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THE STUDY ON NATIONAL TRANSPORT PLAN IN THE ISLAMIC REPUBLIC OF PAKISTAN

TECHNICAL PAPER VOL. 2

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JAPAN INTERNATIONAL COOPERATION AGENCY

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VII. HIGHWAY PLANNING

1. Limitation of the Study

Highway planning dealed in this study is integrated into a Pakistan National Transport Plan so as to establish the adequate multi-model transport systems in Pakistan.

Required investment scale for highway sector will be recommended through highway planning incorporating with the National Transport plan.

Road Network for National Transport plan is selected on the basis of relevant reports prepared for road plannings in Pakistan and discussion made with Pakistan authorities concerned.

Road Network selected does not cover all highway networks existing in Pakistan and subject differs from an ordinally highway master plan.

Although, highway construction standard is presented according to the reports of past studies in Pakistan, it does not always result from any pre-evaluation.

It has to be mentioned that this study dealt with inter-regional traffic in order to set up the plan for inter-regional main highway network.

And there is no available topographical map for foreign study team.

2. Introduction of Highway System in Japan

2-1 Highway Network in Japan

Highway network in Japan consists of national expressway, national highway, prefectural road and municipal road.

National highway, prefectural road and municipal road are opened to traffic with free of charges to the users as general. There are also toll roads, such as national expressway and other similar roads, constructed and administered by the Japan Highway Public Corporation, Tokyo and Hanshin Expressway Public Corporations, local road public corporations and local governments.

Prefectural and municipal roads, in which rapid improvement are required, are designated as principal local roads.

The present status of roads in Japan and other developed countries are shown in Table 2-1 and 2-2.

Table 2-1 Present Status of Roads in Japan as of April 1, 1980

Class	Total Length (km)	Improved Section (Roadway width ≧ 5.5 m)		Paved Section (High Standard)	
		Length (km)	Ratio (%)	Length (km)	Ratio (%)
National expressways	2,579.1	2,579.1	100.0	2,579.1	100.0
National Highways	40,211.7	33,894.9	84.3	33,503.4	83.3
Principal Local Roads	43,906.4	26,383.0	60.1	23,831.8	54.3
Prefectural Roads	86,930.0	32,831.0	37.8	25,588.3	29.4
Sub-total	173,627.2	95,688.0	55.1	85,502.7	49.2
Municipal Roads	939,760.3	93,625.2	10.0	94,905.0	10.1
Total	1,113,387.5	189,313.2	17.0	180,407.7	16.2

Table 2-2 Road Network Density

	Japan	U.S.A.	W. Germany	England	France	Italy
Area (10,000 km²)	37.8	936.3	24.9	23.0	55.1	30.1
Total road length (10,000 km)	40.0	617.6	47.0	34.5	79.5	28.1
Road network density (km/km²)	1.06	0.66	1.89	1.50	1.44	0.97

Notes: 1. From IRF Statistics 1978, Highway Statistics 1977
2. The total road length of France does not include rural roads of about 700 thousand km.

Source; Roads in Japan 1981

2-2 Road Development Programmes

First Five-Year Road Improvement Programme of Japan was established in 1954 when the revenue from the gasoline tax was allocated to a special found for road improvement.

A main subject of road construction works so called primary reconstruction in 1950's was in the first place to improve the national highways connecting major cities so as to enable cars pass each other.

Regarding to the preliminary reconstruction, first specification of former primary and secondary national highway was performed and followings were examined in advance to above that the scale of the national highway network, coverage of cities by the primary national highway and location of primary highway.

The scale of national highway network was studied adopting formula of highway needs by Japanese Dr. Fujii, which is developed giving hypothesis that "road density is directly proportional to the square root of population density."

The solution is following.

On the assumption that "I" indicated national income per capita ($/Man),

$$k = aI$$

and "a" is solved to be 0.028 from the data of Belgium, France, Italy, Holland and England, which were judged to have comparatively same situation as Japan. Thus,

$$L = 0.028I\sqrt{AP}$$

has been gotten.

Using above equation, the team has got following figures in case of Pakistan.

$A = 768,874\ km^2$

$P = 83,782,000$

CDP/capita = 258 $

$L = 0.028\ I\sqrt{AP} \fallingdotseq 60,000$ km

At this stage, noteworthy point is that Japanese economic scale in 50's is remarkably similar to that of present Pakistan.

Vehicle composition at the end of 1953 in Japan consists of 77% truck and 18% passenger car, which is similar situation of the present Pakistan.

In the last half of 1960's, national expressways such as the Tomei Expressway, urban expressways and by-passes around cities were constructed (secondary reconstruction) extensively and, low cost road pavement was adopted for rural roads.

In spite of these efforts in road improvement works, road traffic demand exceeded road improvement works, which brought about such problems as traffic congestion, traffic accidents, pollution and so on.

In order to cope with this situation and to achieve the goals of road works, it was necessary to implement the works in a planned way by setting up and intermediate range planning with 1990 as the target year for the accomplishment of the urgent measures, at the same time, by setting up a new long range road improvement vision with the first years of the 21st century as target years, while paying attention to the changes in domestic and foreign socio-economic environments and fully looking back on the former long range road improvement vision.

In accordance with this intermediate plan, the 8th Five-Year Road Improvement Program has been launched to recover the delay of road improvement by promoting the work to meet the urgent necessities of coming five years.

Trends of the five-year road improvement programmes and road expenditures are shown in Fig. 2-1.

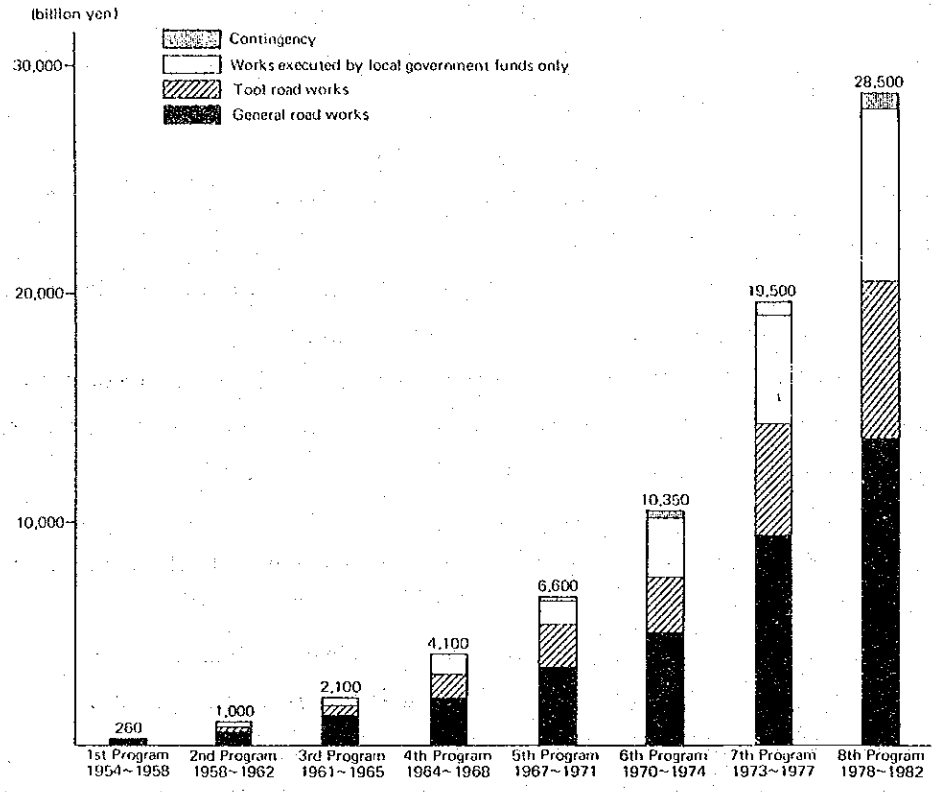


Fig. 2-1 Trend of the Five-Year Road Improvement Programme

2-3 Construction Standards

Construction Standards for public roads are provided in the Road Structure Ordinance (enacted in 1970 according to the Road Law). The outline of this ordinance is as follows.

Construction Standards are classified into four types according to whether the road is an expressway or not, and the area where the highway is located.

Type 1 and 2 roads are respectively located in rural and urban areas, and classified into four and two categories. But both of them are expressways. On the other hand, Type 3 and 4 roads, also respectively located in rural and urban areas, are classified into five and four classes. These are the roads other than expressways.

Each type-and-class of construction standard is applied to the highway according to the design traffic volume and the terrain where te highway is located.

Construction standards of cross section, design speed, etc. are provided according to the type-and-class of the road.

Construction standard for Expressway is show in Table 2-3 and that of Road other than Expressway is shown in Table 2-4.

Table 2-3 Construction Standard (1)

Express-way or not	Type	Class	Design speed (km/h)	Access control	Design traffic volume (vehicles/day)				Remarks
					Over 30,000	30,000–20,000	20,000–10,000	Less than 10,000	
Express-ways	1	1	120	F	N.E. in level terrain				Over 4-lane road
		2	100	F,P	N.E. in mountainous terrain	N.E. in level terrain			Over 4(2)-lane road
					E. in level terrain				
		3	80	F,P		N.E. in mountainous terrain		N.E. in level terrain	
					E. in mountainous terrain		E. in level terrain		Over 2-lane road
		4	60	F,P				N.E. in mountainous terrain	
							E. in mountainous terrain		
	2	1	80	F	N.E. in urban area, E. in urban area except the center of Metropolis				Over 4-lane road
		2	60	F	E. in the center of Metropolis				

Note: N.E. : National Expressway
E. : Expressway other than National Expressway
F : Full control of access
P : Partial control of access
N : Non control of access

Table 2-4 Construction Standard (2)

Express-way or not	Type	Class	Design speed (km/h)	Access control	Design traffic volume (vehicles/day)						Remarks
					Over 20,000 vehicles	20,000–10,000	10,000–4,000	4,000–1,500	1,500–500	Less than 500	
Roads other than Express-way	3	1	80	P,N	N.H. in level terrain						Over 4-lane road
		2	60	N	N.H. in mountainous terrain	N.H. in level terrain					
					P.M. in level terrain						
		3	60 50 40	N		N.H. in mountainous terrain		N.H. in level terrain P. in level terrain			Over 2-lane road
					P.M. in mountainous terrain			M. in level terrain			
		4	50 40 30	N				N.H. & P. in mountainous terrain			
								M. in level terrain			
								M. in mountain-ous terrain			
		5	40 30 20	N						M. in level terrain or mountain-ous terrain	1-lane road
	4	1	60	P,N	N.H. in urban area						Over 4(2)-lane road
					P.M. in urban area						
		2	60 50 40	N			P.M. in urban area	N.H. in urban area			Over 2-lane road
		3	50 40 30	N				P. in urban area			
								M. in urban area			
		4	40 30 20	N						M. in urban area	1-lane road

Note: N.H. : National Highway
P.M. : Prefectural or Municipal Road
P. : Prefectural Road
M. : Municipal Road

SOURCE; Roads in Japan 1981

3. Introduction and Methodology

3-1 Master Plan

The master plan is consistent with the development actions planned in spheres other than highways.

Highway plan is integrated into a transport plan, which should be integrated into a general development plan.

Therefore it takes account of the options (Alternatives) adopted for the allocation of transport between road and rail.

The total amount of the plan must be consistent with the available financial resources adopted in two cases, which are generally studied as a part of the plan.

3-2 Steps in the Planning Process

This plan is built upon a determination of the needs. The first step in the planning process is the collection of information about the needs and the existing conditions.

This is followed by the preparation of long-range programme so-called Master Plan for two alternatives to meet these needs.

The 5-year action programme for the selected alternative plan from 1983/84 upto 1987/88 is next prepared.

The final step of the plan is the preparation of an annual budget to provide the finance for the actual plan of action.

4. Present Highway System in Pakistan

4-1 Highway Administration

There are three main agencies responsible for highways in Pakistan; the Ministry of Communications, Provincial Highway Department and District Councils.

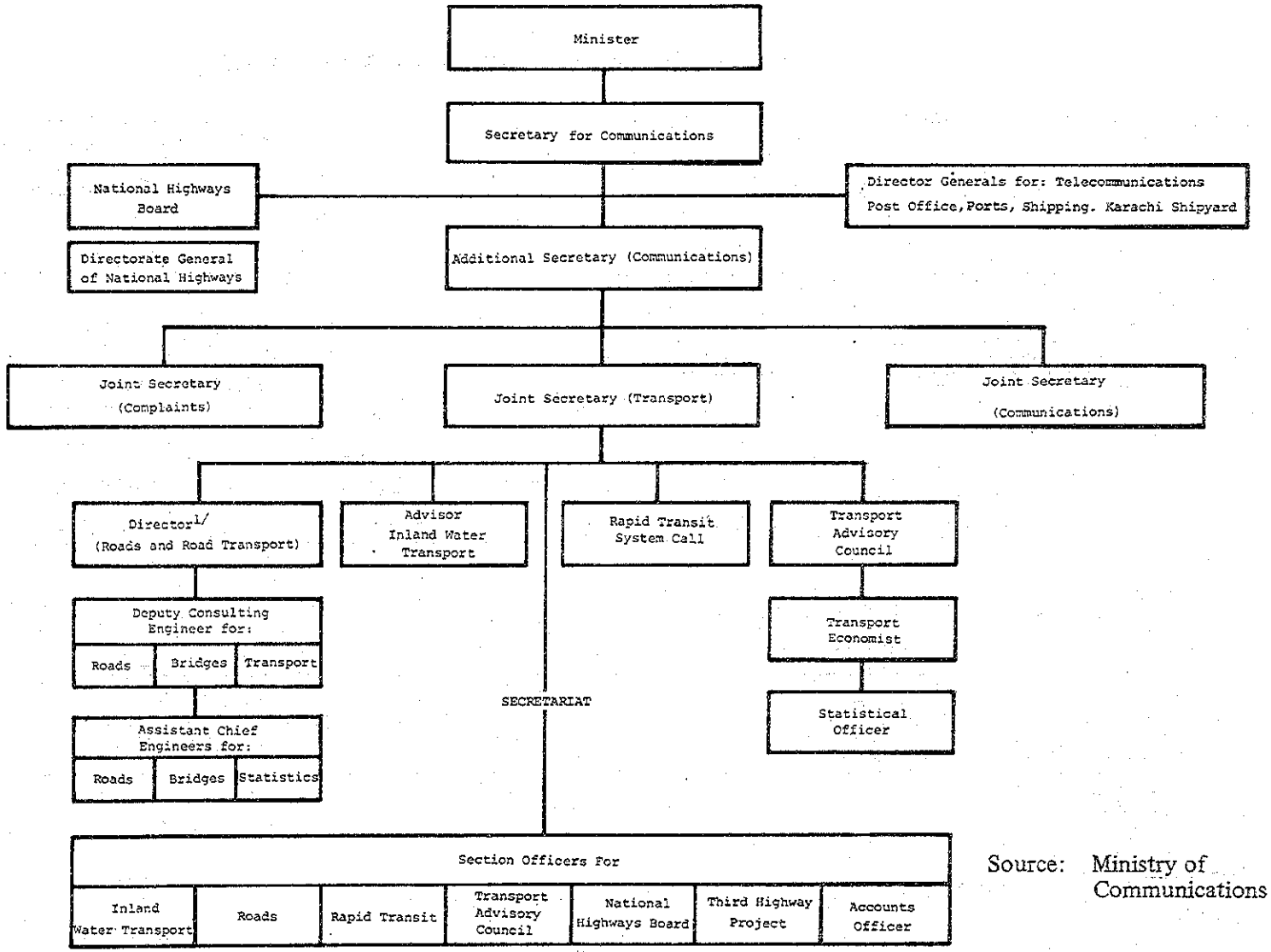
The Rural Development Department and Agency in charge of Social Welfare the Local Government undertake construction of black-top rural roads and all the completed roads transferred to the Highway Department for subsequent maintenance.

The Ministry of Communications is the authority responsible for administration of national highways. Within the MOC the National Highway Board is the agency functioning the planning, construction and maintenance of the national highways.

Organization Charts of the Ministry of Communications and the National Highway Board are shown in Fig. 4-1 and 4-2.

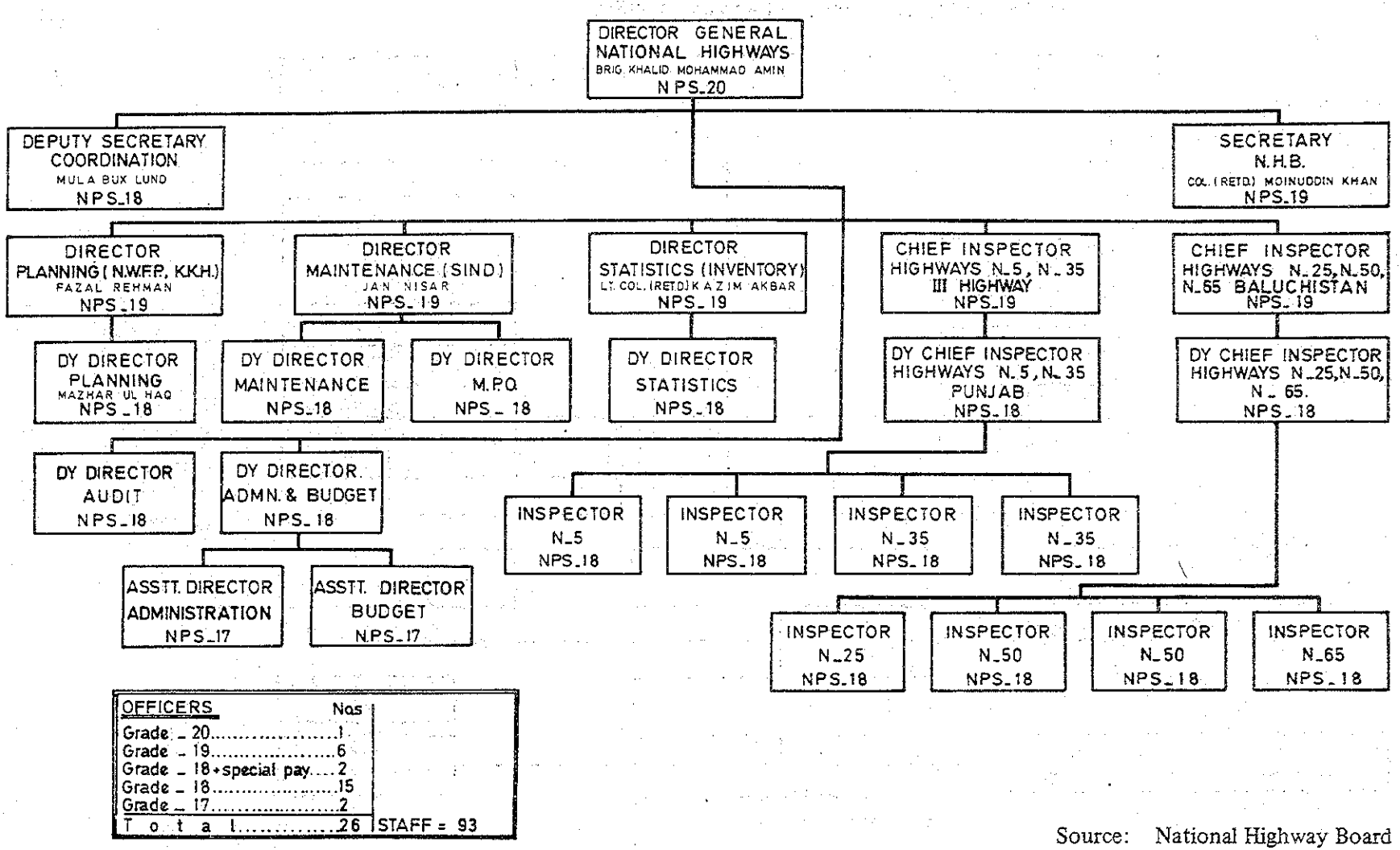
All the functions for the rest of the roads are handled by the four Provincial Government with the responsible agency of Highway Department.

Organization Charts of four Provincial Highway Departments are also shown in Fig. 4-3, 4-4, 4-5, and 4-6.



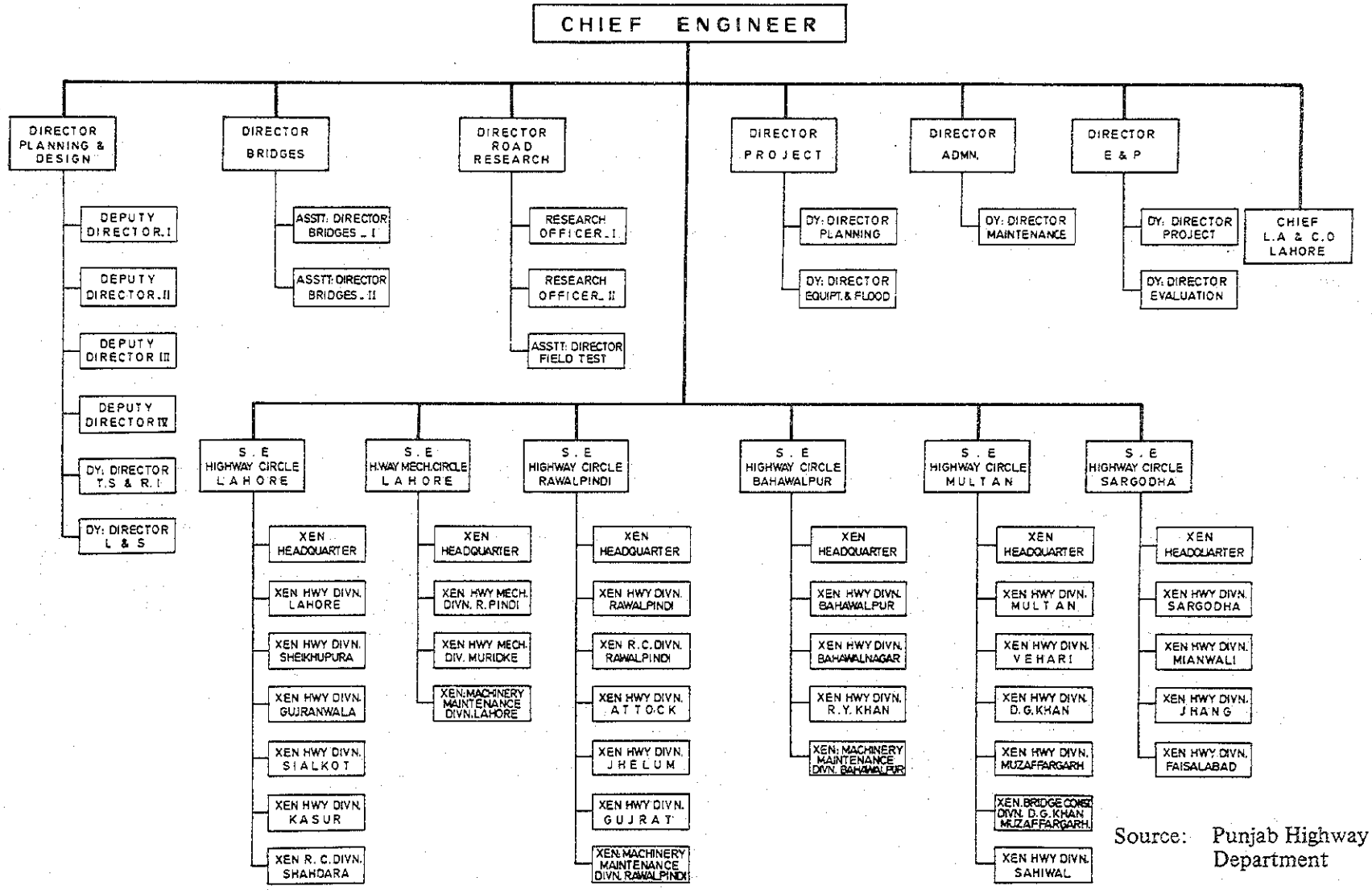
Source: Ministry of Communications

Fig. 4-1 Organization Chart of Ministry of Communications



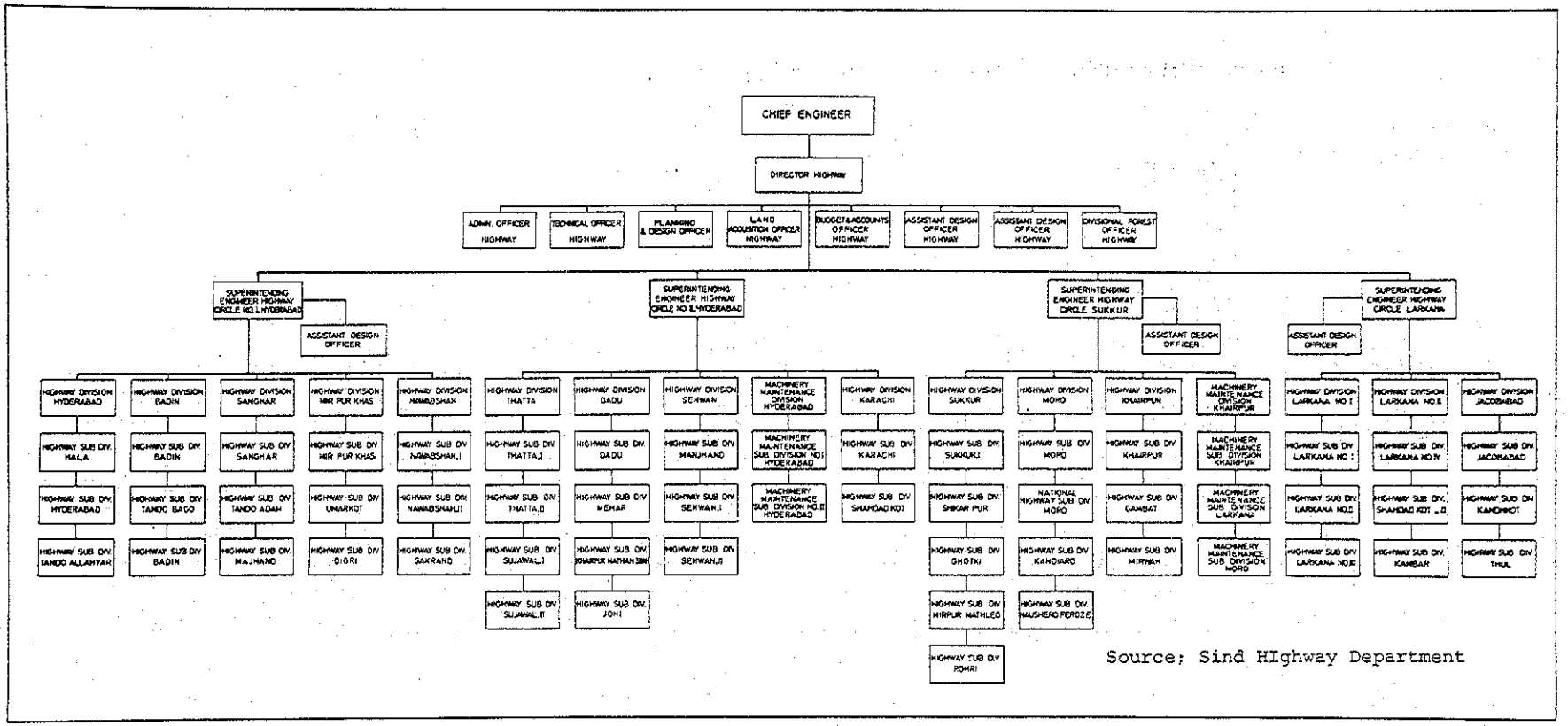
Source: National Highway Board

Fig. 4-2 Organization Chart of National Highway Board



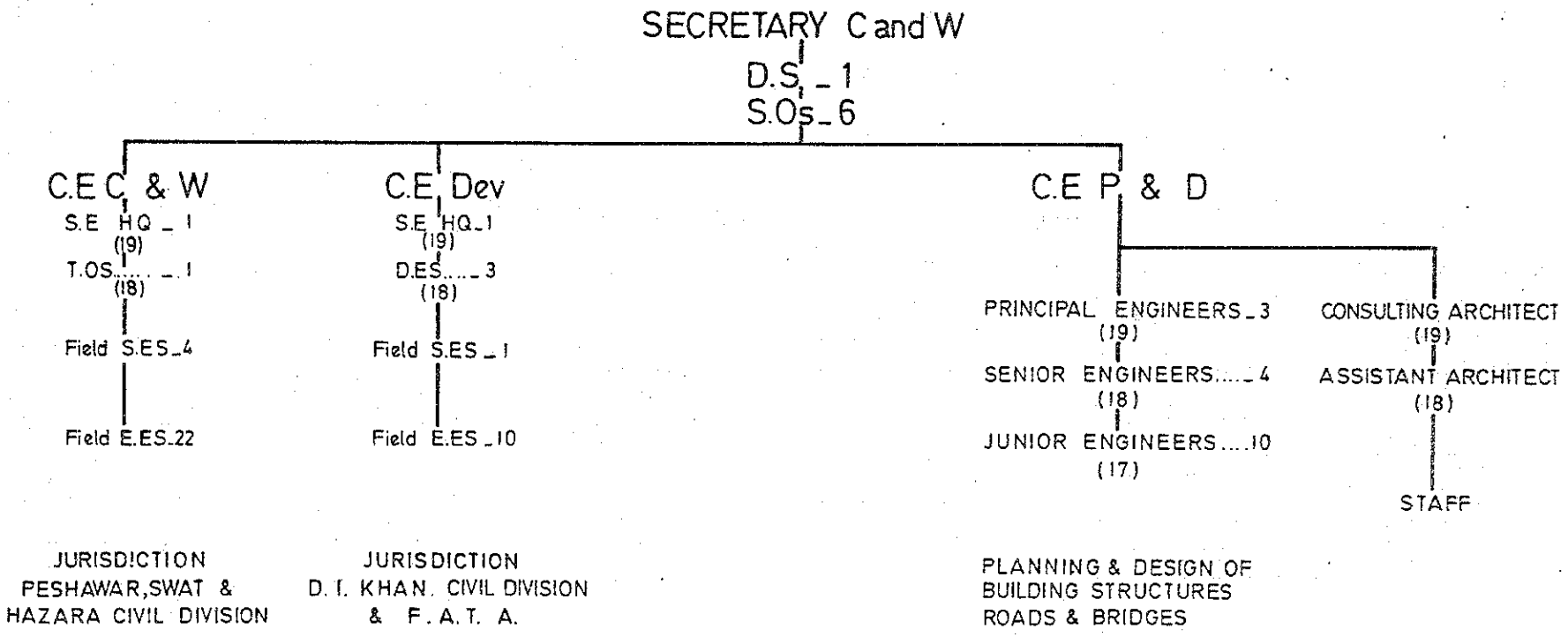
Source: Punjab Highway Department

Fig. 4-3 Organization Chart of Punjab Highway Department



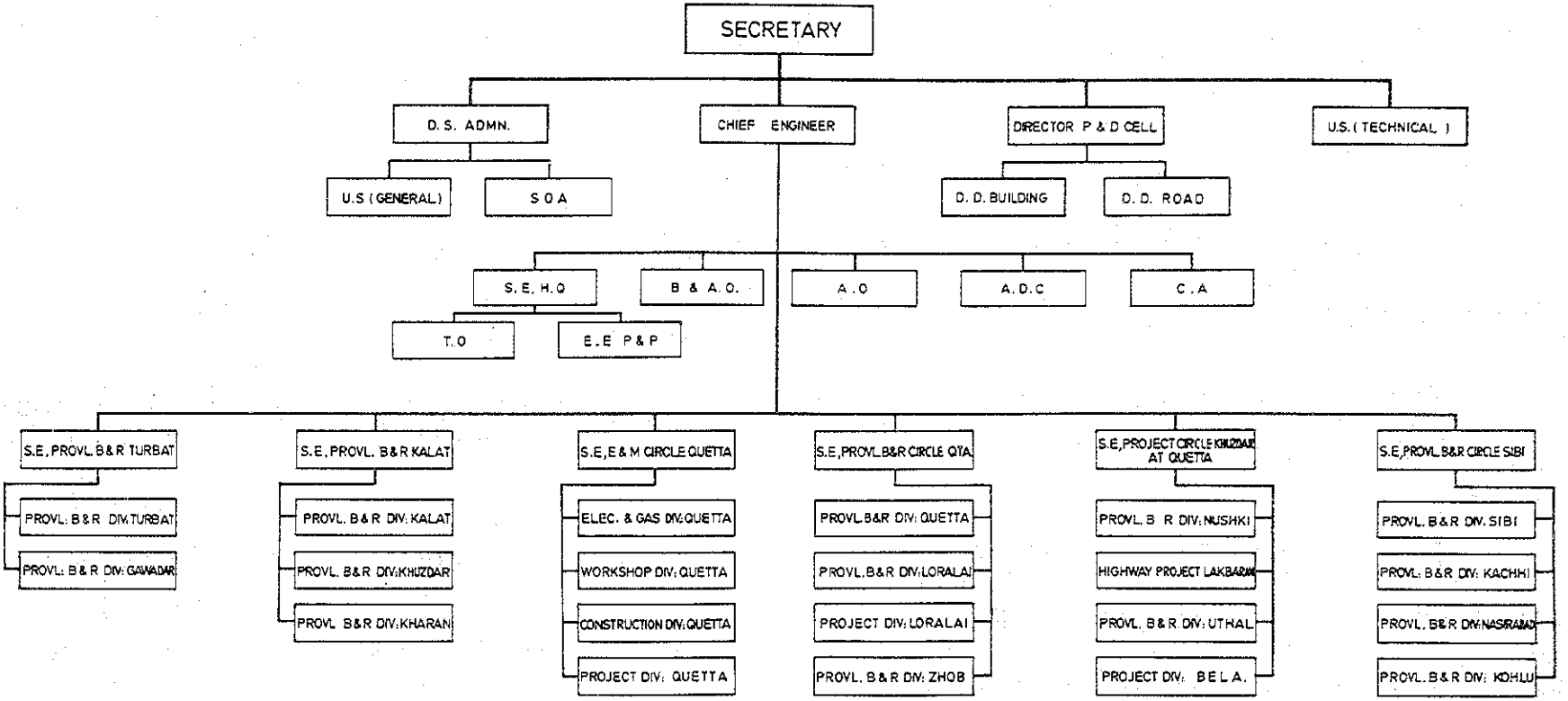
Source: Sind Highway Department

Fig. 4-4 Organization Chart of Highway Department Sind Province



Source: Communication and Works Department, NWFP

Fig. 4-5 Organization Chart of Communication and Works Dept. N.W.F.P.



Source: Communication and Works Department, Baluchistan

Fig. 4-6 Organization Chart of C & W Govt. of Baluchistan

Most of the Project planning and appraisals and design are undertaken by the four provincial highway departments as the whole.

If the cost of individual project is under Rs 2.5 million, it can be approved within the provincial highway department.

If it is under Rs 10.0 million, it can be approved by the Provincial Development Working Party and if over that amount the project has to get an approval from the Federal Government.

4-2 Present Road Network

There is no official road classification system in Pakistan, designating the roads as primary, secondary or local roads.

However, five roads with a length of 4,300 km were categorized as national highways. These roads are functionally regarded as the most important inter-provincial roads from the strategic point of view. Therefore, there are few traffic observed on national highways of N-25, N-35 and N-50 in comparison with N-5 and N-65.

National highway network and detailed location of five highways are shown in Fig. 4-7 and 4-8.

Asian highway network in Pakistan authorized by ESCAP is shown in Fig. 4-9 as compare to national highway network and brief description is given as follows;

o N-5

This is main highway running from Karachi to Torkham of Afghanistan border. The sections of Karachi – Rohri, Rohri – Lahore and Lahore – Torkham correspond to Asian Highway Route A-73, A-2 and A-1.

Construction of a new carriageway from Shadara to Muridke and Gujranwala Bypass has been completed. Construction of the dual carriageway from Nowshera to Peshawar has been taken in hand.

In addition, the improvement works of N-5 have also been taken in hand to remove bottlenecks and ensure speedy movement of essential commodities from Karachi Port to up-country.

o N-25

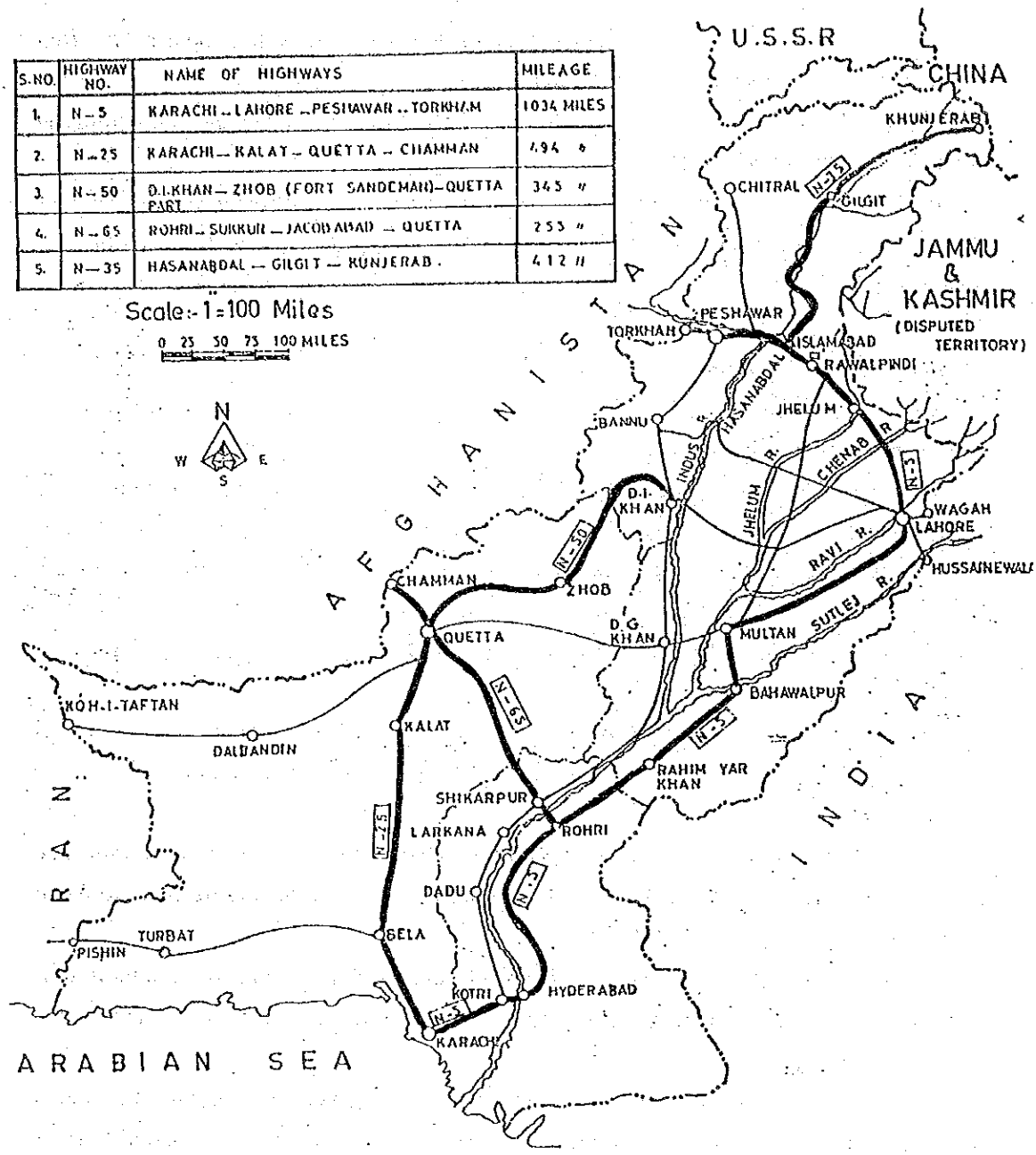
This highway is the so-called RCD highway and corresponds to Asian Highway Route A-74.

RCD highway is now under construction and there are no restaurants and filling stations along this highway.

Therefore this highway will have a potential of diverting traffic from the National Highway.

o N-35

Karakoram Highway N-35 was constructed by the Chinese and Pakistani military engineers to link Islamabad to China in 1979.

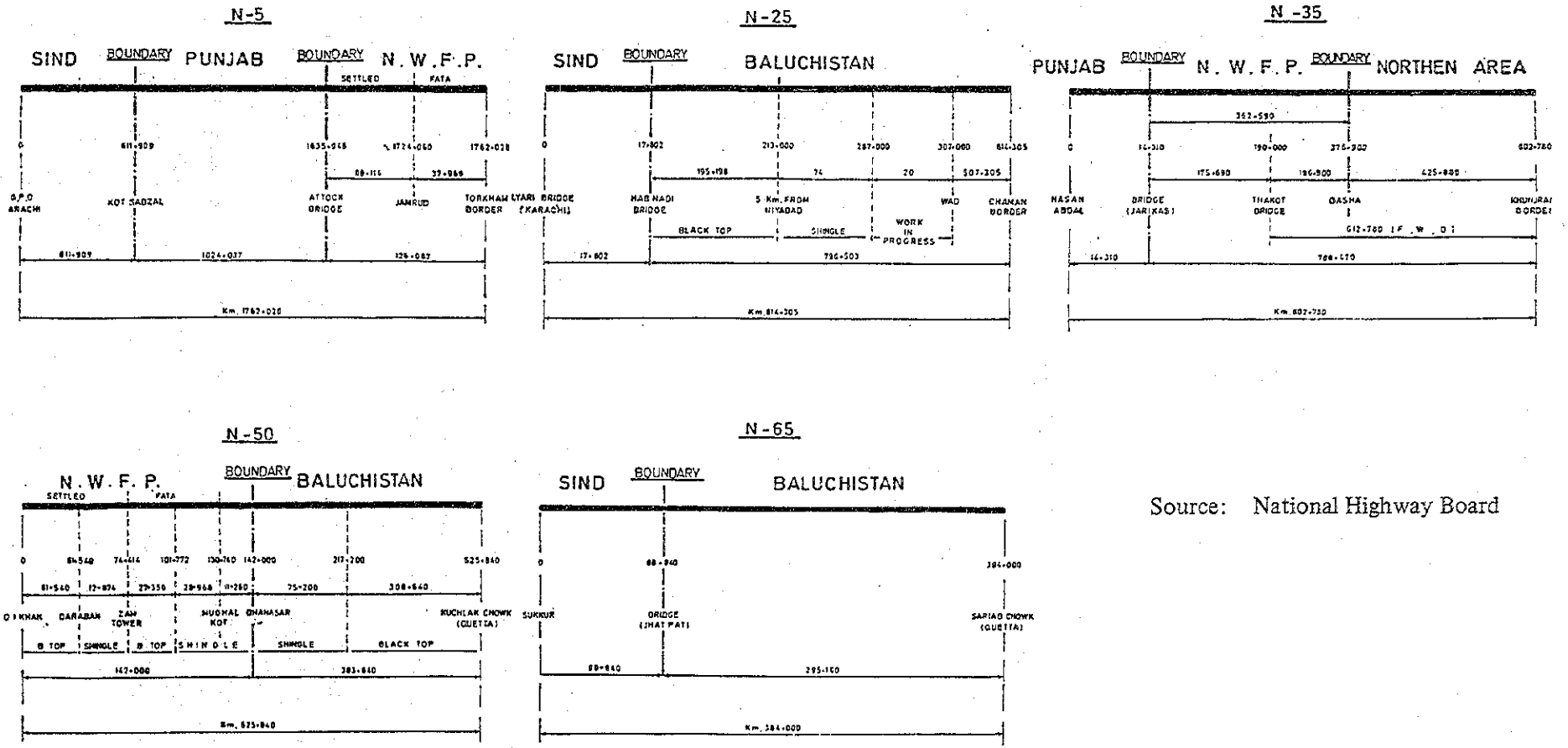


S.NO.	HIGHWAY NO.	NAME OF HIGHWAYS	MILEAGE
1.	N – 5	KARACHI – LAHORE – PESHAWAR – TORKHAM	1034 MILES
2.	N – 25	KARACHI – KALAT – QUETTA – CHAMAN	494 "
3.	N – 50	D.I.KHAN – ZHOB (FORT SANDEMAN) – QUETTA PART	345 "
4.	N – 65	ROHRI – SUKKUR – JACOBABAD – QUETTA	255 "
5.	N – 35	HASANABDAL – GILGIT – KUNJERAB .	412 "

LEGEND	
1.	INTERNATIONAL BOUNDARY
2.	PROVINCIAL BOUNDARY
3.	NATIONAL HIGHWAYS
4.	OTHER ROADS
5.	HIGHWAY No. N-5
6.	RIVERS

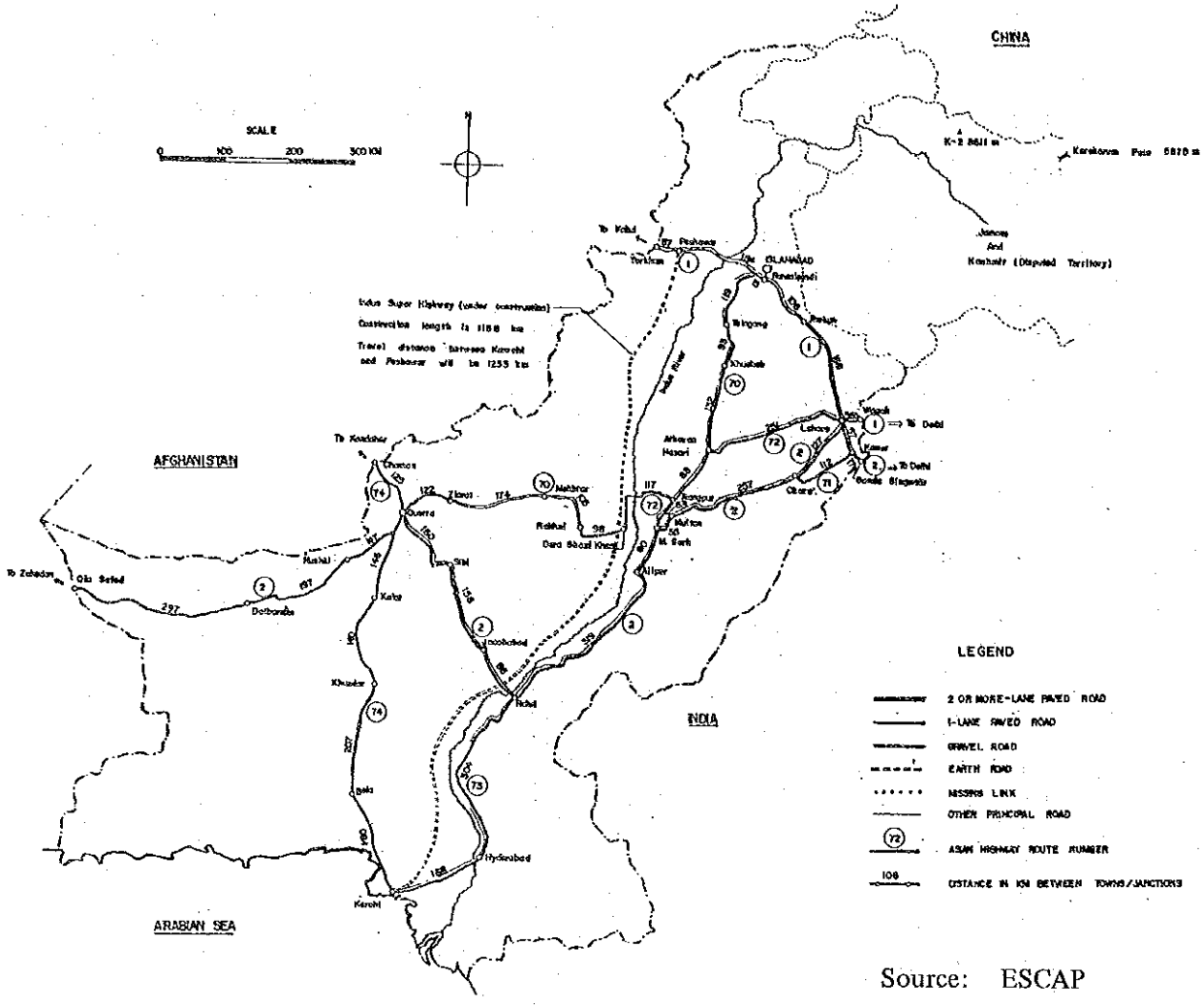
Source: Ministry of Communications

Fig. 4-7 National Highway Network



Source: National Highway Board

Fig. 4-8 Detailed Location of National Highway



Source: ESCAP

Fig. 4-9 Asian Highway Network in Pakistan

○ N-65

This route corresponds to Asian Highway Route A-2.

The main road network consists of about 24,000 km of paved roads and 15,000 km of un-paved roads.

48% of paved road in Pakistan has been constructed in Punjab. There are some 40,000 km of earth roads in addition to the main road network. Road Kilometerage in Pakistan in 1979/80 is shown inTable 4-1.

Most of the major highways have been built as one-lane or two-lane highways. Pavement structural strength on major highways is insufficient to carry a heavy traffic load.

Total length of major roads in Pakistan by type of surface and pavement width is shown in Table 4-2.

Table 4-1 Road Kilometerage in Pakistan (1979/80)

PROVINCE	UN-METALLED	METALLED	TOTAL
UNDER HIGHWAY DEPARTMENT:			
PUNJAB	172	11,583	11,755
SIND	1,975	5,997	7,972
NWFP	3,700	3,543	7,243
BALUCHISTAN	8,841	3,019	11,860
SUB-TOTAL:	14,688	24,142	38,830
UNDER DISTRICT COUNCILS:			
PUNJAB	16,823	3,856	20,679
SIND	13,172	193	13,365
NWFP	3,871	178	4,049
BALUCHISTAN	4,596	99	4,695
SUB-TOTAL:	38,462	4,326	42,788
UNDER MUNICIPALITIES:			
PUNJAB	606	3,854	4,460
SIND	304	3,253	3,557
NWFP	78	199	277
BALUCHISTAN	85	299	384
ISLAMABAD	-	560	560
SUB-TOTAL:	1,073	8,165	9,238
UNDER FATA:	1,967	1,956	3,923
AZAD KASHMIR:			
HIGHWAY	960	826	1,786
DISTRICT COUNCILS	693	-	693
SUB-TOTAL:	1,653	826	2,479
NORTHERN AREAS:	2,288	-	2,288
CANAL ROADS*			
PUNJAB	112 (35,139)	-	112 (35,139)
SIND	27 (17,647)	-	27 (17,647)
NWFP	187 (2,258)	-	187 (2,258)
BALUCHISTAN	801 (801)	-	801 (801)
SUB-TOTAL:	1,127	-	1,127
OTHERS:	4,000	3,000	7,000
GRAND TOTAL:	65,258	42,415	107,673

* OPEN TO PUBLIC ( ) Total Canal Roads

Source: Transport Bulletin (Supplementary No. 1) Nov. 1981 NTRC

Table 4-2 Length of Road Under Highway Department in 1978/79

Name of Province	Low Type			High Type Black Top by Width										
	Earthen	Shingle	Total Low Type	Up to 12'	12-18	18-24	24-28	28-36	36-44	44-48	Above 48 Divided	Above 48 Undivided	Total High Type	Total
Punjab	116.45	55.79	172.24	7,045.31	1,140.28	3,069.18	160.88	107.77	25.35	7.43	8.41	18.60	11,583.22	11,755.46
Sind	1,898.00	77.25	1,975.25	3,576.95	184.69	1,285.70	734.94	9.01	139.08	5.60	5.66	54.90	5,996.53	7,972.00
NWFP	826.50	2,873.39	3,699.89	2,233.68	412.65	732.53	43.11	96.64	2.00	1.44	20.16	0.86	3,542.77	7,242.66
Baluchistan		8,840.54	8,840.54	1,880.95	1,113.92	24.00							3,018.87	11,859.41
Total:	2,840.95	11,846.97	14,687.92	14,736.89	2,851.54	5,111.41	938.94	213.42	166.43	14.17	34.23	74.36	24,141.39	38,829.53

Length of Road under District Councils in 1980

Punjab	15,866.64	956.64	16,323.28	3,683.08	53.57	17.00		102.00					3,855.65	20,678.93
Sind	12,951.17	221.18	19,172.35	144.57	48.16								192.73	19,365.08
NWFP	2,807.49	1,063.12	3,870.61	144.15	33.66								177.81	4,048.42
Baluchistan	2,171.53	2,420.99	4,592.52	66.95	31.42		0.8						99.17	4,694.69
Total:	33,816.83	4,641.53	38,458.76	4,038.75	166.81	17.00	0.8	102.00					4,326.16	42,784.92

Source: Transport Bulletin (Supplementary No. 1) Nov. 1981 NTRC

The present kilometerage is hardly 0.1 per square km of area which is one of the lowest in the world and also lower than many other developing countries. This looks most insignificant when compared with 1.06 km per sq. km in Japan and 1.50 km per sq. km in England.

Existing road network for four provincies are shown inFig. 4-10, 4-11, 4-12 and 4-13.

4-3 Road Network for National Transport Plan

This paragraph deals with the character and quality of the existing network for national transport plan, presenting the results of the inventory carried out by the Team. Inventory study is based on information received from the highway authorities concerned. The results are shown in Appendix I.

4-3-1 Selection of Road Network for National Transport Plan

Road network for National Transport Plan shown in Fig. 4-14 is formulated after discussion with authorities and counterpart concerned, which is basically attributed to the O-D survey conducted by NTRC. Road Network prepared for NTRC O-D survey is shown in Fig. 4-15.

In addition in order to determine the road network for National Transport Plan the Team studied the networks of Asian Highway Network shown in Fig. 4-16, Minimum National Highway Linking shown in Fig. 4-17 proposed by Master Plan for Highways by Techno-Consult in 1978 and Proposed Location Class I & II Highways shown in Fig. 4-18 prepared by Government of West Pakistan in 1962 through Master Plan for Highways.

The number of each link is also indicated in Fig. 4-14. And list of links for selected network for National Transport Plan is shown in Table 5-11.

Selected Road length by province is as follows:

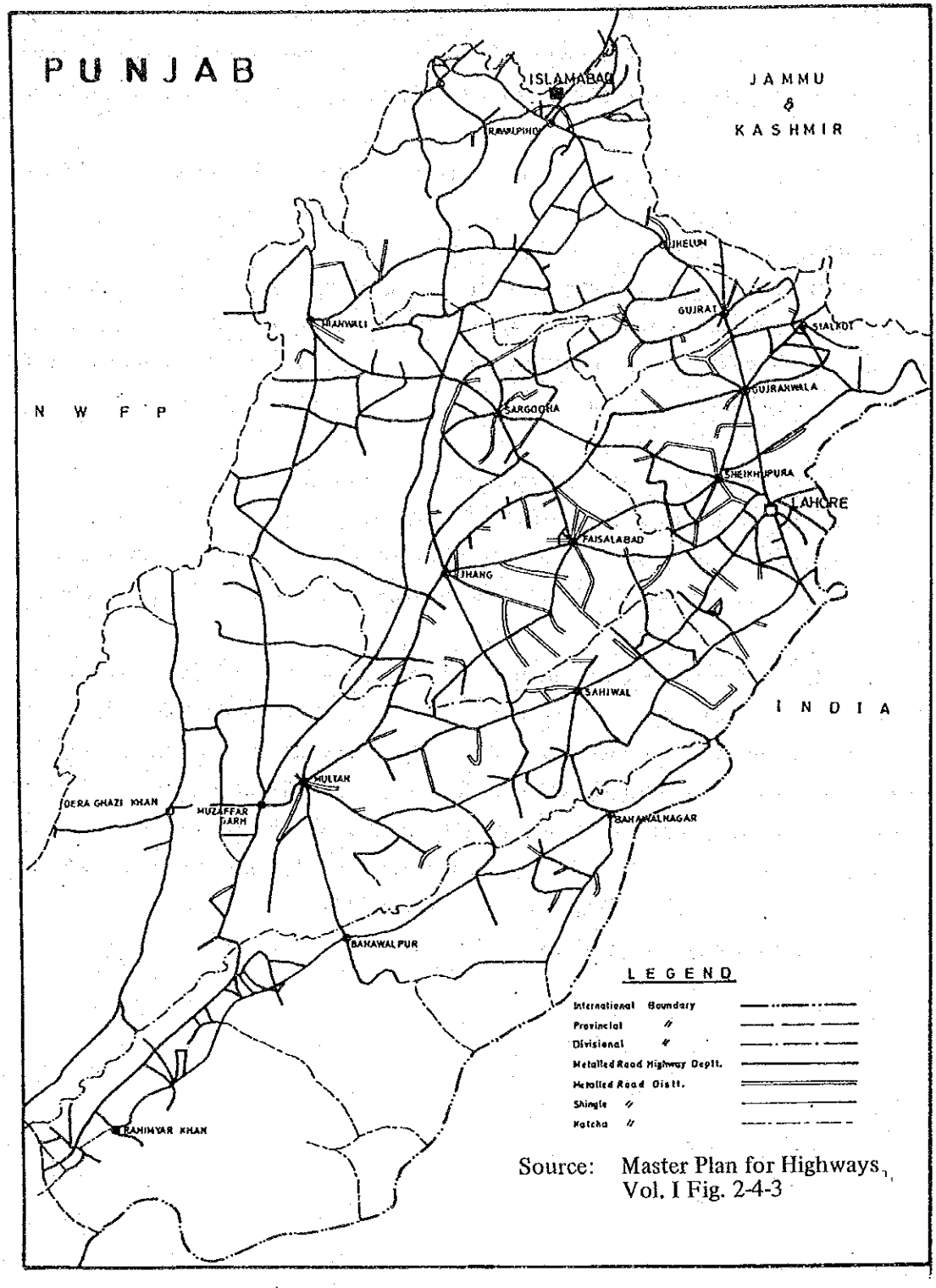
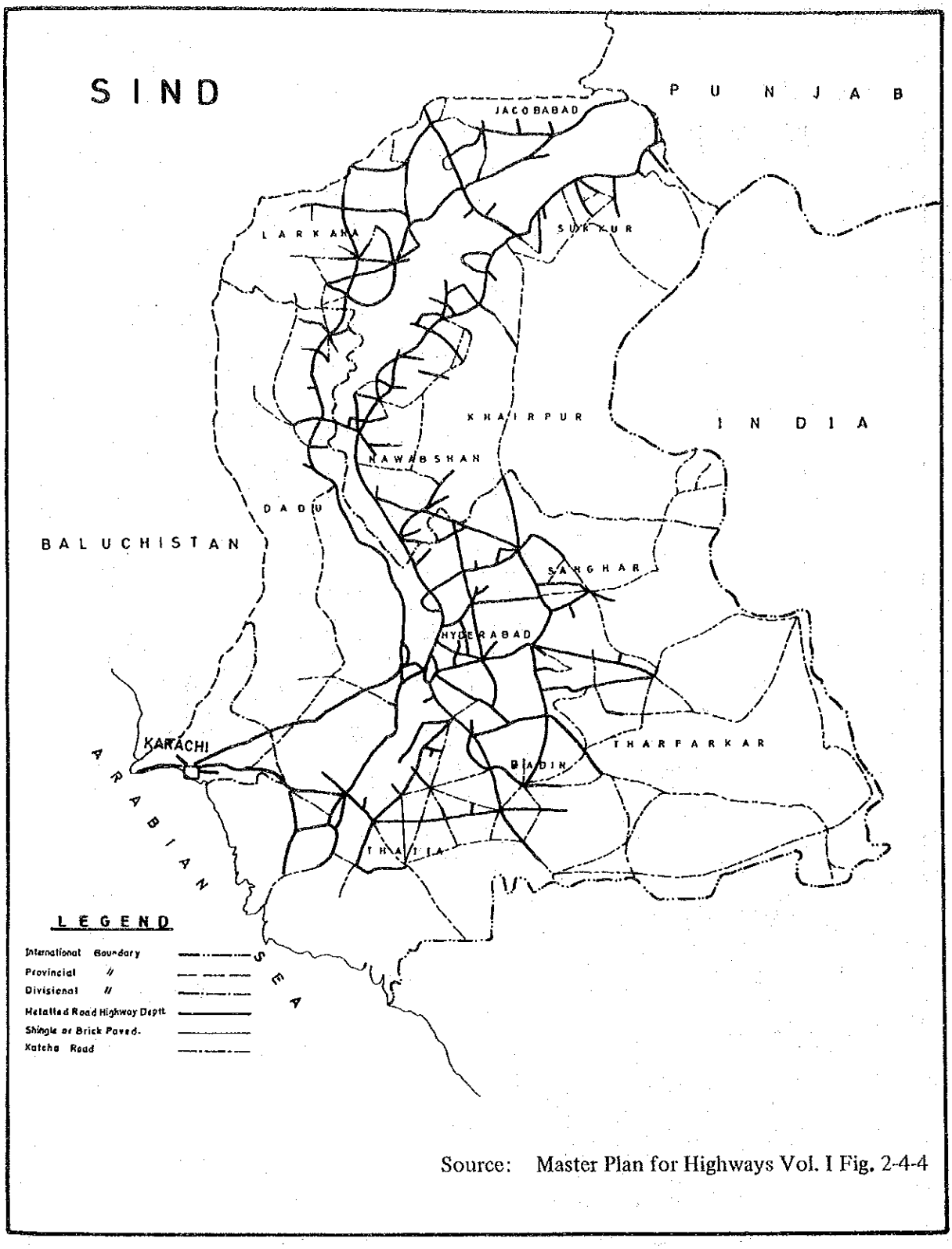


Fig. 4-10 Highway Network of Punjab



Source: Master Plan for Highways Vol. I Fig. 2-4-4

Fig. 4-11 Highway Network of Sind

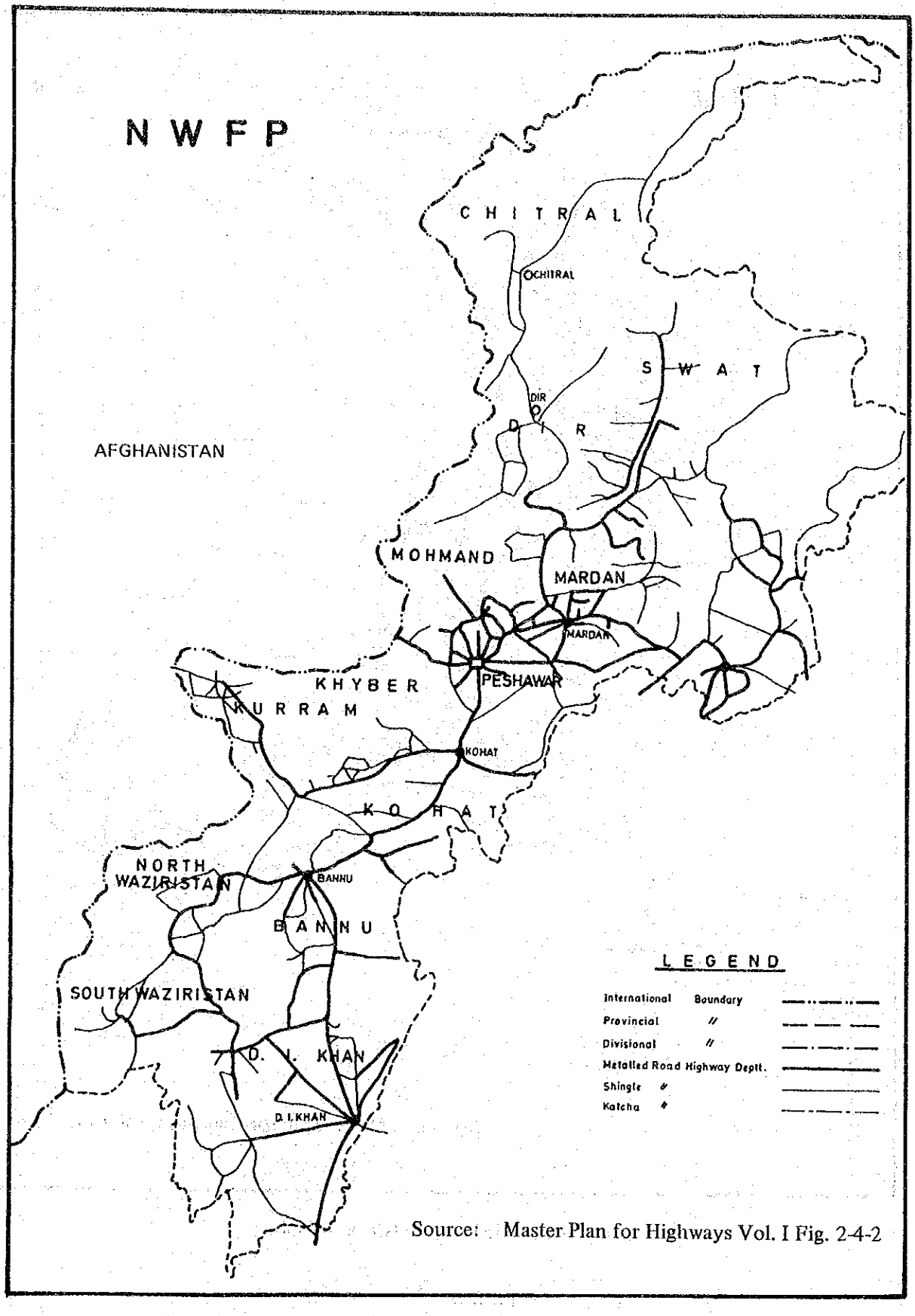


Fig. 4-12 Highway Network of NWFP

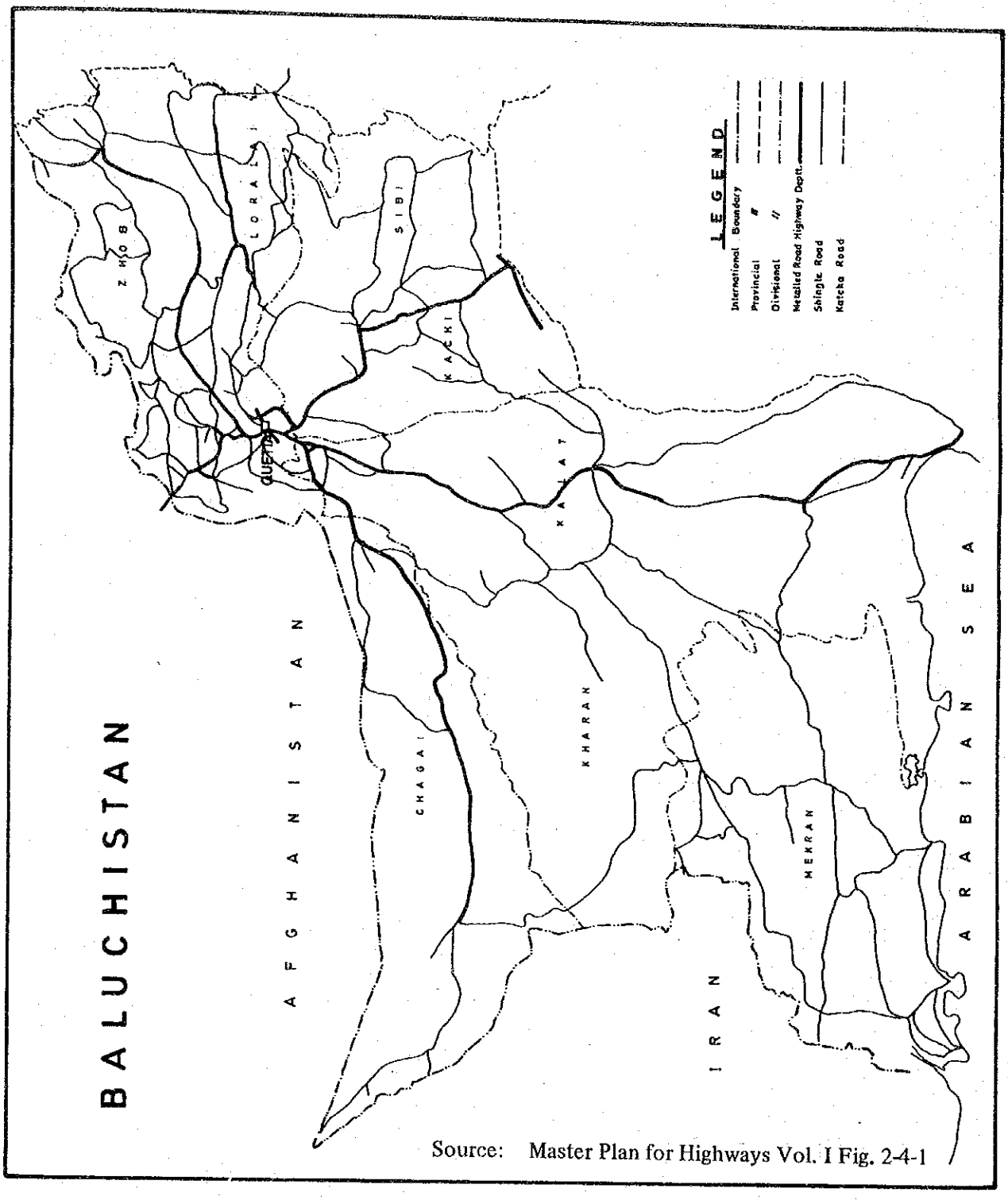
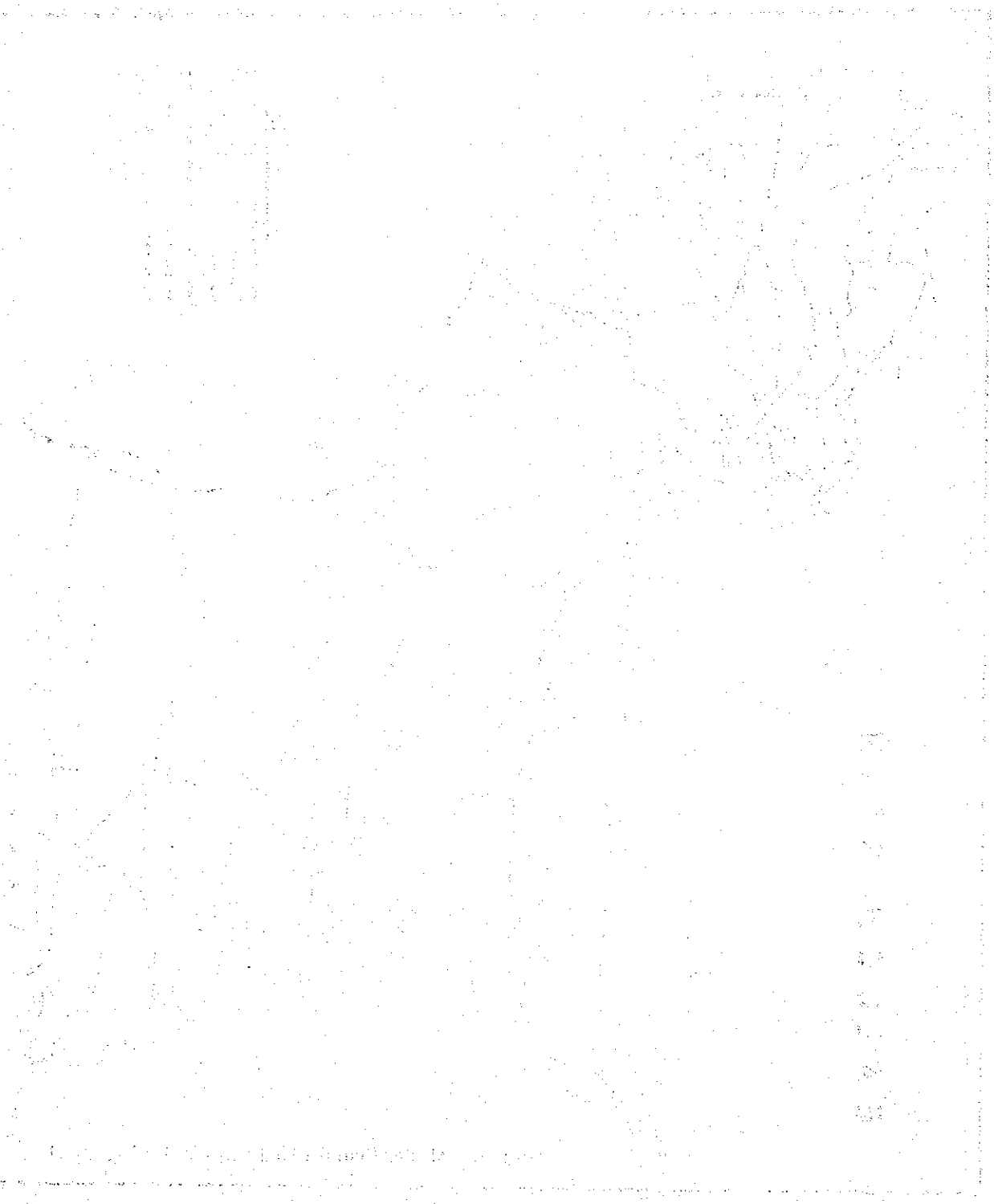


Fig. 4-13 Highway Network of Balcuchistan



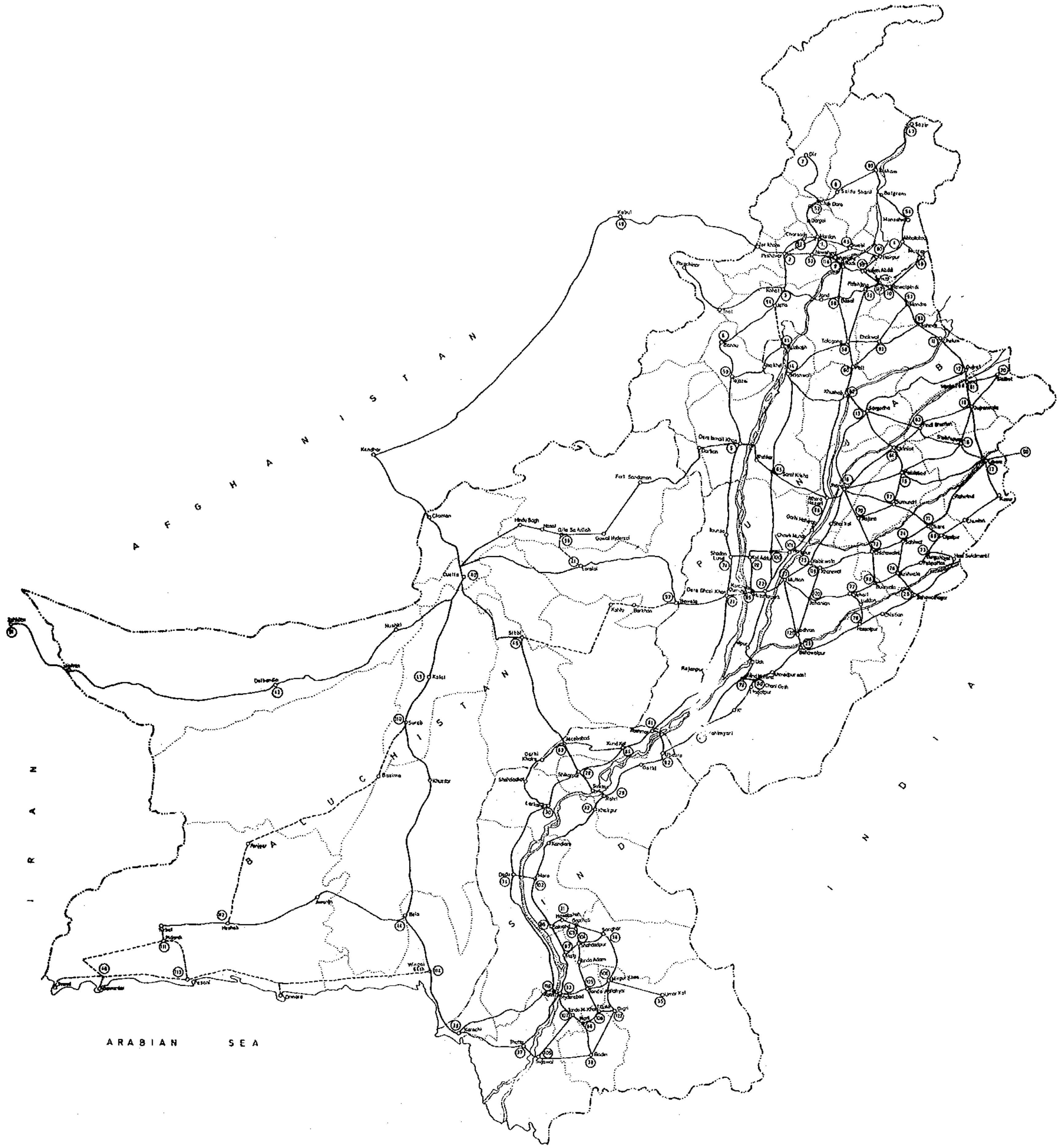


Fig. 4-14 Road Network for National Transport Plan

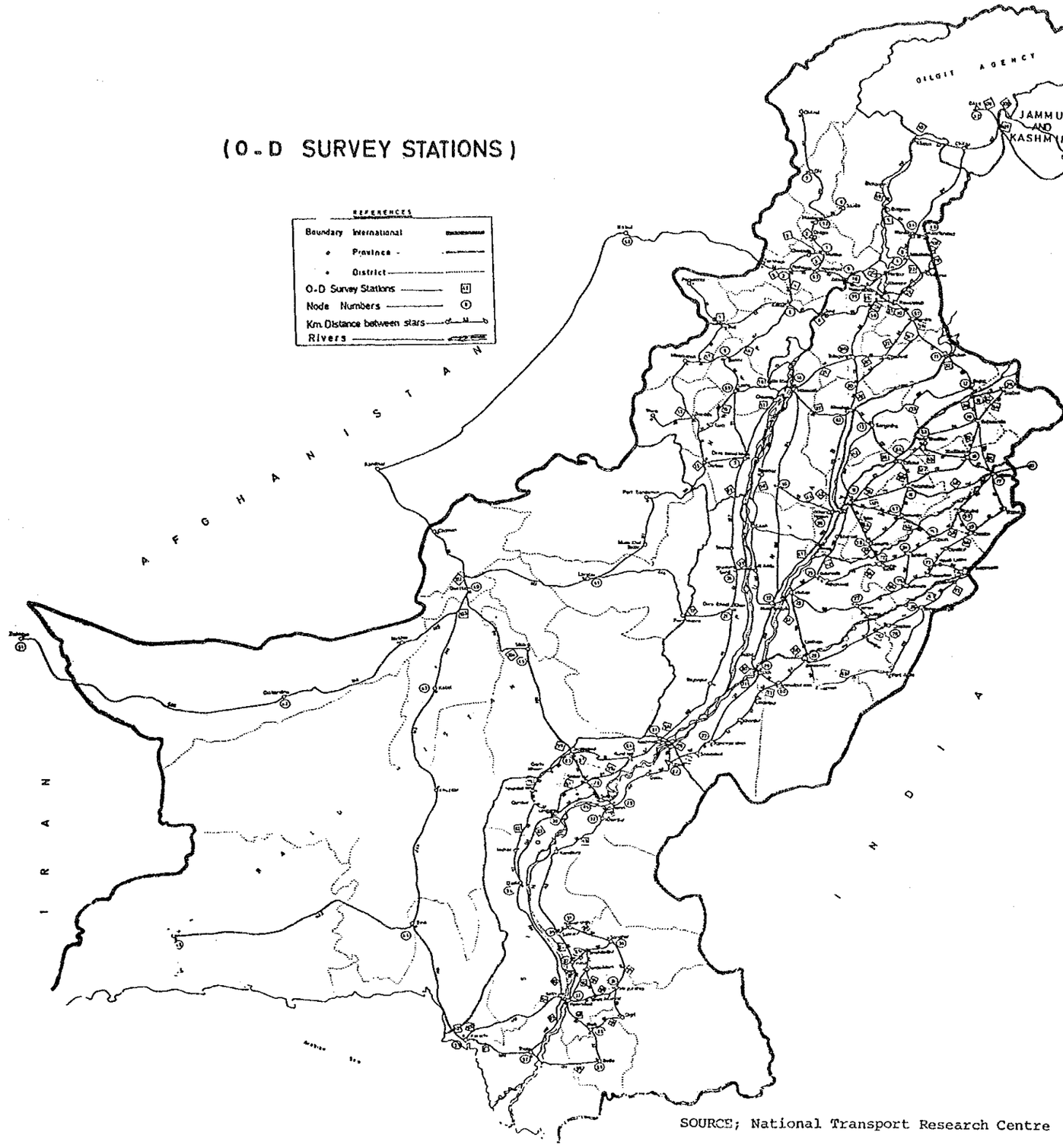


Fig. 4-15 Pakistan Road Network for NTRC O-D Survey

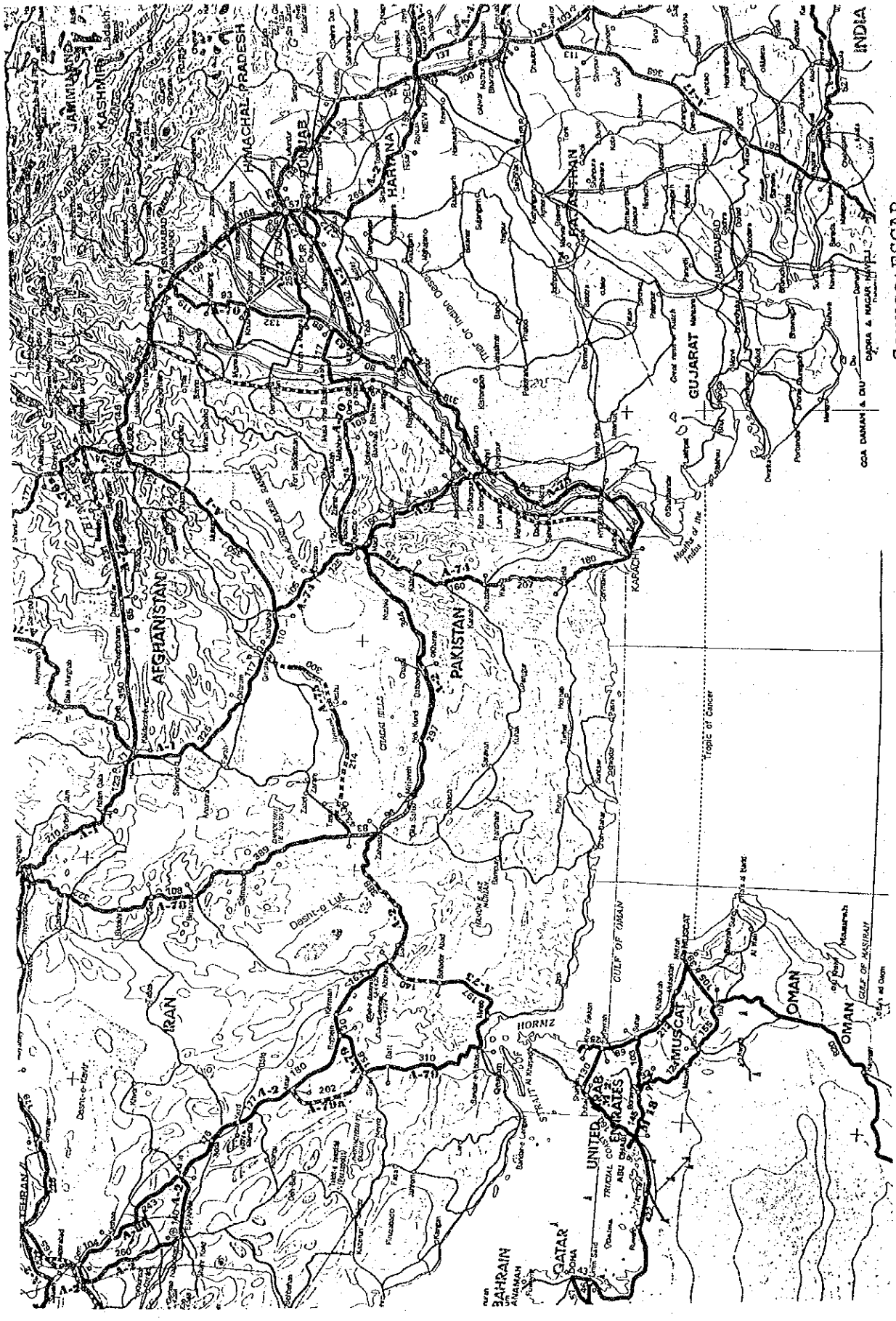
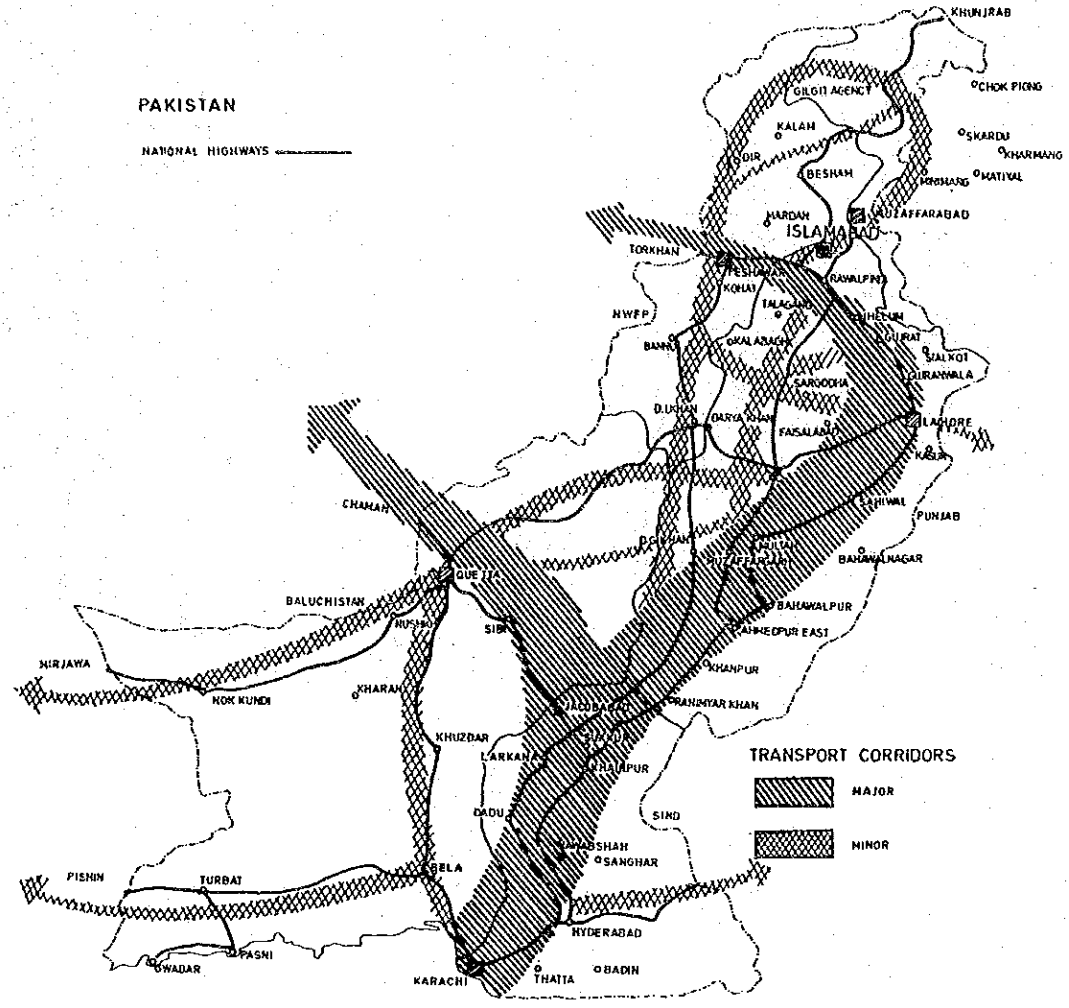
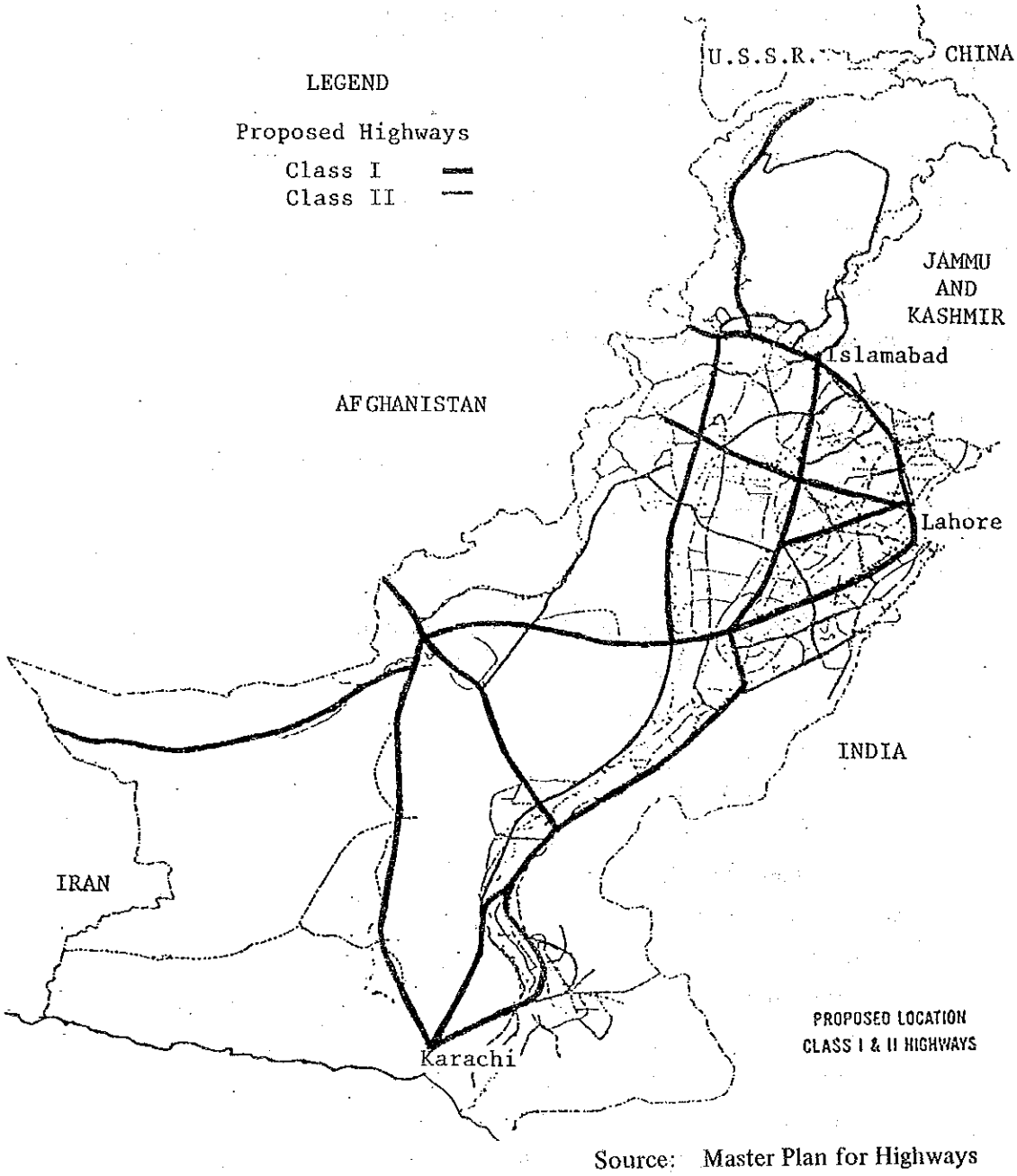


Fig. 4-16 Asian Highway Network



Source: Master Plan for Highways by Techno-Consult

Fig. 4-17 Recommended National Highway Network by Techno-Consult



Source: Master Plan for Highways

Fig. 4-18 Proposed Location of Class I & II Highways

	National Highway (km)	Provincial Highway (km)
Punjab	1,038	5,528
Sind	719	1,860
NWFP	630	1,333
Baluchistan	1,476	3,322
Total	3,863	12,043

4-3-2 Preparation of the Road Inventory

The objective of making a inventory of the Road Network is to obtain useful information about the physical conditions.

The following items were investigated during the field surveys:

- Distance
- Terrain
- Design Speed
- Cross-Section (ROW, Formation and Pavement)
- Type of Surface
- Surface Condition*
- Pavement Depth
- Sub-grade CBR
- No of Culverts
- Major Structures

* has been graded into following categories

Good

Fairly Good

Fair

Poor

Very Poor

Detailes are shown in Appendix I by link. Summary is shown in Fig. 4-19.

(Shows Pavement Width,Condition & Link Distance)

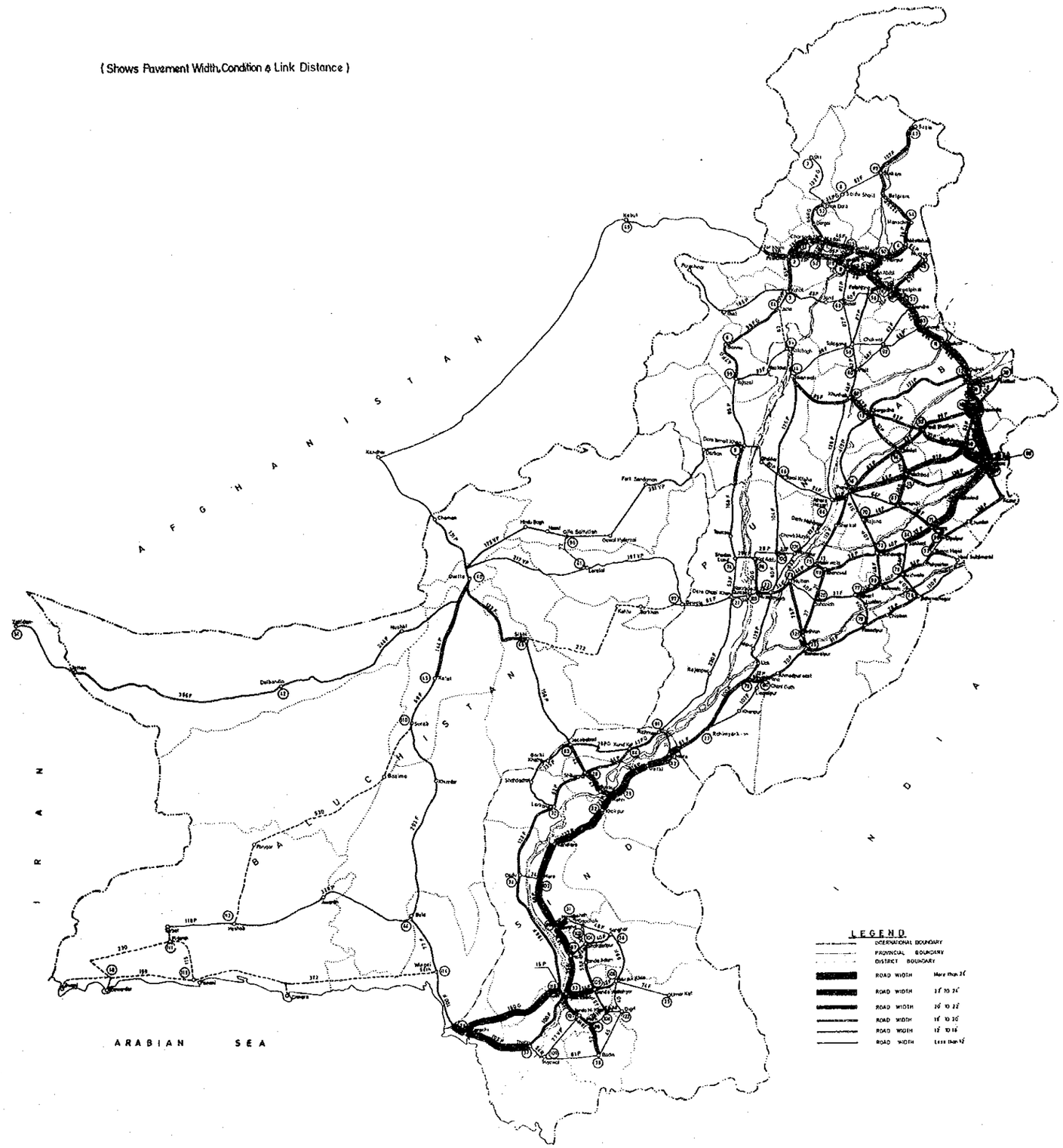


Fig. 4-19 Inventory Road Map of Pakistan in 1982

4-4 Technical Problems for Highway Planning

Although, a rapid increase in road traffic for the last two decades has exceeded both the traffic capacity and the pavement strength on the road network, Pakistan has an ancient road system which had been initially constructed by over-burnt brick or water bound base on not properly compacted subgrade.

Soil conditions in NWFP and Baluchistan are generally good. On the other hand, subgrade soil in Punjab and Sind are usually poor. Typical subgrade soils in Punjab and Sind have the nature that even a little moisture increase may result in strength loss although they are compacted at the optimum moisture contents close to plastic limit.

Punjab and Sind are subject to annual flooding and high soil salinity. Many roads in Pakistan have suffered from periodic heavy flood during 1973, 1975 and 1976. Floods lead to raising the level of watertable and damage the roads. They also wash away sections of roads and flow of traffic was suspended. In addition, an average holding distance of highway materials is extend to 200 km.

Geological Map of Pakistan, Soil Salinity Area in Pakistan, Water Logged Areas in Pakistan, Flood Affected Area in 1973, Existing Food Protection Facilities and Road Aggregate Deposit are shwon in Fig. 4-20, 4-21, 4-22, 4-23, 4-24 and 4-25.

Highway authorities express that one of the most serious problems is the overloaded vehicles, leading to a rapid deterioration of road and old bridges. It is also said that service lives of most of road structures have been almost terminated.

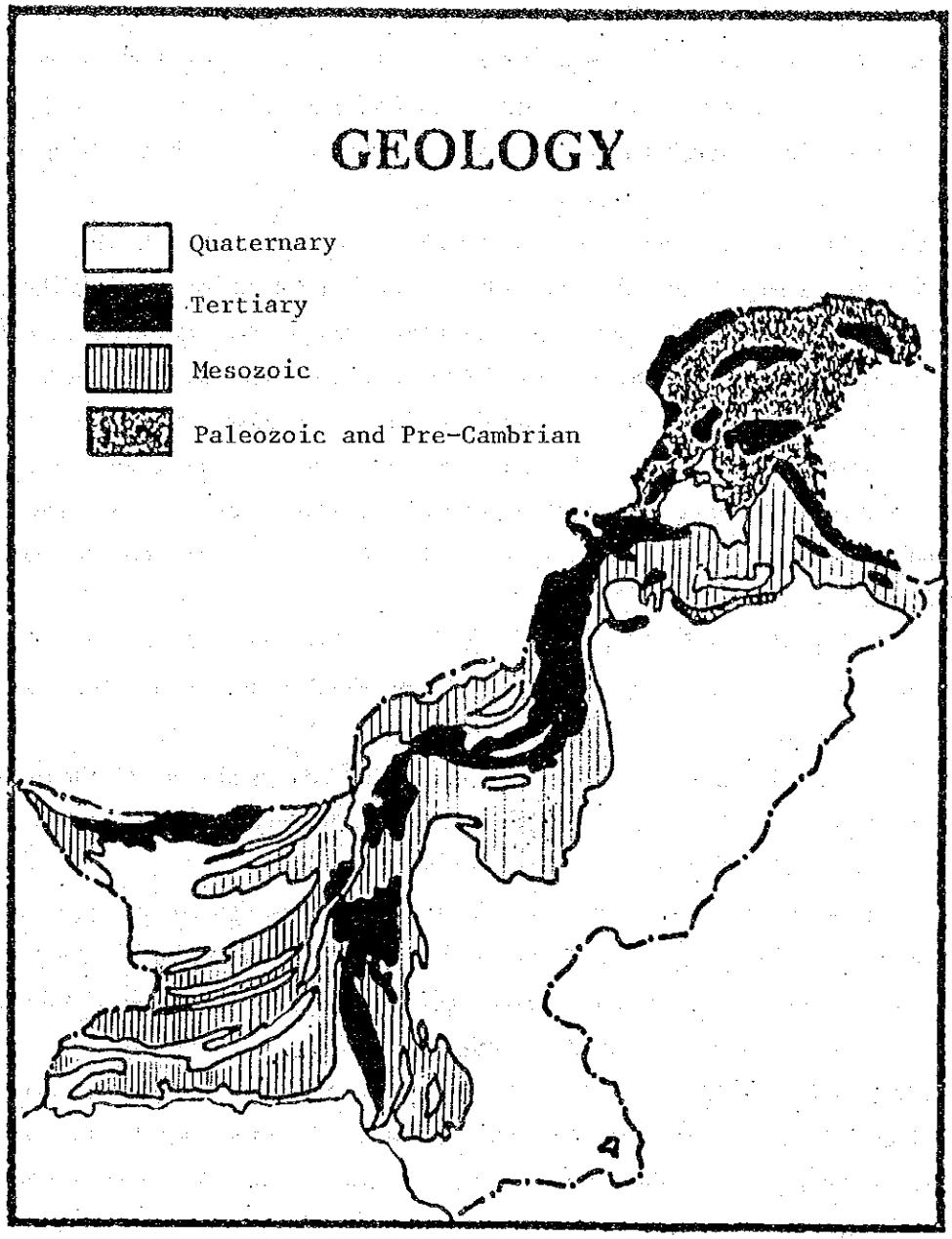
The problem is further compounded by the fact that insufficient funds are provided for the proper maintenance. Road maintenance by provincial highway department relies on road gangs who carry out routine maintenance, while periodic maintenance is done on an ad hoc basis as funds and equipment are available.

Structural overloading, together with inadequate maintenance is already causing complete failure on major highways. This will come to result in the loss of whole section of highway system. For example, increasing the axle load from 8-ton to 10-ton doubles the distructive effect.

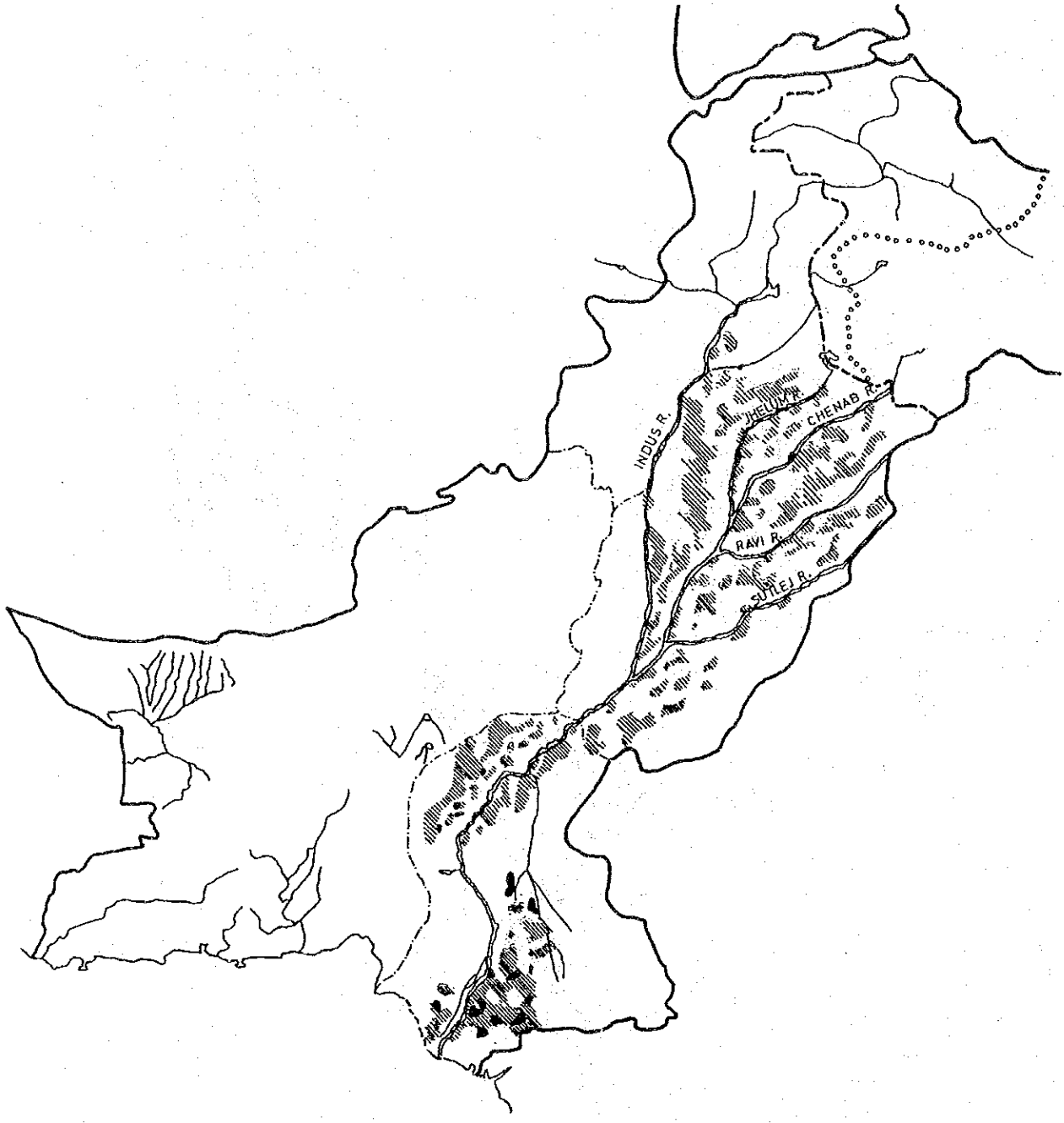
There are sections under construction on the 3rd Highway project by IBRD (see Table 4-3) between Lahore and Sahiwal. Road construction progress are far behind the schedule due to the shortage of organized contractors and their inadequate management, and on Rohri section the constractor gave up construction after finishing a half mile of over laying.

Because, contractors generally have had more experience in building construction than in highway construction,and apart from locally made rollers, few domestic contractors including NLC hold equipment suitable for modern highway construction. Equipment hold by five agencies are shown in Appendix II.

In addition to above, preconstruction testing for design purposes and effective quality control during construction are insufficient in Pakistan.



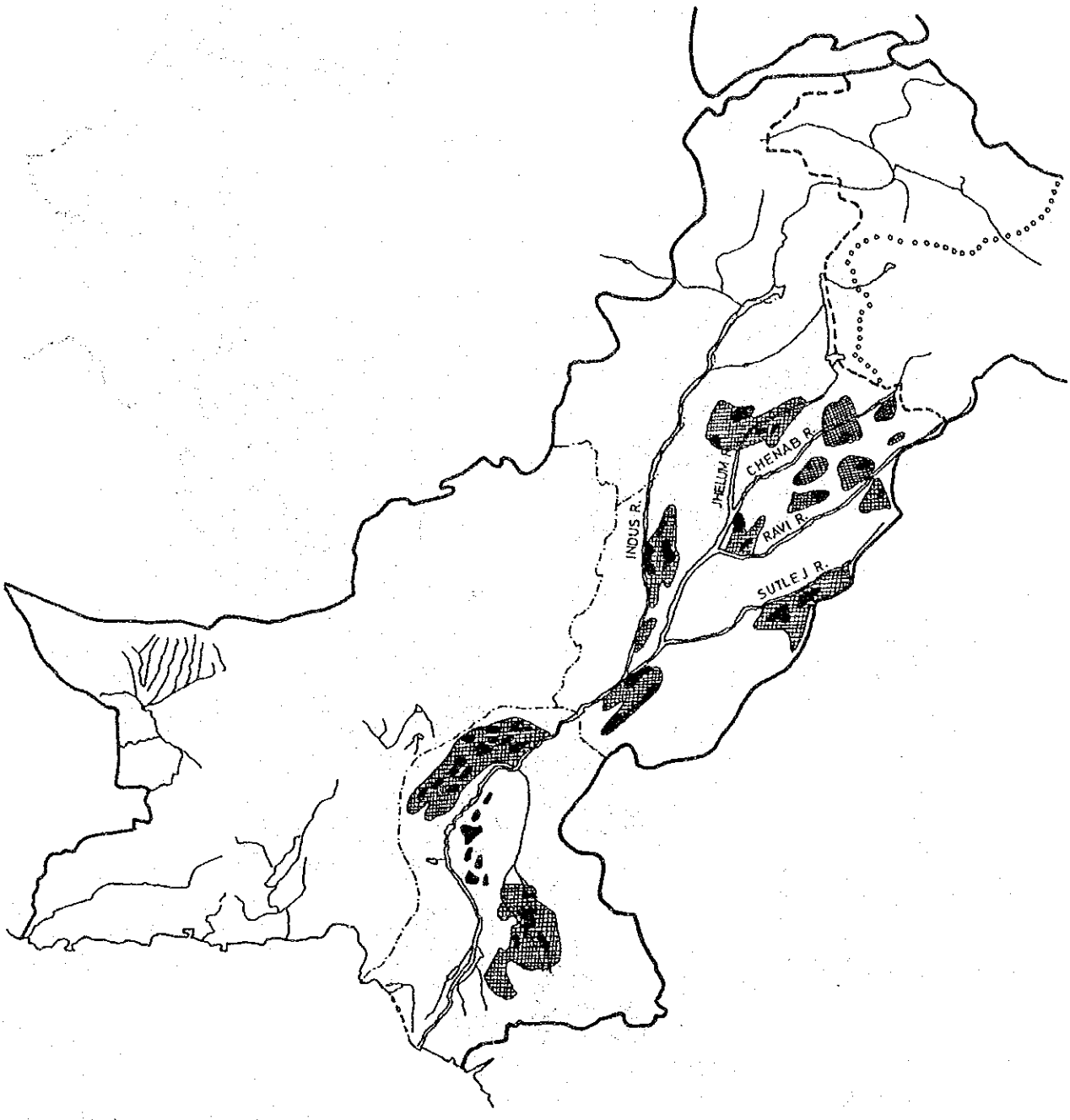
Source: Oxford Atlas for Pakistan



Source: Master Plan for Highways
by Techno Consult

Severly Salt Affected Areas

SWAMPS

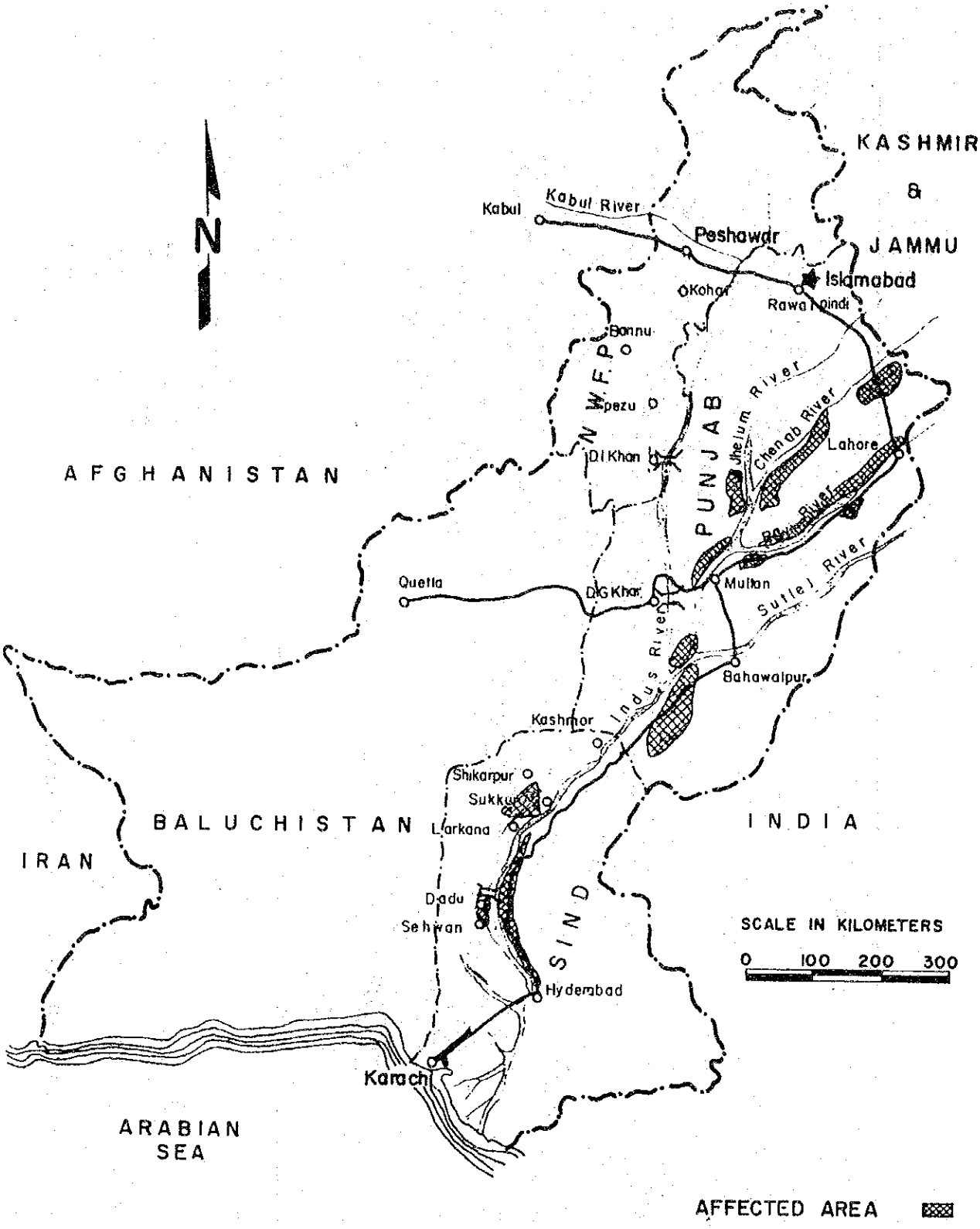


Source: Master Plan for Highways
by Tecnno Consult

Depth to water table 0' - 5'

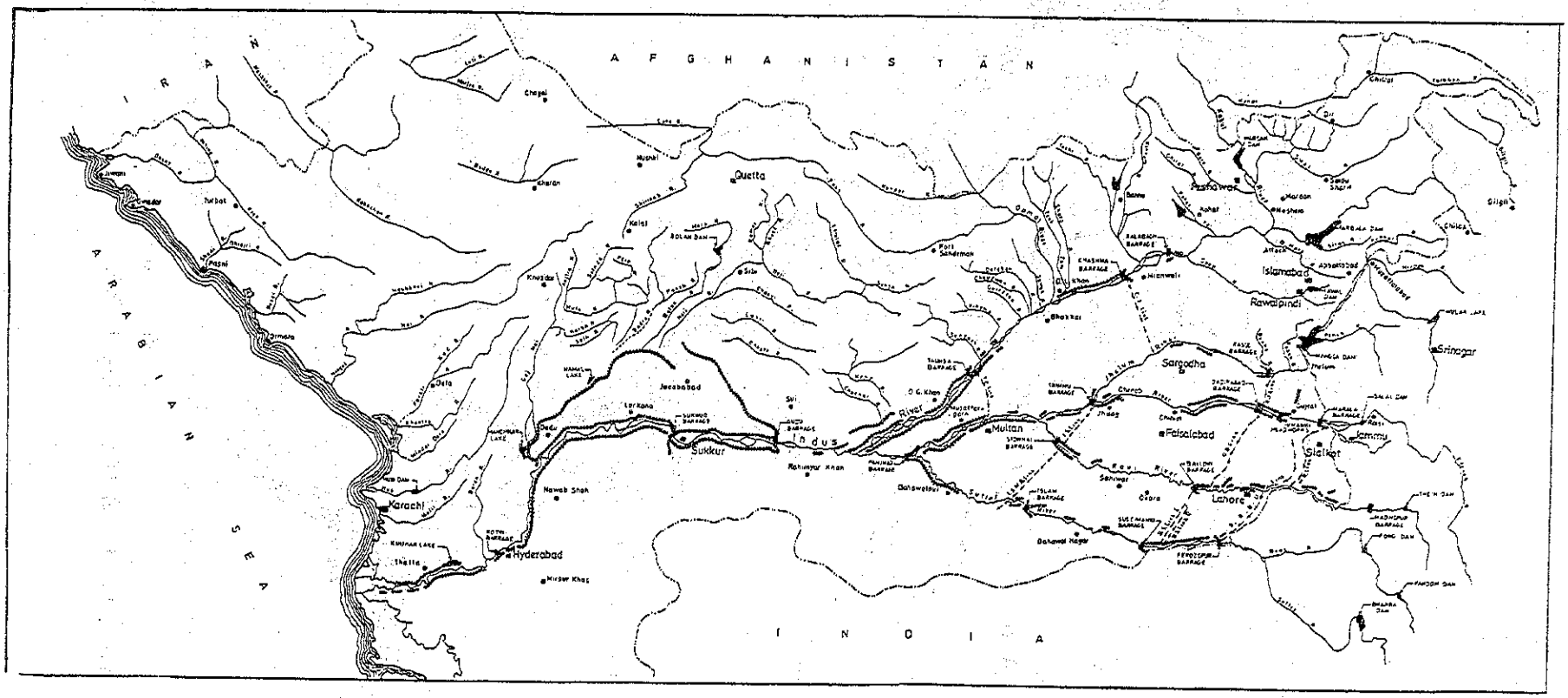
Depth to water table 5' - 10'

Fig. 4-22 Water Logged Areas in Pakistan



Source: Indus Super Highway Board

Fig. 4-23 Flood Affected Area in 1973



LEGEND

- RIVER
- DAM
- BARRAGE OR HEADWORKS
- LINK CANAL
- INTERNATIONAL BOUNDARY
- CITY, TOWN
- EXISTING BUND

Fig. 4-24 Existing Flood Protection Facilities on Major River

Source: Master Plan for Highways by TechnoConsult

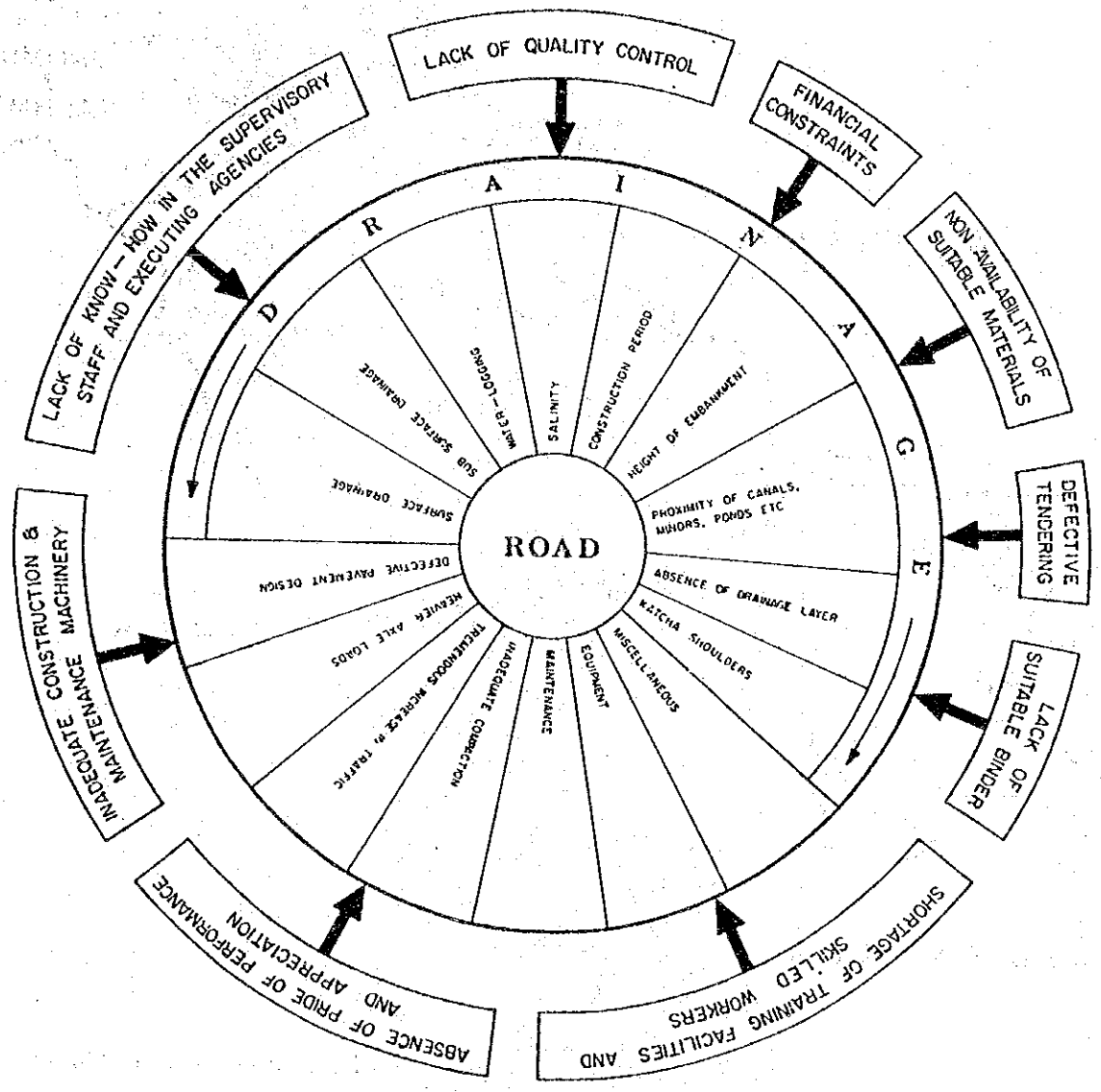
CRUSHED STONE ✦

BAJRI •

Fig. 4-25 Road Aggregate Deposit

Overlay constructed on the section between Nowshera and Khairabad was damaged in few months after opening to traffic due to the above reason.

Finally, the analysis of the major causes of road failure is indicated in Fig. 4-26 which has been prepared by Punjab Highway Department in 1980.



Source: Punjab Highway Department

Fig. 4-26 Major Causes of Road Failure

Table 4-3 Third Highway Project Contracts

Project No.	Sector	Tender Received	Date Agrmt. Signed	Name of the Contractor	Name of the Consultant	Contract Amount in (Rs.)	Completion Date	Mobilization Advance Paid	Remarks
1	Peshawar	12.7.79	29.3.80	M/S Nazir & Co. Ltd. Lahore	M/S Progressive Consultants	20,067,885	Dec. 1982	30,10,000	Paid on 17.5.80
	Charsadda					58,02,000		2,18,857	Paid on 17.5.80
2	Khairabad	12.7.79	29.3.80	–DO–	–DO–	20,712,380	Dec. 1982	31,07,000	Paid on 17.5.80
	Nowshera					55, 93,250		2,18,857	Paid on 17.5.80
3	Lahore	12.7.79	26.6.80	M/S Saadullar	NESPAK	14,78,96,974		2,35,52,753	Paid on 30.6.80
4	Pattoki	26.1.80		Khan & Bros.		91,21,380		44,39,474	Paid on 23.9.80
4	Pattoki	12.7.79	26.6.80	–DO–	–DO–	25,12,65,485	Dec. 1984	4,07,19,965	Paid on 7.9.80
	Sahiwal	20.1.80				2,02,00,950		6,06,474	Paid on 23.9.80
7	Kotdiji	12.7.79	30.3.80	M/S Continental	–DO–	10,85,00,000	Dec. 1983	1,69,20,000	Paid on 17.5.80
	Rohri			Engineer Ltd. Lahore		77,50,000		3,12,088	Paid on 17.5.80

Source: National Highway Board

4-5 The Current Development Programme and Its On-going Project

The Fifth Five Year Plan is aimed at the completion of project already started and the improvement or reconstruction of the existing roads.

The construction of the Indus Highway was eliminated from the Plan, because this road has more strategic than economic justification. As far as the alignment of Indus Highway is concerned, the section of the road up to Larkana and Shikarpur in Sind, it would traverse relatively undeveloped regions.

It has been decided that limited resources should usefully be spent to duplicate the National Highway N-5 and other congested routes. Rs. 3,619 million (46.8%) were allocated for national highways out of total amount of Rs. 7,734 million.

Details are shown in Table 4-4.

The Fifth Five Year Plan does not include farm to market roads which are handled under the people's work program.

An Annual Development Program is prepared by each provincial government on the following priority basis;

i) Completion of On-going project

ii) Defense Requirements

iii) Demands by the Public

These ADP's are incorporated into the Five-Year Plan on a yearly basis.

ADP of National Highway Board for 1982-1985 is shown in Table 4-5.

Map of on-going projects with the cost more than Rs. 10 million and located on the Road Network for National Transport study is shown in Fig. 4-27 and summary of on-going projects is indicated in Appendix III.

4-6 Average Daily Traffic Volume on the Road Network

The team obtained traffic counts data in 1980/81 for selected links during the field survey from authorities concerned.

Most reliable data was obtained from Punjab Highway Department because Lahore was the centre for the Wast Pakistan Highway Department, and traffic counts have been taken as yearly basis and not only in Punjab but also in other provinces.

In addition to above, the team also obtained traffic counts data from the National Transport Research Center which were taken in conjunction with the NTRC O-D survey in 1980.

Daily Traffic Volumes on the road network are shown in Fig. 4-28.

On the main highway, traffic volumes vary from about 2,500–5,000 daily traffic in the rural area. About 70% of the traffic volume on major highway is shared by trucks.

Daily Traffic Volume in Punjab is separately shown in Fig. 4-29.

Table 4-4 Summary of Road Programme

		(Rs. Million)
A.	Federal:	
	(i) Improvement and widening of existing network:–	
	(a) National Highways including D.I. Khan-Fort Sandeman Road, R.C.D. Highway and North South link on west bank of Indus.	781.00
	(b) Third Highway Project:	
	Lahore-Okara Okara-Khanewal Okara-Dipalpur Hyderabad-Nawabshah Nawabshah-Khairpur Rohri-Reti Khairabad-Peshawar Peshawar-Charsada	650.00
	(ii) Roads in Federally Administeted Areas:	
	Azad Kashmir 300	
	Northern Area 180	
	FATA 250	730.00
	(iii) Other Roads	1,132.00
	(iv) Major Bridges:	
	Nowshera, Attock, D.I. Khan, D.G. Khan and Dadu-Moro	300.00
	(v) Studies:	
	Traffic count programme, Master Plan for Road Development and Rapid Transit System, etc.	26.00
	Sub-total "A"	3,619.00
B.	Provincial	4,115.00
	Total	7,734.00

Source: The Fith Plan 1978–83

Table 4-5(1) National Highway Board Development Programme (ADP) for 1982-85

PROFORMA-I

Name of the Sector: Communication Division

Name of the Executing Agency: DIRECTORATE GENERAL NATIONAL HIGHWAYS

Sl. No.	Name, Status and Location of the Project.	Estimated Cost. Total	F.E.C.	Estimated Expenditure up to June 1981	Revised Estimates for 1981-82	Physical achievements in quantitative %age terms upto June, 1982	Allocations during 1982-85 1982-83	1983-84	1984-85	Total 1982 to 1985	Proposed allocations for 1985-86 to 1987-88.	Balance if any, after 1987-88
1.	2.	3.	4.	5.	6.	7.	8.	9	10	11	12	13
	MAJOR SCHEMES (APPROVED)											
1.	Ghazi Ghat Bridge (Punjab) (Approved)	260.019	-	104.360	65.000	65%	85.000	-	-	85.000	-	Work will be completed in 1983 to 1985
2.	Const: of new Carriageway (Punjab)	121.932	-	85.065	14.224	85%	22.540	-	-	22.540	-	
3.	Providing dual carriageway 169/4-201/4(Punjab)	116.017	-	39.170	22.810	46%	29.600	24.434	-	54.034	-	
4.	Chowk Yatim Khana (Pb)	55.152	-	-	-	-	20.000	20.000	15.152	55.152	-	
5.	Talibwal Bridge(PB) (Not yet approved)	270.000	70.000	-	-	-	-	50.000	100.000	150.000	170.000 (70.000 FEC)	-do-
6.	Imp.of N-5 having dual carriageway throughout N-5,Punjab,Sind,NWFP.	480.000	80.000	-	-	-	-	180.000 (30.00) (FEC)	100.00	280.000 (including) (50.00 FEC)	-	-do-
7.	Karachi-Hyderabad additional carriageway including Indus Bridge at Kotri.	847.383	100.00	-	-	-	-	200.000	400.000	600.000	247.383	-do-
8.	Special Repair to Kcy-Hyderabad Supper Highway (Sind)	124.000	-	7.983	23.780	25%	35.000	30.000	19.220	84.220	-	-do-
9.	Const:of Bypass at Moro Sind	21.576	-	-	-	-	8.722	8.000	4.854	21.576	-	-do-
10.	Const:of dual H/way Nowshera-Peshawar(NWFP)-App.	132.384	14.703	13.956	23.780	21.7%	30.000 (14.703) (FEC)	40.000	23.604	93.604	-	-do-
11.	Imp.of Zhob D.I.Khan Rd. (NWFP portion).	150.000	-	-	-	-	-	50.000	50.000	100.000	50.000	-do-
12.	Imp.of Darazaida Moghal Kot Rd.(NWFP)	26.693	-	15.213	1.745	63.5%	5.000	-	-	5.000	-	-do-

Contd.../2

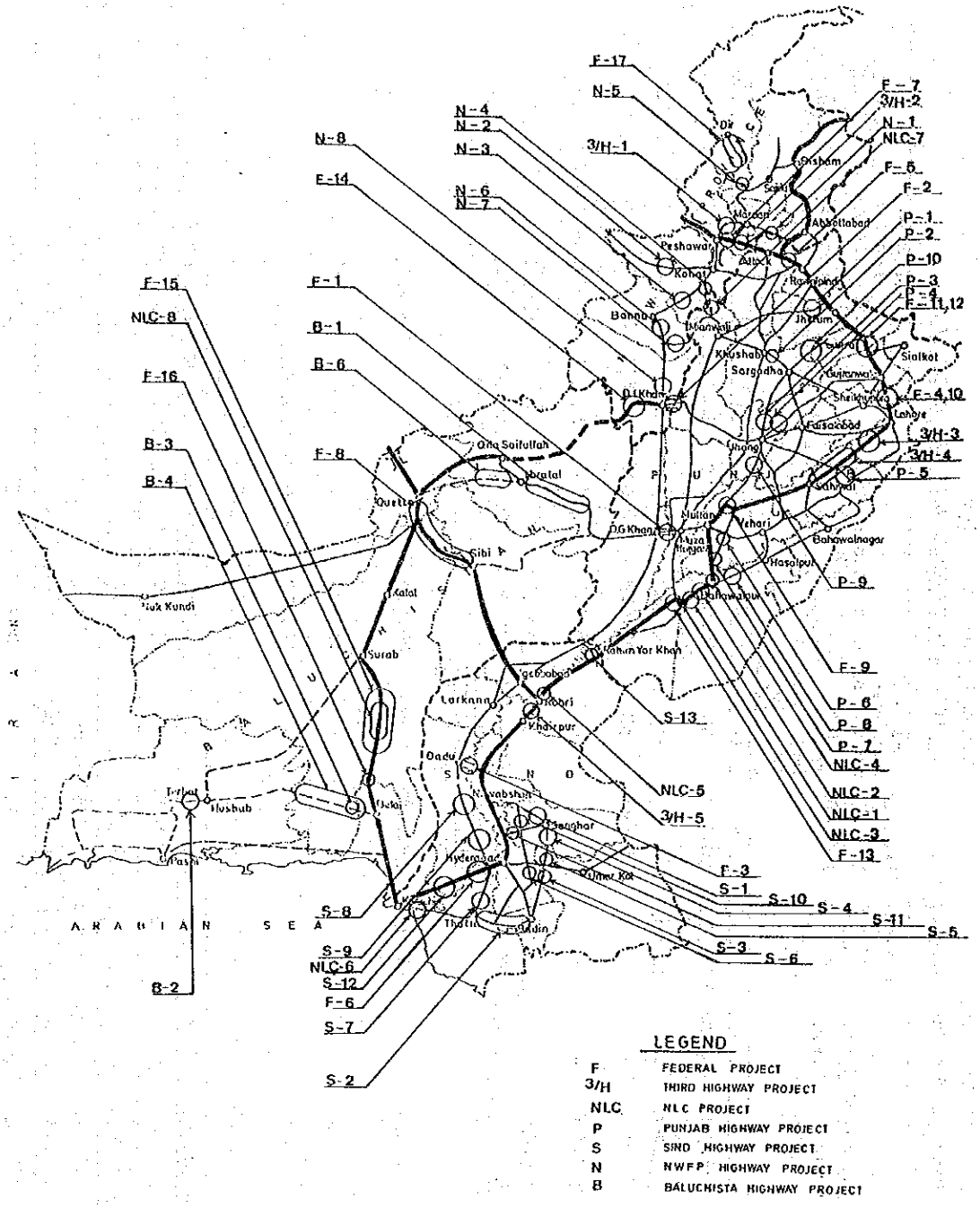
Table 4-5(2) National Highway Board Development Programme (ADP) for 1982–85

PROFORMA-I

Name of the Sector: Communication Division

Name of the Executing Agency: DIRECTORATE GENERAL NATIONAL HIGHWAYS

Sl. No.	Name, Status and Location of the Project.	Estimated Cost. Total	F.E.C.	Estimated Expenditure up to June 1981	Revised Estimates for 1981-82	Physical achievements in quantitative %age terms upto June, 1982	Allocations during 1982-85 1982-83	1983-84	1984-85	Total 1982 to 1985	Proposed allocations for 1985-86 to 1987-88.	Balance if any, after 1987-88
1.	2.	3.	4.	5.	6.	7.	8.	9.	10	11	12	13
13.	D.I.Khan Darya Khan Bridge (Approved)	386.300	44.000	101.315	50.000	39%	70.000 (44. FEC)	80.000	84.985	234.985	-	-
14.	Purali Bridge (App.)	23.960	-	14.000	-	60%	9.960	-	-	9.960	-	-
15.	Imp.of Quetta-Sibi Section (N-65)	71.820	-	-	6.945	5%	25.000	20.000	19.875	64.875	-	-
16.	Const:of N-50 Mile 210 to 255 Zhob-Dhonser Section.	209.310	-	-	-	-	8.000	12.000	13.500	33.500	175.810	-
17.	RCD Highway	262.720	-	183.819	50.445	90%	21.540	-	-	21.540	-	-
18.	3rd Highway Project	645.958 691.958	101.560	107.946	150.000 8.000 Main FEC	(Project) (1*2=100%) (3*4= 25%) (7= 7%)	200.000	88.841	46.000	334.841	-	-
19.	Widening and reconditioning of NH in diff miles of N-5, N-35	107.972	-	48.934	18.315		48.262	78.341	-	126.603	-	-
20.	Providing overlay between Peshawar-Nowshera (34.0KN)	21.830	-	-	-	-	15.000	6.830	-	21.830	-	-
21.	Const:of 5 Bridges on Peshawar - Charsadda Road.	45.000	-	-	-	-	10.000	20.000	15.000	45.000	-	-
22.	Const:of Amangarh overhead Bridge.	20.500	-	-	-	-	5.000	15.000	-	20.500	-	-
	Total Major Schemes:	4400.526	410.263	721.761	427.044	-	648.624	923.946	892.190	2464.760	643.193	
	Minor Schemes ongoing and new:pro	310.123	-	152.750	10.838	-	85.000	98.802	115.483	299.285	190.000	
	GRAND TOTAL:	4710.649	410.263	874.511	437.882	-	733.624	1022.748	1007.673	2764.045	833.193	
F.W.O 23.	Azad Kashmir Rds.(4)	246.998	36.330	163.873	16.703	95%	30.812	11.563	-	41.685	-	-
24.	K.K.Sakardu Road.	461.430	11.846	33.886	44.421	82%	67.594	-	-	67.594	-	-
	TOTAL:	708.428	48.176	197.759	61.124	-	98.406	11.563	-	109.279	-	-



LEGEND

F	FEDERAL PROJECT
3/H	THIRD HIGHWAY PROJECT
NLC	NLC PROJECT
P	PUNJAB HIGHWAY PROJECT
S	SIND HIGHWAY PROJECT
N	NWFP HIGHWAY PROJECT
B	BALUCHISTA HIGHWAY PROJECT

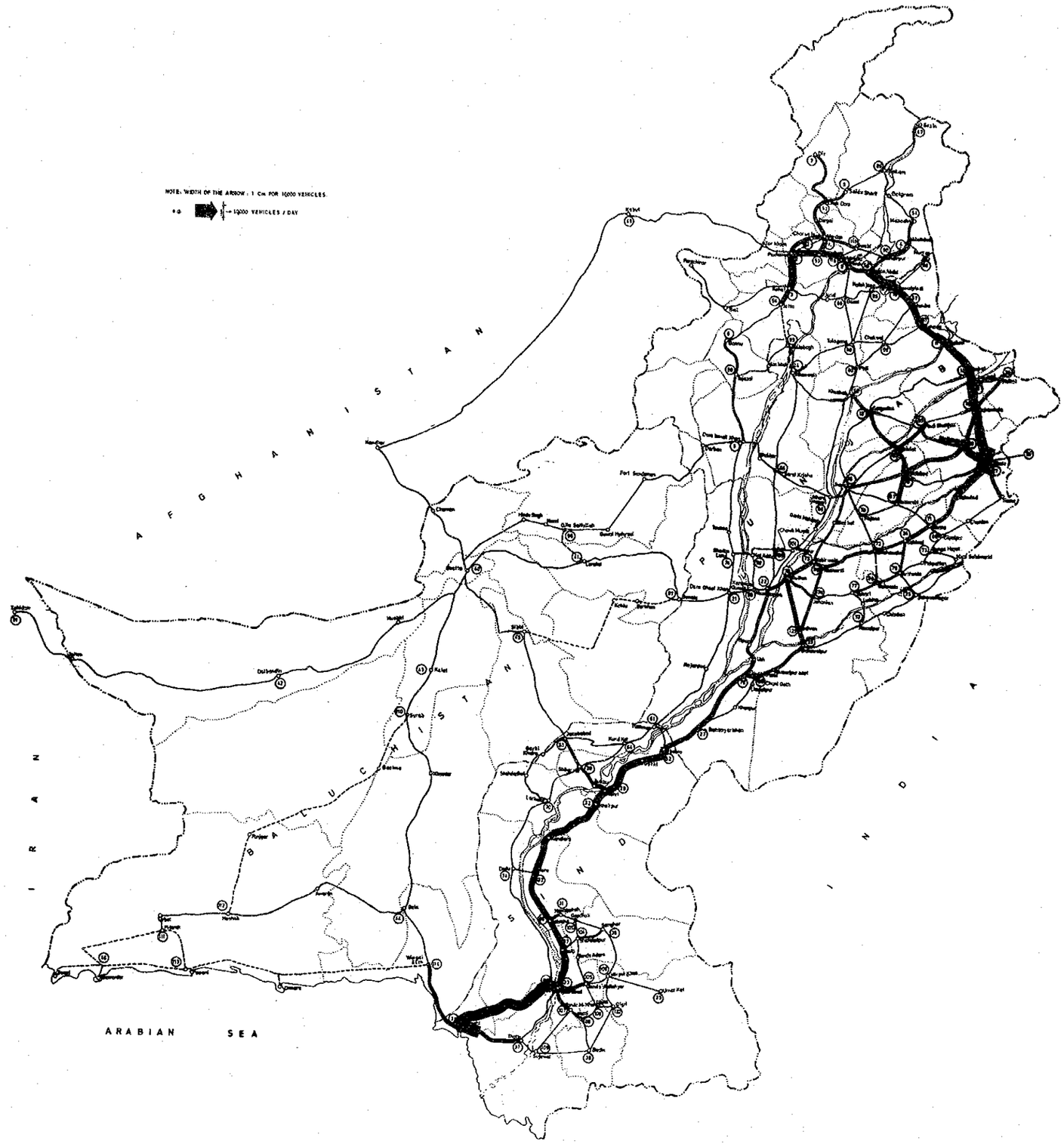


Fig. 4-28 Pakistan Highway Traffic Flow Map Mixed Traffic in 1980-81

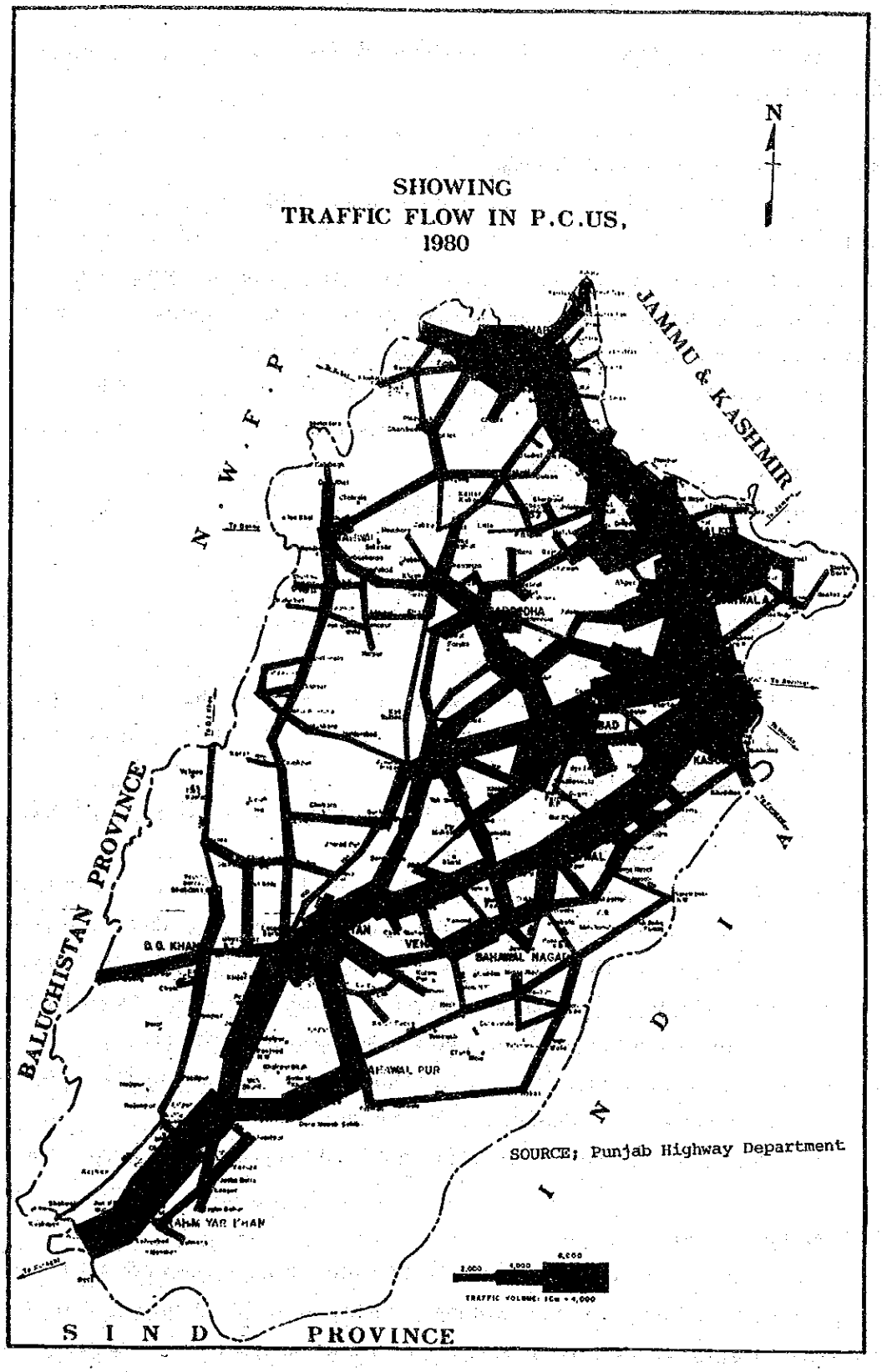


Fig. 4-29 Road Map of the Punjab

5. Highway Planning

Long-range planning means determination of the needs for as far ahead as can reasonably be foreseen.

5-1 Basic Objectives of Road Planning

Road is a most general and basic transportation facility which is indespensable for daily life and production activities, and which also plays an important role in forming confortable living environment and providing public space for disaster prevention.

Among the surface transportation means, motor vehicle transportation is play in an important role because of its mobility, door to door serviceability and reliability.

The main objects of the formulation of the future road network are as follows;

- The minimization of the total transport costs taking account of other modes and Multimodal transportation.
- The interconnection of important centres.

5-2 Strategies

To attain the above-mentioned basic objectives, road planning work is to be carried out based on the following five strategies;

1. Higher priority should be given to the improvement of inter-regional trunk roads which would yield high and quick economic return from the view-point of present and future road traffic demand.
2. The national highway N-5 should be substantially improved keeping in view the traffic requirements in various sections.
3. The balanced national highway network should be established by rationalizing the existing network to include the roads of national importance such as Indus Highway, RCD Highway (Quetta – Taftan Section), D.I.K. Lahore, Nowshera-Chitral & Multan-Rawalpindi (direct) via Khushab roads and by giving greater priority to rehabilitation and improvement of other arterial roads.
4. Construction of bridges across the major rivers/main canals and by-pass of trunk roads around big cities should be given priority.
5. New construction of road should be restricted to opening up of isolated areas.

5-3 Planning Process

The future traffic demands assigned to the future highway network are compared with the future highway capacity resulting from the standards adopted, and the future deficiencies which result from retaining the present network are calculated for two alternatives.

- Determine the deficiencies on the basis of desire lines and trial traffic assignment to existing network (Desire lines in the year 1987/88 and 1999/2000 are shown in

Fig. 5-1 and Fig. 5-2)

- Development tentative networks to eliminate the deficiencies (capacity requirements for future network)
- Test the most promissing tentative plans by 2nd traffic assignment
- Develop the balanced road network with due regard to the future traffic flow and the road construction standard.

5-4 Classification of Highway System and Construction Standards

The highway system as proposed along with the construction standards will rationalise the basis and procedure for the proper growth and development of balanced road network.

5-4-1 Highway Classification

Prior to determination of the needs and an orderly solution of the multitude of problems on highways, classification of highways is necessary. Classification is the tool by which the complex network of highways can be allocated into groups or systems of routes having similar characteristics.

There are two types of classifications in highway system;

i) Administrative classification

ii) Functional classification

The administrative classification exists in Pakistan such as National Highway and Provincial Highway are identified from their administrative point of view.

The functional classification does not exist in Pakistan officially and the emphasis is primarily laid on the function and relative importance of the highway in the network.

The latter is more important because it is required for the road users to utilize highway efficiently and in an economical manner.

Actual assigned traffic volume in the year 1987/88 and 1999/2000 on each link has been considered as one of the most reliable parameter for determining the service required.

Road Network System for National Transport Plan is classified into three categories as follows;

i) Primary Highway

ii) Secondary Highways

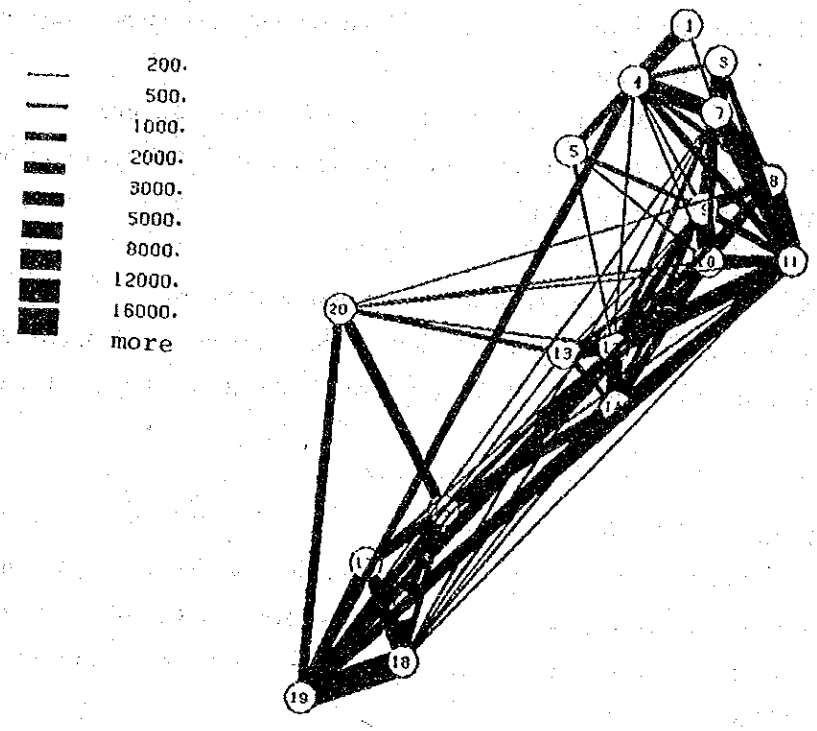
iii) Feeder Roads

Definitions are as follows;

Primary Highways

These are the main highways which form a part of international routes and link up all federal and provincial capitals. These road also pass through two or more provinces. Primary highways selected for this study on the basis of above criteria and policy mentioned before are shown in Fig. 5-3.

CASE;A



CASE;B

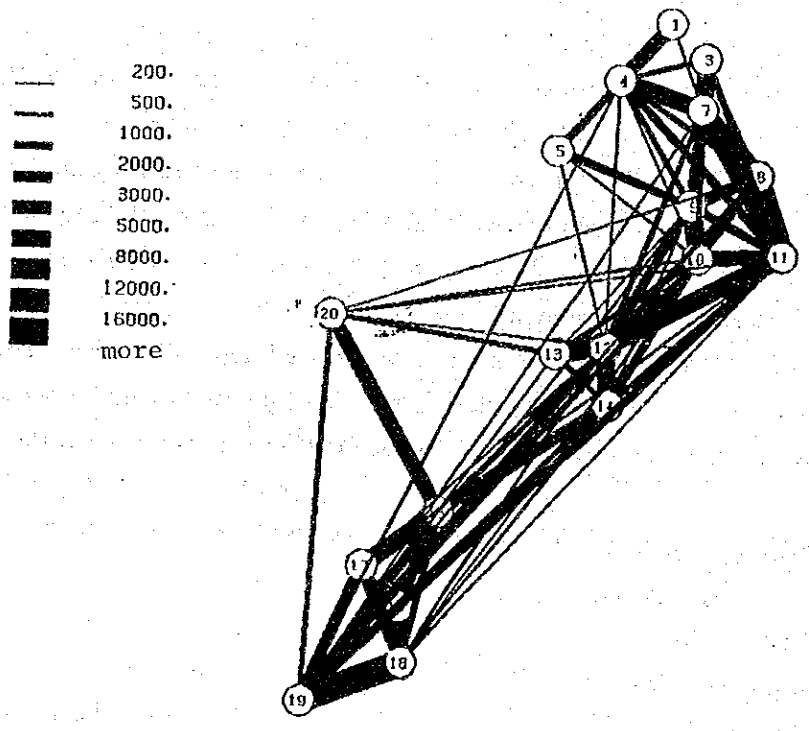


Fig. 5-1 Desire Line in the Year 1987/88

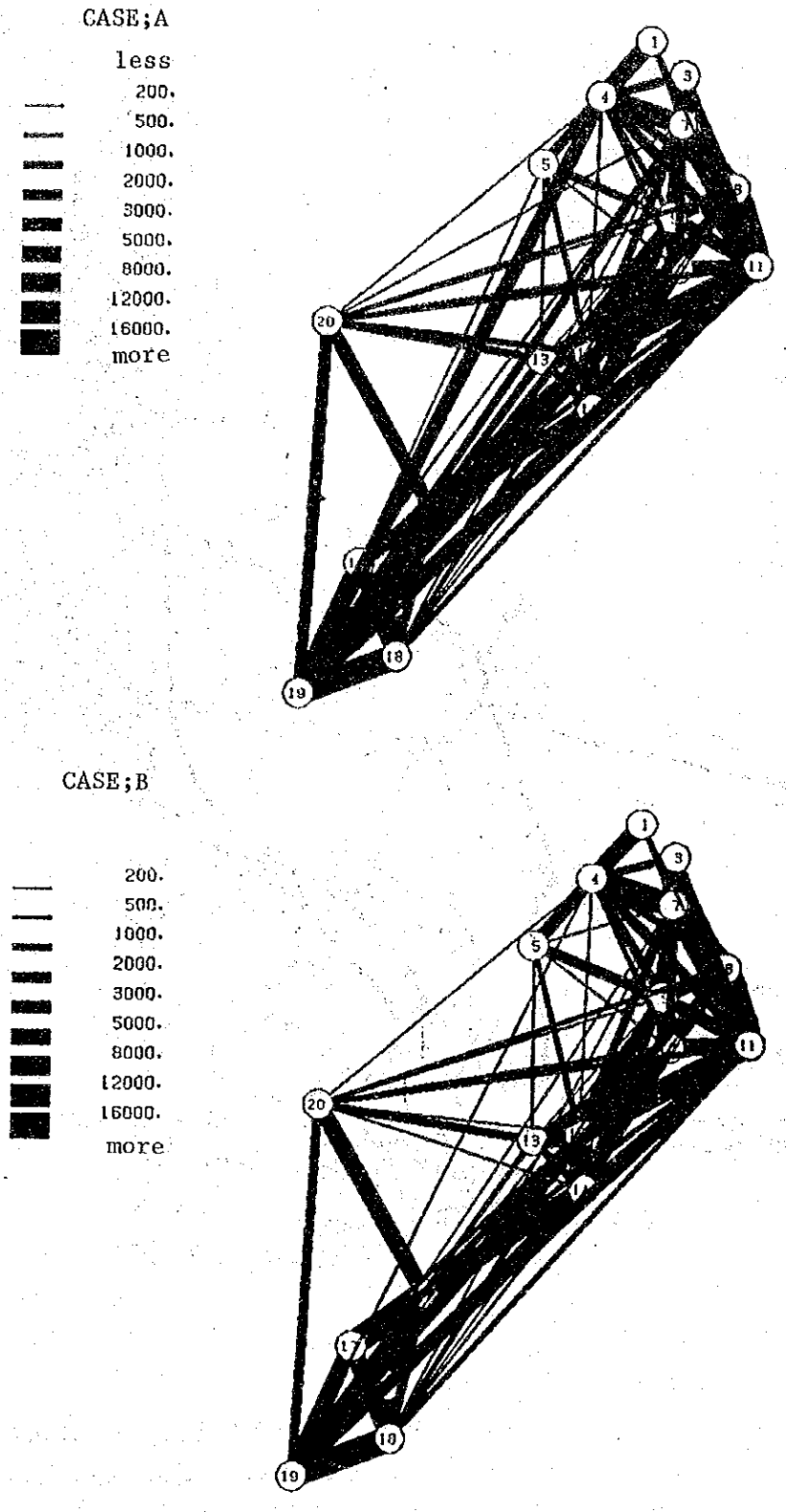


Fig. 5-2 Desire Line in the Year 1999/2000

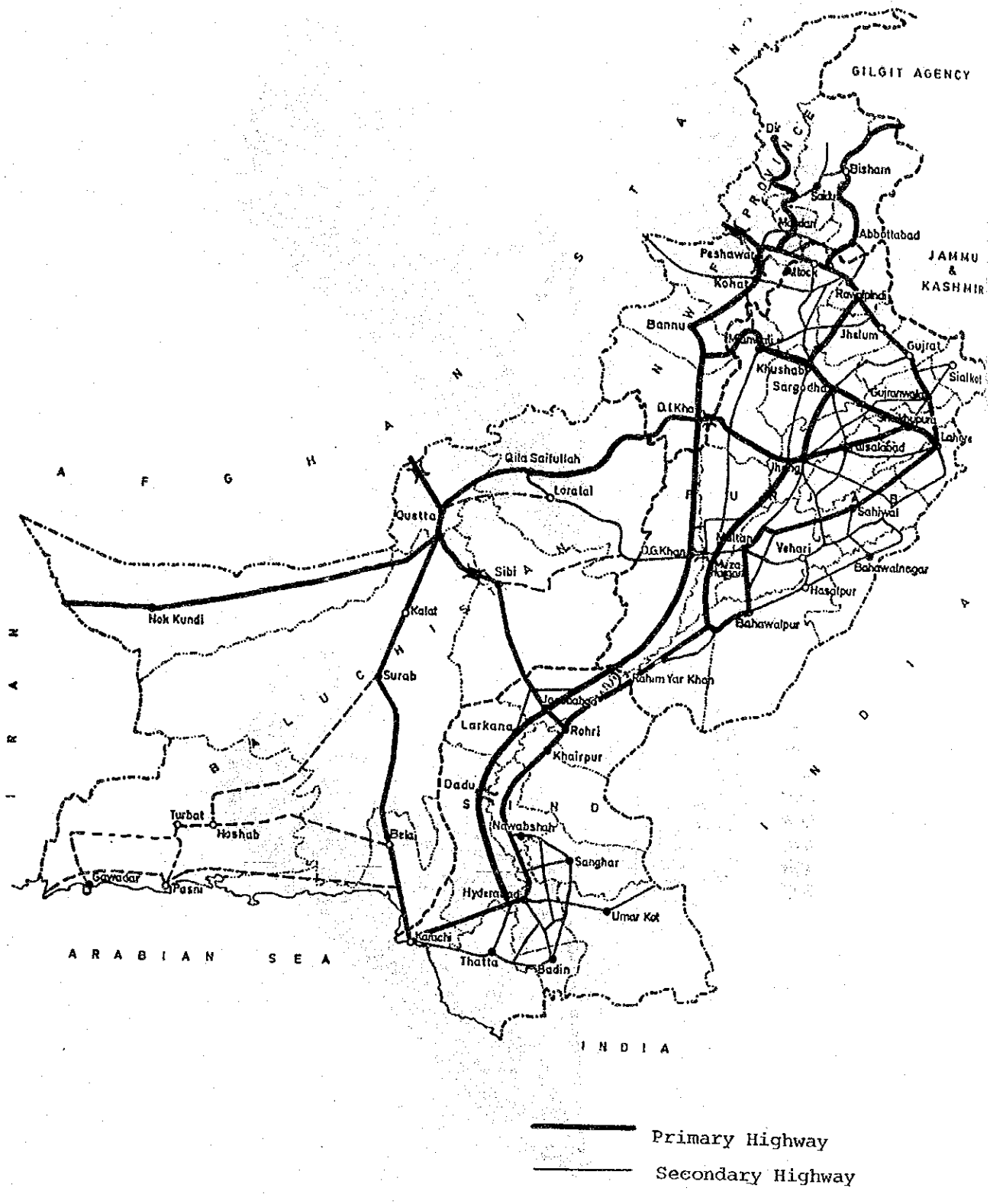


Fig. 5-3 Highway Classification

Secondary Highways

These highways connect divisional or district headquarters with each other and also link up divisional or district headquarters to primary highways. Those highways other than the primary highways on the road networks for national transport plan will be defined as secondary highways.

Feeder Road

The feeder roads will be all other roads which feed into the primary and secondary systems. This class of road is not dealt with in this Report.

Although the functional classification is not directly settled by analyses of the traffic on existing roads, it is important, through Origin-Destination analyses, to obtain a proper picture of the links actually used for commuting between different centres.

Functional Classification of the road network should not be regarded as a one-time process. A short-cut reducing the distance between two centres may imply a downward reclassification of the previous main route.

Sections of primary and secondary highways will be prepared for improvement or reconstruction depending on the assigned volume of traffic into any of the five construction standards.

5-4-2 Construction Standards

One of the aspects of the functional classification of roads is to demonstrate the importance of establishing and maintaining a certain level of accessibility between and among the various parts and centres in the country.

There is a clear difference between functional and technical classification. The above mentioned two categories of roads (primary and secondary) adopted into the highway systems will be constructed in different standard on the basis of the traffic volume.

For roads with a traffic too low to justify an acceptable level of construction, minimum construction standard should be established.

On the other hand, the introduction of possibly higher standards shall be applied with justification of benefit-cost analyses for the additional investments and user benefits that such improvement entail.

In view of the national economy and scarce resources, the construction standards for this road planning is determined through making comparison of several standards adopted for road planning in Pakistan and other countries.

Standards studies are as follows;

i) Suggested Design Standard for Two-Lane Highway by IBRD (see Table 5-5).

ii) Tolerable Standards for 2-Lane Highways by U.S. Department of Transportation Federal Highway Administration (see Table 5-6).

iii) Pakistan Rural Highway-Computed Highway Capacity by Techno-Consult for "Master Plan for Highways" in 1978 (see Tables 5-7 and 5-8).

iv) Construction Standards Recommended in "Classification of Highway System and Design Criteria June 1972 by Directorate of Planning and Design Highway Department, Lahore, (see Table 5-9).

v) Design Characteristics for Roads in Different Type of Terrain by Central Road Organization, MOC, Government of Pakistan (see Table 5-10).

Basically, the construction standards recommended by the "Classification of Highway System and Design Criteria in June 1972" is adopted for this highway planning. The Construction Standards for this highway planning is shown in Table 5-1, and typical cross sections are shown in Fig. 5-4.

Table 5-1 Road Construction Standards for Highway Planning

Class	ADT on Opening (Mixed Traffic)	Type of Pavement	Formation Width	Right of Way	Design Speed (km/hr)	Level of Service on Opening
I	100 - 500	12-ft (3.65m) Surface Treated	32ft (9.75m)	110feet (33.53m)	L: 80 R: 65 M: 40	C
II	500 - 1500	20-ft (6.0m) Surface Treated	44ft (13.40m)	110feet (33.53m)	L: 90 R: 80 M: 50	B
III	1501 - 4000	24-ft (7.3m) Surface Treated	50ft (15.20m)	220feet (67.05m)	L: 95 R: 80 M: 60	B
IV	4001 - 8000	24-ft (7.3m) Asphaltic Concrete + 6-ft Treated Shoulder	50ft (15.20m)	220feet (67.05m)	L: 100 R: 90 M: 70	B
V	8001 - 48,000	2 x 24ft (7.3m) Asphaltic Concrete + 6-ft Treated Shoulder	96ft (29.05m)	220feet (67.05m)	L: 110 R: 100 M: 80	B

Note: The mixed traffic ADT of Class IV in above Road Construction Standards might be modified to be 4001-7200 for practical Pakistan Standard, although the ADP categorization is based on the information prevalent up to May, 1982.

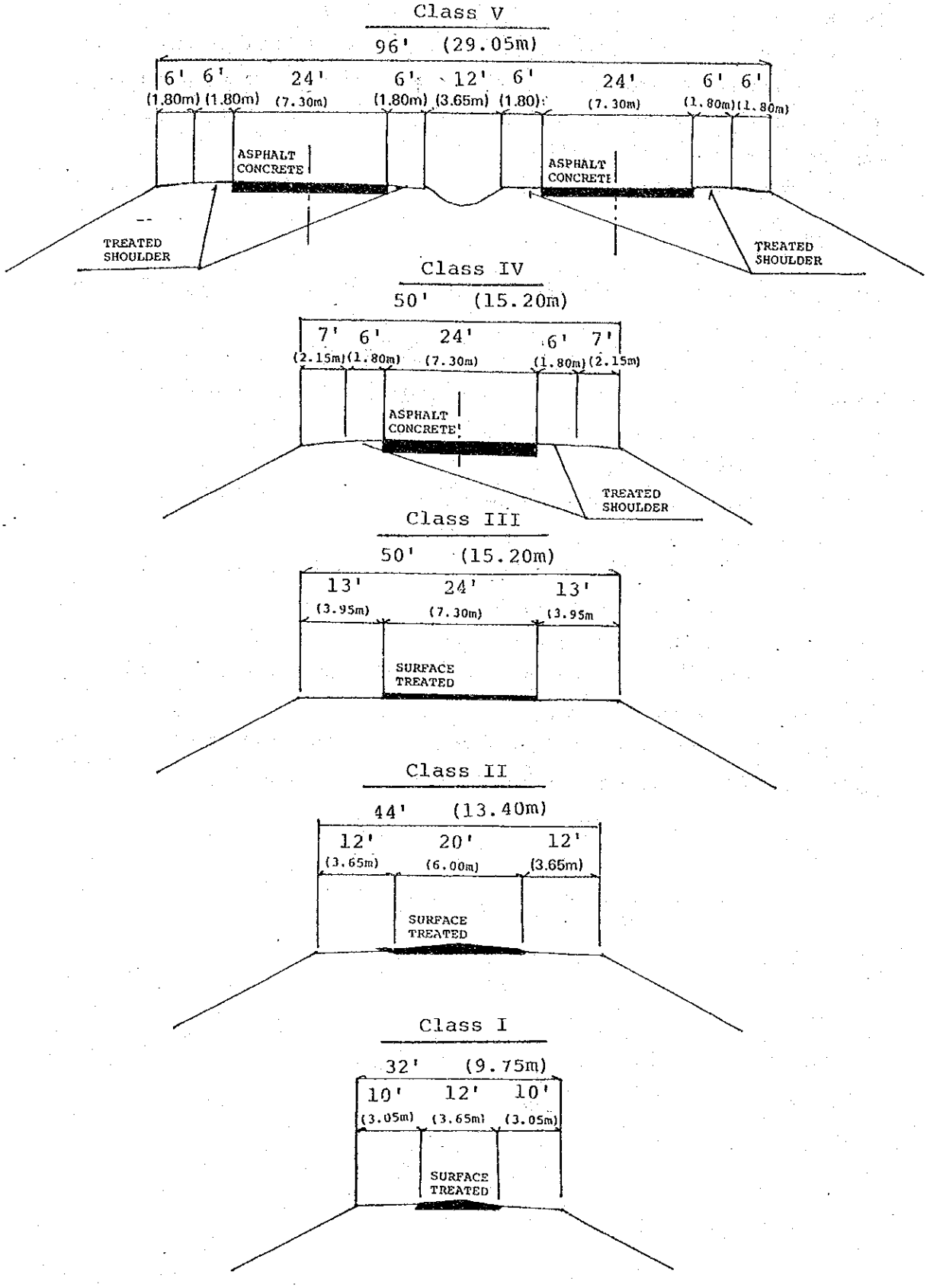


Fig. 5-4 Typical Cross Section

Design Speed & Capacity

It will not be economical to design all roads for very high speed. A road has, therefore, to be designed for specific speed known as 'Design speed'. The design speed is defined as the maximum approximately uniform speed. This is the safe uniform speed which depends on the following factors.

i) Type and condition of surface
ii) Type of terrain
iii) Width of roadway

In order to set up the Q-V curves for traffic assignment the following Table 5-2 gives the speed recommended.

On the basis of above mentioned design speed traffic capacity in terms of mixed traffic by type of terrain and road width is calculated as in Table 5-3 so as to set up the Q-V curves for traffic assignment purposes.

Level of Service in terms of V/C Ratio

The quality of highway service is measured by two reasonably reliable indicators;

i) Operating Speed
ii) The "Volume/capacity ratio" that is, the ratio of the volume of traffic assigned to the maximum volume given in Q-V curve.

These indicators have been used to define six level of service shown in Table 5-4.

The selected standard as the residual level of service will not fall below a level is to be acceptable to the users of the highway.

The level of service concept does not apply to class I, but for all other classes level of service analysis is a tool for selecting standards for candidate projects.

Table 5-2 Design Speed (Vmax)

Type of Terrain	Type of Road Surface	width (0.1m)				
		≦36	36< ≦60	60< ≦72	72< ≦108	73x2
Flat	Metalled Good	80	90	95	100	110
	Metalled Poor	60	70	70	75	80
	Un-Metalled	40	45	-	-	-
Rolling	Metalled Good	65	80	80	90	100
	Metalled Poor	50	60	60	70	75
	Un-Metalled	30	40	-	-	-
Mountainous	Metalled Good	40	50	60	70	80
	Metalled Poor	30	35	45	50	60
	Un-Metalled	20	25	-	-	-

Table 5-3 Capacity (Qmax) Mixed Traffic

Type of Terrain	width (0.1m)				
	≦36	36<≦60	60<≦72	72<≦108	73x2
Flat	500	1,500	4,000	8,000	48,000
Rolling (0.9xFlat)	450	1,350	3,600	7,200	43,000
Mountainous (0.7xFlat)	350	1,000	2,800	5,600	34,000

Table 5-4 Operating Criteria and Maximum Service Volumes Under Ideal Conditions

Level of Service	Description	Operating Speed (mph)	Volume/ Capacity Ratio	Maximum Service Volume
		Passenger vehicles per hour in both directions		
A	Free flow	60 (96km)	.20	400
B	Stable flow	50 (80km)	.45	900
C	Stable flow	40 (64km)	.70	1400
D	Approaching unstable flow	35 (56km)	.85	1700
E	Unstable flow	30	1.00	2000
F	Forced flow	30	Not meaningful	

Source: Highway Capacity Manual, pp. 302-3.

Table 5-5 Suggested Design Standard for Two-Lane Highways

Design Class		Class I			Class II			Class III			Class IV			Class V		
ADT on opening (Mixed traffic)		Under 50			50 to 400			400 to 1,000			1,000 to 2,000			Over 2,000		
Terrain		Flat	Rolling	Moun-tain-ous	Flat	Rolling	Moun-tain-ous	Flat	Rolling	Moun-tain-ous	Flat	Rolling	Moun-tain-ous	Flat	Rolling	Moun-tain-ous
Design speed	km p.h.	60	40	30	80	65	40	90	80	50	95	80	60	100	90	70
Maximum gradient	%	6.0	8.0	10.0	6.0	7.0	9.0	5.0	6.0	8.0	4.0	5.0	7.0	4.0	5.0	7.0
Width of surfacing	m	4.0 to 5.0 depending on design speed			5.0 to 6.2 depending on design speed			6.0 to 6.7 depending on design speed			6.7 to 7.0 depending on design speed			7.0 to 7.3 depending on design speed		
Width of one shoulder*	m	1.0			1.5			2.0			2.4			3.0		
Total width of roadway*	m	6.0 to 7.0			8.5 to 9.2			10.0 to 10.7			11.5 to 11.8			13.0 to 13.3		
Minimum radius	m	As in Table 3-4 for 10 percent maximum superelevation														
Non-passing sight distance	m	As in Table 3-5														
Passing sight distance	m	As in Table 3-6														
Width of bridges L<20	m	3.5 to 4.0 (Single Lane)			8.5 to 9.2			10.0 to 10.7			11.5 to 11.8			13.0 to 13.3		
Between Curbs L>20	m	3.5 to 4.0 (Single Lane)			7.0 to 7.7			7.5 to 8.2			8.7 to 9.0			9.0 to 9.3		
Vertical clearance	m	5.0			5.0			5.0			5.0			5.0		
Design live loading (AASHO or equiv.)		H 15-44			HS 20-44			HS 20-44			HS 20-44			HS 20-44		
Axle load for pavement design (Legal limit)	m ton				9			9			9			9		
Right-of-way width	m	25			35			40			50			60+		
Surface Type (Assuming an adequate base)		Granular			Granular, Single or Double Surface Treatment			Multiple-layer surface treatment, Bituminous Macadam, Road Mix or Asphaltic Concrete			Asphaltic Concrete or Road Mix			Asphaltic Concrete or rigid pavement		

* Shoulder and roadway width may be reduced in rough mountainous terrain.

Source: A Review of Highway Design Practicies in Developing Countries by IBRD

Table 5-6 Tolerable Standard for 2-Lane Highways

S.No.	Average Daily Traffic PCUs per day	Topography	Design Speed Km/hr	Min. Sight Distance		Roadway width (m)			Surface Type	Traveled way	Horizon Clearance	Vertical Clearance
				Stopping (m)	Passing (m)	Traveled way	Shoulder	Total				
1.	Less than 150	Level	70	90	470	5.0	1.0	7.0	Gravel(or other all weather)	5.0	6.2	4.5
		Rolling	50	60	330	5.0	1.0	7.0		5.0	6.2	4.5
		Mountainous	30	30	190	5.0	1.0	7.0		5.0	6.2	4.5
2.	150-500	Level	100	160	680	6.0	1.0	8.0	Gravel(or other all weather)	6.0	7.3	4.5
		Rolling	70	90	470	5.5	1.0	7.5		5.5	6.7	4.5
		Mountainous	40	45	200	5.0	1.0	7.0		5.0	6.2	4.5
3.	500-1500	Level	110	185	740	6.0	1.5	9.0	Surface Treatment	6.0	7.3	4.5
		Rolling	90	135	610	6.0	1.5	9.0		6.0	7.3	4.5
		Mountainous	60	75	400	6.0	1.0	8.0		6.0	7.3	4.5
4.	1500-5000	Level	110	185	740	6.7	1.5	9.7	Bituminous Carpet	6.7	8.0	4.5
		Rolling	100	160	680	6.7	1.5	9.7		6.7	8.0	4.5
		Mountainous	70	90	470	6.0	1.5	9.0		6.0	7.3	4.5
5.	5000-14000	Level	110	185	740	7.3	2.5	12.3	Bituminous Carpet	7.3	8.5	4.5
		Rolling	100	160	680	7.3	2.5	12.3		7.3	8.5	4.5
		Mountainous	80	110	540	6.7	2.0	10.7		6.7	8.0	4.5

Source: "Measuring Highway improvement Needs and Priority Analysis" U.S. Department of Transportation - Federal Highway Administration - 1976 Developed for Argentina Modified .

Table 5-7 Pakistan Rural Highway Computed Highway Capacity "Service Level C"

i) National and Provincial Primary Highways - Service Level C
ii) Provincial Secondary Highways - Service Level D

PAV.WIDTH (m)	EXISTING					IMPROVED				
	A.H.S. (k.p.h.) (as observed)	Width Factor (w)	V/C	D.H.V.	Capacity (A.D.T) (Rounded in p.c.us)	Design Speed (k.p.h.)	Width Factor (w)	V/C	D.H.V.	Capacity (A.D.T) (Rounded in p.c.us)
Katcha	-	-	-	-	50	-	-	-	-	50
Shingle	-	-	-	-	100	-	-	-	-	100
2.74-3.66	-	-	-	-	250	-	-	-	-	250
3.96-5.18	-	-	-	-	500	-	-	-	-	500
5.49	80	0.520	0.470	0.08	6000	113	0.633	0.70	0.08	11000
6.10	80	0.567	0.470	0.08	7000	113	0.688	0.70	0.08	12000
6.71	80	0.623	0.470	0.08	7500	113	0.760	0.70	0.08	13500
7.32-10.67	80	0.72	0.470	0.08	8500	113	0.875	0.70	0.08	15500
10.97-11.89	80	0.66	0.250	0.08	16500					
12.19-13.11	80	0.74	0.250	0.08	18500					
13.41-14.33	80	0.79	0.250	0.08	20000					
14.63	80	0.81	0.250	0.08	20500					
2 x 7.32	113	0.81	0.75	0.08	61000	113	0.96	0.75	0.08	72000
2 x 10.97	113	0.91	0.80	0.08	110000	113	0.97	0.80	0.08	120000
2 x 14.63	113	0.91	0.83	0.08	150000	113	0.97	0.83	0.08	160000

SOURCE: Master Plan for Highways by Techno-consult

Table 5-8 Pakistan Rural Highway Computed Highway Capacity "Service Level D"

PAV.WIDTH (m)	EXISTING					IMPROVED				
	A.H.S. (k.p.h.) (as observed)	Width Factor (w)	V/C	D.H.V.	Capacity (A.D.T) (Rounded in p.c.us)	Design Speed (k.p.h.)	Width Factor (w)	V/C	D.H.V.	Capacity (A.D.T) (Rounded in p.c.us)
Katcha	-	-	-	-	50	-	-	-	-	50
Shingle	-	-	-	-	100	-	-	-	-	100
2.74-3.66	-	-	-	-	250	-	-	-	-	250
3.96-5.18	-	-	-	-	500	-	-	-	-	500
5.49	80	0.550	0.69	0.08	9500	113	0.657	0.85	0.08	14000
6.10	80	0.593	0.69	0.08	10000	113	0.707	0.85	0.08	15000
6.71	80	0.647	0.69	0.08	11000	113	0.775	0.85	0.08	16500
7.32-10.67	80	0.74	0.69	0.08	13000	113	0.885	0.85	0.08	19000
10.97-11.89	80	0.66	0.70	0.08	46000					
12.19-13.11	80	0.74	0.70	0.08	52000					
13.41-14.33	80	0.79	0.70	0.08	55000					
14.63	80	0.81	0.70	0.08	57000					
2 x 7.32	113	0.81	0.90	0.08	73000	113	0.96	0.90	0.08	86500
2 x 10.97	113	0.91	0.90	0.08	125000	113	0.97	0.90	0.08	130000
2 x 14.63	113	0.91	0.90	0.08	165000	113	0.97	0.90	0.08	175000

SOURCE: Master Plan for Highways by Techno-consult

Table 5-9 Recommended Construction Standard by Master Plan for Highways

Volume limits (vehicle/day)	Construction Standards	Type of Pavement	Formation Width	Right of Way
101 - 500	Class III	12-ft. surface treated	32 feet	110 feet
501 - 1500	Class II	20-ft. surface treated	44 feet	110 feet
1501 - 4000	Class I	24-ft. surface treated	50 feet	220 feet
4001 - 8000	Class I carpetted	24-ft. carpetted with 6-ft. treated shoulders	50 feet	220 feet
8001 - 48000	4-Lane divided	Each 24-ft. carpetted with 6-ft. treated shoulders	96 feet	220 feet

Note: The designed speeds for Class I, and Class II standard highways will be adopted as follows:

Flat open terrain	-	70 miles per hour
Rolling hilly terrain	-	50 miles per hour
Semi-hilly terrain	-	40 miles per hour
Urban areas	-	50 miles per hour
Minimum speed allowed	-	30 miles per hour

The designed speed for a Class III standard highway shall be 50 miles per hour. In extremely mountainous areas, where cost would be high and traffic volume low, a minimum speed of 20 miles per hour wil be used.

Source: Classification of Highway System and Design Criteria in 1972 by Punjab Highway Department

Table 5-10 Design Characteristics for Roads in Different Type of Terrain

Characteristics Roads	Terrain	Design Speed M.P.H.	Radius of Curvature(ft) Minimum	Radius of Curvature(ft) Desirable	Maxim. Gradient(%)	Maximum Length of grade (ft)	Formation width (Permanent surfacing and shoulders) (ft)	width of permanent surfacing (ft)
Primary	Flat or rolling	50-70	625-1175	675-1250	4	None	32-42	20-24
	Hilly	35-50	300-625	325-675	5-7	2,000ft over4%	32-42	20-24
	Mountainous	25-35	160-300	175-325	7-9	2,450ft over6%	26-30	20-24
Secondary	Flat or rolling	35-50	300-625	325-675	5	None	32-39	20-22
	Hilly	30-35	250-300	275-350	5-7	None	32-39	20-22
	Mountainous	20-30	115-250	130-275	7-9	2,450ft over 6%	26-30	20-22
Feeder	Flat or rolling	30-35	250-300	275-350	7	None	25-26	12-18
	Hilly	20-30	115-250	130-275	7-9	None	25-26	12-18
	Mountainous	15-20	65-115	90-130	9-12	3,300ft over9%	25-26	12-18

Note: The absolute minimum radius of curvature shown here take account of a superelevation of 10 per cent and a sideways for co-efficient of 0.16.
Carriage-ways narrower than 20-ft. wide should not be used for roads carrying more than 1,500 vehicles per day. In case of primary roads, the maximum gradient for bridge approaches in flat or rolling terrain may be kept 2 to 3%.

Source: Guide to Highway Design Standard and Specifications by Central Roads Organization, MOC, Government of Pakistan

5-5 Traffic Assignment

Traffic assignment is the technical term used for the process of determining the distribution over the road network of the traffic demand between different zones.

The determination of the anticipated amount of traffic on a new network must be made before the size of the facility can be determined.

Such an estimation can be made only after an evaluation of the type of traffic which will use the new facility and an estimation of their volume.

Studies have indicated that the distribution of traffic between alternative routes such as mentioned Fig. 5-5 in the network depends on various characteristics of the routes involved. When, these characteristics are known for a new route, it is thus possible to estimate the traffic volume which can be expected on that route.

Balanced network in the year 1987/88 and 1999/2000 for two alternatives are shown in Fig. 5-6 and 5-7.

5-6 List of Candidate Project

Balance Network with type of improvement in terms of Construction Standard by the year 1987/88 and 1999/2000 for two alternatives are recommended as shown in Table 5-12 and Table 5-13. List of links is shown in Table 5-11.

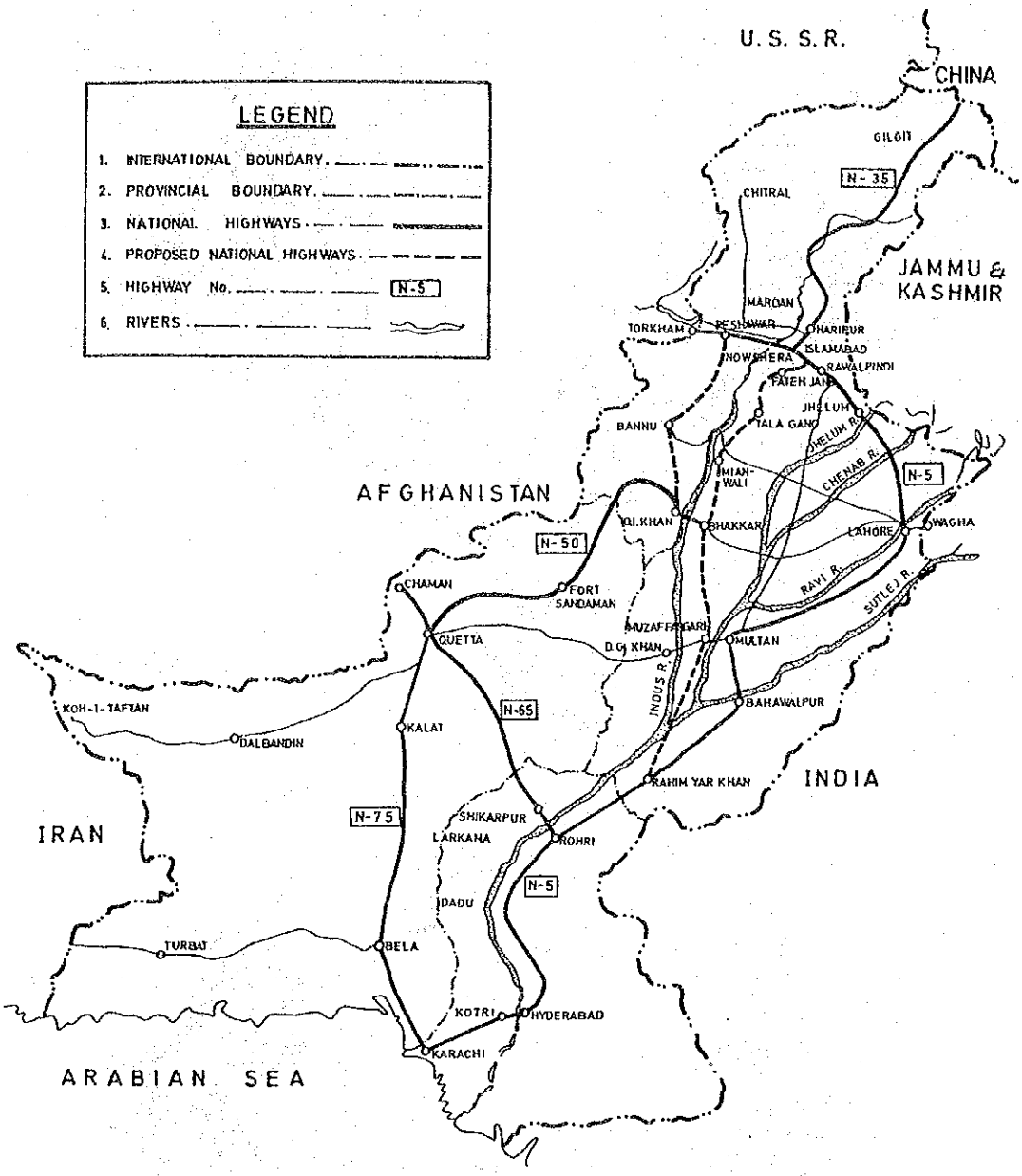
In order to set up the Candidate Projects the Improvement Criteria for primary and secondary highways are recommended in advance as follows:

Improvement Criteria for Primary Highway

1. The highway shall be a two-lane highway at least in the year 2000.
2. Volume/capacity ratio must be less than 0.70 (level of service "C") in the year 1999/2000 and 0.85 (level of service "D") in the year 1987/88.
3. All railway crossings must be eliminated by the year 2000.
4. In case of dual carriageways, all junction should preferably be grade-separated.
5. The entire carriageway width of pavement plus paved shoulder shall be carried across all structures.

Improvement Criteria for Secondary Highway

1. Volume/capacity ratio must be less than 0.85 (level of service "D")
2. In case of dual carriageways, all railway crossings and junctions shall preferably be grade-separated.
3. At least pavement width shall be carried across all structures.



Source: Communication and Works Department, NWFP

Fig. 5-5 Alternative Location of Indus Highway

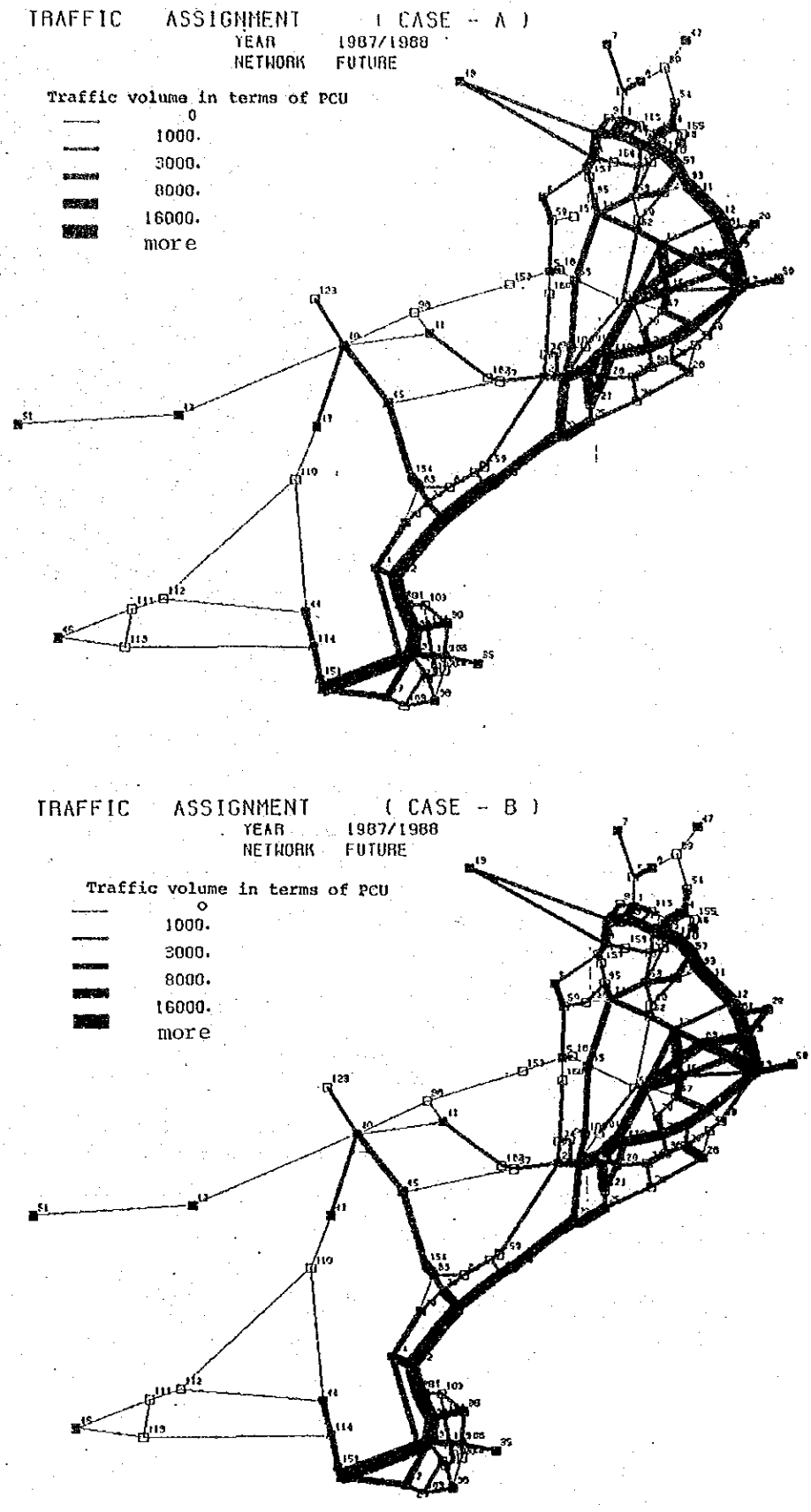
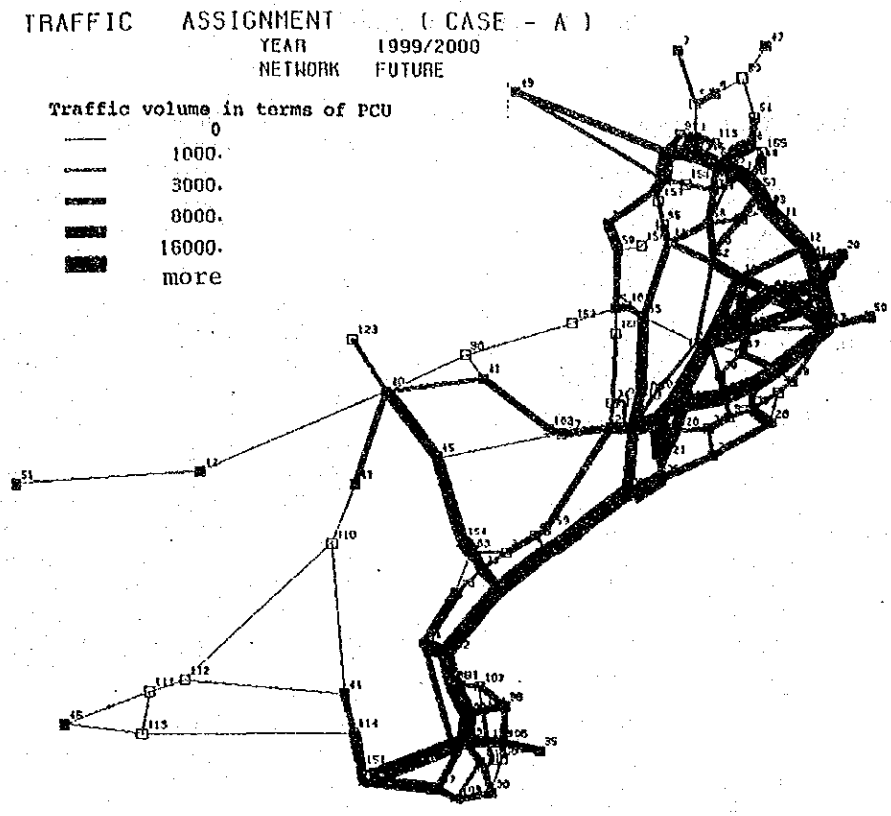


Fig. 5-6 Traffic Assignment in the Year 1987/88



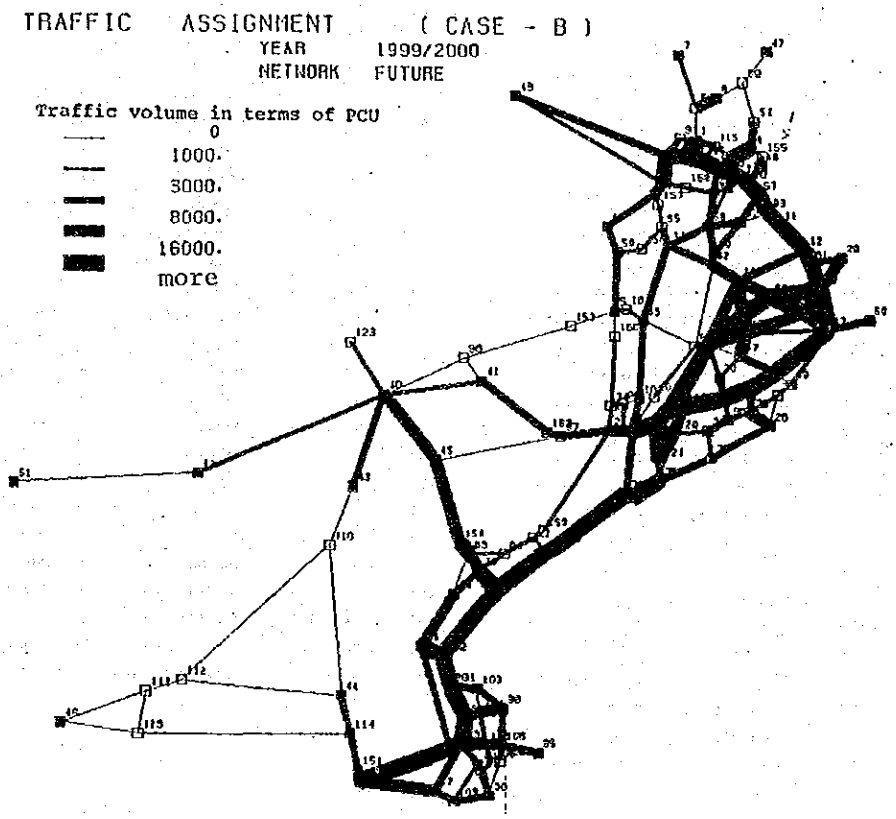


Fig. 5-7 Traffic Assignment in the Year 1999/2000

Table 5-11 (1) List of Links

PUNJAB PROVINCE

LINK NO.	NO. OF NODE	NAME OF NODE		LINK NO.	NO. OF NODE	NAME OF NODE	
051001	150 - 27	S/P Bound	- Rahimyar Khan	001056	13 - 12	Sargodha	- Gujrat
02	27 - 29	Rahimyar Khan	- Rohri	57	18 - 63	Sheikhupura	- Pindi Bhattian
03	79 - 80	Trindi	- Chani Goth	58	63 - 13	Pindi Bhattian	- Sargodha
04	80 - 25	Chani Goth	- Bahawalpur	59	13 - 62	Sargodha	- Khushab
05	25 - 121	Bahawalpur	- Lodhran	60	62 - 14	Khushab	- Mianwali
06	121 - 23	Lodhran	- Multan	61	18 - 19	Sheikhupura	- Gujranwala
07	23 - 75	Multan	- Kabirwala	62	19 - 20	Gujranwala	- Sialkot
08	75 - 119	Kabirwala	- Khanewal	63	20 - 61	Sialkot	- Wazirabad
09	119 - 72	Khanewal	- Chichawatni	64	17 - 15	Lahore	- Faisalabad
10	72 - 24	Chichawatni	- Sahiwal	65	25 - 78	Bahawalpur	- Hassalpur
11	24 - 71	Sahiwal	- Okara	66	78 - 26	Hassalpur	- Bahawalnagar
12	71 - 17	Okara	- Lahore	67	26 - 76	Bahawalnagar	- Arifwala
13	17 - 19	Lahore	- Gujranwala	68	76 - 24	Arifwala	- Sahiwal
14	19 - 61	Gujranwala	- Wazirabad	69	67 - 15	Sumundri	- Faisalabad
15	61 - 12	Wazirabad	- Gujrat	70	15 - 64	Faisalabad	- Chiniot
16	12 - 11	Gujrat	- Jhelum	71	64 - 13	Chiniot	- Sargodha
17	11 - 93	Jhelum	- Sohawa	72	27 - 80	Rahimyar Khan	- Chani Goth
18	93 - 57	Sohawa	- Mandra	73	26 - 73	Bahawal Nagar	- Bunga Hayat
19	57 - 10	Mandra	- Rawalpindi	74	69 - 71	Dipalpur	- Okara
20	10 - 117	Rawalpindi	- Tarnaul	75	77 - 78	Vahari	- Hassalpur
21	117 - 55	Tarnaul	- Hasanabdal	76	119 - 120	Kahnewal	- Jahanian
051022	55 - 9	Hasanabdal	- Attock	77	120 - 121	Jahanian	- Lodhran
351023	55 - 152	Hasanabdal	- P/N Bound	111078	23 - 120	Multan	- Jahanian
001024	10 - 48	Rawalpindi	- Murree	79	120 - 77	Jahanian	- Vehari
25	48 - 155	Murree	- P/N Bound	80	77 - 98	Vehari	- Burewala
26	156 - 95	N/P Bound	- Kalabagh	81	98 - 76	Burewala	- Arifwala
27	95 - 14	Kalabagh	- Minawali	82	76 - 73	Arifwala	- Bunga Hayat
28	157 - 95	N/P Bound	- Kalabagh	83	73 - 69	Bunga Hayat	- Dipalpur
29	158 - 69	N/P Bound	- Basal	84	69 - 17	Dipalpur	- Lahore
30	68 - 56	Basal	- Fateh Jang	85	67 - 70	Sumundri	- Rajana
31	56 - 117	Fateh Jang	- Tarnaul	86	98 - 72	Burewala	- Chichawatni
32	159 - 21	S/P Bound	- D.G.Khan	87	72 - 70	Chichawatni	- Rajana
33	21 - 74	D.G. Kahn	- Shadan Lund	88	70 - 16	Rajana	- Jhang
34	74 - 160	Shadan Lund	- P/N Bound	89	16 - 64	Jhang	- Chiniot
35	17 - 18	Lahore	- Sheikhupura	90	64 - 63	Chiniot	- Pindi Bhattian
36	18 - 15	Sheikhupura	- Faisalabad	91	63 - 19	Pindi Bhattian	- Gujranwala
37	15 - 16	Faisalabad	- Jhang	92	22 - 100	Muzaffargarh	- Chowk Munda
38	16 - 66	Jhang	- Athara Hazari	93	100 - 65	Chowk Munda	- Sarai Krishma
39	66 - 65	Athara Hazari	- Sarai Krishma	94	65 - 14	Sarai Krishma	- Mianwali
40	65 - 161	Sarai Krishma	- P/N Bound	95	14 - 58	Minawali	- Talagang
41	162 - 97	B/P Bound	- Bewata	96	60 - 58	Pail	- Talagang
42	97 - 21	Bewata	- D.G. Khan	97	58 - 68	Talagang	- Basal
43	79 - 22	T.M. Ranah	- Muzaffargarh	98	68 - 9	Basal	- Attock
44	22 - 101	Muzaffargarh	- Rangpur	99	58 - 56	Talagang	- Fateh Jang
45	101 - 66	Rangpur	- Athara Hazari	100	93 - 92	Sohawa	- Chakwal
46	66 - 62	Athara Hazari	- Khushab	101	92 - 58	Chakwal	- Talagang
47	62 - 60	Khushab	- Pail	102	16 - 67	Jhang	- Sumundri
48	60 - 92	Pail	- Chakwal	103	67 - 71	Sumundri	- Okara
49	92 - 57	Chakwal	- Mandra	104	74 - 99	Shadan Lund	- Kot Addu
50	17 - 50	Lahore	- Indo	105	99 - 100	Kot Addu	- Chowk Munda
51	21 - 85	D.G. Khan	- Karamad Qureshi	106	100 - 101	Chowk Munda	- Pangpur
52	85 - 22	Karamad Qureshi	- Muzaffargarh	107	85 - 99	Karamad Qureshi	- Kot Addu
53	22 - 23	Muzaffargarh	- Multan				
54	75 - 16	Kabirwala	- Jhang				
55	16 - 13	Jhang	- Sargodha				

Table 5-11 (2)

SIND PROVINCE

LINK NO.	NO. OF NODE	NAME OF NODE	
052001	39 - 118	Karachi	- Kotri
2	118 - 33	Kotri	- Hyderabad
3	33 - 87	Hyderabad	- Hala
4	87 - 86	Hala	- Sakrand
5	86 - 102	Sakrand	- Moro
6	102 - 32	Moro	- Khairpur
7	32 - 29	Khairpur	- Rohri
8	29 - 82	Rohri	- Ubauro
9	82 - 150	Ubauro	- S/P Bound
252010	39 - 151	Karachi	- S/P Bound
652011	29 - 28	Rohri	- Shikarpur
652012	28 - 83	Shikarpur	- Jacobabad
652013	83 - 154	Jacobabad	- S/B Bound
002014	118 - 34	Kotri	- Dadu
15	34 - 30	Dadu	- Larkana
16	30 - 28	Larkana	- Shikaupur
17	28 - 84	Shikarpur	- Kund Kot
18	84 - 81	Kund Kot	- Kashmor
19	81 - 159	Kashmor	- S/P Bound
20	33 - 105	Hyderabad	- Tnado Allayar
21	105 - 106	Tando Allayar	- Mirpur Khas
22	106 - 35	Muirpur Khas	- Umar Kot
002023	39 - 37	Karachi	- Thatta
24	37 - 33	Thatta	- Hyderabad
002025	34 - 102	Dadu	- Moro
26	86 - 31	Sakrand	- Nawabshah
27	31 - 103	Nawabshah	- Gupchani
28	103 - 36	Gupchani	- Sanghar
29	36 - 106	Sanghar	- Mirpur Khas
30	106 - 122	Mirpurkhas	- Digri
31	122 - 38	Digri	- Badin
32	38 - 109	Badin	- Sujwal
33	109 - 37	Sujwal	- Thatta
34	33 - 107	Hyderabad	- Tando Mohammad Kuhan
35	107 - 88	Tando M.Khan	- Matli
36	88 - 38	Matli	- Badin
37	103 - 104	Gupchani	- Shahdadpur
38	104 - 105	Shahdadpur	- Tando Allayar
39	105 - 108	Tando Allayar	- Toali
40	108 - 88	Toali	- Matli
41	107 - 109	Tando M. Khan	- Sujwal
42	81 - 82	Kashmor	- Ubauro
112043	87 - 104	Hala	- Shahdadpur
44	104 - 36	Shahdadpur	- Sanghar
45	30 - 83	Larkana	- Jacobabad
46	83 - 84	Jacobabad	- Kund Kot
47	108 - 122	T.G. Ali	- Digri

N.W.F.P.

LINK NO.	NO. OF NODE	NAME OF NODE	
053001	9 - 116	Attock	- Jehangira
2	116 - 53	Jehangira	- Nowshora
3	53 - 2	Nowshera	- Peshawar
4	2 - 49	Peshawar	- Afghan. Bound
353005	152 - 90	P/N Bound	- Haripur
6	90 - 4	Haripur	- Abbottabad
7	4 - 54	Abbottabad	- Mansehra
8	54 - 89	Mansehra	- Besham
9	89 - 47	Besham	- Sazin
503010	5 - 153	D.I. Khan	- N/B Bound
11	155 - 4	P/N Bound	- Abbottabad
12	59 - 156	Jajazai	- N/P Bound
13	94 - 157	Jatta	- N/P Bound
14	49 - 3	Kabul	- Kohat
15	3 - 158	Kohat	- N/P Bound
16	160 - 5	P/N Bound	- D.I. Khan
17	5 - 59	D.I. Khan	- Jajazai
18	59 - 6	Jajazai	- Bannu
19	6 - 94	Bannu	- Jatta
20	94 - 3	Jatta	- Kohat
21	3 - 2	Kohat	- Peshawar
22	161 - 5	P/N Bound	- D.I. Khan
003023	53 - 1	Nowshera	- Mardan
24	1 - 52	Mardan	- Chakdara
25	52 - 7	Chakdara	- Dir
26	2 - 91	Peshawar	- Charsadda
27	91 - 1	Charsadda	- Mardan
28	1 - 115	Mardan	- Swani
29	115 - 90	Swabi	- Haripur
30	52 - 8	Chakdara	- Saidu Sharif
31	8 - 89	Saidu Sharif	- Besham
32	116 - 115	Jehangira	- Swabi
33	2 - 1	Peshawar	- Mardan

BALUCHISTAN PROVINCE

LINK NO.	NO. OF NODE	NAME OF NODE	
254001	151 - 114	S/B Bound	- Wingai
2	114 - 44	Wingai	- Bela
3	44 - 110	Bela	- Surab
4	110 - 43	Surab	- Kalat
5	43 - 40	Kalat	- Quetta
5	40 - 49	Quatta	- Afghan Bound
504007	153 - 96	N/B Bound	- Qila Saifullah
8	96 - 40	Qila Saifullah	- Quetta
654009	154 - 45	S/B Bound	- Sibi
10	45 - 40	Sibi	- Quetta
004011	40 - 41	Quetta	- Loralai
12	41 - 162	Loralai	- B/P Bound
13	40 - 42	Quetta	- Dalbandin
14	42 - 51	Dalbandin	- Iran Bound
15	44 - 112	Bela	- Hoshab
16	112 - 111	Hoshab	- Pidspak
17	111 - 46	Pidspak	- Gawadar
18	110 - 112	Surab	- Hoshab
19	114 - 113	Wingai	- Pasani
004020	113 - 46	Pasani	- Gawardar
21	111 - 113	Pidarak	- Pasani
22	41 - 96	Loralai	- Qila Saifullah
23	45 - 97	Sibi	- Bewata

Table 5-12 (1) List of Candidate Project by the Year 1987/1988 (1st stage construction)

SEQ	HIGHWAY SECTION LINK-NO	LENGTH (KM)	EXISTING ROAD TER.	WIDTH	TYPE	COND.	IMPROVEMENT A.D.T.	AXLE LOAD	FOR MASTER PLAN IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	IMPROVEMENT A.D.T.	AXLE LOAD	FOR MASTER PLAN IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
1	52001	160	3	75	5	1	13327.3	4532.4	V	B	80	***	***	12131.5	4031.8	V	B	81	***	***
2	52002	15	3	70	5	4	12511.6	3973.5	V	B	81	***	***	11464.7	3539.5	V	B	81	***	***
3	52003	55	3	69	5	3	13868.7	3721.7	V	B	82	***	***	12816.8	3291.9	V	B	82	***	***
4	52004	38	3	75	5	3	10182.4	3578.6	V	B	83	***	***	8831.8	3013.9	V	B	84	***	***
5	52005	68	3	75	5	4	9860.0	3585.6	V	B	83	***	***	8157.8	2874.3	V	B	85	***	***
6	52006	132	3	75	5	4	7661.8	2526.2	V	B	86	***	***	7755.1	2603.8	V	B	86	***	***
7	52007	22	3	75	5	4	9277.6	2989.5	V	B	84	***	***	9562.9	3131.7	V	B	83	***	***
8	52008	109	3	75	5	4	6325.1	2446.4	V	A	***	***	***	4998.1	1888.8	V	A	***	***	***
9	52009	13	3	75	5	3	5708.9	2167.3	V	A	***	***	***	4596.7	1705.2	IV	D	***	***	83
10	51001	48	3	62	5	3	5307.4	2057.5	V	A	***	***	***	4263.2	1619.4	IV	D	***	***	84
11	51002	100	3	61	5	3	5288.8	2021.3	V	A	***	***	***	4305.0	1599.5	IV	D	***	***	84
12	51003	12	3	61	5	4	3151.8	1200.2	IV	C	***	83	***	2476.0	934.5	IV	B	***	***	***
13	51004	70	3	58	5	3	4388.0	1486.2	IV	D	***	81	86	3489.7	1162.4	IV	C	***	81	***
14	51005	18	3	64	5	3	4353.8	1480.4	IV	D	***	80	85	3724.7	1243.8	IV	C	***	81	***
15	51006	75	3	64	5	4	3185.0	828.2	IV	C	***	81	***	3207.1	885.1	IV	C	***	81	***
16	51007	44	3	62	5	4	7292.6	2174.7	V	B	86	***	***	7327.0	2188.6	V	B	86	***	***
17	51008	13	3	63	5	4	4604.5	1107.5	IV	D	***	82	86	4628.0	1108.5	IV	D	***	82	86
18	51009	79	3	62	5	4	4664.0	1291.8	IV	D	***	81	85	4181.7	1091.0	IV	C	***	82	***
19	51010	40	3	62	5	4	5564.5	1588.1	V	A	***	***	***	4961.7	1336.5	IV	D	***	82	85
20	51011	37	3	69	5	4	6305.5	1755.4	V	A	***	***	***	5933.8	1596.4	V	A	***	***	***
21	51012	130	3	75	5	4	4955.5	1378.5	IV	D	***	81	85	4625.1	1238.4	IV	D	***	81	85
22	51013	67	3	96	5	5	10025.5	1449.0	V	B	86	***	***	10126.4	1672.5	V	B	86	***	***
23	51014	32	3	80	5	3	8420.9	1647.2	V	A	***	***	***	9677.2	2161.9	V	B	85	***	***
24	51015	15	3	84	5	3	7565.1	1716.2	V	A	***	***	***	9154.4	2368.9	V	B	84	***	***
25	51016	52	3	85	5	3	7235.3	1634.7	V	A	***	***	***	8000.9	1954.4	V	A	***	***	***
26	51017	38	2	81	5	3	8343.6	1737.5	V	B	85	***	***	8725.2	1890.5	V	B	84	***	***

TER (terrain) 1: Mountainous 2: Hilly 3: Flat

TYPE (surface) 1: Earth 2: Gravel 3: Bituminous Surface Single
4: Pavement (Double) 5: Pavement (Triple)

COND (surface condition) 1: Good 2: Fairly Good 3: Flat 4: Poor
5: Very Poor

Table 5-12 (2) List of Candidate Project by the Year 1987/1988 (1st stage construction)

SEQ	HIGHWAY SECTION LINK-NO	LENGTH (KM)	EXISTING ROAD TER.	WIDTH (M)	TYPE	COND.	IMPROVEMENT FOR MASTER PLAN A A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL LEV.	OF SERVICE A-B	B-C	C-D	IMPROVEMENT FOR MASTER PLAN B A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL LEV.	OF SERVICE A-B	B-C	C-D
27	51018	32	2	74	5	3	6824.1	1465.7	V	A	***	***	***	7136.8	1592.2	V	A	***	***	***
28	51019	29	3	73	5	3	7096.9	1679.1	V	A	***	***	***	7457.1	1831.1	V	A	***	***	***
29	51020	16	3	133	5	3	11809.4	2451.4	V	B	81	***	***	13199.8	3037.4	V	B	81	***	***
30	51021	30	3	113	5	3	8177.5	1779.8	V	A	***	***	***	9165.6	2193.9	V	B	85	***	***
31	51022	45	2	74	5	3	6678.3	1515.7	V	A	***	***	***	7261.1	1759.9	V	A	***	***	***
32	53001	14	3	60	5	3	4903.5	919.7	IV	C	***	***	***	5310.7	1069.4	IV	D	***	***	85
33	53002	36	3	60	5	3	3972.4	831.6	IV	C	***	84	***	4349.1	977.3	IV	C	***	83	***
34	53003	23	3	100	5	3	7498.4	1180.0	V	A	***	***	***	8158.7	1447.1	V	A	***	***	***
35	53004	53	1	65	5	4	1302.6	211.8	III	C	***	85	***	1302.6	211.8	III	C	***	85	***
36	252010	18	3	73	3	3	2984.1	539.1	III	D	***	80	86	2983.4	538.8	IV	B	***	***	***
37	254001	82	3	50	3	3	1707.9	423.7	III	C	***	86	***	1707.4	423.5	III	C	***	86	***
38	254002	77	2	38	3	3	1689.1	416.3	III	C	***	84	***	1688.6	416.0	III	C	***	84	***
39	254003	293	1	38	3	3	230.2	88.6	I	E	***	***	***	230.2	88.6	II	B	***	***	***
40	254004	69	2	38	3	3	230.2	88.6	I	D	***	***	***	230.2	88.6	I	D	***	***	***
41	254005	144	2	61	3	4	1207.1	139.6	III	B	***	***	***	1307.5	182.7	III	B	***	***	***
42	254006	131	2	51	3	4	1283.0	206.2	III	B	***	***	***	1283.0	206.2	III	B	***	***	***
43	351023	14	3	75	5	3	4367.9	720.5	IV	C	***	84	***	4960.0	973.8	IV	C	***	82	***
44	353005	3	2	67	5	3	3239.7	661.1	IV	C	***	85	***	3795.8	899.2	IV	C	***	83	***
45	353006	54	1	69	5	3	5674.6	717.0	V	A	***	***	***	6234.2	955.7	V	A	***	***	***
46	353007	24	1	65	5	3	1891.0	218.7	III	C	***	***	***	1891.0	218.7	III	C	***	***	***
47	353008	122	1	66	5	5	259.0	35.1	II	B	***	***	***	259.0	35.1	II	B	***	***	***
48	353009	157	1	66	3	3	102.0	29.3	II	A	***	***	***	102.0	29.3	II	A	***	***	***
49	503010	141	2	39	3	4	158.4	53.4	I	C	81	86	***	121.6	38.9	I	B	81	***	***
50	504007	210	1	44	3	5	158.4	53.4	I	C	80	84	***	121.6	38.9	I	B	80	***	***
51	504008	175	1	37	3	5	202.4	41.1	I	C	***	***	***	256.0	82.3	II	B	***	***	***
52	652011	43	3	69	5	4	2534.3	670.7	IV	B	***	***	***	3540.7	1105.1	IV	C	***	84	***

Table 5-12 (3) List of Candidate Project by the Year 1987/1988 (1st stage construction)

SEQ	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL LEV.	LEVEL OF SERVICE A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL LEV.	LEVEL OF SERVICE A-B	B-C	C-D
53	652012	42	3	61	5	4	2181.9	634.6	IV	B	81	***	***	2775.9	897.1	IV	C	81	86	***
54	652013	8	3	66	5	4	3387.2	1110.6	IV	C	***	84	***	4145.9	1443.2	IV	D	***	83	86
55	654009	148	3	48	4	4	2326.4	639.9	III	D	***	82	86	2742.8	825.4	IV	B	80	***	***
56	654010	163	1	56	5	3	1986.3	700.6	IV	C	80	86	***	1916.5	676.8	IV	C	80	86	***
57	1024	63	1	65	5	4	1018.1	126.2	III	B	***	***	***	1018.1	126.2	III	B	***	***	***
58	1025	9	1	35	5	4	361.7	63.6	II	B	***	***	***	361.7	63.6	II	B	***	***	***
59	3011	55	1	35	5	4	230.5	21.5	I	C	***	83	***	230.5	21.5	I	C	***	83	***
60	3012	39	2	48	4	4	286.1	82.7	II	B	***	***	***	399.3	131.4	II	B	***	***	***
61	1026	54	3	33	5	3	286.1	82.7	II	B	***	***	***	399.3	131.4	II	B	***	***	***
62	1027	48	3	33	5	3	2909.2	875.4	IV	C	81	86	***	1993.8	585.8	III	C	***	83	***
63	3013	999	1	33	3	4	943.6	374.0	III	C	82	86	***	454.0	183.0	II	C	82	84	***
64	1028	999	1	28	3	4	943.6	374.0	III	C	82	86	***	454.0	183.0	II	C	82	84	***
65	3014	186	1	42	5	4	871.0	129.8	III	B	***	***	***	871.0	129.8	III	B	***	***	***
66	3015	50	3	54	4	4	395.7	89.9	II	B	***	***	***	432.3	102.9	II	B	***	***	***
67	1029	38	3	30	5	3	450.0	103.0	II	B	***	***	***	493.8	118.4	II	B	***	***	***
68	1030	40	3	30	5	3	521.7	106.3	II	B	***	***	***	563.4	119.5	II	B	***	***	***
69	1031	30	3	61	5	3	711.5	119.3	II	C	***	***	81	735.9	123.6	II	C	***	***	82
70	2014	196	3	54	5	3	1352.7	444.4	III	B	***	***	***	1352.7	444.4	III	B	***	***	***
71	2015	123	3	54	5	3	1837.1	520.4	III	C	***	***	***	1823.1	512.5	III	C	***	***	***
72	2016	63	3	54	5	4	781.1	127.3	II	C	***	***	83	1001.5	218.4	II	D	***	***	***
73	2017	64	3	54	5	4	478.9	136.3	II	B	***	***	***	478.9	136.3	II	B	***	***	***
74	2018	47	3	54	5	2	765.1	267.3	II	C	***	***	84	805.6	281.4	II	D	***	***	***
75	2019	2	3	54	5	1	846.0	278.6	II	D	***	80	85	773.2	242.8	II	C	***	80	***
76	1032	224	3	31	5	3	846.0	278.6	II	D	***	80	85	773.2	242.8	II	C	***	80	***
77	1033	53	3	35	5	3	978.6	312.7	III	B	***	***	***	978.6	312.7	III	B	***	***	***
78	1034	106	3	37	5	3	407.7	138.9	II	B	***	***	***	407.7	138.9	II	B	***	***	***

Table 5-12 (4) List of Candidate Project by the Year 1987/1988 (1st stage construction)

-HIGHWAY SECTION--			----EXISTING ROAD----				------IMPROVEMENT FOR MASTER PLAN A-------							------IMPROVEMENT FOR MASTER PLAN B-------					
SEQ	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
79	3016	62	3	62	5	4	355.6	131.1	II	B	***	***	***	355.6	131.1	II	B	***	***	***
80	3017	95	3	40	5	4	759.7	173.2	II	C	***	***	82	745.6	164.0	II	C	***	***	81
81	3018	47	3	58	5	2	1425.9	273.3	III	B	***	***	***	1517.2	306.9	III	C	***	86	***
82	3019	98	2	54	5	2	827.4	212.0	III	B	***	***	***	814.0	203.8	II	D	***	***	***
83	3020	29	3	40	5	5	5582.9	629.6	IV	C	***	83	***	4693.7	425.9	IV	C	***	86	***
84	3021	65	1	50	5	3	4767.4	999.6	V	A	***	***	***	4326.8	861.2	IV	D	***	***	84
85	1035	38	3	140	5	3	5453.9	1146.5	V	A	***	***	***	8548.5	1915.5	V	B	86	***	***
86	1036	97	3	69	5	3	2818.7	488.6	III	D	***	***	***	2953.1	562.1	IV	B	***	***	***
87	1037	82	3	70	5	3	3849.2	1059.0	IV	C	***	81	***	3965.0	1125.5	IV	C	***	80	***
88	1038	32	3	61	5	3	1004.5	310.0	III	B	***	***	***	1004.5	310.0	III	B	***	***	***
89	1039	94	3	26	5	3	258.9	66.5	I	D	***	***	86	239.6	62.6	I	C	***	***	***
90	1040	999	3	28	5	3	221.0	65.1	II	B	***	***	***	282.0	93.6	II	B	***	***	***
91	3022	999	3	28	5	3	1781.0	678.7	III	C	82	84	***	1222.0	239.1	III	B	***	***	***
92	4011	217	1	36	2	5	228.0	39.5	I	C	80	83	***	95.9	21.7	I	B	82	***	***
93	4012	189	1	36	3	5	791.4	323.7	III	B	81	***	***	757.0	308.8	III	B	81	***	***
94	1041	8	3	27	2	3	791.4	323.7	II	D	***	82	85	757.0	308.8	II	D	***	82	86
95	1042	84	1	30	5	3	890.5	370.9	III	C	81	86	***	653.5	271.2	III	B	81	***	***
96	2020	34	3	73	3	3	2078.2	469.8	III	C	***	***	82	2195.4	516.3	III	C	***	***	84
97	2021	32	3	60	3	3	2638.2	577.7	III	D	***	***	85	2767.6	629.5	III	D	***	***	84
98	2022	74	3	36	3	3	1129.3	276.9	III	B	***	***	***	1181.3	297.3	III	B	***	***	***
99	2023	102	3	73	3	3	2158.3	640.3	III	C	***	***	86	2584.5	822.3	III	D	***	***	***
100	2024	100	3	55	3	3	1275.8	401.0	III	B	***	***	***	1275.8	401.0	III	B	***	***	***
101	2025	999	3	55	3	3	2747.5	988.9	IV	C	82	86	***	4196.3	1614.6	IV	D	81	84	86
102	2026	21	3	73	3	4	2151.9	417.7	III	C	***	84	***	2416.1	530.6	III	C	***	83	***
103	2027	16	3	36	3	3	501.0	98.7	II	B	***	***	***	661.8	167.7	II	C	***	82	***
104	2028	48	3	36	3	3	851.7	192.2	II	C	***	80	***	1190.6	337.8	III	B	81	***	***

Table 5-12 (5) List of Candidate Project by the Year 1987/1988 (1st stage construction)

-HIGHWAY SECTION-- SEQ	LINK-NO	LENGTH (KM)	----EXISTING ROAD---- TER.	WIDTH (M)	TYPE	COND.	------IMPROVEMENT FOR MASTER PLAN A------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	------IMPROVEMENT FOR MASTER PLAN B------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
105	2029	68	3	42	3	3	1077.3	265.7	III	B	***	***	***	1113.4	273.4	III	B	***	***	***
106	2030	40	3	33	3	4	1105.9	243.0	III	B	***	***	***	1105.9	243.0	III	B	***	***	***
107	2031	45	3	33	3	4	217.3	51.2	I	C	***	81	***	217.3	51.2	I	C	***	81	***
108	2032	81	3	33	3	5	562.5	163.3	II	C	***	85	***	561.0	162.6	II	C	***	85	***
109	2033	24	3	33	3	5	1138.8	316.6	III	B	***	***	***	1135.5	315.2	III	B	***	***	***
110	2034	34	3	64	3	5	1083.3	220.5	III	B	***	***	***	1094.7	225.4	III	B	***	***	***
111	2035	16	3	58	3	5	1415.7	368.1	III	B	***	***	***	1436.2	377.0	III	B	***	***	***
112	2036	52	3	64	3	5	1059.7	244.2	III	B	***	***	***	1072.8	249.9	III	B	***	***	***
113	2037	30	3	36	3	4	193.1	48.0	I	B	***	***	***	193.1	48.0	I	B	***	***	***
114	2038	55	3	55	3	3	1270.7	309.1	III	B	***	***	***	1270.7	309.1	III	B	***	***	***
115	2039	45	3	38	3	4	608.0	169.0	II	C	***	***	***	608.0	169.0	II	C	***	***	***
116	2040	26	3	33	3	5	608.0	169.0	II	C	***	***	***	608.0	169.0	II	C	***	***	***
117	2041	77	3	36	3	5	601.0	139.4	II	C	***	***	***	601.0	139.4	II	C	***	***	***
118	2042	31	3	40	3	5	731.0	239.6	II	C	***	***	***	731.0	239.6	II	C	***	***	***
119	112043	26	3	54	3	4	2375.7	334.8	III	C	***	84	***	2597.5	428.3	III	C	***	83	***
120	112044	40	3	50	3	3	1907.1	352.9	III	C	***	84	***	2185.7	470.8	III	C	***	82	***
121	112045	135	3	40	3	3	16.0	3.8	I	A	***	***	***	16.0	3.8	I	A	***	***	***
122	112046	76	3	46	3	2	873.1	186.5	II	C	***	82	***	919.4	194.3	II	C	***	82	***
123	1043	129	3	50	5	4	2871.6	1089.5	IV	C	***	84	***	2452.3	879.8	IV	B	***	***	***
124	1044	63	3	30	5	3	588.2	217.7	II	C	***	84	***	325.7	103.6	II	B	***	***	***
125	1045	92	3	30	5	3	592.5	240.9	II	C	***	82	***	396.8	145.3	II	B	***	***	***
126	1046	138	3	30	5	4	536.2	217.0	II	C	82	86	***	135.5	54.3	I	B	83	***	***
127	1047	46	1	37	5	3	644.3	150.1	III	B	***	***	***	849.7	223.8	III	B	***	***	***
128	1048	58	3	30	5	3	545.5	87.8	II	B	***	***	***	575.0	100.3	II	C	***	84	***
129	1049	62	3	43	5	3	1723.8	274.0	III	B	***	***	***	1786.0	309.0	III	C	***	86	***
130	1050	68	3	75	5	2	2775.0	383.0	III	C	***	***	***	2775.0	383.0	III	C	***	***	***

Table 5-12 (6) List of Candidate Project by the Year 1987/1988 (1st stage construction)

-HIGHWAY SECTION--			----EXISTING ROAD----				------IMPROVEMENT FOR MASTER PLAN A-------							------IMPROVEMENT FOR MASTER PLAN B-------					
SEQ	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
131	1051	999	3	35	5	4	1495.4	524.9	III	C	81	85	***	1522.3	536.2	III	C	81	85	***
132	1052	26	3	42	5	3	1734.5	551.1	III	C	***	83	***	1761.9	562.5	III	C	***	83	***
133	1053	34	3	63	5	3	5618.6	1739.9	V	A	***	***	***	6179.9	1934.0	V	A	***	***	***
134	1054	113	3	58	5	3	4015.5	1414.7	IV	D	***	83	86	3889.4	1364.4	IV	C	***	83	***
135	1055	117	3	39	5	4	1809.4	549.7	III	C	***	82	***	1778.7	534.0	III	C	***	83	***
136	1056	171	3	60	5	4	1039.6	154.9	II	C	***	***	***	1041.4	159.1	II	C	***	***	***
137	1057	70	3	73	5	3	3214.0	786.6	IV	C	***	85	***	3766.3	988.6	IV	C	***	83	***
138	1058	63	3	36	5	3	1833.0	381.0	III	C	***	84	***	1948.0	426.1	III	C	***	84	***
139	1059	47	3	73	5	3	2730.3	632.0	IV	B	***	***	***	2812.9	677.0	IV	C	***	86	***
140	1060	89	3	61	5	3	1191.5	329.8	III	B	***	***	***	1131.3	319.7	III	B	***	***	***
141	1061	53	3	59	5	3	1633.2	330.9	III	C	***	***	***	1688.2	373.0	III	C	***	***	***
142	1062	48	3	57	5	3	3498.4	514.5	IV	C	***	86	***	3577.0	531.4	IV	C	***	86	***
143	1063	42	3	47	5	3	784.4	148.4	III	B	***	***	***	1247.9	336.4	III	B	***	***	***
144	1064	138	3	61	5	4	617.0	108.9	II	C	***	***	***	617.0	108.9	II	C	***	***	***
145	1065	91	3	30	5	3	1738.0	102.9	III	B	***	***	***	1723.4	98.3	III	B	***	***	***
146	1066	78	3	60	5	4	869.8	168.9	II	D	***	***	86	842.5	158.9	II	C	***	***	***
147	1067	40	3	36	5	3	1909.6	380.0	III	C	***	82	***	2948.2	828.8	IV	C	80	85	***
148	1068	46	3	55	5	3	727.8	118.6	II	C	***	***	***	1109.0	276.8	III	B	***	***	***
149	1069	40	3	63	5	3	1802.5	298.9	III	C	***	***	***	1836.3	310.1	III	C	***	***	***
150	1070	37	3	60	5	3	2611.8	713.7	III	D	***	***	82	2854.2	777.8	IV	C	***	86	***
151	1071	52	3	58	5	3	3363.7	874.7	IV	C	***	80	***	3379.4	881.4	IV	C	***	80	***
152	1072	107	3	35	5	4	481.0	90.9	II	B	***	***	***	481.0	90.9	II	B	***	***	***
153	1073	130	3	37	5	4	330.0	65.9	I	D	***	***	***	330.0	65.9	I	D	***	***	***
154	1074	25	3	61	5	3	111.0	12.8	II	A	***	***	***	111.0	12.8	II	A	***	***	***
155	1075	50	3	36	5	4	390.0	82.0	II	B	***	***	***	390.0	82.0	II	B	***	***	***
156	1076	31	3	60	5	3	2827.4	1141.6	IV	C	80	85	***	2228.7	890.2	IV	B	80	***	***

Table 5-12 (7) List of Candidate Project by the Year 1987/1988 (1st stage construction)

-HIGHWAY SECTION-- SEQ	LINK-NO	LENGTH (KM)	----EXISTING ROAD---- TER.	WIDTH (M)	TYPE	COND.	------IMPROVEMENT FOR MASTER PLAN A------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	------IMPROVEMENT FOR MASTER PLAN B------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
157	1077	57	3	60	5	3	2827.4	1141.6	IV	C	***	85	***	2228.7	890.2	IV	B	***	***	***
158	111078	40	3	45	5	3	1443.0	333.5	III	C	***	***	***	1443.0	333.5	III	C	***	***	***
159	111079	57	3	51	5	3	1001.1	283.6	III	B	***	***	***	1001.1	283.6	III	B	***	***	***
160	111080	35	3	61	5	3	1322.8	355.6	III	B	***	***	***	1322.8	355.6	III	B	***	***	***
161	111081	40	3	43	5	3	1003.2	274.5	III	B	***	***	***	1003.2	274.5	III	B	***	***	***
162	111082	54	3	60	5	4	556.5	148.9	II	C	***	***	***	556.5	148.9	II	C	***	***	***
163	111083	24	3	35	5	3	463.2	144.8	II	B	***	***	***	463.2	144.8	II	B	***	***	***
164	111084	138	3	55	5	3	597.5	154.5	II	C	***	***	***	597.5	154.5	II	C	***	***	***
165	111085	48	3	56	5	3	930.2	242.4	III	B	***	***	***	930.2	242.4	III	B	***	***	***
166	111086	48	3	58	5	3	719.0	156.4	II	C	***	***	***	719.0	156.4	II	C	***	***	***
167	111087	40	3	52	5	4	1121.3	302.9	III	B	***	***	***	1121.3	302.9	III	B	***	***	***
168	111088	51	3	38	5	3	335.7	57.1	II	B	***	***	***	343.8	59.4	II	B	***	***	***
169	111089	82	3	61	5	4	2908.3	1041.6	IV	C	82	86	***	3381.7	1215.2	IV	C	81	85	***
170	111090	33	3	61	5	3	2908.3	1041.6	IV	C	80	85	***	3823.3	1324.4	IV	C	80	84	***
171	111091	99	3	61	5	4	2920.9	941.9	IV	C	81	86	***	3535.0	1117.9	IV	C	81	84	***
172	111092	60	3	30	5	3	2161.6	778.7	III	D	80	83	86	1437.1	476.3	III	C	80	85	***
173	111093	104	3	50	5	3	2120.4	755.3	III	D	***	82	86	1376.7	450.5	III	C	***	85	***
174	111094	125	3	50	5	3	1738.7	661.7	III	C	***	83	***	1210.1	440.4	III	B	***	***	***
175	111095	99	3	33	5	4	1336.7	437.4	III	B	***	***	***	1336.7	444.4	III	B	***	***	***
176	111096	47	3	35	5	4	131.1	42.0	II	A	***	***	***	413.3	128.5	II	B	82	***	***
177	111097	82	3	30	5	4	835.8	272.2	III	B	84	***	***	1062.9	337.7	III	B	83	***	***
178	111098	81	2	33	5	4	835.8	272.2	III	B	84	***	***	1051.5	333.1	III	B	83	***	***
179	111099	87	3	47	5	4	691.3	201.2	II	C	***	***	***	691.3	201.2	II	C	***	***	***
180	111100	68	3	31	5	4	418.0	82.2	II	B	***	***	***	418.0	82.2	II	B	***	***	***
181	111101	46	3	32	5	4	1170.7	425.5	III	B	83	***	***	1268.1	473.3	III	B	83	***	***
182	111102	64	3	37	5	3	146.0	25.7	I	B	***	***	***	146.0	25.7	I	B	***	***	***

Table 5-12 (8) List of Candidate Project by the Year 1987/1988 (1st stage construction)

-HIGHWAY SECTION-- SEQ	LINK-NO	LENGTH (KM)	----EXISTING ROAD---- TER.	WIDTH (M)	TYPE	COND.	------IMPROVEMENT FOR MASTER PLAN A------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	------IMPROVEMENT FOR MASTER PLAN B------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
183	111103	57	3	58	5	3	1114.7	220.4	III	B	***	***	***	1127.2	225.1	III	B	***	***	***
184	111104	29	3	30	5	5	793.1	246.3	II	D	***	***	***	793.1	246.3	II	D	***	***	***
185	111105	29	3	30	5	4	314.1	97.7	II	B	***	***	***	314.1	97.7	II	B	***	***	***
186	111106	31	3	30	5	4	186.8	67.5	I	C	***	***	***	186.8	67.5	I	C	***	***	***
187	111107	50	3	55	5	1	788.0	216.2	II	C	***	***	***	788.0	216.2	II	C	***	***	***
188	3023	23	3	62	5	2	4772.6	719.1	IV	C	***	81	***	5082.6	852.4	IV	C	***	81	***
189	3024	66	2	59	5	2	2360.0	396.7	III	C	***	***	***	2478.7	447.7	III	D	***	***	85
190	3025	132	1	36	4	2	544.7	127.2	II	C	***	***	***	549.3	129.1	II	C	***	***	***
191	3026	29	3	73	4	3	3102.0	488.3	III	D	***	***	***	3102.0	488.3	III	D	***	***	***
192	3027	28	3	73	4	3	654.0	110.1	II	C	***	***	***	654.0	110.1	II	C	***	***	***
193	3028	46	3	71	4	3	1757.4	241.0	III	B	***	***	***	1757.4	241.0	III	B	***	***	***
194	3029	999	1	71	4	3	572.0	53.4	II	C	***	***	***	572.0	53.4	II	C	***	***	***
195	3030	35	3	48	5	2	2193.3	287.3	III	C	***	83	***	2287.7	327.9	III	C	***	83	***
196	3031	82	1	36	5	3	0.2	0.1	I	A	***	***	***	0.2	0.1	I	A	***	***	***
197	3032	33	3	61	4	3	1173.0	159.3	II	D	***	***	***	1173.0	159.3	II	D	***	***	***
198	4013	344	2	39	4	3	136.7	27.1	I	B	***	***	***	223.8	64.8	I	C	***	83	***
199	4014	366	3	39	2	3	0.4	0.0	I	A	***	***	***	0.4	0.0	I	A	***	***	***
200	4015	328	3	36	1	4	226.0	87.3	I	C	***	***	***	226.0	87.3	I	C	***	***	***
201	4016	118	3	36	2	4	230.0	22.4	I	C	***	***	***	230.0	22.4	I	C	***	***	***
202	4017	230	3	36	2	4	6.5	1.9	I	A	***	***	***	6.5	1.9	I	A	***	***	***
203	4018	530	2	36	2	4	6.5	1.9	I	A	***	***	***	6.5	1.9	I	A	***	***	***
204	4019	999	3	36	3	4	18.8	7.5	I	A	***	***	***	18.8	7.5	I	A	***	***	***
205	4020	169	3	36	3	4	18.8	7.5	I	A	***	***	***	18.8	7.5	I	A	***	***	***
206	4021	115	3	36	3	4	15.4	5.7	I	A	***	***	***	15.4	5.7	I	A	***	***	***
207	4022	72	1	36	3	4	182.4	32.4	I	C	***	***	***	182.4	32.4	I	C	***	***	***
208	4023	272	2	36	3	4	102.4	42.2	I	B	83	***	***	7.2	2.9	I	A	***	***	***

Table 5-13 (1) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

-HIGHWAY SECTION-- SEQ	LINK-NO	LENGTH (KM)	----EXISTING ROAD---- TER.	WIDTH (M)	TYPE	COND.	------IMPROVEMENT FOR MASTER PLAN A------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	------IMPROVEMENT FOR MASTER PLAN B------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
1	52001	160	3	75	5	1	29370.6	10484.1	VI	C	***	94	***	24766.1	8573.2	V	C	***	90	***
2	52002	15	3	70	5	4	27178.0	9167.7	VI	C	***	96	***	22349.1	7216.7	V	C	***	92	***
3	52003	55	3	69	5	3	28296.1	8325.9	VI	C	***	97	***	23133.3	6277.4	V	C	***	93	***
4	52004	38	3	75	5	3	21810.5	8002.5	V	C	***	92	***	15934.7	5591.2	V	B	***	***	***
5	52005	68	3	75	5	4	21446.2	8070.7	V	C	***	92	***	14639.8	5279.7	V	B	***	***	***
6	52006	132	3	75	5	4	16672.9	5777.8	V	C	***	98	***	18209.3	6612.2	V	C	***	96	***
7	52007	22	3	75	5	4	20113.5	6833.8	V	C	***	94	***	22459.3	7941.0	V	C	***	93	***
8	52008	109	3	75	5	4	14376.7	5678.2	V	B	87	***	***	9434.6	3611.1	V	B	91	***	***
9	52009	13	3	75	5	3	13084.3	5086.2	V	B	88	***	***	8807.7	3310.9	V	B	93	***	***
10	51001	48	3	62	5	3	12200.2	4827.1	V	B	89	***	***	8186.5	3143.9	V	B	94	***	***
11	51002	100	3	61	5	3	14277.9	5584.5	V	B	88	***	***	9760.3	3682.5	V	B	92	***	***
12	51003	12	3	61	5	4	10921.9	4200.3	V	B	92	***	***	8403.3	3140.8	V	B	95	***	***
13	51004	70	3	58	5	3	11712.6	4072.0	V	B	91	***	***	9212.9	3058.7	V	B	94	***	***
14	51005	18	3	64	5	3	11220.9	3992.2	V	B	91	***	***	9276.1	3177.7	V	B	93	***	***
15	51006	75	3	64	5	4	16525.2	5821.8	V	C	90	97	***	12074.3	3994.4	V	B	92	***	***
16	51007	44	3	62	5	4	18707.5	6187.9	V	C	***	95	***	15203.9	4766.4	V	B	***	***	***
17	51008	13	3	63	5	4	8935.0	2243.4	V	B	94	***	***	8387.4	2006.3	V	B	96	***	***
18	51009	79	3	62	5	4	9306.9	2693.1	V	B	93	***	***	8298.1	2244.1	V	B	95	***	***
19	51010	40	3	62	5	4	11293.3	3365.7	V	B	90	***	***	9658.1	2667.7	V	B	92	***	***
20	51011	37	3	69	5	4	12616.6	3710.7	V	B	88	***	***	11523.4	3243.0	V	B	89	***	***
21	51012	130	3	75	5	4	10085.0	2953.9	V	B	91	***	***	9088.3	2540.9	V	B	93	***	***
22	51013	67	3	96	5	5	18780.4	2939.9	V	B	***	***	***	19805.6	3291.2	V	B	***	***	***
23	51014	32	3	80	5	3	16689.3	3550.9	V	B	87	***	***	19780.2	4791.5	V	C	***	97	***
24	51015	15	3	84	5	3	14932.3	3640.0	V	B	87	***	***	18823.3	5205.5	V	C	***	96	***
25	51016	52	3	85	5	3	14018.6	3372.1	V	B	88	***	***	15725.7	4091.2	V	B	87	***	***
26	51017	38	2	81	5	3	15984.4	3563.2	V	B	***	***	***	16836.8	3912.4	V	B	***	***	***

Table 5-13 (2) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

-HIGHWAY SECTION--			----EXISTING ROAD----				-------IMPROVEMENT FOR MASTER PLAN A--------							-------IMPROVEMENT FOR MASTER PLAN B--------					
SEG	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL LEV.	OF SERVICE A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL LEV.	OF SERVICE A-B	B-C	C-D
27	51018	32	2	74	5	3	13079.2	2997.8	V	B	88	***	***	13772.2	3286.1	V	B	87	***	***
28	51019	29	3	73	5	3	13717.3	3450.0	V	B	88	***	***	14232.0	3683.4	V	B	87	***	***
29	51020	16	3	133	5	3	23072.4	5176.1	V	C	***	95	***	26196.1	6500.6	V	C	***	92	***
30	51021	30	3	113	5	3	15963.6	3732.3	V	B	87	***	***	18174.0	4666.0	V	C	***	98	***
31	51022	45	2	74	5	3	12866.9	3113.1	V	B	88	***	***	14265.0	3696.0	V	B	87	***	***
32	53001	14	3	60	5	3	9771.0	1917.5	V	B	96	***	***	10327.5	2141.0	V	B	94	***	***
33	53002	36	3	60	5	3	7998.0	1751.6	V	A	***	***	***	8539.9	1973.5	V	B	98	***	***
34	53003	23	3	100	5	3	13902.7	2325.2	V	B	90	***	***	15146.7	2848.6	V	B	88	***	***
35	53004	53	1	65	5	4	2429.5	430.8	IV	C	***	98	***	2429.5	430.8	IV	C	***	98	***
36	252010	18	3	73	3	3	5946.8	1209.4	IV	D	***	89	97	5819.4	1162.8	V	A	***	***	***
37	254001	82	3	50	3	3	3524.3	952.5	IV	C	***	96	***	3430.2	915.4	IV	C	***	97	***
38	254002	77	2	38	3	3	3478.8	934.2	IV	C	***	94	***	3384.7	897.0	IV	C	***	95	***
39	254003	293	1	38	3	3	230.2	88.6	II	B	***	***	***	230.2	88.6	II	B	***	***	***
40	254004	69	2	38	3	3	230.2	88.6	II	B	***	***	***	230.2	88.6	II	B	***	***	***
41	254005	144	2	61	3	4	2322.9	346.0	IV	B	90	***	***	2456.4	413.0	III	C	***	90	***
42	254006	131	2	51	3	4	1283.0	206.2	III	B	***	***	***	1283.0	206.2	III	B	***	***	***
43	351023	14	3	75	5	3	8711.0	1591.9	V	A	***	***	***	10002.3	2141.3	V	B	96	***	***
44	353005	3	2	67	5	3	6576.2	1467.2	V	A	***	***	***	7787.1	1983.4	V	B	97	***	***
45	353006	54	1	69	5	3	11107.2	1569.2	V	B	91	***	***	12332.1	2087.5	V	B	88	***	***
46	353007	24	1	65	5	3	1891.0	218.7	III	C	***	***	***	1891.0	218.7	III	C	***	***	***
47	353008	122	1	66	5	5	259.0	35.1	II	B	***	***	***	259.0	35.1	II	B	***	***	***
48	353009	157	1	66	3	3	102.0	29.3	II	A	***	***	***	102.0	29.3	II	A	***	***	***
49	503010	141	2	39	3	4	158.4	53.4	II	A	***	***	***	121.6	38.9	II	A	***	***	***
50	504007	210	1	44	3	5	158.4	53.4	II	B	***	***	***	121.6	38.9	II	A	***	***	***
51	504008	175	1	37	3	5	202.4	41.1	II	B	***	***	***	256.0	82.3	II	B	***	***	***
52	652011	43	3	69	5	4	5012.1	1425.1	V	A	***	***	***	6967.0	2273.3	V	A	***	***	***

Table 5-13 (3) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

SEQ	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEV.	A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEV.	A-B	B-C	C-D
	HIGHWAY SECTION		EXISTING ROAD				IMPROVEMENT FOR MASTER PLAN A			LEVEL OF SERVICE				IMPROVEMENT FOR MASTER PLAN B			LEVEL OF SERVICE			
53	652012	42	3	61	5	4	4477.2	1373.7	V	A	***	***	***	5682.2	1918.3	V	A	***	***	***
54	652013	8	3	66	5	4	6611.0	2227.8	V	A	***	***	***	7844.8	2789.0	V	B	96	***	***
55	654009	148	3	48	4	4	4469.7	1281.5	IV	C	***	90	***	5122.7	1594.0	V	A	***	***	***
56	654010	163	1	56	5	3	3960.2	1422.4	V	A	***	***	***	3703.8	1331.9	V	A	***	***	***
57	1024	63	1	65	5	4	1754.2	201.6	III	C	***	91	***	1754.2	201.6	III	C	***	91	***
58	1025	9	1	35	5	4	618.8	102.4	II	C	***	90	***	618.8	102.4	II	C	***	90	***
59	3011	55	1	35	5	4	402.8	34.7	II	B	88	***	***	402.8	34.7	II	B	88	***	***
60	3012	39	2	48	4	4	365.9	115.8	II	B	***	***	***	714.7	261.7	II	D	***	88	97
61	1026	54	3	33	5	3	365.9	115.8	II	B	***	***	***	714.7	261.7	II	C	***	89	***
62	1027	48	3	33	5	3	1888.6	549.5	IV	B	***	87	***	2654.2	836.7	IV	B	***	***	***
63	3013	999	1	33	3	4	431.0	178.6	III	B	***	88	***	485.0	198.2	II	D	***	***	98
64	1028	999	1	28	3	4	431.0	178.6	III	B	***	88	***	485.0	198.2	II	D	***	***	98
65	3014	186	1	42	5	4	871.0	129.8	III	B	***	***	***	871.0	129.8	III	B	***	***	***
66	3015	50	3	54	4	4	859.2	230.5	II	D	***	90	97	932.1	262.0	II	D	***	89	95
67	1029	38	3	30	5	3	985.6	267.3	III	B	90	***	***	1072.5	304.9	III	B	89	***	***
68	1030	40	3	30	5	3	983.0	221.9	III	B	90	***	***	1072.0	260.1	III	B	89	***	***
69	1031	30	3	61	5	3	1341.6	252.2	III	B	***	***	***	1322.5	250.1	III	B	***	***	***
70	2014	196	3	54	5	3	1352.7	444.4	III	B	***	***	***	1352.7	444.4	III	B	***	***	***
71	2015	123	3	54	5	3	3686.9	1098.5	IV	C	***	93	***	3588.5	1048.1	IV	C	***	93	***
72	2016	63	3	54	5	4	1408.7	239.5	III	B	***	***	***	1882.5	426.5	III	C	***	94	***
73	2017	64	3	54	5	4	478.9	136.3	II	B	***	***	***	478.9	136.3	II	B	***	***	***
74	2018	47	3	54	5	2	1245.8	447.6	III	B	***	***	***	1107.9	389.2	III	B	***	***	***
75	2019	2	3	54	5	1	1230.6	413.5	III	B	***	***	***	918.6	285.7	III	B	***	***	***
76	1032	224	3	31	5	3	1230.6	413.5	III	B	***	***	***	918.6	285.7	III	B	***	***	***
77	1033	53	3	35	5	3	978.6	312.7	III	B	***	***	***	978.6	312.7	III	B	***	***	***
78	1034	106	3	37	5	3	407.7	138.9	II	B	***	***	***	407.7	138.9	II	B	***	***	***

Table 5-13 (4) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

-HIGHWAY SECTION--			----EXISTING ROAD----				------IMPROVEMENT FOR MASTER PLAN A-------							------IMPROVEMENT FOR MASTER PLAN B-------						
SEG	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
79	3016	62	3	62	5	4	355.6	131.1	II	B	***	***	***	355.6	131.1	II	B	***	***	***
80	3017	95	3	40	5	4	2673.7	848.6	IV	C	89	98	***	1568.3	395.3	III	C	***	96	***
81	3018	47	3	58	5	2	3705.5	992.6	IV	C	***	94	***	2871.9	667.0	IV	B	***	***	***
82	3019	98	2	54	5	2	2651.4	872.5	IV	C	88	97	***	1599.2	432.9	III	C	***	94	***
83	3020	29	3	40	5	5	9160.3	1109.8	V	A	***	***	***	7913.4	692.9	IV	D	***	***	96
84	3021	65	1	50	5	3	8480.0	1828.8	V	B	91	***	***	7769.7	1543.9	V	B	94	***	***
85	1035	38	3	140	5	3	10398.9	2385.8	V	B	93	***	***	17592.3	4381.5	V	B	***	***	***
86	1036	97	3	69	5	3	4237.4	655.1	IV	C	***	89	***	5137.7	930.5	IV	D	***	87	96
87	1037	82	3	70	5	3	6320.7	1719.6	V	A	***	***	***	5141.0	1450.0	V	A	***	***	***
88	1038	32	3	61	5	3	1004.5	310.0	III	B	***	***	***	1004.5	310.0	III	B	***	***	***
89	1039	94	3	26	5	3	258.9	66.5	I	D	***	***	***	239.6	62.6	I	C	***	***	***
90	1040	999	3	28	5	3	1781.0	678.7	III	C	89	94	***	877.1	304.6	III	B	92	***	***
91	3022	999	3	28	5	3	1781.0	678.7	III	C	***	***	***	1222.0	239.1	III	B	***	***	***
92	4011	217	1	36	2	5	551.4	124.2	II	C	***	93	***	615.2	175.0	II	D	88	93	97
93	4012	189	1	36	3	5	2139.5	888.2	IV	C	***	95	***	1762.6	728.2	IV	C	87	98	***
94	1041	8	3	27	2	3	2139.5	888.2	III	D	***	90	96	1762.6	728.2	III	C	***	92	***
95	1042	84	1	30	5	3	2219.5	932.3	IV	C	***	94	***	1790.7	750.3	IV	C	88	97	***
96	2020	34	3	73	3	3	4131.3	1088.2	IV	C	***	92	***	4369.3	1184.7	IV	C	***	91	***
97	2021	32	3	60	3	3	4922.4	1234.0	IV	D	***	89	97	5193.5	1344.6	IV	D	***	88	96
98	2022	74	3	36	3	3	2132.1	568.0	III	C	***	91	***	2250.5	612.9	III	C	***	90	***
99	2023	102	3	73	3	3	4121.9	1322.6	IV	C	***	90	***	4770.3	1597.1	IV	D	***	87	95
100	2024	100	3	55	3	3	1275.8	401.0	III	B	***	***	***	1275.8	401.0	III	B	***	***	***
101	2025	999	3	55	3	3	6277.0	2375.7	V	A	***	***	***	11633.7	4720.8	V	B	90	***	***
102	2026	21	3	73	3	4	4058.6	852.1	IV	C	***	95	***	4608.6	1091.8	IV	C	***	91	***
103	2027	16	3	36	3	3	983.6	193.2	II	D	***	90	98	1343.8	347.3	III	B	87	***	***
104	2028	48	3	36	3	3	1680.2	377.6	III	C	***	98	***	2438.3	703.0	III	D	***	89	97

Table 5-13 (5) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

-HIGHWAY SECTION-			----EXISTING ROAD----				------IMPROVEMENT FOR MASTER PLAN A-------							------IMPROVEMENT FOR MASTER PLAN B-------					
SEQ	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
105	2029	68	3	42	3	3	2002.4	495.8	III	C	***	92	***	2125.7	518.6	III	C	***	91	***
106	2030	40	3	33	3	4	1732.9	341.8	III	C	***	97	***	1732.9	341.8	III	C	***	97	***
107	2031	45	3	33	3	4	345.6	74.5	II	B	88	***	***	345.6	74.5	II	B	88	***	***
108	2032	81	3	33	3	5	1172.6	366.2	III	B	87	***	***	1166.4	363.5	III	B	87	***	***
109	2033	24	3	33	3	5	2419.4	725.7	III	D	***	90	97	2406.4	720.2	III	D	***	90	97
110	2034	34	3	64	3	5	1743.5	369.0	III	C	***	96	***	1789.4	388.7	III	C	***	95	***
111	2035	16	3	58	3	5	2311.7	620.5	III	D	***	88	98	2394.4	656.1	III	D	***	87	97
112	2036	52	3	64	3	5	1717.6	410.4	III	C	***	95	***	1770.8	433.3	III	C	***	95	***
113	2037	30	3	36	3	4	193.1	48.0	I	B	***	***	***	193.1	48.0	I	B	***	***	***
114	2038	55	3	55	3	3	1270.7	309.1	III	B	***	***	***	1270.7	309.1	III	B	***	***	***
115	2039	45	3	38	3	4	608.0	169.0	II	C	***	***	***	608.0	169.0	II	C	***	***	***
116	2040	26	3	33	3	5	608.0	169.0	II	C	***	***	***	608.0	169.0	II	C	***	***	***
117	2041	77	3	36	3	5	601.0	139.4	II	C	***	***	***	601.0	139.4	II	C	***	***	***
118	2042	31	3	40	3	5	731.0	239.6	II	C	***	***	***	731.0	239.6	II	C	***	***	***
119	112043	26	3	54	3	4	4002.0	582.2	IV	C	***	98	***	4532.7	804.0	IV	C	***	93	***
120	112044	40	3	50	3	3	3459.1	704.7	IV	C	***	98	***	4114.6	980.3	IV	C	***	93	***
121	112045	135	3	40	3	3	16.0	3.8	I	A	***	***	***	16.0	3.8	I	A	***	***	***
122	112046	76	3	46	3	2	1188.2	295.4	III	B	***	***	***	1039.6	248.6	II	D	***	***	90
123	1043	129	3	50	5	4	4379.8	1774.2	IV	D	***	***	95	1681.7	645.1	IV	B	***	***	***
124	1044	63	3	30	5	3	588.2	217.7	II	C	***	***	***	325.7	103.6	II	B	***	***	***
125	1045	92	3	30	5	3	592.5	240.9	II	C	***	***	***	396.8	145.3	II	B	***	***	***
126	1046	138	3	30	5	4	536.2	217.0	II	C	***	***	***	135.5	54.3	I	B	***	***	***
127	1047	46	1	37	5	3	2666.9	863.8	IV	C	88	93	***	2056.4	622.1	IV	C	***	96	***
128	1048	58	3	30	5	3	1596.6	384.4	III	C	88	96	***	1224.5	250.3	III	B	88	***	***
129	1049	62	3	43	5	3	3240.4	585.9	IV	B	***	***	***	2931.5	513.0	III	D	***	***	96
130	1050	68	3	75	5	2	2775.0	383.0	III	C	***	***	***	2775.0	383.0	III	C	***	***	***

Table 5-13 (6) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

-HIGHWAY SECTION-- SEQ	LINK-NO	LENGTH (KM)	----EXISTING ROAD---- TER.	WIDTH (M)	TYPE	COND.	------IMPROVEMENT FOR MASTER PLAN A------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	------IMPROVEMENT FOR MASTER PLAN B------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
131	1051	999	3	35	5	4	3269.6	1195.9	IV	C	***	94	***	3141.4	1143.4	IV	C	***	94	***
132	1052	26	3	42	5	3	3697.9	1243.1	IV	C	***	92	***	3565.4	1190.4	IV	C	***	92	***
133	1053	34	3	63	5	3	8976.8	2760.4	V	B	92	***	***	9492.0	2915.6	V	B	90	***	***
134	1054	113	3	58	5	3	9151.3	3358.2	V	B	93	***	***	7561.9	2735.4	V	B	96	***	***
135	1055	117	3	39	5	4	3680.5	1174.2	IV	C	***	92	***	3549.1	1116.1	IV	C	***	92	***
136	1056	171	3	60	5	4	1916.1	290.3	III	C	***	98	***	1886.8	293.0	III	C	***	98	***
137	1057	70	3	73	5	3	9789.8	2897.8	V	B	95	***	***	10575.1	3230.3	V	B	93	***	***
138	1058	63	3	36	5	3	3561.4	815.9	IV	C	***	94	***	3875.2	935.8	IV	C	***	92	***
139	1059	47	3	73	5	3	4618.6	1145.4	IV	D	***	87	96	4963.6	1304.4	IV	D	***	***	94
140	1060	89	3	61	5	3	1686.0	492.4	III	C	***	90	***	1867.6	572.3	III	C	***	89	***
141	1061	53	3	59	5	3	3045.5	652.3	IV	C	***	97	***	3488.0	781.1	IV	C	***	94	***
142	1062	48	3	57	5	3	6017.4	928.8	IV	D	***	***	95	6213.4	957.8	IV	D	***	***	94
143	1063	42	3	47	5	3	1349.6	266.7	III	B	***	***	***	2460.9	709.1	III	D	***	88	95
144	1064	138	3	61	5	4	617.0	108.9	II	C	***	***	***	617.0	108.9	II	C	***	***	***
145	1065	91	3	30	5	3	3028.0	192.7	III	C	***	92	***	2964.0	174.4	III	C	***	92	***
146	1066	78	3	60	5	4	1589.4	328.1	III	C	***	96	***	1478.7	289.2	III	C	***	98	***
147	1067	40	3	36	5	3	3524.3	721.7	IV	C	***	93	***	5788.0	1704.4	V	A	***	***	***
148	1068	46	3	55	5	3	1367.1	229.5	III	B	***	***	***	2147.0	566.7	III	D	***	89	98
149	1069	40	3	63	5	3	3066.7	499.5	IV	C	***	98	***	3510.3	654.6	IV	C	***	94	***
150	1070	37	3	60	5	3	4204.3	1152.4	IV	C	***	88	***	6232.8	1795.6	V	A	***	***	***
151	1071	52	3	58	5	3	5593.4	1477.3	V	A	***	***	***	5899.9	1576.7	V	A	***	***	***
152	1072	107	3	35	5	4	481.0	90.9	II	B	***	***	***	481.0	90.9	II	B	***	***	***
153	1073	130	3	37	5	4	330.0	65.9	II	B	***	***	***	330.0	65.9	II	B	***	***	***
154	1074	25	3	61	5	3	111.0	12.8	II	A	***	***	***	111.0	12.8	II	A	***	***	***
155	1075	50	3	36	5	4	390.0	82.0	II	B	***	***	***	390.0	82.0	II	B	***	***	***
156	1076	31	3	60	5	3	4370.4	1799.7	IV	D	***	***	94	4066.5	1644.7	IV	D	***	88	97

Table 5-13 (7) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

SEQ	LINK-NO	LENGTH (KM)	TER.	WIDTH (M)	TYPE	COND.	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEV.	A-B	B-C	C-D	A.D.T.	AXLE LOAD	IMPROVE TYPE	LEV.	A-B	B-C	C-D
	-HIGHWAY SECTION--		----EXISTING ROAD----				-------IMPROVEMENT FOR MASTER PLAN A--------							-------IMPROVEMENT FOR MASTER PLAN B--------						
											LEVEL OF SERVICE							LEVEL OF SERVICE		
157	1077	57	3	60	5	3	4370.4	1799.7	IV	D	***	***	94	4066.5	1644.7	IV	D	***	88	97
158	111078	40	3	45	5	3	1443.0	333.5	III	C	***	***	***	1443.0	333.5	III	C	***	***	***
159	111079	57	3	51	5	3	1001.1	283.6	III	B	***	***	***	1001.1	283.6	III	B	***	***	***
160	111080	35	3	61	5	3	1322.8	355.6	III	B	***	***	***	1322.8	355.6	III	B	***	***	***
161	111081	40	3	43	5	3	1003.2	274.5	III	B	***	***	***	1003.2	274.5	III	B	***	***	***
162	111082	54	3	60	5	4	556.5	148.9	II	C	***	***	***	556.5	148.9	II	C	***	***	***
163	111083	24	3	35	5	3	463.2	144.8	II	B	***	***	***	463.2	144.8	II	B	***	***	***
164	111084	138	3	55	5	3	597.5	154.5	II	C	***	***	***	597.5	154.5	II	C	***	***	***
165	111085	48	3	56	5	3	930.2	242.4	III	B	***	***	***	930.2	242.4	III	B	***	***	***
166	111086	48	3	58	5	3	719.0	156.4	II	C	***	***	***	719.0	156.4	II	C	***	***	***
167	111087	40	3	52	5	4	1121.3	302.9	III	B	***	***	***	1121.3	302.9	III	B	***	***	***
168	111088	51	3	38	5	3	666.0	117.9	II	C	***	93	***	696.9	126.3	II	C	***	92	***
169	111089	82	3	61	5	4	10448.8	3877.6	V	B	93	***	***	12447.9	4370.8	V	B	91	***	***
170	111090	33	3	61	5	3	10183.4	3780.5	V	B	93	***	***	9218.6	3358.7	V	B	93	***	***
171	111091	99	3	61	5	4	7167.4	2471.1	V	B	98	***	***	6498.5	2162.4	V	A	***	***	***
172	111092	60	3	30	5	3	4172.6	1548.2	IV	D	***	89	97	2099.6	679.6	III	D	***	***	97
173	111093	104	3	50	5	3	3754.4	1376.1	IV	C	***	89	***	1929.7	612.5	III	C	***	***	***
174	111094	125	3	50	5	3	1646.1	600.3	III	C	***	***	***	1488.5	532.7	III	C	***	88	***
175	111095	99	3	33	5	4	1698.6	559.7	III	C	***	87	***	1781.7	610.5	III	C	***	87	***
176	111096	47	3	35	5	4	1090.6	370.7	III	B	92	***	***	1080.4	375.1	III	B	89	***	***
177	111097	82	3	30	5	4	2346.4	813.5	IV	B	89	***	***	2100.2	727.4	III	D	***	89	97
178	111098	81	2	33	5	4	2083.9	706.6	III	D	***	90	96	1842.8	621.8	III	D	***	88	98
179	111099	87	3	47	5	4	691.3	201.2	II	C	***	***	***	691.3	201.2	II	C	***	***	***
180	111100	68	3	31	5	4	418.0	82.2	II	B	***	***	***	418.0	82.2	II	B	***	***	***
181	111101	46	3	32	5	4	924.4	317.6	III	B	***	***	***	1513.7	575.8	III	C	***	87	***
182	111102	64	3	37	5	3	146.0	25.7	I	B	***	***	***	146.0	25.7	I	B	***	***	***

Table 5-13 (8) List of Candidate Project by the Year 1999/2000 (2nd stage construction)

SEQ	-HIGHWAY SECTION-- LINK-NO	LENGTH (KM)	----EXISTING ROAD---- TER.	WIDTH (M)	TYPE	COND.	------IMPROVEMENT FOR MASTER PLAN A------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D	------IMPROVEMENT FOR MASTER PLAN B------- A.D.T.	AXLE LOAD	IMPROVE TYPE	LEVEL OF SERVICE LEV.	A-B	B-C	C-D
183	111103	57	3	58	5	3	1962.7	399.4	III	C	***	90	***	1988.4	408.3	III	C	***	89	***
184	111104	29	3	30	5	5	793.1	246.3	II	D	***	***	***	793.1	246.3	II	D	***	***	***
185	111105	29	3	30	5	4	314.1	97.7	II	B	***	***	***	314.1	97.7	II	B	***	***	***
186	111106	31	3	30	5	4	186.8	67.5	I	C	***	***	***	186.8	67.5	I	C	***	***	***
187	111107	50	3	55	5	1	788.0	216.2	II	C	***	***	***	788.0	216.2	II	C	***	***	***
188	3023	23	3	62	5	2	8156.2	1312.0	V	A	***	***	***	8952.3	1654.1	V	B	98	***	***
189	3024	66	2	59	5	2	4309.4	795.0	IV	C	***	90	***	4599.9	920.0	IV	D	***	89	98
190	3025	132	1	36	4	2	1054.8	265.3	III	C	***	97	***	1078.0	275.2	III	C	***	96	***
191	3026	29	3	73	4	3	3102.0	488.3	III	D	***	***	***	3102.0	488.3	III	D	***	***	***
192	3027	28	3	73	4	3	654.0	110.1	II	C	***	***	***	654.0	110.1	II	C	***	***	***
193	3028	46	3	71	4	3	1757.4	241.0	III	B	***	***	***	1757.4	241.0	III	B	***	***	***
194	3029	999	1	71	4	3	572.0	53.4	II	C	***	***	***	572.0	53.4	II	C	***	***	***
195	3030	35	3	48	5	2	3925.9	570.1	IV	C	***	97	***	4152.9	667.8	IV	C	***	95	***
196	3031	82	1	36	5	3	0.3	0.1	I	A	***	***	***	0.3	0.1	I	A	***	***	***
197	3032	33	3	61	4	3	1173.0	159.3	II	D	***	***	***	1173.0	159.3	II	D	***	***	***
198	4013	344	2	39	4	3	258.2	64.4	II	B	95	***	***	507.4	172.3	II	C	***	96	***
199	4014	366	3	39	2	3	0.7	0.0	II	A	***	***	***	0.7	0.0	II	A	***	***	***
200	4015	328	3	36	1	4	226.0	87.3	I	C	***	***	***	226.0	87.3	I	C	***	***	***
201	4016	118	3	36	2	4	230.0	22.4	I	C	***	***	***	230.0	22.4	I	C	***	***	***
202	4017	230	3	36	2	4	13.3	4.1	I	A	***	***	***	13.3	4.1	I	A	***	***	***
203	4018	530	2	36	2	4	13.3	4.1	I	A	***	***	***	13.3	4.1	I	A	***	***	***
204	4019	999	3	36	3	4	45.5	18.4	I	A	***	***	***	45.5	18.4	I	A	***	***	***
205	4020	169	3	36	3	4	45.5	18.4	I	A	***	***	***	45.5	18.4	I	A	***	***	***
206	4021	115	3	36	3	4	15.4	5.7	I	A	***	***	***	15.4	5.7	I	A	***	***	***
207	4022	72	1	36	3	4	182.4	32.4	I	C	***	***	***	182.4	32.4	I	C	***	***	***
208	4023	272	2	36	3	4	183.7	76.2	I	C	***	92	***	135.3	56.3	I	B	92	***	***