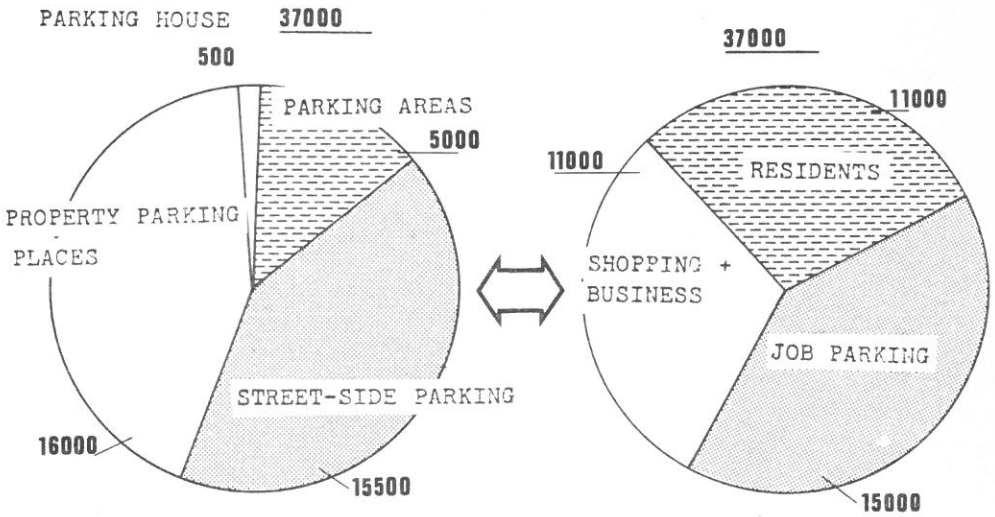
8.1
Present situation

The present number of parking places on the Helsinki headland (the centre area) is approximately 37 000, of which about 11 000 are available for residents and about 15 000 for parking while at work. Approximately 11 000 parking places are thus left for short-time parking.

The number of parking places in the rest of the core area is approximately 46 000, of which 19 000 are available for residents, about 21 000 for parking while at work and about 6 000 for short-time parking.

FIGURE 7.

DISTRIBUTION OF PARKING LOCATIONS 1975



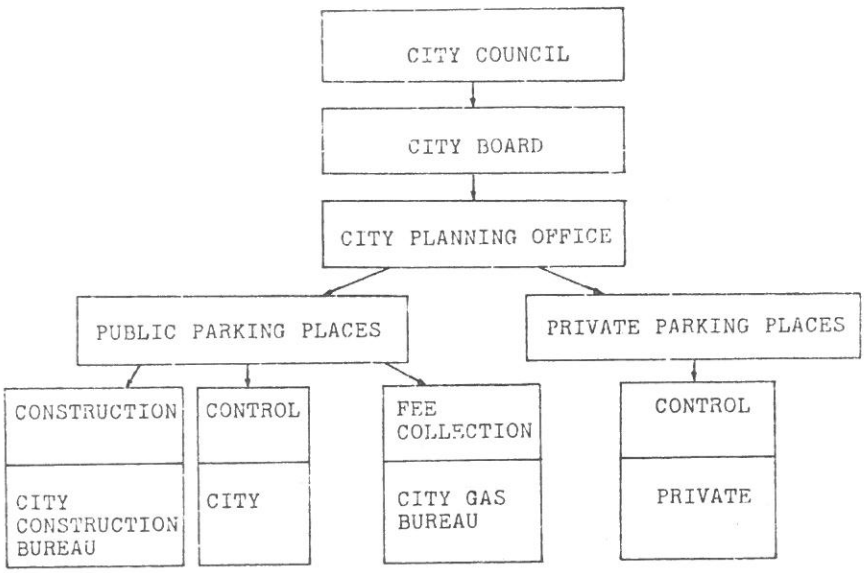
There is some variation in the amount of the parking charge that is collected by means of parking meters (numbering 2 500 in 1976) put up by the city. The city is divided into three different charge zones, their rates on 1 January 1976 being:

Zone I	(Centre)	2 mk/h
Zone II	(around Centre)	1 mk/h
Zone III	(north part of city)	40 p/h

New parking areas based on a centralized parking system have been established in the suburbs. In order to ensure the proper use of these parking areas, street-side parking is prohibited in such sections. One of the shortcomings of centralized parking lies in parking offences consisting of parking, say, on pedestrian routes which follows as a consequence of the distance on foot between dwelling and parking place. Nor has equity been accomplished in respect of the walking distance. On the other hand, it has been possible to establish peaceful car-free backyards by utilizing such concentrated parking.

FIGURE 8.

ORGANISATION OF PARKING PLANNING AND CONTROL IN HELSINKI



8.2
Aims

The policy on parking places which supports the traffic aims of the city core has been expressed in the master plan for the core area:

- the growth in the amount of car traffic is restricted in the central areas of the city core. The volume of car traffic entering and leaving the centre is controlled through measures in car policy. It is a recognized objective that the volume of car traffic arriving at the centre should be no bigger in 1985 than it is today. At the border of the core area, the increase should be no greater than 25 per cent.

- the implementation of land use objectives is supported by means of measures of parking policy, which means that the following principles are adhered to in controlling the number and the use of parking places:

  - the number of parking places controlled by the city is increased when possible,

  - the places for cars which are needed by residents are constructed,

  - the parking places for brief shopping and business errands are constructed,

  - parking places required while occupants are at work are not built out.

An effort is usually made to satisfy the parking needs in the suburban areas. An exception is the centres of the suburban sections where a high level of public service transport exists or can be arranged. Job parking is restricted in these centres, but attempts are made to ensure that there is parking space for residents even in these suburban centres.

8.3
Standards employed in city planning

The parking standards utilized in the city planning vary according to the city section. The following table shows the parking standards relating to their main functions:

Table 11.
Standard employed in city planning pp/m^2

	Dwellings	Customer services	Offices	Industry
City core, south	1/120	1/150	1/350	not determined
City core, north	1/100	1/100	1/250	not determined
Suburban areas	1/80	not determined	1/60	1/90-130
Centres of suburban sections	1/80	not determined	1/100	1/180-260

pp = parking place (for one car)
m^2 = square metre of floorspace

A policy has also been adopted for the suburban areas under which the requirements for about five years are satisfied, with the number of parking places supplied in the first phase, with means approximately 50-80 per cent of the above parking standards.

8.4
Instructions on the planning of parking

Instructions on the planning of parking are being prepared in the City Planning Iffice. The principles on which the instructions will be based are:

- parking places should usually be concentrated in the central and commercial sections, primarily along the sides of the main streets and catchment streets surrounding the centres; and, in the residential sections, in the noisy areas of the streets

- any parking place should be located as closely as possible to the functions it serves, with a view to environmental aspects, traffic safety, etc.

- in the locating of parking places, consideration must be given to keeping noise down to a tolerable level

- street-side parking should not be allowed in new areas, and, in old arease, the street-side spots should mainly be reserved for brief parking and for parking by residents

- in industrial areas, parking places should be so located that parking does not interfere with loading and unloading

- parking places should be on the same side of the street as the functions that they serve

- the parking places must have immediate connection with the light traffic network, while the main entrances to buildings should be on the side of the light traffic network and on the opposite side of the building to the parking.

9
BUS AND TRAM TRAFFIC

The present public transport system in Helsinki is based on very heavy bus traffic. The overall length of the system of bus-lines today is roughly 500 kilometres, and is probably one of the most closely meshed networks and among those providing the best service anywhere in the world. The rail transport system, not counting the tram network, is undeveloped in comparison. It is only in very recent years that the employment of railways for local transport has become intensively utilized.

It follows from the dominance of the bus traffic that the numbers of motor vehicle are very high in some streets. On the streets where the traffic is at its liveliest, the number of buses is approximately 10 000 a day. This means that the amount of traffic at rush hour is about 400 buses per hour in the direction in which the rush is moving. The moving of such amounts of traffic naturally requires lane arrangements and widened places for bus stops.

The buses in Helsinki are almost exclusively diesel-powered. The utilization of electrically powered trolley buses was discontinued in 1974. The reason was that the equipment was old and partly unserviceable. There has been a great deal of discussion about the acquisition of new trolley buses in Helsinki, but no decision has been made as yet on purchasing any, and it seems that any traffic with trolley buses cannot possibly begin until the 1980s.

A decision to develop the tram traffic was made by Helsinki Council in 1969, at the same time as it was decided to construct the Metro. Forty new articulated trams have been bought in recent years, and a policy decision has been made to order more. It appears that tram traffic is going through a period of revival in Helsinki.

9.1 Passenger volume

The number of passengers carried in the public transport vehicles of the Helsinki Transport Administration has developed as follows in recent years (number of passengers getting on, per year).

Table 12.
Passenger volume, Helsinki Transport Authority, in millions of trips a year

Year	Tram	Bus	Total
1971	71.3	112.6	183.8
1972	71.4	131.0	202.3
1973	64.3	134.1	198.4
1974	66.6	135.2	201.8
1975	66.5	134.3	200.8

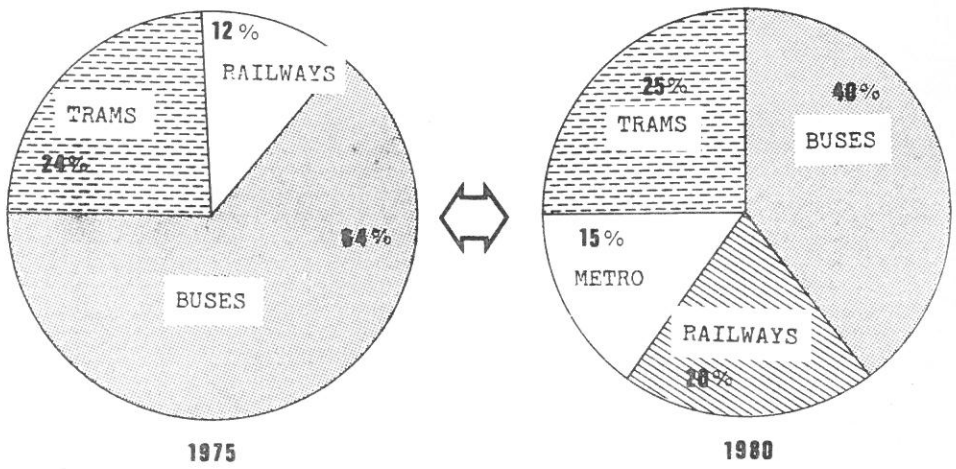
About 3.7 million trips in addition to the above volume were made within the State Railway's joint fare area (the city of Helsinki) in 1975.

About 40 private bus-line owners carry on bus traffic in the Helsinki urban region, additional to the Helsinki Transport Authority. Some 75 per cent of all bus trips to the centre of Helsinki are nowadays made on buses belonging to the Helsinki Transport Authority while roughly 25 per cent are made on privately owned buses.

The proportion of the trips by public transport that are made by bus will decrease in the future. The development of local railway traffic, the completion of the first rail stretch of the Metro, and the improvement of the tram traffic will, it is estimated, reduce the share of bus traffic in trips made to the centre of Helsinki by some 15 per cent. Today the share of the bus transport is about 65 per cent.

FIGURE 9.

DISTRIBUTION OF PASSANGERS IN PUBLIC TRANSPORT CROSSING THE INNERMOST COUNTING LINE 1976/1980



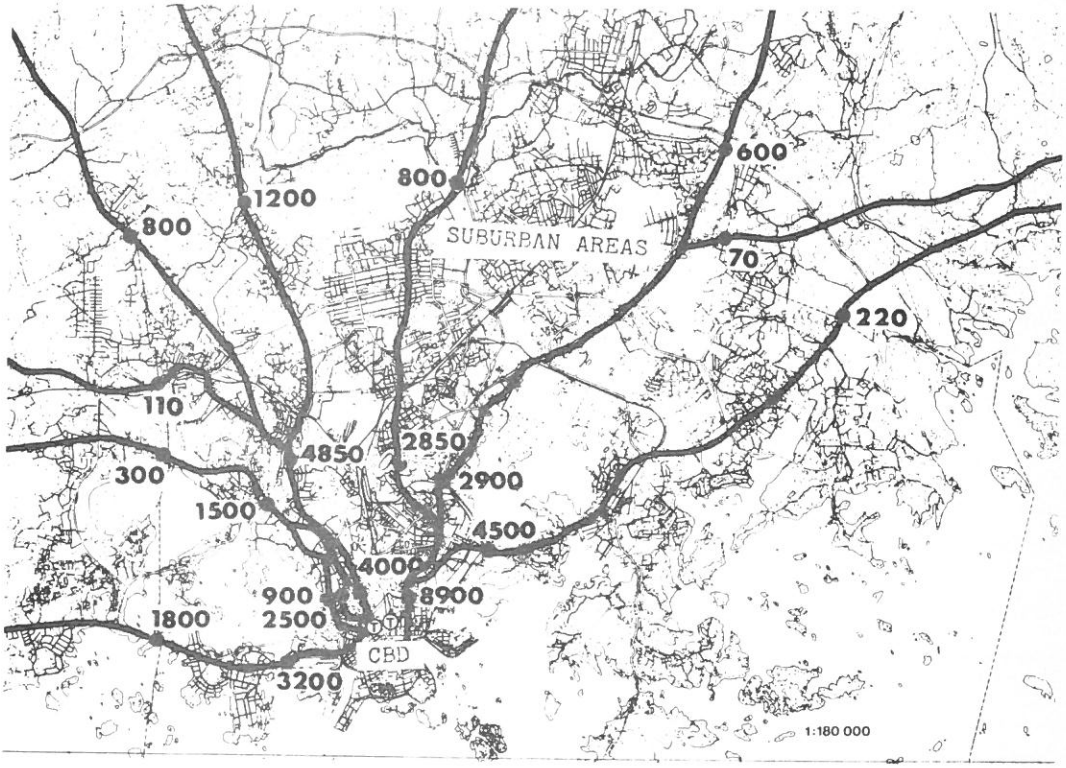
In the traffic internal to the city core, tram transport is expected to retain its present position at least, with a share of approximately 70 per cent of the trips made in the centre.

Local and long-distance traffic

The numbers of long-distance passengers arriving in the centre by bus and train are today equal, at approximately 20 000 a day each.

FIGURE 10.

NUMBERS OF BUSES IN HELSINKI 1975 (MAIN ROUTES)
BUSES/DAY



9.2
Development of route conditions

Public transport has been vigorously developed in Helsinki in recent years. As a step towards raising the service level and the passenger volume in public transport, route conditions have been improved by reserving separate lanes for public transport.

The following will show the development of the separate bus and tram lanes in Helsinki in recent years.

Table 13.
Separate lanes for public transport (kilometres)

Year	Tram lanes	Bus lanes
1969	24.0	-
1970	28.2	-
1971	36.4	-
1972	38.6	9.6
1973	40.9	18.8
1974	43.5	43.4
1975	43.5	44.0

The overall length of the railway network was 77.5 km approximately in 1975. The tram lanes are effective around the clock, and cannot be used under any circumstances except by "alarm" vehicles such as ambulances, fire engines, etc. The regulation of bus lanes is in effect in the direction of the rush, the periods being the rush hours of 7 a.m. to 9 a.m. and 3 p.m. to 6 p.m. In addition to buses, these lanes may be used by taxis and bicycles. The rest of the traffic may employ the bus lane for getting into file. The speeds of tram traffic and bus traffic have been considerably raised thanks to the system of lanes. The travelling speeds of buses in the city core at rush hours are today some 10 per cent higher than those of the car traffic. Another remarkable advantage is the improvement of the regularity of the runs.

The tramway network will be expanded in the future (by 10 kilometres under the 5-year programme), and more separate lanes will be reserved on the present network. More trams will be acquired.

The development of the route conditions of the bus traffic is of extreme importance, especially durin the 1970s. The plan for the near future (the 5-year programme) will reserve about 15 kilometres of bus lanes. Only at a later stage, when the metro and the railway traffic is adequately developed, will it be possible to change over to using the transportation capacity provided by broad-gauge rail transportation. Part of the bus traffic will then be converted so as to provide feeder traffic for rail transport.

9.3 Terminal stop areas in the centre

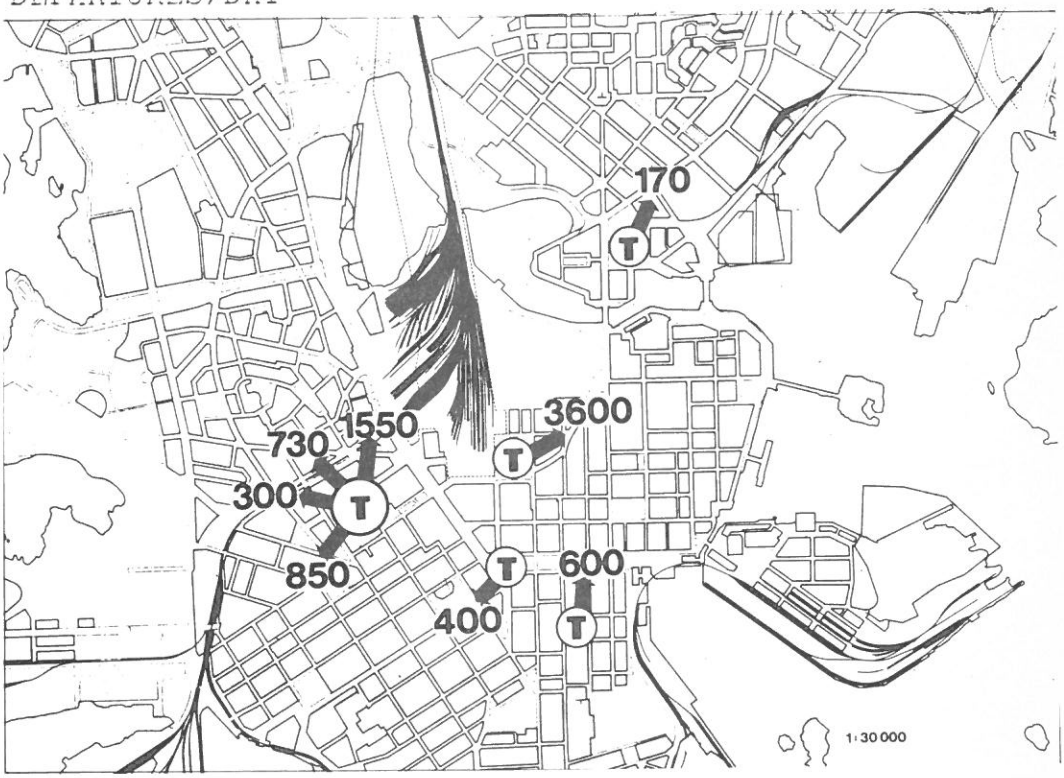
On account of the geographic location of Helsinki, the bus lines have taken on a radial pattern. The terminale areas are located in the very centre of the town. The present terminal areas occupy old squares and unbuilt city landlots.

On account of the overloading of these areas, the smooth running of the traffic and the safety of the passengers have continuously deteriorated. The most heavily loaded terminal area, that of Rautatientori (the Railway Square), is about 150 x 100 metres. The bus traffic from this place amounts to some 400 departures per peak hour and about 4 000 departures a day.

As a consequence of the overloading of the terminal areas, plans have been made for the construction of concentrated multistorey terminals in the commercial centre. According to the present plans, these terminals will be built in the early 1980s.

FIGURE 11.

TERMINAL AREAS IN THE CENTRE OF HELSINKI 1976
DEPARTURES/DAY



10
RAILWAYS IN LOCAL AND SHORT-DISTANCE TRANSPORTATION IN HELSINKI

10.1
Importance of railway traffic

The national trunk line from Helsinki northwards was completed in 1862, and it carried important local traffic as long ago as the late 19th century. The coastal railway line to the west was completed in 1903 where local traffic is concerned. More than 15 pairs of trains a day served Helsinki local transport along the two lines in 1910. Important improvement in respect of equipment in Helsinki's short-distance traffic occurred in 1958, when the steam-engined trains were rather rapidly replaced with diesel equipment. However, where the short-distance traffic is concerned, the real leap forward did not occur until 1969-70, when the electric rolling stock was taken into use on a large scale. The number of train trips was substantially increased, and the timetable speeded up.

The national and regional importance

Since the end of the 1960s, the Helsinki region has endeavoured to favour railway traffic for trunk connections in public transportation. The railway traffic offers rapid connections with nearby towns, which allows for commuting. The Helsinki region is actually the only area in the country with heavy short-distance traffic by rail. The catchment railway of the electrified short-distance traffic extends along the trunk line for about 73 kilometres, and on the coastline railway for about 40 kilometres, from Helsinki. The passenger volume in the short distance traffic on weekdays was about 43 000 in 1970 and 94 000 in 1975, and according to estimate will be 230 000 passenger trips a day in 1985, the annual growth being approximately 9 per cent per year.

In the catchment area for short-distance transportation in the region, that of Helsinki railway station excluded, there were 330 000 inhabitants and 125 000 jobs in 1975, and according to estimate there will be 510 000 inhabitants and 210 000 there in 1985. About 61 per cent and 72 per cent respectively of the entire passenger volume of the State Railways consists of passengers in short-distance traffic in 1975 and, projectedly, 1981, the respective figures for passenger kilometres being approximately 13 and 18.

In respect of goods traffic by rail, Helsinki is of importance also on account of its large port facilities. The incoming and departing volumes of goods traffic are roughly equal, being approximately 6 300 tons, i.e. nearly 30 goods trains, per weekday.

Local importance

Together with the metro, the State Railways will constitute the network of broad-gauge rail transport in the future. There are the national trunk line and the coastal railway line, and the Martinlaakso railway that forks off from the latter, in Helsinki. The aggregate length of these in the town is 25.5 kilometres, with a total of 15 stations and halts. The share of the railways in public transport into the city core from the catchment area of the railways that encompasses the northwestern and northeastern sectors of Helsinki will be roughly 50 per cent in 1985.

Approximately 75 000 passengers per day passed through Helsinki's main railway station in 1975, some 15 000 of these being long-distance travellers. The number of passengers going through Pasila Station was about 13 500 per day. In 1985 these stations will, it is

estimated, receive approximately 150 000 and 35 000 passengers a day respectively. The other stations serving mainly the traffic to the centre of Helsinki and to Pasila had a total of 23 000 passengers per day in 1975, but according to estimates they will have approximately 85 000 passengers a day in 1985, of whom some 23 000 a day would be on transfer journeys. The annual growth would be 14 per cent for the years 1975-1985. Among these other stations, Malmi would clearly be the biggest, with approximately 22 000 passengers a day in 1985 because of the transfer traffic. The other stations would on average have approximately 5 000 to 7 000 passengers a day in 1985.

The present frequency of the local trains is 4 trains an hour during rush hours and 2 trains an hour at other times. The speed of the trains in travel is about 42 kilometres an hour. To facilitate travel, a joint fare system between the State Railways and the city of Helsinki came into effect in 1975, with the tickets of the Helsinki Transport Administration being valid on trains within the limits of the city.

10.2
Track standard

The trunk line has three tracks and the coastal line nad the Martinlaakso line have two tracks. The most sizeable project, where short-distance traffic is concerned, will be the fourth track (of about 16 kilometres) out to Tikkurila, which is projected for construction along the trunk line in the early 1980s, and which will allow for a substantial increase in the frequency of the local trains, as these will be allotted tracks of their own. A possible new line to Porvoo carrying local traffic will join up with the trunk line at Tapanila.

The last of the many level crossings on the trunk and the coastal lines will be eliminated in 1978, and it is the intention to get rid of all the level crossing of rails by road traffic at stations, as elsewhere, by constructing 12 split-level rail crossings by 1983. These railway lines would then have about 40 crossing points, at average distances of about 0.5 kilometres. There have been quite a number of fatal accidents in Helsinki in recent years, i.e. approximately 11 a year, 60 per cent of which have occurred at stations or in their vicinity.

Stations

All the 11 stations along the trunk line and the coastal line within Helsinki will be renovated, because the safety and the sevice standards are inferior. The platform system at a number of stations will also be amended. The improvement of these

stations has already begun, and they will probably have become modernized by 1985.

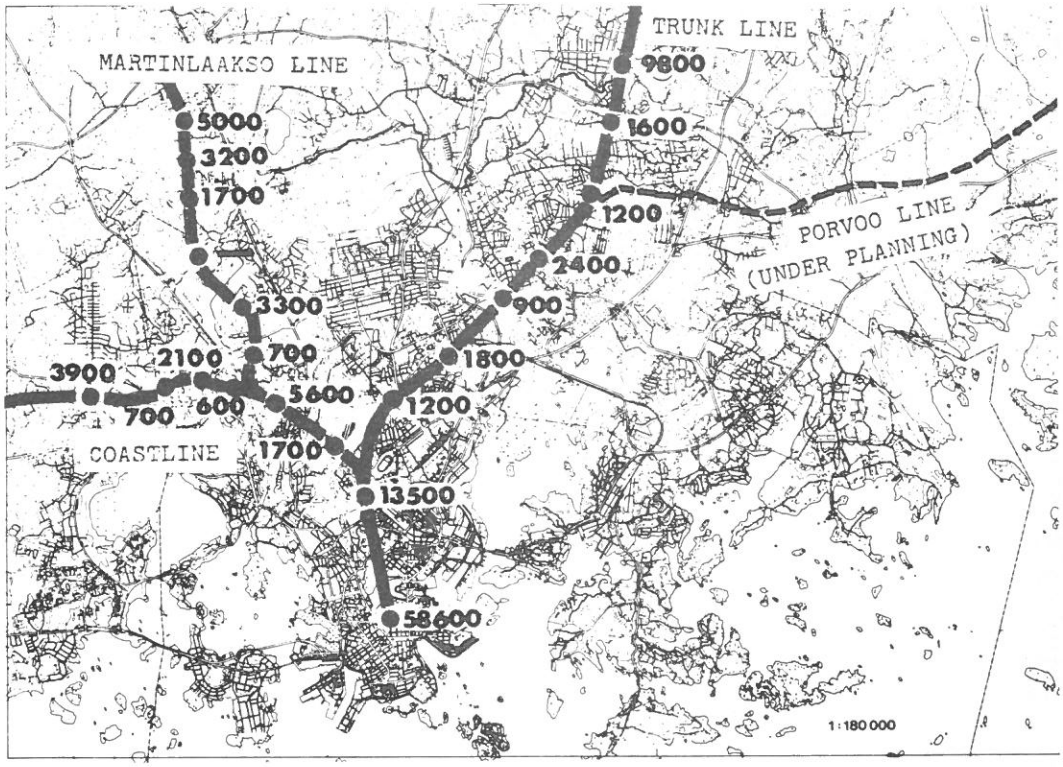
On the trunk line, use will be made of central-platform stations to be built between the third and the fourth tracks, with the station premises on the platform. The coast railway will have twin-platform stations. There will be stairs and a pair of lifts on each platform for changing levels, and space for escalators. At the large stations of Malmi and Pasila, the station premises will be above the tracks and they will immediately be furnished with escalators. All platforms will have roofing. The station facilities will cost some 4.5 to 20 million marks at the different stations, depending on the location and the size of the station and on the bridge or tunnel projects - that is, they will altogether cost about 110 million marks and will be built in co-operation with the State Railways.

The Martinlaakso line

The Martinlaakso line was built as a joint project by the towns of Helsinki and Vantaa and the State Railways in 1973-1975, to serve the public transport of the Haaga-Vantaa and Etelä-Vantaa areas being constructed in the northwestern part of Helsinki and in the town of Vantaa and to be completed by 1985. The catchment area of the railway will have about 33 000 residents in Helsinki and some 55 000 in Vantaa. The line is 8.5 kilometres long, about 25 per cent of it being along bridgeworks, and will be crossable at distances of about 200 metres. The railway line will have seven stations, and the forecast passenger volume is 50 000 passengers a day. Three stations and 4.9 kilometres of line will be within city limits. The completed stations at Pohjois-Haaga and Kannelmäki are on spacious ground and are equipped with lifts and with platform roofing. The overall costs of the line, including stations, will be approximately 110 million marks. Helsinki's share in the costs of the line will be about 50 per cent. Upon the completion of the line in 1975, the passenger volume was approximately 14 000 passengers a day.

FIGURE 12.

THE PASSANGER VOLUME OF SHORT DISTANCE RAILWAY TRAFFIC 1975
PASSANGERS/STATION/DAY



11
THE HELSINKI METRO

11.1
Construction stage I of the metro

In May 1969 the Helsinki City Council decided that the metro line Kamppi-Puotinharju should be constructed. The studies and investigations preceding the decision has taken some 15 years.

The length of the Kamppi-Puotinharju line is about 11.5 kilometres, 7.5 kilometres of which is surface line and about 4.0 kilometres underground in the centre of the city. The underground section will be built in the form of a rock-cut tunnel between 15 and 30 metres below surface level. There will be nine stations along the line Kamppi-Puotinharju, five of these being underground stations.

The construction of the line was begun in 1970, with the building of what was called "the testing track". The length of the testing track is approximately 2.8 kilometres. It will be a part of the final line. The testing track was completed in 1971, since which

time trial traffic to test rolling stock, track and technical arrangements has been run along the line. By 1976 most of the track of the outer area and the underground sections in the city centre will have been completed.

The construction of the metro stations is being carried out. According to the present timetable, the traffic on the metro will start up in the late 1980s.

The diurnal passenger volume of the metro line is estimated at 100 000 to 130 000 passengers at the commencement of traffic. The eastern suburban areas will, it is estimated, have about 120 000 inhabitants at that time. The share of the metro in the whole public transport system of Helsinki will then be about 11 per cent.

The bus lines running to the centre of Helsinki from the eastern suburban areas will be directed to the metro stations when the traffic on the metro has been started up. Two-thirds of the metro passengers from the eastern part of Helsinki are expected to reach the metro stations by bus.

The overall costs of the metro line between Kamppi and Puotinharju have been estimated at approximately 900 million marks, which will cover everything that is needed to start up the metro traffic along the line.

11.2 Later development of the metro

After the first stage of construction on the metro, the most profitable alternative will be the construction of the coastal metro, i.e. the extension of the metro line from Kamppi to Espoo (westwards). Lines passing through Lauttasaari and Töölö have been studied as routes alternative to each other. As a result, a line running through Töölö was recommended. An extension of the Kamppi-Puotinharju metro line eastwards to Vesala has also been investigated. This line, however, would primarily be of local importance, and will probably not be built until after a westwards extension. It should be pointed out that no decision regarding any extension durin a second stage of construction has yet been made.

Metro networks far more extensive than the above coastal line have been proposed, for instance a two-branch line in the city centre. The plans were prompted, however, in a situation in which the growth forecasts for the land use in Helsinki and its region were of quite a different order from the present state of affairs.

FIGURE 13.A

THE DIURNAL PASSANGER VOLUME OF THE METRO LINE KAMPPI - PUOTINHARJU 1980

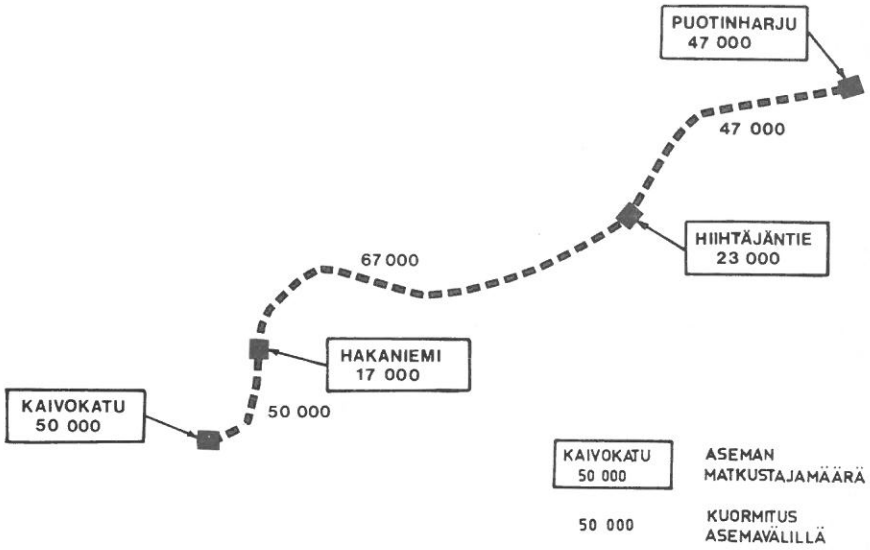
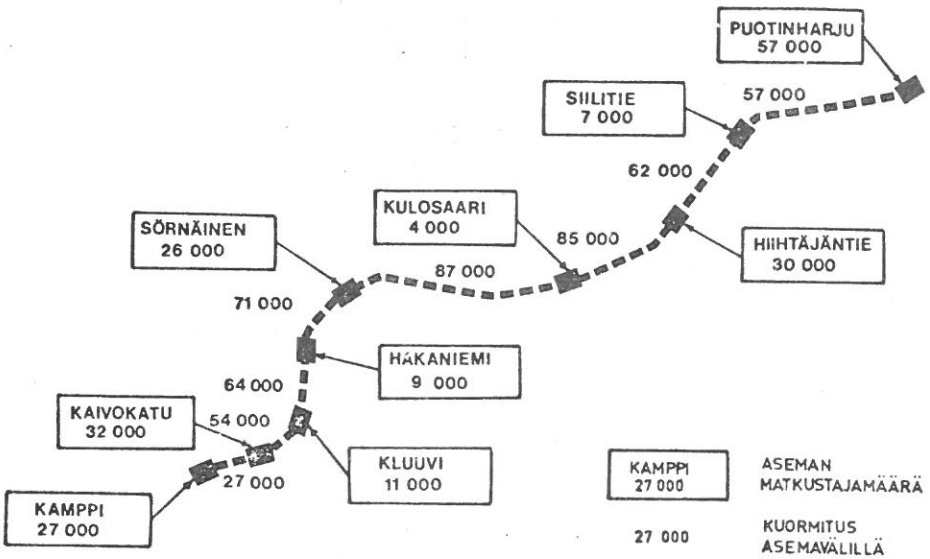


FIGURE 13.B

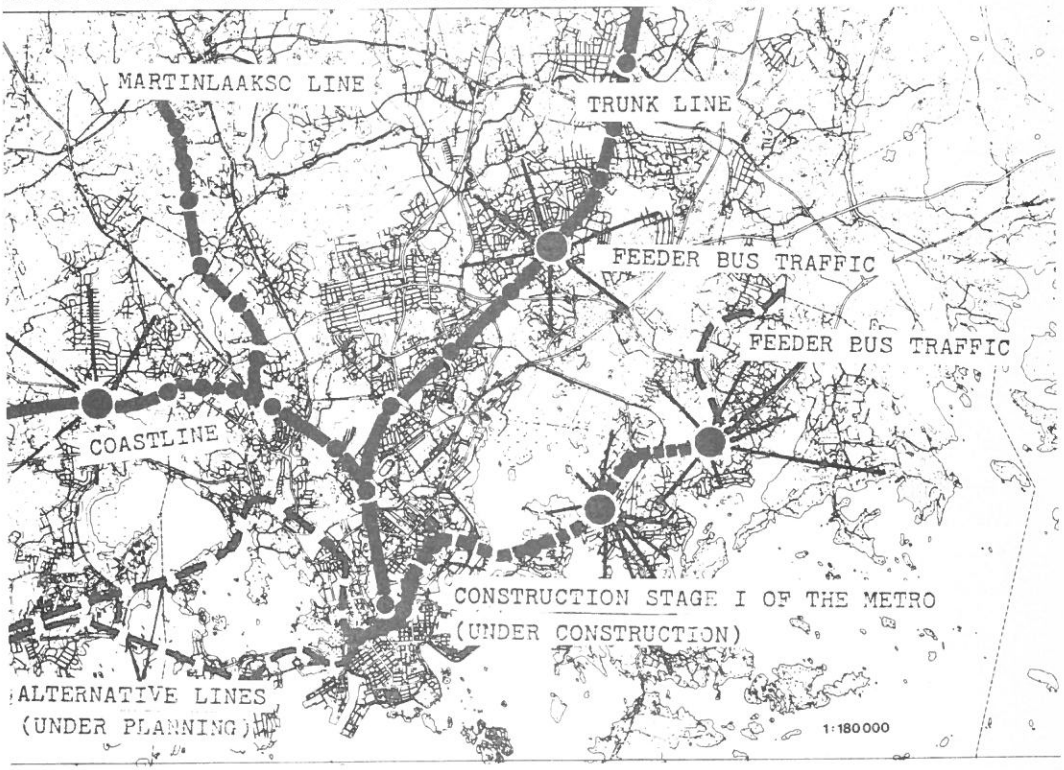
THE DIURNAL PASSANGER VOLUME OF THE METRO LINE KAMPPI - PUOTINHARJU 1985



Any further extension of the metro will depend on the measures taken by neighbouring Espoo and by the Finnish government. If the government cannot be interested in financing the metro, it seems improbable that Espoo might go in for the idea. In this event, construction would be put off to the indefinite future, which would not be desirable for the balanced development of the broad-gauge rail traffic.

FIGURE 14.

HELSINKI METRO AND RAILWAY NETWORK 1985



12
ORGANIZATION OF THE MANAGEMENT OF PUBLIC TRANSPORT IN HELSINKI

Those responsible for the management of the public transportation with both terminals within the administrative boundaries of the city of Helsinki are the City of Helsinki Transport Administration, two traffic companies owned by the city, five private busline companies and the State Railways. Public transport crossing the Helsinki city limits is run not only by the State Railways but also by 30 private traffic firms engaged in short-distance transportation in the region of the capital and by a number of traffic firms engaged in long-distance transportation.

12.1
City of Helsinki Transport Administration

According to the directives approved by the City Council in 1968, the duties of the City of Helsinki Transport Administration are to plan, manage and develop the public transport that is maintained by the city within the area of Helsinki, with the greatest possible economy and expediency, under the supervision of the City Transport Administration Board.

The operations of the Transport Administration are run by a general manager. It has a general department, a traffic department, a technical department, a construction department, a development department and an office department.

In the city of Helsinki, The Transport Administration operates all the tram traffic and 54 per cent of the bus traffic that runs within the city confines (1975), as well as the ferry traffic to Korkeasaari Island.

12.2
Co-operation

Co-operation with the busline firms

A co-operation agreement between the city of Helsinki and busline firms operating in Helsinki has been in effect since May 1, 1971.

Under this co-operation agreement, the network of lines inside the city and the operation of that network will be planned at negotiations among the concerned parties, and the bus-line transportation system is developed in co-operation, with a view to economic aspects and an integrated and good level of service. All the parties to the agreement employ the same fare and ticket system as the Transport Administration. The city guarantees a separately determined income, calculated by number of kilometres covered, to every party to the agreement.

Co-operation with the State Railways

A co-operation agreement between the State Railways Board and the City of Helsinki Transport Administration concerning the railway passenger transportation within the city of Helsinki became effective on March 1, 1975.

Under the agreement, not only the State Railway tickets but also tickets issued under the fares of the Transport Administration in accordance with the provisions for their validity will be valid for journeys between railway stations inside the area of the city of Hel-

sinki. Efforts are being made to plan in co-operation among the parties the timetables and the numbers of trains operating in passenger transportation within the city of Helsinki, so that these may smoothly fit into the public transport system in the city area. The city of Helsinki pays a monthly compensation to the State Railways in the same amount as the loss of ticket earnings suffered by the State Railways from honouring this agreement.

Regional co-operation

When the Act on the Co-operation Delegation for the Region of the Capital had come into effect on January 1, 1974, the communes in the region of the capital gave the Delegation the authorization referred to in the Act, to devote time to a clarification of the organization of public transportation. Accordingly, a Delegation traffic committee was set up to go into the matter. On the basis of the studies made by this committee, the Board of the Delegation requested on June 19, 1975 that the town executives in the region of the capital should provide statements of opinion on a communal federation to be formed for the purpose of managing affairs relating to the arrangement of public transport in the region of the capital.

13
PROVISIONS FOR PEDESTRIAN AND BICYCLE TRAFFIC

Pedestrianism has always occupied an important position in Helsinki, but transportation by bicycle has existed on a smaller scale than in other Finnish cities, on account of the size of Helsinki and the fact that it has good public transport. Bicycling decreased further in the 1950s and the 1960s, with cars filling up thecrowded streets, but began once again to grow in the 1970s. Where lightweight traffic is concerned, the objective is to maintain pedestrianism on the present level at least, substantially to increase bicycling, and to improve traffic safety. The possibilities for lightweight traffic in Helsinki are good, because the land area is flat; but, on the other hand, bicycling is impeded by the road conditions during the winter. The construction of multi-level crossings, however, is held back by the flatness of the land and the poor substratum.

13.1
Volume of lightweight traffic

In 1971, a study of pedestrianism was made in the city core of Helsinki, in which the numbers of pedestrians, the features of pedestrian traffic and

the attitudes of pedestrians were investigated by aerial photographs, counts and interviews. According to the study, some 45 per cent of the time spent by Helsinki dwellers in dwellers was devoted to walking. The travel output in trips performed entirely on foot was about 2.5 trips and 1.7 trips per resident above the age of 15 in the core area and the suburbs respectively. The average length of these pedestrian trips was about 720 metres for all Helsinki, and roughly 460 metres for the core area. The length of the average terminal walk was about 300 metres in the core area. At 4.30 p.m., soon after the peak of rush hour, the pedestrian density at Aleksanterinkatu Street was about 0.20 to 0.35 pedestrians per square metre, and elsewhere in the nucleus 0.10 to 0.20 pedestrians per square metre.

Bicycling is increasing sharply with the construction of a network of bicycle paths, especially in travel to work and school or for recreation. Bicycling is concentrated almost entirely upon the suburban areas so far. There are nowadays almost 150 000 bicycles in Helsinki, and in recent years sales have amounted to more than 10 000 bicycles a year.

13.2
Conditions

Conditions in the centre, now and in the future

The urban structure of the centre of Helsinki is well adapted for the formation of pedestrian precincts. Business activities are concentrated upon a small area, at the edge of which are found the railway station and the terminal areas for bus traffic. In the future, two metro stations will also be located right in the centre.

An area in the commercial centre reserved for pedestrians has been in the air for many years. The plan comprises an area bordered by eight downtown blocks in the very nucleus of the town. The size of the area is roughly 500 by 300 metres. On account of the concentrated structure of the town, the numbers of pedestrians in this area are very high. Helsinki dwellers moreever walk relatively long distances in the centre (average walk approximately 500 metres), without employing public transport.

The first stage in the formation of a pedestrian centre would be to reserve Aleksanterinkatu, the town's most central shopping street, primarily for pedestrians and trams. The plan will probably be put into effect in 1977.

In addition to the plans for the city nucleus, there are plans for numerous malls (pedestrian streets) and combined public transport and pedestrian streets. Implementation of these projects, however, usually requires the construction of some new main streets in the city centre. If these main streets cannot be laid out within the next years for financial or other reasons, some of the projects for pedestrian streets and public transport streets will also have to be deferred to a later date.

FIGURE 15.

THE CENTRE OF HELSINKI
NUMBERS OF PEDESTRIANS (x100)

PLAN FOR THE CENTRE
MOTOR VEHICLE TRAFFIC
PEDESTRIAN STREETS

Conditions in the suburban areas

There are rather few separated rows and bicycle paths in the old suburban areas, and construction of them is impeded by the lack of space. Efforts are being made to build the most important connections in these areas in parks or by narrowing the roads. On the other hand, by regulating the network of streets, the internal vehicle traffic of the area is decreased, which considerably helps cycling.

In the new areas, good networks for lightweight traffic are built either totally separate from the vehicular traffic or along the streets, so that bicycling along roads only occurs on driveways. The crossings of rows and main streets are preferably to be made at separate levels, and split-level crossings are also preferred

on feeder streets, if they fit into the terrain in a natural way. Attempts are also being made to provide areas of urban renewal with similar networks for lightweight traffic.

13.3
Planning and construction of the network

The object with the planning of networks for lightweight transport to cover the entire city is to create safe and attractive connections separate from the vehicular traffic between the various sections and particularly from various areas into the centre of Helsinki, and also to form regional routes for outings. Locally, the object is to create good connections from the various parts of each suburb to the local shopping centre and the schools, and to link such parts with one another and with the network of rows outside such areas, as also to create local recreation routes. The planning of networks for lightweight traffic is done in connection with the drawing up of city plans at various levels and extensive traffic arrangement projects, and with implementation programmes. The traffic planning department, working in co-operation of the other departments of the City Planning Office and other Offices, are primarily responsible for the network and general planning of the routes for lightweight traffic.

The most applied cross-section of the rows is that of a 3-metre wide combined row. At the same time this is the minimum width, on account of the building equipment and the equipment for clearing the streets in winter. Wider cross-sections can be employed if the road is used a great deal or if it is desirable to separate pedestrians from bicyclists, for instance along a street. The main rows are asphalt-paved and lighted, but the other rows are usually made with ashes and are lit up according to need.

The width of pedestrian bridges is usually 3.5 metres, but exceptionally it is 5 metres. The width of underpasses for pedestrians is usually between 6 and 8 metres depending on the row, the place, the width of the street above and the model of underpass.

There are about 200 kilometres of bicycle paths in Helsinki, most of which are in the suburbs. Split-level crossings for lightweight traffic, either separate or in connection with streets, come to a total of 170. According to plan, approximately 195 kilometres of rows and some 35 bridges or underpasses will be constructed in the period 1977-1981.

A network for lightweight traffic will be built in the new areas, financed out of areal project funds. The rows and split-level crossings linking up with traffic routes and streets and with railway stations will be constructed in connection with such projects. Footpaths in parks, and outing trails, are built by the park department of the Construction Office and by the Sports and Recreation Office.

14
TRAFFIC SAFETY

The raising of traffic safety is one of the most important objects in traffic planning. The measure of traffic safety is usually the number of traffic accidents and of their victims, the dead and injured.

Numbers of accidents

In the last twenty-five years, 1 294 persons have been killed and 42 382 injured in traffic accidents occurring in Helsinki, according to police statistics. In 1974 the number of victims was twice the figure for 1950. The growth in the number of victims mainly concerned car drivers and passengers up until the middle of the 1960s. The number of victims per accident leading to injury has concurrently kept on growing into the 1970s. In 1974 a total of 31 per cent of the victims were pedestrians, 10 per cent were drivers of two-wheeled vehicles, 24 per cent were drivers of heavy vehicles and 35 per cent were passengers in heavy motor vehicles. Examined on the basis of the number of victims of traffic accidents in the police statistics, 1972 proved to be the worst year in respect of traffic safety in Helsinki.

The traffic accidents in Helsinki are concentrated on the core area, the main routes, junctions, pedestrian crossings and the vicinity of public transport stops. A total of 62 per cent of all the accidents producing injuries and of 78 per cent of all accidents to pedestrians occurred in the city core area in 1974. The accidents were particularly numerous on the routes running through the northern parts of the core area. About 61 per cent of the accidents producing injuries in 1974 occurred along 140 kilometres of the main routes, which comprise about 14 per cent of the aggregate length of the streets and roads in Helsinki. Here as elsewhere, the accidents centred upon junctions.

In the 1970s, a total of 18 per cent of all the traffic accidents recorded in Finland by the police occurred in Helsinki. A total of 14 per cent of

accidents leading to injury similarly occurred in Helsinki. The number of accidents leading to injury was nearly as high as the total for the aggregate figure for the five next biggest cities in Finland (Tampere, Turku, Espoo, Vantaa, Lahti). In 1974 the number of persons killed or injured per 1 000 inhabitants was 3.9 in Helsinki and 3.2 for the country as a whole.

Compared with the other big cities in the Nordic countries, the traffic safety situation in Helsinki is relatively poor. The number of victims relative to the population was 1.8 times as high as in Stockholm in the period 1968-1974. Compared with Gothenburg the figure was 1.3, with Oslo 1.1 and with Copenhagen 0.7.

The statistics, however, do not give the right picture of the whole extent of the traffic safety problem, for a large proportion of the accidents are not recorded in the statistics.

Measures

A systematic analysis of traffic accidents and the planning of measures to improve the traffic environment based on that analysis were started in Helsinki in 1966. Information was obtained through studies of the effects of city planning, traffic planning, traffic environment and traffic control measures upon traffic safety, of the safety of various methods of transportation, etc. As a result of the study, a City of Helsinki traffic safety policy (1972) programme was drawn up, which expresses the aims of the traffic safety work in the city and various steps to reduce traffic accidents. A check list of traffic safety (1975) was drawn up for the city plans and the respective traffic plans. Active efforts have been made in recent years to improve traffic safety by means of various geographically restricted traffic safety plans. A publication is prepared every year on the development of the traffic safety situation in Helsinki. The citizens have been informed at public briefings and through guide booklets providing practical advice to allow for safer moving about.

15
TRAFFIC NOISE AND POLLUTION

15.1
Traffic noise

Traffic noise has become a serious environmental detriment in Helsinki. The street "canyons" of the city centre have become the worst places in respect of traffic noise. Roughly 90 000 people (approximately 45 per cent) of the inhabitants of the city core area are estimated to be disturbed by the traffic noise. In the suburbs, noise causes disturbance in the vicinity of motor roads, main streets, routes for heavy traffic, and the trunk railway. Avition noise is a problem in the northeastern sections, in the take-off and landing sectors of Helsinki Airport and Malmi Aerodrome.

The growth in noise levels during the past 15 years is expressed by the changes in noise level shown in the following table and calculated from the growth of traffic volumes and of vehicular stock.

Table 15.
Changes in noise at traffic counting lines

	1960-1965	1965-1970	1970-1975
Inner concentric line	+ 1.9 dBA	+ 0.8 dBA	± 0 dBA
Intermediate concentric line	+ 2.0 dBA	+ 1.1 dBA	+ 0.4 dBA
Outer concentric line	+ 2.9 dBA	+ 1.8 dBA	+ 1.2 dBA
Registered heavy motor vehicles	+ 2.8 dBA	+ 1.3 dBA	+ 1.0 dBA

The table shows that there was a greater rise in noise level in the five-year period 1960-1965 than during those of 1965-1970 and 1970-1975. On the headland the noise levels have remained at the same level during the last five years.

The noise levels underwent their greatest increase on the outer concentric line, but there too the growth has clearly slowed down.

The worst places in terms of noise are the streets in the centre and the sides of the motor roads in the suburban areas. The effective diurnal average noise levels rise in the worst streets the noise levels are usually at 60-70 dBA. The average noise levels of residential streets are below 60 dBA.

The noise levels in the core area will remain at the present level without any steps being necessary. In the suburban areas, the noise will increase to some extent along motor roads. The future development of the noise level can be affected through muffling of the sources of noise, through traffic arrangements and through measures in city planning, as also through noise barriers and an increase in the noise insulation of structures. In the near future, noise can be decreased in the city core area by regulation of the street network, a great deal of which is under preparation. The construction of noise barriers must be considered for places that are badly disturbed by noise in the suburban areas. In the long run, traffic noise will decrease in the whole city when the permissible noise limit for vehicles is lowered. Noise levels can be lowered in connection with new construction and the repairing of old buildings, through the locating of functions and buildings, and by structures with good sound insulation.

Permissible noise levels

City planners have been given instructions about protection against noise and about permissible noise levels. The functions sensitive to noise are sleeping, relaxation, rest and teaching. Where sleeping is concerned, the planning aims at an effective average noise level of below 25-30 dBA in residential rooms at night. The noise peaks at night should be below 45 dBA when the windows are shut. In functions sensitive to noise, 30-35 dBA will be permissible indoors during the daytime, and 40 dBA in the existing environment. A noise level of 55 dBA is the target outside dwellings, but exceptions on grounds of cost and town structure have been made up to 70 dBA. In recreation areas and in playgrounds, the target is a noise level of 55 dBA.

15.2
Traffic pollution

The deleterious effect that traffic has on the atmosphere is at its worst in the narrow streets in the centre, with their lively traffic. There are also problems in the vicinity of the bus terminals. Regarding the impurities that traffic causes in the atmosphere, studies have been made in Helsinki of the overall fallout of particulate materials and of lead, and also of buoyant particulate materials and their lead contents; and, among mollecular materials,

of the contents of sulphur dioxide, carbon monoxide and nitrogen oxide.

In the narrow heavily trafficked streets, the impurity content caused by the traffic rises to the same level in Helsinki as it does in great cities. The idling of vehicle engines causes localized detriment in streets and yeards, especially when the air flow is small. The present relatively good situation, however, must not lead to an overly casual attitude to the problem of pollution, and community planning and regulations on vehicles must ensure that the detriment from pollution will remain at the present level or, preferably, decrease - especially in the most exposed areas.

16
RESTRICTION OF THROUGH TRAFFIC IN THE RESIDENTIAL AREAS OF HELSINKI

The big increase in traffic has brought with it a variety of problems in Helsinki as elsewhere. Most of the main road network was built at a time when there was little traffic, and when insufficient attention was paid to the environmental detriment caused by traffic. The main road network has not been developed at a pace which the growth in traffic would presuppose.

Also, new areas have been built as have establishments that generate a lot of traffic, without the connections they require being built concurrently. This has resulted in the traffic spreading out into narrow routes and into areas in which it causes serious detriment to functions.

Extent of problem

The problems caused by through traffic have become particularly burning issues in residential areas surrounding the centre. Although no improvements have been made in the traffic network, the traffic volume has grown. The absence of concentric routes in the centre has in particular increased the volume of through-passing traffic in the centre and its surrounding areas. This has led to a decrease in dwelling comfort, and to the hindering of other functions. Comfort has been decreased through the increasing numbers of traffic accidents, through increasing noise and through an increasing amount of impurities in the atmosphere. The movement of school children and aged persons has been impeded most.

The harm to the environment caused by the traffic has been one reason for the conversion into offices

of areas surrounding the centre, and for the decrease in the number of inhabitants. There were 111 000 persons living on the Helsinki headland in 1960, but there were only 75 000 left in 1974. At the same time the number of jobs increased from 134 000 to 150 000. It is from this development that the continuously growing amounts of traffic into the city centre result.

A similar unfavourable drift of traffic into residential areas can also be found in many of the residential areas of the suburbs. Although the through traffic might not be very big in volume, it is often experienced as being highly disturbing. The reason is the high speed maintained by vehicles passing through. The serious, albeit numerically few, accidents cause unquiet among the residents.

Remedies

Stopping the decline in the number of inhabitants is one of the city's overall development objectives. One device to achieve this is the improvement of dwelling conditions by the restriction of through traffic. This is done by directing the traffic, according to various means, along routes where it does not disturb dwelling and other functions. At the same time, the possibilities of pedestrian and public transportation are improved.

Through traffic can be restricted in a variety of ways. Previously, when there was little traffic, it was usually sufficient to guide traffic by means of lane, traffic refuge and other arrangements. Gradually, with the growth in traffic and in the congestion of main routes, such arrangements have proved inadequate.

The commonest wish among residents would be to have a prohibition on through traffic which would not apply to themselves. The police hav adopted a reluctant attitude to arrangements implemented merely by traffic signs prohibiting through driving, because the chances of enforcing this are rather restricted. The effect is dependent on how natural the points of restriction are, and on how well the prohibition can be supervised.

Recently, most restrictions have been implemented by means of absolute bans on through traffic. These prohibitions have, further been made effective by means of concrete barriers placed in the streets. The prohibitions do not usually apply to public transport or to emergency vehicles. In the core area, taxis have been grouped under public transport, but in the suburban areas the traffic prohibitions cover taxis too. So far there have been relatively few traffic prohibition on specified vehicles only, for instance applying solely to lorry (truck) traffic.