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KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

THE TOLL HIGHWAY DEVELOPMENT STUDY IN THE KINGDOM OF THAILAND

FINAL REPORT
—MOTORWAYS IN VARIOUS COUNTRIES—

JULY 1991

JAPAN INTERNATIONAL COOPERATION AGENCY

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INTRODUCTION

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According to "World Road Statistics 1984 — 1988" published by IRF (International Road Federation), there are about 50 countries in the world, who have the motorways. However, they are quite varying on their history, system, physical conditions, etc.

Nevertheless, it is needed to analyze the following items with same indexes as much as possible in order to clearly realize the necessity for establishment of the toll motorway network in Thailand;

— Relationship between conditions of the motorway development and socio-economic indexes

— Financing, organization and systems for construction and operation of the motorways, including toll rate and toll collection systems.

Therefore, ten countries; France, Germany, Italy, Japan, United Kingdom, United States of America, Indonesia, Korea, Malaysia and Philippines, have been selected and reviewed on the motorways for The Study.

The outcomings of each country are described in the following structure:

1. GENERAL
2. HIGHWAY AND TRANSPORT CONDITIONS
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   - 2.2 Transportation Modes
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   - 3.5 Financing
   - 3.6 Operation
   - 3.7 Toll System

3.8 Maintenance
3.9 Typical Design Standards

The data used in this review are obtained from the following sources:

1. World Road Statistics, 1984—1988, IRF
2. Handbook of World Statistics, 1989, Bureau of Statistics, JAPAN
3. Handbook of Overseas Economic Cooperation, 1989, OECF
4. Expressways in The World, 1990, EHRF
5. Seminar-Cum-Study Tour on Toll Road System in Japan, 1988, ESCAP
6. Roads in Japan, 1989, Road Bureau of MOC, JAPAN
7. National Expressway Practices, 1988, Nihon Doro Kodan
8. Study on Traffic Control and Management System of Malaysian Expressways and Toll Highways, 1989, JICA
9. Roads in Korea, 1989
10. P. T. Jasa Marga (Persero) Jakarta Tollway Management Services for The Tollway System Project, Technical Reports, 1988, IECA-EHRF-OPMAC

I. FRANCE

I. FRANCE

I.1 GENERAL

The land of French Republic (hereinafter France) is locating in the western part of the Europe Continent and its land area is 551,500 km^2.

France has a population of 55,392,000 in 1987.

Both of land area and population of France are almost same as those of Thailand.

GNP of France reaches at 726,450 million Dollars in 1986 and Per Capita Income in 1986 is 13,124 Dollars which is about 16.5 times to that of Thailand.

I.2 HIGHWAY AND TRANSPORT CONDITIONS

I.2.1 Road Network

Roads in France are classified depending on who is in charge, as follows:

- Autoroute (Motorway)
- Routes Nations (National Roads)
- Chemins Departemenfaux (Country Roads)
- Voies Communates (City and Town Roads)

Autoroute (Motorway) is also a part of national roads, however, in relation to Motorways, the access control and the user's constrains are legally enacted in Act No. 55-435 dated April 18, 1955. In relation to the Motorways, besides Autoroutes, the name of Route Express is also used. In total, the terminology at vole Rapide is the legal definition.

The national roads are classified by their function in the Schema Directear Route (National Road Basic Scheme).

— Autoroute (Motorway) 8,290 km
— Liaison Assurant la Continuite du Reseau Autoroutier (Supplemental Semi-expressway) 2,840 km
— Grandes Liaison L' Amenagement du Teritoire (Primary Trunk Roads for National Development) 4,940 km
— Autres Routes Nationales (Other National Roads) 20,000 km

Table I.1 gives the total road length for the years from 1980 to 1987.

Table I.1 TOTAL ROAD LENGTH

Year	Length (km)				
	Express-way	Trunk roads	Secondary roads	Others	Total
1968	1,132	80,956	286,000	420,000	788,088
1969	1,305	81,116	286,000	420,000	788,421
1970	1,553	81,200	286,000	420,000	788,753
1971	1,715	81,242	286,000	420,000	789,957
1972	2,172	39,000	328,000	420,000	789,172
1973	2,426	37,825	333,400	420,000	793,651
1974	2,830	29,500	341,700	420,000	794,030
1975	3,401	27,489	343,800	420,000	794,690
1976	3,894	28,793	343,000	420,000	795,687
1977	4,283	32,830	341,500	425,000	803,613
1978	4,604	28,500	346,800	422,000	801,904
1979	4,896	28,500	350,000	420,000	803,764
1980	5,264	28,500	350,000	420,000	803,764
1981	5,715	28,500	350,000	420,000	804,215
1982	5,907	28,500	350,000	420,000	804,407
1983	5,845	28,500	350,000	420,000	804,345
1984	6,005	28,500	350,000	420,000	804,505
1985	6,150	28,500	350,000	420,000	804,650
1986	6,265	28,500	350,000	420,000	804,765
1987	6,440	28,500	350,000	420,000	804,940

I.2.2 Transportation Modes

As shown in Table I.2, the domestic transports, which areboth the freight transport and the passenger transport, are dependent on the roads. Comparing with other modes, the road users of the freight and passengers have been increasing notably. As of 1987, the roads occupy 90.7% of the passenger transport in terms of passenger-km, and 69.2% of the freight transport in terms of ton-km.

Table I.2 THE SHARE OF TRANSPORTATION MODES

	Domestic Freight Transport						Domestic Passenger Transport million persons km		
	Million tons			Million tons-km			Roads		
Year	Roads	Inland shipping	Railways	Roads	Inland shipping	Railways	Public transport	Private transport	Railways
1982	1,203	76	184	108,000	7,700	56,000	-	-	56,850
1983	1,350	72	-	103,000	7,200	54,000	57,000	460,000	58,400
1984	1,260	69	177	105,000	7,000	55,000	60,000	460,000	60,200
1985	1,243	64	171	106,000	7,000	54,000	54,000	49,400	61,850
1986	1,260	63	146	110,000	6,000	48,000	-	-	59,620
1987	1,435	58	136	119,000	6,000	47,000	39,000	517,000	57,000

I.2.3 Number of Registered Vehicles

As shown in Table I.3, the number of registered vehicles has been increasing since 1982.

The total number of four (4) - wheel vehicles as of 1987 is 26.05 million which has increased by 5.7% over the previous year with a rate of 468 units per 1000 persons.

Table I.3 NUMBER OF REGISTERED VEHICLES

Unit: 1,000

	Four - wheel vehicles					Tractor trailer semi-trailer	Motor-cycle
Year	Passenger	Bus	Trucks	Van	Total		
1982	20,300	61	32	237	23,056	281	5,250
1983	20,600	62	345	2,692	23,699	278	5,150
1984	20,800	62	340	2,771	23,973	285	5,065
1985	20,940	64	330	2,895	24,229	278	4,030
1986	21,250	65	326	3,015	24,656	281	3,675
1987	21,970	65	323	3,694	26,052	273	3,370

I.2.4 Accidents

The number of traffic accidents and other related indexes are shown in Table I.4.

Table I.4 NUMBER OF TRAFFIC ACCIDENTS AND OTHER INDEXES

	Number of accidents per 100 million vehicle-km					
Year	Number of accident	Number of injured	Number of killed	Number of accident	Number of injured	Number of killed
1982	230,700	321,369	12,409	69	96	3.7
1983	216,129	301,422	11,946	63	89	3.5
1984	202,638	284,906	11,684	63	83	3.4
1985	191,132	270,799	10,448	55	78	3.0
1986	184,626	259,009	10,961	51	71	3.0
1987	170,994	237,638	9,855	45	62	2.6

The traffic accidents in terms of the number of injured, and the number of killed are decreasing as shown in the above table. The number of accidents has decreased by 20.9% for the past five years. The number of accidents per 100 million vehicle-km as of 1987 is 45, which is quite low compared with other foreign countries. However, the accidents in the urban area occupy 72.0% out of the total accidents, which is quite high. This figure shows that the population densed area is quite dangerous.

I.3 MOTORWAY DEVELOPMENT

I.3.1 History

As of 1955, the total length of expressways in operation was 80 km, which was far behind West Germany and Italy. At the moment, as of January 1988, the total length reached to 5,340 km. This rapid increase is due to the introduction of toll road system. By the Expressway Act which was enacted in April, 1955, the central government was permitted to provide authorities of expressway construction and operation to the public institutions, public parties, chamber of commerce, and concession companies such as Joint Economic Society (SEM) as an exceptional case. In July, 1960, the sentence, "as an exceptional case" was deleted. During the period between 1956 and 1963, five (5) SEM were approved as shown in Table I.5.

Table I.5 SEM, 1956–1963

Name of Company	Date of Establishment	Date of Officially Announced	First Agreement for Authorization
ESCOTA	1956. 1.17	1957. 5.21	1957. 5.21 48 km
SAVR	1957. 5.16	1961. 3.13	1958. 9.16 71 km
SAPN	1963. 4. 4	1963. 8. 1	1963. 6.28 69 km
SAPL	1961. 9.28	1963. 8. 5	1963. 8. 5 158 km
SAPRR (SANF)	1963. 4. 9	1963.11. 9	1963. 7.29 132 km

As of 1970, the aggregated length of expressways reached to 1600 km, in which 840 km were toll roads. SEM was provided more authorities by the Finance Act enacted in December, 1969. Four (4) more companies, which are in charge of construction of 1300 km expressways, were established in 1971. The section connecting with Mount Blanc Tunnel with a total length of 100 km, which was proposed by the Mount Blanc Highway Tunnel Company, was approved.

In Figure I.1, the development status of expressways as of 1968 and 1978 is shown.

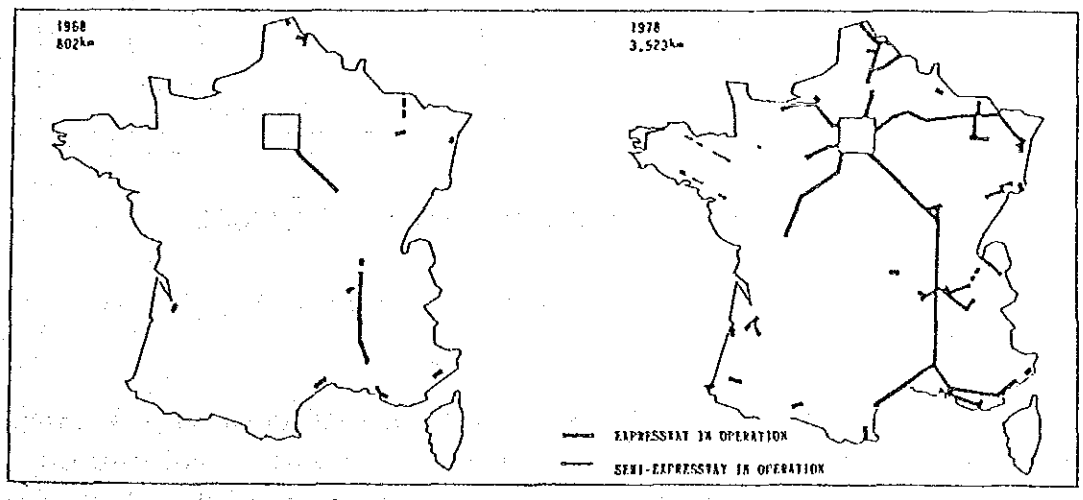


Figure I.1 DEVELOPMENT STATUS OF EXPRESSWAYS

I.3.2 Motorway Network

The present motorway network as of March, 1988 is shown in Figure I.2. The aggregated length of expressways operation is 5,337 km.

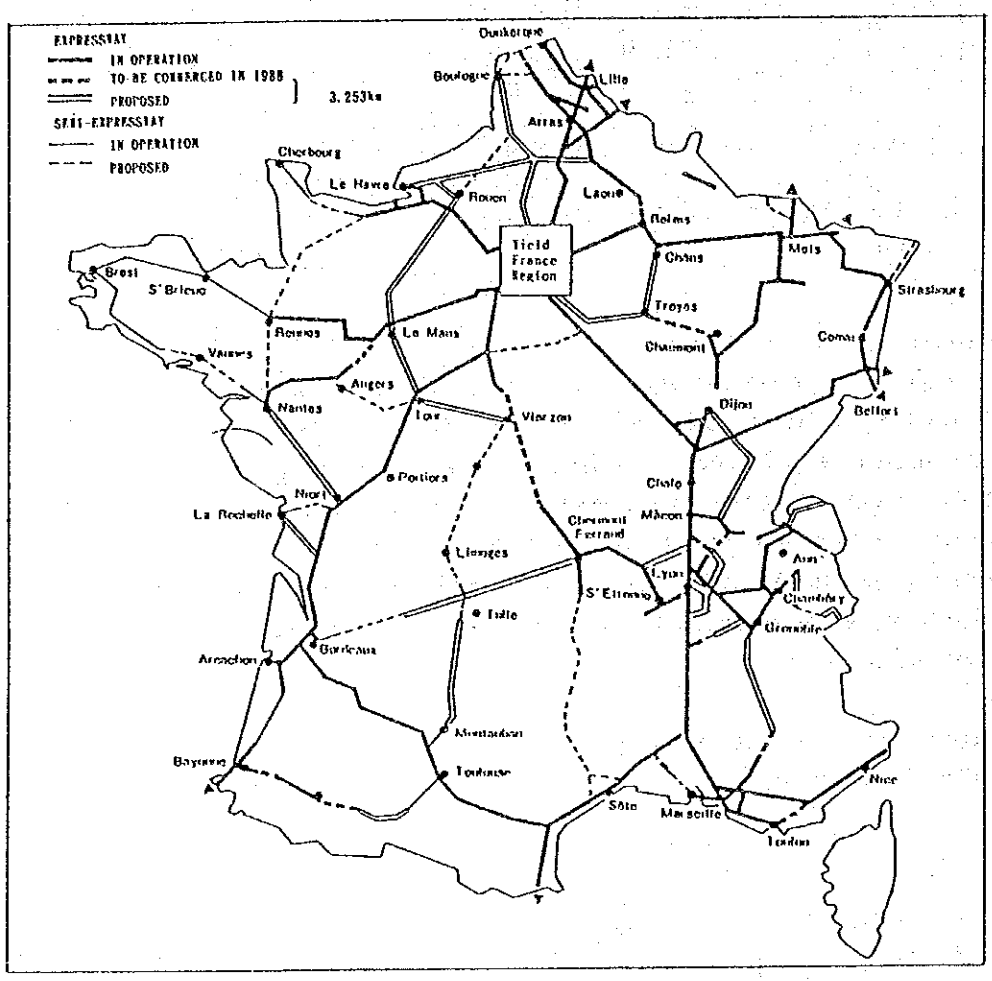


Figure I.2 PRESENT MOTORWAY NETWORK

I.3.3 Future Plan

In February 1988, the Minister's Committee for the national development (CIAT) determined the new road development basic plan, which would be a final target for the development of expressways, high-level roads and national roads. The Plan involves 8,590 km expressways, 2,740 km extension of expressways, 4,850 km national development trunk roads and 20,600 km

other national roads. The total length of proposed expressway network is 11,330 km. The section in which the construction has commenced was doubled from 100 km per year in 1986 to 200 km per year in 1987. From 1985, the section length to be commenced per year was increased to 300 km per year, and thus it is expected that all the proposed expressway network will be completed in year 2000.

Figure I.3 shows the proposed highway network in year 2000.

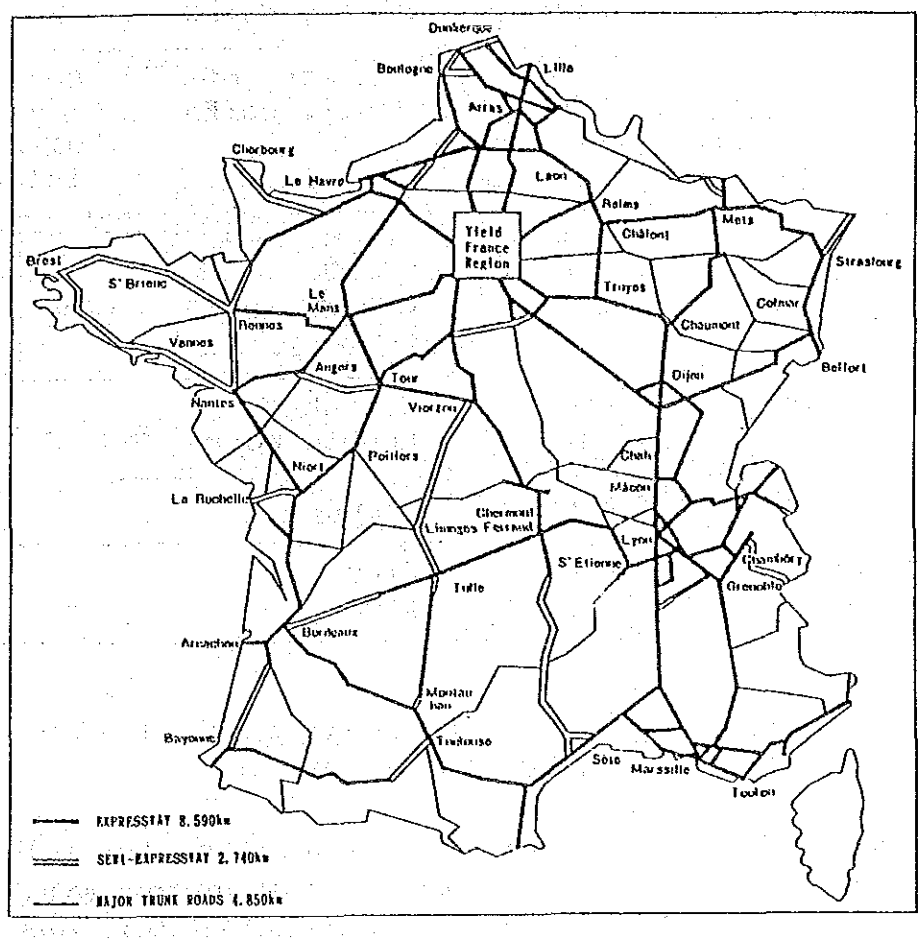


Figure I.3 THE PROPOSED HIGHWAYS NETWORK IN 2000

I.3.4 Motorway Administration

The motorway administration is under the control of Ministry of Public Works, SEM, Societe Prive Concessionnaire, county, city and town. The Motorway is managed by the government and also by the SEM and concession company for the toll motorways.

The executing agency for each road is shown in Table I.6.

Table I.6 EXECUTING AGENCY FOR EACH ROAD

Type of Road		Toll or Free	Executing Agency	Remarks
Express-way	Inter-urban	Free	Ministry of Public Works	
	Intra-urban	Free	Ministry of Public Works	Connecting major ports with the inland
		Toll	SEM	
		Toll	Concession Company	
National Roads		Free	Ministry of Public Works	
County Roads		Free	County	
City, Town, Country Roads		Free	City, Town	

The development of motorways is dependent on the toll roads. The implementing organization for the toll motorways is composed of nine (9) SEM (Societe d'Economic Mixte), one private company, France Motorway Organization, National Motorway Fund, France Toll Motorway Union and France Motorway Association.

The organization which is in charge of construction and operation of motorway is shown in Figure I.4.

SEM (Societe d'Economic Mixte):

SEM is composed of capital investments from the central government, local government authority, and private banks. The fund

for construction involves the government advance payed loan and the bonds issued by the Motorway National Bank. The repayment period is 30 years after the opening.

Concession Company (Societe Prive Concessionnaire):

By tendering, the Government and the private company make a contact on the construction and operation of motorways. The government is not involved in the management of the company, but in the fund procurement.

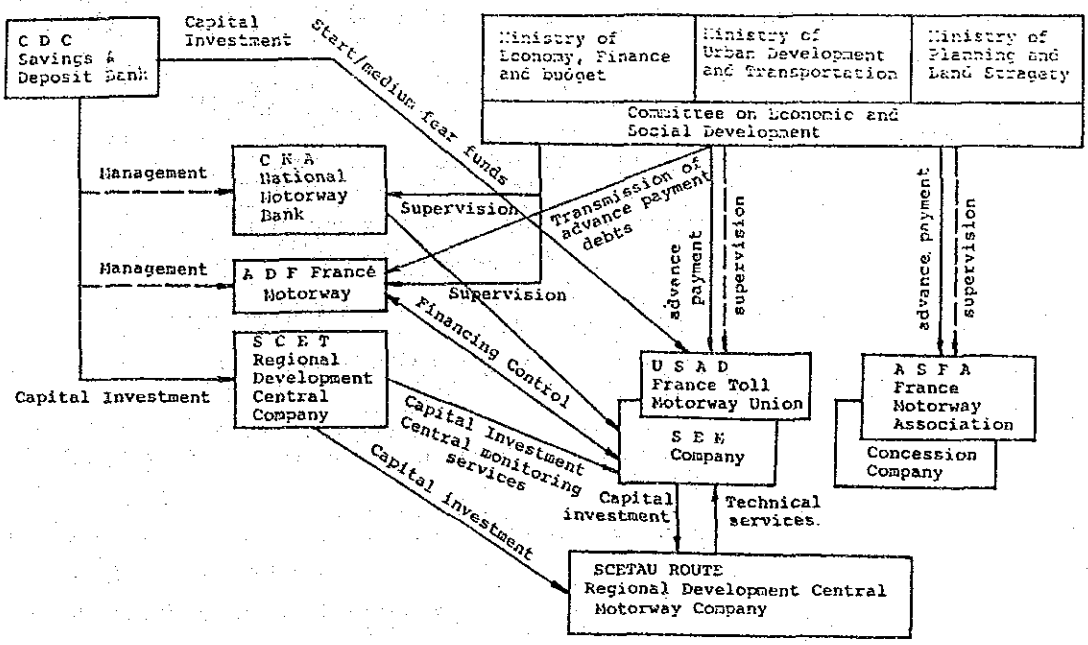


Figure I.4 ORGANIZATION IN CHARGE OF CONSTRUCTION AND OPERATION OF MOTORWAY

I.3.5 Financing

The Bureau of Roads, Ministry of Public Works is in charge of the budget for national roads including motorways. Regional roads are handled by the State Ministry. The costs required for the development of the intra-urban national roads are raised by the central government by 100%. For the approaching section into an urban area, the central government pays 85% and the local government 15%, and this ratio of share is actually determined through negotiations.

Local roads are handled within the grant provided to the local

government. In 1982, the Special Funds for the Major Project was established. This is the system in which the funds are collected by issuing bonds, and also by putting a new tax on the fuel, and repayment is made.

This fund is used not only in highways but also in the public transportation system, and energy related facilities.

The funds for motorways are raised by the capitals of SEM and concession companies, the government funds, the government - warranty bonds, non-guaranteed bonds, and the donations from the local communities as shown in Table I.7.

Table I.7 FUNDS FOR EXPRESSWAYS

Type of Fund	Details
SEM	Investors are local government authorities, Industrial, commerce and agricultural group, C.D.C group, Banks
Concession Company	Investors are contractors, banks oil company, restaurants
Flat Advance Payment	The advance payment to assist the balance of the income and expenditures from FSIR
Cash	The borrowings are limited and the defference with the required funds are lent in advance
Goods	Highway facilities constructed by the government, Land acquired by the government
Government-warranty Bonds	Bonds issued by CNA Interest rate is 15%, No grace period Repayment period is 10-12 years
Non-guarantee Bonds	No guarantee by the government The long-term convertible bonds
Funds from local Participants	Non refundable funds

I.3.6 Motorway Operation

As discussed in I.3.4 Motorway Administration, and depending on the roads, each executing agency is in charge of the operation of highways which are under its jurisdiction.

I.3.7 Toll System

The toll charges of motorways in France vary by the company in charge and by route. However, since the ADF (Autoroute de France) was established, the adjustment to correct the difference in the operational status and the toll charges among

companies was made. Thus, the uniform toll system, practically the pool system is being introduced.

The rate of toll charges as of April 1, 1984 is 0.27 F/km in average. The ratio of tolls among the type of vehicle is shown in Table I.8.

Table I.8 RATIO OF TOLLS AMONG THE TYPE OF VEHICLE

Category		Type of Vehicle	Ratio
I	1)	Two axles, Height of vehicle at the front axles is less than 1.3 m	1
II	2)	Three axles, Height of vehicle at the front axles is less than 1.3 m	1.5
	3)	Three axles, Height of vehicle at the front axle is more than 1.3 m	
III	4)	Three axles, Height of vehicle at the front axle is more than 1.3 m	2
IV	5)	Two axles	0.5

I.3.8 Maintenance

Although some differences are found depending on the concession companies, the organization as shown in Figure I.9 operates and maintains the motorways.

	Organization	Scope of Services
Central Institution	Direction Generalc	In charge of the laison and coordination with the Ministries cencerned and other highway authorities. Most of these institutions are located in Paris, and staffed by the executive officers
	Direction d'Exploitation	This organization as a head office in charge of operations and usually located in the central region of the expressway network in charge
Field Maintenance Offices	Region	This is the Burean/Operations which has 5-6 districts under this office
	Districts	In charge of the section of expressways with a length of 50 km and also the Centre d'Entretion is provided
	Centre d'entretion	Practically in charge of ma ntenance in the field
	gave	Toll plaza on the throughway

Figure I.9 THE ORGANIZATION FOR THE OPERATION OF MOTORWAYS

The maintenance works including the daily inspection, minor rehabilitation, cleaning, removal of snow and ice, and the treatment of accidents, are undertaken by administration. Major work such as the detailed inspection and the improvement of pavement are implemented by the Regional Construction and Research Institute or private companies.

In relation to the traffic control system applied in the motorways, the following systems are adopted.

Motorway Information System: The information on the motorway network is provided to drivers through the Highway Information Center.

Information System on the Electric Sign Board: The information collected through the emergency telephones and the traffic detector is provided to the drivers on A1, A6, and A86 routes.

I.3.9 Typical Design Standards

The design standards for motorways are defined in the "Inter-urban Highway Geometrics" for the rural motorways and in the "Urban Motorway Geometrics" for the urban motorways.

The design speed for motorways is basically either 100 or 120 km/hr. The standard lane width is 3.5 m.

The typical cross section with the dimensions are shown in Figure I.5.

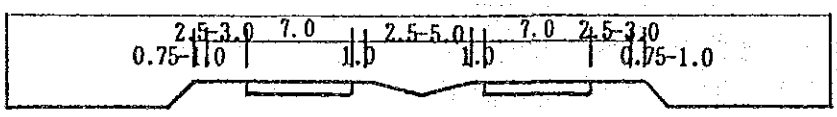


Figure I.5 TYPICAL CROSS SECTION

Rest facilities are divided into rest areas and service areas. The spacing of rest area is 15 km in average and 20 km as maximum. The service area is provided with an average interval of less than 45 km and at maximum of 55 km.

II. GERMANY

II. GERMANY

II.1 General

The land of the Federal Republic of Germany (hereinafter Germany) is located in almost centre of the Europe Continent and its land area is 248,577 km^2, which is 48% to that of Thailand.

Germany has a population of 61,048,000 in 1986 which is 116% to that of Thailand.

GNP of Gernmany in 1986 is 891,995 million Dollars and Per Capita Income in 1986 is 14,611 Dollars which is 18.4 times to that of Thailand.

II.2 Highway and Transport Conditions

II.2.1 Road Network

The classification of highways and roads is shown in Table II.1.

Table II.1 CLASSIFICATION OF HIGHWAYS AND ROADS

Trunk Roads	Rural Roads	Agricultural and Forest Roads
Federal Long-distance Roads	Regional	Agricultural road
a) Autobahn (Expressway)	a) Arterial road	a) Arterial road
b) Federal Highway	b) Ordinary road	b) Forming road
	c) Access road	
	d) Local road	
Land Roads (National roads)	Intra-Region	Forest Road
	a) Link road	a) Arterial road
	b) Other regional road	b) Entry road
Kreis (County) Roads	c) Intra-regional link road	c) Exit road
		Others

The aggregated length of highway network defined in the Federal Road Act is 491,463 km. The divisions by the type of road are shown in Figure II.1.

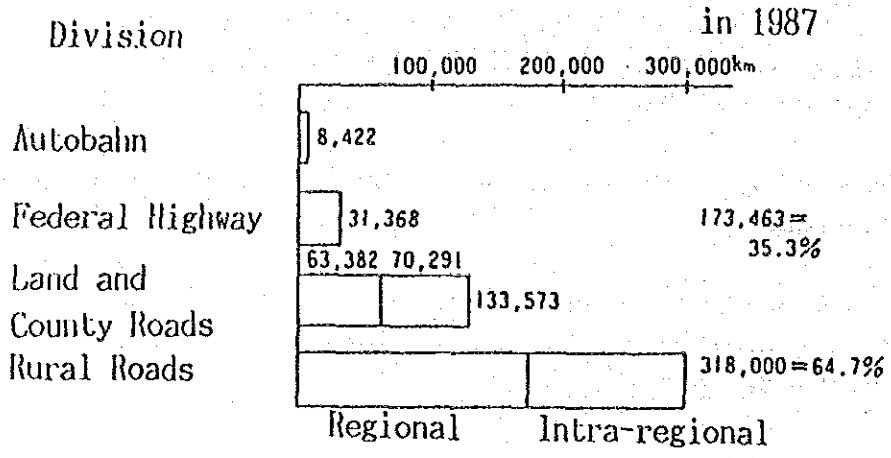


Figure II.1 DIVISIONS BY THE TYPE OF ROAD
(Total Length=491,463 km)

The total area of the overall highway network is 3,221.5 km2, which occupies 1.3% of the total country's land area. Based on the "Federal Long-distance Road Act", the Federal long-distance highways are divided into the Autobahn and Federal Highways, which form the highway network and serve for the long-trip traffic. The Federal government is responsible for the budget of implementation, but the construction and operations are undertaken by the Land (State) concerned.

II.2.2 Transportation Modes

The share of transportation modes in the freight transport and passenger transport is shown in Tables II.2 and II.3, respectively.

As shown in Table II.2, trucks carry almost 80% of the total freight transport. In relation to the passenger transport, the aggregated total of passenger cars and buses occupies 90% of the total passenger transport. These figures show the important role of highways in both passenger and freight transports.

Table II.2 SHARE OF TRANSPORTATION MODES IN THE FREIGHT TRANSPORT

(Unit: billion ton-km)

Year	Trucks		Railways		Inland Shipping		Pipelines		Civil Aviation		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
1965	1643.3	74.8	311.4	14.2	195.7	8.9	46.3	2.1			2196.7	100.0
1968												
1969												
1970	2136.9	75.1	378.0	13.3	240.0	8.4	89.2	3.1	0.4	0.0	2844.5	100.0
1971												
1972												
1973												
1974												
1975	2079.9	76.9	315.0	11.7	227.3	8.4	80.3	3.0	0.5	0.0	2703.0	100.0
1976												
1977												
1978												
1979												
1980	2553.2	79.1	350.1	10.8	241.0	7.5	84.0	2.6	0.7	0.0	3229.0	100.0
1981	2397.5	79.0	335.0	11.0	231.4	7.6	71.1	2.3	0.7	0.0	3035.7	100.0
1982	2250.6	79.0	307.5	10.8	221.9	7.8	66.7	2.3	0.7	0.0	2847.4	100.0
1983	2307.6	79.6	299.7	10.3	223.9	7.7	67.1	2.3	0.7	0.0	2899.0	100.0
1984	2363.1	79.1	319.2	10.7	236.5	7.9	68.3	2.3	0.8	0.0	2987.9	100.0
1985	2300.7	78.9	324.4	11.1	222.4	7.6	69.0	2.4	0.9	0.0	2917.4	100.0
1986	2391.2	79.8	305.3	10.2	229.5	7.7	70.5	2.4	0.9	0.0	2997.4	100.0

Table II.3 SHARE OF TRANSPORTATION MODES IN THE PASSENGER TRANSPORT

(Unit: billion passenger-km)

Year	Passenger Car		Bus		Railways		Inland Shipping		Civil Aviation		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
1965												
1968												
1969												
1970	350.6	76.8	60.1	13.2	39.2	8.6			6.6	1.4	456.5	100.0
1971												
1972												
1973												
1974												
1975	405.4	77.8	69.5	13.3	37.7	7.2			8.4	1.6	521.0	100.0
1976												
1977												
1978	449.1	79.0	72.4	12.7	36.8	6.5			9.9	1.7	568.2	100.0
1979	465.2	78.9	74.5	12.6	38.8	6.6			10.9	1.8	589.4	100.0
1980	470.3	78.6	76.3	12.7	41.0	6.8			11.0	1.8	598.6	100.0
1981	444.0	77.5	77.9	13.6	40.3	7.0			10.9	1.9	573.1	100.0
1982	460.5	78.3	76.5	13.0	40.5	6.9			10.7	1.8	588.2	100.0
1983	473.4	79.1	75.1	12.5	39.3	6.6			10.9	1.8	598.7	100.0
1984	484.1	79.7	72.0	11.9	39.6	6.5			11.8	1.9	607.5	100.0
1985	481.6	80.0	63.9	10.6	43.5	7.2			12.7	2.1	601.7	100.0
1986	513.5	81.3	63.2	10.0	42.1	6.7			13.0	2.1	631.8	100.0

II.2.3 Number of Registered Vehicles

The number of registered vehicles is shown in Table II.4.

Table II.4 NUMBER OF REGISTERED VEHICLES

Units : per 1000

Year	Passenger car	Others						Total	Motorcycle
			Bus	Track	Van	Subtotal	Trailer		
1978	21,620	2750	67	1,357	153	1,577	1,173	24,370	2,614
1979	22,614	2919	69	1,422	164	1,655	1,264	25,533	2,489
1980	23,236	2901	71	1,288	175	1,534	1,367	26,137	2,940
1981	23,681	3003	71	1,294	183	1,548	1,455	26,684	2,600
1982	24,036	3069	71	1,273	191	1,535	1,534	27,105	2,893
1983	24,689	3173	71	1,274	203	1,548	1,625	27,862	2,950
1984	25,378	3269	69	1,275	214	1,558	1,711	28,647	2,895
1985	26,100	3372	69	1,281	227	1,577	1,795	29,472	2,868
1986	27,224	4671	69	1,294	252	1,615	3,056	31,895	2,689
1987	28,304	4525	70	1,309		1,379	3,146	32,829	2,520

The total number of registered vehicles is approximately 33 million as of 1987. The growth rate over the previous year is +3.2%. The growth rate of passenger carrier types is steady. As the roads are improved, and also the spare time increases, the number will be increasing.

II.2.4 Accidents

The number of traffic accidents involving casualties by year is shown in Table II.5.

Table II.5 NUMBER OF TRAFFIC ACCIDENTS INVOLVING CASUALTIES

Year	Number of accident involving killed & injured	Number of injured	Number of killed	Accident rate (per million veh.-km)		
				Number of accident	Number of injured	Number of killed
1978	380,252	508,644	14,662	120.0	161.0	4.6
1979	367,500	486,441	13,222	111.0	147.0	4.0
1980	379,235	500,463	13,041	109.0	144.0	3.8
1981	362,617	475,944	11,674	112.0	147.0	3.6
1982	358,588	466,899	11,572	108.0	141.0	3.5
1983	374,107	489,210	11,732	107.0	140.0	3.4
1984	359,485	466,033	10,199	100.0	130.0	2.8
1985	327,745	422,095	8,400	91.0	118.0	2.3
1986	341,921	443,217	8,948	89.0	115.0	2.3
1987	325,446	424,540	7,963			

The total number of accidents is increasing. However, the number of killed is decreasing since 1970's.

Table II.6 shows the traffic accident by type of road for every 5 years.

The accident occurance rate in vehicle-km is generally decreasing. Especially, as far as the autobahn is concerned, the number of accidents and also the number of killed and injured are tremendously decreasing, and the rate of accident involving injury in terms of vehicle-km is only 1/6 out of the total accidents.

The accidents on the autobahn occupy only 5% in the number of accidents involving injury, 6% in the number of injured, and 9% in the number of killed out of the total accidents. These figures show that the autobahn is very safe.

Table II.6 TRAFFIC ACCIDENTS BY TYPE OF ROAD

Type of Accident	Type of Road	1970	1975	1980	1985
Number of accidents injured (persons/ billion veh.-km)	Federal autobahn	447	245	202	154
	Federal highway	1,548	1,121	1,040	870
	Land (state) road	1,550	1,288	1,270	1,049
	Kreis (County) road	1,118	1,040	1,043	891
	City & Town roads	2,653	2,058	2,087	1,732
	Total	1,614	1,209	1,120	907
Number of killed (persons/ billion veh.-km)	Federal autobahn	27	17	10	7
	Federal highway	105	66	50	31
	Land (state) road	99	72	58	35
	Kreis (County) road	74	63	48	30
	City & Town roads	76	51	35	21
	Total	82	53	39	23
Number of injured injury (persons/ billion veh.-km)	Federal autobahn	775	404	313	235
	Federal highway	2,327	1,608	1,452	1,193
	Land (state) road	2,261	1,821	1,746	1,398
	Kreis (County) road	1,591	1,438	1,397	1,160
	City & Town roads	3,400	2,577	2,549	2,064
	Total	2,274	1,639	1,478	1,168

II.3 Motorway Development

II.3.1 History

In 1927, the research institute on motorways (STRFA) proposed the plan on the Germany Long-distance Highway Network (exclusively for automobiles) with a total length of 22,500 km. The construction of motorway with four (4) lanes for the section between Köln and Bonn started in 1929 and was completed in 1932. This highway is the first motorway constructed in Germany and at present is up-graded to six (6) lanes. In September, 1933, the construction of motorway for the section between Frankfurt and Darmstadt started. In 1934, the plan of the Imperial Autobahn network with a total length of 6,900 km was proposed, and by 1936, a 1,000 km section was constructed and opened to public. In 1942, the plan was terminated because of the war. However, by that time, the sections with a total length of 3,869 km were in operation and furthermore 2,000 km were under construction in the former imperial territory.

Because of the World War II (1939—1945), the autobahn network with an aggregated length of 2,175 km was left as of 1950.

In 1955, the construction project of the Federal Autobahn network was replanned.

In 1957, as a part of the Federal long-distance highway network plan, which was proposed by the Federal Transportation Ministry, the long-term construction plan of the autobahn network was established. The proposed total length was 1,990 km. Since 1963, the length of autobahn construction has been extended.

The total length of autobahn, which was proposed in 1970, was 10,000km. By the end of 1970, 4,460 km were in operation and further 1,200 km sections were under construction. In the "Act on the Construction of the Federal Long-distance Highways from 1972 to 1985", which was enacted in June 30, 1971, the total length of autobahn network was determined to be 15,000 km. During the period from 1971 to 1985, the plan was reviewed several times. As of 1985, the final target length of the autobahn network was corrected to be 10,500 km.

The development of the autobahn network from 1929 to 1985 is shown in Figure II.2.

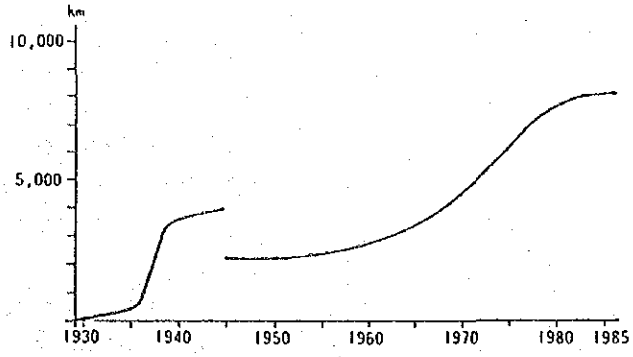


Figure II.2 DEVELOPMENT OF THE AUTOBAHN NETWORK FROM 1929 TO 1985

II.3.2 Motorway Network

The aggregated length of the autobahn network as of 1987 is approximately 8,400 km, of which (eighty) 80% is also the sections of European motorway network. The present autobahn network is shown in Figure II.3.

The aggregated length of the Federal long-distance highway network, which includes the autobahn with a length of 8,618 km and the Federal highways with a length of 31,196 km is the most important highway network. The section length by number of lanes is shown in Table II.7.

Table II.7 SECTION LENGTH BY NUMBER OF LANES IN 1988

Type of Highway	Section Length by Number of Lanes							
	1 or 2	3	4	5	6	7	8 or more	Total
Autobahn	208	26	6,677	484	1,181	15	30	8,618
Federal Highway Land (National) Roads	27,081	434	1,790	28		35		29,368
City, Town	1,151	35	519	12		111		1,828
								31,196

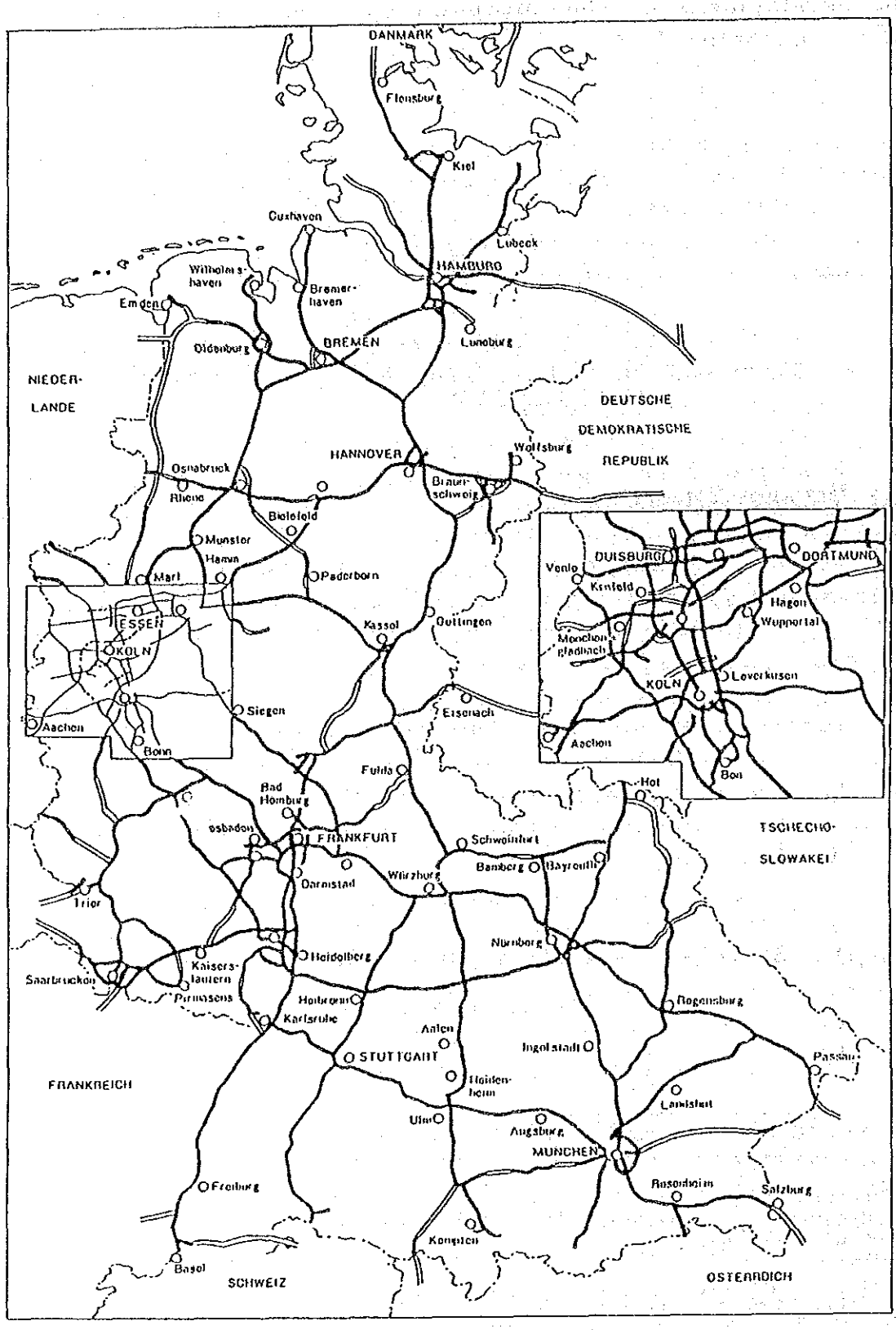


Figure II.3 PRESENT AUTOBAHN NETWORK

II.3.3 Future Plan

The plans of the Federal long-distance highways have been implemented through the following three (3) plans.

1) Federal Transportation Network Plan
2) Demand Planning
3) Five-year Plan

The present Demand Planning was approved in the Cabinet meeting on January 30, 1986. As shown in Table II.8, the new construction of 1,960 km autobahn, rehabilitation of 2,570 km autobahn sections, the new construction of 7,100 km Federal highways, and rehabilitation of 1,050 km Federal highways are proposed. Upon completion of these programs, the final aggregated length of autobahn will be 10,300 km.

Table II.8 NEW CONSTRUCTION AND REHABILITATION PROGRAMS OF FEDERAL HIGHWAYS (as of 1986)

Type	New Construction		Rehabilitation		Total
	Length Km	Invested amount Billion DM	Length	Invested amount Billion DM	Invested amount Billion DM
Autobahn					
Continued	1,000	7.3	700	4.3	11.6
New Projects	600	5.5	400	2.5	8.0
Sub-Total	1,600	12.8	1,100	6.8	19.6
Long-term	360	7.0	1,470	8.6	15.6
Total	1,960	19.8	2,570	15.4	35.2
Federal Highway					
Continued	1,450	6.3	150	0.5	6.8
New projects	2,000	12.0	100	0.8	12.8
Sub-total	3,450	18.3	250	1.3	19.6
Long-term	3,650	20.7	800	4.7	25.4
Total	7,100	39.0	1,050	6.0	45.0
Autobahn + Federal Highway					
Continued		13.6		4.8	18.4
New projects		17.5		3.3	20.8
Sub-total		31.1		8.1	39.2
Long-term		27.2		13.3	41.0
Total		58.8		21.4	80.2

II.3.4 Motorway Administration

The Ministry of Transportation of the Central Federal Government is in charge of the construction and operation of the Federal long-distance highways and disburses all the expenses. However, the Ministry does not possess an executing organization and conducts only the planning, research, and the distribution of budget. The actual construction and operations are entrusted to each Land (State) government.

Figure II.4 shows the organization of the Federal Transportation Ministry. The Bureau of Highway Construction is responsible for the planning of policies on the Federal long-distance highway network.

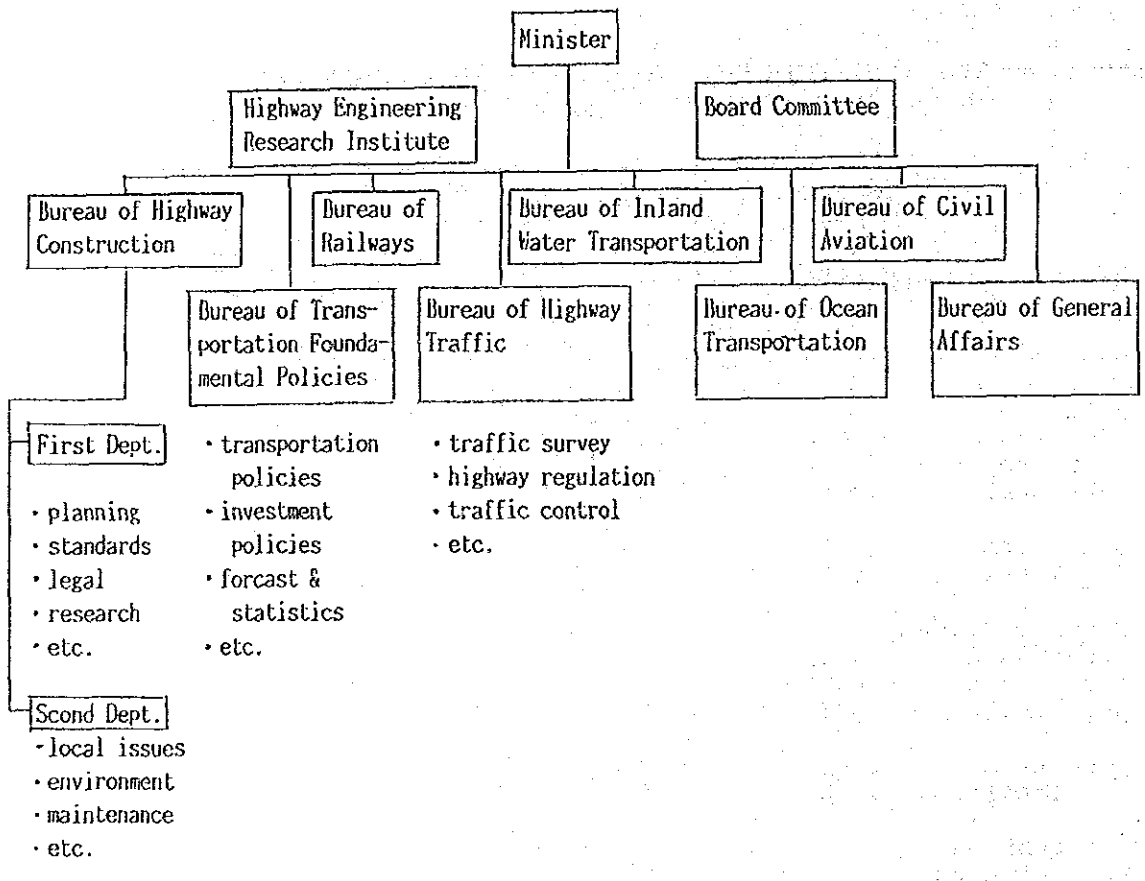


Figure II.4 ORGANIZATION OF THE FEDERAL TRANSPORTATION MINISTRY

The Land (State) government is in charge of planning, construction and operations of the Land Highways and also responsible for the construction and operations of the commissioned Federal Long-distance Highways. Each Land (State) government has the similar Transportation Ministry as the Federal Government.

The organization and title of the Land (State) agency in charge of highways varies by state. The organization of the Hessian State is shown in Figure II.5. This organization is in charge of the operations of autobahn in the State with a total length of 950 km, and the annul budget is US$ 100 million.

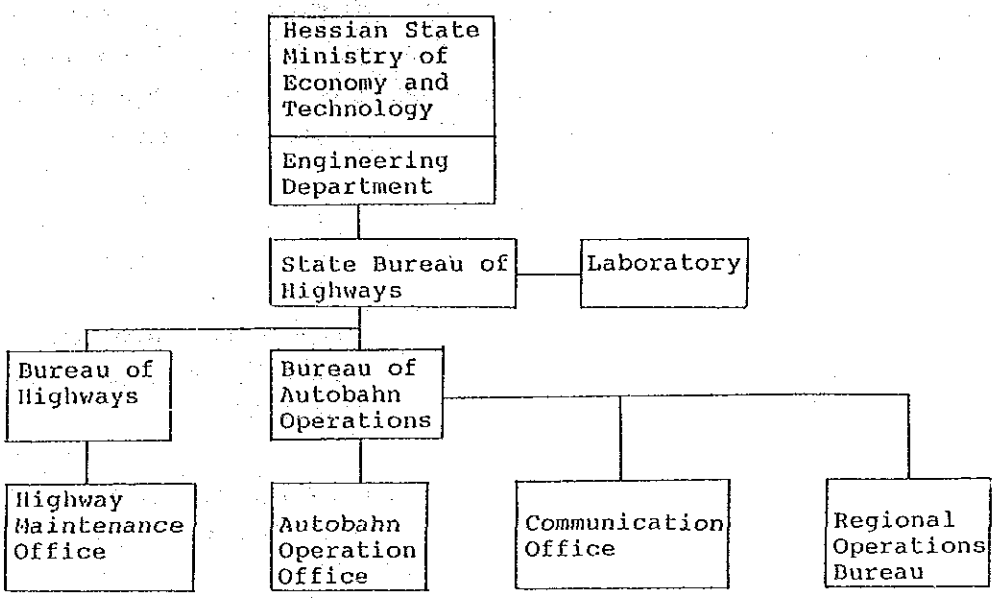


Figure II.5 ORGANIZATION OF THE INSTITUTION IN CHARGE OF HIGHWAYS IN HESSIAN

II.3.5 Financing

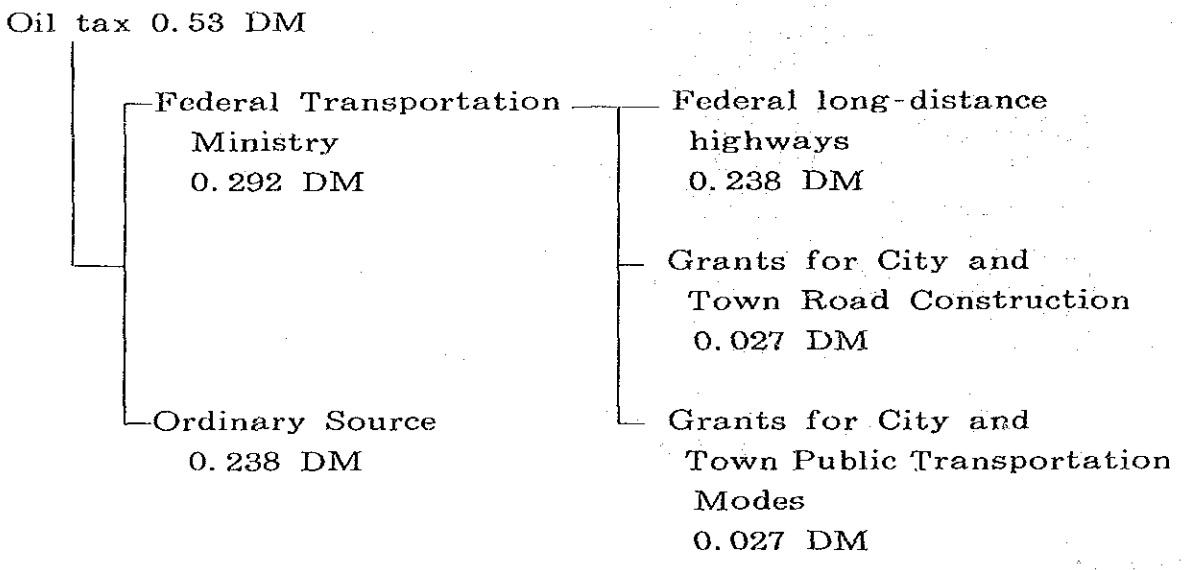
In April 1955, the Transportation Financing Act (Verkehrs Finanzgesetz) was enacted. By this Act, the Special Financing System for highway developments was introduced. In 1963, the Federal Government decided that 45% of the revenue from the oil tax is used exclusively for the highway development and the remaining is transferred to the ordinary budget.

The budget for highway development remains relatively in high standard because of the above mentioned Special Financing System and the revenue from the oil tax. As of April 1985,

the price of regular gasoline is 1.42 DM per liter composed of the follows:

Oil tax	0.53 DM/ℓ	= 37.3%
Additional tax	0.16 DM/ℓ	= 12.3%
Gasoline cost + Margin	0.73 DM/ℓ	= 51.4%
Total	1.42 DM/ℓ	=100.0%

Out of the oil tax, almost the half, 0.238 DM/ℓ is spent to the Federal long-distance highways. By adding the grant for the city and town governments, in which 50% is issued to the highway investments and public transportation, the expenditures of oil tax provided from the one liter regular gasoline are as follows:



The "Five-year Plan" is now approaching to the end of the fourth five-year Plan (1986 — 1990). The total budget for five years is 31 billion DM, which is distributed to each year by 6.2 billion DM.

Out of the total time and rehabilitation of the Federal long-distance highways, 30% goes to the other projects including minor improvements and the counter measures for traffic noise, and 19% to the ordinary maintenance work. The annual budget of the Federal highways is 6.25 billion DM and it is foreseen that this amount will not be increased, and for a while it remains

constant. Table II.9 shows the budget plan.

Table II.9 THE BUDGET PLAN

(Unit: million DM)

Year	1981-1985 (Actual)	1986 (Actual)	1987 (Actual)	1988	1989	1990	1986-1990	1991	1992	1993	1994	1995	1991-1995
Budget for Federal Highways (Art. 1210)	31,099.3	6,196.0	6,250.0	6,250.0	6,250.0	6,250.0	31,196.5	6,250.0	6,250.0	6,250.0	6,750.0	31,250.0	
Non-Investment Account (Maintenance)	5,624.7	1,131.2	1,135.2	1,171.3	1,229.1	1,211.9	5,878.6	1,211.9	1,211.8	1,210.7	1,210.7	1,210.7	6,055.7
Investment Account	25,474.6	5,065.4	5,115.6	5,078.7	5,020.9	5,038.1	25,318.8	5,038.1	5,038.2	5,039.3	5,039.3	5,039.3	25,194.3
Investment based on the Demand Forecast	16,671.7	3,209.9	3,112.5	3,022.5	2,771.3	2,714.2	14,830.4	2,553.4	2,524.1	2,493.1	2,459.3	2,423.7	12,453.6
Other Investments	8,802.9	1,855.5	2,003.1	2,056.2	2,249.6	2,323.9	10,488.4	2,484.7	2,514.1	2,546.2	2,580.0	2,615.6	12,740.7

II.3.6 Motorway Operation

The revenue and expenditures on the Federal long-distance highways in the year 1987 are shown in Table II.10.

The most of the revenue is from the specially defined oil tax. The expenditures are shown in Table II.11.

Table II.10 REVENUE AND EXPENDITURES ON THE FEDERAL LONG-DISTANCE HIGHWAYS IN 1987

Revenue	million DM
Major account (Part of oil tax revenue)	6,250.0
Carry-over from the previous year-1986	29.0
Additional revenue	13.2
Sub-total	6,292.2
Appropriated amount on the Budget decree	028.9
Total (expected)	6,263.3
Expenditures	**million DM**
Distributed amount to the State	6,165.0
Loan and Interest grats	5.0
Tax from Autobahnea Facilities Association	-20.6
Grant to budget account 1211	45.7
Countermeasure work by the State	42.6
Expenditures to the Federal Government	13.1
Sub-total	6,250.8
Non-decreased amount in 1986	1.5
Saved amount of Art, 1412	1.0
Balance of Budget	10.0
Total (expected)	6,263.3

Table II.11 EXPENDITURES FOR FEDERAL LONG-DISTANCE HIGHWAYS IN 1987

Item	Amount million DM	Total million DM
Maintenance & Rehabilitation		1,049.7
. Autobahn	504.7	
. Federal Highways	545.0	
Improvement,Betterment,a new construction of excluding R-O-W costs		2,308.3
. Improvement & Betterment of Autobahn in Operation	606.6	
. Widening of Autobahn in operation	439.2	
. New Construction	1,216.5	
. High-rise buildings	46.0	
Improvement, Betterment of Federal Highways excluding R-O-W costs		1,909.8
. Improvement & Betterment of Federal Highway	846.6	
. New Construction	1,045.7	
. High-rise buildings	17.5	
R-O-W acquisition, Loan, Supply for interest		513.6
. Autobahn 212.5		
. Federal highways	301.1	
Expenditures by railway crossing act		195.0
Design Fees, and Compensation		130.3
Federal Grants to the concerned organization		59.7
Central expenses and others		84.4
. Expenses for research, publication and traffic economy	12.6	
Countermeasure Facilities by the State	42.6	
Others	29.2	
Total		6,250.8

II.3.7 Maintenance

The maintenance costs in a broader sense for the year 1987 is 2,425 million DM as follows.

Constructive Maintenance	178 million DM
Major Repair & Renewal	1,502 million DM
Improvement	745 million DM
Total	2,425 million DM

The major concern of the Autobahn network is the maintenance and the assurance of traffic safety. These operations are implemented by the motorway maintenance office, which is located every 50—60 km. In the region where more deuced highway network is distributed, the maintenance office covers up to 120 kms. As of 1987, 146 maintenance offices were provided for the autobahn network with a length of 8,600 km. Six (6) offices are under construction and seven (7) offices are under the planning stage.

The maintenance office is in charge of cleaning of pavement, bridges, service and parking areas and other drainage facilities in addition to the regular patrol, the treatment of accidents and providing assistance to disabled cars. These offices are usually staffed with 37 persons.

II.3.8 Typical Design Standards

The typical cross section adopted in the autobahn is shown in Figure II.6.

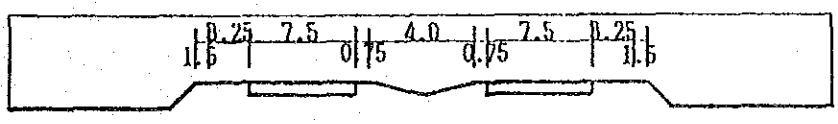


Figure II.6 TYPICAL CROSS SECTION

In the Manual RAS-L-1 on the alignment, which was defined in 1989, the roads are classified into five (5) categories (A—E) by the location, construction limits, and the characteristics.

These are further sub-divided into 13 categories. In the highest grade A1, no speed limit, dual carrigeway, and the grade separation are applied. The design speed is 120 km/hr.

Before, a parking area was provided every 6 km, but nowadays every 10 — 12 km. Recently, the toilet facility is also provided in a park area.

The Drive-in (Service Area) is provided every 100 km, and these facilities are open for 24 hours. The gas station is provided every 60 km.

III. ITALY

III. ITALY

III.1 General

The land of Republic of Italy (hereinafter Italy) is located in the southern part of the Europe Continent and its land area is 301,268 km^2 which is about 59% to that of Thailand.

Italy has a population of 57,221 million in 1986 which is 109% to that Thailand.

GNP of Italy is 599,917 million Dollars in 1986 and Per Capita Income in 1986 is 10,484 Dollars which is 13.2 times to that of Thailand.

III.2 Highway and Transport Conditions

III.2.1 Road Network

Table III.1 shows the growth of road network.

Table III.1 GROWTH OF ROAD NETWORK (km)

Year	Motorways	Highways, main or national roads	Secondary regional	Other roads	Total	Percentage paved %
1984	5,941	45,618	108,082	141,666	301,307	100
1985	5,955	45,765	108,191	141,666	301,577	100
1986	5,997	45,779	108,404	141,666	301,846	100
1987	6,083					

The total road network in 1986 is 301,846 km and the number of kilometers per 1,000 population is 5.3 km which is less than that of Japan (9.0 km/1,000) and EC countries (8.4 km/1,000). However, the ratio of the total of motorways and highways (51,776 km in 1986) to 1,000 population is 0.9 km/1,000, that is more than double of 0.41 km/1,000 of Japan.

III.2.2 Transportation Modes

The share of transportation modes in the passenger and freight transport is shown in Table III. 2 and Table III. 3.

Table III.2 SHARE OF TRANSPORTATION MODES IN PASSENGER TRANSPORT

(passenger-km in billion)

	1984		1985		1986	
	Total	Share(%)	Total	Share(%)	Total	Share(%)
Road	460	91	481	91	506	
Rail	43	8	41	8	44	
Air	4	1	5	1	—	
Total	508		527			

Table III.3 SHARE OF TRANSPORTATION MODES IN FREIGHT TRANSPORT

(ton-km in billion)

	1984		1985		1986	
	Total	Share(%)	Total	Share(%)	Total	Share(%)
Road	140	88	144	88	151	89
Rail	19	12	19	12	18	11
Inland Water	0. 3	0	0. 2	0	0. 2	0
Total	159. 3		163. 2		169. 2	

These tables state that very high share of road transportation in both of the passenger and freight transport has occupied, i. e. 91% for passenger transport and 89% for freight transport.

III.2.3 Number of Registered Vehicles

The growth of the number of registered vehicles, in the years 1984 — 1987, is presented in Table III. 4.

Table III.4 GROWTH OF THE NUMBER OF REGISTERED VEHICLES

(Unit: 1,000)

Year	Four-plus wheels					Tractors, trailers and semi-trailers	Motorcycles and mopeds
	Cars	Business coaches	Goods vehicles	Van	total		
1984	20,888	72	1,683	390	23,033	442	5,163
1985	22,495	76	1,794	390	24,763	522	5,341
1986	23,495	78	1,887	420	25,881	577	5,799
1987	24,307	82	1,906	506	26,801	572	6,285

The number of registered vehicles in 1987 is 26,801,000 (excluding tractors, trailers, motorcycles), the number per 1,000 population is 448 which is higher than that of Japan (409/1,000 population).

III.2.4 Accidents

Table III.5 and Table III.6 show the trend of accidents on roads and on motorways respectively.

Table III.5 ACCIDENTS ON ALL ROADS

Year	Total number of accidents involving injury to persons	Number of injured	Number of killed	Rate per 100 million veh—km		
				Injury accidents	persons injured	Persons killed
1984	159,051	217,553	7,184	57	78	2.6
1985		212,628	7,042		74	2.4
1986	155,427	213,159	7,076	52.4	71.9	2.4
1987	158,208	217,511	6,784	50.4	69.3	2.2

Table III.6 ACCIDENTS ON MOTORWAYS

Year	Number per 100 million veh—km			
	Number of accidents		Number of persons	
	Total number of accidents	Number of killed	Casual-ties	Persons killed
1966	103	—	65	4.05
1970	96	2.34	55	2.97
1975	75	1.76	40	2.21
1980	62	1.69	33	2.18
1985	62	1.22	32	1.58
1986	63	1.33	30	1.73

The number of persons killed per 100 million veh—km for the motorways is 1.73 in 1986 which is 73% to that for the all roads, i.e. 2.2, in the same year.

III.3 Motorway Development

III.3.1 History

In 1925, the first expressway in Europe was in operation between Milano and the Lake Area in Italy, and then until 1935, 500 km of expressways were constructed and operated.

ANAS (Departments of Roads), which was established in 1946, started in 1947 the reconstruction of the national road network which had been seriously damaged because of the 2nd World War,

and almost completed it in 1952. ANAS publicly announced the long term plan on "the development and expansion for the motorways and national highways" due to the increase of the traffic volume, which was in force by the Law 463 in 1955. The particularies of this Law are as follows;

- to limit the direct participation of the government
- to give concession to the private companies on the construction and management of the motorways and to fund them
- to introduce the toll rate for the refund

After that, the government had been developing the motorway network in the 1960's and the beginning of 1970's under the Law 729 in 1961 and the Law 385 in 1968 which pay attention to the following:

- to introduce the Pool System to the management of Autostrade concession company
- To abandon the participation by the government in the financing and management of the motorways.

The government, however, was resolved on suspension to construct the motorways because of the 1st oil crisis and the public opinion that the mass transit transportation system would be more needed than the motorways. Following that situation, most of the concession companies were ill managed because of the steep rise in construction cost and wages. Therefore, the government supported the concession companies on an advance of debt, a subsidy for interests and an expansion for debt in order to allow them to reconstruct their management.

In 1982, the Law 531 on "ten years plan for development of the Trunk Highway Network and reconstruction of the motorway network", including 7,500 km of motorway network, was enforced to nationwidely develop the socio-economic activities.

III.3.2 Motorway Network

The total length in use of the motorways in 1987 was 6,011 km. Of these 6,011 km, 5,136 km are the toll motorways as shown in Table III.7, Table III.8 and Figure III.1.

Table III.7 MOTORWAY NETWORK

(km)

Year	Total length of motorways	length of toll motorways		
		Total	Autostrade concession	Other concession comp.
1956	520	520	—	520
1960	1,161	1,161	320	841
1965	1,736	1,736	1,100	636
1970	3,913	3,369	1,917	1,452
1975	5,431	4,520	2,388	2,132
1980	5,901	4,921	2,618	2,303
1985	5,955	5,072	2,633	2,439
1986	5,997	5,132	2,685	2,447
1987	6,011	5,136	2,675	2,461

Table III.8 BREAKDOWN OF MOTORWAY NETWORK IN 1987

Type	Company	In operation	In onstruction	In plan	Total
Toll	Autostrade	2,674.6	156.5	19.7	2,850.8
	SARA-ANAS	270.4	18.8	—	289.2
	Others	2,190.9	32.5	488.9	2,712.3
	Un-decided	—	—	44.0	44.0
	Sub-Total	5,135.9	207.8	532.9	5,876.6
Non-toll	ANAS	875.5	—	9.8	885.3
	Total	6,011.4	207.8	542.7	6,761.9

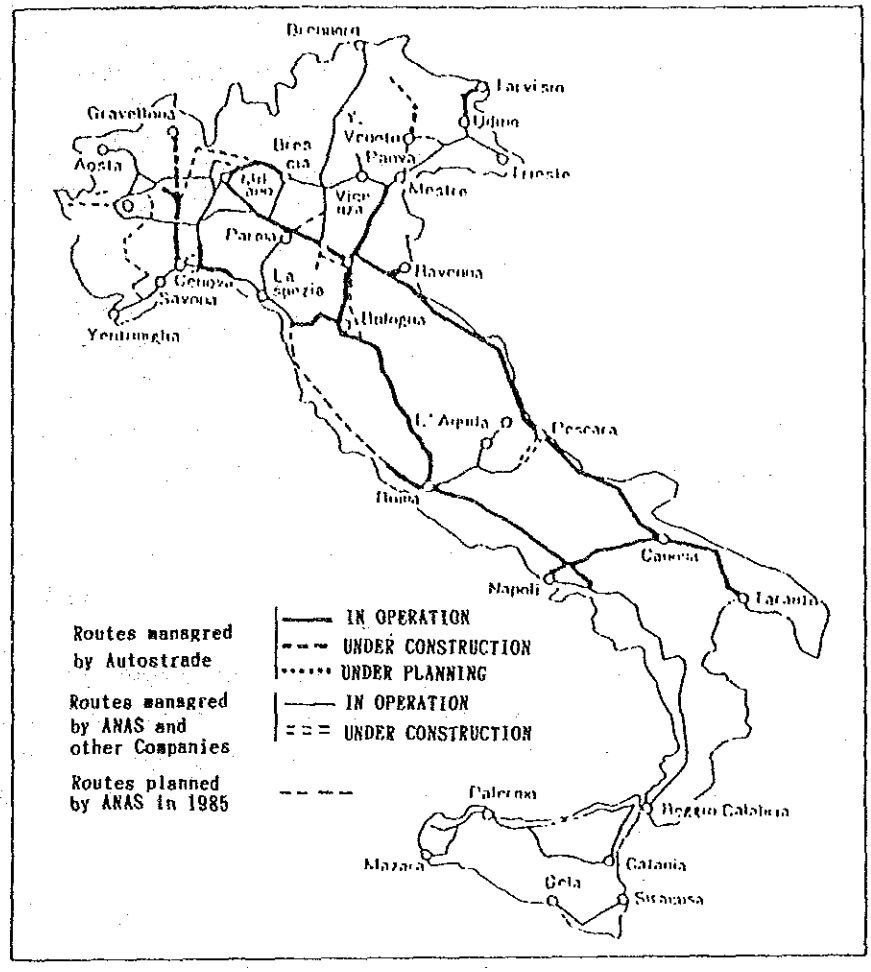


Figure III.1 EXPRESSWAY NETWORK

III.3.3 Future Plan

In 1985 "Expressway Project Plan" was established by ANAS in response to the request of CIPE (Cabinet Boad Meeting on Economic Plan) and the Parliament Special Committee. Contents of the plan are as follows:

- Proposed length, priority and cost

Priority	Length (km)	Cost (Billion Lira)
1st	418	7,292
2nd	198	2,765
3rd	784	10,450
Total	1,400	20,507

— Project breakdown

New construction under the Law 531 (1982)	110 km
Windening	338 km
Connecting roads	17 km
New construction	935 km

— Distribution to areas

Northern	907 km
Central	286 km
Southern	207 km

III.3.4 Motorway Administration

The main administrative bodies are ANAS and the concession companies.

ANAS (Azienda Nazionale Autonoma dells Strade)
"Azienda Nazionale Autonoma" is translated "national independent body" in English. ANAS is under the Ministry of Public Works (MOPW) and is independent from MOPW on budget. The main roles of ANAS on the expressways are as follows:

- administration and control
- improvement
- direct and/or indirect construction
- supervision of the construction and maintenance
- investment to movable and/or unmovable property
- management of the Law and regulations
- collecting data
- study on the construction, traffic, etc.
- reporting on financing, management, statistics, etc.

Concession Companies

There are 25 concession companies as followings:

— Completely private Co., Ltd.	2
— Private Co., Ltd. 1/2 capitaled by Government	4
— Private Co., Ltd. 1/2 capitaled by domestic Government	15
— Provincial association	3
— Private Co., Ltd. directly managed by ANAS	1
Total	25

Autostrade Co., Ltd. manages the length of the motorway of 2,675 km among the above.

III.3.5 Financing

The financing of the concession companies are covered by fund from private and/or governmental financing companies, the investment of either or both of government and municipal government, private companies and toll revenue. The term of concession is 30 years in principle under the Law 463.

III.3.6 Operation

As mentioned in Section III.3.1 "History", almost all concession companies were in the red from the 1970's until 1982. In 1986, 15 concession companies were still in the red and 6 companies, except Autostrade Co., Ltd. were well or even managed.

III.3.7 Toll System

There are 2 toll rate systems, one is rated based on the number of wheel base/axle and the other is based on exhausting volume/carrying capacity. The former is more adopted than the later. Table III.10 shows the toll rate by the concession companies and wheel base/axle categories.

Table III.10 TOLL RATE

Unit : Lira/km 1984

Name of Company		Passenger Car						Freight Car								
		0	2A	2B	2C	3	4	2A	2B	2C	3	4	5	6	7	8
Auto-strade	A	23.31	27.52	52.45	61.43	70.46	116.76	27.52	52.45	53.90	64.14	104.68	117.32	129.95	129.95	129.95
	B	26.11	32.98	62.84	73.22	84.25	139.69	32.98	62.84	64.19	76.23	124.69	140.09	155.24	155.24	155.24
A.T.I.V.A	A	27.27	31.74	61.10	71.68	82.08	130.79	31.74	61.10	71.66	84.44	133.15	149.25	165.54	181.65	197.94
Serravalle Milano	A	23.31	27.54	52.45	61.43	70.46	116.77	27.52	52.45	53.90	64.14	104.63	117.32	129.95	129.95	129.95
S.A.L.T	A	26.78	33.87	64.49	76.00	87.13	130.01	33.87	64.49	76.00	89.50	140.37	158.13	175.36	192.45	209.64
	B	42.52	50.21	95.14	113.37	130.15	207.30	50.21	96.30	113.35	132.50	209.64	235.46	261.16	286.95	312.63
S.A.V	B	36.77	45.61	87.54	103.34	118.64	-	45.81	87.54	103.34	121.00	191.47	215.00	238.43	261.96	285.48
A.d.f	B	40.30	68.09	105.02	146.58	191.65	255.63	68.09	105.02	146.58	194.01	257.99	296.35	316.17	330.75	337.69
Aut. Le CTSA	B	33.77	39.69	75.25	88.58	101.92	161.18	39.69	75.25	8.58	104.28	163.54	184.28	204.28	224.28	245.01
S.A.S.A	B	16.34	19.41	37.55	44.43	51.04	-	19.42	37.56	44.43	51.04	81.69	91.92	102.13	112.34	122.56
Teng. Napoli	A	250 Lira/axle														

A : Flat
B : Mountainous

III.3.8 Maintenance

The maintenance system on the motorways was standardized and organized in 1981 under the Presidential anouncement as "Maintenance Centre" which has the following organization:

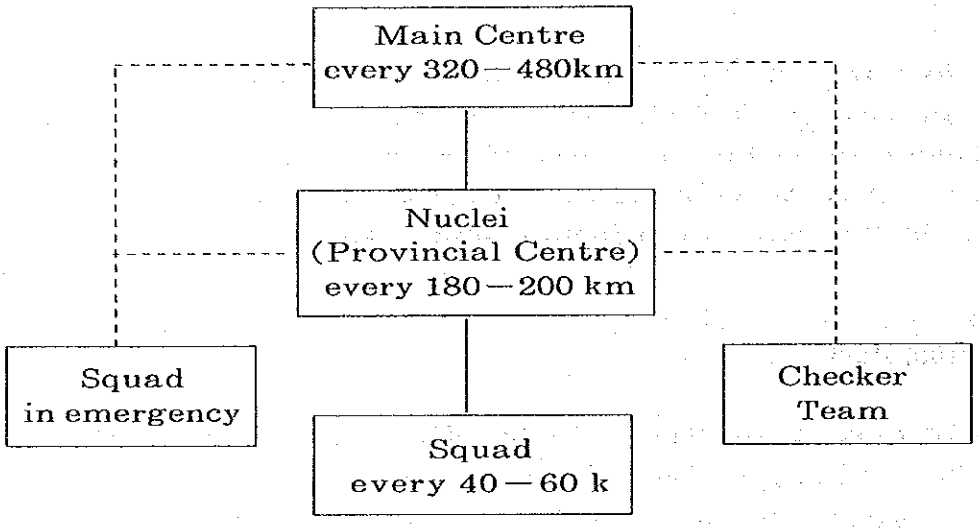


Figure III.2 MAINTENANCE SYSTEM

III.3.9 Typical Design Standards

The typical cross section adopted by Autostrade Co., Ltd. is shown in Figure III. 3.

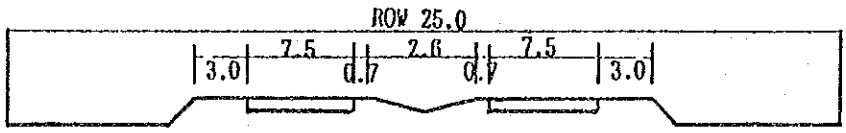


Figure III.3 TYPICAL CROSS SECTION

The service facilities on the motorways are located as follows:

Parking area	about 60 km
Service station	about 30 km
Restaurant	about 80 km