

Table 2.2.6 Transport Demand of the Products of Pakistan Steel Mill

	(000 tons)				
	Production of Pig Iron A	Pig Iron to be Sold B	Production of Other Items C	Other Items to be Sold D	Total to be Sold (B+D)
1981/82	382	382	--	--	382
1982/83	463	420	40	38	458
1983/84	491	280	196	187	467
1984/85	706	191	479	460	651
1985/86	854	135	669	656	791
1986/87	1,002	77	860	843	920
1987/88	1,150	21	1,050	1,029	1,050
1992/93	1,500	27	1,370	1,343	1,370
1997/98	1,500	27	1,370	1,343	1,370
2005/06	2,500	48	2,280	2,234	2,282

Note: Estimated based on 1986 Statistical Yearbook and 1984/85 Annual Report of the Public Sector Industries.

⑨ Mining:

- This commodity category is divided into the following:

- A. Natural Gas
- B. Limestone
- C. Other Minerals

Note: Crude oil and coal are dealt with under another different item.

- The production of natural gas increases or decreases in proportion to the estimated GRP of natural gas industry.
- The production of limestone increases or decreases in proportion to the estimated GRP of limestone industry.
- Other minerals, which include antimony, argonite/marble, china clay, celestite, chromite, fire clay, fullers earth, gypsum, magnesite, rock salt, silica sand, ochre, sulphur, soap stone, baryte, bauxite/laterite, iron ore and copper ore, increases or decreases in proportion to the estimated GRP of "other minerals" industry.

⑩ Coal and Coke:

- This commodity category is divided into:

- A. Coal
- B. Coke

- The production of coal increases or decreases in proportion to the estimated GRP of coal.

- The production of coke is considered to have been realized only in Pakistan Steel Mill in Karachi. It is assumed that the coke production grows in proportion to the production of pig iron.

⑪ Petroleum:

- This commodity category is divided into:
 - A. Crude Oil
 - B. Petroleum Mix Product by Refineries
- The production of crude oil is expected to grow at an annual rate of 13.5% between 1985/86 and 1992/93, 11.2% between 1992/93 and 1997/98 and 9.5% thereafter.
- Petroleum mix products are currently produced by Attock Refinery Ltd., Pakistan Refinery Ltd. and National Refinery Ltd. PRL and NRL are located at Karachi. The production of this product is considered to increase in proportion to the refining capacity which is supposed to grow at an annual rate of 6.6%, 6.0% and 6.5% for the 7th, 8th and 9th FYP period, respectively. However, the zonal distribution was estimated based on the present processing quantity of crude oil, namely 17.4% to Attock (Punjab) and 82.6% to Karachi (Sind), as shown in Table 2.2.7.

Table 2.2.7 Crude Oil Processed by Refineries, 1985/86

Refinery	Processed Crude Oil (000 tons)	%
Attock Refinery Ltd.	967	17.4
Pakistan Refinery Ltd.	2,229	40.2
National Refinery Ltd.	2,348	42.4
Total	5,544	100.0

Source: 1986 Energy Yearbook

⑫ Firewood:

- The future production was assumed to increase/decrease in proportion to the estimated GRP of forestry.

⑬ Sugarcane:

- The future production was assumed to increase/decrease in proportion to the estimated GRP of sugarcane.

⑭ Fruits and Vegetable:

- The future production was assumed to increase/decrease in proportion to the estimated GRP of fruits/vegetable.

⑮ Livestock:

- The future production was assumed to increase/decrease in proportion to the estimated GRP of livestock industry.

⑯ Rock Phosphate:

- The production of phosphate rock in Pakistan is negligible at present. Taking into account, however, the exploitable reserve of about 12 million tons found in Kakul and Lagarban areas in NWFP, it is assumed that 500 and 1,000 thousand tons will be produced in 1997/98 and 2005/06, respectively.

⑰ Railway Material:

- This item is transported only by railway. Production of this item is considered to be covered under other items.

⑱ Railway Oil:

- Same as Railway Material above.

⑲ Others:

- This item covers a wide variety of commodity. It is considered almost impossible to estimate the production amount in tonnage due to the limitation in data availability. Therefore, the transport demand of the commodity items falling into this category is estimated separately in the following sections.

2.3 Projection of Consumption and Import/Export by Commodity

This section firstly estimates the consumption of each commodity item based on the past trends of production, import/export, population and GDP (or per capita GDP), then estimates the import/export quantity as the gap between projected production and consumption.

However, the 3 commodity items of which production was not estimated (17. Railway Material, 18. Railway Oil, 19. Others) are not dealt with as explained above. Railway material and railway oil are covered by other items and, therefore, are excluded from this projection. For "others", import and export are estimated independently from other commodity items, and consumption is not estimated due to the same reason as production.

2.3.1 Total Consumption

The total consumption of a specific commodity item can be considered to be the sum of domestic production and import or the difference of domestic production and export. The consumption was projected by commodity as follows:

① Wheat

The per capita consumption of wheat has been increasing as shown in Table 2.3.1.

Table 2.3.1 Past Trends of Per Capita Wheat Consumption

Year	Production* (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Per Capita Annual Consumption (kgs)	
				Yearly	3-Y Ave.
1971-72	6,890	690	6,891	105.5	-
1972-73	7,442	1,359	8,057	120.5	114.5
1973-74	7,629	1,229	8,095	117.4	118.0
1974-75	7,673	1,344	8,250	116.1	118.9
1975-76	8,691	1,186	9,008	123.1	118.3
1976-77	9,144	499	8,729	115.7	116.4
1977-78	8,367	1,052	8,582	110.4	121.9
1978-79	9,950	2,236	11,191	139.7	124.3
1979-80	10,587	602	10,130	122.7	129.5
1980-81	11,475	305	10,633	126.2	123.0
1981-82	11,304	360	10,534	120.0	124.7
1982-83	12,414	396	11,569	127.9	117.1
1983-84	10,382	291	9,635	103.3	117.0
1984-85	11,703	980	11,513	119.7	123.6
1985-86	13,923	1,909	14,440	147.8	-

Note: * 10% reserve as feed and seed is taken into account to calculate the total consumption.

Source: 1986/87 Economic Survey

The per capita wheat consumption listed above can be expressed by the following formula:

$$\text{PWC} = 3.65096 \times \text{PGDP} + 106.43$$

$$(\text{R} = 0.35, \text{T} = 1.25)$$

Where, PWC : Per Capita Wheat Consumption as a 3-Year Moving Average (Kgs)

PGDP : Per Capita GDP (000 Rs.)

Using this formula, the per capita wheat consumption was calculated at 129.1, 132.7 and 139.7 Kgs per year for 1992-93, 1997-98 and 2005-06, respectively. Hence the future wheat consumption was estimated as presented in Table 2.3.2.

Table 2.3.2 Projection of Wheat Consumption

Year	Per Capita Wheat Consumption (Kgs)	Population (000)	Wheat Consumption (000 tons)
1992-93	129.1	120,955	15,615
1997-98	132.7	139,975	18,575
2005-06	139.7	172,485	24,096

Source: JICA Study Team

The projected wheat consumption will grow at an annual rate of 3.5% during the 7th FYP and 8th FYP period and 3.3% thereafter as compared to the average annual consumption between 1983/84 and 1985/86. However, per capita and 0.6% for the 7th FYP, 8th FYP period and thereafter, respectively.

② Rice

The per capita consumption of rice during the last 15 years is as shown in Table 2.3.3.

The per capita annual consumption of rice seems very irregular, but the 3-year moving average is considered to be almost constant.

In view of this fact, the future per capita consumption of rice has been assumed to show a relatively moderate increase, i.e. 22.5, 23.0 and 23.8 Kgs per year for 1992-93, 1997-98 and 2005-06, respectively. Hence the future rice consumption was estimated as shown in Table 2.3.4.

Table 2.3.3 Past Trends of Per Capita Rice Consumption

Year	Production* (000 tons)	Export (000 tons)	Total Consumption (000 tons)	Per Capita Annual Consumption (kgs)	
				Yearly	3-Y Ave.
1971-72	2,262	198	1,838	28.1	-
1972-73	2,330	798	1,308	19.6	23.7
1973-74	2,455	597	1,613	23.4	21.9
1974-75	2,314	478	1,605	22.6	23.3
1975-76	2,818	782	1,754	24.0	22.2
1976-77	2,737	945	1,518	20.1	22.3
1977-78	2,950	879	1,776	22.8	22.3
1978-79	3,272	1,015	1,930	24.1	22.6
1979-80	3,126	1,087	1,726	20.9	21.2
1980-81	3,123	1,244	1,567	18.6	21.3
1981-82	3,430	951	2,136	24.3	22.4
1982-83	3,445	905	2,196	24.3	22.4
1983-84	3,340	1,265	1,741	18.7	22.2
1984-85	3,315	719	2,265	23.5	18.5
1985-86	2,919	1,316	1,311	13.4	-

Note: * 10% reserve as feed and seed is taken into account to calculate the total consumption.

Source: 1986/87 Economic Survey

Table 2.3.4 Projection of Rice Consumption

Year	Per Capita Rice Consumption (Kgs)	Population (000)	Rice Consumption (000 tons)
1992-93	22.5	120,955	2,721
1997-98	23.0	139,975	3,219
2005-06	23.8	172,485	4,105

Source: JICA Study Team

The projected consumption of rice will grow at an annual rate of 5.5%, 3.4% and 3.1% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 3-year average between 1983/84 and 1985/86. For the same period, however, the per capita consumption will show quite a moderate increase annual rate of 2.5%, 0.4% and 0.4%.

③ Cotton

The past trends of cotton consumption are as shown in Table 2.3.5.

Table 2.3.5 Past Trends of Cotton Consumption

Year	Production (000 tons)	Export (000 tons)	Total Consumption (000 tons)	Total Consumption 3-Year Average (000 tons)
1971-72	707	196	511	-
1972-73	702	216	486	540
1973-74	659	37	622	514
1974-75	634	200	434	486
1975-76	514	113	401	417
1976-77	435	18	417	431
1977-78	575	101	472	436
1978-79	473	55	418	456
1979-80	728	251	477	428
1980-81	715	325	390	461
1981-82	748	231	517	492
1982-83	824	255	569	494
1983-84	495	98	397	570
1984-85	1,008	263	745	573
1985-86	1,217	639	578	-

Source: 1986/87 Economic Survey

The cotton consumption in the past seems highly unstable, but after taking a 3-year moving average, it is gradually increasing except for the period between 1972-73 and 1974-75.

The primary consumer of raw cotton is considered to be the textile industry in Pakistan. Therefore, if the industry grows then the demand for cotton will increase as well. Assuming that the cotton consumption will grow in proportion to the industry's growth in GDP, the future consumption of cotton was estimated as presented in Table 2.3.6.

Table 2.3.6 Projection of Cotton Consumption

Year	Cotton Consumption (000 tons)
1992/93	900
1997/98	1,192
2005/06	1,735

Source: JICA Study Team

The projection shows that the cotton consumption will increase at an annual rate of 5.8% upto 1997/98 and 4.8% thereafter as compared to the 3-year average between 1983/84 and 1985/86. This rapid increase may be attributed to the high growth expected in the textile industry.

④ Edible Oil

The past trends of edible oil consumption are as presented in Table 2.3.7.

Table 2.3.7 Past Trends of Per Capita Edible Oil Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Per Capita Annual Consumption (kgs)	
				Yearly	3-Y Ave.
1971-72	162	52	214	3.28	-
1972-73	187	69	256	3.83	4.14
1973-74	225	142	367	5.32	5.24
1974-75	272	194	466	6.56	6.32
1975-76	277	241	518	7.08	7.27
1976-77	326	290	616	8.16	7.77
1977-78	360	268	628	8.08	8.92
1978-79	422	420	842	10.51	9.42
1979-80	452	346	798	9.66	10.57
1980-81	505	467	972	11.54	11.45
1981-82	531	624	1,155	13.16	12.54
1982-83	513	656	1,169	12.92	13.88
1983-84	595	857	1,452	15.57	14.02
1984-85	640	664	1,304	13.56	14.61
1985-86	612	825	1,437	14.71	-

Source: 1986/87 Economic Survey

The per capita consumption of edible oil is increasing rapidly. Due, however, to the fact that there should be a certain upper limit in per capita consumption of edible oil, a logistic curve was applied to the figures of 3-year moving average. In this analysis, the upper limit was calculated at 17.5 Kgs/year. The calculated values for the years 1992-93, 1997-98 and 2005-06 are 16.96, 17.33 and 17.47 Kgs/year, respectively.

The result of the projection is presented in Table 2.3.8.

Table 2.3.8 Projection of Edible Oil Consumption

Year	Per Capita Edible Oil Consumption (Kgs)	Population (000)	Edible Oil Consumption (000 tons)
1992-93	16.96	120,955	2,051
1997-98	17.33	139,975	2,426
2005-06	17.47	172,485	3,013

Source: JICA Study Team

The projected consumption will grow at an annual rate of 4.9%, 3.4% and 2.7% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 3-year average between 1983/84 and 1985/86. For the same period, however, the per capita consumption will grow at an annual rate of only 1.9%, 0.4% and 0.1%.

⑤ Sugar

The per capita consumption of sugar has been increasing as shown in Table 2.3.9.

Table 2.3.9 Past Trends of Per Capita Sugar Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Per Capita Annual Consumption (kgs)	
				Yearly	3-Y Ave.
1971-72	375	62	437	6.69	-
1972-73	429	197	626	9.36	8.59
1973-74	608	61	669	9.71	8.71
1974-75	502	0	502	7.07	8.59
1975-76	630	29	659	9.00	8.66
1976-77	736	11	747	9.90	10.08
1977-78	861	20	881	11.33	9.64
1978-79	607	10	617	7.70	9.10
1979-80	586	98	684	8.28	8.99
1980-81	851	74	925	10.98	11.36
1981-82	1,301	0	1,301	14.82	12.78
1982-83	1,127	7	1,134	12.53	13.23
1983-84	1,145	6	1,151	12.34	12.89
1984-85	1,306	21	1,327	13.80	13.41
1985-86	1,107	268	1,375	14.08	-

Source: KPT Annual Reports

The per capita consumption of sugar was relatively stable between 1972-73 and 1979-80, but it started to increase sharply after 1980-81. Since this increase is not considered to continue for a long time, a logistic curve was applied for approximation. The upper limit was calculated at 20.0 Kgs/Year, and the calculated values for years 1992-93, 1997-98 and 2005-06 are 16.05, 17.33 and 18.64 Kgs/Year, respectively.

The result of the projection is shown in Table 2.3.10.

Table 2.3.10 Projection of Sugar Consumption

Year	Per Capita Sugar Consumption (Kgs)	Population (000)	Sugar Consumption (000 tons)
1992-93	16.05	120,955	1,941
1997-98	17.33	139,975	2,426
2005-06	18.64	172,485	3,215

Source: JICA Study Team

The projected consumption will grow at an annual rate of 5.3%, 4.6% and 3.6% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 3-year average between 1983/84 and 1985/86. The per capita consumption will increase at an annual rate of 2.3%, 1.5% and 0.9% for the same period.

⑥ Cement

The past trends of cement consumption is shown in Table 2.3.11.

Table 2.3.11 Past Trends of Cement Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Total Consumption 3-Year Average (000 tons)
1971-72	2,606	- 540	2,066	-
1972-73	2,878	- 520	2,358	2,290
1973-74	3,145	- 699	2,446	2,547
1974-75	3,320	- 483	2,837	2,794
1975-76	3,196	- 98	3,098	2,998
1976-77	3,071	- 13	3,058	3,138
1977-78	3,224	34	3,258	3,323
1978-79	3,023	630	3,653	3,622
1979-80	3,343	611	3,959	3,863
1980-81	3,538	444	3,982	4,292
1981-82	3,637	1,302	4,939	4,502
1982-83	3,938	647	4,585	4,966
1983-84	4,503	871	5,374	5,126
1984-85	4,698	722	5,420	5,330
1985-86	4,980	217	5,197	-

Note: Negative figures in the "Import" column show exports.

Source: KPT Annual Reports

It is said that the cement consumption is strongly related to the GDP of construction industry. In order to test this assumption, regression analysis was conducted. The resultant formula is:

$$cc = 0.177689 \times \text{GDPCON} + 563.554$$

$$(R = 0.98, T = 17.85)$$

Where, cc : Cement Consumption as a 3-Year Moving Average (000 tons)

GDPCON : GDP of Construction Industry (million Rs.)

Based on this formula, the future cement consumption is calculated at 9,674, 13,223, and 21,992 thousand tons per year for 1992-93, 1997-98 and 2005-06, respectively. This is summarized in Table 2.3.12.

Table 2.3.12 Projection of Cement Consumption

Year	Cement Consumption (000 tons)
1992-93	9,674
1997-98	13,223
2005-06	21,992

Source: JICA Study Team

The projected consumption will grow at an annual rate of 7.7%, 6.4% and 6.6% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 1983/84 -1985/86 average consumption. Due to the high growth expected for the construction industry, the demand for cement will be increasingly larger.

⑦ Fertilizer:

The past trends of fertilizer consumption are shown in Table 2.3.13.

Table 2.3.13 Past Trends of Fertilizer Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Total Consumption 3-Year Average (000 tons)
1971/72	565	159	724	-
1972/73	703	335	1,038	1,048
1973/74	752	631	1,383	1,192
1974/75	785	370	1,155	1,247
1975/76	824	380	1,204	1,193
1976/77	824	395	1,219	1,280
1977/78	813	604	1,417	1,716
1978/79	938	1,575	2,513	2,073
1979/80	1,177	1,112	2,289	2,567
1980/81	1,605	1,294	2,899	2,485
1981/82	1,952	314	2,266	2,811
1982/83	2,575	692	3,267	2,822
1983/84	2,676	256	2,932	3,037
1984/85	2,714	198	2,912	2,885
1985/86	2,734	78	2,812	-

Source: KPT and PQA Annual Reports

The primary consumer of fertilizer is the agriculture industry (major and minor crops). The consumption of fertilizer can be expressed by the following formula:

$$FC = 0.0958275 \times \text{GDPCROP} - 3917.85$$

$$(R = 0.93, T = 8.36)$$

Where, FC : Fertilizer Consumption as a 3-Year Moving Average (000 tons)

GDPCROP: GDP of Major and Minor Crops (million Rs.)

Using the above formula, the future consumption of fertilizer can be projected as shown in Table 2.3.14.

Table 2.3.14 Projection of Fertilizer Consumption

Year	Fertilizer Consumption (000 tons)
1992/93	5,905
1997/98	7,681
2005/06	10,877

Source: JICA Study Team

The consumption of fertilizer will grow rapidly at an annual rate of 9.4%, 5.4% and 4.4% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 1983/84 - 1985/86 average.

⑧ Iron and Steel

The past trends of iron and steel consumption are as shown in Table 2.3.15.

Table 2.3.15 Past Trends of Iron and Steel Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Total Consumption 3-Year Average (000 tons)
1971/72	166	383	549	-
1972/73	184	472	656	596
1973/74	218	364	582	677
1974-75	224	570	799	667
1975/76	231	395	626	722
1976/77	270	476	746	759
1977/78	315	589	904	825
1978/79	362	463	825	919
1979/80	421	608	1,029	930
1980/81	495	442	937	1,068
1981/82	933	305	1,238	1,190
1982/83	1,095	299	1,394	1,274
1983/84	1,121	70	1,191	1,452
1984/85	1,370	402	1,772	1,608
1985/86	1,523	338	1,861	-

Source: KPT and PQA Annual Reports

Iron/steel is a basic material for almost all manufacturing industries. Its consumption can be expressed by the following formula:

$$\text{ISC} = 0.0208614 \times \text{GDPMAN} - 55.6624$$

(R = 0.99, T = 28.43)

Where, ISC : Iron/Steel Consumption as a 3-Year Moving Average (000 tons).

GDPMAN: GDP of Manufacturing Industry (million Rs.).

Using the above formula, the future consumption of iron/steel was projected as presented in Table 2.3.16.

Table 2.3.16 Projection of Iron/Steel Consumption

Year	Iron/Steel Consumption (000 tons)
1992/93	2,968
1997/98	4,282
2005/06	7,154

Source: JICA Study Team

The consumption of iron/steel will increase at a annual rate of 8.0%, 7.6% and 6.6% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 1983/84 - 1985/86 average.

⑨ Mining Products

In this category, there are 3 items, i.e.; natural gas, limestone and other minerals. With regard to natural gas and limestone, no import/export was recorded during the last 15 years. Because this situation is not likely to change in the near future, the future consumption of natural gas and limestone was assumed to be the same as production as presented in Table 2.3.17.

Table 2.3.17 Past Trends and Future Projection of Natural Gas and Limestone Consumption

	Natural Gas (million m ³)		Limestone (000 tons)	
	Production	Consumption	Production	Consumption
1971/72	3,516	3,516	2,628	2,628
1972/73	4,031	4,031	2,846	2,846
1973/74	4,598	4,598	3,258	3,258
1974/75	4,957	4,957	3,008	3,008
1975/76	4,965	4,965	2,968	2,968
1976/77	5,369	5,369	3,888	3,888
1977/78	5,632	5,632	4,029	4,029
1978/79	6,236	6,236	3,298	3,298
1979/80	7,317	7,317	2,798	2,798
1980/81	8,446	8,446	3,464	3,464
1981/82	9,109	9,109	3,682	3,682
1982/83	9,780	9,780	4,232	4,232
1983/84	9,768	9,768	4,696	4,696
1984/85	10,195	10,195	4,634	4,634
1985/86	10,768	10,768	6,313	6,313
1992/93	26,090	26,090	9,221	9,221
1997/98	43,067	43,067	12,632	12,632
2005/06	69,078	69,078	20,595	20,595

Source: 1986/87 Economic Survey

As for "other minerals", the past trends of consumption are as shown in Table 2.3.18.

Table 2.3.18 Past Trends of "Other Minerals" Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Total Consumption 3-Year Average (000 tons)
1971/72	530	-49	481	-
1972/73	615	-22	593	622
1973/74	819	-26	793	846
1974/75	1,173	-22	1,151	968
1975/76	995	-34	961	975
1976/77	837	-23	814	961
1977/78	1,116	-9	1,107	994
1978/79	1,069	-9	1,060	1,122
1979/80	1,217	-17	1,200	1,299
1980/81	1,441	196	1,637	1,587
1981/82	1,218	706	1,924	1,879
1982/83	1,310	766	2,076	2,058
1983/84	1,309	866	2,175	2,228
1984/85	1,276	1,157	2,433	2,477
1985/86	1,499	1,325	2,824	-

Note: Negative figures in the "Import" column show export.

Source: KPT and PQA Annual Reports

The primary consumer of "other minerals" is considered to be the "metal and metal products" industry including Pakistan Steel Mill. The sharp increase of consumption after 1980/81 can be attributed to the iron ore consumed by the Mill.

Due, however, to the absence of the past trend value-added data of the industry, the future consumption of "other minerals" was projected assuming that it would grow in proportion to the estimated GDP of metal and metal products industry, as shown in Table 2.3.19.

Table 2.3.19 Projection of "Other Minerals" Consumption

Year	"Other Minerals" Consumption (000 tons)
1992/93	5,215
1997/98	6,993
2005/06	11,902

Source: JICA Study Team

The consumption was projected to increase at an annual rate of 9.8%, 6.0% and 6.9% for the 7th FYP, 8th FYP period and thereafter respectively compared to the 1983/84 - 1985/86 average. The rapid growth can be attributed to the assumed high increase in the GDP of metal and metal products industry.

⑩ Coal and Coke

The past trends of coal/coke consumption are shown in Table 2.3.20.

Table 2.3.20 Past Trends of Coal/Coke Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Total Consumption 3-Year Average (000 tons)
1971/72	1,214	0	1,214	-
1972/73	1,192	0	1,192	1,206
1973/74	1,212	0	1,212	1,233
1974/75	1,295	0	1,295	1,187
1975/76	1,055	0	1,055	1,183
1976/77	1,200	0	1,200	1,169
1977/78	1,251	0	1,251	1,279
1978/79	1,387	0	1,387	1,402
1979/80	1,569	0	1,569	1,563
1980/81	1,577	156	1,733	1,970
1981/82	2,096	513	2,609	2,280
1982/83	1,979	519	2,498	2,612
1983/84	2,239	491	2,730	2,876
1984/85	2,689	711	3,400	3,199
1985/86	2,632	834	3,466	-

Source: PQA Annual Reports

The largest coal/coke consumer in Pakistan is the brick manufacturers at present (1986/87 Economic Survey). In the future, however, its consumption for generating electricity, iron/steel industry and other manufacturers will increase.

Due, however, to the absence of the past trend value-added data of these individual industries, the future consumption of coal/coke was projected assuming that it would increase in proportion to the estimated GDP of cement/ceramics, metal/metal products and electricity/gas (for energy generation) industries, as shown in Table 2.3.21.

Table 2.3.21 Projection of Coal/Coke Consumption

Year	Coal/Coke Consumption (000 tons)
1992/93	6,176
1997/98	8,578
2005/06	14,793

Source: JICA Study Team

The consumption will grow at an annual rate of 8.6%, 6.8% and 7.0% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 1983/84 - 1985/86 average consumption. As coal/coke is one of the essential materials for manufacturing industry, the consumption will increase at a considerably high growth rate.

⑪ Petroleum

The past consumption trends of crude oil and petroleum products are shown in Table 2.3.22.

Table 2.3.22 Past Trends of Petroleum Consumption

Year	Crude Oil (000 tons)				Petroleum Product (000 tons)			
	Production	Import	Total Consum- ption	Total Consump. 3-Y Avg.	Produc- tion	Import*	Total Consum- ption	Total Consump. 3-Y Avg.
1971-72	341	3,343	3,684	-	3,246	-459	2,787	-
1972-73	347	3,398	3,745	3,680	3,263	-521	2,742	2,924
1973/74	323	3,288	3,611	3,606	3,227	15	3,242	3,194
1974/75	277	3,184	3,461	3,420	3,078	521	3,599	3,406
1975-76	285	2,904	3,189	3,323	2,963	414	3,377	3,457
1976-77	413	2,907	3,320	3,569	3,064	332	3,396	3,580
1977-78	401	3,798	4,199	3,953	3,851	116	3,967	3,778
1978-79	420	3,919	4,339	4,334	3,782	190	3,972	4,196
1979-80	404	4,061	4,465	4,484	4,266	383	4,649	4,419
1980-81	403	4,245	4,648	4,751	4,278	359	4,637	4,780
1981-82	449	4,691	5,140	4,886	4,756	298	5,054	5,192
1982-83	537	4,332	4,869	4,967	4,566	1,318	5,884	5,824
1983-84	553	4,340	4,893	4,976	4,672	1,863	6,535	6,529
1984-85	1,079	4,088	5,167	5,138	5,046	2,121	7,167	7,004
1985-86	1,627	3,726	5,353	-	4,842	2,467	7,309	-

Note: * Import - Export

Source: KPT Annual Reports

At present, the largest consumer of petroleum products is the transport industry. However, there are so many other consumers including agricultural industry, electricity power industry, general household, and government agencies. Hence, the consumption of petroleum products was analyzed in relation to the total GDP.

$$PPC = 0.0179434 \times GDP - 1247.47$$

$$(R = 0.99, T = 25.21)$$

Where, PPC : Petroleum Product Consumption as a 3-Year Moving Average (000 tons)

GDP : Total GDP (million Rs.)

Using this formula, the future consumption of petroleum products was calculated at 12,234, 16,812 and 26,944 thousand tons for 1992-93, 1997-98 and 2005-06, respectively.

With regard to crude oil, its consumption is directly connected to the production of petroleum products. Actually the ratio of petroleum production to crude oil consumption has been almost constant at around 0.92. Assuming that this ratio will be maintained constant at 0.92 in the future, consumption of crude oil was projected at 8,233, 11,017 and 18,234 thousand tons for 1992-93, 1997-98 and 2005-06, respectively.

These projections are summarized in Table 2.3.23.

Table 2.3.23 Projection of Petroleum Consumption

Year	Consumption (000 tons)	
	Crude Oil	Petroleum Product
1992-93	8,233	12,234
1997-98	11,017	16,812
2005-06	18,234	26,944

Source: JICA Study Team

The consumption of crude oil will grow at an annual rate of 6.1%, 6.0% and 6.5% for the 7th FYP, 8th FYP period and thereafter respectively as compared to the 1983/84 -1985/86 average. The same figures for petroleum product will be 7.2%, 6.6% and 6.1%.

⑫ Firewood

This item is not considered to be imported or exported. Therefore, the consumption was assumed to be the same as its production.

⑬ Sugarcane

Due to the same reason as firewood, the consumption was assumed to be the same as its production.

⑭ Fruits and Vegetable

Due to the same reason as firewood, the consumption was assumed to be the same as its production.

⑮ Livestock

Due to the same reason as firewood, the consumption was assumed to be the same as its production.

⑯ Rock Phosphate

The past trends of the consumption of rock phosphate are as shown in Table 2.3.24.

Table 2.3.24 Past Trends of Rock Phosphate Consumption

Year	Production (000 tons)	Import (000 tons)	Total Consumption (000 tons)	Total Consumption 3-Year Average (000 tons)
1971-72	0	19	19	-
1972-73	0	45	45	22
1973-74	2	0	2	24
1974-75	15	11	26	21
1975-76	2	34	36	29
1976-77	0	26	26	40
1977-78	1	58	59	75
1978-79	3	136	139	126
1979-80	3	176	179	170
1980-81	1	191	192	188
1981-82	1	191	192	194
1982-83	0	197	197	224
1983-84	1	283	284	253
1984-85	1	276	277	262
1985-86	1	225	226	-

Source: KPT Annual Reports

The consumer of rock phosphate is the fertilizer industry.

On the assumption that the consumption of rock phosphate grows in proportion to the fertilizer production, it was projected as shown in Table 2.3.25.

Table 2.3.25 Projection of Rock Phosphate Consumption

Year	Consumption of Rock Phosphate (000 tons)
1992-93	391
1997-98	555
2005-06	953

Source: JICA Study Team

The consumption is considered to increase at an annual rate of 5.1%, 7.3% and 7.0% for the 7th FYP, 8th FYP and thereafter respectively as compared to the 1983/84 - 1985/86 average.

2.3.2 Consumption by Zone

The total consumption of Pakistan has been estimated by commodity as mentioned above. This subsection handles the zonal breakdown of the estimated national consumption.

In the absence of zonal production/consumption data, however, the national totals will have to be broken down into zonal consumption data using a zonal parameter already estimated in the preceding sections as the weight. Considering the consistency with the methodology of estimating the total consumption and the availability of data, these parameters have been determined as presented in Table 2.3.26.

Table 2.3.26 Parameter Used for Determining Zonal Consumption

Commodity	Zonal Parameter
1. Wheat	Total GRP
2. Rice	Population
3. Cotton	GRP of textile industry
4. Edible Oil	Population
5. Sugar	Population
6. Cement	GRP of construction industry
7. Fertilizer	GRP of major and minor crops
8. Iron and Steel	GRP of manufacturing industry
9. Mining Products	
- Natural Gas	GRP of electricity/gas industry (for generation)
- Limestone	GRP of cement/ceramics industry
- Other Minerals	GRP of metal/metal products industry
10. Coal and Coke	GRP of cement/ceramics, metal/metal products and electricity/gas industry (for generation)
11. Petroleum	
- Crude Oil	Processing capacity of crude oil (17.4% to Attock and 82.6% to Karachi)
- Petroleum Product	Total GRP
12. Firewood	Population
13. Sugarcane	GRP of large-scale food industry
14. Fruits and Vegetable	Total GRP
15. Livestock	Total GRP
16. Rock Phosphate	Production of fertilizer

Source: JICA Study Team

2.3.3 Import/Export

For each commodity, except 3 commodity items (17. Railway Material, 18. Railway Oil, 19. Others), production and consumption have been estimated. The difference between production and consumption can be considered to be the amount to be imported or exported. The calculation results are shown in Table 2.3.27.

Firewood, sugarcane, fruits/vegetable and livestock were excluded from this calculation because the consumption has been assumed to be the same as the production.

In this subsection, the import/export of the "Others" was estimated separately from other items. The commodity of this category is divided into the following 3 types:

- A. Liquid Export (Molasses)
- B. Dry Export
- C. Dry Import

For each type, the following regression equations have been adopted:

- A. Liquid Export (Molasses):

$$LE = 0.547453 \times SP - 101.656$$

(R = 0.49, T = 1.12)

where, LE : Liquid Export (Molasses, 000 tons)
SP : Sugar Production (000 tons)

- B. Dry Export

$$DE = 0.0158857 \times GDPMAN - 11.2553$$

(R = 0.80, T = 2.67)

where, DE : Dry Export (000 tons)
GDPMAN: GDP of Manufacturing Industry
(million Rs.)

- C. Dry Import

$$DI = 0.00175752 \times GDP + 1690.95$$

(R = 0.44, T = 0.98)

where, DI : Dry Import (000 tons)
GDP: Total GDP (million Rs.)

Table 2.3.27 Comparison of Production and Consumption by Commodity

		(000 tons)			
		1985-86	1992-93	1997-98	2005-06
Wheat	P	13,923	18,274	21,703	28,027
	C	14,440	15,615	18,575	24,096
	I/E	-1,909	832	958	1,128
Rice	P	2,919	4,169	4,694	5,708
	C	1,311	2,721	3,219	4,105
	I/E	1,316	1,031	1,006	1,032
Cotton	P	1,217	1,508	1,731	2,160
	C	578	900	1,192	1,735
	I/E	639	608	539	425
Edible Oil	P	612	955	1,308	2,007
	C	1,437	2,051	2,426	3,013
	I/E	- 825	-1,096	-1,118	-1,006
Sugar	P	1,107	1,727	2,366	3,631
	C	1,375	1,941	2,426	3,215
	I/E	- 268	- 214	- 60	416
Cement	P	4,980	9,688	13,259	22,086
	C	5,197	9,674	13,223	21,992
	I/E	- 217	14	36	94
Fertilizer	P	2,734	4,727	6,711	11,531
	C	2,812	5,905	7,681	10,877
	I/E	- 78	-1,178	- 970	654
Iron & Steel	P	1,523	2,904	3,718	5,905
	C	1,861	2,968	4,282	7,154
	I/E	- 338	- 64	- 564	-1,249
Ore	P	1,499	2,975	3,833	5,246
	C	2,824	5,215	6,993	11,902
	I/E	-1,325	-2,240	-3,160	-6,656
Coal & Coke	P	2,632	3,413	4,241	8,384
	C	3,466	6,176	8,578	14,793
	I/E	- 834	-2,763	-4,337	-6,409
Crude Oil	P	1,627	3,948	6,712	13,874
	C	5,353	8,233	11,017	18,234
	I/E	-3,726	-4,285	-4,305	-4,360
Petroleum Product	P	4,842	7,574	10,136	16,775
	C	7,309	12,234	16,812	26,944
	I/E	-2,467	-4,660	-6,676	-10,169
Rock Phosphate	P	1	0	500	1,000
	C	226	391	555	953
	I/E	- 225	- 391	- 55	47

Note: 1) P - Production, C - Consumption, I/E - Import/Export
 2) 10% reserve as seed and feed was taken from the production of wheat and rice.
 3) Negative figures in the row of "I/E" show import and positive figures export.

Source: JICA Study Team

Using these equations, the import/export amount of the "Others" was estimated as shown in Table 2.3.28.

Table 2.3.28 Projection of Import/Export of "Others" Commodity

(000 tons)

Year	Liquid Export (Molasses)	Dry Export	Dry Import
1980/81	264	765	2,078
1981/82	434	899	2,403
1982/83	640	1,224	2,615
1983/84	389	1,259	2,572
1984/85	670	1,088	2,291
1985/86	736	1,288	2,526
<hr/>			
1992/93	844	2,291	3,011
1997/98	1,194	3,292	3,460
2005/06	1,886	5,479	4,452

Source: KPT and PQA Annual Reports for past trends

In summary, the import/export of the commodity was estimated as presented in Table 2.3.29.

In this projection, wheat and cement will soon attain self sufficiency, and sugar, fertilizer and rock phosphate will also attain self sufficiency in the long run. In contrast, the import of iron/steel, ore, coal/coke and petroleum product will steadily increase. Crude oil and edible oil will be imported at a relatively stable level. For crude oil, however, the projected import might sharply increase, if proper countermeasures are not taken to ensure the planned high growth of domestic production.

Table 2.3.29 Projection of Import/Export

	(000 tons)			
Commodity	1985/86	1992/93	1997/98	2005/06
<u>Import</u>	<u>15,383</u>	<u>19,902</u>	<u>24,705</u>	<u>34,301</u>
Dry	<u>8,218</u>	<u>9,861</u>	<u>12,606</u>	<u>18,766</u>
- Wheat	1,909	-	-	-
- Sugar	268	214	60	-
- Cement	217	-	-	-
- Fertilizer	456	1,178	970	-
- Iron/Steel	430	64	564	1,249
- Minerals (Ore)	1,334	2,240	3,160	6,656
- Coal/Coke	853	2,763	4,337	6,409
- Rock Phosphate	225	391	55	-
- Others	2,526	3,011	3,460	4,452
Liquid	<u>7,165</u>	<u>10,041</u>	<u>12,099</u>	<u>15,535</u>
- Edible Oil	825	1,096	1,118	1,006
- Crude Oil	3,726	4,285	4,305	4,360
- Petroleum Products	2,614	4,660	6,676	10,169
<u>Export</u>	<u>4,624</u>	<u>5,620</u>	<u>7,025</u>	<u>11,161</u>
Dry	<u>3,741</u>	<u>4,776</u>	<u>5,831</u>	<u>9,275</u>
- Wheat	-	832	958	1,128
- Rice	1,316	1,031	1,006	1,032
- Cotton	639	608	539	425
- Sugar	-	-	-	416
- Cement	-	14	36	94
- Fertilizer	378	-	-	654
- Iron/Steel	92	-	-	-
- Minerals	9	-	-	-
- Coal/Coke	19	-	-	-
- Rock Phosphate	-	-	-	47
- Others	1,288	2,291	3,292	5,479
Liquid	<u>883</u>	<u>884</u>	<u>1,194</u>	<u>1,886</u>
- Molasses	736	844	1,194	1,886
- Petroleum Products	147	-	-	-

Source: JICA Study Team

2.4 Projection of Surplus/Deficit by Commodity

This section aims to forecast the surplus/deficit by zone and by commodity in order to relate the demand/supply of commodity to the transport demand.

Transport demand, in general, appears between zones when a specific commodity is produced more than consumed in one zone and is consumed more than produced in another zone. Import/export of the commodity functions to fill the gap that might exist between total production and total consumption.

The surplus/deficit of a commodity can be expressed by the following formula:

$$SDF_i = P_i - C_i$$

where, i : Zone No.
 SDF: Surplus/deficit
 P : Production
 C : Consumption

if, $i = 39$ (Karachi),

$$SDF_i = P_i - C_i + \text{Imp} - \text{Exp}$$

where, Imp: Import
 Exp: Export

The results of this projection are shown in Appendix Tables 3.1 to 3.4. It should be noted, however, that this cannot necessarily be deemed to be the generation/attraction of commodity traffic because actual commodity transport is quite complicated due to transshipment, intermediate processing, market location, commercial customs and so on.

CHAPTER 3 UPDATING OF OD TABLES FROM 1980/81 TO 1985/86

3.1 Road

3.1.1 Vehicle OD

For road transport, there is no comprehensive OD table except those prepared in the previous NTPS. At first, therefore, the previous 1980/81 OD tables of car, bus and truck were updated using the results of traffic counts conducted at some 700 stations in 1985/86, where "car" includes wagon and minibus, and "truck" includes tractor/trailor, similar to the previous NTPS.

The screenlines, or cordons when the national boundary is taken into account, were set as shown in Fig. 3.1.1. This is based on the provincial boundaries. The Punjab Province, however, is divided into two (2) areas considering the distribution of road traffic.

The basic formula to determine the factor of updating is:

$$NOD_{ij} = OOD_{ij} \times \frac{CT\ 86\ mn}{AT\ 81\ mn}$$

where, i, j : Zone No.

m, n : Province No. where zone i and j belong to

AT81: Assigned traffic volume between province m and n based on the 1980/81 OD tables

CT86: Counted traffic volume between province m and n in 1985/86

NOD : Updated traffic volume

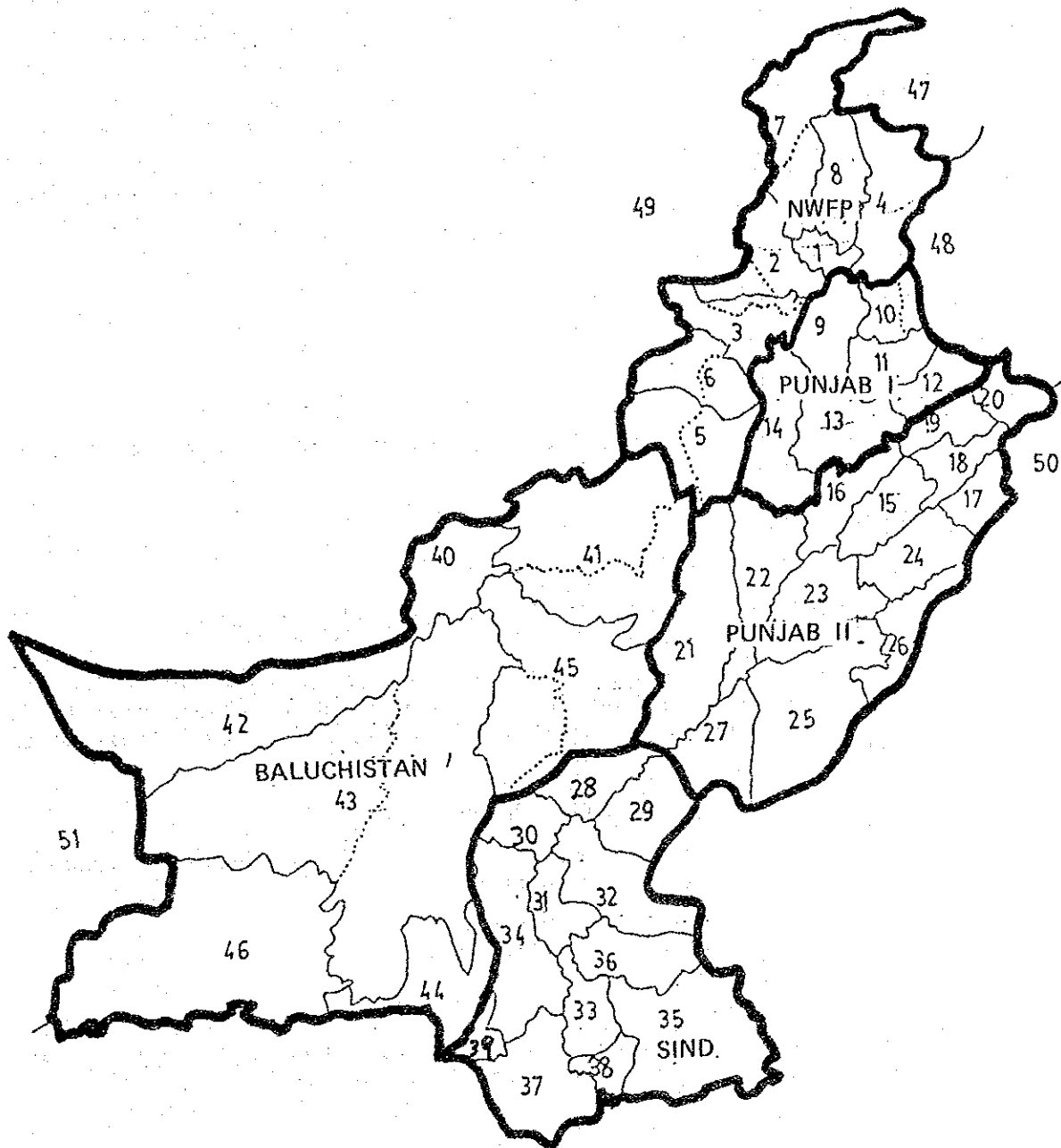
OOD : Traffic Volume before updating

For the OD pairs inside a province, the rate of increase/decrease was calculated as an average of the inter-provincial traffic to and from the province.

Table 3.1.1 shows the results of this traffic adjustment.

On the screenline Sind-Baluchistan, traffic volume actually counted has increased by more than 250%. This is presumably due to the recent developments which have taken place in Lasbela district of Baluchistan very near to Karachi. Also on the screenlines Punjab II - Baluchistan, NWFP - Baluchistan and NWFP - Punjab II, there seems to have occurred an abnormal increase in the traffic volume of car and bus, although the volume itself is still very low. Although a complete comparison of traffic count records between 1980/81 and 1985/86 is impossible due to the absence of 1980/81 data in Baluchistan and a part of NWFP, it is considered to be natural that the boundary area among NWFP, Baluchistan and Punjab II has such a large increase in traffic volume judging from the 1985/86 traffic counts, the NLC present trucking routes, the recent developments in natural gas and so on.

Fig. 3.1.1 Location of Screenlines to Update Vehicular Traffic from 1980/81 to 1985/86



Source: JICA Study Team

Table 3.1.1 Traffic Adjustment on Screenlines

Screenline	A 1985/86 Counted Traffic Volume (vehicles/day)				B 1980/82 Assigned Traffic Volume (vehicles/day)				A/B			
	Car	Bus	Truck	Total	Car	Bus	Truck	Total	Car	Bus	Truck	Total
Sind-Punjab II	289	266	5,023	5,578	206	286	2,983	3,475	1.40	0.93	1.68	1.61
Sind-Baluchistan	3,778	616	2,693	7,087	799	241	967	2,007	4.73	2.56	2.78	3.53
Punjab II-Baluchistan	42	22	192	256	5	6	123	134	8.40	3.67	1.56	1.91
NWFP-Baluchistan	70	45	365	480	8	6	217	231	8.75	7.50	1.68	2.08
NWFP-Punjab I	6,190	1,045	4,347	11,582	2,751	1,200	2,745	6,696	2.25	0.87	1.58	1.73
NWFP-Punjab II	164	75	360	599	24	11	305	340	6.83	6.82	1.18	1.76
Punjab I-Punjab II	6,274	3,098	7,698	17,070	2,624	2,128	4,299	9,051	2.39	1.46	1.79	1.89

Source: JICA Study Team

3.1.2 Passenger OD

Using the updated 1985/86 car and bus OD, passenger OD tables have been prepared as follows:

(Upper Class) Car OD x 5.32

- "Car" includes car and wagon/minibus.
- Average number of passengers on board was 4.00 and 11.91 in 1980/81 for car and wagon/minibus, respectively.
- Using the relative share of car and wagon/minibus on the average cross-section of Route N-5, which is 83.37% and 16.67% respectively as of 1985/86, the average has been calculated at 5.32.

(Lower Class) Bus OD x 38.39

- Average number of passengers on board was 38.39 in 1980/81. This was assumed to be constant.

3.1.3 Commodity OD

First, using the updated 1985/86 truck OD, the total tonnage carried by trucks has been estimated as follows:

Truck OD x 6.06 (tons/vehicle)

- In 1980/81, the average load per truck was 5.68 tons including empty trucks, and the average capacity per truck was 11.45 tons (assuming a 11.0 ton capacity for 2-axle truck, 13.7-ton capacity for 3-axle truck and 25.0-ton capacity for larger trucks).
- In 1985/86, according to the traffic counts on the National Highway Route N-5, the share of 2-axle truck, 3-axle truck and

large trucks was 86.41%, 6.13% and 7.46% respectively, and the average capacity was calculated at 12.21 tons/truck.

- Using the ratio of average truck loading capacity between 1985/86 and 1980/81, the average load has been calculated at 6.06, assuming a constant load factor.

Holding the total tonnage thus calculated as a control total, the OD tables by commodity item were estimated. The procedure is:

- (a) Segregate the tonnage of "19. Others" from the total, assuming the share at 27.5% (the same as 1980/81).
- (b) Estimate the tonnage of remaining commodity items so that the tonnage carried by truck and by railway tallys with the total surplus/deficit by commodity item.
- (c) Estimate the zonal distribution of generation/attraction in proportion to the zonal surplus/deficit conditions by commodity item.
- (d) Create OD table by commodity item using the Fratar method holding the 1980/81 OD tables as present patterns.

3.1.4 Comparison with 1980/81 OD Tables

Table 3.1.2 shows the comparison of updated 1985/86 road OD tables with those as of 1980/81.

Table 3.1.2 Comparison of Updated 1985/86 Road OD Tables with 1980/81

	1980/81 (A)	1985/86* (B)	Ratio (B/A)
Vehicle OD (000 veh-kms/day)			
1. Car	3,118	4,739	1.52
2. Bus	2,262	2,963	1.31
3. Truck	7,114	10,600	1.49
4. Total	12,494	18,302	1.46
Passenger OD (million pass-kms/year)			
1. Upper Class	5,064	8,330	1.64
2. Lower Class	31,525	37,639	1.19
3. Total	36,590	45,969	1.26
Commodity OD (million ton-kms/year)			
1. Total	16,514	21,198	1.28

Note: * calculated based on the minimum distance path approach.

Source: JICA Study Team

For the vehicle OD, car showed the highest increase at 52% followed by truck at 49%. Bus showed a relatively moderate increase. For the passenger OD, the upper class has increased more rapidly than the lower class reflecting the high increase of cars and presumably wagons of the "flying coach" type. The commodity OD has shown a relatively moderate increase at 28% as a whole.

3.2 Railway

3.2.1 Passenger OD

Using the ticket sales records of the 14 major stations, the PR passenger OD tables as of 1985/86 have been created as illustrated in Table 3.2.1.

Table 3.2.1 Updating of PR Passenger OD Tables

OD	Zones covered by 14 Major Stations	Remaining Zones
Zones Covered by 14 Major Stations	(1) As compiled from the records of 14 major stations	(2) As compiled from the records of 14 major stations
Remaining Zones	(3) Reverse of (2)	(4) Estimate by Fratar Method (generation/attraction estimated by the ratio of (2) and (3) to those of 1980/81 OD table)

Source: JICA Study Team

The records from the 14 major stations covered 91% of the total interzonal trips ((1), (2) and (3) in Fig. 3.2.1) both for upper and lower class.

3.2.2 Commodity OD

The 1985/86 commodity OD tables were tabulated from the 1985/86 PR commodity transport records. 19 OD tables by commodity item and a total commodity OD table as their summation were prepared.

3.2.3 Comparison with 1980/81 OD Tables

Table 3.2.2 presents the results of updating OD tables from 1980/81 to 1985/86.

Table 3.2.2 Comparison of Updated 1985/86 Rail
OD Tables with 1980/81

	1980/81 (A)	1985/86* (B)	Ratio (B/A)
Passenger OD (million pass-kms/year)			
1. Upper Class	457	449	0.98
2. Lower Class	14,492	15,354	1.06
3. Total	14,950	15,803	1.06
Commodity OD			
1. Total	7,791	8,288	1.06

Note: * calculated based on the minimum distance path approach.

Source: JICA Study Team

Judging from the above table, the demand for railway has increased only by 6% both in passenger and commodity. Considering the high growth of road transport during the same period, the share of railway in the inland traffic has decreased to a considerable extent.

3.3 Air

The 1985/86 OD tables of PIA domestic passengers and commodity have been compiled from the 1985/86 PIA statistics.

Table 3.2.3 presents the comparison of OD tables between 1980/81 and 1985/86.

Table 3.2.3 Comparison of Updated 1985/86
Air OD Tables with 1980/81

	1980/81 (A)	1985/86* (B)	Ratio (B/A)
Passenger OD (million pass-kms/year)			
	1,205	1,793	1.49
Commodity OD (million ton-kms/year)			
	15.7	24.9	1.59

Note: * calculated based on the distance between zones.

The demand for air transport has shown a considerable increase during the last 5 years. The rate of increase is almost comparable to that of road transport. Although air commodity has increased remarkably, the quantity is still insignificant.

CHAPTER 4 ANALYSIS ON MODAL CHOICE

This section focuses on the intermodal relation between roads and railways.

4.1 Passenger

4.1.1 Modal Split as of 1985/86

Based on the updated road and railway OD tables as of 1985/86, the modal shares have been firstly compiled in relation to travel distance as shown in Table 4.1.1 for upper class, in Table 4.1.2 for lower class and in Table 4.1.3 for the total.

For both classes, there is a tendency for railways to play a more important role as distance increases. This relation can be approximated by the following logit equations:

$$\text{(Upper)} \quad P = \frac{1}{1 + \exp(1.16261 - 0.00103 \times D)}$$

$$\text{(Lower)} \quad P = \frac{1}{1 + \exp(0.73356 - 0.00149 \times D)}$$

Where, P: Share (%) of railway
D: Distance (Kms)

In order to analyze the current modal split relationship between road and rail in detail, the modal shares have been compiled in relation to the fares paid by passengers. The results are presented in Tables 4.1.4 - 4.1.6. In addition, the fare of road and rail adopted in this study is shown in Appendix 4.

From these tables, the following summary can be pointed out.

- For the upper class, the patronage for the railway seems to increase as its fare increases. Since the railway fare for the upper class is much higher than that of road transport, this modal split cannot be explained merely by fare nor by distance. According to the "Intermodal Choice Motivation Study, NTRC, December 1984", the motivation for this railway preference is mainly safety and comfort.
- For the lower class, the passengers' preference seems to clearly split more on road in case of short distance while more on railways in case of long distance at the distances equivalent to the fare level of 40 - 60 Rs.

Table 4.1.1 Intermodal Relation between Road and Rail in Terms of No. of Passengers by Distance 1985/86 - Upper Class

Distance (km)	Road		Rail		Total	
	No.	%	No.	%	No.	%
0- 49	3,665,694	100.0	1,366	0.0	3,667,060	100.0
50- 99	14,402,943	100.0	5,339	0.0	14,408,282	100.0
100- 149	19,373,049	99.8	30,896	0.2	19,403,945	100.0
150- 199	12,775,501	99.8	28,707	0.2	12,804,208	100.0
200- 249	2,326,171	99.5	11,151	0.5	2,337,322	100.0
250- 299	2,435,021	97.5	62,392	2.5	2,497,413	100.0
300- 349	1,597,597	99.6	6,913	0.4	1,604,510	100.0
350- 399	207,161	95.5	9,868	4.5	217,029	100.0
400- 449	312,498	88.3	41,371	11.7	353,869	100.0
450- 499	486,302	96.4	18,213	3.6	504,515	100.0
500- 549	110,603	91.6	10,122	8.4	120,725	100.0
550- 599	8,778	43.8	11,279	56.2	20,057	100.0
600- 649	7,022	28.5	17,640	71.5	24,662	100.0
650- 699	8,778	41.4	12,426	58.6	21,204	100.0
700- 749	28,090	69.9	12,104	30.1	40,194	100.0
750- 799	0	0.0	4,659	100.0	4,659	100.0
800- 849	40,379	64.7	22,051	35.3	62,430	100.0
850- 899	101,826	75.1	33,738	24.9	135,564	100.0
900- 949	5,267	84.6	956	15.4	6,223	100.0
950- 999	0	0.0	22,661	100.0	22,661	100.0
1000- 1049	3,511	20.1	13,994	79.9	17,505	100.0
1050- 1099	47,402	98.4	763	1.6	48,165	100.0
1100- 1149	3,511	18.3	15,694	81.7	19,205	100.0
1150- 1199	24,578	77.2	7,242	22.8	31,820	100.0
1200- 1249	29,845	19.7	121,279	80.3	151,124	100.0
1250- 1299	1,756	13.8	11,009	86.2	12,765	100.0
1300- 1349	3,511	40.6	5,145	59.4	8,656	100.0
1350- 1399	59,690	100.0	18	0.0	59,708	100.0
1400- 1449	29,845	88.2	3,979	11.8	33,824	100.0
1450- 1499	0	0.0	29,136	100.0	29,136	100.0
1500-	14,045	59.0	9,754	41.0	23,799	100.0
Total	58,110,374	99.0	581,865	1.0	58,692,239	100.0

Source: JICA Study Team

Table 4.1.2 Intermodal Relation between Road and Rail in Terms of No. of Passengers by Distance 1985/86 - Lower Class

Distance (km)	Road		Rail		Total	
	No.	%	No.	%	No.	%
0- 49	14,201,614	85.9	2,336,483	14.1	16,538,097	100.0
50- 99	51,523,602	93.3	3,679,281	6.7	55,202,883	100.0
100- 149	67,549,504	88.8	8,506,490	11.2	76,055,994	100.0
150- 199	42,262,780	91.7	3,850,365	8.3	46,113,145	100.0
200- 249	18,901,699	80.9	4,464,582	19.1	23,366,281	100.0
250- 299	16,418,634	75.9	5,211,849	24.1	21,630,483	100.0
300- 349	16,215,935	94.8	880,681	5.2	17,096,616	100.0
350- 399	3,813,278	78.9	1,016,930	21.1	4,830,208	100.0
400- 449	2,052,330	48.5	2,176,348	51.5	4,228,678	100.0
450- 499	1,507,576	53.8	1,297,135	46.2	2,804,711	100.0
500- 549	304,049	28.1	778,951	71.9	1,083,000	100.0
550- 599	38,006	4.4	820,296	95.6	858,302	100.0
600- 649	76,012	3.6	2,007,252	96.4	2,083,264	100.0
650- 699	12,669	1.9	642,164	98.1	654,833	100.0
700- 749	25,338	2.7	914,274	97.3	939,612	100.0
750- 799	0	0.0	674,776	100.0	674,776	100.0
800- 849	126,687	37.5	211,132	62.5	337,819	100.0
850- 899	12,669	1.7	715,800	98.3	728,469	100.0
900- 949	0	0.0	39,192	100.0	39,192	100.0
950- 999	12,669	2.5	498,784	97.5	511,453	100.0
1000- 1049	76,012	25.0	228,221	75.0	304,233	100.0
1050- 1099	114,018	88.8	14,378	11.2	128,396	100.0
1100- 1149	0	0.0	172,402	100.0	172,402	100.0
1150- 1199	76,012	11.2	602,305	88.8	678,317	100.0
1200- 1249	12,669	2.2	569,971	97.8	582,640	100.0
1250- 1299	12,669	7.4	158,529	92.6	171,198	100.0
1300- 1349	0	0.0	198,212	100.0	198,212	100.0
1350- 1399	63,343	66.5	31,886	33.5	95,229	100.0
1400- 1449	0	0.0	39,116	100.0	39,116	100.0
1450- 1499	0	0.0	476,474	100.0	476,474	100.0
1500-	63,343	21.1	236,850	78.9	300,193	100.0
Total	235,473,117	84.4	43,451,109	15.6	278,924,226	100.0

Source: JICA Study Team

Table 4.1.3 Intermodal Relation between Road and Rail in Terms of No. of Passengers by Distance 1985/86 - Total

Distance (km)	Road		Rail		Total	
	No.	%	No.	%	No.	%
0- 49	17,867,308	88.4	2,337,849	11.6	20,205,157	100.0
50- 99	65,926,545	94.7	3,684,620	5.3	69,611,165	100.0
100- 149	86,922,553	91.1	8,537,386	8.9	95,459,939	100.0
150- 199	55,038,281	93.4	3,879,072	6.6	58,917,353	100.0
200- 249	21,227,870	82.6	4,475,733	17.4	25,703,603	100.0
250- 299	18,853,655	78.1	5,274,241	21.9	24,127,896	100.0
300- 349	17,813,532	95.3	887,594	4.7	18,701,126	100.0
350- 399	4,020,439	79.7	1,026,798	20.3	5,047,237	100.0
400- 449	2,364,828	51.6	2,217,719	48.4	4,582,547	100.0
450- 499	1,993,878	60.3	1,315,348	39.7	3,309,226	100.0
500- 549	414,652	34.4	789,073	65.6	1,203,725	100.0
550- 599	46,784	5.3	831,575	94.7	878,359	100.0
600- 649	83,034	3.9	2,024,892	96.1	2,107,926	100.0
650- 699	21,447	3.2	654,590	96.8	676,037	100.0
700- 749	53,428	5.5	926,378	94.5	979,806	100.0
750- 799	0	0.0	679,435	100.0	679,435	100.0
800- 849	167,066	41.7	233,183	58.3	400,249	100.0
850- 899	114,495	13.3	749,538	86.7	864,033	100.0
900- 949	5,267	11.6	40,148	88.4	45,415	100.0
950- 999	12,669	2.4	521,445	97.6	534,114	100.0
1000- 1049	79,523	24.7	242,215	75.3	321,738	100.0
1050- 1099	161,420	91.4	15,141	8.6	176,561	100.0
1100- 1149	3,511	1.8	188,096	98.2	191,607	100.0
1150- 1199	100,590	14.2	609,547	85.8	710,137	100.0
1200- 1249	42,514	5.8	691,250	94.2	733,764	100.0
1250- 1299	14,425	7.8	169,538	92.2	183,963	100.0
1300- 1349	3,511	1.7	203,357	98.3	206,868	100.0
1350- 1399	123,033	79.4	31,904	20.6	154,937	100.0
1400- 1449	29,845	40.9	43,095	59.1	72,940	100.0
1450- 1499	0	0.0	505,610	100.0	505,610	100.0
1500-	77,388	23.9	246,604	76.1	323,992	100.0
Total	293,583,491	87.0	44,032,974	13.0	337,616,465	100.0

Source: JICA Study Team

Table 4.1.4 Intermodal Relation between Road and Rail in Terms of No. of Passengers by Fare 1985/86 - Upper Class

Fare (Rps)	Road		Rail		Total	
	No.	%	No.	%	No.	%
0- 9	4,671,653	100.0	0	0.0	4,671,653	100.0
10- 19	21,097,048	100.0	1,330	0.0	21,098,378	100.0
20- 29	19,711,877	100.0	2,597	0.0	19,714,474	100.0
30- 39	6,493,965	100.0	2,778	0.0	6,496,743	100.0
40- 49	2,731,717	99.2	22,981	0.8	2,754,698	100.0
50- 59	1,869,716	99.5	8,681	0.5	1,878,397	100.0
60- 69	244,028	90.3	26,305	9.7	270,333	100.0
70- 79	481,037	98.9	5,324	1.1	486,361	100.0
80- 89	356,387	98.0	7,351	2.0	363,738	100.0
90- 99	43,890	79.8	11,115	20.2	55,005	100.0
100- 109	7,022	11.8	52,559	88.2	59,581	100.0
110- 119	8,778	68.1	4,105	31.9	12,883	100.0
120- 129	28,090	87.8	3,920	12.2	32,010	100.0
130- 139	36,868	83.9	7,064	16.1	43,932	100.0
140- 149	101,825	89.6	11,868	10.4	113,693	100.0
150- 159	8,779	22.6	30,025	77.4	38,804	100.0
160- 169	0	0.0	15,315	100.0	15,315	100.0
170- 179	47,401	93.9	3,100	6.1	50,501	100.0
180- 189	3,512	26.5	9,758	73.5	13,270	100.0
190- 199	3,511	31.5	7,647	68.5	11,158	100.0
200- 209	54,423	93.1	4,028	6.9	58,451	100.0
210- 219	1,756	5.9	27,774	94.1	29,530	100.0
220- 229	3,511	63.0	2,058	37.0	5,569	100.0
230- 239	68,468	88.2	9,197	11.8	77,665	100.0
240- 249	21,067	87.7	2,943	12.3	24,010	100.0
250- 259	14,045	75.2	4,623	24.8	18,668	100.0
260- 269	0	0.0	15,758	100.0	15,758	100.0
270- 279	0	0.0	6,389	100.0	6,389	100.0
280- 289	0	0.0	34,147	100.0	34,147	100.0
290- 299	0	0.0	451	100.0	451	100.0
300-	0	0.0	240,674	100.0	240,674	100.0
Total	58,110,374	99.0	581,865	1.0	58,692,239	100.0

Source: JICA Study Team

Table 4.1.5 Intermodal Relation between Road and Rail in Terms of
No. of Passengers by Fare 1985/86 - Lower Class

Fare (Rps)	Road		Rail		Total	
	No.	%	No.	%	No.	%
0- 9	46,063,394	85.1	8,051,814	14.9	54,115,208	100.0
10- 19	121,505,495	90.5	12,776,804	9.5	134,282,299	100.0
20- 29	35,333,002	80.3	8,681,285	19.7	44,014,287	100.0
30- 39	24,235,220	85.9	3,985,515	14.1	28,220,735	100.0
40- 49	5,802,265	59.6	3,934,761	40.4	9,737,026	100.0
50- 59	1,811,625	49.8	1,828,206	50.2	3,639,831	100.0
60- 69	50,675	3.9	1,262,308	96.1	1,312,983	100.0
70- 79	88,681	16.6	446,503	83.4	535,184	100.0
80- 89	126,687	8.6	1,342,846	91.4	1,469,533	100.0
90- 99	25,338	6.1	388,627	93.9	413,965	100.0
100- 109	12,669	2.1	580,394	97.9	593,063	100.0
110- 119	190,030	52.5	172,046	47.5	362,076	100.0
120- 129	12,669	100.0	0	0.0	12,669	100.0
130- 139	76,012	100.0	0	0.0	76,012	100.0
140- 149	12,669	100.0	0	0.0	12,669	100.0
150- 159	63,343	100.0	0	0.0	63,343	100.0
160- 169	38,006	100.0	0	0.0	38,006	100.0
170- 179	25,337	100.0	0	0.0	25,337	100.0
180- 189	0	-	0	-	0	-
190- 199	0	-	0	-	0	-
200- 209	0	-	0	-	0	-
210- 219	0	-	0	-	0	-
220- 229	0	-	0	-	0	-
230- 239	0	-	0	-	0	-
240- 249	0	-	0	-	0	-
250- 259	0	-	0	-	0	-
260- 269	0	-	0	-	0	-
270- 279	0	-	0	-	0	-
280- 289	0	-	0	-	0	-
290- 299	0	-	0	-	0	-
300-	0	-	0	-	0	-
Total	235,473,117	84.4	43,451,109	15.6	278,924,226	100.0

Source: JICA Study Team

Table 4.1.6 Intermodal Relation between Road and Rail in Terms of No. of Passengers by Fare 1985/86 - Total

Fare (Rps)	Road		Rail		Total	
	No.	%	No.	%	No.	%
0- 9	50,735,047	86.3	8,051,814	13.7	58,786,861	100.0
10- 19	142,602,543	91.8	12,778,134	8.2	155,380,677	100.0
20- 29	55,044,879	86.4	8,683,882	13.6	63,728,761	100.0
30- 39	30,729,185	88.5	3,988,293	11.5	34,717,478	100.0
40- 49	8,533,982	68.3	3,957,742	31.7	12,491,724	100.0
50- 59	3,681,341	66.7	1,836,887	33.3	5,518,228	100.0
60- 69	294,703	18.6	1,288,613	81.4	1,583,316	100.0
70- 79	569,718	55.8	451,827	44.2	1,021,545	100.0
80- 89	483,074	26.4	1,350,197	73.6	1,833,271	100.0
90- 99	69,228	14.8	399,742	85.2	468,970	100.0
100- 109	19,691	3.0	632,953	97.0	652,644	100.0
110- 119	198,808	53.0	176,151	47.0	374,959	100.0
120- 129	40,759	91.2	3,920	8.8	44,679	100.0
130- 139	112,880	94.1	7,064	5.9	119,944	100.0
140- 149	114,494	90.6	11,868	9.4	126,362	100.0
150- 159	72,122	70.6	30,025	29.4	102,147	100.0
160- 169	38,006	71.3	15,315	28.7	53,321	100.0
170- 179	72,738	95.9	3,100	4.1	75,838	100.0
180- 189	3,512	26.5	9,758	73.5	13,270	100.0
190- 199	3,511	31.5	7,647	68.5	11,158	100.0
200- 209	54,423	93.1	4,028	6.9	58,451	100.0
210- 219	1,756	5.9	27,774	94.1	29,530	100.0
220- 229	3,511	63.0	2,058	37.0	5,569	100.0
230- 239	68,468	88.2	9,197	11.8	77,665	100.0
240- 249	21,067	87.7	2,943	12.3	24,010	100.0
250- 259	14,045	75.2	4,623	24.8	18,668	100.0
260- 269	0	0.0	15,758	100.0	15,758	100.0
270- 279	0	0.0	6,389	100.0	6,389	100.0
280- 289	0	0.0	34,147	100.0	34,147	100.0
290- 299	0	0.0	451	100.0	451	100.0
300-	0	0.0	240,674	100.0	240,674	100.0
Total	293,583,491	87.0	44,032,974	13.0	337,616,465	100.0

Source: JICA Study Team

4.1.2 Modal Split in the Future

In order to attain a reasonable modal split between road and rail in passenger transport, what is reasonable must be defined. In this subsection, the modal split is discussed mainly from the economical viewpoint, and some financial considerations are given. Appendix 5 shows the costing of road transport and railway.

Passenger transport performance of the Pakistan Railway is considered to be low financially and economically as compared to road transport.

- The fare rate of the Pakistan Railway does not cover the financial cost both for upper class and lower class. Especially for lower class, which constitute the major part of the PR's patronage, the financial loss of PR is enormous.
- The economic cost of PR's passenger transport, which is still higher than the fare, is considerably higher than that of road transport both for upper class and lower class.

However, when the operation of PR passenger trains is looked into in detail, the following can be pointed out:

- The passenger train operation becomes profitable when average travel distance of passengers exceeds, more or less, 500 kms. This is an area where mail/express trains are playing a major role. The average travel distance of ordinary trains is always less than 50 kms as far as the available data are analyzed.
- When passenger train operation is profitable, the economic cost is always below that of road transport. This fact implies that the train operation is economically justified where financially desirable.
- The financially profitable trains run mainly on the trunk line of Karachi - Hyderabad - Sukkur - Multan - Lahore - R. Pindi - Peshawar. There are some other lines where profitable trains operate.

Furthermore, there are some more aspects which have to be taken into consideration:

- The premium service of PR (upper class) seems to have a firm patronage judging from the result of the analysis on the current modal split. Most of this patronage prefers railway in spite of the fare being more expensive than road.
- The ordinary service of PR (lower class) is, allegedly, serving the poor people who have no other means of transport at a politically determined low fare level.

Based on the above discussions, the desirable modal split between road and railway in the future shall be as follows:

- 1 For those who travel more than 500 kms along the trunk lines of PR, an increasing share of railway as distance lengthens should be assumed. A logistic curve may be applied to approximate this tendency.
- 2 For those who travel less than 500 kms or more than 500 kms but not along the trunk lines of PR, the present share of railway should be assumed to be maintained even in the future.

These conditions will be adopted as Case II in Chapter 6 and the modal split will be discussed quantitatively.

4.2 Commodity

4.2.1 Modal Split as of 1985/86

Based on the updated commodity OD tables as of 1985/86, the modal shares of road and railway have been tabulated by commodity item as shown in Table 4.2.1. For the modal shares by commodity item and by distance, refer to Appendix Tables 6(1) to 6(10).

The current modal split can be summarized as follows:

- (a) As a whole, road carries nearly 80% of the total commodity traffic in terms of tonnage.
- (b) The share of railway is larger than that of road in transporting wheat, petroleum and rock phosphate in addition to railway material and railway oil. Rice, edible oil, cement and fertilizer are also carried by railway to a considerable extent.
- (c) By distance, the share of railway increases gradually as the distance becomes longer. This tendency is clear for wheat, rice, edible oil, sugar, cement, iron/steel, coal/coke and petroleum. For other items, however, the tendency is not necessarily clear.
- (d) It is generally claimed that consignors modal choice is based on his preference from the view point of shorter transport time and cheaper cost (fare & others) between the origin and destination. Analysis with the available data could not support the above claim with reasonable inference. An extensive survey is considered necessary.

4.2.2 Modal Split in the Future

For determining a reasonable modal split model, an approach from economic viewpoint has been adopted. As detailed in Appendix 5, the economic cost per ton-kilometer can be expressed as follows:

(Road)	- 100 km	0.487 Rs/ton-km
	- 500 km	0.403 "
	501 km -	0.357 "
(Railway)	0.1555 Rs/ton-km + 121.13 Rs/ton	

By comparing these results, the economic break-even distance can be calculated at 489 kms. This implies that railway is economically preferable for transporting goods over 489 kms and that road transport is economically desirable for shorter distances.

Table 4.2.1 Modal Split of Goods Transport between
Road and Railway as of 1985/86

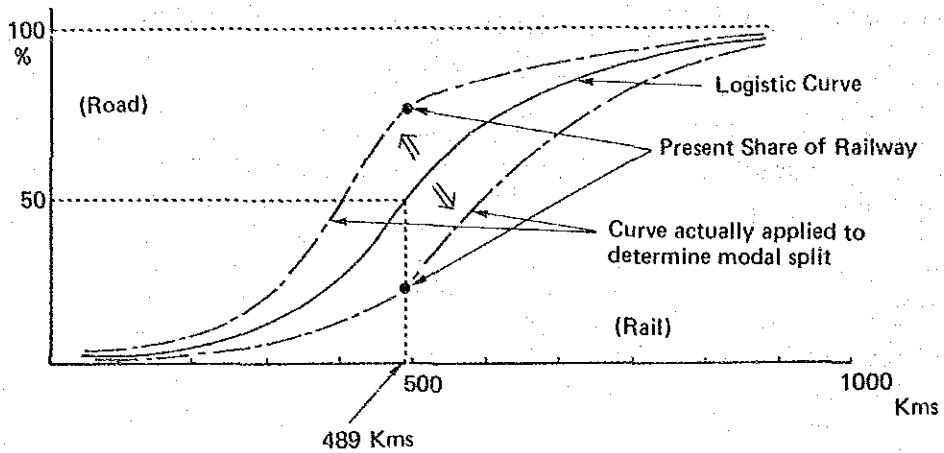
Commodity	Road		Railway		Total	
	Tonnage (000)	%	Tonnage (000)	%	Tonnage (000)	%
1. Wheat	1,326	47.8	1,451	52.2	2,777	100.0
2. Rice	998	57.7	731	42.3	1,729	100.0
3. Cotton	866	94.0	55	6.0	921	100.0
4. Edible Oil	487	75.3	160	24.7	647	100.0
5. Sugar	425	90.6	44	9.4	469	100.0
6. Cement	2,249	76.2	702	23.8	2,950	100.0
7. Fertilizer	968	57.9	705	42.1	1,674	100.0
8. Iron/Steel	719	87.3	104	12.7	823	100.0
9. Mining Product	4,869	91.4	458	8.6	5,326	100.0
10. Coal/Coke	1,449	81.7	324	18.3	1,772	100.0
11. Petroleum	1,010	33.3	2,025	66.7	3,035	100.0
12. Firewood	243	83.2	49	16.8	292	100.0
13. Sugarcane	8,581	100.0	2	0.0	8,583	100.0
14. Fruits/Vegetable	1,541	100.0	0	0.0	1,541	100.0
15. Livestock	2,044	99.7	5	0.3	2,050	100.0
16. Rock Phosphate	0	0.0	222	100.0	222	100.0
17. Railway Material	0	0.0	1,782	100.0	1,782	100.0
18. Railway Oil	0	0.0	587	100.0	587	100.0
19. Others	10,638	86.6	1,648	13.4	12,286	100.0
Total	38,414	77.7	11,053	22.3	49,468	100.0

Note: 1) Totals may not sum due to rounding.
2) For more detail, see App. Tables 6(1) - 6(10)

Source: JICA Study Team

Due, however, to the difference by commodity in the mode preference resulting from unknown or intangible factors, the break-even distance calculated above cannot be considered to be appropriate for direct application. Therefore, a smoothing method schematically illustrated in Fig. 4.2.1 has been adopted, assuming the difference in mode preference resulting from the nature of the commodity item be reflected already in the present modal split.

Fig. 4.2.1 Smoothing of the Modal Split between Road and Rail



This ideal modal split has been taken as Case II and will be dealt with quantitatively in Chapter 6.

CHAPTER 5 MACROSCOPIC TRANSPORT DEMAND FORECAST

5.1 Land Traffic

5.1.1 Passenger

The past trends of land passenger traffic are shown in Table 5.1.1. The share of road transport has been steadily increasing, while railway has lost its share considerably, especially during the last decade.

Table 5.1.2 shows the comparison of interzonal land passenger traffic between 1980/81 and 1985/86. It is note-worthy that the share of interzonal traffic against the total has decreased remarkably as a whole, although railway seems to have been orientated to another direction.

Based on these tables, future land passenger traffic demand has been projected. Firstly, the total passenger-kilometers of land traffic has been estimated based on the following regressional equation:

$$PK = 1.08107 \times POP + 18253.7 \times PGDP - 81912.1$$

(R = 0.998, T1 = 5.63, T2 = 4.60)

where, PK: Total passenger-kilometers of land traffic
(million pass-kms/year)

POP: Population (000)

PGDP: Per capita GDP (000 Rs.)

Table 5.1.1 Past Trends of Land Passenger Traffic

	Passenger-Kms (million)			Share (%)		
	Railway	Road**	Total	Railway	Road	Total
1971/72	9,515	36,520	46,035	20.7	79.3	100.0
1972/73	11,069	40,577	51,646	21.4	78.6	100.0
1973/74	11,694	45,973	57,667	20.3	79.7	100.0
1974/75	12,354	49,860	62,214	19.9	80.1	100.0
1975/76	12,957	49,285	62,242	20.8	79.2	100.0
1976/77	13,199	51,765	64,964	20.3	79.7	100.0
1977/78	15,375	54,665	70,040	22.0	78.0	100.0
1978/79	16,713	57,219	73,932	22.6	77.4	100.0
1979/80	17,316	61,035	78,351	22.1	77.9	100.0
1980/81	16,387	65,991	82,378	19.9	80.1	100.0
1981/82	16,502	*72,752	89,254	18.5	81.5	100.0
1982/83	18,031	79,513	97,544	18.5	81.5	100.0
1983/84	18,287	83,363	101,650	18.0	82.0	100.0
1984/85	17,806	89,952	107,758	16.5	83.5	100.0
1985/86	16,657	97,374	114,031	14.6	85.4	100.0

Note: * estimated by interpolation

** These figures include interzonal and suburban traffic, not including purely urban traffic.

Source: Railway - PR

Road - Transport Sector Profile (Jan. 1987)

Table 5.1.2 Comparison of Interzonal Land Passenger Traffic between 1980/81 and 1985/86

	Passenger-Kms (million)		
	1980/81 (a)	1985/86 (b)	b/a
Railway			
A. Total	16,387	16,657	1.016
B. Interzonal	14,950	15,803	1.057
C. B/A	0.912	0.949	
Road			
A. Total	65,991	97,374	1.476
B. Interzonal	36,590	45,969	1.256
C. B/A	0.554	0.472	
Total			
A. Total	82,378	114,031	1.384
B. Interzonal	51,540	61,772	1.199
C. B/A	0.626	0.542	

Source: 1980/81 - the 1983 NTPS
1985/86 - Study Team's estimate

The results of applying this equation are presented in Table 5.1.3.

Table 5.1.3 Projected Land Passenger Traffic

Year	Passenger-kilometers (million)	
1985/86	114,031	(100.0)
1992/93	162,204	(142.2)
1997/98	200,655	(176.0)
2005/06	270,847	(237.5)

Source: JICA Study Team

Secondly, the passenger-kilometers of the interzonal traffic has been estimated using the elasticity relation of the increment of the interzonal passenger-kilometers to that of the GDP between 1980/81 and 1985/86. The results are presented in Table 5.1.4.

Table 5.1.4 Projection of Interzonal Land Passenger Traffic

Year	GDP (million Rs)	Passenger-Kms (million)		Ratio of Inter-zonal to Total	Ratio to GDP	
		Total	Inter-zonal		Total	Inter-zonal
1980/81	348,027 (137,183)	82,378 (31,653)	51,540 (10,232)	0.626		
1985/86	485,210 (266,127)	114,031 (48,173)	61,772 (15,568)	0.542	(0.2307)	(0.0746)
1992/93	751,337 (255,124)	162,204 (38,451)	77,340 (12,425)	0.477	(0.1810)	(0.0585)
1997/98	1,006,461 (564,697)	200,655 (70,192)	89,765 (22,701)	0.447	(0.1507)	(0.0487)
2005/06	1,571,158	270,847	112,466	0.415	(0.1243)	(0.0402)

Note: Figures in parentheses relate to increments.

Source: JICA Study Team

The share of interzonal traffic continuously decreases as GDP grows. Consequently, the interzonal passenger traffic demand of 2005/06 will be 1.81 times of that of 1985/86, while the total demand will be 2.35 times.

5.1.2 Commodity

The past trends of land commodity traffic are shown in Table 5.1.5. Similar to the passenger traffic, railway has lost its share considerably and road is currently playing a major role.

From Table 5.1.6 which shows the comparison of interzonal land commodity traffic between 1980/81 and 1985/86, it is also clear that the increase of interzonal traffic is lower compared to the intrazonal traffic. Again, however, railway seems to have been specialized in the interzonal traffic.

Based on these tables, future land commodity traffic demand has been projected.

The total ton-kilometers of land traffic has been estimated on the following regression equation:

$$TK = 0.197630 \times POP + 7145.73 \times PGDP - 20281.1$$

$$(R = 0.991, T1 = 1.78, T2 = 3.12)$$

Where, TK: Total ton-kilometers of land traffic
(million ton-kms/year)

POP: Population (000)

PGDP: Per capita GDP (000 Rs.)

Table 5.1.5 Past Trends of Land Commodity Traffic

	Ton-Kms (million)			Share (%)		
	Railway	Road**	Total	Railway	Road	Total
1971/72	7,756	8,047	15,803	49.1	50.9	100.0
1972/73	8,363	8,940	17,303	48.3	51.7	100.0
1973/74	7,370	10,129	17,499	42.1	57.9	100.0
1974/75	8,544	11,001	19,545	43.7	56.3	100.0
1975/76	9,097	10,327	19,424	46.8	53.2	100.0
1976/77	7,857	11,438	19,295	40.7	59.3	100.0
1977/78	8,557	12,319	20,876	41.0	59.0	100.0
1978/79	9,375	14,904	24,279	38.6	61.4	100.0
1979/80	8,598	17,085	25,683	33.5	66.5	100.0
1980/81	7,918	18,207	26,125	30.3	69.7	100.0
1981/82	7,066	*19,704	26,770	26.4	73.6	100.0
1982/83	7,323	21,200	28,523	25.7	74.3	100.0
1983/84	7,385	22,620	30,005	24.6	75.4	100.0
1984/85	7,203	24,126	31,329	23.0	77.0	100.0
1985/86	8,299	26,859	35,158	23.6	76.4	100.0

Note: * estimated by interpolation

** These figures include interzonal and suburban traffic, not including purely urban traffic.

Source: Railway - PR

Road - Transport Sector Profile (Jan. 1987)

Table 5.1.6 Comparison of Interzonal Land Commodity Traffic between 1980/81 and 1985/86

	Ton-Kms (million)		
	1980/81 (a)	1985/86 (b)	b/a
Railway			
A. Total	7,918	8,299	1.048
B. Interzonal	7,791	8,288	1.064
C. B/A	0.984	0.999	
Road			
A. Total	18,207	26,859	1.475
B. Interzonal	16,514	21,198	1.284
C. B/A	0.907	0.789	
Total			
A. Total	26,125	35,158	1.346
B. Interzonal	24,305	29,486	1.213
C. B/A	0.930	0.839	

Source: 1980/81 - the 1983 NTPS

The results are presented in Table 5.1.7.

Table 5.1.7 Projected Land Commodity Traffic

Year	Ton-Kilometers (million)	
1985/86	35,158	(100.0)
1992/93	47,998	(136.5)
1997/98	58,760	(167.1)
2005/06	78,905	(224.4)

Source: JICA Study Team

In relation to the interzonal traffic, elasticity relation between 1980/81 and 1985/86 has been used similar to the passenger traffic. The result of the estimate is shown in Table 5.1.8. As is the case for passenger traffic, the share of interzonal traffic will decrease as GDP grows. The increase of interzonal traffic and the total traffic between 1985/86 and 2005/06 is 1.89 and 2.30 times, respectively.

Table 5.1.8 Projection of Interzonal Land Commodity Traffic

Year	GDP (million Rs)	Ton-Kms (million)		Ratio of Inter-zonal to Total	Elasticity to GDP	
		Total	Inter-zonal		Total	Inter-zonal
1980/81	348,027 (137,183)	26,125 (9,033)	24,305 (5,181)	0.930	(0.0658)	(0.0378)
1985/86	485,210 (266,127)	35,158 (12,840)	29,486 (7,372)	0.839	(0.0482)	(0.0277)
1992/93	751,337 (255,124)	47,998 (10,762)	36,858 (6,174)	0.768	(0.0422)	(0.0242)
1997/98	1,006,461 (564,697)	58,760 (20,145)	43,032 (11,576)	0.732	(0.0357)	(0.0205)
2005/06	1,571,158	78,905	54,608	0.692		

Note: Figures in parentheses relate to increments.

Source: JICA Study Team

5.2 Air

5.2.1 International Traffic

The past trends of international air traffic are presented in Table 5.2.1. During the past 10 years, the total number of international passengers has been continuously increasing though with a diminishing growth rate. With regard to PIA passengers, however, the number of passengers reached its peak in 1982/83 and has been stagnant thereafter, mainly due to the decrease in the Middle East and Far East markets.

It is a well-known fact that the air traffic demand is closely related to the nation's economy, especially to per capita income. However, the PIA's stagnancy stated above is not well explained simply by per capita income or per capita GDP because Pakistan's economy has been steadily growing during the same period. It was also tried to explain this tendency using "Yield", but the yield data were found unstable and it depends largely upon the PIA's discretion in the future.

Hence, the "Net Factor Income from Abroad", which shows the similar stagnancy during the same period, was taken in addition to the per capita GDP to explain the traffic demand.

The regression formulae developed are as follows:

$$\begin{aligned} \text{PAXME} &= 179953 \times \text{PGDP} + 10.4717 \times \text{NIA} - 210861 \\ &(\text{R} = 0.89, \text{T1} = 1.70, \text{T2} = 1.73) \end{aligned}$$

$$\begin{aligned} \text{PAXEU} &= 74353.7 \times \text{PGDP} + 0.672391 \times \text{NIA} - 146495 \\ &(\text{R} = 0.97, \text{T1} = 5.51, \text{T2} = 0.87) \end{aligned}$$

$$\begin{aligned} \text{PAXFE} &= 24967.4 \times \text{PGDP} + 2.165 \times \text{NIA} - 33014.7 \\ &(\text{R} = 0.77, \text{T1} = 0.84, \text{T2} = 1.27) \end{aligned}$$

$$\begin{aligned} \text{PAXRE} &= 82699.6 \times \text{PGDP} + 1.86153 \times \text{NIA} - 285337 \\ &(\text{R} = 0.98, \text{T1} = 6.67, \text{T2} = 2.63) \end{aligned}$$

$$\text{PAXPIA} = \text{PAXME} + \text{PAXEU} + \text{PAXFE} + \text{PAXRE}$$

$$\begin{aligned} \text{PAXTOT} &= 2.22606 \times \text{PAXPIA} - 458845 \\ &(\text{R} = 0.99, \text{T1} = 17.64) \end{aligned}$$

$$\begin{aligned} \text{COMTOT} &= 42979 \times \text{PGDP} + 0.0131521 \times \text{PAXTOT} - 139819 \\ &(\text{R} = 0.997, \text{T1} = 7.29, \text{T2} = 3.19) \end{aligned}$$

where, PAXME : No. of PIA passengers to/from Middle East

PAXEU : No. of PIA passengers to/from Europe

PAXFE : No. of PIA passengers to/from Far East

PAXRE : No. of PIA passengers to/from India, etc.

PAXPIA: Total No. of PIA passengers

PAXTOT: Total No. of Passengers including those of other airlines

COMTOT: Total Tonnage of Air Cargo

Table 5.2.1 Past Trends of International Air Traffic

Year	Passenger PIA											Cargo (ton)	
	Total			Middle East			Europe			No. of Pass.	No. of RPKs (million)		Revenue Per Capita Yield (Rs./RPK) (kms)
	No. of Pass.	RPKs (million)	Revenue Per Capita Yield (Rs./RPK) (kms)	No. of Pass.	RPKs (million)	Revenue Per Capita Yield (Rs./RPK) (kms)	No. of Pass.	RPKs (million)	Revenue Per Capita Yield (Rs./RPK) (kms)				
1976/77	1,245,393	2,910	3,169.7	38.6	1.09	514,228	919	1,325.9	12.2	1.44	137,722	1,436	
1977/78	1,579,011	3,388	3,325.9	43.6	0.98	642,788	1,246	1,547.3	16.0	1.24	146,562	1,487	
1978/79	1,881,016	3,713	3,913.4	46.3	0.95	718,853	1,474	1,965.9	18.4	1.33	154,546	1,471	
1979/80	2,163,288	4,038	4,604.6	48.9	1.14	770,401	1,617	2,316.8	19.6	1.43	163,815	1,558	
1980/81	2,446,596	4,835	5,219.8	57.4	1.08	886,683	1,960	2,696.1	23.3	1.38	163,583	1,809	
1981/82	2,648,615	5,001	5,222.1	57.0	1.04	988,790	2,108	2,786.8	24.0	1.32	168,795	1,783	
1982/83	2,818,252	5,304	5,326.0	58.6	1.00	1,023,639	2,230	3,013.1	24.6	1.35	211,165	1,964	
1983/84	2,938,751	5,290	5,722.7	56.7	1.08	992,813	2,185	3,327.4	23.4	1.52	218,877	1,987	
1984/85	2,956,914	5,273	5,806.7	54.8	1.10	931,814	2,050	3,316.4	21.3	1.62	232,685	2,134	
1985/86	3,120,252	5,269	5,821.0	53.9	1.10	958,053	2,006	3,013.7	20.5	1.50	245,769	2,239	

Year	Passenger PIA											Cargo (ton)	
	Europe			Far East			Regional (India, Afghanistan, etc.)			No. of Pass.	No. of RPKs (million)		Revenue Per Capita Yield (Rs./RPK) (kms)
	Revenue (million Rs.)	Per Capita RPKs (kms)	Yield (Rs./RPK)	Revenue (million Rs.)	Per Capita RPKs (kms)	Yield (Rs./RPK)	Revenue (million Rs.)	Per Capita RPKs (kms)	Yield (Rs./RPK)				
1976/77	1,453.8	19.0	1.01	507	331.3	6.7	0.65	23,411	48	58.7	0.6	31,133	
1977/78	1,271.7	19.1	0.86	565	407.9	7.3	0.72	51,897	90	98.3	1.2	38,558	
1978/79	1,391.3	18.4	0.95	652	452.0	8.1	0.69	84,403	116	104.2	1.4	49,081	
1979/80	1,519.5	18.9	0.98	729	602.0	8.8	0.83	108,365	134	166.3	1.6	59,081	
1980/81	1,610.1	21.5	0.89	926	739.4	11.0	0.80	110,657	140	174.2	1.7	69,682	
1981/82	1,542.8	20.3	0.87	959	728.5	10.9	0.76	128,287	151	164.0	1.7	72,912	
1982/83	1,534.7	21.7	0.78	956	614.1	10.6	0.64	137,290	154	164.1	1.7	88,890	
1983/84	1,683.6	21.3	0.85	950	554.9	10.2	0.58	152,830	168	156.8	1.8	91,632	
1984/85	1,627.7	22.2	0.76	916	668.7	9.5	0.73	164,585	173	193.9	1.8	100,293	
1985/86	1,853.7	22.9	0.83	826	737.6	8.5	0.89	183,226	198	216.0	2.0	114,798	

Source: PIA

Note: 1) Revenue of PIA is expressed in 1985/86 constant prices.

PGDP : Per Capita GDP (000 Rs)

NIA : Net Factor Income from Abroad
(million Rs)

Using the above equations, the international air traffic has been projected as summarized in Table 5.2.2.

Table 5.2.2 Projection of International Air Traffic

Year	No. of Passengers (000)						Cargo (000 ton)
	PIA						
	Total	Total	Middle East*	Europe*	Far East*	Regional*	
1985/86	3,120 (100)	1,525 (100)	958 (100)	246 (100)	138 (100)	183 (100)	115 (100)
1992/93	3,481 (112)	1,770 (116)	1,041 (109)	329 (134)	141 (102)	259 (142)	173 (150)
1997/98	4,020 (129)	2,012 (132)	1,140 (119)	397 (161)	150 (109)	325 (178)	222 (193)
2005/06	5,204 (167)	2,544 (167)	1,374 (143)	534 (217)	174 (126)	462 (252)	320 (278)

Note: * adjusted using the ratio of 1985/86 actual value to 1985/86 calculated value.

Source: JICA Study Team

The result shows that the number of passengers of PIA will increase more rapidly in the "Regional" and "Europe" market while no high growth is expected in the "Middle East" and "Far East" market. This may be attributed to the projected gradual decrease of the "Net Factor Income from Abroad".

5.2.2 Domestic Traffic

Based on the 10-year past trends of domestic air traffic presented in Table 5.2.3, the following regression formulae have been developed:

$$\text{PRPK} = 4.28661 \times \text{PGDP} - 3.35518$$

(R = 0.97, T1 = 11.29)

$$\text{RPK} = \text{POP} \times \text{PRPK}/1000$$

$$\text{PTK} = 0.000325895 \times \text{GDP} + 0.00405434 \times \text{RPK} + 0.527919$$

(R = 0.95, T1 = 0.81, T2 = 0.40)

where, PRPK : Per Capita RPK (kms)
 RPK : RPK (Revenue Passenger-kms, million)
 RTK : RTK (Revenue Ton-kms, million)
 PGDP : Per Capita GDP (000 Rs.)
 POP : Population (000)
 GDP : GDP (million Rs.)

Using these formulae, the future domestic air traffic was projected as shown in Table 5.2.4.

Table 5.2.3 Past Trends of Domestic Air Traffic

	RPKs (million kms)	Revenue (million Rs.)	Per Capita RPKs (kms)	Yield (Rs./RPK)	RTKs (million kms)
1976/77	849	765.8	11.3	0.90	14.80
1977/78	1,026	893.7	13.2	0.87	13.80
1978/79	1,093	1,173.3	13.6	1.07	15.30
1979/80	1,142	1,345.8	13.8	1.18	14.59
1980/81	1,205	1,456.2	14.3	1.21	15.73
1981/82	1,245	1,527.2	14.2	1.23	16.90
1982/83	1,340	1,375.7	14.8	1.03	18.54
1983/84	1,464	1,461.4	15.7	1.00	19.00
1984/85	1,618	1,655.7	16.8	1.02	23.49
1985/86	1,794	1,937.5	18.4	1.08	24.13

Note: 1) Revenue of PIA is expressed in 1985/86 constant prices.

Source: PIA

Table 5.2.4 Projection of Domestic Air Traffic

Year	Passenger-kms (million)	Ton-kms (million)
1985/86	1,794 (100.0)	24.13 (100.0)
1992/93	2,813 (156.8)	36.42 (150.9)
1997/98	3,845 (214.3)	48.92 (202.7)
2005/06	6,158 (343.3)	76.70 (317.9)

According to this projection, the domestic air traffic demand will increase more rapidly than the international air traffic demand. The calculated average annual growth rate is 6.6% for 1985/86 - 1992/93, 6.4% for 1992/93 - 1997/98 and 6.1% thereafter.

5.3

Sea

In Pakistan, domestic sea transport is considered negligible with some exceptions of intrazonal coastal shipping. Hence, this section deals only with international traffic.

International cargo traffic to be handled at Port Karachi and Port Qasim has been already projected as presented in Table 2.3.29.

The past trends of international passenger traffic are shown in Table 5.3.1.

Table 5.3.1 Past Trends of International Sea Passenger Traffic

Year	No. of Passengers			Share (%)		
	Pilgrim	Others	Total	Pilgrim	Others	Total
1972/73	114,038	31,256	145,294	78.5	21.5	100.0
1973/74	76,699	33,322	110,021	69.7	30.3	100.0
1974/75	81,136	19,175	100,311	80.9	19.1	100.0
1975/76	36,205	26,066	62,271	58.1	41.9	100.0
1976/77	28,192	47,506	75,698	37.2	62.8	100.0
1977/78	28,264	51,490	79,754	35.4	64.6	100.0
1978/79	29,611	34,712	64,323	46.0	54.0	100.0
1979/80	29,630	21,457	51,087	58.0	42.0	100.0
1980/81	15,456	21,408	36,864	41.9	58.1	100.0
1981/82	22,242	17,083	39,325	56.6	43.4	100.0
1982/83	21,943	7,989	29,932	73.3	26.7	100.0
1983/84	22,668	8,198	30,866	73.4	26.6	100.0
1984/85	17,896	10,930	28,826	62.1	37.9	100.0
1985/86	14,846	14,485	29,331	50.6	49.4	100.0

Source: KPT

As is apparent in the above table, the number of international sea passengers is decreasing gradually, showing a clear contrast to that of air transport. Although a regression analysis was carried out assuming that the current service levels of sea transport would be maintained in the future, the result was so pessimistic that might directly lead to the conclusion that there would be no need to have passenger ferry boats in the future.

Considering the possibility of upgrading levels of service by introducing high speed ferry boats, etc., however, this study assumed that other passengers than pilgrims would not decrease as calculated but would remain at the same level as 1985/86 during the planning period upto 2005/06. For pilgrims, it was assumed that the pilgrim traffic by sea would disappear due to the absence of plans to replace the currently obsolete Haj vessels.

CHAPTER 6 MICROSCOPIC TRANSPORT DEMAND FORECAST

6.1 Future Role of Pipeline and Inland Water Transport

6.1.1 Pipeline

With regard to the pipeline, the following assumptions have been made:

- (a) Natural gas and crude oil are all carried by pipeline.
- (b) As to petroleum and its products, the following volume is carried by pipeline.

1985/86	Karachi → Multan	2,271	(000 tons)
1992/93	Karachi → Shikarpur	698	
	Karachi → Multan	1,421	
	Karachi → Faisalabad	715	
	Karachi → Lahore	896	
	Total	3,730	(000 tons)
1997/98	Karachi → Shikarpur	946	
	Karachi → Multan	1,926	
	Karachi → Faisalabad	969	
	Karachi → Lahore	1,216	
	Total	5,057	(000 tons)
2005/06	Karachi → Shikarpur	1,466	
	Karachi → Multan	2,984	
	Karachi → Faisalabad	1,501	
	Karachi → Lahore	1,882	
	Total	7,833	(000 tons)

This estimate was made using the current ratio of petroleum transported from Karachi to the estimated surplus volume of Karachi.

The projected petroleum volume carried by pipeline has been adjusted on the surplus/deficit table by year prior to determine future commodity OD tables of road and railway.

6.1.2 Inland Water Transport

In order to make the inland water transport to be feasible, a huge amount of bulky commodity must be diverted from road or railway. This, however, seems extremely unrealistic, considering the limited number of origin-destination pairs suitable for the possible inland water transport routes.

Although the cost and benefit of inland water transport must be tested in detail in future feasibility studies, this study does not take up this mode of transport at this moment.

6.2 Alternative Scenarios for Intermodal Selection of Land Transport

Based on the analyses presented in Chapter 4, the following two scenarios are taken up in this study:

(Case I) Do-Nothing Case

- This case assumes that the present modal share by distance be maintained in the future.
- Therefore, if no important change occurs in fare structure, service levels and social/economical/political aspects that might affect the current intermodal relation, this case will be the basis of comparison with other alternative scenarios.

(Case II) Economical Case

- This case assumes the following for passenger transport:
 - A. For passengers travelling more than 500 kms along the trunk lines of PR, a railway share increasing depending on the travel distance was assumed. For approximation, a logistic curve was applied.
 - B. For passengers travelling less than 500 kms or more than 500 km but not along the trunk lines of PR, the present share of railway was assumed.
 - C. The rest of passenger traffic demand shall be absorbed by road transport.
- For commodity transport, railway will carry longer-distance goods while road will concentrate in the shorter-distance transport. Although the break-even distance is set at 489 kms, this shall not be regarded as the clear-cut point. The nature of transported goods will be reflected by smoothing the modal shares around the break-even distance depending upon the present intermodal relation.

According to these two scenarios, the future Origin-Destination tables have been created as described in the following section.

6.3 Estimate of Future Trip Distribution

6.3.1 Road and Railway

(1) Passenger

Based on the 1985/86 passenger OD tables of road and railway, regression analysis has been carried out. The resultant equations are:

$$\ln UAG = 0.645022 \times \ln POP + 1.56056 \times \ln PGRP + 7.14978$$

(R = 0.59, T1 = 2.91, T2 = 3.28)

$$\ln LAG = 0.978819 \times \ln POP + 1.37988 \times \ln PGRP + 6.56773$$

(R = 0.78, T1 = 6.30, T2 = 4.14)

where UAG : Passenger trip generation and attraction of upper class (trip ends/year)

LAG : Passenger trip generation and attraction of lower class (trip ends/year)

POP : Zonal population (000)

PGRP: Zonal per capita GRP (000 Rs/year)

Using the projected population and per capita GRP by zone, future generation/attraction of passenger trips has been estimated according to the above equations.

Future OD tables have been created by the Fratar method holding the 1985/86 OD tables as the present pattern. Total passenger-kms have been adjusted to the interzonal values projected in Section 5.1.

The segregation of land passenger OD tables thus created into road and railway was conducted based on the two scenarios aforementioned. Table 6.3.1 shows the comparison of future OD tables between Case I and Case II.

In Case I, the number of railway passengers will steadily increase unless the performance of PR will further deteriorate from the present level. In Case II, the number of railway passengers will increase in long distance, especially along the trunk lines of PR, but will remain at almost the same level as at present in shorter distances.

Consequently, the figures of Case I and Case II do not differ much in terms of passenger-kms, although the number of passengers and their average trip length are considerably different between Case I and Case II, as presented in Table 6.3.2.

In addition, Fig. 6.3.1, shows the desired lines of railway and road passenger traffic demand in Case II. Although the demand for railway is small as compared to that for road, it has a relatively long travel distance and this tendency will be made further clearer in the future.

The created OD tables are presented in App. 8.

Table 6.3.1 Passenger Traffic Demand in the Future

	(million pass-kms)						
	1985/86	1992/93		1997/98		2005/06	
		Case 1	Case 2	Case 1	Case 2	Case 1	Case 2
Road							
Total	97,374	(141,942)	(142,020)	(176,878)	(177,990)	(240,345)	(243,349)
Interzonal	45,969	58,465	58,543	67,800	68,912	84,552	87,556
Upper Class	8,330	10,542	10,227	12,252	11,910	15,386	15,007
Lower Class	37,639	47,923	48,316	55,548	57,002	69,166	72,549
Railway							
Total	16,657	(20,262)	(20,184)	(23,777)	(22,665)	(30,502)	(27,498)
Interzonal	15,803	18,875	18,797	21,965	20,853	27,914	24,910
Upper Class	449	450	765	505	847	598	977
Lower Class	15,354	18,425	18,032	21,460	20,006	27,316	23,933
Total							
Total	114,031	162,204	162,204	200,655	200,655	270,847	270,847
Interzonal	61,772	77,340	77,340	89,765	89,765	112,466	112,466
Upper Class	8,779	10,992	10,992	12,757	12,757	15,984	15,984
Lower Class	52,993	66,348	66,348	77,008	77,008	96,482	96,482

Note: Figures in parenthesis assume the same share as 1985/86 in intrazonal traffic demand.

Source: JICA Study Team

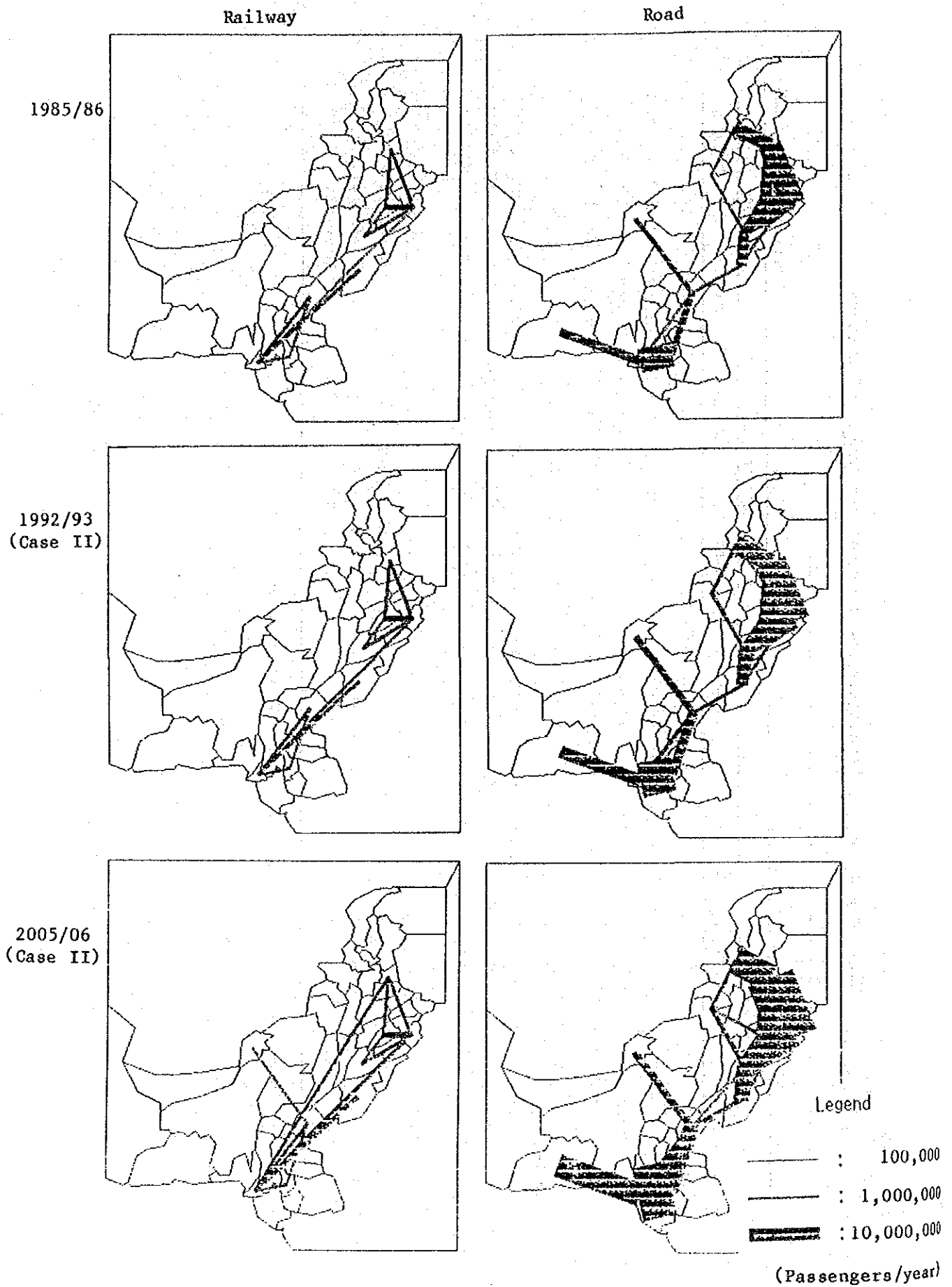
Table 6.3.2 No. of Passengers and Average Trip Length (Interzonal)

	(thousand pass., (kms))							
	1985/86		1992/93		1997/98		2005/06	
	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2
Road								
Interzonal	293,583 (157)	367,143 (159)	372,891 (157)	422,948 (160)	434,421 (159)	521,900 (162)	543,583 (161)	
- Upper Class	58,110 (143)	73,212 (144)	72,982 (140)	84,951 (144)	84,712 (141)	106,639 (144)	106,402 (141)	
- Lower Class	235,473 (160)	293,931 (163)	299,909 (161)	337,997 (164)	349,709 (163)	415,261 (167)	437,181 (166)	
Railway								
Interzonal	44,033 (359)	52,741 (358)	46,993 (400)	60,667 (362)	49,194 (424)	75,176 (371)	53,493 (466)	
- Upper Class	582 (771)	619 (727)	849 (901)	701 (720)	920 (921)	847 (706)	1,037 (942)	
- Lower Class	43,451 (353)	52,122 (353)	46,144 (391)	59,966 (358)	48,274 (414)	74,329 (368)	52,456 (456)	
Total								
Interzonal	337,616 (183)	419,884 (184)	483,615 (186)	597,076 (188)				
- Upper Class	58,692 (150)	73,831 (149)	85,652 (149)	107,486 (149)				
- Lower Class	278,924 (190)	346,053 (192)	397,963 (194)	489,590 (197)				

Note: Figures in parentheses show average trip length of interzonal passengers.

Source: JICA Study Team

Fig. 6.3.1 Desired Lines of Railway and Road Passenger Traffic Demand



Legend

- : 100,000
- : 1,000,000
- ▨ : 10,000,000

(Passengers/year)

(2) Commodity

Unlike the passenger OD tables the pattern of commodity OD tables can be determined based on the estimated zonal surplus/deficit by commodity (see Section 2.4).

The procedure to create future OD tables is as follows:

- (a) For commodity No.1 to No.16, the future generation/attraction has been estimated as stated earlier. The Fratar method has been applied holding the 1985/86 OD table as the present pattern to create future OD tables.
- (b) For commodity No.19 ("Others"), the zonal generation/attraction has been firstly estimated in proportion to the zonal GRP of the manufacturing industry. Then the Fratar method has been applied holding the 1985/86 OD table as the present pattern to obtain future OD tables.
- (c) At this stage, the commodity OD tables thus created (17 items, No.1 - No.16 and No.19) have been split into road and railway as follows:

(Case 1)

Depending on the modal share by distance and by commodity as of 1985/86, the total tonnage has been divided into road and railway for each origin-destination pair. If railway has no access to a certain zone, the total tonnage to/from that zone has been allocated to road.

(Case 2)

This case assumes the "smoothed break-even distance" as explained in Section 4.2.2. For "sugarcane", "fruits/vegetable" and "livestock", however, it was assumed that all tonnage will be carried by road considering the fragile nature and the negligible share of railway at present.

- (d) For "railway material" and "railway oil" that are transported exclusively by railway, the total tonnage to be transported in the future has been calculated assuming a share of 17% and 8% for "railway material" and "railway oil" respectively to the sum of other 17 items carried by railway. These percentages are those as of 1980/81 of PR, because the 1985/86 values are 28% and 7% and these seem to be too large to apply in the future.

Based on the procedure stated above, the future commodity OD tables have been created. The summary of the result is shown in Table 6.3.3. In Case 1, the share of railway in goods transport will decrease from 28% (1985/86) to 24% (2005/06) in the interzonal traffic and from 24% (1985/86) to 16% (2005/06) in the total traffic. In Case 2, however, the railway share will drastically increase from 28% (1985/86) to 54% (1992/93) and 59% (2005/06) in the interzonal traffic and from 24% (1985/86) to 42%

Table 6.3.3 Commodity Traffic Demand in the Future (Before Modification)

(million ton-kms)

	1985/86		1992/93		1997/98		2005/06	
	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2	Case 1	Case 2
Road								
Total	26,859	(39,233)	(28,078)	(48,568)	(34,739)	(65,891)	(46,390)	
Interzonal	21,198	28,115	16,960	32,871	19,042	41,641	22,140	
Railway								
Total	8,299	(8,765)	(19,920)	(10,192)	(24,021)	(13,014)	(32,515)	
Interzonal	8,288	8,743	19,898	10,161	23,990	12,967	32,468	
Total	35,158	47,998	58,760	78,905				
Interzonal	29,486	36,858	43,032	54,608				

Note: Figures in parenthesis assume the same share as 1985/86 in intrazonal traffic demand.

Source: JICA Study Team

(1992/93) and 41% (2005/06). Although this intermodal relation was set to reach an economically desirable solution, it was considered to be too drastic and unrealistic, especially for the figures of 1992/93, due to the following reasons:

- In the 6th FYP, no sufficient fund for the railway to make it possible was allocated, and it is also unlikely for the railway to be allocated funds enough to perform the necessary construction works and technical/managerial improvements during the 7th FYP period.
- PR has not yet established clear-cut policies and strategies towards better levels of service and financial performance.
- Related government agencies as well as PR are not convinced that the proposed drastic change can be possible in the near future.

Hence, it was decided to lower the 1992/93 target of railway to a realistic level. In order to calculate this level, the following approach has been taken:

- The 2005/06 target for railway will remain unchanged.
- Upto 1987/88, which is the first year of the 7th FYP, the demand for railway will follow Case I, the Do-Nothing Case.
- Between the period 1987/88 through 2005/06, a constant growth rate will continue.

Based on this approach, the 1992/93 demand for railway has been calculated at 12.3 billion ton-kms. This is larger than the 1985/86 actual figure (8.3 billion ton-kms) by 48%. Fig. 6.3.2 shows this procedure.

Although the modified target is considered to be realistic enough, the total economic cost of road and railway goods traffic has increased slightly as shown in Table 6.3.4.

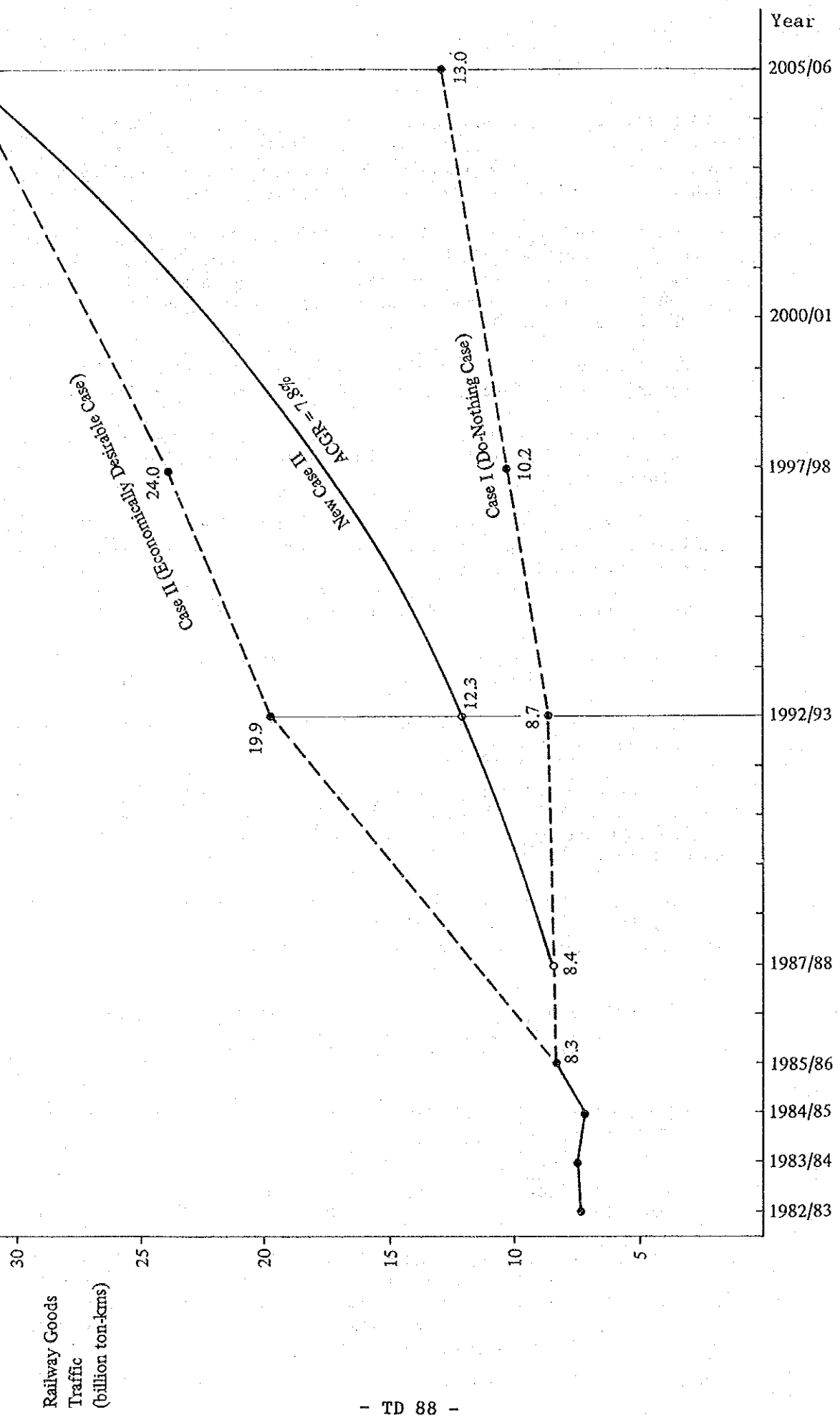
Table 6.3.4 Total Economic Cost of Road and Railway Goods Traffic, 1992/93

	(million Rs.)		
	Road	Railway	Total
Case II before Modification	11,315	6,248	17,563
Case II after Modification	14,380	3,415	17,795

- Note: 1) Investment on infrastructure is not included in the above economic costs. See Appendix 5 for detail.
 2) Economic cost was summed up based on the trip distribution by distance. See Appendix 7 for Case II after modification.

Source: JICA Study Team

Fig. 6.3.2 Modification of 1992/93 Goods Traffic Demand for Railway



Source: JICA Study Team

This increase, however, is not considered to be significant being only 1.3% of the total.

The modified Case II shall be hereinafter referred to simply as Case II.

The modified figures are presented in Table 6.3.5.

Table 6.3.5 Commodity Traffic Demand in the Future
(After Modification)

	(million ton-kms)				
	1985/86	1992/93		2005/06	
		Case 1	Case 2	Case 1	Case 2
Road					
Total	26,859	(39,233)	(35,682)	(65,891)	(46,390)
Interzonal	21,198	28,115	24,564	41,641	22,140
Railway					
Total	8,299	(8,765)	(12,316)	(13,014)	(32,515)
Interzonal	8,288	8,743	12,294	12,967	32,468
Total					
Total	35,158	47,998		78,905	
Interzonal	29,486	36,858		54,608	

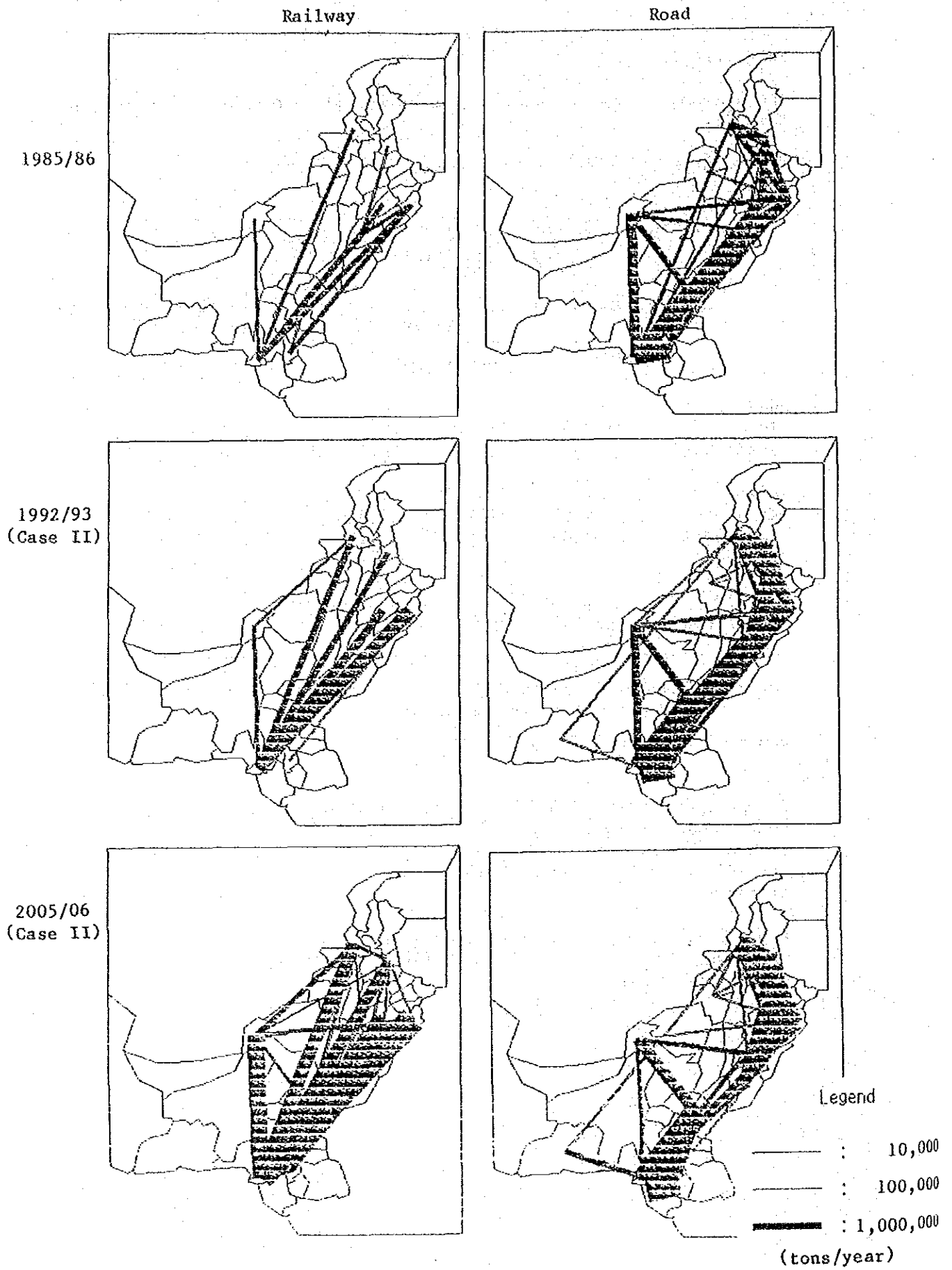
Note: Figures in parenthesis assumed the same share as 1985/86 in interzonal traffic demand.

Source: JICA Study Team

In addition, Fig. 6.3.3 shows the desired lines of railway and road goods traffic demand in Case II. The demand for railway increases rapidly and the railway is gradually specialized in long-distance transport while road gains in shorter-distance transport.

App. 7 shows the commodity-wise modal split between railway and road for the years 1992/93 and 2005/06, and App. 8 presents the created OD tables.

Fig. 6.3.3 Desired Lines of Railway and Road Goods Traffic Demand



6.3.2 Air

Based on the 1985/86 OD tables of passenger and commodity, the future OD tables have been prepared as follows:

- (a) In order to estimate the future distribution of passenger and commodity, regression analyses have been conducted. The resultant equations are:

$$\ln \text{PGA} = 1.59013 \times \ln \text{POP} + 1.57955 \times \ln \text{PGRP} - 4.55359$$

(R = 0.58, T1 = 1.86, T2 = 1.14)

$$\ln \text{CGA} = 0.399549 \times \ln \text{GRP} + 1.15746 \times \ln \text{PGA} - 11.3590$$

(R = 0.95, T1 = 1.33, T2 = 10.06)

where,

- PGA : Zonal generation/attraction of passengers (passengers/year)
- CGA : Zonal generation/attraction of commodity (ton/year)
- POP : Zonal population (000)
- PGRP: Zonal per capita GRP (000 Rs.)
- GRP : Zonal GRP (million Rs.)

The above equations were formulated after determining the influence area for each existing airport.

- (b) Using the above equations, the future generation/attraction has been estimated as follows:

$$GA_i^T = GA_i^{86} \times \frac{TGA_i^T}{TGA_i^{86}}$$

(For zones where airports exist at present)

$$GA_i^T = TGA_i^T \times R$$

(For zones where airports are planned)

where,

- GA_i^T : Generation/attraction of zone i for the year T
- TGA_i^T : Generation/attraction calculated by the regression equation of zone i for the year T
- R : GA_j^{86} / TGA_j^{86} (when zone j is considered to be socio-economically similar to zone i)

(c) Based on the generation/attraction by zone thus estimated, the Fratar method has been applied to obtain future OD tables.

(d) The future OD tables have been further calibrated to the total passenger-kms and ton-kms estimated in Section 5.2.

The OD tables from the above data are presented in App. 8.

APPENDIX FOR
TRANSPORT DEMAND FORECAST

Appendix 1. Projected Working Population by Zone

- 1-1 Estimated Working Population by Zone, 1981 Census
- 1-2 Estimated Working Population by Zone, 1985/86
- 1-3 Projected Working Population by Zone, 1992/93
- 1-4 Projected Working Population by Zone, 1997/98
- 1-5 Projected Working Population by Zone, 2005/06

App. Table 1-1 Estimated Working Population by Zone-1981 (Census)

(000)

Zone Name	Agriculture	Mining/Quarrying	Manufacturing	Electricity/Gas	Construction	Wholesale/Retail	Transport/Comm.	Banking/Insure.	Pub. Ad./Service	TOTAL
1. Nardan	277	2	15	7	18	27	15	2	36	399
2. Peshawar	467	1	35	7	34	84	37	7	155	826
3. Kohat	177	2	9	1	17	20	12	2	43	283
4. Abbottabad	514	0	16	6	22	40	29	3	87	716
5. D. I. Khan	178	0	4	1	9	20	7	1	46	267
6. Bannu	199	0	5	2	7	23	7	1	36	280
7. Dir	201	1	4	1	8	12	5	1	18	251
8. Swat	288	2	8	2	10	22	10	2	37	382
NWFP Total	2,302	7	97	27	127	247	123	17	457	3,404
9. Attock	158	1	18	3	20	25	15	1	39	279
10. Rawalpindi	160	3	52	6	38	67	35	9	181	551
11. Jhelum	118	12	24	1	20	24	10	3	45	268
12. Gujrat	277	1	79	4	30	50	25	4	88	557
13. Sargodha	363	12	60	4	30	76	30	5	114	694
14. Mianwali	235	3	26	2	16	25	15	2	46	368
15. Faisalabad	542	1	260	10	60	161	50	8	194	1,276
16. Jhang	383	1	41	3	21	41	20	2	76	588
17. Lahore	327	2	214	19	92	218	101	21	299	1,293
18. Sheikhupura	291	1	112	2	30	55	26	3	93	618
19. Gujranwala	288	1	148	3	33	87	35	6	109	710
20. Sialkot	302	1	151	4	37	74	31	5	98	703
21. D. G. Khan	309	1	19	1	13	32	12	2	47	435
22. Muzaffargarh	412	1	38	1	28	42	15	2	66	605
23. Multan	846	1	142	6	63	152	66	12	185	1,475
24. Sahiwal	673	1	88	4	35	97	35	9	139	1,081
25. Bahawalpur	245	0	27	2	20	35	15	2	64	410
26. Bahawalnagar	289	0	28	1	12	34	10	1	47	421
27. Rahim Yar Khan	344	1	34	2	17	34	14	2	65	513
Punjab Total	6,563	42	1,562	79	613	1,318	560	99	1,996	12,834
28. Shikarpur	374	0	8	1	13	24	10	2	33	464
29. Sukkur (Rohri)	180	0	19	1	22	29	20	1	36	309
30. Larkana	235	0	6	1	10	24	9	1	30	315
31. Nawabshah	328	0	9	3	12	23	9	2	40	425
32. Khairpur	197	0	6	2	7	21	4	2	23	262
33. Hyderabad	274	2	51	6	33	70	20	5	76	537
34. Dadu	233	9	19	1	7	20	8	1	30	328
35. Tharparkar	332	0	13	1	6	27	8	1	36	424
36. Sanghar	214	0	10	1	5	16	5	1	18	269
37. Thatta	182	0	5	1	6	14	3	0	16	229
38. Badin	192	0	7	0	2	7	3	0	20	232
39. Karachi	73	5	300	14	74	298	157	44	334	1,299
Sind Total	2,814	17	453	33	196	573	255	61	691	5,093
40. Quetta	47	4	7	2	6	44	13	1	31	155
41. Loralai	175	7	1	0	5	11	4	0	10	213
42. Chagai	15	3	0	0	4	2	2	0	2	28
43. Kalat	113	5	0	0	2	3	2	0	6	131
44. Lasbela	54	1	1	0	1	2	1	0	2	62
45. Sibi	339	7	5	1	8	11	5	0	16	392
46. Gwadar	131	0	3	0	18	7	11	0	6	177
Baluchistan Total	874	26	17	4	43	79	39	2	75	1,158
TOTAL	12,552	92	2,129	142	979	2,216	977	179	3,219	22,489

App. Table 1-2 Estimated Working Population by Zone-1985/1986

(000)

Zone Name	Agriculture	Mining/Quarrying	Manufacturing	Electricity/Gas	Construction	Wholesale/Retail	Transport/Comm.	Banking/Insure.	Pub. Ad./Service	TOTAL
1. Nardan	315	2	17	8	21	30	17	2	40	453
2. Peshawar	492	1	40	8	39	95	42	7	177	901
3. Kohat	172	2	10	2	19	22	13	2	47	288
4. Abbottabad	634	0	17	7	23	43	31	3	94	852
5. D. I. Khan	193	0	5	2	11	22	8	1	52	294
6. Bannu	224	0	6	2	8	26	8	1	41	315
7. Dir	243	1	5	1	10	15	6	1	22	305
8. Swat	346	2	10	2	13	27	12	2	44	458
NWFP Total	2,620	8	110	30	144	280	138	20	518	3,867
9. Attock	173	1	19	3	22	27	16	2	43	304
10. Rawalpindi	181	3	59	7	43	76	40	11	206	625
11. Jhelum	126	13	26	1	21	25	11	3	48	274
12. Gujrat	306	1	87	5	33	55	28	4	97	615
13. Sargodha	406	13	68	5	33	85	33	5	127	776
14. Mianwali	267	3	30	2	18	28	17	2	52	419
15. Faisalabad	574	1	276	11	64	159	53	8	205	1,351
16. Jhang	438	1	46	3	24	47	23	3	88	673
17. Lahore	381	3	253	23	109	258	120	26	354	1,526
18. Sheikhpura	333	1	129	2	34	63	30	4	107	702
19. Gujranwala	333	1	172	3	39	100	42	7	126	823
20. Sialkot	327	1	164	5	40	81	33	5	106	751
21. D. G. Khan	371	1	22	2	16	38	14	2	56	522
22. Muzaffargarh	493	1	46	1	34	50	17	3	79	724
23. Multan	979	2	165	7	73	176	76	14	215	1,706
24. Sahiwal	795	1	103	5	41	115	41	10	165	1,275
25. Bahawalpur	290	0	33	2	24	41	18	2	75	486
26. Bahawalnagar	331	0	32	1	14	39	11	1	54	483
27. Rahim Yar Khan	401	1	40	2	20	40	17	2	76	599
Punjab Total	7,506	47	1,768	90	699	1,504	640	113	2,279	14,645
28. Shikarpur	436	0	9	1	15	27	11	2	38	540
29. Sukkur (Rohri)	209	0	23	1	26	33	24	1	41	359
30. Larkana	264	0	7	1	11	27	10	1	34	354
31. Nawabshah	365	0	9	4	13	25	9	2	45	473
32. Khairpur	233	0	7	2	8	25	5	2	27	310
33. Hyderabad	308	2	57	7	37	79	22	6	85	604
34. Dadu	273	10	22	2	8	24	10	2	35	385
35. Tharparkar	413	0	16	1	7	33	11	2	44	526
36. Sanghar	250	0	11	1	6	19	5	1	21	314
37. Thatta	194	0	5	1	7	15	3	0	18	243
38. Badin	219	0	8	0	3	8	3	1	23	265
39. Karachi	91	7	376	18	93	373	197	55	418	1,627
Sind Total	3,255	20	552	39	233	689	310	74	828	6,000
40. Quetta	60	6	8	3	8	56	17	1	40	199
41. Loralai	246	10	2	1	7	15	5	0	14	299
42. Chagai	20	4	0	0	5	2	3	0	3	38
43. Kalat	163	7	0	0	2	5	3	0	9	190
44. Lasbela	70	1	1	0	1	2	1	0	3	80
45. Sibi	437	8	6	1	10	14	6	1	21	504
46. Gwadar	199	0	4	0	28	10	17	0	9	267
Baluchistan Total	1,195	35	23	5	61	104	53	3	99	1,577
TOTAL	14,576	110	2,451	164	1,136	2,576	1,141	210	3,724	26,089

App. Table 1-3 Projected Working Population by Zone-1992/93

Zone Name	Agriculture	Mining/Quarrying	Manufacturing	Electricity/Gas	Construction	Wholesale/Retail	Transport/Comm.	Banking/Insure.	Pub. Ad./Service	TOTAL
1. Mardan	378	3	21	9	25	36	21	3	48	644
2. Peshawar	548	1	48	9	47	116	62	9	215	1,045
3. Kohat	178	2	12	2	23	25	15	2	55	314
4. Abbottabad	861	0	18	7	25	46	33	4	101	1,096
5. D. I. Khan	221	0	6	2	13	27	9	1	64	343
6. Bannu	263	0	7	2	9	30	9	1	48	370
7. Dir	316	1	7	1	13	19	8	1	29	396
8. Swat	441	2	13	3	16	34	16	2	57	584
NWFP Total	3,206	10	131	35	171	335	163	24	618	4,693
9. Attock	195	1	22	3	24	30	19	2	48	345
10. Rawalpindi	216	3	72	8	51	90	49	14	251	755
11. Jhelum	137	14	28	1	23	27	12	4	53	298
12. Gujrat	353	1	100	6	38	63	32	5	112	708
13. Sargodha	475	15	79	5	39	100	39	6	149	908
14. Mianwali	321	4	36	3	22	34	20	3	62	504
15. Faisalabad	621	1	298	12	69	172	57	9	222	1,462
16. Jhang	531	1	56	4	29	57	28	3	106	815
17. Lahore	476	3	322	29	139	331	154	32	453	1,940
18. Sheikhupura	406	2	156	3	41	76	36	4	130	854
19. Gujranwala	412	1	213	4	48	124	52	8	156	1,017
20. Sialkot	368	1	184	5	44	91	38	6	119	855
21. D. G. Khan	485	1	29	2	20	50	18	3	74	683
22. Muzaffargarh	644	1	60	2	44	65	23	4	103	946
23. Multan	1,214	2	204	8	91	219	94	17	266	2,116
24. Sahiwal	1,015	2	132	7	52	147	52	13	210	1,629
25. Bahawalpur	373	1	42	3	31	53	23	3	97	625
26. Bahawalnagar	406	1	39	2	17	47	14	1	66	592
27. Rahim Yar Khan	503	1	50	2	25	50	21	3	95	751
Punjab Total	9,151	55	2,123	109	848	1,828	780	139	2,773	17,806
28. Shikarpur	547	0	11	1	18	34	13	2	47	674
29. Sukkur (Rehri)	259	0	28	2	32	41	29	2	51	445
30. Larkana	311	0	8	2	13	31	12	1	40	418
31. Nawabshah	426	0	11	4	15	29	11	2	52	551
32. Khairpur	297	0	9	2	10	32	6	2	34	394
33. Hyderabad	363	3	68	9	44	94	26	7	101	714
34. Dadu	343	13	28	2	10	30	12	2	44	484
35. Tharparkar	563	0	22	1	10	45	14	2	60	719
36. Sanghar	314	0	14	1	7	24	7	1	26	394
37. Thatta	212	0	6	1	7	17	3	1	19	266
38. Badin	266	0	10	0	3	10	4	1	27	321
39. Karachi	124	9	510	24	126	506	267	75	568	2,208
Sind Total	4,026	25	725	50	296	892	405	99	1,070	7,588
40. Quetta	79	7	11	3	10	74	23	2	53	263
41. Loralai	371	15	3	1	10	23	8	0	21	451
42. Chagai	28	5	0	0	7	3	5	0	5	54
43. Kalat	250	11	1	0	3	7	4	0	14	292
44. Lasbela	93	1	2	0	2	3	2	0	4	106
45. Sibi	591	10	8	1	14	18	8	1	28	678
46. Gwadar	321	0	6	0	45	15	27	1	14	430
Baluchistan Total	1,733	50	31	6	92	144	77	4	138	2,273
TOTAL	18,116	140	3,009	201	1,407	3,198	1,426	265	4,598	32,369

App. Table 1-4 Projected Working Population by Zone-1997/98

(000)

Zone Name	Agriculture	Mining/Q uarrying	Manuf-acturing	Electri-city/Gas	Construc-tion	Wholesale/Retail	Transpor-t/Comm.	Banking/Insure.	Pub. Ad./Service	TOTAL
1. Mardan	426	3	23	10	28	41	23	3	55	614
2. Peshawar	600	1	55	11	53	133	59	10	247	1,171
3. Kohat	188	2	13	2	27	28	17	3	62	342
4. Abbottabad	1,075	0	18	7	25	47	33	4	103	1,313
5. D. I. Khan	245	0	6	2	15	31	11	1	74	386
6. Bannu	294	0	8	3	10	34	10	1	54	415
7. Dir	373	2	9	1	16	22	10	1	34	468
8. Swat	514	3	15	3	19	40	18	3	66	680
NWFP Total	3,715	12	147	39	193	377	182	27	695	5,387
9. Attock	214	1	24	3	27	33	20	2	53	377
10. Rawalpindi	247	4	83	10	59	103	57	16	291	870
11. Jhelum	145	15	30	1	24	29	13	4	56	317
12. Gujrat	390	1	110	6	41	70	35	5	124	783
13. Sargodha	531	17	88	6	44	112	44	7	166	1,015
14. Mianwali	366	4	41	3	25	38	23	3	71	574
15. Faisalabad	656	2	315	12	73	182	60	9	235	1,544
16. Jhang	608	1	64	5	34	65	32	4	121	934
17. Lahore	553	4	381	35	165	392	183	38	536	2,287
18. Sheikhupura	463	2	178	3	47	87	41	5	148	975
19. Gujranwala	476	1	246	5	55	143	60	9	180	1,175
20. Sialkot	396	1	198	6	48	98	41	6	128	922
21. D. G. Khan	584	2	35	2	25	60	22	3	89	822
22. Muzaffargarh	775	1	72	2	53	78	27	5	124	1,138
23. Multan	1,406	2	237	10	105	253	109	20	309	2,453
24. Sahiwal	1,201	2	156	8	62	173	62	15	249	1,927
25. Bahawalpur	444	1	50	4	36	63	28	3	115	744
26. Bahawalnagar	466	1	45	2	19	54	16	1	76	680
27. Rahim Yar Khan	588	1	59	3	29	59	25	4	112	878
Punjab Total	10,509	62	2,412	125	971	2,095	895	161	3,182	20,414
28. Shikarpur	638	0	12	2	20	39	15	3	54	783
29. Sukkur (Rohri)	298	1	32	2	37	48	34	2	59	511
30. Larkana	345	0	9	2	14	35	13	1	44	463
31. Nawabshah	468	0	12	5	17	32	12	2	58	606
32. Khairpur	348	0	11	3	12	38	7	3	40	462
33. Hyderabad	403	3	75	10	48	104	29	8	112	793
34. Dadu	398	15	33	2	11	35	14	2	50	561
35. Tharparkar	693	0	27	2	12	56	18	3	74	884
36. Sanghar	363	0	16	1	8	27	8	1	31	455
37. Thatta	222	0	6	1	8	18	3	1	20	278
38. Badin	300	0	12	0	4	11	4	1	31	362
39. Karachi	152	11	626	30	155	621	328	92	697	2,711
Sind Total	4,628	30	871	59	347	1,062	486	119	1,269	8,870
40. Quetta	92	9	13	4	12	86	26	2	61	306
41. Loralai	474	19	3	1	13	29	11	0	27	578
42. Chagai	35	7	1	0	9	4	6	0	6	67
43. Kalat	324	14	1	0	4	10	6	0	19	378
44. Lasbela	108	1	2	0	2	3	2	0	4	124
45. Sibi	690	11	9	1	16	21	9	1	32	790
46. Gwadar	433	1	7	0	62	20	36	1	18	579
Baluchistan Total	2,157	61	36	7	118	173	96	5	167	2,821
TOTAL	21,010	164	3,467	231	1,629	3,707	1,660	311	5,314	37,492

App. Table 1-5 Projected Population by Zone 2005/06

(000)

Zone Name	Agriculture	Mining/Quarrying	Manufacturing	Electricity/Gas	Construction	Wholesale/Retail	Transport/Comm.	Banking/Insure.	Pub. Ad./Service	TOTAL
1. Mardan	498	4	27	12	33	48	27	4	64	716
2. Peshawar	689	1	67	13	64	161	71	13	299	1,378
3. Kohat	208	3	15	2	32	33	21	3	74	392
4. Abbottabad	1,466	0	16	6	22	44	30	4	96	1,685
5. D. I. Khan	286	0	8	3	18	38	13	2	90	457
6. Bannu	346	0	9	3	12	40	12	1	63	487
7. Dir	477	2	11	2	21	28	13	2	43	599
8. Swat	642	3	19	4	23	50	23	4	83	850
NWFP Total	4,612	14	172	45	225	442	210	32	812	6,563
9. Attock	241	1	27	4	30	37	23	2	60	425
10. Rawalpindi	302	5	104	13	74	126	72	22	369	1,086
11. Jhelum	157	16	32	1	26	31	14	4	60	342
12. Gujrat	448	1	127	7	48	80	40	6	142	899
13. Sargodha	619	20	103	7	51	130	51	8	194	1,184
14. Mianwali	442	5	49	3	30	46	28	3	86	692
15. Faisalabad	700	2	336	13	77	194	64	10	250	1,647
16. Jhang	737	1	78	6	41	79	38	5	147	1,132
17. Lahore	695	5	491	45	214	506	237	50	692	2,935
18. Sheikhpura	564	2	217	4	57	106	50	6	180	1,187
19. Gujranwala	591	1	305	6	69	178	74	12	223	1,459
20. Sialkot	441	1	220	6	53	109	45	7	143	1,025
21. D. G. Khan	752	2	46	3	32	77	29	4	114	1,059
22. Muzaffargarh	997	1	92	3	69	101	35	6	160	1,464
23. Multan	1,707	3	288	12	128	308	133	25	375	2,977
24. Sahiwal	1,506	2	196	10	77	218	77	19	312	2,418
25. Bahawalpur	579	1	65	6	48	82	36	4	150	970
26. Bahawalnagar	575	1	55	3	24	67	19	2	94	839
27. Rahim Yar Khan	746	1	75	3	37	75	31	4	141	1,113
Punjab Total	12,798	72	2,907	154	1,183	2,552	1,097	199	3,893	24,855
28. Shikarpur	792	0	15	2	25	47	18	3	66	967
29. Sukkur (Rohri)	359	1	39	2	44	57	41	2	71	616
30. Larkana	394	0	10	2	16	40	15	2	50	528
31. Nawabshah	526	0	14	5	19	36	14	3	65	681
32. Khairpur	432	0	13	3	15	47	9	3	50	574
33. Hyderabad	459	4	86	11	55	118	33	9	127	903
34. Dadu	486	18	40	3	14	42	17	3	62	685
35. Tharparkar	932	0	36	2	17	75	24	4	100	1,188
36. Sanghar	441	0	20	1	10	33	9	2	37	554
37. Thatta	230	0	6	1	8	18	3	1	21	289
38. Badin	351	0	14	0	4	13	5	1	36	424
39. Karachi	204	15	843	40	208	835	441	124	937	3,648
Sind Total	5,606	37	1,134	74	435	1,362	630	156	1,622	11,056
40. Quetta	113	11	16	5	15	106	32	3	75	375
41. Loralai	678	27	5	2	19	41	15	0	39	827
42. Chagai	47	9	1	0	12	5	8	0	8	90
43. Kalat	455	21	1	1	5	14	8	1	27	532
44. Lasbela	128	1	2	0	2	4	2	0	5	146
45. Sibi	848	12	11	1	21	25	11	1	38	968
46. Gwadar	646	1	10	1	93	30	54	1	26	862
Baluchistan Total	2,916	82	46	9	166	225	131	6	218	3,800
TOTAL	25,933	205	4,259	281	2,010	4,581	2,067	392	6,545	46,274

Appendix 2. Projected GRP by Zone

2-1(1) - (5) Projected GRP by Zone, 1985/86

2-2(1) - (5) Projected GRP by Zone, 1992/93

2-3(1) - (5) Projected GRP by Zone, 1997/98

2-4(1) - (5) Projected GRP by Zone, 2005/06

App. Table 2-1(1) Projected GRP by Zone-1985/86

Industry	(million Rs. at 1985/86 constant prices)									
	1	2	3	4	5	6	7	8	9	
1. Agriculture	1,534	2,956	1,288	1,995	2,148	1,598	805	1,880	14,305	1,320
1) Major Crops	741	1,045	284	350	385	358	252	717	4,365	603
-Wheat	190	354	165	236	190	189	91	230	1,644	532
-Rice	3	10	20	23	33	7	82	111	288	0
-Gram	1	1	35	1	110	80	0	0	228	18
-Maize	271	182	49	282	18	76	67	285	1,210	24
-Cotton	0	0	0	0	0	0	0	0	0	0
-Sugarcane	240	449	1	1	16	17	0	0	782	0
-Others	36	51	14	27	19	19	12	35	213	29
2) Minor Crops	284	538	126	147	828	298	124	681	3,076	97
-Fruit/Vegetable	238	534	98	111	801	266	95	566	2,699	96
-Others	46	64	27	36	27	33	29	115	377	1
3) Livestock	607	1,320	876	1,250	923	911	374	421	6,682	594
-Milk	288	535	415	552	437	432	177	199	3,156	364
-Meat & Others	320	695	461	658	486	479	197	221	3,516	230
4) Fishery	1	1	0	1	6	0	0	1	11	7
5) Forestry	0	1	2	47	5	0	54	61	171	19
2. Mining/Quarrying	67	28	52	9	3	4	29	54	246	46
1) Natural Gas	0	0	0	0	0	0	0	0	0	0
2) Crude Oil	0	0	0	0	0	0	0	0	0	0
3) Limestone	37	15	29	5	2	2	17	30	138	6
4) Coal	4	2	1	1	0	0	2	4	16	3
5) Others	25	10	19	3	1	0	11	20	92	3
3. Manufacturing	859	2,469	139	904	62	78	62	202	4,787	460
1) Large-Scale	673	2,019	26	710	7	13	0	38	3,536	317
-Food	401	606	17	27	7	3	0	3	1,064	0
-Tobacco	123	234	0	0	0	0	0	0	377	0
-Textile	4	155	9	126	0	0	0	48	350	195
-Apparel	0	36	0	0	0	0	0	0	36	0
-Wood & Paper	0	385	0	0	0	0	0	0	395	0
-Chemical	19	194	0	74	0	0	0	23	310	0
-Cement/Ceramic	125	87	0	376	0	0	0	0	589	103
-Metal/Metal Product	0	49	0	0	0	0	0	0	49	0
-Machinery/Equipment	1	243	0	106	0	0	0	15	366	20
2) Small-Scale	196	450	112	195	56	66	62	114	1,251	142
-Food	33	75	19	32	9	11	10	19	208	18
-Textile/Apparel	44	101	25	44	12	15	14	25	250	44
-Wood/Furniture	29	67	17	29	8	10	9	17	186	17
-Metal Product/Machinery	22	50	12	22	6	7	7	13	139	18
-Others	69	188	39	68	19	23	22	40	438	44
4. Construction	759	1,404	710	854	382	281	373	459	5,232	565
5. Electricity & Gas	147	370	30	1,743	31	45	15	74	2,455	93
1) Distribution	147	148	30	125	31	40	15	39	573	93
2) Generation	0	222	0	1,519	0	6	0	35	1,882	0
6. Transport & Communications	553	1,285	394	950	318	272	206	409	4,385	414
1) for Consumption	349	860	264	627	161	155	131	252	2,798	259
2) for Business	204	424	130	323	155	118	75	157	1,587	155
7. Wholesale & Retail Trade	867	4,503	615	1,232	641	734	415	788	9,779	555
1) Wholesale	0	1,790	0	0	0	0	0	0	1,790	0
2) Retail	867	2,713	615	1,232	641	734	415	788	7,989	555
8. Banking & Insurance	113	389	96	167	53	46	42	95	981	95
9. Ownership of Dwellings	98	280	74	181	62	73	63	103	930	137
10. Public Admin./Defence	462	2,026	538	1,077	598	466	254	510	5,930	465
11. Service	399	1,752	466	982	517	403	219	411	5,130	413
TOTAL	5,969	17,447	4,403	10,044	4,824	4,000	2,489	4,935	54,170	4,354
Per Capita GRP (000 Rs.)	3.49	4.95	3.41	3.20	4.48	3.15	2.10	2.79	3.51	3.65

App. Table 2-1(2) Projected GRP by Zone-1985/86

(million Rs. at 1985/86 constant prices)

Industry	10	11	12	13	14	15	16	17	18	19
1) Agriculture	1,650	871	2,638	4,360	3,079	6,206	3,874	3,595	3,196	3,315
1) Major Crops	411	313	1,130	2,300	2,003	3,388	2,203	1,561	1,819	2,020
-Wheat	332	278	639	1,089	644	1,736	1,152	971	890	1,001
-Rice	0	3	201	204	0	119	95	320	672	799
-Gram	1	8	6	374	1,009	7	51	4	7	17
-Maize	57	4	22	73	2	221	28	35	35	12
-Cotton	0	4	17	169	178	319	485	58	56	11
-Sugarcane	0	1	190	300	72	320	263	199	121	81
-Others	20	15	55	112	98	165	107	81	98	98
2) Minor Crops	99	44	696	976	271	1,278	477	1,033	567	478
-Fruit/Vegetable	90	44	556	472	225	319	393	394	461	439
-Others	9	1	139	503	46	459	84	140	105	38
3) Livestock	1,085	485	1,432	803	777	1,524	1,185	883	802	809
-Milk	722	303	557	1,252	453	1,070	801	647	573	580
-Meat & Others	363	182	236	440	324	454	384	236	229	229
4) Fishery	7	7	7	22	22	14	7	16	7	7
5) Forestry	49	21	2	10	6	2	2	2	1	1
2) Mining/Quarrying	223	984	47	1,008	224	103	51	197	108	53
1) Natural Gas	16	72	3	73	16	8	4	14	8	5
2) Crude Oil	152	689	32	685	152	70	35	134	73	43
3) Limestone	28	124	6	127	28	13	6	25	14	8
4) Coal	15	66	3	67	15	7	3	13	7	4
5) Others	12	54	3	56	12	6	3	11	6	3
3) Manufacturing	3,044	1,443	1,305	1,432	888	5,073	675	4,863	5,683	2,156
1) Large-Scale	2,615	1,255	672	929	571	3,039	337	3,017	4,744	900
-Food	252	8	195	433	0	1,708	195	228	1,793	109
-Tobacco	92	46	92	0	0	0	0	0	0	0
-Textile	237	100	64	187	114	924	134	198	718	52
-Apparel	7	0	7	7	0	18	4	258	42	7
-Wood & Paper	0	35	6	0	0	131	0	167	393	34
-Chemical	1,162	435	158	8	486	112	0	482	1,725	144
-Cement/Ceramic	379	618	68	36	71	71	0	12	7	5
-Metal/Metal Product	30	0	1	245	0	5	0	1,168	512	150
-Machinery/Equipment	455	14	81	14	0	90	4	504	554	400
2) Small-Scale	430	188	634	493	217	2,014	340	1,846	939	1,256
-Food	56	24	82	64	28	251	44	239	122	163
-Textile/Apparel	134	59	198	154	68	658	106	575	293	392
-Wood/Furniture	51	22	75	58	25	238	40	218	111	149
-Metal Product/Machinery	55	24	82	64	28	250	44	238	121	162
-Others	134	59	197	154	68	637	106	575	293	391
4) Construction	1,116	545	853	873	471	1,661	634	2,849	887	1,011
5) Electricity & Gas	237	822	202	188	71	772	115	777	168	126
1) Distribution	229	37	167	158	71	368	115	777	72	112
2) Generation	8	784	34	0	0	334	0	0	96	14
6) Transport & Communications	1,026	464	751	1,026	559	1,667	694	2,656	1,094	1,076
1) For Consumption	634	173	436	525	264	829	360	1,890	467	560
2) For Business	391	291	315	501	295	838	334	766	627	416
7) Wholesale & Retail Trade	3,219	523	1,136	2,255	582	5,130	978	10,241	1,304	3,074
1) Wholesale	1,650	0	0	485	0	1,823	0	4,832	0	993
2) Retail	1,569	523	1,136	1,771	582	3,307	978	5,339	1,304	2,081
8) Banking & Insurance	678	206	269	340	131	507	168	1,565	221	411
9) Ownership of Dwellings	458	136	273	469	172	248	1,120	265	1,120	509
10) Public Admin./Defence	2,351	527	1,062	1,391	567	2,244	957	3,869	1,166	1,375
11) Service	1,999	468	943	1,235	504	1,993	850	3,437	1,035	1,221
TOTAL	15,901	6,988	9,479	14,737	7,248	26,123	9,245	35,168	15,127	14,338
Per Capita GRP (000 Rs.)	5.71	5.64	3.81	5.16	4.62	5.26	4.08	5.87	6.27	4.63

App. Table 2-1(3) Projected GRP by Zone-1985/86

Industry	(million Rs. at 1985/86 constant prices)										
	20	21	22	23	24	25	26	27	Punjab	28	
1. Agriculture	2,795	2,200	3,567	11,942	7,284	3,005	3,050	4,812	72,967	2,574	
1) Major Crops	1,309	1,230	2,050	8,532	4,346	2,014	1,776	3,192	42,300	1,489	
-Wheat	738	481	1,097	2,893	2,272	664	687	888	18,943	1,155	
-Rice	426	91	59	95	425	40	113	77	3,740	1,040	
-Gram	1	41	126	9	15	20	127	18	1,861	1,203	
-Maize	17	3	13	103	126	13	27	15	865	0	
-Cotton	9	523	502	4,673	863	930	608	1,825	11,159	1	
-Sugarcane	54	30	153	343	433	248	127	233	3,670	8	
-Others	64	60	100	416	212	98	87	156	2,062	73	
2) Minor Crops	706	116	398	1,119	1,344	355	566	763	11,383	125	
-Fruit/Vegetable	684	91	268	544	1,022	233	411	204	7,976	117	
-Others	22	25	130	54	323	122	155	559	3,407	7	
3) Livestock	770	821	1,087	2,268	1,574	515	708	844	18,886	913	
-Milk	366	469	719	1,538	1,104	409	469	537	12,703	514	
-Meat & Others	204	352	368	730	471	206	239	307	6,183	399	
4) Fishery	7	19	19	19	18	10	10	10	235	39	
5) Forestry	3	14	13	3	1	11	37	4	163	8	
2. Mining/Quarrying	58	80	55	130	97	37	37	46	3,596	0	
1) Natural Gas	4	6	4	9	7	3	3	3	262	0	
2) Crude Oil	40	54	38	89	66	25	25	31	2,444	0	
3) Limestone	7	10	7	16	12	5	5	6	452	0	
4) Coal	4	5	4	9	7	2	2	3	240	0	
5) Others	3	4	3	7	5	2	2	3	198	0	
3. Manufacturing	1,690	237	640	3,700	1,239	423	509	1,789	87,247	277	
1) Large-Scale	495	73	306	2,496	484	190	276	1,496	24,332	132	
-Food	33	0	0	696	381	4	209	1,241	6,485	132	
-Tobacco	0	0	0	0	46	0	0	0	0	0	
-Textile	2	55	306	420	1	144	57	114	4,022	0	
-Apparel	95	14	0	176	36	24	10	69	755	0	
-Wood & Paper	0	1	0	0	1	0	0	0	775	0	
-Chemical	102	0	0	1,062	6	8	0	63	5,854	0	
-Cement/Ceramic	0	0	0	73	0	0	0	0	1,444	0	
-Metal/Metal Product	38	0	0	32	0	1	0	0	2,182	0	
-Machinery/Equipment	224	1	0	37	14	10	10	10	2,429	0	
2) Small-Scale	1,195	164	333	1,203	755	238	233	293	12,315	145	
-Food	135	21	43	156	98	31	30	38	1,872	93	
-Textile/Apparel	373	51	104	375	235	74	73	91	4,026	12	
-Wood/Furniture	141	19	39	142	89	28	28	35	1,328	10	
-Metal Product/Machinery	154	21	43	155	97	31	30	38	1,666	9	
-Others	372	51	104	375	235	74	73	91	4,023	20	
4. Construction	1,035	410	991	1,919	1,068	623	354	517	18,283	350	
5. Electricity & Gas	135	53	49	513	175	83	49	61	4,510	58	
1) Distribution	155	53	49	232	174	83	49	61	3,057	58	
2) Generation	0	0	0	281	2	0	0	0	1,553	0	
6. Transport & Communications	885	408	598	2,331	1,258	543	425	715	18,509	525	
1) for Consumption	527	222	274	1,195	642	283	175	264	10,078	326	
2) for Business	358	186	325	1,136	616	261	250	451	8,531	200	
7. Wholesale & Retail Trade	2,169	791	1,037	4,866	2,381	857	802	852	42,732	510	
1) Wholesale	496	0	0	1,212	0	0	0	0	11,541	0	
2) Retail	1,673	791	1,037	3,655	2,381	857	802	852	31,191	510	
8. Banking & Insurance	333	131	181	890	635	122	50	150	7,086	156	
9. Ownership of Dwellings	483	208	284	1,189	467	189	173	235	7,588	295	
10. Public Admin./Defence	1,155	616	963	2,345	1,797	823	592	831	24,895	453	
11. Service	1,026	547	766	2,032	1,596	731	525	738	22,111	464	
TOTAL	11,785	5,681	8,932	31,655	18,001	7,440	6,556	10,727	555,724	5,763	
Per Capita GRP (000 Rs.)	4.01	2.99	3.44	5.06	4.22	4.32	4.18	4.99	4.75	3.04	

App. Table 2-1(4) Projected GRP by Zone-1985/86

(million Rs. at 1985/86 constant prices)

Industry	29	30	31	32	33	34	35	36	37	38
1. Agriculture	1,703	1,786	2,729	1,519	2,610	949	1,929	2,144	827	1,214
1) Major Crops	935	1,200	1,944	896	1,307	545	1,174	1,526	336	727
-Wheat	253	155	930	448	448	202	562	596	12	64
-Rice	12	983	25	13	70	234	16	19	143	177
-Cram	70	17	8	5	4	11	0	1	1	2
-Maize	1	0	1	0	4	1	8	4	1	1
-Cotton	484	0	564	284	372	24	411	668	4	28
-Sugarcane	69	5	320	102	345	46	112	65	157	419
-Others	46	58	95	44	64	27	57	74	16	35
2) Minor Crops	119	75	232	207	561	381	238	192	102	131
-Fruit/Vegetable	29	23	135	179	181	8	128	99	45	106
-Others	600	478	523	407	703	320	518	372	289	245
3) Livestock	316	357	451	345	316	293	357	244	246	314
-Milk	285	121	72	62	386	38	160	128	43	31
-Meat & Others	39	33	26	8	33	26	0	54	85	10
4) Fishery	10	0	4	1	5	5	0	0	15	0
5) Forestry	64	0	0	0	430	1,847	0	0	0	0
2. Mining/Quarrying	15	0	0	0	100	429	0	0	0	0
1) Natural Gas	36	0	0	0	236	1,014	0	0	0	0
2) Crude Oil	2	0	0	0	59	254	0	0	0	0
3) Limestone	5	0	0	0	32	139	0	0	0	0
4) Coal	0	0	0	0	3	11	0	0	0	0
5) Others	1,591	166	552	323	2,977	1,319	740	321	1,624	885
3. Manufacturing	1,233	60	502	210	2,069	1,319	490	142	1,540	751
1) Large-Scale	210	42	255	131	794	173	115	21	457	751
-Tobacco	0	0	0	0	0	73	0	0	0	0
-Textile	5	2	0	0	345	533	0	2	215	0
-Apparel	33	16	233	8	221	45	343	35	0	0
-Wood & Paper	0	0	0	0	171	10	32	84	15	0
-Chemical	853	0	0	11	171	10	0	0	852	0
-Cement/Ceramic	60	0	0	60	125	19	0	0	0	0
-Metal/Metal Product	38	0	0	0	109	95	0	0	0	0
-Machinery/Equipment	22	0	13	0	109	95	0	0	0	0
2) Small-Scale	358	106	150	113	909	353	250	179	85	134
-Food	232	69	97	73	597	228	161	118	55	87
-Textile/Apparel	30	9	13	10	77	30	21	15	7	11
-Wood/Furniture	24	7	10	7	60	23	17	12	6	9
-Metal Product/Machinery	23	7	10	7	58	22	15	11	5	9
-Others	50	15	21	16	127	49	35	25	12	19
4. Construction	616	261	315	192	877	133	175	135	162	63
5. Electricity & Gas	135	64	171	84	572	70	48	28	44	12
1) Distribution	65	64	171	94	328	70	48	28	44	12
2) Generation	69	0	0	0	244	0	0	0	0	0
6. Transport & Communications	961	436	520	278	1,126	555	492	321	250	238
1) For Consumption	709	296	283	148	668	287	315	160	87	95
2) For Business	252	140	237	130	458	268	177	161	163	133
7. Wholesale & Retail Trade	748	594	561	568	2,344	533	742	422	343	178
1) Wholesale	0	0	0	0	573	0	0	0	0	0
2) Retail	748	594	561	568	1,771	533	742	422	343	178
8. Banking & Insurance	124	91	163	160	520	132	136	81	42	46
9. Ownership of Dwellings	198	199	285	180	538	196	290	168	126	138
10. Public Admin./Defence	489	397	532	319	1,008	409	523	249	207	266
11. Service	500	407	544	326	1,031	419	535	255	212	273
TOTAL	7,129	4,401	6,472	3,949	14,035	6,613	5,610	4,123	3,838	3,303
Per Capita GRP (000 Rs.)	5.59	3.44	3.53	3.40	6.08	5.24	3.01	3.82	4.74	3.72

App. Table 2-1(5) Projected GRP by Zone-1985/86

Industry	(million Rs. at 1985/86 constant prices)										
	39	Sind	40	41	42	43	44	45	46	Baluchi	TOTAL
1. Agriculture	3,492	23,477	2,987	466	231	438	566	2,422	810	7,921	118,670
1) Major Crops	1	12,080	58	69	5	74	2	1,352	7	1,566	60,311
-Wheat	1	8,945	54	58	6	70	1	566	4	759	25,291
-Rice	0	2,712	0	0	0	0	0	647	3	650	7,390
-Gram	0	322	0	0	0	0	0	67	0	67	2,478
-Maize	0	21	1	7	0	0	0	0	0	8	2,104
-Cotton	0	2,842	0	0	0	0	0	0	0	0	14,001
-Sugarcane	0	1,649	0	0	0	0	0	6	0	6	6,107
-Others	0	589	3	3	0	4	0	66	0	76	2,940
2) Minor Crops	07	2,092	871	172	106	171	35	429	255	2,039	18,590
-Fruit/Vegetable	55	1,209	656	84	100	130	31	376	168	1,544	13,428
-Others	11	883	215	88	7	42	4	53	86	495	5,162
3) Livestock	1,208	6,687	2,959	225	114	192	102	641	121	3,454	35,709
-Milk	69	3,823	763	21	0	14	7	50	17	863	20,555
-Meat & Others	1,139	2,864	1,296	203	114	178	95	591	114	2,591	15,154
4) Fishery	2,216	2,568	0	0	0	0	428	0	428	855	3,669
5) Forestry	0	50	0	1	5	1	0	0	0	7	391
2. Mining/Quarrying	1,158	3,499	664	1,129	450	800	94	931	39	4,107	11,448
1) Natural Gas	289	813	472	803	320	569	67	662	28	2,921	3,996
2) Crude Oil	655	1,920	0	0	0	0	0	0	0	0	4,364
3) Limestone	189	481	1	2	1	2	0	2	0	8	1,079
4) Coal	87	264	106	180	72	128	15	149	6	556	1,176
5) Others	7	21	84	144	57	102	12	118	5	522	833
3. Manufacturing	29,851	40,727	423	16	3	4	348	70	42	909	83,670
1) Large-Scale	23,900	31,994	335	0	0	0	334	3	0	672	60,534
-Food	1,764	4,845	71	0	0	0	52	3	0	125	12,519
-Tobacco	217	230	7	0	0	0	0	0	0	7	950
-Textile	3,430	4,533	11	0	0	0	61	0	72	977	8,977
-Apparel	644	1,620	0	0	0	0	0	0	0	2,421	0
-Wood & Paper	508	503	0	0	0	0	33	0	33	1,756	0
-Chemical	5,429	7,493	246	0	0	0	107	0	0	353	14,110
-Cement/Ceramic	7,422	843	0	0	0	0	12	0	12	2,888	0
-Metal/Metal Product	7,459	7,642	0	0	0	0	0	0	0	9,873	0
-Machinery/Equipment	3,936	4,176	0	0	0	0	70	0	70	7,040	0
2) Small-Scale	5,951	8,733	88	18	3	4	14	68	42	237	23,136
-Food	3,843	5,640	69	14	2	3	11	53	33	185	7,705
-Textile/Apparel	568	738	17	4	1	1	3	13	8	46	5,090
-Wood/Furniture	393	377	0	0	0	0	0	0	0	2,291	0
-Metal Product/Machinery	578	554	0	0	0	0	0	0	0	2,959	0
-Others	634	1,224	2	0	0	0	0	2	1	5	5,591
4. Construction	2,208	5,537	177	153	113	48	29	225	624	1,369	30,421
5. Electricity & Gas	2,601	3,687	114	21	3	7	3	27	10	184	11,136
1) Distribution	810	1,782	86	21	3	7	3	27	10	156	5,868
2) Generation	1,791	2,105	28	0	0	0	0	0	0	28	5,268
6. Transport & Communications	8,298	10,692	769	270	147	165	101	415	575	2,443	39,429
1) Motor Consumption	5,887	9,262	491	156	96	83	35	180	478	1,519	23,557
2) for Business	2,411	4,730	278	134	51	83	65	264	37	924	15,772
7. Wholesale & Retail Trade	16,865	24,507	2,450	483	71	153	73	448	318	4,027	51,645
1) Wholesale	8,529	9,102	665	0	0	0	0	0	0	865	23,035
2) Retail	8,336	15,405	1,815	483	71	153	73	448	318	3,162	57,610
8. Banking & Insurance	4,765	6,417	192	31	10	25	10	68	45	371	14,555
9. Ownership of Dwellings	2,116	4,727	173	63	10	41	15	108	59	366	13,303
10. Public Admin./Defence	4,946	9,798	576	203	10	135	42	301	17	1,430	42,053
11. Service	5,061	10,026	641	225	52	150	46	355	142	1,293	39,560
TOTAL	81,360	146,594	9,087	3,054	1,136	1,965	1,327	5,349	2,794	24,722	485,210
Per Capita GRP (000 Rs.)	11.95	6.52	9.34	3.88	6.97	2.60	6.42	2.98	2.82	4.19	4.57

App. Table 2-2(1) Projected GRP by Zone-1992/93
(million Rs. at 1985/86 constant prices)

Industry	1	2	3	4	5	6	7	8	9
1) Agriculture	2,275	4,106	1,807	2,829	2,933	2,205	1,133	2,620	19,921
1) Major Crops	1,025	1,426	285	788	433	501	372	1,024	6,013
-Wheat	262	499	232	333	264	267	123	224	2,320
-Rice	5	16	32	36	52	11	133	175	455
-Gram	1	1	30	1	94	68	0	415	194
-Maize	394	266	72	382	27	111	97	0	1,762
-Cotton	0	0	0	0	0	0	0	0	0
-Sugarcane	312	582	2	1	21	22	0	74	1,014
-Others	46	63	17	35	21	22	17	46	267
2) Minor Crops	380	789	167	195	1,118	401	165	910	4,125
-Fruit/Vegetable	322	710	133	150	1,084	360	129	766	2,532
-Others	58	80	34	45	34	41	37	144	472
3) Livestock	868	1,887	1,253	1,787	1,319	1,303	534	601	9,553
-Milk	411	894	593	846	625	617	253	285	4,525
-Meat & Others	457	993	659	941	694	686	281	316	5,028
4) Fishery	3	2	1	2	13	1	1	1	24
5) Forestry	0	0	2	57	6	0	65	74	208
2) Mining/Quarrying	110	44	87	14	4	6	64	95	412
1) Natural Gas	0	0	0	0	0	0	0	0	0
2) Crude Oil	0	0	0	0	0	0	0	0	0
3) Limestone	58	23	46	7	2	3	22	50	218
4) Coal	4	1	3	0	0	0	2	3	14
5) Others	48	19	38	6	2	2	23	42	181
3) Manufacturing	1,395	4,124	235	1,528	1,07	134	120	359	8,012
1) Large-Scale	1,048	3,316	42	1,224	11	20	0	155	5,816
-Food	640	967	28	43	11	6	0	6	1,699
-Tobacco	158	326	0	0	0	0	0	0	484
-Textile	7	241	14	196	0	14	0	74	545
-Apparel	0	47	0	0	0	0	0	0	47
-Wood & Paper	0	608	0	0	0	0	0	0	606
-Chemical	37	382	0	146	0	0	0	45	610
-Cement/Ceramic	205	143	0	614	0	0	0	0	961
-Metal/Metal Product	0	90	0	0	0	1	0	0	91
-Machinery/Equipment	3	514	0	225	0	0	0	31	773
2) Small-Scale	347	808	194	304	96	114	120	214	2,197
-Food	82	191	46	72	23	27	28	50	519
-Textile/Apparel	57	134	32	50	16	19	20	35	363
-Wood/Furniture	56	132	32	50	16	19	20	35	358
-Metal Product/Machinery	38	84	20	32	10	12	13	22	229
-Others	115	268	64	101	32	38	40	71	728
4) Construction & Gas	1,202	2,405	1,205	1,285	672	469	693	830	8,851
1) Electricity & Gas	264	480	80	3,271	55	74	29	110	4,383
2) Distribution	264	268	50	199	55	70	29	74	1,008
2) Generation	0	213	0	3,072	0	3	0	37	3,325
5) Transport & Communications	884	2,076	621	1,432	486	419	353	674	6,945
1) for Consumption	563	1,405	418	895	259	245	230	432	4,448
2) for Business	321	671	204	537	227	174	122	242	2,497
7) Wholesale & Retail Trade	1,359	7,203	933	1,730	1,017	1,136	1,700	1,378	15,356
1) Wholesale	0	2,877	0	0	0	0	0	0	2,877
2) Retail	1,359	4,326	933	1,730	1,017	1,136	700	1,378	12,479
8) Banking & Insurance	172	573	144	237	81	68	69	153	1,497
9) Ownership of Dwellings	127	355	89	239	77	92	96	141	1,217
10) Public Admin./Defence	716	3,188	817	1,498	945	713	425	839	9,141
11) Service	592	2,637	675	1,239	782	589	351	694	7,561
TOTAL	9,189	27,191	6,664	15,302	7,164	5,906	4,028	7,804	83,248
Per Capita GRP (000 Rs.)	4.48	6.65	4.64	3.95	5.74	3.95	2.60	3.42	4.52

App. Table 2-2(2) Projected GRP by Zone 1992/93

Industry	(million Rs. at 1985/86 constant prices)																		
	10	11	12	13	14	15	16	17	18	19									
1. Agriculture	2,269	1,178	3,598	5,859	3,586	8,191	5,084	4,749	4,353	4,405									
1) Major Crops	521	389	1,400	2,781	2,082	4,362	2,767	2,140	2,370	2,624									
-Wheat	417	350	803	1,343	810	2,183	1,449	1,221	1,118	1,258									
-Rice	0	4	276	279	0	163	131	439	920	1,094									
-Gram	1	7	5	319	891	6	43	3	6	14									
-Maize	79	6	30	100	3	303	95	38	47	17									
-Cotton	0	4	20	205	217	389	566	71	7	13									
-Sugarcane	0	2	261	412	98	1,125	361	273	166	112									
-Others	23	17	65	123	98	193	123	95	106	116									
2) Minor Crops	126	57	885	1,235	345	1,620	607	1,316	721	609									
-Fruit/Vegetable	115	56	710	287	1,045	502	1,141	589	560	560									
-Others	11	1	175	633	58	576	105	175	132	42									
3) Livestock	1,551	693	1,148	1,790	1,111	2,179	1,694	1,262	1,147	1,157									
-Milk	1,032	433	810	1,161	647	1,529	1,145	925	819	829									
-Meat & Others	519	260	337	629	464	650	549	337	328	328									
4) Fishery	14	14	14	41	41	27	14	30	14	14									
5) Forestry	58	26	2	12	7	2	2	2	1	1									
2. Mining/Quarrying	337	1,357	68	1,494	341	141	79	319	166	98									
1) Natural Gas	33	134	7	147	34	14	8	32	16	10									
2) Crude Oil	219	882	45	971	222	92	51	207	108	64									
3) Limestone	48	180	9	198	45	19	10	42	22	13									
4) Coal	15	60	3	66	15	6	4	14	7	4									
5) Others	23	100	5	110	25	10	6	24	12	7									
3. Manufacturing	5,257	2,373	2,122	2,315	1,498	8,016	1,102	8,671	10,037	3,878									
1) Large-Scale	4,525	2,087	1,101	1,507	1,133	4,966	527	5,373	8,438	1,703									
-Food	334	12	305	678	0	2,674	305	337	1,241	170									
-Tobacco	117	59	117	0	0	0	0	0	0	0									
-Textile	369	153	100	291	177	1,439	208	308	1,118	52									
-Apparel	0	0	9	9	0	23	6	336	54	8									
-Wood & Paper	17	86	14	0	0	334	0	411	968	84									
-Chemical	2,010	752	273	14	840	193	0	834	2,984	249									
-Cement/Ceramic	610	994	110	57	115	115	0	20	11	9									
-Metal/Metal Product	53	0	1	429	0	10	0	2,049	899	353									
-Machinery/Equipment	955	28	171	23	0	188	8	1,857	1,152	339									
2) Small-Scale	731	287	1,021	808	366	3,030	575	3,298	1,800	2,175									
-Food	140	55	193	155	70	53	110	631	306	416									
-Textile/Apparel	176	69	245	194	88	733	138	793	384	523									
-Wood/Furniture	99	39	139	110	50	414	78	447	217	295									
-Metal Product/Machinery	92	36	129	102	46	384	72	415	202	274									
-Others	224	88	313	248	112	936	177	1,012	491	567									
4. Construction	1,833	807	1,336	1,390	771	2,445	1,045	4,564	1,488	1,702									
5. Electricity & Gas	406	815	301	261	121	879	196	1,406	198	206									
1) Distribution	401	57	272	261	121	561	195	1,406	124	195									
2) Generation	5	758	29	0	0	318	0	0	74	11									
6. Transport & Communications	1,635	660	1,112	1,513	811	2,411	1,040	4,335	1,753	1,704									
1) For Consumption	983	239	639	783	404	1,143	556	3,088	723	1,040									
2) For Business	652	421	473	730	407	1,269	484	1,297	1,040	664									
7. Wholesale & Retail Trade	5,007	714	1,640	3,379	878	7,420	1,485	16,457	1,990	4,826									
1) Wholesale	2,654	0	0	780	0	2,933	0	7,852	0	1,596									
2) Retail	2,352	714	1,640	2,599	878	4,487	1,485	8,605	1,990	3,229									
8. Banking & Insurance	1,080	283	392	503	199	694	258	2,548	340	644									
9. Ownership of Dwellings	576	154	328	573	321	921	313	1,496	336	657									
10. Public Admin./Defence	3,390	709	1,511	2,012	844	3,000	1,431	6,117	1,752	2,102									
11. Service	2,884	603	1,285	1,711	718	2,552	1,218	5,204	1,450	1,788									
TOTAL	24,674	9,655	13,603	21,010	9,984	36,671	13,251	56,615	23,773	22,010									
Per Capita GRP (000 Rs.)	7.34	7.15	4.75	6.29	5.29	6.86	4.83	7.39	8.10	5.74									

App. Table 2-2(3) Projected GGP by Zone 1992/93

(million Rs. at 1985/86 constant prices)

Industry	20	21	22	23	24	25	26	27 Punjab	28
1. Agriculture	3,714	2,890	4,630	15,243	3,508	3,871	3,925	6,141	94,752
1) Major Crops	1,656	1,515	2,518	10,543	5,513	2,509	2,175	2,950	52,666
-Wheat	928	605	1,379	3,627	2,855	835	864	1,092	23,817
-Rice	58	125	81	129	582	55	154	106	5,119
-Grain	1	35	107	8	13	17	109	16	1,588
-Maize	23	5	17	142	174	18	38	20	1,187
-Cotton	12	637	611	5,689	1,050	1,133	740	2,222	13,586
-Sugarcane	74	42	210	471	594	340	175	320	5,024
-Others	75	67	112	467	244	111	96	175	2,335
2) Minor Crops	901	147	505	1,416	1,709	450	719	961	14,451
-Fruit/Vegetable	872	116	343	734	1,204	297	525	260	10,173
-Others	28	31	163	682	408	153	194	701	4,272
3) Livestock	1,101	1,173	1,554	3,243	2,251	879	1,012	1,207	27,001
-Milk	809	670	1,028	2,199	1,578	585	671	767	18,159
-Meat & Others	292	503	1,525	1,043	673	295	341	440	8,842
4) Fishery	14	37	57	37	34	12	18	18	443
5) Forestry	3	17	16	4	1	14	0	5	195
2) Mining/Quarrying	83	132	92	205	158	60	57	73	5,327
1) Natural Gas	8	13	9	20	16	6	6	7	526
3) Crude Oil	54	86	60	133	102	39	37	47	2,364
3) Limestone	11	18	12	27	21	8	8	10	707
4) Coal	4	6	4	9	7	3	3	3	227
5) Others	6	10	7	15	12	4	4	5	392
3) Manufacturing	2,773	411	1,087	6,152	2,094	726	829	2,853	62,931
1) Large-Scale	833	111	477	4,061	1,748	297	429	2,238	41,220
-Food	52	2	0	1,030	586	6	328	1,942	10,134
-Tobacco	0	0	0	0	59	0	0	0	351
-Textile	4	86	477	654	1	225	89	177	6,254
-Apparel	124	19	0	229	45	31	12	89	396
-Wood & Paper	0	3	0	0	3	0	0	0	1,910
-Chemical	177	0	0	1,836	11	13	0	108	10,295
-Cement/Ceramic	0	0	0	116	0	0	0	0	2,323
-Metal/Metal Product	67	0	0	57	0	1	0	0	3,828
-Machinery/Equipment	459	2	0	78	28	21	0	21	5,098
2) Small-Scale	1,880	300	610	2,091	1,350	429	400	515	21,711
-Food	360	57	117	400	258	82	76	98	4,152
-Textile/Apparel	452	72	147	502	324	103	96	124	5,218
-Wood/Furniture	255	41	83	284	183	58	54	70	2,945
-Metal Product/Machinery	237	38	77	263	170	54	50	65	2,735
-Others	577	92	187	641	414	131	123	158	6,661
4) Construction & Gas	1,582	729	1,583	3,239	1,855	1,091	590	882	30,181
5) Electricity & Gas	246	98	849	1,101	315	150	85	108	7,890
1) Distribution	246	98	91	406	313	150	85	108	5,240
2) Generation	0	0	758	694	3	0	0	0	2,650
6) Transport & Communications	1,296	645	987	3,562	1,948	844	627	1,070	28,613
1) for Consumption	754	370	455	1,889	1,045	464	273	422	15,542
2) for Business	542	275	531	1,673	899	380	354	649	12,971
7) Wholesale & Retail Trade	3,153	1,297	1,699	7,693	3,814	1,383	1,233	1,310	66,113
1) Wholesale	1,998	0	0	1,949	0	0	0	0	18,562
2) Retail	2,357	1,297	1,699	5,688	3,614	1,383	1,233	1,310	47,551
8) Banking & Insurance	473	216	298	1,383	1,031	198	94	238	11,011
9) Ownership of Dwellings	568	284	387	1,223	622	254	221	308	9,596
10) Public Admin./Defence	1,603	996	1,303	3,956	2,838	1,309	896	1,289	37,442
11) Service	1,368	847	1,185	3,059	2,414	1,113	752	1,095	31,848
TOTAL	16,858	8,547	14,189	46,998	26,593	10,999	9,318	15,368	355,714
Per Capita GRP (000 Rs.)	5.11	3.44	4.19	5.98	4.86	4.96	4.82	5.70	5.85
									3.84

App. Table 2-2(4) Projected GRP by Zone 1992/93
(million Rs. at 1985/86 constant prices)

Industry	29	30	31	32	33	34	35	36	37	38
1. Agriculture	2,342	2,533	3,889	2,139	3,700	1,355	2,728	3,004	1,171	1,774
1) Major Crops	1,260	1,705	2,798	1,282	1,888	784	1,674	2,150	497	1,088
-Wheat	377	231	1,386	657	667	302	848	1,037	18	96
-Rice	17	35	19	19	100	334	23	27	204	253
-Gram	60	15	7	4	4	9	0	1	1	1
-Maize	1	0	1	0	5	1	11	6	2	2
-Cotton	641	0	748	377	494	32	545	884	6	38
-Sugarcane	107	9	496	159	535	72	173	100	244	650
-Others	86	75	124	57	84	35	74	95	22	48
2) Minor Crops	162	101	305	254	757	59	313	253	135	179
-Fruit/Vegetable	126	72	135	40	531	49	153	129	54	146
-Others	36	29	170	224	226	10	161	124	71	33
3) Livestock	859	694	748	582	1,005	473	740	531	413	493
-Milk	451	511	645	493	452	419	511	349	352	449
-Meat & Others	407	173	103	89	553	54	229	183	61	44
4) Fishery	49	43	33	10	43	33	0	69	108	13
5) Forestry	12	0	5	1	7	6	0	0	19	0
2. Mining/Quarrying	145	0	0	0	932	4,260	0	0	0	0
1) Natural Gas	59	0	0	0	380	1,739	0	0	0	0
2) Crude Oil	65	0	0	0	419	1,915	0	0	0	0
3) Limestone	11	0	0	0	73	332	0	0	0	0
4) Coal	9	0	0	0	55	253	0	0	0	0
5) Others	1	0	0	0	5	22	0	0	0	0
3. Manufacturing	2,733	276	985	542	4,894	2,189	1,190	562	2,660	1,396
1) Large-Scale	2,067	88	724	327	3,224	1,524	678	226	2,521	1,133
-Food	322	65	303	202	1,219	266	176	32	701	1,113
-Tobacco	0	0	0	0	0	93	0	0	0	0
-Textile	8	3	0	0	57	529	0	3	335	0
-Apparel	43	21	303	10	288	59	447	46	0	0
-Wood & Paper	18	0	0	0	0	26	0	0	23	0
-Chemical	1,463	0	0	19	234	17	56	145	1,463	0
-Cement/Ceramic	96	0	0	96	0	0	0	0	0	0
-Metal/Metal Product	71	0	0	0	336	35	0	0	0	0
-Machinery/Equipment	46	0	28	0	227	199	0	0	0	0
2) Small-Scale	666	188	262	215	1,669	665	511	326	139	244
-Food	472	134	186	155	1,141	472	363	239	98	173
-Textile/Apparel	37	10	15	12	89	37	28	18	9	14
-Wood/Furniture	43	12	17	14	104	45	33	22	9	16
-Metal Product/Machinery	35	10	14	11	84	35	27	18	7	13
-Others	79	22	31	25	190	79	60	40	15	29
4. Construction	1,037	419	495	331	1,409	313	325	229	240	104
5. Electricity & Gas	156	107	281	151	730	123	92	50	1,641	20
1) Distribution	114	107	281	151	546	133	92	50	66	20
2) Generation	43	0	0	0	184	0	0	0	1,573	0
6. Transport & Communications	1,498	646	769	435	1,722	973	309	493	482	352
1) for Consumption	1,090	434	498	234	980	533	333	248	118	143
2) for Business	408	212	269	201	742	524	276	245	364	210
7. Wholesale & Retail Trade	1,140	863	804	890	3,603	855	1,246	690	450	355
1) Wholesale	0	0	0	0	1,029	0	0	0	0	0
2) Retail	1,140	863	804	890	2,574	855	1,246	690	450	355
8. Banking & Insurance	180	127	223	240	725	185	215	130	54	55
9. Ownership of Dwellings	253	242	341	236	554	284	407	216	141	172
10. Public Admin./Defence	738	572	755	494	1,451	637	870	580	278	353
11. Service	721	559	738	483	1,418	613	850	372	259	364
TOTAL	10,944	5,344	9,284	5,941	21,237	11,728	8,735	5,077	7,335	4,927
Per Capita GNP (000 Rs.)	6.93	4.20	4.35	4.02	7.78	7.59	3.43	4.49	6.37	4.37

App. Table 2-2(5) Projected GRP by Zone 1992/93
(million Rs. at 1985/86 constant prices)

Industry	39	Sind	40	41	42	43	44	45	46	Baluchi.	TOTAL
1. Agriculture	4,649	32,828	4,245	659	331	629	791	2,678	1,098	11,402	158,213
1) Major Crops	1	17,136	59	106	10	114	3	2,156	11	2,488	78,303
-Wheat	1	5,875	88	91	9	109	2	1,881	6	1,182	32,194
-Rice	0	3,873	0	0	0	0	0	1,101	5	1,106	10,554
-Gram	0	275	0	0	0	0	0	57	0	57	2,114
-Maize	0	30	1	10	0	0	0	1	0	12	2,991
-Cotton	0	3,755	0	0	0	0	0	0	0	17,351	0
-Sugarcane	0	2,658	0	0	0	0	0	21	0	8,627	0
-Others	0	760	4	5	0	5	0	95	0	110	3,472
2) Minor Crops	91	2,732	1,211	221	151	238	49	607	350	2,837	24,205
-Fruit/Vegetable	77	1,685	941	120	143	186	44	540	242	2,216	17,733
-Others	14	1,107	270	111	8	52	5	66	108	621	6,472
3) Livestock	1,729	9,563	2,945	321	164	275	146	915	174	4,941	51,058
-Milk	99	5,455	1,081	31	0	20	10	71	10	1,234	29,384
-Meat & Others	1,629	4,097	1,854	291	164	254	136	845	164	3,707	21,674
4) Fishery	2,828	3,277	0	0	0	0	0	0	563	1,126	4,876
5) Forestry	0	60	0	1	7	2	0	1	0	10	471
2. Mining/Quarrying	2,882	8,220	1,190	2,196	827	1,633	160	1,474	75	7,494	21,454
1) Natural Gas	1,176	3,355	1,875	1,700	640	1,264	124	1,141	58	5,801	9,882
2) Crude Oil	1,296	3,695	0	0	0	0	0	0	0	0	7,159
3) Limestone	224	640	2	3	1	2	0	2	0	11	1,576
4) Coal	171	488	97	189	71	141	14	127	6	645	1,384
5) Others	15	42	156	304	114	226	22	204	10	1,027	1,652
3. Manufacturing	54,333	72,223	795	46	8	10	559	147	102	1,767	144,834
1) Large-Scale	42,232	55,028	603	0	0	0	629	5	0	1,237	103,301
-Food	2,708	7,440	133	0	0	0	26	5	0	234	19,527
-Tobacco	5,333	7,047	19	0	0	0	0	0	0	9	1,214
-Textile	890	2,108	0	0	0	0	107	0	0	126	13,382
-Apparel	768	835	0	0	0	0	0	0	0	3,151	0
-Wood & Paper	9,402	12,857	442	0	0	0	51	0	0	3,402	0
-Chemical	676	1,352	0	0	0	0	192	0	0	624	24,396
-Cement/Ceramic	13,970	14,312	0	0	0	0	28	0	0	28	4,564
-Metal/Metal Product	8,208	8,707	0	0	0	0	155	0	0	155	14,733
-Machinery/Equipment	12,101	17,195	192	46	8	10	30	143	102	520	41,633
2) Small-Scale	8,584	12,197	157	37	6	8	24	116	83	432	17,300
-Food	673	956	21	5	1	1	3	16	11	59	6,596
-Textile/Apparel	783	1,112	0	0	0	0	0	0	0	4,415	0
-Wood/Furniture	633	899	4	1	0	0	1	3	2	11	3,874
-Metal Product/Machinery	1,429	2,031	10	2	0	1	2	8	5	28	9,448
-Others	4,071	9,558	305	301	210	90	50	402	1,325	2,684	51,274
4. Construction & Gas	2,843	6,738	194	47	5	15	229	52	20	562	19,523
1) Distribution	1,548	3,195	179	47	6	15	6	52	20	318	9,761
2) Generation	1,095	3,543	21	0	0	0	223	0	0	244	9,762
6. Transport & Communications	14,272	23,270	1,264	513	265	320	180	671	1,157	4,369	63,206
1) for Consumption	9,907	15,933	826	300	174	164	58	294	985	2,801	37,924
2) for Business	4,365	8,246	437	213	174	156	191	377	172	1,568	25,282
7. Wholesale & Retail Trade	29,220	40,892	4,237	956	134	311	125	768	650	7,183	139,544
1) Wholesale	15,302	16,331	1,093	0	0	0	0	0	0	1,093	38,863
2) Retail	13,918	24,561	3,144	956	134	311	125	768	650	6,090	90,681
8. Banking & Insurance	7,603	9,973	276	34	15	41	15	97	74	553	23,036
9. Ownership of Dwellings	2,955	6,251	101	100	65	65	20	152	100	553	17,517
10. Public Admin./Defence	8,180	15,416	978	393	85	268	71	510	252	2,557	64,556
11. Service	7,993	16,065	1,073	432	94	294	78	560	277	2,805	57,230
TOTAL	138,802	240,445	14,598	5,677	1,988	3,677	2,348	8,513	5,129	41,930	751,337
Per Capita GRP (000 Rs.)	15.02	8.44	11.33	3.57	8.53	3.53	7.25	3.51	3.21	4.93	6.21

App. Table 2-3(1) Projected GRP by Zone-1997/98
(million Rs. at 1985/86 constant prices)

Industry	1	2	3	4	5	6	7	8	9	
1. Agriculture	2,776	5,046	2,284	3,516	3,712	2,759	1,406	3,239	24,719	2,124
1) Major Crops	1,189	1,647	467	949	579	601	450	1,234	7,116	858
-Wheat	334	523	230	415	335	333	150	404	2,834	769
-Rice	6	19	38	42	62	14	156	211	550	0
-Gram	1	1	34	1	105	76	0	0	217	17
-Raize	464	312	34	450	32	131	115	488	2,076	37
-Cotton	0	0	0	0	0	0	0	0	0	0
-Sugarcane	335	625	2	2	22	23	1	79	1,090	1
-Others	48	67	19	39	24	24	18	50	289	35
2) Minor Crops	487	1,015	214	250	1,440	515	212	1,167	5,300	150
-Fruit/Vegetable	416	915	172	194	1,368	464	165	988	4,713	148
-Others	72	99	42	56	42	51	46	179	587	2
3) Livestock	1,095	2,380	1,579	2,253	1,654	1,643	674	758	12,046	1,072
-Milk	520	1,130	750	1,070	790	780	320	360	5,720	659
-Meat & Others	575	1,250	829	1,183	874	863	354	398	6,326	414
4) Fishery	5	4	1	4	22	1	2	2	41	20
5) Forestry	0	1	2	60	7	0	68	77	216	23
2) Mining/Quarrying	151	59	121	17	4	9	77	133	570	82
1) Natural Gas	0	0	0	0	0	0	0	0	0	7
2) Crude Oil	0	0	0	0	0	0	0	0	0	0
3) Limestone	84	33	68	9	2	5	43	75	319	13
4) Coal	4	2	4	0	0	0	2	4	17	3
5) Others	62	24	50	7	2	4	32	55	234	6
3) Manufacturing	1,930	6,874	339	2,168	154	194	184	545	12,388	1,007
1) Large-Scale	1,428	5,679	57	1,777	15	30	0	225	9,211	700
-Food	887	1,340	39	1,559	15	8	0	8	2,354	0
-Tobacco	184	380	0	0	0	0	0	0	564	0
-Textile	9	327	19	267	0	19	0	101	741	401
-Apparel	0	60	0	0	0	0	0	0	60	0
-Wood & Paper	0	1,484	0	0	0	0	0	0	1,484	0
-Chemical	55	564	0	216	0	0	0	66	1,901	0
-Cement/Ceramic	285	202	0	369	0	0	0	0	1,360	233
-Metal/Metal Product	0	486	0	0	0	3	0	0	489	0
-Machinery/Equipment	4	837	0	366	0	0	0	51	1,258	55
2) Small-Scale	508	1,194	282	392	139	164	184	320	3,177	307
-Food	137	326	77	107	38	45	50	87	868	59
-Textile/Apparel	69	164	39	54	19	23	25	44	456	53
-Wood/Furniture	82	195	46	64	19	23	25	44	456	53
-Metal Product/Machinery	50	119	28	39	14	16	18	32	317	38
-Others	164	390	92	128	45	54	60	104	1,037	95
4) Construction	1,801	3,399	1,896	1,591	952	650	1,015	1,194	12,301	1,144
5) Electricity & Gas	394	711	73	4,657	83	109	45	156	6,272	206
1) Distribution	394	711	73	4,657	83	109	45	156	6,272	206
2) Generation	0	404	73	265	83	104	46	113	1,480	206
6) Transport & Communications	1,214	2,967	856	4,434	0	5	0	53	4,789	0
1) for Consumption	780	1,977	850	1,101	362	337	335	518	6,050	481
2) for Business	434	990	276	733	302	228	168	325	3,451	302
7) Wholesale & Retail Trade	1,825	10,067	1,248	2,092	1,391	1,520	979	1,772	20,854	999
1) Wholesale	0	4,156	0	0	0	0	0	0	4,156	0
2) Retail	1,825	5,911	1,248	2,092	1,391	1,520	979	1,772	15,738	999
8) Banking & Insurance	252	788	196	500	110	92	99	172	2,029	178
9) Ownership of Dwellings	150	422	102	290	91	108	118	172	1,853	182
10) Public Admin./Defence	339	4,255	1,672	1,771	1,269	931	582	1,156	11,955	804
11) Service	775	3,500	882	1,457	1,044	766	475	535	9,835	575
TOTAL	12,185	38,088	8,848	19,758	9,473	7,704	5,490	10,448	111,974	8,188
Per Capita GNP (000 Rs.)	5.26	8.32	5.61	4.40	6.77	4.61	3.00	5.93	5.46	5.29

App. Table 2-3(2) Projected GRP by Zone-1997/98
(million Rs. at 1985/96 constant prices)

Industry	10	11	12	13	14	15	16	17	18	19
1. Agriculture	2,786	1,436	4,199	6,992	4,238	9,723	6,942	5,659	5,003	5,160
1) Major Crops	595	445	1,548	3,142	2,347	4,945	3,140	2,416	2,554	2,935
-Wheat	480	402	1,548	1,546	932	2,152	1,567	1,405	1,287	1,448
-Rice	0	4	300	304	0	178	142	479	1,003	1,193
-Gram	1	8	6	356	950	7	48	4	7	16
-Maize	89	7	34	113	3	342	107	43	54	19
-Cotton	0	5	23	233	246	440	542	80	8	13
-Sugarcane	0	2	293	452	110	1,263	406	307	187	125
-Others	24	18	57	128	96	202	128	99	109	120
2) Minor Crops	153	69	1,080	1,517	421	1,985	741	1,604	380	741
-Fruit/Vegetable	139	68	863	732	349	1,270	610	1,387	716	682
-Others	14	1	217	786	72	715	131	218	164	80
3) Livestock	1,957	875	1,449	2,259	1,402	2,750	2,138	1,593	1,448	1,461
-Milk	1,305	548	1,024	1,468	818	1,933	1,448	1,169	1,036	1,048
-Meat & Others	653	327	425	792	583	817	690	424	413	413
4) Fishery	20	20	20	60	60	40	20	44	20	20
5) Forestry	60	27	2	12	2	2	2	2	1	1
2. Mining/Quarrying	483	1,620	85	1,876	437	168	102	425	213	128
1) Natural Gas	35	132	7	153	36	14	8	35	17	10
2) Crude Oil	282	1,055	55	1,222	285	109	66	276	139	83
3) Limestone	67	250	13	290	68	26	16	66	33	20
4) Coal	16	60	3	70	6	6	4	16	8	5
5) Others	33	122	6	142	33	13	32	16	16	10
3. Manufacturing	7,575	3,391	2,953	3,105	2,108	11,159	1,535	12,527	15,035	5,716
1) Large-Scale	6,521	3,011	1,552	1,980	1,589	7,146	714	7,674	12,812	2,588
-Food	541	17	419	931	0	3,671	418	490	1,704	234
-Tobacco	135	67	135	0	0	0	0	0	0	0
-Textile	488	205	132	384	235	1,901	275	407	1,477	108
-Apparel	0	0	12	11	0	30	7	429	69	11
-Wood & Paper	41	211	35	0	0	793	0	1,007	2,371	205
-Chemical	2,853	1,068	388	20	1,193	274	0	1,184	4,235	353
-Cement/Ceramic	858	1,397	154	81	161	161	0	28	16	11
-Metal/Metal Product	62	0	2	507	0	11	0	2,420	1,062	311
-Machinery/Equipment	1,543	46	276	45	0	304	14	1,708	1,877	1,355
2) Small-Scale	1,054	380	1,406	1,125	519	4,013	821	4,854	2,273	3,129
-Food	237	85	317	253	117	904	183	1,093	512	704
-Textile/Apparel	215	77	287	230	105	819	168	991	464	639
-Wood/Furniture	147	53	195	157	72	559	114	675	316	435
-Metal Product/Machinery	130	47	173	139	64	495	101	599	280	385
-Others	325	117	433	347	160	1,237	233	1,496	700	964
4. Construction	2,530	1,029	1,772	1,864	1,055	3,101	1,436	7,058	2,010	2,359
5. Electricity & Gas	506	1,190	423	370	174	1,217	284	2,111	288	301
1) Distribution	568	1,77	380	370	174	750	284	2,111	179	285
2) Generation	8	1,113	43	0	0	467	0	0	103	16
6. Transport & Communications	2,265	873	1,457	1,972	1,073	3,103	1,372	6,154	2,469	2,321
1) for Consumption	1,342	300	832	1,031	543	1,423	4,314	4,314	973	1,416
2) for Business	922	574	625	941	531	1,680	632	1,839	1,496	905
7. Wholesale & Retail Trade	6,771	378	2,097	4,438	1,158	9,539	1,938	22,641	2,627	6,522
1) Wholesale	3,668	0	0	1,077	0	4,053	0	10,850	0	2,206
2) Retail	3,103	378	2,097	3,361	1,158	5,486	1,938	11,791	2,627	4,316
8. Banking & Insurance	1,536	359	518	671	271	875	333	3,615	463	888
9. Ownership of Dwellings	682	169	373	659	254	1,003	370	1,825	355	782
10. Public Admin./Defence	4,430	849	1,862	2,833	1,084	3,573	1,847	8,159	2,253	2,736
11. Service	3,742	717	1,590	2,140	916	3,018	1,560	6,891	1,903	2,311
TOTAL	33,355	12,511	17,355	26,620	12,769	46,478	16,888	77,065	32,710	29,225
Per Capita GRP (000 Rs.)	8.64	8.72	5.48	7.13	5.93	8.19	5.37	8.57	9.76	6.60

App. Table 2-3(3) Projected GRP by Zone-1997/98

Industry	20	21	22	23	24	25	26	27	28
1. Agriculture	4,414	3,447	5,510	17,851	11,225	4,544	4,644	7,213	112,211
1) Major Crops	1,905	1,715	2,860	11,960	5,244	2,842	2,461	4,472	59,587
-Wheat	1,057	696	1,586	4,184	3,286	961	994	1,256	27,400
-Rice	636	136	89	141	635	60	168	115	5,585
-Gram	1	39	120	19	121	19	121	1,770	193
-Maize	26	5	130	160	136	21	43	23	1,342
-Cotton	13	722	693	6,448	1,190	1,284	838	2,518	15,399
-Sugarcane	83	47	236	529	382	196	359	5,655	15
-Others	78	70	117	489	255	116	101	183	2,437
2) Minor Crops	1,096	180	519	1,740	2,038	551	879	1,186	17,531
-Fruit/Vegetable	1,061	141	417	893	1,588	361	638	316	12,377
-Others	35	39	202	847	450	190	241	870	5,304
3) Livestock	1,390	1,480	1,961	4,093	2,841	1,110	1,278	1,523	34,032
-Milk	1,023	847	1,299	2,780	1,994	739	848	970	22,956
-Meat & Others	367	633	662	1,313	847	371	429	553	11,126
4) Fishery	20	54	54	50	50	27	27	27	558
5) Forestry	3	18	16	4	1	14	0	5	203
2) Mining/Quarrying	100	179	124	267	210	81	74	95	6,698
1) Natural Gas	8	15	10	22	17	7	6	8	547
2) Crude Oil	65	116	81	174	136	53	48	52	4,361
3) Limestone	15	28	19	41	32	12	11	15	1,035
4) Coal	4	7	5	10	8	3	3	4	249
5) Others	8	14	9	20	16	6	6	7	506
3) Manufacturing	3,847	600	1,543	8,636	3,004	1,033	1,155	3,952	89,937
1) Large-Scale	1,323	150	630	5,618	1,015	399	583	3,202	59,206
-Food	72	3	0	1,436	818	8	450	2,666	13,939
-Tobacco	0	0	0	0	67	0	0	0	404
-Textile	5	113	630	864	2	297	117	235	8,277
-Apparel	158	24	0	292	59	39	16	114	1,271
-Wood & Paper	0	7	0	0	0	0	0	0	4,577
-Chemical	251	0	0	2,607	16	19	0	154	14,616
-Cement/Ceramic	0	0	0	165	0	0	0	0	2,265
-Metal/Metal Product	79	0	0	57	0	2	0	0	4,523
-Machinery/Equipment	758	3	0	125	48	34	0	34	8,233
2) Small-Scale	2,524	450	913	3,018	1,999	635	572	749	30,731
-Food	568	101	206	679	448	143	129	169	6,919
-Textile/Apparel	515	92	186	616	406	130	117	153	6,274
-Wood/Furniture	351	63	127	420	277	88	80	104	4,277
-Metal Product/Machinery	311	56	113	372	245	78	71	92	3,792
-Others	778	139	281	930	613	196	176	231	9,469
4. Construction	2,047	1,054	2,234	4,507	2,635	1,557	814	1,238	41,494
5. Electricity & Gas	336	150	1,211	1,616	472	226	124	160	11,504
1) Distribution	336	150	1,138	1,596	468	226	124	160	7,612
2) Generation	0	0	1,113	1,020	4	0	0	0	3,892
6. Transport & Communications	1,670	884	1,354	4,758	2,619	1,143	821	1,419	38,509
1) For Consumption	958	525	2,581	3,581	1,457	650	370	581	21,171
2) For Business	711	360	709	2,177	1,162	493	451	838	17,338
7. Wholesale & Retail Trade	4,044	1,807	2,363	10,321	5,222	1,903	1,638	1,771	88,707
1) Wholesale	1,103	0	0	2,693	0	0	0	0	25,651
2) Retail	2,941	1,807	2,363	7,628	5,222	1,903	1,638	1,771	63,056
8. Banking & Insurance	610	311	430	1,461	1,457	311	129	332	15,189
9. Ownership of Dwellings	629	352	480	1,461	759	311	261	371	11,316
10. Public Admin./Defence	1,950	1,352	1,897	4,697	3,784	1,755	1,159	1,597	48,430
11. Service	1,647	1,142	1,534	3,967	3,196	1,432	979	1,433	40,906
TOTAL	21,294	11,277	18,821	59,992	34,581	14,316	11,798	19,681	504,903
Per Capita GRP (000 Rs.)	5.99	3.77	4.62	6.67	5.37	5.42	5.32	6.25	6.68
									4.22