

## CHAPTER 3

### INFRASTRUCTURE

In view of the crucial importance of power, transport and other infrastructure industries in the economy, the Government has accorded particular importance to improving management and performance in these sectors. As a result the current will be the third consecutive year in which the infrastructure sector has recorded a 9-10 per cent growth rate. The high growth rate over the last three years, particularly in key sectors such as electricity, coal and rail traffic would tend to suggest an easing of bottlenecks and an enhancement of the growth process in other industries.

3.2 Foremost among the infrastructure sectors showing impressive growth is the power

sector. Power generation has increased by 10.3 per cent during April—December 1986 and this growth comes on top of two previous relatively high growth years : 8.6 per cent in 1985-86 and 11.6 per cent in 1984-85. Perhaps the most important indicator of improved management and increased Plan investment in this sector is the record levels of Plant Load Factor (PLF) achieved over the last two years and the high growth rates achieved in the thermal power generation in particular. The PLF in 1986-87 (April—December) is highest for the last seven years, and the growth rate in thermal power generation has been between 13 and 15 per cent over the last three years.

TABLE 3.1

*Trends in the Performance of the Infrastructure Sector*

Year	Item	Unit	1983-84	1984-85	1985-86 <sup>£</sup>	April-December <sup>£</sup>		(Percentage change)		
						1985-86	1986-87	1984-85	1985-86	1986-87*
								1983-84	1984-85	1985-86*
1. Coal :										
	(a) Production . . . .	Mn. Tonnes	138.2	147.4	154.2	103.9	113.0	6.7	4.6	8.7
	(b) Pit-head stock (year end)	„	22.7	29.2	27.2	20.8	22.1	28.6	—6.8	6.3
	(c) Despatches . . . .	„	130.7	135.5	150.0	109.8	114.2	3.7	10.7	4.0
2.	Electricity Generated (utilities only)	Billion Kwh	140.2	156.4	170.0	125.7	138.6	11.6	8.6	10.3
	(a) Hydel . . . .	„	50.0	53.8	50.9	39.9	41.4	7.6	—5.3	4.0
	(b) Thermal (incl. Nuclear)	„	90.2	102.6	119.1	85.8	97.2	13.7	16.1	13.2
3. Petroleum . . . . . Mn. Tonnes										
	(a) Crude Oil Production . .	„	26.0	29.0	30.2	22.0	23.0	11.5	4.1	4.5
	(b) Refinery throughput . .	„	35.3	35.6	42.9	31.5	33.5	0.8	20.5	6.3
4. Railways										
	Revenue earning goods traffic . . . . .	„	230.12	236.43	258.55	187.02	199.30	2.7	9.4	6.6
5.	Cargo handled at major ports	„	100.5	106.7	120.0	87.3	88.1	6.2	12.5	0.9

\* April—December

£ Provisional.

3.3 The performance of the railways has once again been well above target with a growth rate in revenue earning goods traffic of 6.6 per cent in April—December 1986 over the same period last year. This is particularly creditable as it follows a high 9.4 per cent growth rate in 1985-86. An important aspect of this year's growth has been the excellent performance of the railways in transportation of two key commodities : foodgrain movement increased by 19.7 per cent and iron ore for exports increased by 13.6 per cent during the April-December period compared to the same period last year.

3.4 Of the other infrastructure industries, the growth in coal production has been the most impressive. During the April—December period in 1986, coal output has increased by 8.7 per cent over the same months of last year, recording the highest growth rate for five years. Growth rate in the hydro-electric power generation has shown disturbing trends. Delays in commissioning hydel projects are now reaching chronic proportions and require immediate steps to prevent further slippages. Moreover, the poor mon-

soons over the last three years have been partly responsible for a low growth rate in hydel power generation. The following sections of this chapter analyse the trends in each industry of the infrastructure sector in greater detail.

### Electricity

3.5 The generation of thermal electricity in 1985-86 was higher than the target, but the hydel generation was affected by insufficient rainfall in the Western region and the consequent low water levels in the major hydro reservoirs in these regions. The achievement in the case of thermal generation was 103.7 per cent of the target while in the case of nuclear and hydel sector it was 124.6 per cent and 91 per cent, of the respective targets. The total generation during 1985-86 was higher than that in the previous year by 8.6 per cent, and the target set for the year was fully achieved. While hydel generation was less than that of the preceding year by 5.3 per cent, thermal (including nuclear) generation was substantially higher by 16.1 per cent.

TABLE 3.2

#### Trends in the Power Sector\*

Sl. No.	Item	1983-84	1984-85	1985-86†	April-December‡		(Percentage change)		
					1985-86	1986-87	1984-85	1985-86	1986-87**
							1983-84	1984-85	1985-86**
1.	Additional Capacity Commissioned/ Rolled (MW)	3976	3252	4204	2072	1491.5	-28.2	29.3	-28.0
2.	Power Generation (Billion Kwh)	140.2	156.4	170.0	125.7	138.6	11.6	8.6	10.3
	(i) Hydel	50.0	53.8	50.9	39.9	41.4	7.6	-5.3	4.0
	(ii) Thermal (incl. Nuclear)	90.2	102.6	119.1	85.8	97.2	13.7	16.1	13.2
3.	Plant Load Factor of Thermal Plants (per cent)	47.9	50.1	52.4	50.8	52.1	..	..	..
4.	Estimated Deficit in Power availability (per cent)	10.7	6.7	7.9	8.3	9.7	..	..	..

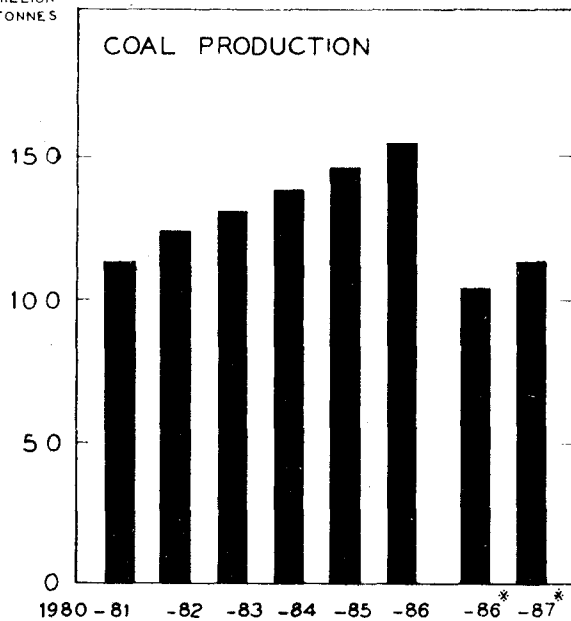
\*Utilities only.

\*\*April—December

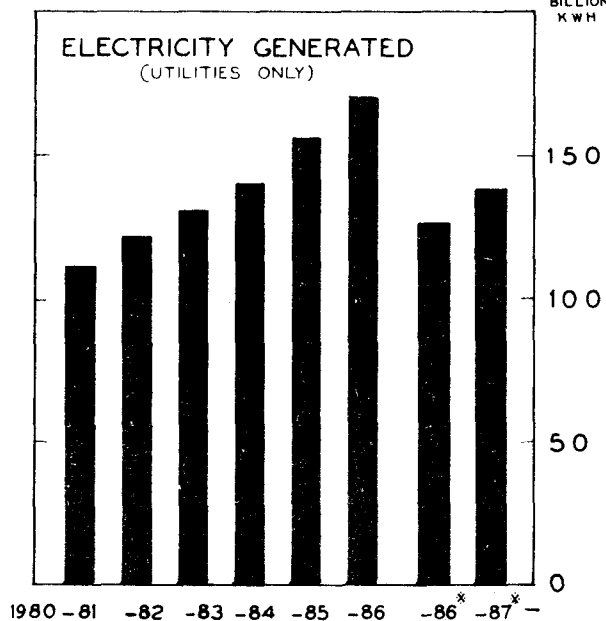
‡Provisional

# PERFORMANCE OF INFRASTRUCTURE SECTORS

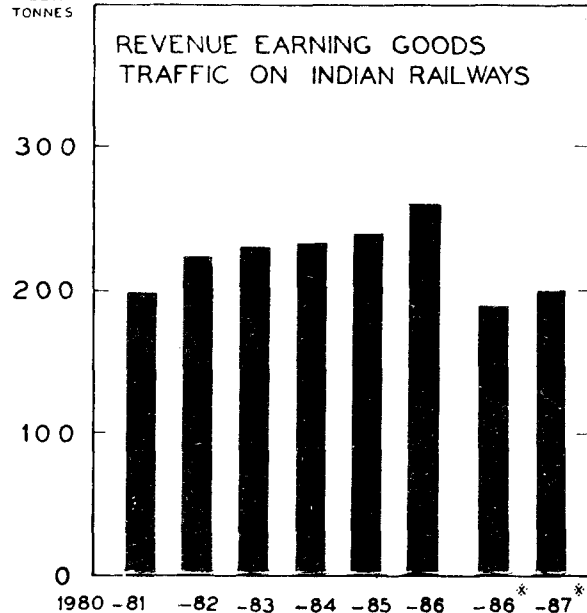
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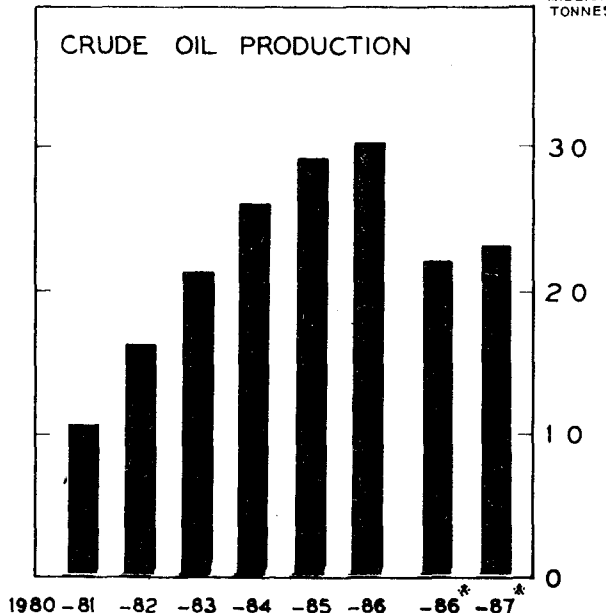
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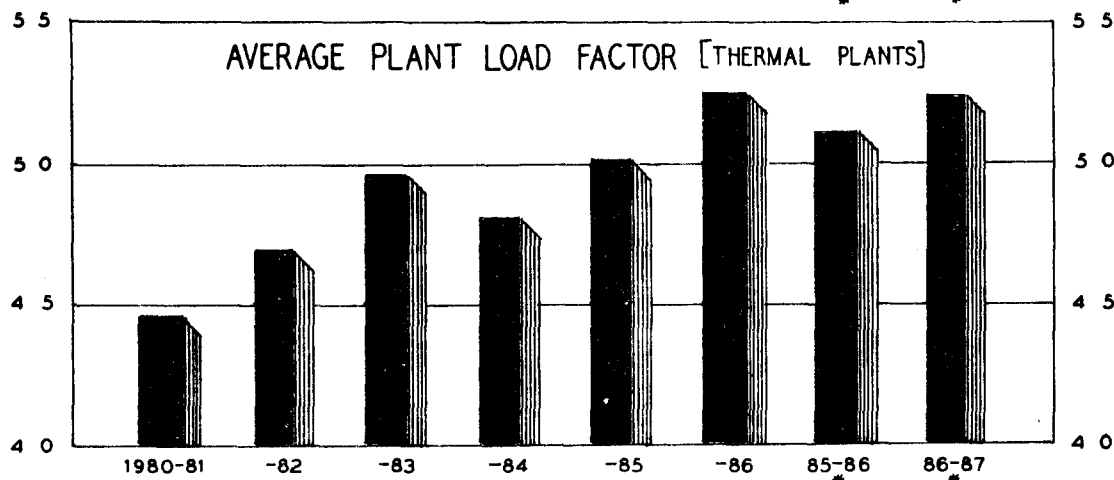
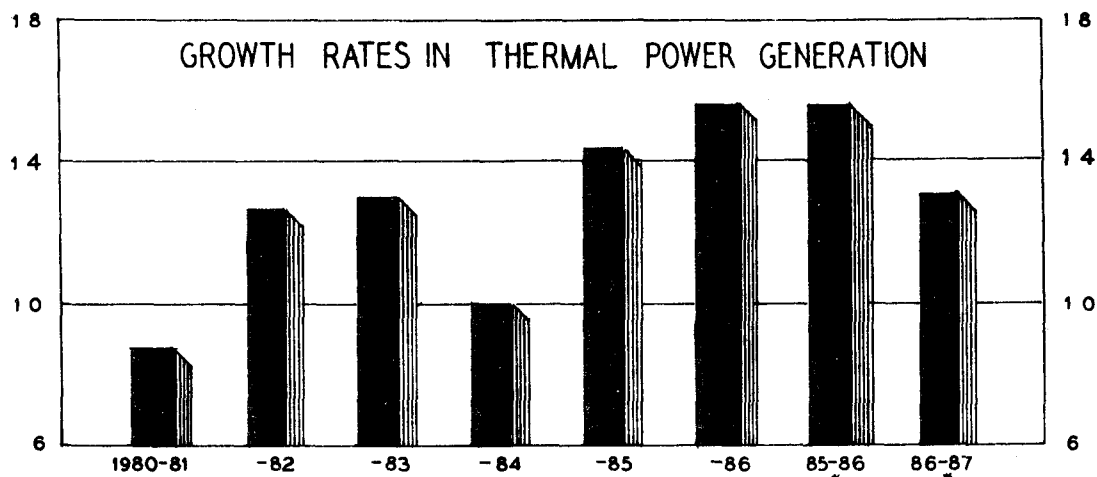
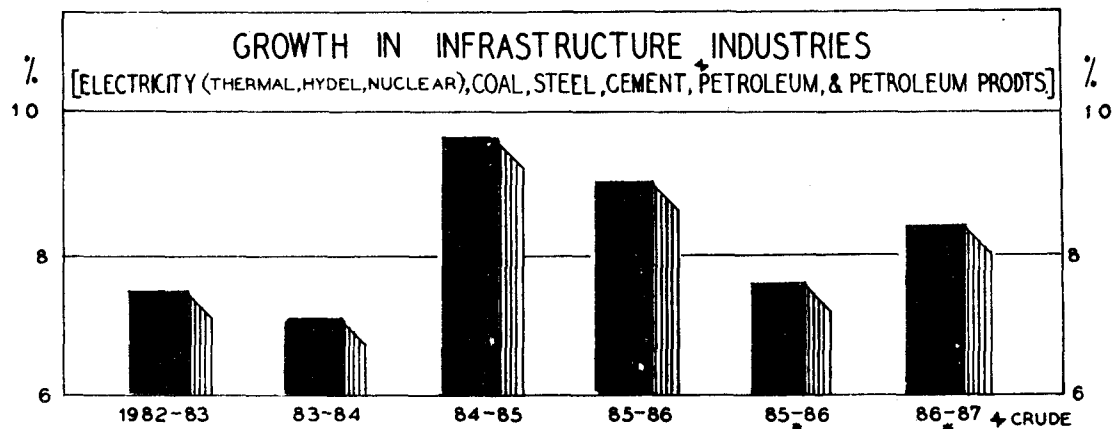


MILLION  
TONNES



\* APRIL - DECEMBER

MINISTRY OF FINANCE, ECONOMIC DIVISION.



\* APR.-DEC. OVER SAME PERIOD IN PREVIOUS YEAR

MINISTRY OF FINANCE, ECONOMIC DIVISION.

3.6 The source-wise generation target and achievement in respect of utilities are as under :

TABLE 3.3  
Power Generation : Targets and Achievements  
(billion kwh)

Sector	1984-85		1985-86	
	Target	Actual	Target	Actual
1. Hydel	52.0	53.8	56.0	50.9
2. Thermal	98.5	98.5	110.0	114.1
3. Nuclear	3.5	4.1	4.0	5.0
<b>TOTAL</b>	<b>154.0</b>	<b>156.4</b>	<b>170.0</b>	<b>170.0</b>

3.7 Power generation during the first nine months of 1986-87 at 138.6 billion kwh was 10.3 per cent higher than the corresponding period of the previous year. Category-wise, thermal (including nuclear) generation has shown an increase of 13.2 per cent and hydel generation recovered the ground lost in the preceding year and registered an increase of 4.0 per cent during April-December 1986 over the corresponding period of 1985. However, while thermal generation registered a marginal shortfall from target because of the poor performance of certain State Electricity Boards in the Northern and Eastern regions in particular, hydel generation lagged behind the target for the second successive year due to failure of monsoon in the Western and Southern regions. Nuclear generation has been lagging behind marginally against the target mainly on account of the long-duration outages of the unit 1 of Madras Atomic Power Station.

3.8 The Plant Load Factor (PLF) of thermal power stations has been progressively increasing during the last few years. The All India Thermal Plant Load Factor (PLF) improved from 50.1 per cent in 1984-85 to 52.4 per cent in 1985-86. The average PLF during the period April-December 1986 was 52.2 per cent compared to 50.8 per cent during the corresponding period of 1985. The achievement was, however, short of the target of 52.5 per cent during that period. DESU, Durgapur Projects Ltd. and SEBs of Gujarat, Madhya Pradesh, Andhra Pradesh and Tamil Nadu exceeded their target PLF. The PLF of 64.4 per cent and 50 per cent was achieved by Punjab and Maharashtra SEBs even though it was below their target. The average PLF achieved by SEBs/Undertakings during the period April-December, 1986 was 48.3 per cent against the target of 49.7 per cent. In the Central Sector, the overall target of PLF of 62.4 per cent was exceeded, the achievement being 62.8 per cent. While NTPC and NLC exceeded their target, DVCs achievement fell short of the target. Amongst the private utilities,

Trombay and CESC exceeded their target PLF the Ahmedabad Electric Supply Co. could not achieve the target even though the achievement was 60.2 per cent. The overall average achievement of private utilities was 63.2 per cent compared to the target of 54.1 per cent. State-wise details in Table 3.4 show that there are still a large number of States where a low PLF is a chronic problem : five States have a PLF below 40 per cent. A major effort is required to improve the efficiency and performance of SEBs in these States if any real impact is to be made on the overall average PLF and the supply of power in the country.

TABLE 3.4  
Organisation-wise Details of PLF Target/Actual achievement during the year 1986-87 and April-December 1986

Board/Undertaking/ Sector	P.L.F. (Percentages)		
	Target for 1986-87	April—December 86	
		Target	Actual
1	2	3	4
<b>PLF above 50%</b>			
1. Delhi Electricity Supply Undertaking, Delhi	67.0	65.2	70.1
2. Andhra Pradesh State Electricity Board	62.3	59.6	67.3
3. Tamil Nadu State Electricity Board	59.2	57.1	64.9
4. Punjab State Electricity Board	56.4	68.4	64.4
5. Gujarat State Electricity Board	51.6	50.0	52.8
6. Madhya Pradesh State Electricity Board	52.3	50.7	51.1
<b>PLF 40% to 50%</b>			
1. Maharashtra State Electricity Board	52.9	55.1	50.0
2. Rajasthan State Electricity Board	57.1	52.9	46.3
3. Kerala State Electricity Board	43.8	46.8	45.3
<b>PLF below 40%</b>			
1. Haryana State Electricity Board	36.2	36.4	34.7
2. Uttar Pradesh State Electricity Board	43.0	42.1	37.9
3. Bihar State Electricity Board	37.7	37.8	33.8
4. Orissa State Electricity Board	43.5	42.0	29.1
5. Assam State Electricity Board	31.2	29.1	17.8
<b>PLF : Central Sector (Total)</b>	<b>63.3</b>	<b>62.4</b>	<b>62.8</b>
1. National Thermal Power Corporation	70.1	69.2	69.4
2. Neyveli Lignite Corporation	69.3	66.2	70.3
3. Damodar Valley Corporation	45.1	48.4	44.4
<b>PLF : Private Utilities (Total)</b>	<b>55.5</b>	<b>54.1</b>	<b>63.2</b>
1. A.E. Co.	60.4	77.7	60.2
2. Trombay	48.0	46.0	68.0
3. CESC	54.2	54.5	57.3

3.9 Progress in the commissioning of the new generating units: The position of the generating capacity

rolled/commissioned during the April-December 1986 vis-a-vis the capacity scheduled is indicated below :

TABLE 3.5  
*Power Generation Capacity : Targets and Achievements*

Sector	Scheduled during 1986-87		April-December 1986			
	No.	Capacity (M.W.)	Scheduled		Commissioned/Rolled	
			No.	Capacity (M.W.)	No.	Capacity (M.W.)
Thermal . . . . .	20	2192	14	1210.0	12	1180.0 (97.5%)
Hydel . . . . .	59	1204	25	910.5	8	311.5 (34.2%)
<b>TOTAL . . . . .</b>	<b>79</b>	<b>3396</b>	<b>39</b>	<b>2120.5</b>	<b>20</b>	<b>1491.5 (70.3%)</b>

Note : Figures in brackets indicate percentage to the capacity scheduled during April-December, 1986

Table 3.5 shows that there has been considerable and disturbing slippages in the implementation of hydel power projects and the magnitude of the problem suggests that immediate action is necessary to prevent further losses in time and resources.

#### Coal

3.10 The coal sector has performed fairly well this year. The production of coal during the period April-December 1986, increased by 8.7 per cent to reach 113.0 million tonnes, compared to 103.9 million

tonnes during the corresponding period of 1985. The production of Coal India Limited (CIL) showed an increase of 9.5 per cent during April-December, 1986 over the corresponding period of 1985 and of Singareni Collieries Co. Ltd. by 5.3 per cent. Pit-head stocks at the end of December, 1986 increased by 6.3 per cent over the end of December, 1985 and despatches by 4.0 per cent over the corresponding period of 1985. Details regarding the coal production, pit-head stocks and despatches from 1983-84 onwards are given in the Table below :

TABLE 3.6  
*Trends in Coal Sector*

										(Million tonnes)		
S.No.	Item	1983-84	1984-85	1985-86	[ April-December		Percentage change					
					1985-86	1986-87	1984-85	1985-86	1986-87*			
							1983-84	1984-85	1985-86*			
1. Production :												
	(i) CIL . . . . .	121.4	130.8	134.1	89.3	97.8	7.7	2.5	9.5			
	(ii) SCCL . . . . .	12.7	12.3	15.7	11.3	11.9	—3.1	27.6	5.3			
	(iii) Others . . . . .	4.1	4.3	4.4	3.3	3.3	4.9	2.3	No change			
	TOTAL . . . . .	138.2	147.4	154.2	103.9	113.0	6.7	4.6	8.7			
	2. Pit-head stocks (year end) . . . . .	22.7	29.2	27.2	20.8	22.1	28.6	—6.8	6.3			
	3. Despatches . . . . .	130.7	135.5	150.0	109.8	114.2	3.7	10.7	4.0			

\*April—December.

£ Provisional

In 1985-86 production of coal reached a level of 154.2 million tonnes virtually fulfilling the overall target of 154.5 million tonnes. Coal India Ltd. marginally exceeded its target, but the shortfall in the production from Bharat Coking Coal Co. Ltd. (BCCL), the main source of coking coal supplies to steel industry, was significant. A notable feature in 1985-86 was the vast improvement in the performance of Singareni Collieries Co. Ltd. where the production at 15.7 million tonnes was 27.6 per cent more than the preceding year's level. The railway, had planned a movement of 115 million tonnes of coal including railway coal in 1985-86 as compared with the actual movement of 101.9 million tonnes in 1984-85. The actual movement in 1985-86 was 111.7 million tonnes, which marks a considerable improvement over the previous year. As coal production increased significantly in the last quarter of the 1985-86, the pit-head stocks, which had come down by 9.6 million tonnes in the first seven months, started rising again, and at the end of the year stood at 27.2 million tonnes as against 29.2 million tonnes at the end of 1984-85.

3.11 The target of coal production for 1986-87 is 166.8 million tonnes of which 143.5 million tonnes is to be met by CIL, 18 million tonnes by SCCL and the balance 5.3 million tonnes by TISCO/HISCO/DVC. Even though the production of coal increased by 8.7 per cent during the first nine months of this year, it has been less than the target for the period by 3.5 per cent. This has been largely because of the shortfalls in CIL and SCCL by 2.2 per cent and 10.5 per cent respectively. While CIL's production is reported to have been affected by power problems in the coal companies of the Eastern region served by DVC and heavy rain in the Western Coal-fields Ltd., the shortfall from target in SCCL has been attributed to labour strike, absenteeism, breakdown of machinery, etc. To avoid a mis-match between demand and supply, the target of coal movement by the railways has been fixed at 120 million tonnes for 1986-87. The demand for coal in 1986-87 has been estimated at 176.6 million tonnes (excluding 5.71 million tonnes of middlings). This is 13.2 per cent more than the off-take level of 156 million tonnes in 1985-86. Of the total demand, six major sectors account for about 79 per cent; power 47 per cent, steel 16 per cent, cement 5 per cent, railways 5 per cent, fertilizers 3 per cent and soft coke 3 per cent.

3.12 Availability of coal across the country improved as 114.2 million tonnes of coal were despatched during April—December, 1986, compared to

109.8 million tonnes during the corresponding period of 1985. Pit-head stocks at the end of December 1986 stood at 22.1 million tonnes as compared with 20.8 million tonnes a year ago. The main thrust in the strategy to improve despatches has been to maximise the supply of coal by rail. The daily average coal loading in CIL during April—December 1986 stood at about 10900 wagons/day. This, however, was below the target by as much as 1440 wagons/day or 11.6 per cent. Loading at Singareni Collieries Company Ltd. coal-fields also fell short of the target by 11 per cent due to a decline in their offers. Loading of other coal, i.e. coal for/from non-CIL washeries, imported coal, mixed coke loaded by steel plants etc. was higher than the target by 31.9 per cent.

3.13 Coking Coal : For the past few years there has been a short fall of coking coal availability from domestic sources. The table below indicates the supply/demand position with regard to coking coal for steel plants during the last three years :

TABLE 3.7  
*Estimated Demand/Supply of Coking Coal for the Steel Industry*  
(Million tonnes)

Particulars	1983-84	1984-85	1985-86
1. Total requirement	14.77	13.87	15.40*
2. Actual supplies (Domestic)	11.53	11.11	13.93**
3. Shortfall in supplies	3.25	2.76	1.47**
4. Imported coal received	0.46	0.66	2.03
(C&F value in Rs. crores)	(37.5)	(55.8)	(161.8)

\*This was subsequently reduced to 13.90 million tonnes.

\*\*It was initially planned to import 1.5 million tonnes of coking coal to cover the gap, but as the indigenous availability was found to be lower than that anticipated earlier, the total import during 1985-86 came to 2.03 million tonnes.

During 1985-86, the total requirement of steel plants were estimated to be 15.40 million tonnes. The actual domestic supplies were 13.93 million tonnes. Initially imports of 1.5 million tonnes were planned to cover the gap and to provide for necessary blending. However, indigenous availability was subsequently found to be less than the anticipated level with the result that a total of 2.03 million tonnes had to be imported.

4.14 In the last three years washed coal from prime coal washeries has had 21-22 per cent of ash content,

During the current year, the ash content of domestic washed coal declined to about 19 per cent. The quality of coal despatched to consumers has received continued attention in the coal companies. As against 1577 complaints received by CIL in 1984-85, only 314 complaints were received during 1985-86, and in the first six months of 1986-87, the number of complaints was 142 only. Sustained efforts for building up the basic infrastructure for quality control, like coal handling plants (CHPs) with screening and picking arrangement, weigh-bridges and laboratories in the coalfields have yielded results in ensuring reduction of complaints.

3.15 Lignite : The target for lignite production in 1985-86 from Neyveli Lignite Corporation was 6.8 million tonnes (Neyveli; first mine 6.5 million tonnes and second mine 0.3 million tonnes). The development of the second mine Stage I (4.7 million tonnes) was completed in 1985-86. The total production from Neyveli was 7.29 million tonnes exceeding the target by 0.49 million tonnes. The Gujarat Mineral Deve-

lopment Corporation provided an additional 0.9 million tonnes of lignite. The target for 1986-87 is 7.4 million tonnes for Neyveli Lignite Corporation and 0.9 million tonnes for the Gujarat Mineral Development Corporation. The production during the first nine months of this year has been 5.72 million tonnes from Neyveli Lignite Corporation as compared to 5.09 million tonnes during the corresponding period of 1985-86. At this rate, it is expected that the production target for the year 1986-87 will be fully achieved.

### Petroleum

3.16 During 1985-86, the crude oil production target was fully achieved. The output of crude oil was 30.17 million tonnes against the target of 30.14 million tonnes. This was in spite of a shortfall in crude oil production (vis-a-vis the targets) in the oil fields of ONGC and Oil India Ltd. in the Eastern region. Details regarding trends in production in the last 2 years are given in Table 3.8.

TABLE 3.8  
Trends in Petroleum Sector

Item	1983-84	1984-85	1985-86 <sup>£</sup>	April-December <sup>£</sup>		(Million tonnes)		
				1985-86	1986-87	Percentage change		
						1984-85	1985-86	1986-87*
						1983-84	1984-85	1985-86*
1. Crude Oil Production	26.0	29.0	30.2	22.0	23.0	11.5	4.1	4.5
(i) On-shore	8.6	8.9@	9.4	7.0	7.5	3.5	5.6	7.1
(a) ONGC	5.8	6.1	6.7	5.0	5.4	5.2	9.8	8.0
(b) OIL	2.8	2.7	2.7	2.0	2.1	3.6	No change	5.0
(ii) Off-shore (ONGC)	17.4	20.1	20.8	15.0	15.5	15.5	3.5	3.3
2. Refinery throughput	35.3	35.6	42.9	31.5	33.5	0.8	20.5	6.3
3. Natural Gas (Billion Cubic Meters)	6.0	7.2	8.1	4.5@@	5.6@@	20.0	12.5	24.4

@Figures due to round off.

@@Data relates to April-October.

\* April-December.

£ Provisional

3.17 During 1986-87 crude oil production is expected to exceed the targeted figure of 30.2 million tonnes. During the first nine months of this year, crude oil production amounted to 23.0 million tonnes registering a growth of 4.5 per cent over the corresponding period of last year. This was 102.2 per cent of the target for the period. The production of on-shore oil registered a growth of 7.1 per cent and off-shore crude oil was higher by 3.3 per cent over the corresponding period of last year. Refinery production (in terms of crude throughput) amount-

ed to 33.5 million tonnes during the first nine months of this year and registered an increase of 6.3 per cent over the corresponding period of last year. Targets were fully achieved though the throughput achieved by the refineries at Haldia, Bombay (HPCL), Vizag, Cochin, Madras and Assam (BRPL) has been less than the targets. The production of natural gas registered a significant increase of 24.4 per cent during the first seven months of this year over the same period of last year. During the year, the production and exploratory activities were further intensified



by ONGC. A total of 3.84 lakh metres of exploratory drilling has been planned for 1986-87 by ONGC and OIL, comprising 2.71 lakh metres on-shore and 1.13 lakh metres off-shore. These targets imply increase of 13 per cent in off-shore and 14 per cent in on-shore drilling over the achievements in 1985-86. During the year, there is likely to be increased drilling in Cambay Basin.

3.18 The total LPG production by gas fractionation, both by ONGC and OIL, is targeted at 4 lakh tonnes during 1986-87. Increased LPG production during 1986-87 is on account of capacity build-up by LPG Plant—Phase II at Uran as well as from LPG Plant at Ankleshwar in Gujarat.

3.19 The targeted refinery throughput of 44.9 million tonnes is likely to be achieved during 1986-87, which would result in some savings in the import of petroleum products. During the first nine months of

1986-87, refinery throughput was 33.5 million tonnes, an increase of 6.3 per cent over the corresponding period of 1985-86. This has amounted to an achievement of 100.1 per cent of the target for the period.

3.20 Consumption of petroleum products increased by 5.4 per cent during 1985-86. It is estimated to increase further by 6.7 per cent during the current year and is likely to reach a figure at 43.7 million tonnes. Middle distillates, consisting of kerosene, high speed diesel oil, etc. constitute the major products. Their share was 59 per cent in 1985-86 and is likely to remain around the same level during the current year also. Kerosene consumption recorded a relatively modest growth of 3.3% in 1985-86, partly due to the increased availability of LPG. The table below gives details of consumption of petroleum products in the last 3 years;

TABLE 3.9

*Consumption of Petroleum Products\**

(Million. tonnes)

Item	1983-84	1984-85	1985-86 <sup>f</sup>	April-September <sup>f</sup>		Percentage change		
				1985-86	1986-87	1984-85	1985-86	1986-87**
						1983-84	1984-85	1985-86**
1. Light Distillates . . . . .	5.6	6.3	6.8	3.2	3.5	12.5	7.9	9.4
of which : Naphtha . . . . .	2.8	3.1	3.1	1.4	1.5	10.7	No change	7.1
2. Middle Distillates . . . . .	20.6	22.4	24.0	11.5	12.1	8.7	7.1	5.2
of which : (a) Kerosene . . . . .	5.5	6.0	6.2	2.9	3.1	9.1	3.3	6.9
(b) High Speed Diesel oil . . . . .	12.6	13.7	14.9	7.2	7.6	8.7	8.8	5.6
3. Heavy Ends . . . . .	9.6	10.1	10.1	4.9	5.0	5.2	No change	2.0
of which : Fuel Oil . . . . .	7.6	7.9	7.9	3.8	3.8	3.9	No change	No change
Total . . . . .	35.8	38.8	40.9	19.6	20.6	8.4	5.4	5.1

\*Excluding RBF.

\*\* April-September

‡ Provisional

3.21 Natural gas is increasingly becoming an important source of energy and feed-stock. With the rise in crude oil output, natural gas production has also increased. In the absence of compression and dehydration facilities, however, a sizeable amount of off-shore gas had to be flared. During the first seven months of this year, gas production was 5.6 billion cubic metres, reflecting an increase of 24.4 per cent over the level achieved in the corresponding period of 1985. It is anticipated that by 1989-90 gas production would reach the level of 14.9 billion cubic metres. This increase would be mainly on account of commercial production of free gas from the Bombay Basin. The production of associated gas from the Cambay and Upper Assam Basins is also

expected to increase with an increase in crude production. During 1985-86, about one-third of the country's output of LPG came from associated gas. The consumption of LPG is expected to increase from about 1.24 million tonnes in 1985-86 to 1.52 million tonnes in 1986-87. This will represent an increase of 22.5 per cent and should help slow down the growth in the consumption of kerosene in the country.

3.22 Energy Strategy : Some of the key elements of the energy strategy during the current plan are accelerated exploitation of coal, investment in the generation of hydel and nuclear power and strengthening of its transmission infrastructure, intensification

of exploration for oil and gas, improved management of oil demand including the formulation of a national transport fuel policy, exploitation of renewable sources of energy like energy forestry, bio-gas, bio-mass and the solar energy, with particular focus on the energy requirements of the rural communities.

**3.23 National Project on Bio-gas Development :** Against the target of 1.5 lakh family size bio-gas plants, 1.93 lakh plants were set up during 1985-86, bringing the total number of bio-gas plants in the country to 6.5 lakhs. During 1986-87, an outlay of Rs. 59 crores has been provided for the construction of 1.51 lakh plants under the national project on bio-gas development. During current year, the focus has been on improving the operation and maintenance of plants through technically trained man-power, especially at the grass-root levels. Training in maintenance of bio-gas plants has been introduced under TRYSEM and instructions have been issued to State nodal departments incharge of bio-gas programmes to coordinate with other departments implementing the scheme of TRYSEM and develop suitable courses on the maintenance and repair of bio-gas plants. A programme of field demonstrations on the utility of bio-gas plants has been taken up in order to make the rural beneficiaries aware of the value of bio-gas slurry which is qualitatively superior to conventional manure. Under the R&D Programmes for bio-gas, the focus has been on developing low-cost design and diversification of feed stock.

**3.24 HBJ Gas Pipeline Project :** In April 1976, free gas was discovered in the South Basin off-shore field about 90 Kms. from Bombay coast. Originally, the total gas reserves in this zone were estimated at 216 billion cubic metres of gas. More recent estimates suggest that the gas reserves could be 275 billion cubic metres. The field can, therefore, produce 20 mmscmd over a plateau period of 20 years. Two working groups were set up by the Government of India to go into the question of optimum utilisation of off-shore gas and the optimum location of new gas-based fertilizer projects.

**3.25 Priority for the use of natural gas** has been fixed on the basis of opportunity cost for each of the fractions contained in the natural gas. The highest opportunity cost for the C-1 fraction (lean gas) is in the production of nitrogenous fertiliser. The optimum use of C-2 and C-3 fraction is in the production of petro-chemicals. The utilisation of C-4 fraction alongwith C-3 in the form of LPG constitutes the most economic use of this fraction.

**3.26** The working group on location of new gas based fertilizer plants suggested the setting up of six new fertilizer plants in addition to the two gas-based plants in Maharashtra and in Gujarat. Each of these plants will have a capacity of 1350 tonnes per day of ammonia, utilising 1.5 mmscmd of lean gas. In addition to the fertilizer plants, it is also proposed to utilise gas for power projects.

**3.27** In order to transport the gas to the fertilizer plants, power projects etc. it was proposed to construct a pipeline from Hazira to Jagdishpur and Babrala.

**3.28** Five alternative routes were studied and the route selected is the most promising one from the point of view of gentle terrain, proximity to major railway lines and national/state highways, passing of the pipeline through less populated areas, shorter length of the trunk pipeline etc. (see Map on next page). The HBJ gas pipeline will run through the heartland of India for over 1700 Kms. covering 343.7 Kms. of rocky terrain, 56.3 Kms. of forests, 29 railway crossings and 7 major and 68 small river crossings. The project is estimated to cost Rs. 1700.17 crores (including a foreign exchange component of Rs. 680.35 crores), and is expected to be completed by July 1989. Phase-wise commissioning of various sections of the pipeline project will match the completion schedule of the six fertilizer plants. The supply of gas for the first fertilizer plant at Bijaipur (Madhya Pradesh) is expected to commence by May, 1987.

**3.29** A review made by Gas Authority of India regarding the demand for gas on the HBJ pipeline indicates that the six fertilizer plants will require 10.76 mmscmd. With the throughput of 18.2 mmscmd, the HBJ pipeline will be able to cater to the proposed six fertilizer plants, three power plants, two LPG plants, as well as other fall back consumers en-route. The HBJ pipeline is one of the most significant energy projects conceived and implemented in the nation's history and the output generated from feedstock provided by the pipeline will make major impact on the Indian economy.

**3.30 Status of Exploration :** The total prognosticated reserves of the country are estimated to be around 17 billion tonnes. About 25 per cent of these reserves have already been established. Out of the established reserves, only about 25 per cent are recorded as recoverable reserves. The position of recoverable reserves by the end of 1985 was as follows :

Crude Oil	558 million tonnes
Natural Gas	497 million cubic meters

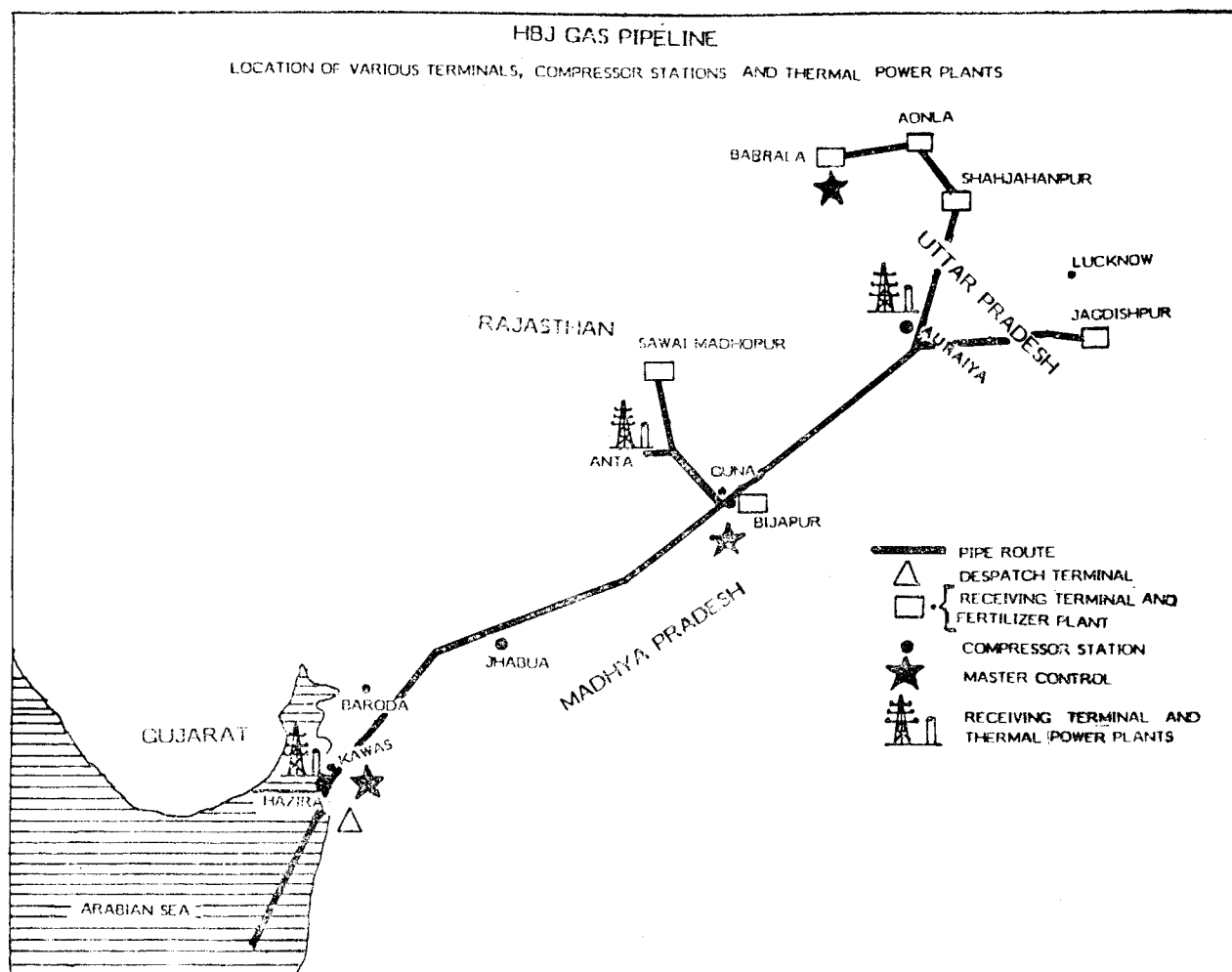
3.31 The proposed exploratory metrage of 28.21 lakhs during the Seventh Plan would mark an increase of 192 per cent over the achievement of 9.6 lakhs metres of such drilling in the Sixth Plan. Besides, intensified exploratory efforts by the ONGC and the Oil India Ltd., an Indo-Soviet cooperation for integrated exploration in selected areas of the Cauvery and Cambay Basins has also been formalised. This programme would soon be extended to an agreed on-shore area of West Bengal. Further, 27 offshore blocks were offered for exploration by foreign oil companies by bidding, for which 12 bids have been received from seven foreign oil companies for 9 blocks.

3.32 During 1986-87, so far the following dis-

coveries of oil/gas were made :

Name of the well	Oil/Gas
Andhra Pradesh :	
Tatipaka . . . . .	Gas
Kaikalur-3 . . . . .	Gas/Oil
Assam	
Namti . . . . .	Oil
Shalmari . . . . .	Oil
Bombay Off-shore :	
B-42-1 . . . . .	Oil
R-71 . . . . .	Oil
CD-1 . . . . .	Oil
CA-I . . . . .	Oil
B-172-2 . . . . .	Oil
R-7-A . . . . .	Oil & Gas

Further exploratory work is in progress in these structure to determine the potential of reserves for establishing commercial viability. It is planned to drill 125 exploratory wells during 1986-87.



### Railways

3.33 In 1985-86, the Indian Railways carried 286.4 million tonnes of total originating traffic, including 258.6 million tonnes revenue earning originating traffic. These impressive levels exceeded the target of 277 million tonnes, including 250 million tonnes revenue-earning traffic. There was a quantum jump of 21.6 million tonnes in the total originating traffic and over 22 million tonnes or 9.4 per cent in the revenue-earning traffic, over the previous year. In terms of net tonne kms. which is often considered to be a better indicator of the transport effort, the increase

was 13.9 per cent. The target assigned for the carriage of traffic was exceeded in almost all commodities, the main exceptions being coal and steel plant traffic. The shortfall in these sectors was largely due to inadequate offer. In spite of these shortfalls and despite obvious limitations, such as the non-transferability of loading capacity from one type of commodity and one area to another, the railways made up the shortfalls by higher loading in other commodities. The overall loading performance of the Indian Railways during 1985-86 remained above the target.

TABLE 3.10  
Performance of the Railway Sector

Item	1983-84	1984-85	1985-86 <sup>£</sup>	April-December <sup>£</sup>		Percentage change		
				1985-86	1986-87	1984-85	1985-86	1986-87*
						1983-84	1984-85	1985-86*
1. Total revenue earning traffic (million tonnes)	230.12	236.43	258.55	187.02	199.30	2.7	9.4	6.6
(i) Coal	88.97	91.58	101.64	73.47	78.78	2.9	11.0	7.2
(ii) Raw materials for steel plants (excl. coal)	21.74	22.59	22.99	16.78	17.09	3.9	1.7	1.8
(iii) Pig iron & finished steel from steel plants	7.80	8.22	8.85	6.19	6.57	5.4	7.7	6.1
(iv) Iron ore for exports	9.07	11.06	12.54	8.96	10.18	21.9	13.4	13.6
(v) Cement	15.55	16.88	17.96	12.82	13.97	8.5	6.4	9.0
(vi) Foodgrains	24.57	20.78	24.11	17.12	20.50	-15.4	16.0	19.7
(vii) Fertilizers	8.15	12.21	13.62	10.26	10.58	49.8	11.5	3.1
(viii) Mineral Oils	17.95	18.17	18.64	13.73	13.84	1.2	2.6	0.8
(ix) Balance "Other goods"	36.32	34.94	38.22	27.69	27.29	3.8	9.4	0.4
2. Net tonne kilometres (billion tonnes)	168.9	172.6	196.6	143.1	154.3	2.2	13.9	7.8
3. Net tonne kilometres per wagon per day (BG)	1112	1150	1296	1255	1321	3.4	12.7	5.3
*April-December.				£ Provisional				

3.34 The target for the current year 1986-87 was fixed at 294 million tonnes of originating traffic, including 267 million tonnes of revenue-earning originating traffic. This is an increase of 3.3 per cent over the level of revenue earning traffic already achieved in 1985-86 and the performance in 1986-87 is likely to be better than the target. The revenue earning freight traffic, moved during April-December, 1986 was 199.30 million tonnes, a 3.3 million tonnes above the target fixed for the period. In the current year also the coal and steel plant traffic has been below expectation. In relation to the targets, the shortfall in coal traffic was as high as 3.12 million tonnes and in the steel plant traffic, 2.44 million

tonnes. However, the improved loading of 4.45 million tonnes over the target in the case of foodgrains and the impressive performance in loading of residual "other goods", of which 4.1 million tonnes in excess of the target were loaded, more than off-set the shortfall from the core sector.

3.35 In terms of total transport effort, measured in net tonne kms., the revenue earning goods traffic during April-December, 1986 has registered an impressive growth of 7.8 per cent over the corresponding period of the last year as well.

3.36 The improved efficiency of the Indian Railways in the freight movement can be gauged by the

comprehensive index of wagon utilization viz. Net Tonne Kms. per wagon/day which reflects not only the mobility of the wagon but also the pay-load. In 1985-86, the Net Tonne Kms. per wagon/day averaged 1296 on the BG and 677 on the MG as against 1150 and 565 on the BG and MG, respectively in 1984-85 recording growth rates of 12.7 per cent and 19.8 per cent respectively. During the first nine months of 1986-87, there has been a further improvement in Net Tonne Kms. per wagon/day (BG) to the level of 1321.

3.37 The Railways continued their programme of replacement of over-aged assets and modernisation of operations in order to improve efficiency and safety environment. However, owing to severe resource constraints, the renewal of railway tracks could not be undertaken at the required pace. In the Seventh Plan top priority has been given to the replacement of overaged assets, maintenance of existing assets and the completion of essential on-going projects which add to the transport capacity. Induction of new technology by upgrading the motive power technology, computerisation of freight operation, introduction of micro-processors in yards and other areas, induction of special type stock to carry bulk traffic, etc. are being planned as a part of long term profile of the railway freight system. Efforts are also being made to persuade major users like steel plants and collieries to even out the flows over the year and offer rake loads as far as possible.

3.38 Computerisation on Indian Railways : The Railways are striving to update their computer hardware and software and expand the area of computer applications. A major scheme to computerise the freight operations envisages a two-tier system architecture to provide a totally integrated operations management system. When fully implemented, the system will streamline the freight operations and bring about a qualitative improvement in customer services. The railways have also launched a project to compu-

terise passenger reservations at all the major stations in the country. In the first phase, computerisation of reservations has started as a pilot project in Delhi and will cover the whole of Delhi area by the end of the current financial year. In the second phase, similar systems are to be set up at other metropolitan towns viz. Calcutta, Bombay and Madras and would be interconnected through communication lines. Work on this phase has also started. The third phase will cover other important stations with large number of reservations.

3.39 As a part of the Management Information System, the existing computers in the Railway Board, Production Units and most of the Zonal Railway Headquarters have been replaced by advanced generation computers and a large number of micro processor based systems have been procured for office automation and specific user-oriented applications on the railways.

### Ports

3.40 The traffic handled at major ports during 1985-86 was 120 million tonnes, an increase of 12.5 per cent over the previous year. This increase was achieved by improving utilisation of existing assets and the build-up of additional capacity. POL and iron ore traffic increased by 9.9 per cent and 10.8 per cent, respectively and these two sections constitute about 70 per cent of the total traffic handled at major ports. The increase of nearly 26 per cent in 1985-86 over the previous year in container traffic was in line with the projections of the Seventh Plan. The increase in container traffic was particularly marked at the Madras Port, where it rose by 86 per cent over the previous year's level. Correspondingly, as a result, the break bulk traffic had declined, though marginally. A capacity addition of 9.2 million tonnes was achieved during the year 1985-86. This included the addition of 4 million tonnes each of POL traffic in Vizag and Madras ports and of 1.2 million tonnes in fertilizers raw material capacity at Paradip.

TABLE 3.11  
Trends in Port Traffic

Item	(Million tonnes)							
	1983-84	1984-85	1985-86 <sup>£</sup>	April-December <sup>£</sup>		Percentage change		
				1985-86	1986-87	1984-85	1985-86	1986-87*
						1983-84	1984-85	1985-86*
Total	100.5	106.7	120.0	87.3	88.1	6.2	12.5	0.9
of which :								
(a) P.O.L.	47.5	49.7	54.6	42.1	39.2	4.6	9.9	-6.9
(b) Iron Ore	21.9	26.0	28.8	19.1	21.1	18.7	10.8	10.5
(c) Others	31.1	31.0	35.7	26.1	27.8	-0.3	15.2	6.5

\* April-December.

£ Provisional

3.41 During 1986-87 emphasis has been on improved utilisation of equipment and on raising the labour productivity as well as on the expansion of facilities to handle throughput. Traffic of 121.75 million tonnes has been targeted for 1986-87. However, because of the sealing down of fertilizer imports by 2 million tonnes from the original plan for the year, the projected cargo traffic is to be lower by the same order. The aggregate port capacity is likely to increase marginally from 141.93 million tonnes in 1985-86 to 142.93 million tonnes in 1986-87. The increase in capacity is scheduled to be at Haldia port where coal handling capacity is expected to increase by 1 million tonnes. Special attention is being given to timely completion of on-going schemes such as the construction of Nhava Sheva Port, the coal handling system at Haldia and the deepening of Bharti Dock at Madras.

3.42 During the period April—December 1986, the major ports in the country handled 88.1 million tonnes of cargo as compared to 87.3 million tonnes of cargo handled in the corresponding period of last year, thereby recording an increase of 0.9 per cent. Commodity-wise, it is observed that during the first nine months of this year, there has been a shortfall in the traffic handled in the case of POL to the extent of 6.9 per cent as compared to the corresponding period of last year. The volume of traffic handled in the case of fertilizers, sugar and cement has also been less than in last year because of reduced imports dur-

the growth ranging from 10.5 per cent in respect of iron ore to 34.2 per cent in respect of coal.

3.43 The main thrust in the Seventh Plan for the development of Ports Sector are :

- (a) expansion of container handling facilities to handle at least 50 per cent of general cargo.
- (b) augmentation of port capacities;
- (c) modernisation of port facilities; and
- (d) development of infrastructure to match type and size of ships as well as volume and type of cargo.

3.44 Nhava Sheva Port, under construction at Bombay with an estimated cost of Rs. 506 crores, when completed would be handling a traffic of 5.9 million tonnes, of which 3 million tonnes container and 2.9 million tonnes would be bulk cargo.

3.45 The ports handling exports of iron ore viz., Paradip, Visakhapatnam, Madras, New Mangalore and Mormugao, can receive at present vessels of only upto 1,30,000 DWT. It is proposed to take up the deepening of Paradip, Visakhapatnam Madras and Mormugao Ports during the Seventh Plan so as to enable them to receive iron ore vessels of upto 1,70,000 DWT.