4-2 Masterplan Alternative B

Masterplan Alternative B is formulated taking into consideration of the projects identified in each sub-sector, based on examination on the total transport economic cost of cargo transport by railway and road. this examination is attributed to the concept of break-even point on distance where the General Transport Cost (GTC) of a certain commodity carried either by railway or by road transport reaches equal.

Demand forecast of shifted pattern to railway is estimated as follows.

(i) calculation of break-even distance for modal split by present pattern on each commodity.

(ii) shifting some percentage of traffic which is exceeding break-even distance to railway.

(iii) shifting some percentage of traffic which is less than the break-even distance to road .

Traffic forecast shifted pattern to railway is being assessed intending to seek the ideal economic transport system in the national economy which leads to utilization of sunk cost of railway, efficiency in energy consumption for railway and to countercheck the time restraint to arrange the necessary road in case of the assignment of the traffic for the road as the present pattern.

Considering the above demand forecast, it is considered that the main target, necessary to solve by this Masterplan is to shorten the overall traffic time through the smooth connection between different modes of transport and by speed-up of train runs.

Therefore, in order to speed up overall transportation time, intensive policy for cargo traffic converting long distance traffic to the railway and the short distance traffic to road is to be suggested.

It is also suggested that development/improvement of so-called hardware facility necessary to increase overall capacity is to be implemented urgently.

As for railway in Masterplan Alternative B, positive enforced investment projects as double-tracking, electrification, level up of signal and communication system etc., have been adopted to cover the increased demand for railway.

Compared to present pattern, the volume of goods to be transported by railway will be 50 percent more and over, which proceeds the capacity of single-track between Lahore and Lodhran. Therefore, double-track rails should be constructed for that section. The basic routes will be as follows.

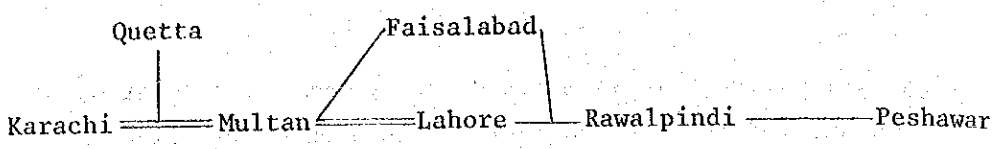


Fig. 4-2-1 Basic Transportation Route

If the projects for railway are implemented, majority of the goods to up-country would go through Lahore, and partially by way of Faisalabad.

As for the service level of railway, it is considered that maximum average speed of 100 km/h including stopping with least minimum speed of 50 km/h for some portion in general together with enough serviceability and comfortability should be fulfilled.

Summarizing above, projects are identified for formulation of Masterplan Alternative B with railway's share for Rs. 66,694 million which is the 30.1% of total development fund for Masterplan Alternative B.

As for road, fundamentally arrangement of road is similar to Masterplan Alternative A, but the required fund becomes slightly less due to lower demand for road compared to that of Masterplan Alternative A.

Allocation of fund for each mode are as follows.

	Million Rs.	%
Road	81,939	37.0
Road Transport	10,991	5.0
Railway	66,694	30.1
Port	8,940	4.0
Shipping	11,522	5.2
Airport	8,905	4.0
Aviation	32,700	14.8
TOTAL	221,691	100.0

Total amount of fund needed for Masterplan Alternative B is expanded by about 12.8% to that of Masterplan Alternative A.

Concerning other modes than railway and road, composition and method adopted for development/improvement are the same as those of Masterplan Alternative A.

It is considered that the level of transport system after completion of the projects listed in Masterplan Alternative B can cover the transport demand with acceptable service level by each mode, which can contribute to achieve the expected goal of GDP at 2000 in Pakistan and offer the comfortability coping with the level of GDP/capita in 2000.

Refer to List of Projects in Masterplan Alternative A for those projects being same both in Masterplan Alternative A and B.

The projects for road and railways conceived for the realization of this Masterplan Alternative B have been summarized and listed as per attached.

List of Projects Constituent Masterplan Alternative B

Million Rs., Financial, 1981 Price

Mode	Name of Projects	Contents of Project	Remarks	Cost
1. Road	1. Widening of N-5 to 4 Lanes Project	Widening and Grade up Work	52001-52009,51001-51022, 53001-53003 34 Links	15,386
	2. Grade up of the Road of Quetta, Rohri Project (N-65)		4010, 4009, 2012, 2011, 2013 5 Links	3,446
	3. Grade up of the Road of Quetta, Lahore via D.G.Khan till Multan		4008, 4022, 4012, 1042, 1051, 1041, 1052, 1053 8 Links	1,517
	4. Short Cut Trunkroad in Punjab of Kabirwala, Jhang, Sargodha, Khushab Pail, Mandra Road		1054, 1055, 1059, 1047-1049 6 Links	2,015
	5. Rehabilitation of Karachi, Quetta Road Project (N-25)	Rehabilitation	2010, 4001-4005 6 Links	1,173
	6. Rehabilitation of Quetta, Taftan Road Project	"	4013, 4014 2 Links	918
	7. Grade up of Qila Saifullah, D.I. Khan Road Project	Grade up	4007, 3010 2 Links	379
	8. Indus Highway of Kotri, Peshawar Road Project	Indus Highway	2014-2018, 1032-1034, 3016-3021, 2019 15 Links	1,998
	9. Bridge Construction between D.I.Khan, Sarai Krisha Project	Bridge Construction	3022, 1040 2 Links	107
	10. Rehabilitation of Sarai Krisha, Gujranwala Project	Rehabilitation	1036-1039, 1061 5 Links	1,134
	11. Rehabilitation of Innd M. Fana, Atharan Hazari Road Project	"	1043-1045 3 Links	573

12. Rehabilitation of Lahore, Sargodha Road Project	Rehabilitation	1035, 1057, 1058 3 Links	928
13. Rehabilitation of Khushab, Tajazai Road Project	"	1060, 1027, 1026, 3012 4 Links	491
14. Rehabilitation of Pail, Talagang, Fatehjang, Tarnual Road Project	"	1096, 1099, 1031 3 Links	261
15. Grade up of Hasan Abdal Sazin Road Project (N-35)	Grade up	1023, 3005-3009 6 Links	912
16. Grade up of Nowshera, Dir Road Project	"	3023-3025 3 Links	385
17. Construction of Sibi, Bewata Road Project	"	4023 1 Link	448
18. Construction of Wingai, Jiwani Road Project	"	4019, 1020 2 Links	895
19. Rehabilitation of Bela, Turbat Road Project	Rehabilitation	4015, 4016 2 Links	339
20. Construction of Pasni, Gwadar Ling Road Project	Grade up	4021, 4017 2 Links	587
21. Construction of Surab, Hoshab Road Project	"	4018 1 Link	917
22. Grade up of Quetta, Chaman Road Project	"	4006 1 Link	314
23. Rehabilitation of Kohat, Parachinar Road Project	Rehabilitation	3014 1 Link	307
24. Grade up of Chak Darra, Bishab Road Project	Grade up	3030, 3031 2 Links	101
25. Construction of Jatta, Kalabagh By-pass Road Project	"	3013, 1028 2 Links	63

26.	Rehabilitation of Rahimyar-khan, Chani Goth Road Project	Rehabilitation	1072 1 Link	147
27.	Rehabilitation of Sargodha, Gujrat Road Project		1056 1 Link	453
28.	Rehabilitation of Jhang, Gujranwala via Chiniot Road Project	"	1089-1091 3 Links	1,560
29.	Rehabilitation of Multan, Jahania, Kasur, Lahore Road Project	"	1078-1084 7 Links	510
30.	Rehabilitation of Bahawalpur, Bunga Hayat Road Project	"	1065, 1066, 1073 3 Links	401
31.	Rehabilitation of Lahore to India Road Project	"	1050 1 Link	123
32.	Rehabilitation of Muzaffar-garh, Mianwali Road Project	"	1092-1094 3 Links	451
33.	Rehabilitation of Atharan Hazari, Khushab Road Project	"	1046 1 Link	54
34.	Rehabilitation of Gujranwala, Sialkot, Wazirabad Road Project	"	1062, 1063 2 Links	301
35.	Rehabilitation of Rawalpindi, Abbottabad Road Project	"	1024, 3011, 1025 3 Links	195
36.	Rehabilitation of Peshawar, Charsadda, Mardan Road Project	"	3026, 3027 2 Links	70
37.	Rehabilitation of Quetta, Loralai Road Project	"	4011 1 Link	309
38.	Rehabilitation of Larkana, Jacobabad Road Project	"	2045 1 Link	54

39. Construction of Dadu, Moro Bridge Project	Grade up	2025	1 Link	232
40. Rehabilitation of Kashmir, Ubauro Bridge Project	Rehabilitation	2042	1 Link	40
41. Grade up of Karachi, Hydera-bad Road Project	Grade up	2023, 2024	2 Links	457
42. Rehabilitation of Thatta, Sakrand Ling Road Project	Rehabilitation	2026-2033	8 Links	631
43. Rehabilitation of Mirpur Khas, Umarkot Road Project	"	2022	1 Link	129
44. Rehabilitation of Jacobabad, Kund Kot Road Project	"	2046	1 Link	65
45. Rehabilitation of Mianwali, Talagang, Sohawa Road Pro-ject	"	1095, 1101, 1100	3 Links	415
46. Rehabilitation of Faisalabad, Lahore Road Project	"	1064	1 Link	154
47. Rehabilitation of Kohat, Fatehjang Road Project	"	3015, 1029, 1030	3 Links	281
48. Rehabilitation of Attock, Talagang Road Project	"	1097, 1098	2 Links	396
49. Rehabilitation of Lodhran, Khanewal Road Project	"	1076, 1077	2 Links	164
50. Rehabilitation of Jhang, Burewala Road Project	"	1086, 1087, 1088	3 Links	191
51. Rehabilitation of Jhang, Dipalpur Road Project	"	1102, 1103, 1074	3 Links	163
52. Rehabilitation of Rajana, Sargodha Road Project	"	1085, 1069, 1070, 1071	4 Links	1,055
53. Rehabilitation of Mardan, Haripur Road Project	"	3028, 3029	2 Links	142

54. Rehabilitation of Nowshera, Swabi Short Cut Road Project	Rehabilitation	3032 1 Link	28
55. Rehabilitation of Shadan Lund, Rangpur Road Project	"	1104-1106 3 Links	79
56. Rehabilitation of Kot Addu, Karamdad Road Project	"	1107 1 Link	55
57. Rehabilitation of Sahiwal, Bahawalnagar Road Project	"	1067, 1068 3 Links	357
58. Rehabilitation of Vehari, Hasilpur Road Project	"	1075 1 Link	48
59. Rehabilitation of Hyderabad, Badin Road Project	"	2034-2036 3 Links	179
60. Rehabilitation of Matli, Copchali Road Project	"	2037-2040 4 Links	201
61. Rehabilitation of Hala, Sanghar Road Project	"	2043, 2044 2 Links	186
62. Rehabilitation of Hyderabad, Mirpur Khas Road Project	"	2020, 2021 2 Links	162
63. Rehabilitation of Sujawal, Tando M. Khan Road Project	"	2041 1 Link	100
64. Rehabilitation of Peshawar, Torkham Road Project	"	3004 1 Link	163
65. Ghazi Ghat Bridge over River Indus	Bridge Construction	On-going Project	6
66. Providing Carpetted Dual C/Way from Mile 169/4 to 201/4	Grade up	"	30
67. Special Repairs Karachi-Hyderabad Super Highway NWFP	Rehabilitation	"	49

68. Construction of Dual C/Way between Nowshera-Peshawar	Construction of Dual C/Way	On-going Project	63
69. Improvement & B/Topping of Darazinda, Mughalkot Road, Mile 9/43 35 Mile	Improvement	"	5
70. Const. of D.I.Khan-Darya Khan Bridge over River Indus	Construction of Bridge	"	165
71. Implementation of Quetta-Sibi (N-65)	Implementation	"	40
72. Implementation & Widening of Quetta-Chaman Road Mile 15-69 (N-25)	"	"	13
73. Construction of Sind Hamid-Lora Bridge on N-25 at Mile 39	Construction of Bridge	"	6
74. Third Highway Project	Third Highway Project	"	236
75. Road Chakdara-Chitral 227km (Revised PC-1)	Rehabilitation	"	144
76. W/R of Nawabshah-Sanghar Road	Widening	"	5
77. Reconditioning of Badin Sujawal Thatta Road	Rehabilitation	"	1
78. Reconditioning of Tando Ghulam Ali Road	"	"	3
79. Reconditioning of Gupjani Shahdadpur Road	"	"	10
80. Reconditioning of Hala Shah-dadpur Road	"	"	10
81. Karachi-Hyderabad Super High-way, 1st Priority	Karachi-Hyderabad Super Highway	"	14
82. W/R of Ubauro Guddo Road (31km)	Grade up	"	8

83. Construction of Bridge over Bada Khawar in Mile 10, Swabi, Topi Road	Construction of Bridge	On-going Project	7
84. Improvement of Kohat Thal Road (37.00 Miles)	Improvement	"	8
85. Improvement & Widening of D.I.Khan-Bannu Road(23Miles)	"	"	5
86. Improvement & Widening of Bannu-D.I.Khan Road Tajazai Fezu	"	"	9
87. Construction of Dual Carriageway Nowshera-Mardan	Widening	"	35
88. Construction of Loralai D.G. Khan Road	Construction	"	7
89. Construction of Kanki Bridge	"	"	2
90. Construction of Sibi Harnai Road	"	"	16
91. Under Federal Budget		Outside the Study	8,271
92. Under Punjab Government Budget		"	11,192
93. Under Sind Government Budget		"	8,789
94. Under NWFP Government Budget		"	5,290
95. Under Baluchistan Government Budget		"	1,205
TOTAL			81,939

List of Projects Constituent Masterplan Alternative B

Million Rs., Financial, 1981 Price

Mode	Name of Project	Contents of Project	Remarks	Cost
2. Railway	1. Electrification KHI-ROH Project	Electrification	Rationalization, Speed up and Energy Efficiency	2,074
	2. Electrification ROH-SMA Project	"	"	1,439
	3. Electrification SMA-KWL Project	"	"	523
	4. Electrification SMA-MUL, MUL-KWL Project	"	"	432
	5. Electrification LHR-LLM Project	"	"	629
	6. Electrification LLM-RWP Project	"	"	382
	7. Electrification SIBI-KLR Project	"	"	424
	8. Electrification Mah.Kot-Shershar Project	"	"	108
	9. Track Doubling Lodhran-KWL Project	Double-Tracking Work	Demand Forecast Speed and Capacity up	546
	10. Track Doubling MUL-KWL Project	"	"	228
	11. Track Doubling KWL-Raiwind Project	Double-Tracking Work	Demand Forecast Speed and Capacity up	1,470
	12. Track Doubling KWL-Raiwind (Electrification) Project	"	"	529
	13. Track Doubling LHR-WZB Project	"	"	558
	14. Track Doubling WZB-LLM Project	"	"	198

15. Track Doubling LLM-RWP Project	Double-Tracking Work	Demand Forecast Speed and Capacity up	910
16. Track Doubling LLM-RWP (Electrification)	"	"	360
17. Track Doubling Lodhran-Multan	"	"	430
18. Track Doubling Lodhran-Multan (Electrification) Project	Replacement of Worn-out Facility	Speed up and Capacity up	155
19. Track Renewal Project KHL-LLM	"	"	4,395
20. Track Renewal Project LLM-PSC	"	"	377
21. Track Renewal Project ROH-QIA	"	"	616
22. Track Renewal Project SSH-MMK	"	"	73
23. Track Renewal Project KWL-FSD	"	"	248
24. Track Renewal Project SQR-SQD	"	"	243
25. Track Renewal Project MMK-KDN	"	"	368
26. Track Renewal Rail Renewal Project	"	"	553
27. Station Improvement Terminal 1 (Karachi) Project	Terminal Enlargement & Track Extension	"	428
28. Station Improvement Terminal 6 Project	"	"	527
29. Station Improvement Terminal 8 Project	"	"	524

30. Station Improvement Loop 4 Project	Terminal Enlargement & Track Extension	Speed and Capacity up	17
31. Station Improvement Loop 4 Project	"	"	17
32. Station Improvement Loop 5 Project	"	"	22
33. Station Improvement LHR Container Project	New Construction of Container Terminal	Containerization in Port	1,101
34. Station Improvement LHR Goods Project	New Construction of Cargo Terminal	Demand Forecast	399
35. Signalling KHI-SMA Project	Grade up and Enforcement of Signal and Communication	Rationarization	730
36. Signalling SMA-KWL Project	"	"	187
37. Signalling Lodhran-MUL-KML Project	"	"	194
38. Signalling Shershar-Mahmud Kot Project	"	"	99
39. Signalling KWL-LHR Project	"	"	455
40. Signalling LHR-LLM Project	"	"	211
41. Signalling LLM-RWP Project	"	"	300
42. Signalling RWP-PSW Project	"	"	294
43. Signalling ROH-SIBI Project	"	"	324
44. Signalling SIBI-QTA Project	Replacement and Enforcement of Signal and Communication Facilities	"	241
45. Signalling DWL-FSD Project	"	"	271
46. Signalling FSD-WZD Project	"	"	61

47. Signalling Shorkot-SQD Project	Replacement and Enforcement of Signal and Communication Facilities	Rationalization	63
48. Signalling MAH.KOT-KDN Project	"	"	104
49. Rolling Stock Electrification SMA-KWL Project	Purchase of EL	Capacity up, Demand Forecast	1,004
50. Rolling Stock Electrification SIBI-KLR Project	"	"	634
51. Rolling Stock Electrification ROH-SMA Project	"	"	2,347
52. Rolling Stock Electrification LHR-LLM Project	"	"	491
53. Rolling Stock Electrification KWL-LHR Project	"	"	1,070
54. Rolling Stock Electrification KHI-ROH Project	"	"	2,878
55. Rolling Stock Electrification LLM-RWP Project	"	"	624
56. Rolling Stock Electrification SSH-MMK Project	"	"	22
57. Rolling Stock Wagons Container Project	Purchase of Container Wagon	Containerization Project in Port	393
58. Rolling Stock Wagons Replace Project	Purchase of Bogie	Replacement of Worn-out Facilities	6,406
59. Rolling Stock Wagons Replace Project	Purchase of Zaxle	"	1,930
60. Rolling Stock Electrification Work Shop	Work Shop	Electrification	1,295

61. Rolling Stock Electrification Sheds Project	Sheds	Electrification	310
62. Rolling Stock Electrification Re-engine Project	Purchase of Rolling Stock	"	259
63. Rolling Stock Diesel Purchase Project	Purchase of Diesel	Demand Forecast	3,415
64. Rolling Stock Diesel Re-engine Project	"	"	5,302
65. Rolling Stock Coaches Purchase	Purchase of Coach	Replacement	2,127
66. Rolling Stock Coaches Replace	"	"	2,273
67. Rolling Stock Wagons High Speed TR Project	Purchase of Wagon	Speed up	1,000
68. Rolling Stock Wagons Additional Project	"	Demand Forecast	650
69. Minor Projects		10% of Above Total Amounts	5,927
70. Loco Factory		On-going	800
71. Others		"	700
TOTAL			66,694

VII. EVALUATION AND SELECTION OF MASTERPLAN ALTERNATIVES

VII. EVALUATION AND SELECTION OF MASTERPLAN ALTERNATIVES

1. Quantitative Evaluation of Masterplan

1-1 Methodology

1-1-1 General

As explained in above chapter, Masterplan Alternatives A and B are being formulated.

Fundamental difference between Alternatives A and B is characterized with the differences of traffic amounts projected, based on the different modal split between road and railway among the land transport, while traffic of other modes as port/shipping and airport/aviation being equal both in Alternatives A and B.

Alternative A : Present pattern modal split.

Alternative B : Strategical modal split, based on economic transport cost in the break-even distance theory, i.e. intensive policy for road transport of short distance traffic and railway transport of long distance traffic.

Therefore, among the Masterplan, only the portion of land transport is to be evaluated.

It is necessary that evaluation of Masterplan is to be performed comprehensively, not as project base independently.

Thus, it is considered that Masterplan should have the optimized objective targets as economic standard, equality and minimized gap between demand and supply under the constraints of budget, energy, supply capacity of construction materials,pollution, technical know-how.

Here, constraints of budget and demand/supply have been already analyzed through the project identification considering the demand/supply and budget frame.

Also, on the process of project identification technical constraints has been analyzed.

Other resource constraints like labor, land etc. have not taken account for this Masterplan evaluation, since these matters should be analyzed not with transport sector, but all sectors. Therefore, it could be generalized that method of evaluation for this Masterplan is to make the comparative evaluation of economics of general transport cost and energy consumption quantitatively at the year 2000.

1-1-2 General Transport Cost

General Transport Cost is estimated as following the flow of Fig.1-1-1. General Road Transport Cost consists of VOC, Time Cost and Road Cost, while General Railway Transport Cost is calculated with Rail Cost, Time Cost and Feeder Cost.

(1) General Road Transport Cost

Formula to calculate General Transport Cost (GTC) of road is as follows.

$$GTC = VOC + TC + RC$$

$$VOC = \sum_{l}\sum_{k} VOC_{l,k} \cdot Q_{l,k} \cdot D_{l}$$

$$TC = \sum_{l}\sum_{k} w_{k} \cdot D_{l} / V_{l,k} \cdot Q_{l,k}$$

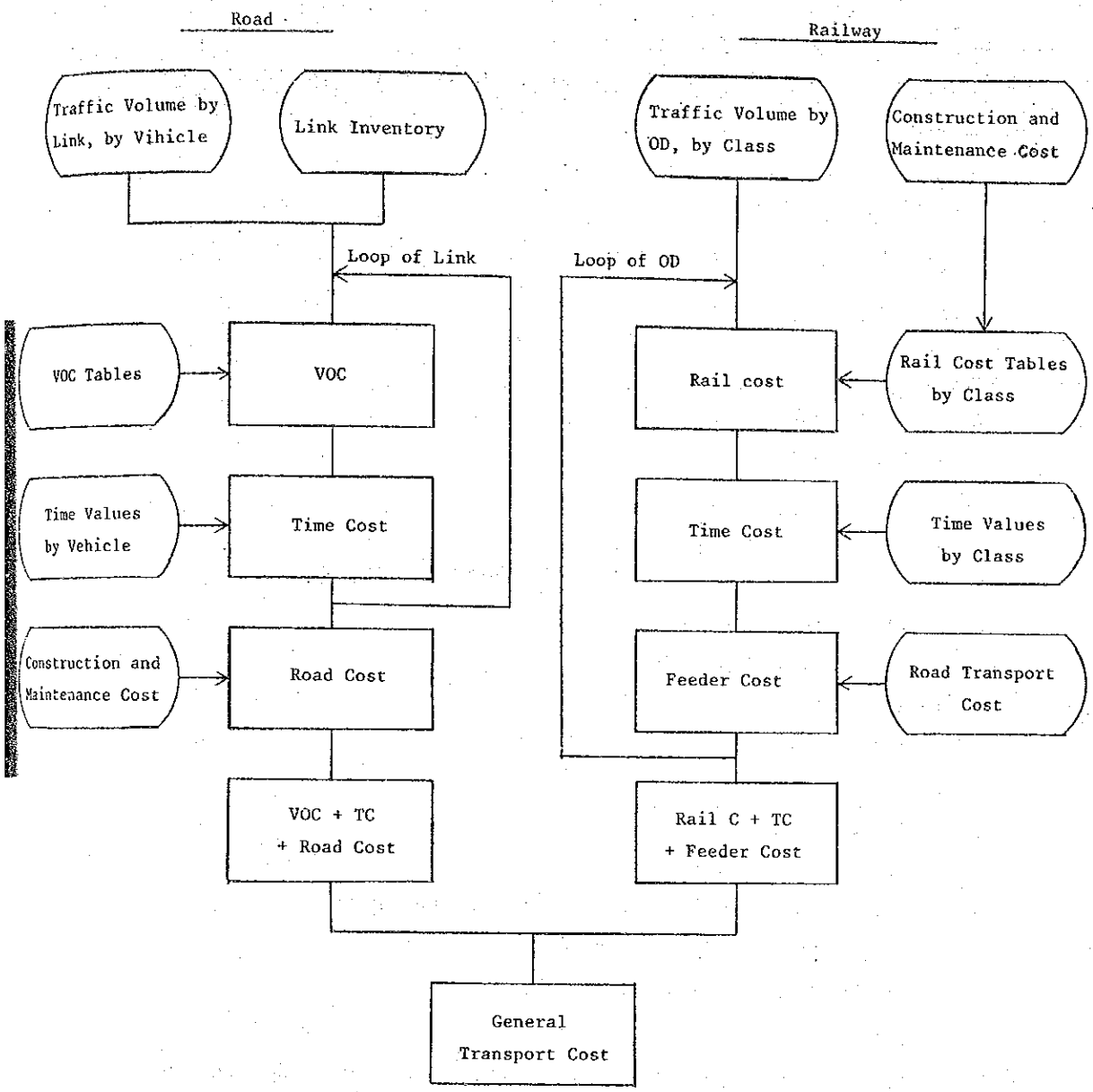
$$RC = IC \cdot CRF + MC$$

$$CRF = r(1+r)^{n} / \{(1+r)^{n} - 1\}$$

where,

- VOC: Vehicle Operationg Cost
- TC : Time Cost
- RC : Road Cost
- l : Index for Link
- k : Index for Vehicle-type (bus, car, truck)
- Q : Traffic Volume
- D : Distance
- w : Value of Time
- V : Velocity
- IC : Investment Cost
- CRF: Capital Recovery Factor
- MC : Maintenance Cost
- r : Interest Rate (=12%)
- n : Project Life

Fig. 1-1-1 Estimation of the General Transport Cost



Here, as for VOC constituent Engine Oil, Fuel Consumption, Tyre Wear, Depreciation, Interest, Labor and Parts, the Figure of 1981 by Ministry of Communication is used.

(2) General Railway Transport Cost

Formula to calculate General Transport Cost (GTC) for railway is as follows.

$$GTC = RLC + TC + FC$$

$$RLC = \sum_{l}\sum_{k}(TMC_k + KMC_k \cdot D_l) \cdot Q_{l,k}$$

$$TC = \sum_{l}\sum_{k} w_k (TT + D_l / V_l) \cdot Q_{l,k}$$

$$FC = \sum_{l}\sum_{k}(VOC_k + w_k / v_k) \cdot L \cdot Q_{l,k}$$

where,

RLC: Rail Cost
TC : Time Cost
FC : Feeder Cost
l : Index for OD Pair
k : Index for Passenger-class or Commodity-type
Q : Traffic Volume
D : Distance for Railway
TMC: Terminal Cost
KMC: Kilometric Cost
w : Value of Time
TT : Terminal Time
V : Velocity of Railway
VOC: Vehicle Operating Cost of Feeder Transport
v : Velocity of Feeder Transport
L : Distance for Feeder Transport

Cost items of KMC are General Administration, Fuel Consumption, Operating Staff, Repairs & Maintenance, Other Expenditure, Depreciation and Interest, besides Investment cost estimated reflecting Depreciation and Interest.

1-1-3 Energy Consumption

(1) Road Transport

As for energy consumption, petrol for car and diesel oil for bus and truck are assessed. On the process of General Road Transport Cost calculation, the amounts of consumption is calculated as one of cost item for VOC.

(2) Railway Transport

As for energy consumption of railway transport, steam, diesel and electric locomotives use furnace oil, HSD and electricity respectively.

As the first step, traffic volume in 1980/81 is divided into types of locomotive, and unit cost of energy consumption by the types of locomotive is assessed. (See Table 1-1-1)

As the second step, energy consumption is calculated by divided traffic volume in 2000 by locomotive and above unit cost.

Table 1-1-1
Estimation of Traffic Volume and Energy Consumption by Locomotive
(1980-81)

	Steam	Diesel	Electric	Total
(1) Trains KM(Killion)				
A Freight	0.841	10.956	1.155	12.952
B Passenger	6.508	27.294	2.204	36.006
(2) Traffic volume(Million)				
C Ton KM	443	6,946	529	7,918
D Wagon KM on freight & mixed trains	30	585	66	681
E GTKM (freight) C+E*a+A*b	852	14,356	1,314	16,422
F Passenger KM	2,301	12,079	1,931	16,311

(3) Energy consumption	Furnace oil (t)	HSD (t)	(1000KWH)
G Total	279,606	145,932	44,630
H Freight E*c	30,928	54,553	19,579
I Passenger G-H	248,678	91,379	25,051
(4) Energy consumption/Traffic volume			
J Freight H/C	69.8	7.854	37.011
K Passenger I/F	108.1	7.565	12.011

Source: PAKISTAN RAILWAYS YEARBOOK OF INFORMATION 1980-81
EXTENTION OF ELECTRIC TRACTION OVER KHANEWAL-SAMASATA

Notes: (1) wagon weight (10.7t)
(2) locomotive weight (steam, diesel 105t, electric 68t)
(3) energy consumption
steam 36.3kg/1000GTKM
diesel 3.8kg/1000GTKM
electric 14.9 KWH/1000GTKM

1-2 Output

1-2-1 General Transport Cost

As to the Table 1-2-1 , output of demand forecast by Alternative A and B, Growth of Traffic Volume of Alternative B in railway, especially freight transport is prominent.

General Transport Cost is summarized in Table 1-2-2.

As for Road Transport Cost, it can be generalized as

(i) VOC is large enough compared to Time Cost and Road Cost

(ii) Cost of freight transport is about 2 times as to the cost of passenger transport

(iii) GTC of Alternative B is smaller than Alternative A by about 13%

As for Railway Transport Cost, it can be generalized as

(i) Railway Cost is large enough compared to Time Cost, Feeder Cost

(ii) Total Cost of freight transport and passenger transport are about the same.

(iii) GTC of Alternative B is larger than the Alternative A by about 3%

GTC of road and railway of Alternatives A and B are Rs. 41 billion and Rs. 37 billion respectively.

As the result, GTC of Alternative B is lower than that of Alternative A by about 10%.

1-2-2 Energy Consumption

Estimates of energy consumption for road and railway are summarized in Table 1-2-3 , 1-2-4 respectively.

It should be noted that energy consumption of road is far higher than that of railway in money term. Also, it can be considered that energy cost of railway would decrease in proportion to the degree of electrification because of relatively lower cost of electricity.

Total energy cost for road and railway of Alternatives A and B are Rs. 14 billion and Rs.12 billion respectively.

As the result Alternative B is also preferrable to Alternative A as Alternative B can save about 13% of energy consumption than Alternative A (See Table 1-2-5).

Table 1-2-1 Traffic Volume for Land Transport

		1980/81	1999/00	
			Case A	Case B
Passenger (MPKM)	Sum	51,539	144,573	144,549
	Road	36,590	97,910	97,172
	Rail	14,950	46,662	47,377
Freight (MTKM)	Sum	24,561	86,707	87,918
	Road	16,514	66,519	51,561
	Rail	8,047	20,188	36,357

Source: JICA Study Team estimation

Note: The figures don't include the intra-zonal traffic.

Table 1-2-2 General Transport Cost for Land Transport

(Million Rs.)

			1980/81	1999/00 Case A	1999/00 Case B
Road	(1) Passenger	VOC	2,525	5,870	5,827
		Time Cost	1,420	1,773	1,811
		Sum	3,945	7,643	7,638
	(2) Freight	VOC	5,132	17,678	13,928
		Time Cost	857	1,505	1,190
		Sum	5,989	19,183	15,118
	(3) Total =(1)+(2)	VOC	7,657	23,548	19,755
		Time Cost	2,277	3,278	3,001
		Sum	9,934	26,826	22,756
	(4) Road Cost		1,537	5,610	5,416
	(5) General Road Cost =(3)+(4)		11,471	32,436	28,172
Railway	(6) Passenger	Railway Cost	1,049	2,917	2,623
		Time Cost	446	1,380	1,237
		Feeder Cost	415	1,147	953
		Sum	1,910	5,444	4,812
	(7) Freight	Railway Cost	1,211	2,687	3,445
		Time Cost	199	414	428
		Feeder Cost	118	372	482
		Sum	1,528	3,473	4,355
	(8) General Railway Cost =(6)+(7)		3,438	8,917	9,167
General Transport Cost (5)+(8)			14,909	41,353	37,339

Source: JICA Study Team estimation

Note: The figures don't include the intra-zonal traffic.

Table 1-2-3 Fuel Consumption for Road Transport

		1980/81	1999/00	
			Case A	Case B
Traffic Volume	Bus (MPKM)	31,525	84,281	83,630
	Car (MPKM)	5,064	13,630	13,542
	Truck (MPKM)	16,514	66,519	51,561
Fuel Consumption (MRs)	Sum	3,426	13,566	11,349
	Bus	608	1,886	1,864
	Car	484	1,577	1,551
	Truck	2,334	10,103	7,934
Fuel Consumption ('000' ton)	Bus	163	507	501
	Car	66	214	211
	Truck	627	2,716	2,133

Source: JICA Study Team estimation

Notes: (1) Price of petrol = 7.36Rs./kg

(2) Price of diesel = 3.72Rs./kg

(3) The figures don't include the intra-zonal traffic.

Table 1-2-4 Estimation of Energy Consumption and Cost for Railway

	Steam	Diesel	Electric	Total
(1) Traffic volume (Million)				
1980/81				
Ton KM	525	6,864	529	7,918
Passenger KM	2,775	11,605	1,931	16,311
1999/2000 (Case A)				
Ton KM	-	7,864	12,324	20,188
Passenger KM	-	11,079	37,789	48,868
1999/2000 (Case B)				
Ton KM	-	15,183	21,174	36,357
Passenger KM	-	10,919	38,663	49,582

	Furnace Oil (t)	HSD (t)	(1000KWH)
(2) Energy consumption			
1980/81			
Freight	248,678	54,553	19,579
Passenger	30,928	91,379	25,051
Total	279,606	145,932	44,630
1999/2000 (Case A)			
Freight	-	61,764	456,124
Passenger	-	83,813	490,237
Total	-	145,577	946,361
1999/2000 (Case B)			
Freight	-	119,247	783,671
Passenger	-	82,602	501,575
Total	-	201,849	1,285,246

(3) Energy cost (Million Rs., 1981 Price)				
1980/81	334	504	13	851
1999/2000 (Case A)	-	503	284	787
1999/2000 (Case B)	-	697	386	1,083

Source: Pakistan railways yearbook of information 1980-81

Note: Energy unit price

Furnace oil	Rs. 1,193.60/t
HSD	Rs. 3,452.93/t
Electric	Rs. 0.30/KWH

Table 1-2-5 Energy Consumption for Land Transport

(Million Rs)

	1980/81	1999/00	
		Case A	Case B
Sum	4,277	14,353	12,432
Road	3,426	13,566	11,349
Railway	851	787	1,083

Source: JICA Study Team estimation

2. Selection of Masterplan

Selection of Masterplan for the National Transport System is made mainly based on the result of quantitative evaluation applied for Alternatives A and B in terms of comparison of general transport cost of road and railway combined between the Alternatives A and B, whose outcomes are as shown in Table 1-2-2 Rs. 41,353 million for Alternative A and Rs. 37,339 million for Alternative B respectively. This result means that the general transport cost of Alternative B in economic terms is about 10 percent less than that of Alternative A.

Also, the result of evaluation on the combined cost of energy for road and railway between the two Alternatives shows that the said cost of Alternative B is approximately 13 percent less than that of Alternative A.

In addition to the quantitative evaluation,qualitative one was applied on the degrees of air and noise pollutions and the rate of traffic accidents both of which are mainly attributed to road transport as a whole. It can be said that the less the road transport are, the less the degree of pollutions and rate of traffic accidents would be. Because of the reason that the intensive training and education are needed to the road transport drivers in Pakistan, it can also be said that the more the road transport traffics are, the more these pollutions and traffic accidents would be accelerated.

Judging from the results of these quantitative and qualitative evaluation of the two Alternatives, Masterplan Alternative B is selected.

VIII. PLAN OF ACTION FOR THE 6TH FIVE YEAR PLAN PERIOD

VIII. PLAN OF ACTION FOR THE 6TH FIVE YEAR PLAN PERIOD

1. General Concept of Implementation Plan and Criteria

The most probably acceptable Plan of Action for the next Five Year Plan is worked out with the following steps based on Masterplan Alternative B which has been adopted through the comprehensive evaluation.

Step I Selection of projects to meet with the traffic demands in 1988 under the several constraints for the next Five Year Plan.

Step II Approach to implementation schedule by year by mode, considering the structural elements.

(1) Step I

The projects, potential to implements for the next Five Year Plan are to be selected, keeping in line with (i) financial frame and (ii) development criteria for project list up.

(i) Financial Frame

Standard Frame Rs. 31,131 Million

calculated with assumption of about 16% share to transport sector against total amount to be required for development in ADP category.(Ref.:V.2.2-1 (4) & V. Table 2-2-5)

Positive Frame Rs. 38,914 Million

calculated with assumption of about 20% share to transport sector against total amount to be required for development in ADP category.

- 25% higher than standard frame -

(Ref.:V.2.2-1 (5) & V. Table 2-2-7)

Given the financial frames as above, project grouping for the next Five Year Plan has been performed, trying not to make more than acceptable gap from the positive frame.

As for non-ADP, Rs. 16,725 Million is estimated for the next Five Year Plan through the extraportation of the past trend. (Ref.:V.2.2-2 (2) & V. Table 2-2-5)

(ii) Criteria for Project List Up

Project selection for the next Five Year Plan by mode is performed by the mode specialist in consideration of the following factors.

(a) Correspondence with policy and strategy.

(b) Giving the highest priority to complete on-going project.

(c) Coordination with on-going projects and scheduled plans by several organization.

(d) Dissolution of bottleneck, considering the degree of urgency.

(e) Giving the higher priority on the project which has clear standard of benefitability, if quantitative evaluation is possible.

The projects identified by mode and practical procedure are described in VIII. 3..

Also, project list constituent to the next Five Year Plan is given in VIII. 4.

(2) Step II

In order to formulate implementation schedule by year, following items are to be studied.

(i) Examination of the Fund Allocation by Mode

It is necessary to examine whether the modal fund allocation is in line with that of Masterplan, as road 37.9%, road transport 8.9%, railway 33.5%, port 11.1%, airport 8.6% in ADP category and port 7.7%, shipping 30.8%, aviation 61.5% in non-ADP category.

(ii) Formation of Implementation Schedule by Project

It is necessary to make yearly phasing of the project by mode specialist, considering technical and engineering factors.

(iii) Examination of Annual Fund Allocation

It is necessary to examine that annual distribution of total ADP category fund for next Five Year Plan is in line with the following shares, 1st year 17.32%, 2nd year 18.57%, 3rd year 19.90%, 4th year 21.33% and 5th year 22.87%.

(iv) Examination on Provincial and Organizational Distributions

It is necessary to examine if the project grouping is acceptable by region and organization since the fund distribution is also applied to provincial and organizational bases.

(v) Examination of Implementation Capacity

It is necessary to examine if the supply capacity to implement total investment for the next Five Year Plan in Pakistan can be provided. Factors to be checked are
(a) engineering, (b) materials, (c) foreign currency portion, etc.

Output of above is listed in VIII. 4.,
Implementation Schedule and Budget Allocation.

2. Development Policy and Strategy

The policies and strategies of each mode of transport for the next Five Year Plan were prepared through the analysis of existing situation of each mode, the analysis of future traffic demand and the close discussions with related agencies of transport.

Recommendable policies and strategies for the next Five Year Plan would be as follows.

2-1 Policy and Strategy in Summary

1. Integrated development of different modes of transport should be ensured according to the modal distribution of future traffic made on the basis of suitability of commodities and passengers for transport by mode and the relative costs.
2. Encouraging and increasing production and commercial activities and contribution to economic development of the country should be one of the primary aims of the transport system.
3. Opening-up of the backward area should also be one of the aims of the transport system development.
4. The transport capacity of existing facilities and equipments should be fully utilized by elimination of their bottlenecks and optimization of their performance efficiency.
5. Only those new projects should be considered which have a sufficient economic viability or higher importance from the view point of national integration.
6. Private sector investment should be more introduced in transport sector to reduce the restrictions of public resources and to stimulate the transport activities.
7. Since a substantial part of the total traffic is expected to be between Karachi and up-country, the transport capacity of national corridor should be substantially improved.
8. Transport facilities at the international transport terminals should be substantially developed.

9. Railways should be more strengthened on the long haul freight traffic along the national corridor by operation of long distance train runs between major stations.

10. In view of energy economics, electrification in railways should be accelerated.

11. Dependable alternate North-South links should be initiated to develop as alternate of national corridor and for regional development toward the west bank of the Indus.

12. Private investment in road transport sector should be encouraged and comprehensive policies may be introduced to promote this sector as an industry.

13. Port capacity should be increased by close coordination between KPT and PQA.

14. Comprehensive measures to containerization should be developed in close coordination among shipping, ports, railways and road transport.

15. Serious bottlenecks at Airports of Karachi, Lahore, Islamabad and Quetta should be removed on the highest priority.

2-2 Development Strategy of Each Mode

2-2-1 Development Strategy for Roads

1. Emphasis should be on the completion of on-going programmes.
2. Improvement of major national and provincial highways should have the highest priority so that they could cater for the increased traffic.
3. The national highway N-5 should be substantially improved keeping in view the traffic requirements in various sections.
4. The balanced national highway network should be established by rationalizing the existing network including the roads of national importance such as Indus Highway, RCD Highway (Quetta-Taftan Section), Quetta-D.G. Khan route and Multan-Jhang-Gujranwala route.
5. East-West trunk roads should be substantially improved to cater for future international or inter regional traffic.
6. Greater priority should be given to rehabilitation and improvement of other arterial roads, which contribute to economic development of the country and ensure quick economic returns.
7. Construction of bridges across the major rivers/main canals and by-passes of trunk roads around big cities such as new Kotri bridge for N-5 and long span bridge on Sargodha-Pindi Bhattian road should be given priority for elimination of the bottlenecks.
8. New roads will be provided only for opening up of hitherto isolated areas of the country.
9. The pace of farm-to-market road should be accelerated to meet with the need of rapid socio-economic development of rural areas.
10. Possibility of using canal roads for public transport should be seriously examined.

2-2-2 Development Strategy for Road Transport

1. Road transport should be utilized mainly for short haul or for high value cargoes.
2. Road transport should be considered as an important means to integrate backward regions and rural areas with more advanced regions.
3. Till such time the railway capacity is substantially improved to carry its share of the projected traffic, road transport shall be relied on to meet the demand.
4. Large size truck may be introduced for freight transport so far as to be regulated axle load of 10 tons for single and 18 tons for tandem axle.
5. More attempts should be made to improve operational and maintenance efficiency of public sector road transport.
6. Large private investment in road transport sector should be encouraged and comprehensive incentive policies should be introduced to promote road transport as an industry.
7. Comprehensive counter measures to highway accidents should be more advanced, through the study of developed countries experiences in view of research, training, regulations, safety facilities, organization and so on.

2-2-3 Development Strategy for Railways

1. Railways system should be strengthened as the primary transport mode for long haul traffic along the national corridor.
2. East-West rail trunk route i.e. Rohri-Quetta (-Tafton) should be substantially improved to facilitate (the international traffic,) transport of natural resources from Baluchistan and for integration of the country.
3. Increasing the capacity of freight transport by operational improvement should be given high priority for better productivity.
4. Rehabilitation or replacement of worn-out facilities should be given higher priority over new line construction for increasing performance efficiency of railways.

5. Linkage facilities i.e. terminal,access road, etc. between railway and other modes should be improved substantially to increase the overall capacity of the transport system of the country.

6. Containerization in railways should be coordinated with the development of containerization of ports and shipping to make maximum possible use of the dry port at Lahore.

7. In view of the energy economics, electrification programmes of the railways should be accelerated.

2-2-4 Development Strategy for Ports

1. The roles of the Karachi Port and Port Qasim should be co-ordinated to ensure the maximum handlines of cargoes.

2. All import of iron ore and coal for Pakistan Steel Mills and import/export in full ship loads of wheat, rice, fertilizer and phosphate rock shall be handled at Port Qasim.

3. Import/Export of general cargo and above mentioned commodities in parcel size shall be handled mainly by Karachi Port.

4. All liquid bulk import/export upto a total of 10 million ton per annum shall be handled at KPT any additional liquid cargo import/export shall be assigned to PQA.

5. A specialized container terminal should be established at KPT.

6. The existing port capacity should be further improved through modernization of handling facilities and improvement of labour productivity.

7. Effective coordination between inland transportation and the two ports should be ensured in view of the expected increase in traffic and the handling capacity in both ports.

8. Construction of mini port/ports on the Baluchistan coast should be seriously considered.

2-2-5 Development Strategy for Shipping

1. As for general cargo, newly built 14 multi-purpose vessels developed under 5th Plan, have enough capacity to carry a reasonable share of liner cargo (maximum 40% in accordance with the frame work of the UN code of conduct liner conference). In order to maintain the loading target, full container vessels should be introduced at the time of completion of container terminals.
2. As for bulk carriers for Steel Mill, fleet requirements should be decided jointly by PNSC and Steel Mill in order to secure most competitive freight rate and to achieve optimum utilization of the bulk fleet. Short and long terms measures should be considered according to production schedule and draft limitation.
3. As for tanker for liquid bulk, fleet requirements should be decided by national tanker company on the basis of economical efficiency and national policy in consideration of the policy of the oil exporting country.
4. As for tramper for dry bulk, conventional type vessels replaced by newly built multi-purpose vessels, will be shifted to the tramp trade and should be operated on the basis of economical efficiency.
5. Ships over 20 years age should be replaced by new ships to lower the operating costs and increasing productivity.
6. Private investment in shipping should be encouraged.

2-2-6 Development Strategy for Airport/Civil Aviation

1. Introduction of the Twin Jet aircrafts and expansion of the wide bodied jet fleet should be implemented when higher yield and improvement of financial position can be ensured.
2. Feasibility of feeder service should be decided after full examination.
3. The ground hauling capacity of the major airports need to be further expanded to match the expected traffic demand.

4. Improvement of air navigational system at existing airports should be given greater priorities for precise operation and higher efficiency.

5. Main international airports at Karachi, Islamabad, Lahore and Peshawar should be further developed to increase their capacity and safety to handle the expected traffic demand.

6. Quetta, Multan, Faisalabad and Nawabshah (as alternative to Karachi Airport) should be developed for safe and effective handling of bigsize jet aircrafts.

7. The remaining 16 provincial airports, including 2 under construction at Ormara and Bannu, shall be developed for short-haul turbo-prop jet aircrafts.

8. All new airports should be established to cater for the following:
   1) To meet the traffic demand.
   2) The importance can be recognized from the view point of national or regional development policy.

3. Modal Development Plan

3-1 Road Plan

The total amount of the plan of action for the 6th Five Year Plan period must be consistant with the available financial resources. The plan is divided into five units covering the highway networks of National Transport Plan.

A plan of action has been framed by selecting a limited number of groups of priority highway sections from first stage construction plan of 'B' which can reasonably be implemented during the 6th Five Year Plan period.

In the absence of Sufficiency Rating System becomes a priority tool for highway improvement because of limitation of required data, the comparison in cost with benefit in terms of savings in time and operating costs are basically used as a means to determine the priority of construction for highways.

The optimum operating year and internal rate of return are calculated by road section. The economic rates of return have been calculated for the same base year 1983 to make all roads comparable with each other. The calcualtions show that many of the projects are feasible already before the base year 1983/84, with an opportunity cost of capital of 12%. Results are shown in Table 3-1-1.

For determing the highways of national importance, highway programme is grouped for the continuity and consistency of route development as shown in Table 3-1-2.

Highway with low-priority in terms of economic rate of return such as N-50, RCD Highway and direct highway from Quetta to Multan have been included through discussion made with authorities concerned.

As the result, primary and secondary road networks must be considered equal importance to the national economy and these roads will take up the major part of total highway investment in Pakistan. It is, therefore, proposed that the Federal Government shall be in charge of road authority and financial responsibility for the primary as well as the secondary road listed in Table 3-1-2 as plan of action for road project under federal budget.

On the basis of the priority determinations made, plan of actions are prepared and shown in Table 3-1-2 and 3-1-3.

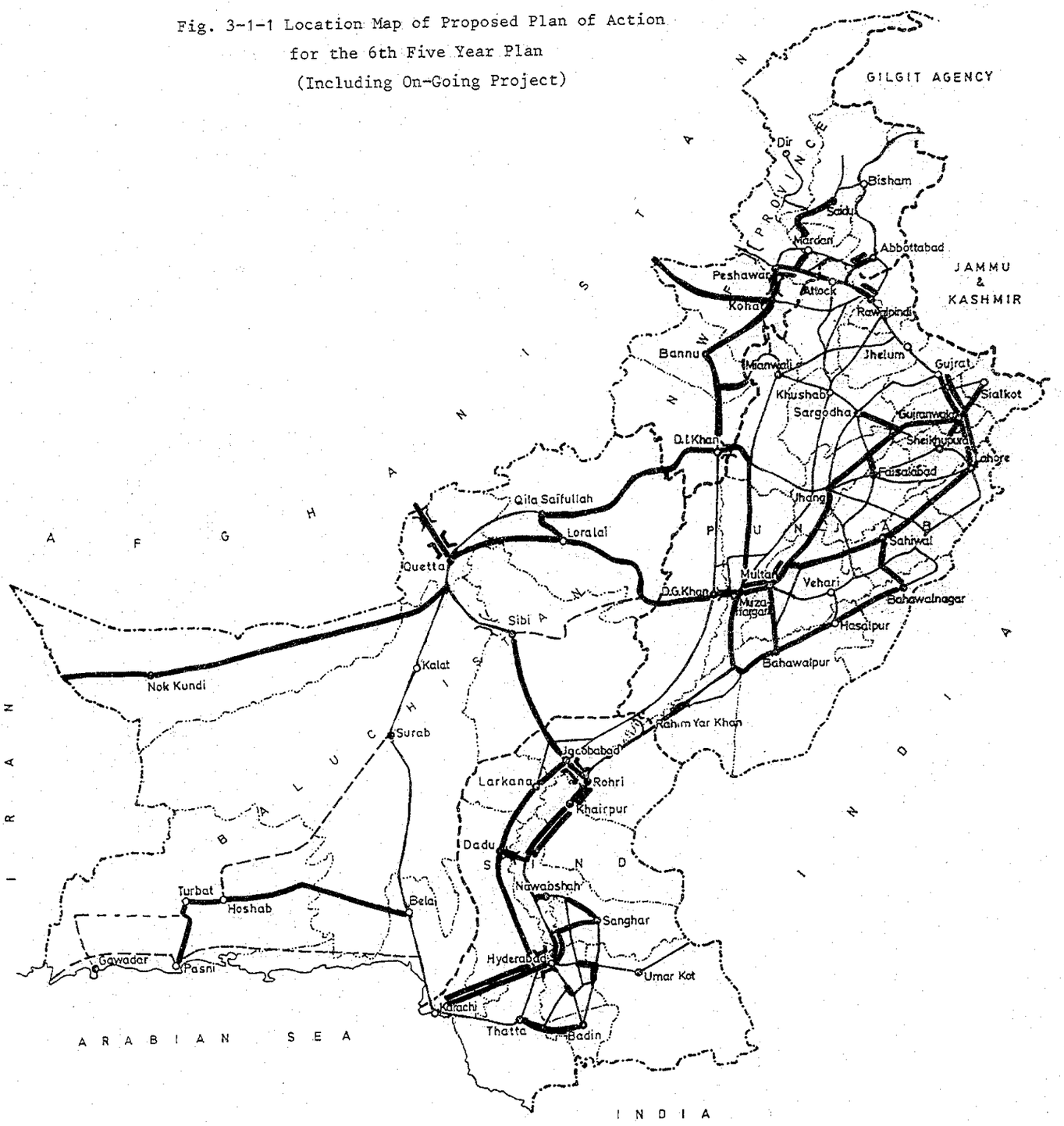
The proposed plan of actions are shown in Fig. 3-1-1.

The annual phasing for road projects have been carried out on the basis of the size of the projects and construction capabilities. The smaller projects costing less than Rs. 200 million are phased to complete in 3 years and the phasing of their expenditures over the years will be made in the ratio 30:50:20.

The bigger projects costing more than Rs. 200 million are phased to complete in 4 years and the phasing of their expenditures over the years will be made in the ratio 20:35:35:10.

Functional classification of the road network should not be regarded as a one-time process, being social economy valid for all times to come. It is proposed that the decision on the proper classification of a highway should be based on an evaluation of the functional use and the character of the interest.

Fig. 3-1-1 Location Map of Proposed Plan of Action
for the 6th Five Year Plan
(Including On-Going Project)



Proposed Section for Plan of Action

Two-Lane Highway

Four-Lane Highway

Fig. 3-1-2 Index Plan of National Highway to be Started in the 6th Plan Period

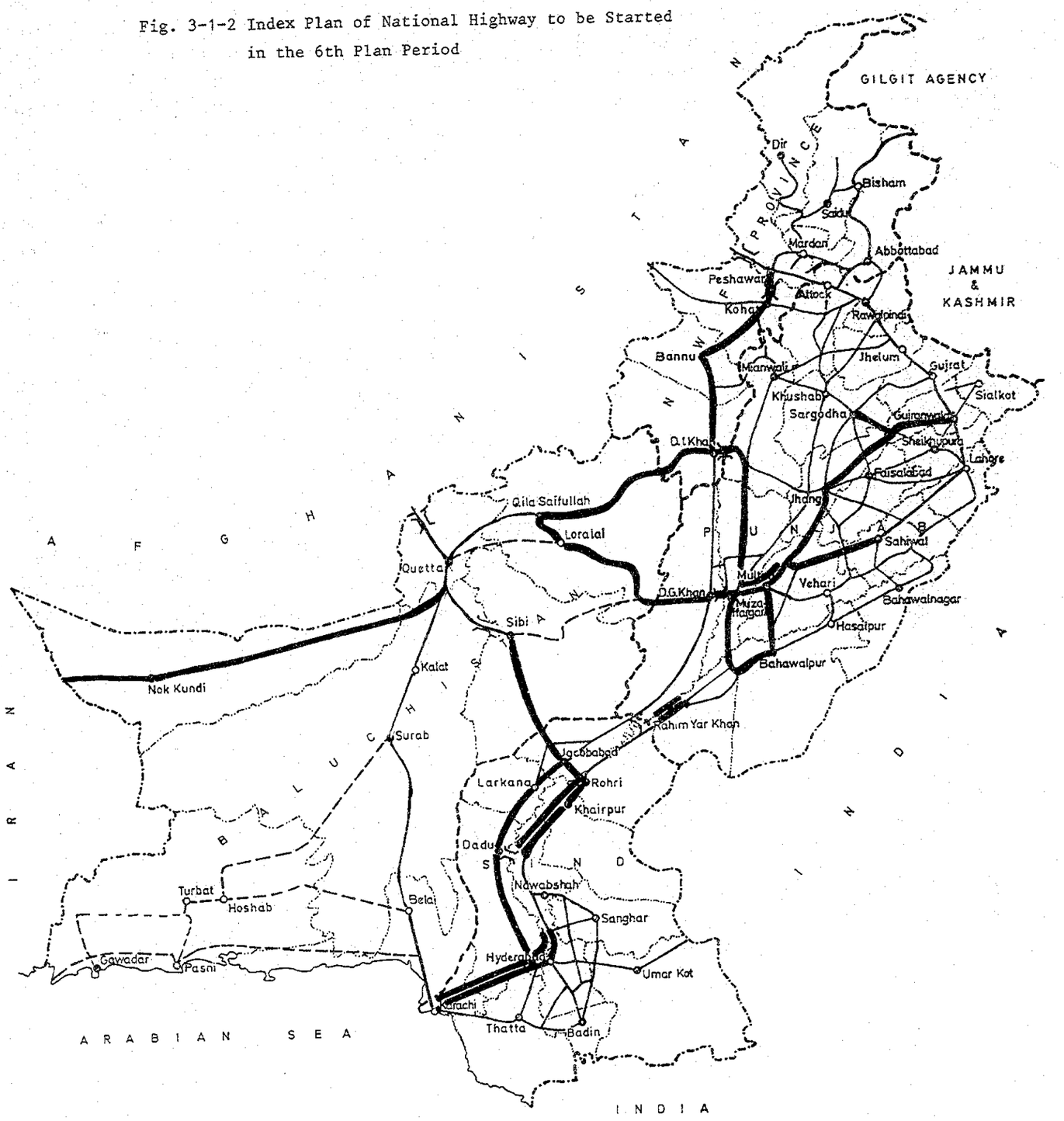


Table 3-1-1 (1) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
54	652013	8	100.0	96.70	5.42	17.84	91.28	1	3.15	5.25	2.10		1.85	83/84
102	2026	21	100.0	18.01	13.89	1.30	4.12	2	8.08	13.46	5.39		0.29	83/84
188	3023	23	86.5	230.94	20.47	11.28	210.47	3	11.90	19.84	7.94		1.41	83/84
52	652011	43	82.2	506.68	35.60	14.23	471.09	4	20.70	34.50	13.80		1.13	83/84
17	51008	13	81.2	221.34	19.81	11.17	201.53	5	11.52	19.20	7.68		1.24	83/84
84	3021	65	73.5	260.08	43.20	6.02	216.88	6	25.12	41.88	16.75		1.24	83/84
171	111091	99	71.6	1308.57	120.58	10.85	1187.99	7	70.13	116.88	46.75		0.90	83/84
2	52002	15	70.0	643.75	51.76	12.44	591.99	8	30.10	50.17	20.07		0.93	83/84
97	2021	32	69.9	122.74	19.28	6.37	103.46	9	11.21	18.69	7.48		1.05	83/84
83	3020	29	66.6	357.22	35.86	9.96	321.36	10	20.86	34.76	13.90		0.90	83/84
138	1058	63	61.3	341.72	48.73	7.01	292.99	11	28.34	47.23	18.89		0.78	83/84
147	1067	40	61.2	452.10	53.09	8.52	399.01	12	30.88	51.46	20.59		0.77	83/84
15	51006	75	60.2	1026.45	120.98	8.48	905.48	13	70.36	117.26	46.91		0.65	83/84
71	2015	123	58.9	533.59	77.33	6.90	456.26	14	44.97	74.95	29.98		0.75	83/84
189	3024	66	56.7	207.86	49.03	4.24	158.83	15	28.51	47.52	19.01		0.79	83/84
18	51009	79	56.4	1136.29	149.67	7.59	986.63	16	60.93	106.63	106.63	30.47	0.88	83/84
169	111089	82	55.8	1011.56	128.00	7.90	883.56	17	74.44	124.07	49.63		0.51	83/84
20	51011	37	54.5	996.79	125.96	7.91	870.83	18	73.26	122.09	48.84		0.63	83/84
6	52006	132	54.1	3619.52	335.15	10.80	3284.38	19	136.45	238.79	238.79	68.22	0.70	83/84
141	1061	53	53.3	325.82	52.24	6.24	273.58	20	30.38	50.64	20.26		0.64	83/84
119	112043	26	52.9	185.40	29.43	6.30	155.97	21	17.12	28.53	11.41		0.61	83/84
87	1037	82	52.1	773.31	125.45	6.16	647.86	22	72.96	121.60	48.64		0.61	83/84
201	4016	118	50.7	197.46	36.27	5.44	161.19	23	21.09	35.15	14.06		0.65	83/84
16	51007	44	49.9	1360.93	160.41	8.48	1200.52	24	65.31	114.29	114.29	32.65	0.64	83/84
150	1070	37	49.6	359.13	57.58	6.24	301.55	25	33.49	55.81	22.33		0.55	83/84
7	52007	22	49.6	819.34	105.11	7.80	714.23	26	61.13	101.88	40.75		0.50	83/84

Table 3-1-1 (2) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
53	652012	42	49.3	415.58	52.32	7.94	363.26	27	30.43	50.71	20.29		0.37	83/84
142	1062	48	49.0	568.46	92.46	6.15	476.00	28	53.77	89.62	35.85		0.55	83/84
195	3030	35	47.1	189.32	35.72	5.30	153.60	29	20.77	34.62	13.85		0.53	83/84
1	52001	160	46.9	3763.53	479.99	7.84	3283.54	30	195.42	341.98	341.98	97.71	0.54	83/84
120	112044	40	46.5	173.55	37.34	4.65	136.22	31	21.71	36.19	14.48		0.52	83/84
145	1065	91	46.1	390.78	69.00	5.66	321.78	32	40.13	66.88	26.75		0.51	83/84
111	2035	16	45.8	82.10	14.71	5.58	67.39	33	8.56	14.26	5.70		0.50	83/84
81	3018	47	45.7	248.01	43.04	5.76	204.98	34	25.03	41.71	16.69		0.43	83/84
156	1076	31	45.6	172.53	29.80	5.79	142.72	35	17.33	28.89	11.56		0.48	83/84
157	1077	57	45.6	317.10	54.80	5.79	262.30	36	31.87	53.11	21.25		0.48	83/84
132	1052	26	45.1	113.75	26.69	4.26	87.06	37	15.52	25.87	10.35		0.50	83/84
94	1041	8	44.8	48.99	9.10	5.38	39.89	38	5.29	8.82	3.53		0.47	83/84
151	1071	52	44.7	557.29	108.76	5.12	448.54	39	63.25	105.42	42.17		0.50	83/84
167	111087	40	44.7	170.20	37.34	4.56	132.86	40	21.72	36.19	14.48		0.54	83/84
134	1054	113	43.9	851.31	189.01	4.50	662.30	41	76.95	134.67	134.67	38.48	0.60	83/84
21	51012	130	43.9	1311.11	201.79	6.50	1109.32	42	82.16	143.77	143.77	41.08	0.45	83/84
173	111093	104	43.9	438.96	85.19	5.15	353.77	43	49.54	82.57	33.03		0.42	83/84
3	52003	55	42.8	1197.89	186.45	6.42	1011.44	44	75.91	132.84	132.84	37.95	0.49	83/84
33	53002	36	42.7	335.09	79.40	4.22	255.69	45	46.18	76.96	30.79		0.45	83/84
172	111092	60	42.6	254.58	52.83	4.82	201.75	46	30.72	51.20	20.48		0.45	83/84
184	111104	29	42.4	75.35	17.76	4.24	57.59	47	10.33	17.21	6.89		0.51	83/84
5	52005	68	41.7	1576.34	261.74	6.02	1314.60	48	106.56	186.48	186.48	53.28	0.48	83/84
32	53001	14	41.6	147.86	41.73	3.54	106.13	49	24.27	40.45	16.18		0.48	83/84
19	51010	40	41.4	574.71	131.64	4.37	443.07	50	53.59	93.79	93.79	26.80	0.58	83/84
12	51003	12	41.4	122.59	22.72	5.40	99.87	51	13.21	22.02	8.81		0.26	83/84
146	1066	78	41.0	129.94	25.85	5.03	104.09	52	15.03	25.05	10.02		0.38	83/84

Table 3-1-1 (3) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
158	111078	40	41.0	145.98	36.07	4.05	109.91	53	20.98	34.96	13.99		0.48	83/84
104	2028	48	40.6	145.72	29.17	5.00	116.55	54	16.96	28.27	11.31		0.39	83/84
10	51001	48	40.2	282.53	90.54	3.12	192.00	55	52.66	87.76	35.10		0.47	83/84
55	654009	148	39.7	1427.56	268.95	5.31	1158.61	56	109.50	191.62	191.62	54.75	0.45	83/84
72	2016	63	39.7	103.52	24.34	4.25	79.18	57	14.16	23.59	9.44		0.39	83/84
155	1075	50	39.3	94.86	24.81	3.82	70.06	58	14.43	24.04	9.62		0.46	83/84
148	1068	46	39.2	175.96	27.47	6.40	148.49	59	15.98	26.63	10.65		0.18	83/84
123	1043	129	38.7	678.46	184.03	3.69	494.43	60	74.93	131.12	131.12	37.46	0.57	83/84
109	2033	24	38.4	103.43	22.32	4.63	81.11	61	12.98	21.63	8.65		0.36	83/84
170	111090	33	38.4	177.26	56.22	3.15	121.04	62	32.70	54.49	21.80		0.30	83/84
175	111095	99	38.1	434.54	109.17	3.98	325.37	63	63.49	105.82	42.33		0.40	83/84
13	51004	70	37.8	478.01	129.24	3.70	348.77	64	52.62	92.08	92.08	26.31	0.43	83/84
106	2030	40	36.6	165.29	41.48	3.98	123.81	65	24.12	40.21	16.08		0.37	83/84
177	111097	82	36.5	405.88	98.04	4.14	307.84	66	57.02	95.03	38.01		0.32	83/84
183	111103	57	35.6	275.11	53.92	5.10	221.20	67	31.36	52.26	20.91		0.17	83/84
135	1055	117	34.9	710.87	197.87	3.59	513.00	68	80.56	140.98	140.98	40.28	0.39	83/84
131	1051	999	34.6	197.07	55.96	3.52	141.11	69	32.54	54.24	21.70		0.31	83/84
45	353006	54	34.6	858.73	198.93	4.32	659.80	70	80.99	141.74	141.74	40.50	0.35	83/84
133	1053	34	34.5	471.90	127.73	3.69	344.16	71	74.29	123.82	49.53		0.33	83/84
86	1056	97	34.4	631.87	104.41	6.05	527.46	72	60.73	101.21	40.48		0.15	83/84
108	2032	81	34.2	190.49	54.71	3.48	135.78	73	31.82	53.03	21.21		0.32	83/84
37	254001	82	34.0	260.21	70.12	3.71	190.09	74	40.78	67.96	27.19		0.24	83/84
22	51013	67	33.9	2437.50	570.73	4.27	1866.78	75	232.36	406.63	406.63	116.18	0.33	83/84
4	52004	38	33.6	491.49	122.82	4.00	368.68	76	71.43	119.05	47.62		0.27	83/84
129	1049	62	33.3	256.78	68.62	3.74	188.16	77	39.91	66.51	26.61		0.20	83/84
178	111098	81	33.2	366.33	106.14	3.45	260.19	78	61.73	102.88	41.15		0.30	83/84

Table 3-1-1 (4) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
11	51002	100	33.2	469.76	184.42	2.55	285.34	79	75.08	131.39	131.39	37.54	0.48	83/84
174	111094	125	32.9	352.47	94.57	3.73	257.90	80	55.00	91.67	36.67		0.20	83/84
65	3014	186	32.7	504.31	150.99	3.34	353.32	81	61.47	107.58	107.58	30.74	0.40	83/84
27	51018	32	32.6	559.16	131.43	4.25	427.73	82	53.51	93.64	93.64	26.76	0.20	83/84
38	254002	77	32.6	198.94	68.83	2.89	130.11	83	40.03	66.71	26.69		0.32	83/84
23	51014	32	32.5	578.70	138.59	4.18	440.10	84	56.43	98.75	98.75	28.21	0.29	83/84
101	2025	999	32.0	140.09	54.87	2.55	85.22	85	31.91	53.18	21.27		0.35	83/84
98	2022	74	31.7	227.25	66.43	3.42	160.82	86	38.63	64.39	25.76		0.28	83/84
136	1056	171	31.4	259.11	76.69	3.38	182.42	87	44.60	74.33	29.73		0.26	83/84
8	52008	109	31.2	1467.30	344.29	4.26	1123.01	88	140.17	245.30	245.30	70.08	0.18	83/84
200	4015	328	30.7	400.77	131.85	3.04	268.92	89	53.68	93.94	93.94	26.84	0.36	83/84
128	1048	58	30.6	142.87	49.38	2.89	93.49	90	28.72	47.86	19.15		0.29	83/84
163	111083	24	30.3	32.76	12.01	2.73	20.75	91	6.98	11.64	4.66		0.33	83/84
92	4011	217	29.7	294.49	73.80	3.99	220.69	92	42.92	71.53	28.61		0.16	83/84
176	111096	47	29.5	95.55	31.78	3.01	63.77	93	18.48	30.80	12.32		0.23	83/84
103	2027	16	28.8	25.20	9.63	2.62	15.58	94	5.60	9.33	3.73		0.27	83/84
117	2041	77	28.8	131.73	51.48	2.56	80.25	95	29.94	49.90	19.96		0.31	83/84
68	1030	40	28.6	77.34	27.90	2.77	49.43	96	16.23	27.04	10.82		0.25	83/84
181	111101	46	28.0	172.10	66.37	2.59	105.72	97	38.60	64.33	25.73		0.25	83/84
76	1032	224	27.9	372.04	136.11	2.73	235.93	98	55.42	96.98	96.98	27.71	0.30	83/84
26	51017	38	27.6	829.01	272.50	3.04	556.52	99	110.94	194.15	194.15	55.47	0.24	83/84
67	1029	38	26.8	67.45	26.58	2.54	40.88	100	15.46	25.76	10.30		0.23	83/84
143	1063	42	26.2	175.74	62.73	2.80	113.01	101	36.49	60.81	24.32		0.14	84/85
152	1072	107	26.0	170.98	75.88	2.25	95.10	102	44.13	73.55	29.42		0.27	83/84
51	504008	175	25.9	89.74	39.87	2.25	49.88	103	23.19	38.64	15.46		0.26	83/84
56	654010	163	25.8	551.03	229.38	2.40	321.65	104	93.39	163.43	163.43	46.69	0.26	83/84

Table 3-1-7 (5) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
80	3017	95	25.4	138.01	56.49	2.44	81.52	105	32.86	54.76	21.90		0.19	83/84
180	111100	68	25.3	84.37	38.68	2.18	45.69	106	22.49	37.49	15.00		0.26	83/84
116	2040	26	25.0	41.87	19.45	2.15	22.42	107	11.31	18.85	7.54		0.26	83/84
91	3022	999	24.8	21.50	10.09	2.13	11.40	108	5.87	9.79	3.91		0.25	83/84
70	2014	196	24.1	302.14	137.63	2.20	164.51	109	56.03	98.06	98.06	28.02	0.26	83/84
42	254006	131	23.9	335.24	154.44	2.17	180.80	110	62.88	110.04	110.04	31.44	0.26	83/84
31	51022	45	23.9	827.88	331.62	2.50	496.26	111	135.01	236.27	236.27	67.51	0.15	83/84
127	1047	46	23.4	93.43	53.15	1.76	40.28	112	30.91	51.52	20.61		0.24	83/84
28	51019	29	23.3	404.52	162.48	2.49	242.03	113	66.15	115.77	115.77	33.08	0.19	84/85
57	1024	63	23.0	120.72	54.31	2.22	66.41	114	31.59	52.64	21.06		0.18	83/84
60	3012	39	22.9	29.04	12.95	2.24	16.10	115	7.53	12.55	5.02		0.17	83/84
61	1026	54	22.7	64.28	30.47	2.11	33.81	116	17.72	29.54	11.82		0.15	83/84
34	53003	23	22.2	312.59	132.18	2.36	180.42	117	53.81	94.17	94.17	26.91	0.13	84/85
93	4012	189	22.2	392.24	198.91	1.97	193.33	118	80.98	141.72	141.72	40.49	0.20	83/84
105	2029	68	22.1	173.03	68.05	2.54	104.98	119	39.58	65.96	26.38		0.13	86/87
35	53004	53	21.2	141.49	75.72	1.87	65.77	120	44.04	73.39	29.36		0.15	83/84
185	111105	29	20.9	29.35	16.80	1.75	12.56	121	9.77	16.28	6.51		0.21	83/84
41	254005	144	20.2	257.74	128.62	2.00	129.11	122	52.37	91.64	91.64	26.18	0.13	83/84
77	1033	53	19.7	132.18	80.90	1.63	51.28	123	47.05	78.42	31.37		0.20	83/84
90	1040	999	19.0	51.71	27.45	1.88	24.27	124	15.96	26.60	10.64		0.15	86/87
62	1027	48	18.9	197.88	124.41	1.59	73.47	125	72.36	120.59	48.24		0.17	83/84
24	51015	15	18.8	314.99	178.36	1.77	136.63	126	72.62	127.08	127.08	36.31	0.13	83/84
63	3013	999	18.2	25.55	17.12	1.49	8.43	127	9.96	16.60	6.64		0.18	83/84
179	111099	87	17.7	67.79	46.53	1.46	21.26	128	27.06	45.10	18.04		0.17	83/84
25	51016	52	17.3	723.06	453.14	1.60	269.92	129	184.49	322.85	322.85	92.24	0.13	84/85
107	2031	45	17.0	21.72	14.45	1.50	7.27	130	8.40	14.00	5.60		0.13	85/86

Table 3-1-1 (6) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
66	3015	50	16.8	39.00	25.38	1.54	13.62	131	14.76	24.60	9.84		0.12	86/87
125	1045	92	16.8	73.25	52.98	1.38	20.27	132	30.81	51.35	20.54		0.17	83/84
100	2024	100	16.5	143.66	106.00	1.36	37.66	133	61.65	102.75	41.10		0.16	83/84
118	2042	31	16.3	27.35	20.43	1.34	6.93	134	11.88	19.80	7.92		0.16	83/84
110	2034	34	15.1	39.22	30.61	1.28	8.61	135	17.80	29.67	11.87		0.13	86/87
112	2036	52	14.9	59.87	47.22	1.27	12.65	136	27.46	45.77	18.31		0.12	86/87
64	1028	999	14.8	18.65	15.38	1.21	3.27	137	8.94	14.90	5.96		0.15	83/84
186	111106	31	14.8	7.57	6.25	1.21	1.32	138	3.63	6.05	2.42		0.14	83/84
190	3025	132	14.7	32.96	29.75	1.11	3.20	139	17.30	28.84	11.54		0.34	83/84
73	2017	64	14.7	27.62	22.94	1.20	4.68	140	13.34	22.23	8.89		0.14	83/84
58	1025	9	13.8	9.54	8.36	1.14	1.18	141	4.86	8.11	3.24		0.12	85/86
162	111082	54	13.2	32.19	29.48	1.09	2.70	142	17.15	28.58	11.43		0.13	83/84
44	353005	3	12.8	19.13	18.28	1.05	0.85	143	10.63	17.71	7.09		0.14	84/85
14	51005	18	10.4	114.20	125.66	0.91	-11.46	144	73.08	121.80	48.72		0.13	84/85
144	1064	138	10.1	68.98	79.50	0.87	-10.53	145	46.24	77.06	30.83		****	*****
95	1042	84	10.1	94.99	107.02	0.89	-12.02	146	62.24	103.73	41.49		0.13	86/87
114	2038	55	9.8	38.85	45.81	0.85	-6.96	147	26.64	44.40	17.76		****	*****
59	3011	55	9.8	14.38	17.34	0.83	-2.96	148	10.09	16.81	6.72		****	*****
79	3016	62	9.7	19.46	23.09	0.84	-3.64	149	13.43	22.38	8.95		****	*****
115	2039	45	9.0	23.88	30.21	0.79	-6.33	150	17.57	29.28	11.71		****	*****
113	2037	30	8.3	6.03	8.05	0.75	-2.02	151	4.68	7.80	3.12		****	*****
165	111085	48	8.1	28.28	38.35	0.74	-10.07	152	22.30	37.17	14.87		****	*****
161	111081	40	7.8	26.04	36.15	0.72	-10.11	153	21.03	35.04	14.02		****	*****
126	1046	138	7.8	19.81	27.78	0.71	-7.96	154	16.15	26.92	10.77		****	*****
159	111079	57	7.5	35.76	51.18	0.70	-15.42	155	29.77	49.61	19.84		****	*****
47	353008	122	3.8	24.07	48.61	0.50	-24.54	156	28.27	47.12	18.85		****	*****

Table 3-1-1 (7) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
50	504007	210	1.1	17.69	47.56	0.37	-29.87	157	27.66	46.10	18.44		****	*****
49	503010	141	0.1	13.32	40.21	0.33	-26.89	158	23.38	38.97	15.59		****	*****
130	1050	68	0.0	0.09	63.42	0.00	-63.33	159	36.88	61.47	24.59		****	*****
160	111080	35	0.0	0.0	35.03	0.0	-35.03	160	20.37	33.96	13.58		****	*****
89	1039	94	0.0	0.0	19.13	0.0	-19.13	161	11.13	18.54	7.42		****	*****
9	52009	13	0.0	0.0	19.33	0.0	-19.33	162	11.24	18.73	7.49		****	*****
74	2018	47	0.0	0.0	16.77	0.0	-16.77	163	9.76	16.26	6.50		****	*****
164	111084	138	0.0	0.0	63.17	0.0	-63.17	164	36.74	61.23	24.49		****	*****
75	2019	2	0.0	0.0	0.73	0.0	-0.73	165	0.42	0.70	0.28		****	*****
166	111086	48	0.0	0.0	31.39	0.0	-31.39	166	18.26	30.43	12.17		****	*****
46	353007	24	0.0	0.0	15.43	0.0	-15.43	167	8.97	14.95	5.98		****	*****
168	111088	51	0.0	0.0	29.90	0.0	-29.90	168	17.39	28.98	11.59		****	*****
39	254003	293	0.0	0.0	84.74	0.0	-84.74	169	49.29	82.14	32.86		****	*****
137	1057	70	0.0	0.0	82.37	0.0	-82.37	170	47.90	79.84	31.94		****	*****
78	1034	106	0.0	0.0	92.68	0.0	-92.68	171	53.90	89.84	35.94		****	*****
139	1059	47	0.0	0.0	82.29	0.0	-82.29	172	47.86	79.76	31.91		****	*****
140	1060	89	0.0	0.0	85.46	0.0	-85.46	173	49.70	82.84	33.14		****	*****
96	2020	34	0.0	-93.75	16.99	-5.52	-110.74	174	9.88	16.46	6.59		****	*****
48	353009	157	0.0	-3.48	87.34	-0.04	-90.82	175	50.80	84.66	33.86		****	*****
40	254004	69	0.0	-8.37	19.96	-0.42	-28.32	176	11.61	19.34	7.74		****	*****
99	2023	102	0.0	-393.59	104.49	-3.77	-498.07	177	60.77	101.28	40.51		****	*****
29	51020	16	0.0	0.0	40.90	0.0	-40.90	178	23.79	39.64	15.86		****	*****
82	3019	98	0.0	0.0	51.90	0.0	-51.90	179	30.18	50.30	20.12		****	*****
121	112045	135	0.0	0.11	27.61	0.00	-27.51	180	16.06	26.76	10.71		****	*****
122	112046	76	0.0	0.0	33.70	0.0	-33.70	181	19.60	32.67	13.07		****	*****
182	111102	64	0.0	-1.63	19.30	-0.08	-20.93	182	11.23	18.71	7.48		****	*****

Table 3-1-1 (8) Priority Rating in Terms of IRR with Phasing and Optimum Timing of Construction

SEQ	LINK-NO	LENGTH	1987/88 PLAN IRR	BENEFIT	COST	B/C	B-C	PRIORITY	CONSTRUCTION COST 1ST	2ND	3RD	4TH	1ST Y.R.	OPTIMUM TIMING
149	1069	40	0.0	0.0	32.15	0.0	-32.15	183	18.70	31.16	12.46		****	*****
69	1031	30	0.0	-17.12	20.28	-0.84	-37.40	184	11.80	19.66	7.86		****	*****
124	1044	63	0.0	13.29	48.92	0.27	-35.63	185	28.45	47.41	18.97		****	*****
36	252010	18	0.0	0.0	22.32	0.0	-22.32	186	12.98	21.63	8.65		****	*****
187	111107	50	0.0	0.0	28.22	0.0	-28.22	187	16.41	27.35	10.94		****	*****
153	1073	130	0.0	-1.94	30.70	-0.06	-32.64	188	17.85	29.75	11.90		****	*****
154	1074	25	0.0	0.12	10.77	0.01	-10.65	189	6.26	10.43	4.17		****	*****
85	1035	38	0.0	0.0	128.24	0.0	-128.24	190	74.59	124.31	49.72		****	*****
191	3026	29	0.0	-24.21	20.87	-1.16	-45.08	191	12.14	20.23	8.09		****	*****
192	3027	28	0.0	2.09	15.47	0.13	-13.39	192	9.00	15.00	6.00		****	*****
193	3028	46	0.0	0.0	31.06	0.0	-31.06	193	18.07	30.11	12.04		****	*****
194	3029	999	0.0	-22.75	42.04	-0.54	-64.79	194	24.45	40.75	16.30		****	*****
43	351023	14	0.0	0.0	24.23	0.0	-24.23	195	14.09	23.49	9.40		****	*****
196	3031	82	0.0	0.0	16.48	0.0	-16.48	196	9.58	15.97	6.39		****	*****
197	3032	33	0.0	-7.57	14.56	-0.52	-22.12	197	8.47	14.11	5.64		****	*****
198	4013	344	0.0	-190.52	107.20	-1.78	-297.72	198	62.35	103.91	41.56		****	*****
199	4014	366	0.0	0.19	98.96	0.00	-98.77	199	57.55	95.92	38.37		****	*****
30	51021	30	0.0	0.0	159.40	0.0	-159.40	200	64.90	113.57	113.57	32.45	****	*****
88	1038	32	0.0	0.0	28.82	0.0	-28.82	201	16.76	27.93	11.17		****	*****
202	4017	230	0.0	8.38	195.56	0.04	-187.18	202	79.62	139.33	139.33	39.81	****	*****
203	4018	530	0.0	28.02	450.65	0.06	-422.63	203	183.47	321.08	321.08	91.74	****	*****
204	4019	999	0.0	9.95	302.67	0.03	-292.72	204	123.23	215.65	215.65	61.61	****	*****
205	4020	169	0.0	4.52	136.98	0.03	-132.46	205	55.77	97.59	97.59	27.88	****	*****
206	4021	115	0.0	1.64	97.59	0.02	-95.95	206	56.76	94.60	37.84		****	*****
207	4022	72	0.0	12.95	60.94	0.21	-48.00	207	35.44	59.07	23.63		****	*****
208	4023	272	0.0	21.72	219.83	0.10	-198.11	208	89.50	156.62	156.62	44.75	****	*****

Table 3-1-2 (1) Plan of Action for Road Project under Federal Budget

(MILLION RP., FINANCIAL, 1981 PRICE)

	NAME OF PROJECTS	ESTIMATED COST FOR MASTER PLAN TOTAL	FEC	--- ALLOCATION DURING 1983-88 -- 1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	TOTAL 1983 -88	BEYOND 1987 -88	1ST STAGE CONSTRUCTION COST	FEC	TYPE	IRR
NATIONAL HIGHWAY N-5														
1	KABIRWALA - KHANEWAL 51008	99	30	12	19	8	0	0	38	61	38	11	IV	81.2
2	KOTRI - HYDERABAD 52002	100	33	30	50	20	0	0	100	0	100	33	V	70.0
3	LODHRAN - MULTAN 51006	573	181	0	70	117	47	0	235	338	235	75	IV	60.2
4	KHANEWAL - CHICHAWATNI 51009	671	202	0	61	107	107	30	305	366	305	88	IV	56.4
5	MORO - KHAIRPUR 52006	682	215	0	136	239	239	68	682	0	682	211	V	54.1
6	MULTAN - KABIRWALA 51007	327	101	0	65	114	114	33	327	0	327	101	V	49.9
7	KHAIRPUR - ROHRI 52007	204	59	0	61	102	41	0	204	0	204	59	V	49.6
8	KARACHI - KOTRI 52001	977	320	0	195	342	342	98	977	0	977	322	V	46.9
9	HYDERABAD - HALA 52003	380	123	0	0	76	133	133	342	38	380	122	V	42.8
10	ATTOCK - JEHANGIRA 53001	183	46	0	0	24	40	16	81	102	81	19	IV	41.6
11	CHICHAWATNI - SAHIWAL 51010	448	136	0	0	54	94	94	241	207	268	80	IV	41.4
12	TRINDA - CHANI GOTH 51003	102	30	0	0	0	13	22	35	67	44	13	IV	41.4
13	S/P BOUND - RAHIMYAR KHAN 51001	359	112	0	0	0	53	88	141	218	176	55	IV	40.2
14	CHANI GOTH - BAHAWALPUR 51004	591	180	0	0	0	53	92	145	446	263	76	IV	37.8
	SUB TOTAL	5696	1768	42	657	1203	1276	674	3853	1843	4080	1265		

Table 3-1-2 (2) Plan of Action for Road Project under Federal Budget

(MILLION RP., FINANCIAL, 1981 PRICE)

NAME OF PROJECTS	ESTIMATED COST FOR MASTER PLAN TOTAL	FEC	--- ALLOCATION DURING 1983-88 --- 1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	TOTAL 1983 -88	BEYOND 1987 -88	1ST STAGE CONSTRUCTION COST	FEC	TYPE	IRR
NATIONAL HIGHWAY N-35													
1 HARIPUR - ABBOTTABAD 353006	405	110	0	0	0	81	142	223	182	405	109	V	34.6
SUB TOTAL	405	110	0	0	0	81	142	223	182	405	109		
NATIONAL HIGHWAY N-50													
1 N/B BOUND - QILA SAIFULLAH 504007	160	48	0	0	0	0	28	28	133	92	28	I	1.1
2 D.I.KHAN - N/B BOUND 503010	219	62	0	0	0	0	23	23	195	78	23	I	0.1
SUB TOTAL	379	110	0	0	0	0	51	51	328	170	51		
NATIONAL HIGHWAY N-65													
1 JACOBABAD - S/B BOUND 652013	43	14	3	5	2	0	0	11	33	11	4	IV	100.0
2 ROHRI - SHIKARPUR 652011	251	80	21	35	14	0	0	69	182	69	23	IV	82.2
3 SHIKARPUR - JACOBABAD 652012	342	103	0	30	51	20	0	101	240	101	27	IV	49.3
4 S/B BOUND - SIBI 654009	1459	413	0	0	0	109	109	218	1241	548	142	IV	39.7
SUB TOTAL	2095	610	24	70	67	129	109	399	1696	729	196		

Table 3-1-2 (3) Plan of Action for Road Project under Federal Budget

(MILLION RP., FINANCIAL, 1981 PRICE)

	NAME OF PROJECTS	ESTIMATED COST FOR MASTER PLAN TOTAL	ESTIMATED COST FOR MASTER PLAN FEC	--- ALLOCATION DURING 1983-88 -- 1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	TOTAL 1983 -88	BEYOND 1987 -88	1ST STAGE CONSTRUCTION COST	FEC	TYPE	IRR
INDUS HIGHWAY NORTH LINK														
1	KOHAT - PESHAWAR 3021	84	27	25	42	17	0	0	84	0	84	28	IV	73.5
2	JATTA - KOHAT 3020	70	18	21	35	14	0	0	70	0	70	18	IV	66.6
3	JAJAZAI - BANNU 3018	83	18	0	0	25	42	17	83	0	83	18	III	45.7
4	CHOWK MUNDA - SARAI KRISHMA 111093	165	49	0	0	50	83	33	165	0	165	50	III	43.9
5	MUZAFFZRGARH - CHOWK MUNDA 111092	102	29	0	0	31	51	20	102	0	102	30	III	42.6
6	D.I.KHAN - JAJAZAI 3017	181	48	0	0	0	33	55	88	93	109	33	II	25.4
7	T.M.RANAH - MUZAFFARGARH 001043	374	104	0	0	0	0	75	75	299	374	105	IV	38.7
8	SARAI KRISHMA - P/N BOUND 001040	87	25	0	0	0	0	16	16	71	53	16	II	19.0
9	BANNU - JATTA 3019	175	44	0	0	0	0	30	30	145	101	29	II	0.0
	SUB TOTAL	1321	362	46	77	137	209	246	713	608	1141	327		
INDUS HIGHWAY SOUTH LINK														
1	DADU - LARKANA 2015	150	45	0	45	75	30	0	150	0	150	45	III	58.9
2	LARKANA - SHIKARPUR 2016	82	24	0	0	0	14	24	38	44	47	14	II	39.7
3	KOTRI - DADU 2014	280	84	0	0	0	56	98	154	126	280	84	III	24.1
	SUB TOTAL	512	153	0	45	75	100	122	342	170	477	143		

Table 3-1-2 (4) Plan of Action for Road Project under Federal Budget

(MILLION RP., FINANCIAL, 1981 PRICE)

	NAME OF PROJECTS	ESTIMATED COST FOR MASTER PLAN TOTAL	FEC	--- ALLOCATION DURING 1983-88 -- 1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	TOTAL 1983 -88	BEYOND 1987 -88	1ST STAGE CONSTRUCTION COST	FEC	TYPE	IRR
QUETTA-D.G.KHAN-MULTAN LINK														
1	KARAMAD/QURESHI - MUZAFFARGARH 001052	91	27	0	0	16	26	10	52	39	52	14	III	45.1
2	B/P BOUND - BEWATA 001041	28	8	0	0	5	9	4	18	10	18	5	III	44.8
3	MUZAFFARGARH - MULTAN 001053	248	77	0	0	0	74	124	198	50	248	77	V	34.5
4	LORALAI - B/P BOUND 4012	505	150	0	0	0	0	81	81	424	405	117	III	22.2
5	BEWATA - D.G.KHAN 001042	290	86	0	0	0	0	65	65	225	207	62	III	9.5
6	LORALAI - QILA SAIFULLAH 4022	118	34	0	0	0	0	35	35	83	118	34	I	0.0
	SUB TOTAL	1280	382	0	0	21	109	319	449	831	1048	309		
KABIRWALA-JHANG-CHINIOT-PINDI BHATTIAN-GUJRANWALA LINK														
1	PINDI BHATTIAN - GUJRANWALA	674	207	70	117	47	0	0	234	440	234	61	IV	71.6
2	JHANG - CHINIOT 111091	618	190	0	74	124	50	0	248	370	248	67	IV	55.8
3	KABIRWALA - JHANG 111089	1031	295	0	0	77	135	135	346	685	385	104	IV	43.9
4	CHINIOT - PINDI BHATTIAN 001054 111090	268	79	0	0	0	33	54	87	181	109	27	IV	38.4
	SUB TOTAL	2591	771	70	191	248	218	189	915	1676	976	259		

Table 3-1-2 (5) Plan of Action for Road Project under Federal Budget

(MILLION RP., FINANCIAL, 1981 PRICE)

	NAME OF PROJECTS	ESTIMATED COST FOR MASTER PLAN TOTAL	FEC	--- ALLOCATION DURING 1983-88 -- 1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	TOTAL 1983 -88	BEYOND 1987 -88	1ST STAGE CONSTRUCTION COST	FEC	TYPE	IRR
RCD HIGHWAY														
1	QUETTA - DALBANDIN 4013	468	145	0	0	0	0	62	62	406	207	64	I	0.0
2	DALBANDIN - IRAN BOUND 4014	450	137	0	0	0	0	58	58	392	192	60	I	0.0
	SUB TOTAL	918	282	0	0	0	0	120	120	798	399	124		
PINDI BHATTIAN-SARGODHA DIRECT LINK														
1	PINDI BHATTIAN - SARGODHA 001058	191	54	28	47	19	0	0	94	96	94	25	III	61.3
	SUB TOTAL	191	54	28	47	19	0	0	94	96	94	25		
	FEDERAL BUDGET TOTAL	15388	4602	210	1087	1770	2122	1972	7159	8228	9519	2808		

Table 3-1-3 (1) Plan of Action for Road Project under Provincial Budget

(MILLION RP., FINANCIAL, 1981 PRICE)

	NAME OF PROJECTS	ESTIMATED COST FOR MASTER PLAN TOTAL	FEC	--- ALLOCATION DURING 1983-88 -- 1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	TOTAL 1983 -88	BEYOND 1987 -88	1ST STAGE CONSTRUCTION COST	FEC	TYPE	IRR
PUNJAB PROVINCE														
1	BAHAWALNAGAR - ARIFWALA 001067	304	95	31	51	21	0	0	103	201	103	28	IV	61.2
2	SHEIKHUPURA - GUJRANWALA 001061	125	35	30	51	20	0	0	101	23	101	28	III	53.3
3	FAISALABAD - JHANG 001037	714	220	0	73	122	49	0	244	470	244	66	IV	52.1
4	FAISALABAD - CHINIOT 001070	316	96	0	0	33	56	22	111	205	111	29	IV	49.6
5	GUJRANWALA - SIALKOT 001062	179	49	0	0	0	54	90	144	35	179	48	IV	49.0
6	BAHAWALPUR - HASSALPUR 001065	134	35	0	0	0	0	40	40	94	134	35	III	46.1
7	HASSALPUR - BAHAWALNAGAR 001066	111	29	0	0	0	0	15	15	96	50	15	II	41.0
8	ARIFWALA - SAHIWAL 001068	53	15	0	0	0	0	16	16	38	53	15	III	39.2
	SUB TOTAL	1936	574	61	175	196	159	183	774	1162	975	264		
SIND PROVINCE														
1	SAKLAND - NAWABSHAH 2026	55	15	8	13	5	0	0	26	29	26	8	III	100.0
2	TANDO ALLAYAR - MIRPUR KHAS 2021	78	27	11	19	7	0	0	37	41	37	11	III	69.9
3	HALA - SHAHDADPUR 112043	82	23	17	29	11	0	0	57	25	57	17	III	52.9
4	SHAHDADPUR - SANGHAR 112044	104	30	0	22	36	14	0	72	31	72	22	III	46.5
5	TANDO M.KHAN - MATLI 2035	29	8	0	9	14	6	0	29	0	29	9	III	45.8
6	GUPCHANI - SANGHAR 2028	56	17	0	0	17	28	11	56	0	56	17	III	40.6
7	SUJWAL - THATTA 2033	44	13	0	0	13	22	9	44	9	44	13	III	38.4
8	MIRPUR KHAS - DIGRI 2030	80	24	0	0	0	24	40	64	16	80	24	III	36.6
9	BADIN - SUJWAL 2032	173	50	0	0	0	32	53	85	88	106	33	II	34.2
	SUB TOTAL	701	207	36	92	103	126	113	470	239	507	154		

Table 3-1-3 (2) Plan of Action for Road Project under Provincial Budget

(MILLION RP., FINANCIAL, 1981 PRICE)

	NAME OF PROJECTS	ESTIMATED COST FOR MASTER PLAN TOTAL	FEC	--- ALLOCATION DURING 1983-88 -- 1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	TOTAL 1983 -88	BEYOND 1987 -88	1ST STAGE CONSTRUCTION COST	FEC	TYPE	IRR
N W F P														
1	MARDAN - CHAKDARA 3024	116	28	29	48	19	0	0	96	20	96	22	III	56.7
2	CHAKDARA - SAIDU SHARIF 3030	70	17	0	21	35	14	0	70	0	70	17	III	47.1
3	KABUL - KOHAT 3014	307	96	0	0	61	108	108	277	30	307	95	III	32.7
4	JAJAZAI - N/P BOUND 3012	25	8	0	0	8	13	4	25	0	25	8	II	22.9
	SUB TOTAL	518	149	29	69	123	135	112	468	50	498	142		
BULUCHISTAN PROVINCE														
1	HOSHAB - PIDAPAK 4016	70	22	21	35	14	0	0	70	0	70	22	I	50.7
2	BELA - HOSHAB 4015	268	80	0	54	94	94	27	268	0	268	80	I	30.7
3	QUETTA - LORALAI 4011	309	95	0	0	43	72	29	143	166	143	44	I	29.7
4	PIDARAK - PASANI 4021	189	55	0	0	0	57	95	151	38	189	55	I	0.0
	SUB TOTAL	836	252	21	89	151	223	151	632	204	670	201		

3-2 Road Transport Plan

Based on the analysis described in 2-2, Road Transport Plan, following (1) Main Policy for the next Five Year Plan and (2) Criteria to select the project are adopted as explained below.

(1) Main Policy for the Next Five Year Plan

1) Passenger Transport

(i) It should be recommended that long term development and arrnagement schedule are to be clarified by those corporations providing public bus service as PRTB, SRTC, NWFP RTB.

(ii) It is necessary for those public corporations to promote the productivity of bus operation by strengthening the management system.
It is considered that private sector has higher productivity than the public sector.

(iii) It is not preferable that two of public sectors compete at the same route. Commencement of bus service by NLC should coordinate with other public bus service considering above remarks.

2) Freight Transport

(i) It is preferrable to regulate the axle load to 10 tons by single axles and 18 tons by tandem axles.

(ii) It is preferable to introduce large size truck gradually so that the economy of vehicle cost will not be ignored.

(iii) It is necessary to consider to maintain the employment opportunities even in introducing large size such as locally made 3 axles truck and 5 axles truck.

(iv) NLC should clarify the future vision regarding items of transport and shares.
It is not preferable that NLC's service discourages the investment motive of private sector.

(2) Criteria to Select the Project for the Next Five Year Plan

1) Passenger Transport

(i) Semi-public Sector

Operational efficiency of PRTB and SRTC descreased because of higher vintage of existing bus facilities due to no bus supply for long period.

Although, NWFP RTB has realized reasonably steady replacement, bus purchase plan in order to improve the operational activity is given higher priority.

It is recommendable that bus acquisition plan is to be made in longer span, rather than to acquire at once, in order to maintain stable bus service.

(ii) NLC

Bus purchase plan by public sector has lower priority in this Masterplan which has a policy to encourage private and semi-public sectors.

Considering the realizability of bus purchase by NLB, bus acquision project is selected for the next Five Year Plan.

2) Freight Transport

(i) Replacement of Truck and Bowzer by NLC

In order to avoid the decrease of operational efficiency and the increase of cost for the transport of essential commodity, the projects of Nos. 3 and 6 on the list are selected.

(ii) Purchase Plan of Truck

Enforcement programme of truck is given the higher priority, considering the natural growth by year of commodity flow.

(iii) Purchase Plan of Truck for Container

Considering the necessity to coordinate containerization project, purchase plan of truck is selected, although truck acquisition pace has been slow due to railway encouragement policy.

(iv) Purchase Plan of Trailer (30 TON)

Trailer to carry the heavy machine for the copper mine in Saindak is identified, though the timing to acquire is not certain at this stage.

1987 / 88 is given as the starting year.

3-3 Railway Plan

3-3-1 Concept for the 6th Plan Project

It is forecasted that the passenger traffic will increase 1.4 times (passenger-km) and goods traffic by 1.7 times (t-km base) during the Next Five Year Plan period.
As a result, the number of trains between Karachi and Samasata will increase to about 50. This number is not large for one-way running in a double track section. However, the line does not have sufficient potential to ensure the smooth running of trains as long as the present signaling method based on absolute blocks is used.

In addition, in order to recover the lost transportation share of railways for the future, the railways must reestablish their position as a national transportation artery utilizing the container transportation and this is expected to be carried out at the end of 6th Plan, and become the basis for future development.

The following targets may be set-up in the 6th Plan in respect of performance of railways to increase the competitive potential.

- A turn-round time of ordinary goods trains should be shortened from the present 15 days to 12 days by eliminating the troubles of locomotive engines and so on.
- A running time between Karachi and Lahore should be reduced from the present average of 60 hours to the scheduled 36 hours.
- A travelling time of container trains from Karachi to Lahore may be also shortened within 24 hours.

Also, in response to the development of Baluchistan currently being carried out, it is urgently needed to improve the bottleneck in transport at the Bolan Pass which is one of the largest problems of Pakistan Railways.

By taking account of the above, it is required that we emphasize the following project in the 6th Five Year Plan:

- Improving the train operation devices on the main lines
- Introduction of container transportation.
- Introduction of high speed goods transportation.
- Eliminating the bottleneck at the Bolan Pass.
- Improving and developing the fundamentals of transportation.

3-3-2 Identification of the 6th Plan Projects

(1) Improving the Train Operation Devices on the Main Lines

The improvement of the signaling method between Karachi and Lahore, where high speed trains will be introduced, is urgently required, and the overall plan for this may become extremely large in

scale. Thus, it is more realistic to complete this project within about 10 years, during the execution of the 6th and 7th Five Year Plans. It is desirable to carry out the contents of the 6th Plan by taking account of electrification progress, the present condition of single track sections, and the advantages of total execution of the overall development project.

Between Samasata and Lahore:	Automatic signalization Relay interlocking
Between Sibi and Quetta:	Automatic signalization Relay interlocking

(2) Introduction of Container Transportation

According to the forecasts for containerization by 1987/88, the tonnage of containers will be 413 thousand tons for UP trains and 235 thousand tons for DOWN trains, which are equivalent to two container trains with 2000-t tractive force. 3000-t tractive force trains will be planned for by the year 2000, but this can be achieved by beginning with a tractive force of 2000 tons in 1988 and by gradually increasing it thereafter.

To respond to the above, Lahore Dry Port must be arranged and wagons must be purchased.

Lahore Dry Port: To be developed by 40%.

Container wagons: Wagons for two trains are to be purchased.

Locomotives: 3000 HP Locomotives to be commonly operated with high speed goods trains.

(3) Introduction of High Speed Goods Trains

The amount of goods between Karachi and Lahore in 1987/1988 is expected to be 1127 thousand tons for UP trains and 214 thousand tons for DOWN trains. Most of this amount may be absorbed by the introduction of high speed goods trains having a tractive force of 2000 tons. Because of this, two trains should be used at first and then gradually strengthened. Terminals required for this purpose

should be developed at Lahore and Karachi. The terminal at Lahore should be located adjacent to the Dry Port, and it is desirable to use the reception and departure lines,storage sidings for locomotives and so forth in common.

Karachi and Lahore terminals:	To be developed by about 40%.
High speed goods wagons:	To be purchased new. To be replaced.
Locomotives:	3000 HP Locos to be commonly used.

(4) Eliminating the Bottleneck at Bolan Pass

The steep gradient between Sibi and Kolpur is the current bottleneck in transportation, but this section is important as a main transportation route for the future mining industry. This section is consuming extra energy and labor even now, so that it must be immediately electrified in order to reduce the expenses.

Between Sibi and Kolpur:	Electrification. Purchasing electric locomotives.

(5) Improving and Developing the Fundamentals of Transportation

In response to the introduction of container transportation and high speed goods trains, the transportation facilities must be improved and developed. Also, it is desirable to carry out the following projects by taking account of the improvement of speed of trains, the improvement of operating efficiency of locomotives and goods wagons, and the overall improvement of various facilities.

◦ Electrification:	Samasata to Khanenal, Samasata (Loop line) to Khanwal.
◦ Track doubling:	Lodhran to Khanewal , Piran Ghaib to Khanewal.

- Station loop:
  (at the same time with track doubling) — Lodhran, Khanewal
- EL shed: — Multan
- Tack renewal: — Mainly between KHI and LHR
- Replacement of rolling stock

The above projects are illustrated in Figs. 3-3-1 to 3-3-3.

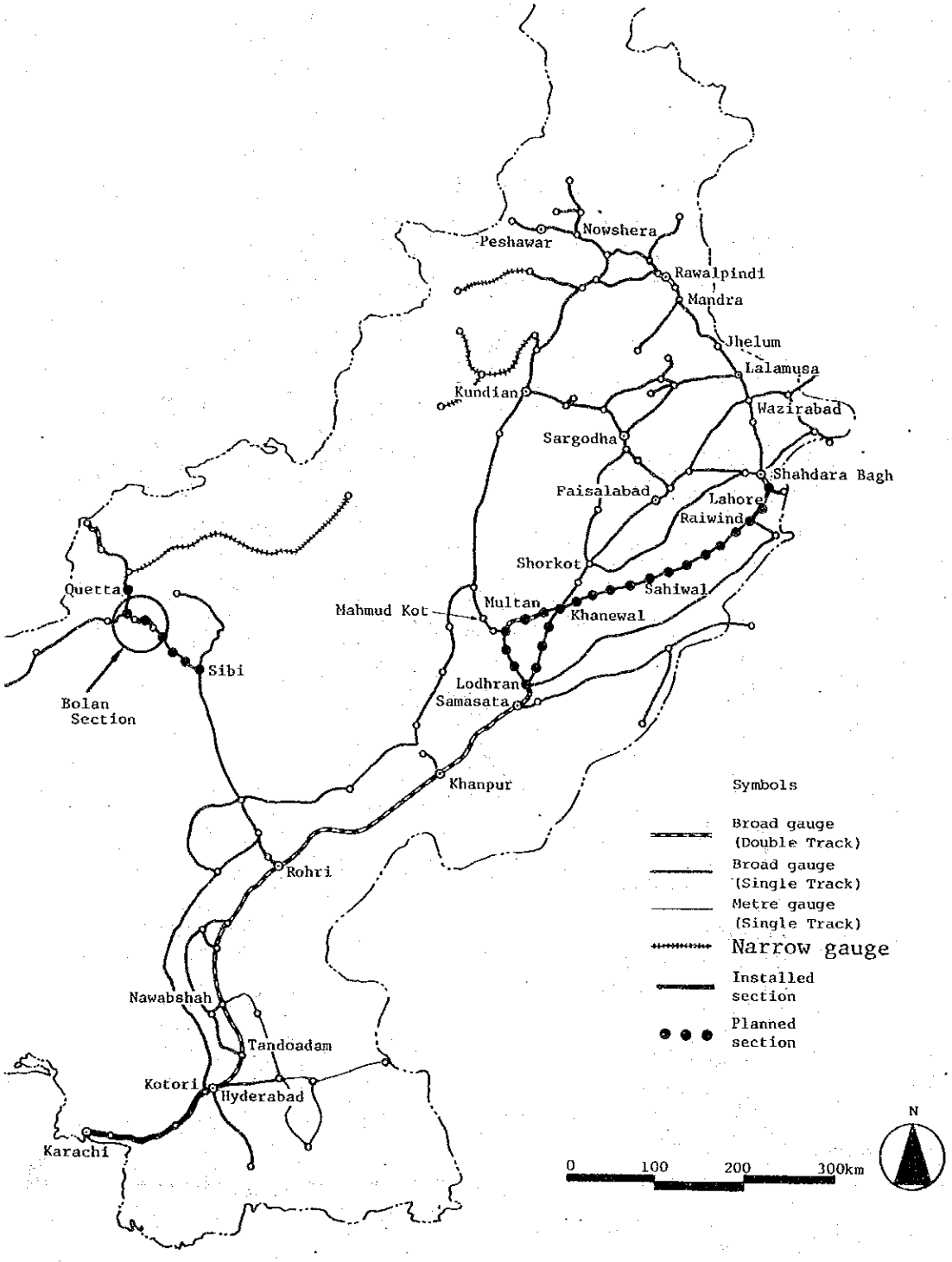


Fig. 3-3-1 Automatic Block and Relay Interlocking Device (6th Five Year Plan)

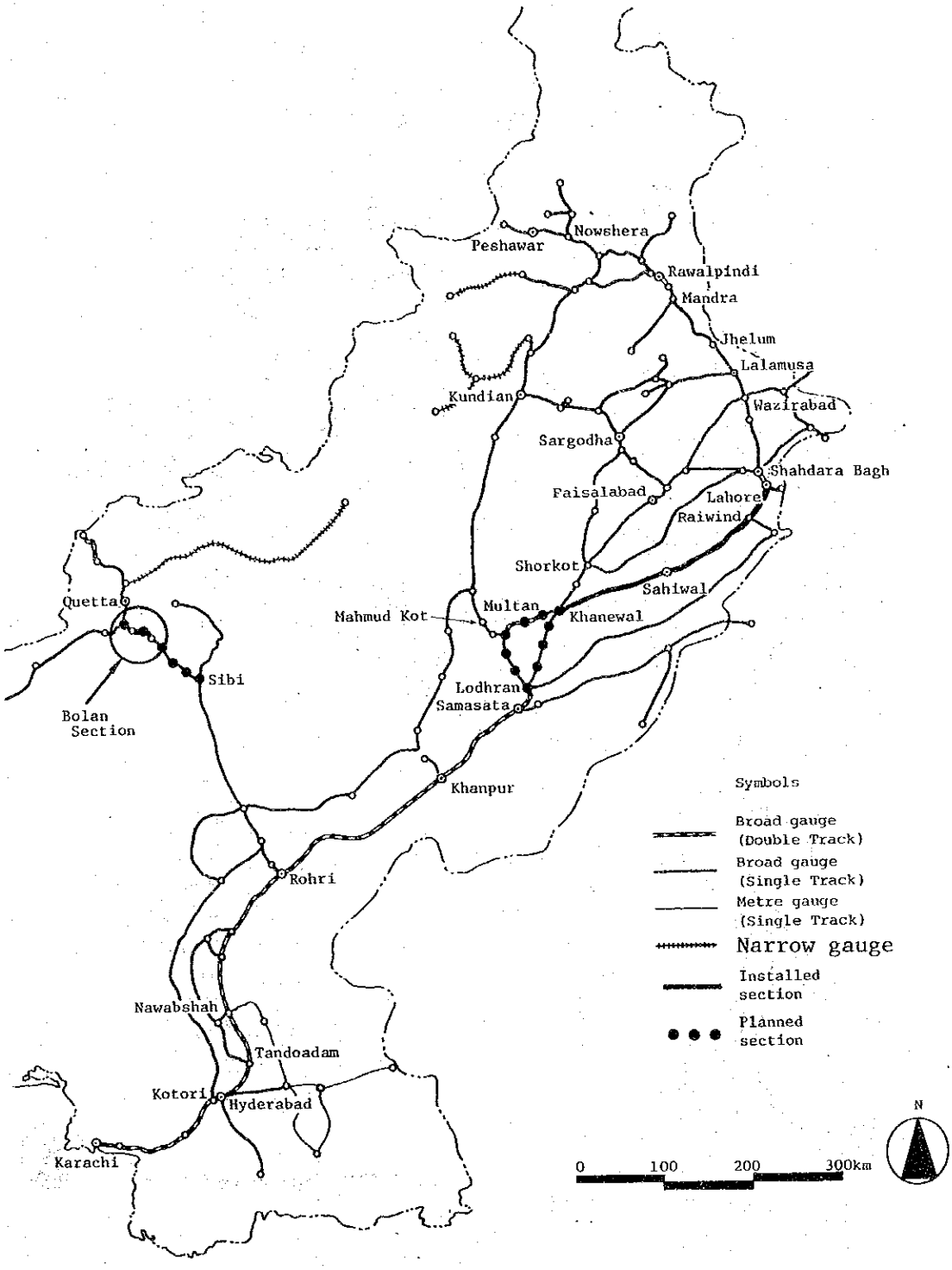


Fig. 3-3-2 Electrification (6th Five Year Plan)

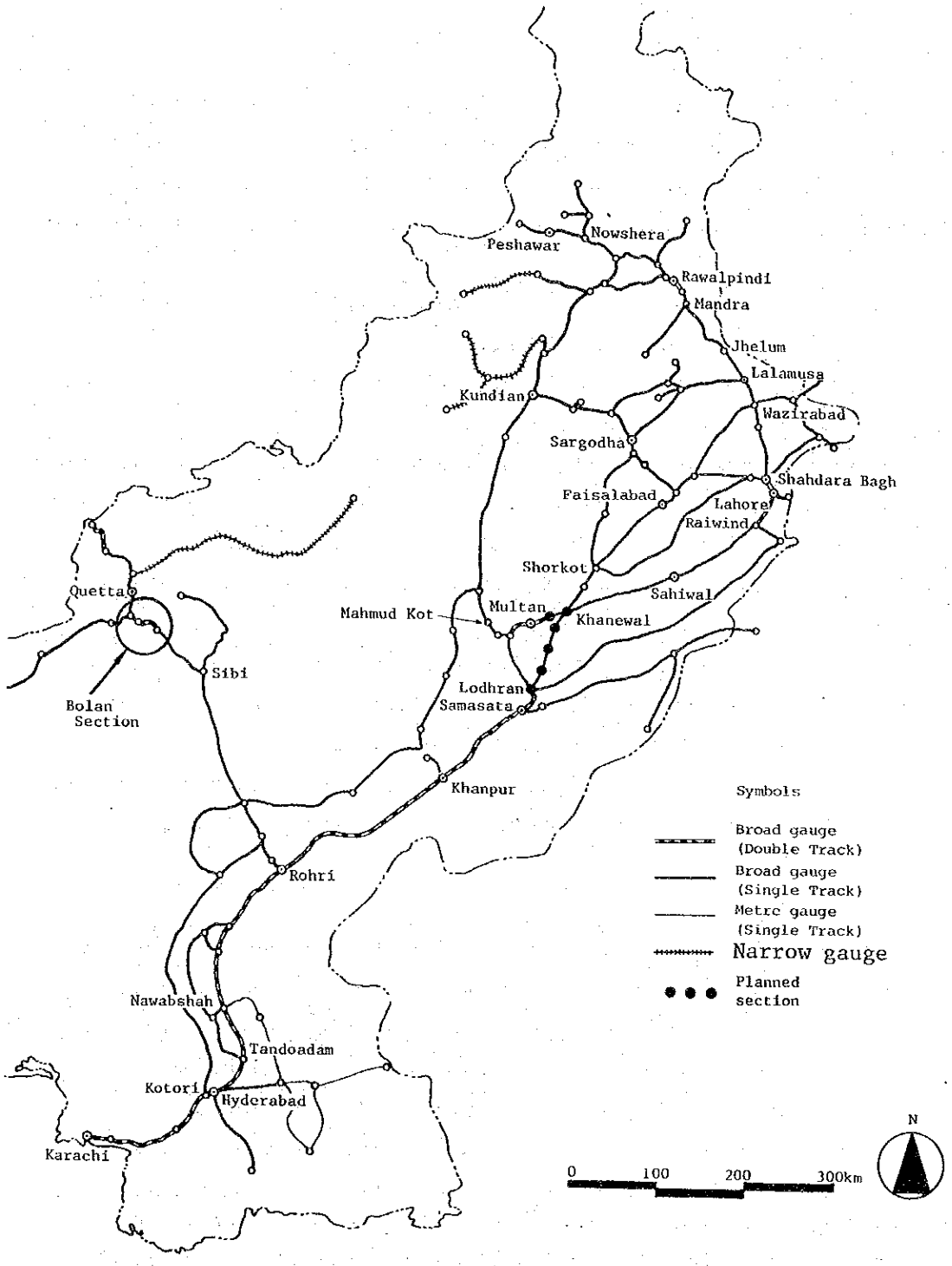


Fig. 3-3-3 Track Doubling (6th Five Year Plan)

3-4 Port Plan

3-4-1 Karachi Port

To solve the problems of port congestion at Karachi Port and to reduce cargo handling costs for container cargo, a full container terminal (depth 12 m, 2 berths, total length 600 m) will be constructed through reclamation along the west sea side area of the existing West Wharf.

This full container terminal will handle 1.7 million tonnes of container cargo by the year 1987/88.

The project cost is estimated at 1,222 million Rs. and commencement of terminal operation is scheduled for 1988.

In order to prepare for the handling of 10 million tonnes of Liquid Cargo, Oil Berths Nos. 2 and 3 will be removed and a new Oil Berth with sufficient capacity will be built at the same location.

The estimated project cost is 120 million Rs. and the operation of this terminal will be commence in 1985.

The main item to be acquired for improvement of onshore equipment is a 35 ton container spreader type Forklift, to increase container cargo handling efficiency through the year 1988.

The main items to be acquired for improvement of offshore equipment are a Backet Dredger and Oil Skimmer for sea water pollution control.

3-4-2 Qasim Port

To help relieve port congestion at Karachi port and to make more efficient use of Multipurpose Berth No. 7 (depth 12m, total length 200 m), it will be converted into a Wheat Terminal with a yearly capacity of 527 thousand tonnes of export wheat by the year 1987/88.

The cost of this project is estimated at 151 million Rs.

To simultaneously handle an estimated 1,193 thousand tonnes of Fertilizer and 278 thousand tonnes of Phosphate Rock/Sulphur efficiently and safety, as was recommended in the Swan Wooster Report, 1980, an independent Fertilizer Terminal will be constructed at the site between the Iron Ore & Coal Berth and the Multipurpose Berth.

The cost of this project is estimated at 490 million Rs. and the operation of this terminal will be commenced in 1988.

By the year 1987/88, Liquid Cargo handling demand will exceed capacity at Karachi Port by 10 million tonnes, therefore a new Oil Berth having a capacity of 3 million tonnes will be constructed at Qasim Port.

The cost of this project is estimated at 158 million Rs. and the operation will be commenced in 1988.

Improvement of onshore equipment will be carried out mainly in teams of maintenance work, because this port has recently opened.

As an item of offshore equipment, a self-propelled hopper suction dredger, oil skimmer, tag boat, and so on will be required for self-maintenance channel dredging.

3-4-3 Other Project

A Mini-Port will be constructed at Gwadar, Baluchistan, as a center of regional development, and coastal shipping, and for the promotion of fishing and employment.

The estimated project cost is 326 million Rs. and the operation will be commenced by 1988.

A Marine Academy which is located at Mauripur, Karachi, will be improved and expanded to promote the self-operation of Pakistan Flag Ships and for the smooth operation of the Full Container and Bulk Terminal.

During 6th Five Year Planning period, enrollment at the Marine Academy will increase from 40 to 90 students and the quality of instructors and equipment will be upgraded to the international level.

The estimated cost of this project is 61 million Rs.

As containerization progresses, container cargo traffic is bound to increase considerably both on rail and road. In the course of time, therefore, Jinnah Bridge project, phase II will become of pressing urgency for a smooth and efficient flow of road container corgoes. This estimated cost is Rs. 200 million.

Table 3-4-1 Port Project for the 6th Five Year Plan Period

Name of Project	Location & Period	Project Amount (Million Rs.)		
		L/C	F/C	Total
Full Container Terminal	Karachi Port 1983 - 1987	472	751	1,223
New Oil Berth	Karachi Port 1983 - 1985	40	80	120
Onshore Equipment	Karachi Port 1983 - 1987	21	39	60
Offshore Equipment	Karachi Port 1983 - 1987	-	150	150
Oil Berth	Qasim Port 1985 - 1987	63	95	158
Fertilizer Terminal	Qasim Port 1983 - 1986	289	201	490
Wheat Terminal Equipment & Storage	Qasim Port 1983 - 1984	81	70	151
Dredger & Equipment	Qasim Port 1983 - 1984	-	445	445
Mini-Port	Gwadar 1983 - 1985	56	270	326
Marine Academy	Mauripur 1983 - 1987	-	61	61
Jinnah Bridge Phase II	Karachi Port 1983-1987	150	50	200
Total		1,172	2,357	3,528

Source: JICA Study Team

3-5 Shipping Plan

3-5-1 General

According to the strategy set up in the Masterplan the following projects were identified as Plan of Action in the 6th Five Year Plan Period:

(1) Acquisition of Full Container Ships
(2) Fleet Replacement Program
(3) Bulk Carrier for Steel Mill
(4) Tanker (Crude Oil)
(5) Tanker (Edible Oil)

3-5-2 Acquisition of Full Container Ships

Two cases of full container ship acquisition have been studied as the case of immediate acquisition according to completion of container terminal and the case of delay on construction of container terminal.

(A) Acquisition of Full Container Ships (Gearless)

(1) Necessity of Introduction of Full Container Ships in Pakistan's Main Liner Trade

It is considered that containerization in liner trade in an irreversible trend in world shipping.

Acquisition of full container ship which should be introduced at the time of completion of full container terminal is to be identified as a coordinated plan with the comprehensive containerization program.

(2) Estimation of Required Number of Container Ships (Gearless)

The estimation flow of required number of container ships is illustrated in the Fig. 3-5-1, and the assumption for estimation is as follows;

1. Completion of full container terminal

It is assumed that full container terminal will be completed in 1987/88 at Karachi as described in JICA Container Report.

2. Traffic demand

Future traffic demand which is projected in this study is shown in Table 3-5-1.

3. Two main liner trade was selected as containerizable route because of containerizable cargo volume namely Europe/Pakistan and Far East/Pakistan.

Fig. 3-5-1 Estimation Flow of Required Number of Container Ships

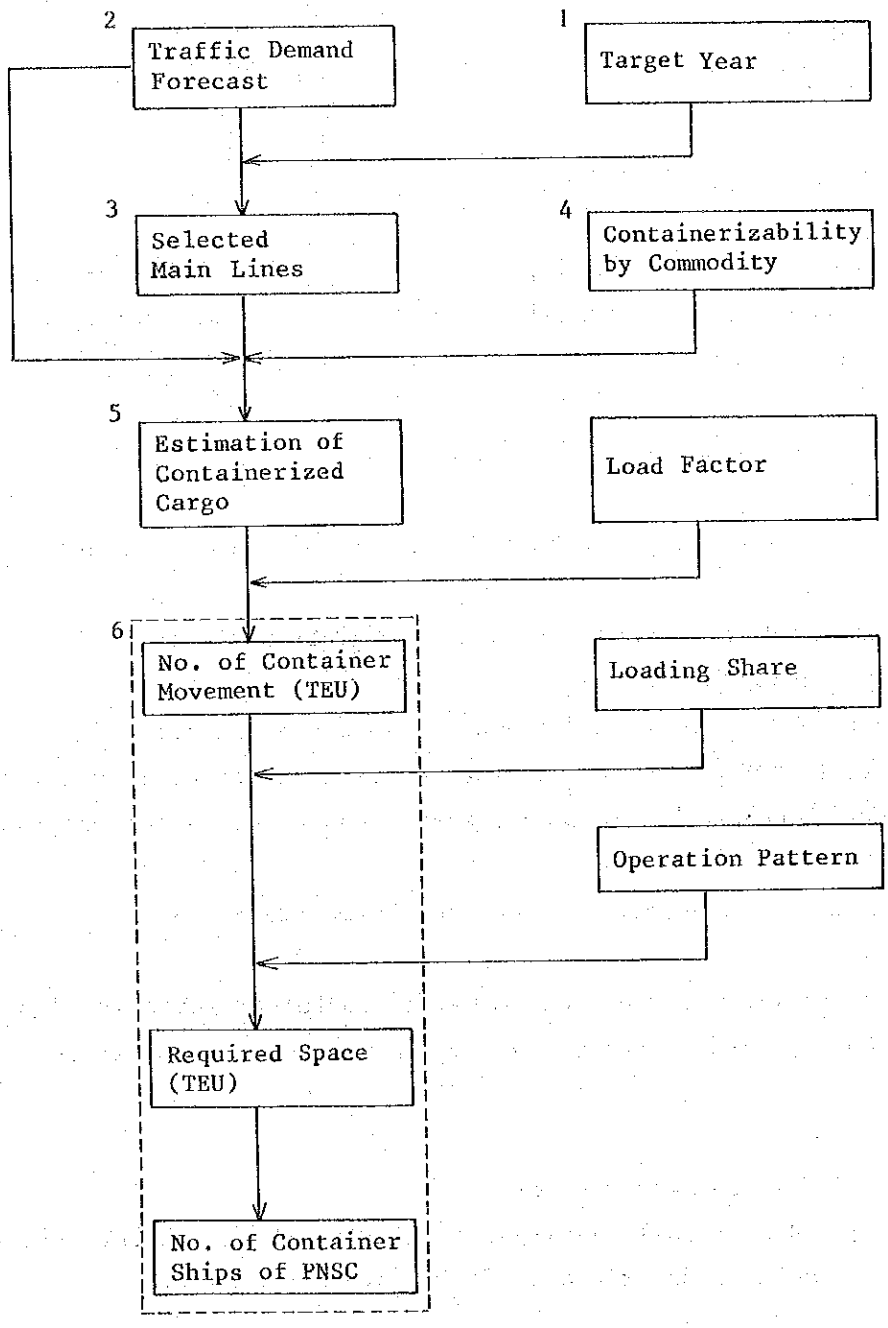


Table 3-5-1 Pakistan's Cargo Movement by Area and Type of Cargo

(UNIT: 1,000 M/T)

--- EXPORT ---
1987 / 1988

	1 EUROPE	2 ASIA	3 MIDDLE EAST	4 AFRICA	5 SOUTH AMERICA	6 NORTH AMERICA	7 OCEANIA	(TOTAL)
1. WHEAT	0.	0.	0.	0.	0.	0.	0.	0.
2. CEMENT	1155.	298.	12.	1.	0.	1.	0.	1467.
3. FERTILIZERS	0.	0.	0.	0.	0.	0.	0.	0.
4. RICE	31.	131.	543.	690.	197.	1.	0.	1593.
5. COAL & ORES	0.	0.	0.	0.	0.	0.	0.	0.
6. PETROLS	0.	876.	822.	0.	34.	0.	93.	1825.
7. MOLASSES	400.	5.	1.	0.	0.	0.	0.	406.
8. EDIBLE & TALLOW	0.	0.	0.	0.	0.	0.	0.	0.
9. COTTON	10.	322.	1.	0.	1.	0.	0.	334.
10. OTHERS	588.	121.	688.	0.	1.	375.	0.	1773.
(TOTAL)	2184.	1753.	2066.	691.	233.	378.	93.	7398.

-- IMPORT --
1987 / 1988

	1 EUROPE	2 ASIA	3 MIDDLE EAST	4 AFRICA	5 SOUTH AMERICA	6 NORTH AMERICA	7 OCEANIA	(TOTAL)
WHEAT	141.	0.	0.	0.	0.	328.	58.	527.
CEMENT	0.	0.	0.	0.	0.	0.	0.	0.
FERTILIZERS	595.	8.	366.	0.	0.	501.	0.	1471.
RICE	0.	0.	0.	0.	0.	0.	0.	0.
COAL & ORES	728.	408.	645.	206.	199.	735.	470.	3390.
PETROLS	87.	67.	8375.	0.	0.	3.	0.	8533.
MOLASSES	0.	0.	0.	0.	0.	0.	0.	0.
EDIBLE & TALLOW	38.	288.	2.	0.	96.	261.	0.	685.
COTTON	0.	0.	0.	0.	0.	0.	0.	0.
OTHERS	913.	1470.	15.	61.	47.	12.	103.	2621.
(TOTAL)	2501.	2241.	9402.	267.	342.	1840.	632.	17227.

-- EXPORT --
1999 / 2000

	1 EUROPE	2 ASIA	3 MIDDLE EAST	4 AFRICA	5 SOUTH AMERICA	6 NORTH AMERICA	7 OCEANIA	(TOTAL)
1. WHEAT	172.	0.	0.	0.	0.	400.	71.	643.
2. CEMENT	1739.	448.	18.	1.	0.	2.	0.	2208.
3. FERTILIZERS	116.	66.	100.	0.	0.	0.	0.	282.
4. RICE	58.	246.	1021.	1299.	370.	2.	1.	2998.
5. COAL & ORES	0.	0.	0.	0.	0.	0.	0.	0.
6. PETROLS	0.	2130.	1997.	0.	83.	0.	225.	4436.
7. MOLASSES	568.	7.	2.	0.	0.	0.	0.	577.
8. EDIBLE & TALLOW	0.	0.	0.	0.	0.	0.	0.	0.
9. COTTON	15.	475.	1.	0.	1.	0.	0.	492.
10. OTHERS	1288.	265.	1508.	0.	3.	821.	0.	3885.
(TOTAL)	3957.	3638.	4645.	1301.	457.	1225.	297.	15521.

-- IMPORT --
1999 / 2000

	1 EUROPE	2 ASIA	3 MIDDLE EAST	4 AFRICA	5 SOUTH AMERICA	6 NORTH AMERICA	7 OCEANIA	(TOTAL)
1. WHEAT	0.	0.	0.	0.	0.	0.	0.	0.
2. CEMENT	0.	0.	0.	0.	0.	0.	0.	0.
3. FERTILIZERS	1148.	16.	706.	0.	0.	967.	1.	2838.
4. RICE	0.	0.	0.	0.	0.	0.	0.	0.
5. COAL & ORES	728.	408.	645.	206.	199.	735.	470.	3390.
6. PETROLS	184.	142.	17810.	0.	0.	7.	0.	18146.
7. MOLASSES	0.	0.	0.	0.	0.	0.	0.	0.
8. EDIBLE & TALLOW	35.	267.	2.	0.	89.	242.	0.	636.
9. COTTON	0.	0.	0.	0.	0.	0.	0.	0.
10. OTHERS	1448.	2332.	23.	97.	75.	19.	164.	4158.
(TOTAL)	3543.	3165.	19185.	303.	363.	1971.	634.	29168.

4. Containerizability by commodity

Table 3-5-2, which is the summarized sheet from JICA container report shows containerizability by commodity.

Table 3-5-2 Estimation of Containerizability by Commodity

	Ultimate Containerizability	1987/1988	1999/2000
1. Wheat	*	0	0
2. Cement	-	0	0
3. Fertilizer	*	0	0
4. Rice	25%	5%	25%
5. Coal and Ores	0	0	0
6. Petrols	0	0	0
7. Mulasses	*	0	0
8. Edible and Tallow	*	0	0
9. Cotton	100%	50%	100%
10. Others - Import	-	30%	60%
Export	-	25%	50%

5. Estimation of containerized cargo in main Liner Trade

Estimated containerized cargo is listed in Table 3-5-3.

6. Capacity Analysis

Number of container ship of PNSC is being calculated by the flow of

i) Number of container required in (TEU)
ii) Necessary Number of container ships
iii) Number of container ships of PNSC

To calculate Table 3-5-4, following i) load factor, ii) operation pattern and iii) loading share are assumed.

i) loadfactor

Rice 15 M/T per TEU

Cotton	15 M/T per TEU
Export - other general cargo	16 M/T per TEU
Import - other general cargo	9.5 M/T per TEU

ii) operation pattern and schedule are

Europe/Pakistan	50 days turn round
Far East/Pakistan	45 days turn round

detail as per Table 3-5-5.

iii) loading share of PNSC is 40% of whole trade cargo.

Table 3-5-3 Estimation of Containerized Cargo in Main Liner Trade

EUROPE/PAKISTAN

REMARKS (A) TOTAL CARGO MOVEMENT (M/T)
(B) CONTAINERLIZED/RESIDUAL CARGO RATIO (%)
(C) CARGO MOVEMENT (M/T)
(D) CONTAINER (TEU)

1987/1988

COMMODITY	IMPORT		EXPORT	
	CONTAINERLIZED CARGO	RESIDUAL CARGO	CONTAINERLIZED CARGO	RESIDUAL CARGO
RICE:				
(A)	-		31,000	
(B)	-	-	5	95
(C)	-	-	1,550	29,450
(D)	-		100	
COTTON:				
(A)	-		10,000	
(B)	-	-	50	50
(C)	-	-	5,000	5,000
(D)	-		330	
OTHERS:				
(A)	913,000		588,000	
(B)	30	70	25	75
(C)	273,900	639,100	147,000	441,000
(D)	28,830		9,190	
TOTAL:	28,830 (TEU)	639,100 (M/T)	9,620 (TEU)	475,450

1999/2000

COMMODITY	IMPORT		EXPORT	
	CONTAINERLIZED CARGO	RESIDUAL CARGO	CONTAINERLIZED CARGO	RESIDUAL CARGO
RICE:				
(A)	-		58,000	
(B)	-	-	25	75
(C)	-	-	14,500	43,500
(D)	-	-	970	
COTTON:				
(A)	-		15,000	
(B)	-	-	100	0
(C)	-	-	15,000	0
(D)	-	-	1,000	
OTHERS:				
(A)	1,448,000		1,288,000	
(B)	60	40	50	50
(C)	868,800	579,200	644,000	644,000
(D)	91 450		40,250	
TOTAL:	91,450 (TEU)	579,200 (M/T)	42,220 (TEU)	687,500 (M/T)

FAR EAST/PAKISTAN

REMARKS (A) TOTAL CARGO MOVEMENT (M/T)
(B) CONTAINERIZED/RESIDUAL CARGO RATIO (%)
(C) CARGO MOVEMENT (M/T)
(D) CONTAINER (TEU)

1987/1988

COMMODITY	IMPORT		EXPORT	
	CONTAINERLIZED CARGO	RESIDUAL CARGO	CONTAINERLIZED CARGO	RESIDUAL CARGO
RICE:				
(A)	-		131,000	
(B)	-	-	5	95
(C)	-	-	6,550	124,450
(D)	-		440	
COTTON:				
(A)	-		322,000	
(B)	-	-	50	50
(C)	-	-	161,000	161,000
(D)	-		10,730	
OTHERS:				
(A)	1,470,000		121,000	
(B)	30	70	25	75
(C)	441,000	1,029,000	30,250	90,750
(D)	46,420		1,890	
TOTAL	46,420 (TEU)	1,029,000 (M/T)	13,060 (TEU)	376,200 (M/T)

1899/2000

COMMODITY	IMPORT		EXPORT	
	CONTAINERLIZED CARGO	RESIDUAL CARGO	CONTAINERLIZED CARGO	RESIDUAL CARGO
RICE:				
(A)	-		246,000	
(B)	-	-	25	75
(C)	-	-	61,500	184,500
(D)	-		4,100	
COTTON:				
(A)	-		475,000	
(B)	-	-	100	0
(C)	-	-	475,000	0
(D)	-		31,670	
OTHERS:				
(A)	2,332,000		265,000	
(B)	60	60	50	50
(C)	1,399 200	932,800	132,500	132,500
(D)	147,280		8,280	
TOTAL	147,280 (TEU)	932,800 (M/T)	44,050 (TEU)	317,000 (M/T)

Table 3-5-4 Capacity Analysis of Container Vessels

YEAR	TRADE	CONTAINER/RESIDUAL	IMPORT/EXPORT	CARGO MOVEMENT	(A) PNSC'S 40% SHARE	(B) TURN ROUND	(C) REQUIRED SPACE	VESSELS
1987/1988	EUROPE/PAKISTAN	CONTAINER	IMPORT	28,830 TEU	11,530 TEU	50 DAYS	1,650 TEU	900 TEU x 2
"	"	RESIDUAL	"	639,100 M/T	255,640 M/T	90 DAYS	65,740 M/T	12,000 M/T x 6
"	FAR EAST/PAKISTAN	CONTAINER	"	46,420 TEU	18,570 TEU	45 DAYS	2,390 TEU	1,200 TEU x 2
"	"	RESIDUAL	"	1,029,000 M/T	411,600 M/T	90 DAYS	105,840 M/T	12,000 M/T x 9
1999/2000	EUROPE/PAKISTAN	CONTAINER	IMPORT	91,450 TEU	36,580 TEU	50 DAYS	5,230 TEU	1,800 TEU x 3
"	"	RESIDUAL	EXPORT	687,500 M/T	275,000 M/T	90 DAYS	70,720 M/T	12,000 M/T x 6
"	FAR EAST/PAKISTAN	CONTAINER	IMPORT	147,280 TEU	58,900 TEU	45 DAYS	7,570 TEU	1,800 TEU x 4
"	"	RESIDUAL	"	932,800 M/T	373,120 M/T	90 DAYS	95,950 M/T	12,000 M/T x 8

Remarks : 1) (A) X (B)/350 DAYS = (C)

2) The above calculation is based on the shipping operation in consortium arrangement with 100% load factor of containers. If the loading factor of containers ranges between 75 and 80%, the number of container vessels will increase proportionately.

Table3-5-5 Operation Pattern and Schedule

	Speed of Ship	Turn Round
EUROPE/PAKISTAN	18 Knots	50 days
FAR EAST/PAKISTAN	18 Knots	45 days

EUROPE/PAKISTAN

	MILAGE	RUN (days)	STAY (days)
SOUTHAMPTON	495	1.1	1.5
HAMBURG	151	0.3	1.5
BREMENHAVEN	327	0.8	1
ROTTERDAM	247	0.6	1.5
LE HAVRE	1,712	4.0	1.5
BARCELONA	185	0.4	1,5
FOS	201	0.5	1.5
GENOA	1,419	3.3	2
SUEZ	2,770	6.4	1
KARACHI	2,770	6.4	2
SUEZ	3,054	7.1	1
SOUTHAMPTON			
RESERVE		1.1	2
TOTAL		32.0	18.0

FAR EAST/PAKISTAN

	MILAGE	RUN (days)	STAY (days)
YOKOHAMA	210	0.5	1.0
NAGOYA	240	0.6	0.5
KOBE	363	0.8	1.5
BUSAN	913	2.1	1.0
KAOHSIUNG	342	0.8	1.0
HONGKONG	1,445	3.3	1.0
SINGAPORE	2,882	6.7	1.0
KARACHI	4,313	10.0	2.0
HONGKONG	1,582	3.7	1.0
YOKOHAMA			
RESERVE		1.0	5.5
TOTAL		29.5	15.5

(3) Estimation of Investment Amount

Estimation of Investment amount is calculated as follows.

1987/1988	Ship		Container	G. Total
		million		
EUROPE	900 TEU x 2	Rs 217 x 2 = 434		
FAR EAST	1,200 TEU x 2	Rs 261 x 2 = 522	Rs 260 million	Rs 1,216 million
		S.Total Rs 956 million		

1999/2000	Ship		Container	G. Total
		million		
EUROPE	1,800 TEU x 3	Rs 348 x 3 = Rs 1,044		
FAR EAST	1,800 TEU x 4	Rs 348 x 4 = Rs 1,392		
		S.Total Rs 2,436 million	Rs 750 million	Rs 3,186 million

◦ Calculation based on the following assumption and estimated figures.

1. Building cost of vessel : delivered price as at 1981

900 TEU	Yen 5,000 million	US$21.7 million	Rs 217 million
1,200 TEU	Yen 6,000 "	US$26.1 "	Rs 261 "
1,800 TEU	Yen 8,000 "	US$34.8 "	Rs 348 "

Exchange rate US$1 = ¥230, US$1 = Rs 10

2. Cost of container US$2,500/unit 2.5 sets/ship

◦ Refering to the footnote 2) of Table 3-5-4, the investment amount will increase proportionately.

(B) Acquisition of Self-Sustained Full Container Ships (Geared)

The project of acquisition of geared full container ships are identified for case of delay on construction of container terminal.

It is also agreeable to identify the projects, because of rapid development of containerization in Pakistan as following situations.

The COBRA Line (Continent - Britain Asia Container Service) which was formed among five major European lines and in later 1981 started direct calling at Karachi, Bombay, Cochin, Colombo and Madras to UK/Continent with 800 TEU geared container ships and multi-purpose vessel with total carrying capacity of 3,560 TEU.

In April 1982, the Indian Container Line (ICL) which is a consortium by three Indian Lines started fortnightly container service in Europe/India route.

The Ceylon Shipping Corp (CSC) started container service to UK/Continent with two containerships (560 TEU) and Colombo will play an important role as a feeder port with the completion of full container terminal around 1984.

From February 1982, PNSC started container service on UK/Continent line by three newly acquired ships with capacity of maximum 400 TEU. However, because of the limited container capacity, these ships are not proving to be fully effective.

Therefore, it is strongly proposed by PNSC that three container ships for UK/Continent/MEG/Karachi service and three container ships for the Far East/Karachi/MEG service are urgently needed to be employed in competition with the foreign operators.

(1) Assumptions, adopted by PNSC to justify 6 geared full containerships as an urgent project are as follows.

1. Time of introduction

		Ship Type	Number
Europe line	1983/84	800 TEU (15 Knots)	x 3 ships
Far East line	1984/85	800 TEU (15 Knots)	x 3 ships

2. The operation pattern
   - UK/Continent/MEG/Karachi Service

Port of call : Tibury, Hamburg, Rotterdam, Marseilles, Dubai, Damman, Kuwait, Karachi

Turn round : 54 days

Voyage per year : 6.25 (15 knots)

- Far East/Karachi/MEG Service

Turn Round : 45 days

Voyage per year : 7.5 (15 knots)

3. Estimated cargo to be lifted by three 800 TEU ships in each line.

a. UK/Continent/MEG/Karachi Service

Average number of Homeward container lifting per voyage	= 640 TEU
Loaded MEG container for UK/Cont.	= 240 TEU
Loaded Karachi containers from UK/Cont.	= 400 TEU
Loaded MEG containers from Karachi	= 200 TEU
Loaded UK/Continent containers from Karachi	= 200 TEU
Average cargo lifting per TEU	= 15 tons
Total Karachi cargo lifted by 3 container ships (3 x 6.25 x 400 x 15)	= 112,500 tons
Total UK/Continent cargo lifted by 3 container ships from Karachi (3 x 6.25 x 200 x 15)	= 56,250 tons
Total MEG cargo lifted by 3 container ships from Karachi (3 x 6.25 x 200 x 15)	= 56,250 tons

b. Far East/Karachi/MEG Service

Average number of Homeward container liftings per voyage	= 640 TEU
Loaded MEG containers from F.E.	= 240 TEU
Loaded Karachi containers from F.E.	= 400 TEU
Loaded MEG containers from Karachi	= 200 TEU
Loaded F.E. containers from Karachi	= 400 TEU
Average cargo lifting per TEU	= 15 tons
Total Karachi bound cargo lifted by 3 container ships (3 x 7.5 x 400 x 15)	= 135,000 tons
Total F.E. bound cargo lifted by 3 container ships from Karachi (3 x 7.5 x 400 x 15)	= 135,000 tons
Total MEG cargo lifted by 3 container ships from Karachi (3 x 7.5 x 200 x 15)	= 67,500 tons

(2) Estimation of Investment Amount 1987/88

Operation	Ship	Cost (Million) Rs.
Container service (Europe)	800 TEU self sustaining container vessel x 3	250 x 3 = 750
Container service (Far East)	" " "	250 x 3 = 750
Container service (Europe & Far East)	Containers	260
	Total	1760

(3) Capacity Analysis

Table 3-5-6 shows a calculation of the number of multi purpose vessels required for handling the remaining general cargo to achieve 40% share of national cargo for PNSC fleet. It has been estimated that 19 ships lifting an average cargo of 12,000 tons would be required to achieve it in main liner trade. The required number of ships could possibly be reduced by achieving higher average liftings and by combining various services.

Table 3-5-6 Capacity Analysis (Geared Container Ships)

1987/88 FLEET REQUIREMENT FOR SHIPMENT OF GENERAL CARGO

(Tons)

Region	Europe	S.E.Asia	Middle East	Africa	South America	North America	Oceania	Total
Exports								
Cotton	10,000	322,000	1,000	-	1,000	-	-	334,000
Others	588,000	121,000	688,000	-	1,000	375,000	-	1,773,000
Total general cargo	598,000	443,000	689,000	-	2,000	375,000	-	2,107,000
40% national fleet share of exports.	239,200	177,200	275,600	-	800	150,000	-	842,800
Exports lifted by container vessels	56,250	135,000	123,750	-	-	-	-	227,250
Exports to be lifted by general cargo liner vessels	182,950	42,200	151,850	-	800	150,000	-	481,950
Imports								
Total General cargo	913,000	1,470,000	15,000	61,000	47,000	12,000	103,000	2,621,000
40% national fleet share of imports:	365,200	588,000	6,000	24,000	18,800	4,800	41,200	1,048,400
Imports lifted by container vessels:	112,500	135,000	-	-	-	-	-	247,500
Imports to be lifted by general cargo liner vessels.	242,700	453,000	6,000	24,000	18,800	4,800	41,200	1,800,900
No. of voyages national fleet(Average lifting 12,000 t)	20	36	13	2	2	12.5	3.5	
Average round voyages per year	3.3	4	13	3	3	3.5	3.5	
No. of ships	6	9	1	-	-	4	1	21

3-5-3 Fleet Replacement Programme (Multi-purpose ships)

24 ships will be over 20 year of age at 1988, end of the 6th Plan Period, so the Fleet Replacement Program for most of these ships must be executed according to the policy under chapter VIII, 2-2-5. (Refer to Table 3-5-7)

The strategy for replacement programme is to acquire efficient ships for liner operations and divert existing ships to tramp operations.

In liner trade, the introduction of full container ships will make tremendously its carrying capacity increase. In bulk trade, the introduction of specialized carrier will also increase its carrying capacity. However, the capacity analysis indicates that 15 conventional ships are necessary to cover residual cargo after employment of full container ships in main trade in order to maintain 40% loading share by PNSC.

It is recommendable that 5 multipurpose ships with certain modification to the design built in 5th Plan period should be acquired. These may preferably be constructed at KSEW under a government sponsored shipbuilding program in a consistent way during the 6th Plan period for the sake of a steady and stable development of shipbuilding industry and up-grading of technical know-how.

The total investment cost of this project amounts to Rs. 1,000 million, based on the estimated price per ships as Rs. 200 million.

Table 3-5-7 PNSC Fleet Position in 1983

AGE	NUMBER	TYPE	DWT	REMARKS
Under 5 years	14	multi-purpose cargo vessels	254,676	New constructions being used on Liner/Container Service.
5 to 15 years	5	general cargo vessels	72,857	Being used on liner service.
15 to 20 years	17	general cargo vessels	210,890	Being used on Liner/Tramp Service. (To be scrapped during 6th Plan Period)
Over 20 years	7	6 general cargo vessels	86,538	Tramp operations (To be scrapped immediately).
		1 passenger vessel		
TOTAL:	43		624,961	

PNSC Fleet Position in 1983

S.No.	Ship's Name	Place of Built	Year of Built	DWT	GRT	TEU
	a. Ships less than 5 years old					
1.	M.V.ISLAMABAD	KSEW Karachi	1983	18250	12480	390
2.	M.V.SIBI	Gdansk Shipyard Poland	1981	16500	11400	381
3.	M.V.KHAIRPUR	- " -	1981	16500	11400	381
4.	M.V.NAWABSHAH	- " -	1981	16500	11400	381
5.	M.V.AYUBIA	A & P Shipyard Sunderland U.K.	1981	18050	11940	494
6.	M.V.KAGHAN	- " -	1981	18050	11940	494
7.	M.V.MURREE	- " -	1981	18050	11940	494
8.	M.V.MULTAN	Mitsui, Japan	1980	18257	12436	390
9.	M.V.HYDERABAD	- " -	1980	18257	12436	390
10.	M.V.CHITRAL	KHI-Kobe Japan	1980	18153	12478	386
11.	M.V.BOLAN	- " -	1980	18153	12478	386
12.	M.V.MALAKAND	IHI-Tokyo	1980	18224	12478	390
13.	M.V.SARGODHA	Oshima Shipyard Nagasaki Japan	1980	18242	12438	390
14.	M.V.MAKRAN	Nskov, Yard No.22 Denmark	1979	23490	16240	770
			TOTAL:	254,676	173490	
	b. Ships 5 to 15 years old					
1.	M.V.LALAZAR	Karachi Shipyard	1974	13326	9025	
2.	M.V.HINGLAJ	Nippon Kai Heavy Ind.Ltd.	1972	15699	9953	
3.	M.V.HUNZA	- " -	1972	15677	9953	
4.	M.V.OCEAN ENVOY	A & P Ltd U.K.	1972	14975	9126	
5.	M.V.SHALAMAR	Karachi Shipyard	1970	13180	8942	
			TOTAL:	72857	46999	
	c. Ships 10 to 20 years old					
1.	M.V.SUNDERBANS	Brodogradiliste Split, YUGOSLAVIA	1968	12400	9101	
2.	M.V.MOENJODARO	- " -	1968	12401	9101	
3.	M.V.RANGAMATI	- " -	1968	12400	9101	
4.	M.V.TARBELA	A.G.Weser West Germany	1968	13000	9590	
5.	M.V.TAXILA	Brodogradi Liste Split Yugoslavia	1968	12075	9101	
6.	M.V.WARSAK	A.G.Weser West Germany	1968	13300	9590	
7.	M.V.KAPTAI	- " -	1968	13300	9590	80

S.No.	Ship's Name	Place of Built	Year of Built	DWT	GRT	TEU
8.	M.V.ZIARAT	Fa.C.Almele and Z.N. HOLLAND.	1968	1735	1110	
9.	M.V.CHRMAZD	Burntisland Shipbuilding Co, B&T UK.	1968	13164	11046	
10.	M.V.AZIZ BHATTI	A.G.Weser West Germany	1966	13300	9572	80
11.	M.V.S.RAFIQUI	- " -	1966	13300	9572	80
12.	M.V. OCEAN ENDURANCE	Bertran & Son Ltd UK	1966	13300	7795	
13.	M.V.BAGH-E-BACCA.	Bodogaldisliste Split Yugoslavia.	1966	12640	8966	
14.	M.V.CHENAB	Brodoradiliste Split Yugoslavia.	1965	12585	9148	
15.	M.V.PUSSUR	M/s.Barjrami & Sons Sunderland U.K.	1965	12100	8900	
16.	M.V. OCEAN ENDEAVOUR.	Lithgows Ltd PG-1 UK	1965	17250	14950	
17.	M.V.BAGH-E. KARACHI.	Bodogaldiliste Split, Yugoslavia.	1964	12640	8999	
			SUB TOTAL:	210890	155232	
	d. Ships over 20 years old					
1.	M.V.AL-KULSUM	N.V.KONMAATS DE Schelde"FLS Netherland"	1960	15720	9869	
2.	M.V.SHAMS	Hitachi Zosen Osaka Japan.	1960	5772	8929	
3.	M.V.KADERBAKSH	Oskar-Shamna-Varr A/B OSK Sweeden.	1959	13186	8891	
4.	M.V.JHELUM	Hawthron Leslie Ltd. HEBOURN on Tyne England	1958	10030	5923	
5.	M.V.AL-HASAN	Weser Werk Seaback Bhn West Germany.	1958	14060	9186	
6.	M.V.MANSOOR	Rheinstabl Nordesee Werk Emd.West Germany.	1958	14940	10613	
7.	M.V. SUTLAJ	Kieler Howalds werke A.G.Kiel West Germany.	1957	12830	6343	
		TOTAL:		86538	59754	
		GRAND TOTAL:		624,961	435,475	

3-5-4 Bulk Carrier for Steel Mill

By 1987/88 Pakistan Steel Mill is expected to import about 1.4 million tons of coal and 2.0 million tons of iron ore.

Two cases of bulk carriers with 40,000 DWT/50,000 DWT are respectively studied for required number of ships based on the following assumptions.

(a) Quantities contracted from various sources

Iron Ore 2,030,000 tons

Country	Loading port	%
Brazil	(Sepetiba)	40%
Australia	(Port Headland)	30%
India	(Karwar)	30%

Coal 1,151,000 tons

Country	Loading port	%
Australia	(New Castle)	30%
Canada	(Robert Bank)	40%
U S A	(Philadelphia)	30%

(b) Draft Limitation at Port Qasim

Due to the draft limitation in the channel, 11.3 m two types of Bulk Carrier are being studied as 40,000 DWT (DFT 10.9 m) and 50,000 DWT (DFT 11.1 m) with speed 13.6 knots and 13.2 knots respectively.

Necessary number of bulk carriers to carry total quantity is calculated as listed in Table 3-5-8.

	Draft	Speed	Required number
40,000 DWT	10.9 m	13.6 knots	10 ships
50,000 DWT	11.1 m	13.2 knots	9 ships

If national flag ships carry approximately 50 percents of the cargo, the investment amount will be Rs.920 million, based on four 50,000 DWT bulk carrier:

Table 3-5-8 Estimation of Required Number of Bulk Carrier

40,000 tons BULKERS S/SPEED 13.6 KNOTS DFT 10.9 M

ORE 2,030,000 T / YEAR Discharging Port Qasim Port

SOURCE	%	Quantity	Voyage	(N.MILE)	Running Day	Reserve	Loading	Discharging	Reserve	Total Turn Round	Voyage per Year x turn Round	
BRAZIL (SEPETIBA)	40	812,000	20.3	7897 x 2	48.4	2	1	4	1	56.4	1,145	
AUSTRALIA (PORT HEDAND)	30	609,000	15.2	4157 x 2	25.5	1	1.3	4	1	32.8	499	
INDIA (KARWAR)	30	609,000	15.2	688 x 2	4.2	0.5	6	4	1	15.7	239	
SUB TOTAL (1)	100	2,030,000	50.7	-	-	-	-	-	-	-	1,883	
COAL 1,151,000 T / YEAR												
AUSTRALIA (NEW CASTLE)	30	345,300	8.6	6524 x 2	20.0	2	4	4	1	31	267	
CANADA (ROBERT BANK)	40	460,400	11.5	9965 x 2	61.0	2	2.7	4	1	70.7	813	
USA (PHILA)	30	345,300	8.6	11516 x 2	70.6	3	2.7	4	1	81.3	699	
SUB TOTAL (2)	100	1,151,000	28.7	-	-	-	-	-	-	-	1,779	
G TOTAL (1) + (2)	-	3,181,000	79.4	-	-	-	-	-	-	-	3,662	÷365=10.0

Estimation of Required Number of Bulk Carrier

50,000 tons BULKER S/SPEED 13.2 KNOTS DFT 11.1 M

ORE 2,030,000 ₹ / YEAR Discharging Port Qasim Port

SOURCE	%	Quantity	Voyage	(N. MILE)	Running Day	Reserve	Loading	Discharging	Reserve	Total Turn Round	Voyage per Year x turn Round	
BRAZIL (SEPTIBA)	40	812,000	16.2	7897 x 2	49.5	2	1.3	5	1	58.8	953	
AUSTRALLA (PORT HEDLAND)	30	609,000	12.2	4157 x 2	26.2	1	1.7	5	1	34.9	426	
INDIA (KARWAR)	30	609,000	12.2	688 x 2	4.3	0.5	7	5	1	17.8	217	
SUB TOTAL (1)	100	2,030,000	40.6	-	-	-	-	-	-	-	1,596	
COAL 1,151,000 ₹ / YEAR												
AUSTRALIA (NEW CASTLE)	30	345,300	6.9	6524 x 2	41.2	2	5	5	1	54.2	374	
CANADA (ROBERT BANK)	40	460,400	9.2	9965 x 2	63.0	2	3.3	5	1	74.3	684	
USA (PHILA)	30	345,300	6.9	11516 x 2	72.7	3	3.3	5	1	85	587	
SUB TOTAL (2)	100	1,151,000	23.0	-	-	-	-	-	-	-	1,645	
G. TOTAL (1) + (2)	-	3,181,000	63.6	-	-	-	-	-	-	-	3,241	÷365=8.9

3-5-5 Tanker (Crude Oil)

The National Tanker Company, a joint venture PNSC/nationalized refineries has acquired one crude oil tanker in 1982.

This 89,000 deadweight ton tanker will be able to lift about 2 million tons of crude oil per year and thus transport about 50% of present crude oil imports of Pakistan.

The crude oil imports are expected to increase about 8 million tons in 1988.

According to the strategy selected by the government during the 5th Plan Period, it is proposed to acquire an additional crude oil tanker of about 80,000 DWT.

The estimated investment amount will be Rs.150 million which is based on price of secondhand ship.

3-5-6 Tanker (Edible Oil)

At present Pakistan imports annually about 600,000 tons of edible oil. About half of it is imported from Malaysia and Indonesia in the form of palm oil. The rest is mainly soya bean oil imported from USA and Brazil.

Since this level of edible oil imports is expected to be maintained for a considerable period, it is recommended to acquire one special product tanker of about 15,000 DWT in order to achieve proper level of self-sufficiency in transport of this commodity. The investment amount is estimated as Rs.100 million by PNSC.

3-6 Airport Plan

3-6-1 Outline of Project for the 6th Five Year Plan

Basic considerations on project for The 6th Five Year Plan are outlined as follows.

(1) Major airports (Karachi, Lahore, Islamabad) are international airport and also key base airport for whole domestic aviation in Pakistan.

Since they have great growing demand and they are requested high qualified function, these existing facilities with reach to the limit of capacity in near future.

Therefore, the improvement and development projects of these airports are urgent and shall be given the top priority.

(2) Peshawar and Gwadar are both international airports and they have higher demand comparatively in the future. In these points, improvement and expansion projects of existing facilities are quite important.

(3) On-going projects brought from the 5th Five Year Plan are desirable to accomplish during the 6th Five Year Plan period.

(4) Local airports need an expansion of terminal facilities in order to meet the growing demand.

(5) Basically air navigation systems will be newly planned and/or upgraded to meet the aircraft operation requirements in correspondence with the increased air traffic volume forecast and introduction of newly developed larger aircraft, taking into consideration internationally acknowledged standard level and future tendency of navaids development.

3-6-2 Main Project for the 6th Five Year Plan

(1) Karachi International Airport

a) Runway and Taxiway

The existing main runway has a regular pattern of cracks, and is heavily marked with rubber. Therefore, the main runway is to be overlaid for good traffic condition. But it is difficult to overlay the runway without closing of aircraft operation because of the continuous traffic. In consideration of this situation, the secondary runway shall be extended to the same length of 3,200 m as the main runway, and new several taxiways shall be installed for use of these, while the main runway will be repaired and strengthened.

b) Apron

In order to meet the growing demands, the terminal area is desirable to be radically improved and developed as a main gateway to the country side for international traffic. From this standpoint, passenger apron, cargo apron and night stay apron are planned to be developed in suitable site in correspondence with existing facilities.

Besides, as described in ICAO Report, MAY 1982, the existing apron is relatively old rigid pavement and several areas near the edge of the apron opposite the international terminal show failure. Therefore, the existing apron shall be repaved.

c) Terminal Facility

The two existing passenger terminal buildings handle respectively the both domestic and international passengers from its history.

Since this system has not a little problem and consequently cause inconvenient for passengers and airlines, the domestic and international terminal building are desired to be newly built.

In addition to terminal building, other terminal facilities such as car parking, access road, control tower, administration office, fire-fighting facility and security facility, etc. shall be constructed and arranged.

(2) Islamabad International Airport

Islamabad International Airport is going to play more important role in Pakistan aviation as an airport of capital. So, it is necessary to develop the 3,200 m runway for operation of long haul aircraft and to

relocate the whole facilities of terminal area to north side of runway from a viewpoint of its function and expansibility.

(3) Lahore International Airport

a) Runway and Taxiway

The present runway strength is so weak that improvement of the runway is essential for operation of wide-bodied aircraft. But it is difficult to strengthen the runway without closing down completely. Therefore, parallel runway shall be newly provided and the existing runway is to be converted into parallel taxiway.

b) Terminal Area

Since the existing terminal area is distant from the runway and limited in space for development, it is necessary to relocate the whole facilities of terminal area near the runway from a viewpoint of it's function and expansibility.

(4) Other International Airport

Peshawar and Gwadar Airport need to expand the terminal facilities (apron, car parking and passenger terminal building) in order to cope with demand.

And the runway of Gwadar Airport is desired to be extended and expanded so as to operate the international flight, and to be overlaid for good pavement condition.

(5) Nawabshah Airport

Nawabshah Airport is desirable to be developed as an alternative airport for both international and domestic flights to Karachi Airport in case of emergency.

Therefore, terminal facilities, i.e., apron including taxiway, car parking including access road, passenger terminal building., control tower, POL.,are planned to expand or newly construct.

(6) New Airport

From the viewpoint of civil minimum, construction of local airports may be justified feasible. Therefore, whole facilities are planned to be provided suitable for F-27 class aircraft.

Particulaly Sibi, Khuzdar and Zhob Airport, which are on going project, shall be followed in the 6th Five Year Plan.

(7) Regional Air Navigation Systems and Related Building Plan

Regional air navigation systems plan include the following four major project items:

a. Regional buildings and airport facility rooms shall be newly constructed at Karachi, Islamabad and Lahore for the regional air traffic services. Those include buildings for flight information center, air traffic control center, search and rescue coordination center, etc.

b. Centralized maintenance centers and training equipment shall be newly provided at Karachi for Familialization to the highly sophisticated equipment and for satisfactory maintenance quality.

c. Remotely controlled VHF air to ground telecommunications facilities shall be newly and additionally constructed along the air routes for en-route air traffic control services.

d. En-route navaids (VOR/DME of NDB) shall be replaced with new one or newly provided for modernization of the en-route guidance to the internationally acknowledged standard in Pakistan territory.

(8) Air Navigation Systems Plan for Karachi International Airport

The existing ASR shall be replaced with a new and modern ASR/SSR in a top priority to expedite safe and efficient aircraft operations at Karachi Control Zone.

Radio navigation aids, aeronautical ground lights and other related facilities shall be replaced and/or newly installed to allow a complete precision approach category - I. This concept should be adopted for

the planned extension and up-grade of B-runway.

(9) Air Navigation Systems Plan for Islamabad International Airport

A terminal ASR/SSR shall be newly provided to improve the congestion in Islamabad Control Zone and also to contribute to the air safety.

Radio navigation aids, aeronautical ground lights and other related facilities shall be replaced and/or upgraded to allow complete precision approach category - I.

(10) Air Navigation Systems Plan for Lahore International Airport

Radio navigation aids, aeronautical ground lights and other related facilities shall be replaced and/or upgraded to allow complete precision approach category - I.

(11) Air Navigation Systems Plan in Minor Airports

The following air navigation systems shall be newly installed to obtain the non-precision IFR operations.

Table 3-6-1 Major Works (Fiscal:1983/84-1987/88)

"1" : Planned (New/Replacement)

Airport	AIR NAVIGATION PLAN										
	ASR	ILS	VOR/DME	T-DME	NDB	ALS	RWYL	VASIS	COM.	TWYL	Others
Peshawar			1					1	1	1	
D.I.Khan			1					1			
Faisalabad		1	1	1	1	1	1	1	1	1	
Multan		1	1		1	1	1	1	1	1	
Hyderabad					1		1	1		1	
Nawabshah		1	1	1	1	1	1	1	1	1	
Sukkur					1		1	1			
Quetta		1	1		1	1	1	1	1	1	
Turbat			1				1	1			
Gwadar			1				1	1			
Jiwani			1		1			1			
Sui					1			1			
Moenjodaro					1		1	1			
Pasni					1		1	1			
New Airport					1			1			

3-6-3 Priority and Schedule of Project for the 6th Five Year Plan

Priority and schedule of projects for the 6th Five Year Plan are summerized as Table 3-6-2, according to the considerations described in 3-6-2.

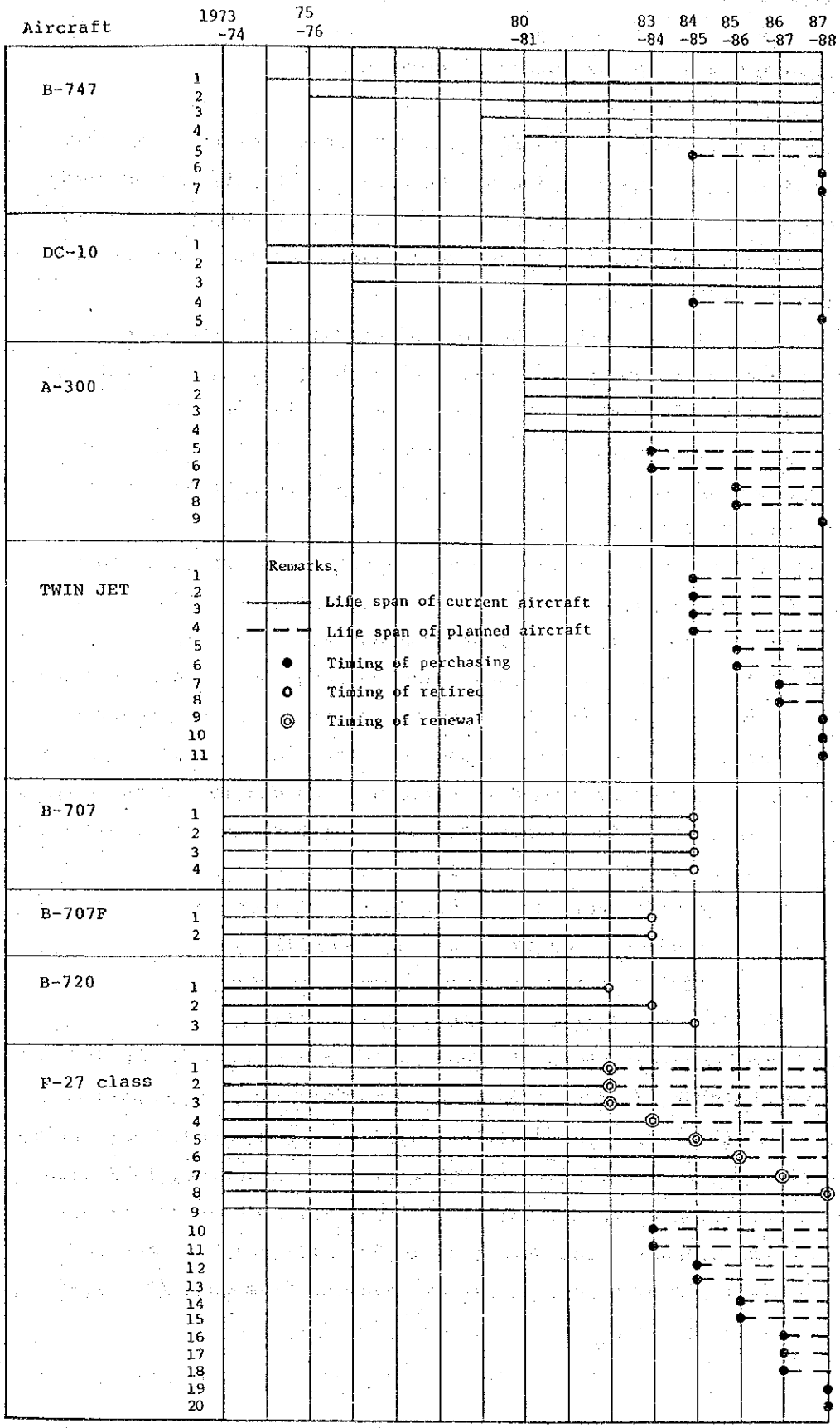
Table 3-6-2 Priority and Schedule of Project for the 6th Five Year Plan

Name of projects	1983 -84	1984 -85	1985 -86	1986 -87	1987 -88	Priority
PESHAWAR AIRPORT						A
D.I.KHAN AIRPORT						C
SAIDU SHARIF AIRPORT						C
CHITRAL AIRPORT						C
ISLAMABAD AIRPORT						Ⓐ
LAHORE AIRPORT RUNWAY,TAXIWAY						Ⓐ
TERMINAL AREA						Ⓐ
FAISALABAD AIRPORT						B
MULTAN AIRPORT						C
KARACHI AIRPORT RUNWAY,TAXIWAY						Ⓐ
PASSENGER LOADING APRON						Ⓐ
CARGO TERMINAL AREA						Ⓐ
NIGHT STAY APRON						Ⓐ
EXISTING APRON						Ⓐ
INT'L TERMINAL FACILITY						Ⓐ
DOM. TERMINAL FACILITY						Ⓐ
NAWABSHAH AIRPORT						A
MOENJODARO AIRPORT						C
SUKKUR AIRPORT						C
QUETTA AIRPORT						C
PANJGUR AIRPORT						B
TURBAT AIRPORT						B
PASNI AIRPORT						C
GWADAR AIRPORT						A
JIWANI AIRPORT						C
SUI AIRPORT						C
NEW AIRPORTS						B
REGIONAL AIR NAVIGATION PLAN						A
AIR NAVIGATION SYSTEM PLAN FOR KARACHI A/P						A
AIR NAVIGATION SYSTEM PLAN FOR ISLAMABAD A/P						A
AIR NAVIGATION SYSTEM PLAN FOR LAHOLE A/P						A
AIR NAVIGATION SYSTEM PLAN IN MINOR AIRPORTS						B

Fleet of PIA up to 2000 is planned as shown in Table 2-6-24 in VI. assuming the aircraft service period in PIA to be about 15 years on the average.

From this fleet forecast, fleet plan during the 6th Five Year Plan period is breakdowned as Table 3-7-1.

Table 3-7-1 Fleet Plan of PIA



4. Implementation Schedule and Budget Allocation

4-1 Budgetary Demand versus Financial Frame

In line with microscopic traffic demand forecast for the next Five Year Plan period in full consideration of the present capacity status, policy and strategy conceived and planning criteria of each mode of transport, the projects designed to fill up the demand and capacity gap with the target year 1987/88 are identified.

It is to be emphasized that the present situation of the transport system and its infrastructure are far behind the level to cope with the socio-economic development of the country, and it is vital that the transport system as the whole shall be improved at least to the level to comply with such development by the positive and concentrated investment in the Sixth Five Year Plan period.

In the light of this concept, the adjustment of the projects to be selected for implementation in this Plan period has been made in line with the positive financial guideline of about 25 percent increase of the previously calculated Standard frame which is based on the past trend and share in ADP category budget. Here, an "adjustment" means a postponement of the appropriation to projects beyond the next Plan period.

The resultant budgetary demand in terms of accumulation of the cost of the projects in this period is summarized as follows, the breakdown of which is shown in Tables 4-1-1 and 4-1-2.

ADP Category	Rs. 40,805 million
Non-ADP Category	Rs. 15,159 million
Total	RS. 55,964 million

In Road the budgetary demand is eventually rendered to Rs. 16,255 million, which is by 37 percent more than the "Standard" framework (Rs. 11,877 million). On the "25% Increase" basis it is by 9 percent more than the allotted framework (Rs. 14,846 million). Likewise, in Railway the demand settled down to Rs. 13,721 million, which is by 32 percent higher than the Standard framework (Rs. 10,393 million). On the 25% Increase basis it is by 6 percent larger than the framework (Rs.12,991 million).

In Road Transport the budgetary demand resulted in Rs. 2,868 million, which is by 4 percent more than the Standard framework (Rs.2,758 million). However, it is by 17 percent less than the positive framework (Rs. 3448 million). In Port the budgetary demand of Rs. 2,999 million falls considerably short of the "Standard" framework (Rs. 3,426 million) - by 12 percent less - mainly because the budget for the construction of container berths has been excluded from and moved outside the ADP category. On the "25% Increase" basis the demand stands by 30 percent below the framework (Rs. 4,283 million). In Airport the investment demand of Rs. 4,962 million exceeds the Standard framework (Rs. 2,677 million) by 85 percent. It also exceeds the positive framework (Rs. 3,346 million) by 48 percent.

Eventually, an amount of Rs. 40,805 million has been decided on as the aggregate of the final ADP budgetary demands, which is greater than the overall Standard framework (Rs. 31,131 million) by 31 percent (Rs. 9,674 million). (Refer to Table 4-1-1). Although an amount of Rs. 38,913 million has been aimed at as the investment guideline in the Plan period, the result stands a little - by 4.9 percent (Rs. 1,892 million) - above it. The share of Transport Sector in the total ADP category budget for the Sixth Plan is calculated to be 21 percent (16.34% × 1.31).

As is shown in Table 4-1-2, with respect to the non-ADP group the total sum of budgetary demands falls well within the overall financial framework.

In Port (KPT) the investment amounting to Rs. 1,553 million will be necessary in the Sixth Plan period to cope with the expansion of seaborne trade and also to implement "containerization". In Shipping (PNSC) the investment amounting to Rs. 3,386 million will be required at the least to maintain the competitive position of the semi-public corporation. In Aviation (PIA) the amount reaching Rs. 10,220 million for the acquisition of aircrafts is budgeted to meet the expanding air traffic. In total the budgetary demands add up to Rs. 15,159 million, which is by 9 percent less than the Standard framework.

The budgetary demand in ADP for the period beyond 1987-88 up to 1999-2000 (Rs. 132,307 million) resulted to be very close to the Standard framework (Rs. 131,724 million), exceeding by only 0.4 percent (Rs. 583 million). Throughout the entire future periods the budgetary demand

(Rs. 172,912 million) is by 6 percent (Rs. 10,057 million) higher than the Standard frame (Rs. 162,855 million). When ADP and non-ADP groups are combined together over the whole future periods the budgetary demand (Rs. 221,691 million) approximately equals the financial framework (Rs. 223,778 million).

The investment expenditure on additional pipeline construction is not treated here since it is budgeted in Energy Section. Also, the expenditure on transport research and development is not taken up because the matter is out of the scope of the study.

Table 4-1-1 Budgetary Demand versus Framework - ADP

- Rs. Million -

Mode	Item	6th Plan Period (1983-88)				Beyond 1987 - 88				Total			
		D	F	D - F	D/F	D	F	D - F	D/F	D	F	D - F	D/F
Road	On-Going	897				0				897			
	New	9,503	6,022	4,378	173%	36,792	29,718	7,074	124%	46,295	35,740	11,452	132%
	Outside the Study	5,855	5,855	0	100%	28,892	28,892	0	100%	34,747	34,747	0	100%
	Sub-Total	16,255	11,877	4,378	137%	65,684	58,610	7,074	112%	81,939	70,487	11,452	116%
Road Transport	New + On-Going	1,975	1,865	110	106%	5,330	6,158	-828	87%	7,305	8,023	- 718	91%
	Outside the Study	893	893	0	100%	2,793	2,793	0	100%	3,686	3,686	0	100%
	Sub-Total	2,868	2,758	110	104%	8,123	8,951	-828	91%	10,991	11,709	- 718	94%
Railway	On-Going	1,500				0				1,500			
	New	11,109				48,158				59,267			
	Minor	1,112				4,815				5,927			
	Sub-Total	13,721	10,393	3,328	132%	52,973	51,284	1,689	103%	66,694	61,677	5,017	108%
Port	On-Going	1,168				0				1,168			
	New	1,831				1,584				3,415			
	Sub-Total	2,999	3,426	-427	88%	1,584	6,431	-4,847	25%	4,583	9,857	-5,274	46%
Airport	On-Going	114				0				114			
	New	4,848				3,943				8,791			
	Sub-Total	4,962	2,677	2,285	185%	3,943	6,448	-2,505	61%	8,905	9,125	- 220	98%
Total		40,805	31,131	9,674	131%	132,307	131,724	583	100%	173,112	162,855	10,257	106%

Note: D = Final Budgetary Demand, F = "Standard" Budgetary Framework

Source: JICA Estimation

Table 4-1-2 Budgetary Demand versus Framework - Non-ADP

- Rs. Million -

Mode	6th Plan Period (1983-88)				Beyond 1987 - 88				Total			
	D	F	D - F	D/F	D	F	D - F	D/F	D	F	D - F	D/F
Port	1,553	1,282	271	121%	2,804	2,734	70	103%	4,357	4,016	341	108%
Shipping	3,386	5,152	-1,766	66%	8,136	11,907	-3,776	68%	11,522	17,059	-5,537	68%
Aviation	10,220	10,291	- 71	99%	22,480	29,557	-7,077	76%	32,700	39,848	-7,148	82%
Total	15,159	16,727	-1,566	91%	33,420	44,198	-10,778	76%	48,579	60,923	-12,344	80%

Note: D = Budgetary Demand
F = Budgetary Framework

Source : JICA Estimation