(17) At the end of 1992, the average age of the locomotive fleet was 18 years for diesels and 17 years for electrics. As with passenger rolling-stock, the technology is now lagging. Diesels in particular are difficult to maintain, are environmentally suspect and are not fuel-efficient. As fuel prices climb to world prices, the argument for further electrification will gather momentum.

(18) The 147,359km network was all broad gauge (1520mm), except for 1,116km of narrow gauges (750/762/1067mm) on Sakhalin Island. The heavy weight of freight trains imposed an onerous maintenance requirement on the track, and by 1992 a relaying backlog of 6,000 kilometres was reported. Russian railways (RZD) have recently initiated a project with European Union assistance to acquire on-track ballast-cleaning and other relaying equipment to tackle the problem.

(19) Electrification, covering about 40% of the network, was a mixture of overhead 3kV DC and overhead 25kV AC systems. Some of the non-SZD industrial railways were energised at 10kV AC.

(20) Most of the signalling was three-aspect colour-light automatic block, but locally-controlled from around 8,000 signal-boxes. High standards of maintenance are not thought to have been subject to any deferral. An extensive radio network enabled cab-communication with control centres and even track maintenance workers. The telephone system had more than one million lines, of which 60% were for railway operations, 30% for the homes of staff, and 10% for commercial services in remote communities.

(21) SZD had an excellent safety record; the extent to which its successor railways' safety performance will be compromised by the effects of deferred infrastructure maintenance remains to be seen.

(22) With the break-up of the Soviet Union in 1991, strenuous efforts were made to manage the transfer of asset ownership in an orderly manner, with the aim of preserving an integrated network. The transfer was initially based on the 32 railway divisions even though they were not always co-terminous with the boundaries of the new republics. The Tashkent-based Sredne Asiatskaya railway, for example (which at 6,330 route kilometres was the fifth largest of the 32[25]), covered Uzbekistan, Turkmenistan, Tadjikistan and southern parts of Kyrgyzystan. Subsequently, all the 15 republics have established their own national railway administrations.

3.4.2 Uzbekistan Temir Yullari (UTJ)

(1) UTJ formally came into being in November 1994 by means of Presidential Decree No. 982 dated 7 November 1994, and supplemented by Resolution No. 551 (and Appendices) of the Cabinet of Ministers dated 14 November 1994. It is a State Joint Stock Company in which the Government holds a nominal 51% of the equity. The State also fulfils regulatory functions by operating a transport licensing system, which came into effect by means of

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[25] The larger four were Oktyabrskaya (St. Petersburg, - 10,186 route-kilometres), Moskovskaya (Moscow - 9,360 route-kilometres), Sverdlovskaya (Sverdlovsk - 7,070 route-kilometres) and Severo-Kavkazskaya (Yaroslavl - 6,486 route-kilometres).

Resolution No. 175 of the Cabinet of Ministers dated 12 May 1996. As with all large enterprises, UTJ also provides a range of social and welfare activities for its 57 thousand staff[26]; in 1996 there were no fewer than 165 medical and educational institutions on UTJ's books.

(2) The network covers around 3,660 route kilometres, of which 680km is double-track, and 489km is electrified at 25kV AC. Operations are complicated by the fact that several lines pass through the territories of neighbouring states: the route from Tashkent to the Fergana Valley passes through Tadjikistan, that from Karshi to Termez through Turkmenistan, the line from Bukhara to Nukus and Kungrad enters Turkmenistan twice, and the line from Tashkent to Djizak traverses a slice of Kazakhstan (although in this latter case an alternative internal route is available). A concern that the neighbouring states could therefore be in a position to hold UTJ to ransom has prompted the authorities to plan new lines on Uzbek territory to avoid such eventualities. Two are already under construction: the Navoi, Uchkuduk, Sultanuizdag and Nukus line (341km), and the Guzor, Boisun and Kumkurgan line (223km) which will re-connect Termez directly to the national network.

(3) As of 1996, UTJ's locomotive fleet was as shown below. This is an overly large fleet for both existing and future demand, with a low daily productivity level (see Loco-Kms in Table 3.4.2-3). For further commentary please refer to Clauses 7.1.7/8.

Table 3.4.2-1 UTJ Locomotive Fleet, 1996

Locomotive Type	1996 (No.)
Electric Locomotives	
VL80 (3 Section)	27
VL80 (1 Section)	6
VL60 (2 Section)	20
VL60 (1 Section)	28
Total:	81
Diesel Locomotives (1)	
TE10 (3 Sections)	122
TE10 (2 Sections)	346
TEP70 (1 Section)	15
TM2 (1 Section)	178
ChM3 (1 Section)	127
Total:	788
Grand Total:	869

Source: Study Team

Notes (1) The TM2 and Czech-manufactured ChM3 locomotives are used mainly on shunting duties.

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[26] Total staff in 1995 was 56,882 of which 40,957 were classified as traffic (or operational) employees. This classification is, however, thought to exclude conductors and loading-staff.

(4) The workload of the fleet is detailed in the following table. It is interesting to note how the electric locomotive fleet (14% of the mainline fleet) undertakes over 30% of the entire passenger and freight workload, lending further support to the view that the fleet is excessive.

Table 3.4.2-2 UTJ Locomotive Fleet Workload, 1994-1995

Type of Traction	Pass-Kms (10^6) 1994	%	Tonne-Kms (10^6) 1994	%	Pass-Kms (10^6) 1995	%	Tonne-Kms (10^6) 1995	%
Electric	642	12.0	6764	35.8	241	9.6	5647	33.6
Diesel	4419	82.3	12104	64.2	2008	80.4	11184	66.4
EMU	305	5.7	-	-	249	10.0	-	-

Source: UTJ EMU = Electric Multiple Unit

(5)

1) UTJ is predominantly a freight railway. In common with the rest of the former Soviet Union, freight traffic has declined markedly since 1991. Outturn projections for 1996 suggest that tonnage over the period is down by 67%, tonne-kilometres by 72%, freight train-kilometres by 66%, wagon-kilometres by 74%, and freight loco-kilometres by 69%. Full details are given in Table 3.4.2-3 and Fig3.4.2-1 to 3.4.2-9.

2) Fig3.4.2-1 shows that only two commodities have weathered the economic downturn: grain (tonnage up by 20%, probably reflecting the need to bolster domestic production with imports), and coal (tonnage down by only 22%). The two worst performers are vegetables (tonnage down by 98%) and aggregates (tonnage down by 80%); even so, the latter still accounts for nearly 24% of all UTJ's tonnage, and, together with oil products, for over 50%.

3) In Fig3.4.2-2, it can be seen that all indicators of freight kilometres are just starting to level out at around 30% of their 1991 level.

4) Freight train-kilometres, wagon-kilometres and locomotive-kilometres are shown split between types of traction in Fig3.4.2-3 to 3.4.2-5. It is clear that UTJ have endeavoured to extract as much as possible from cheaper electric traction which has taken an increasingly larger share of the workload.

5) Fig3.4.2-6 graphs tonne-kilometres per wagon-kilometre. It would be simplistic to assert that this indicates tonnes per wagon (which other statistics indicate are normally loaded to maximum capacity), since it is just as much a measure of the amount of empty working taking place and therefore of the perennial and ubiquitous difficulty in obtaining backloads. Much the same is true of Fig3.4.2-7 which maps tonne-kilometres per train-kilometre and which would also appear to indicate that a quantity of air is being conveyed in empty workings.

6) Fig3.4.2-8 is interesting to the extent that it can be used as a measure of wagons per train. Electric traction is shown to be considerably more productive, averaging 45 wagons per train against 33 for diesel traction in 1996.

Table 3.4.2-3 UTJ Freight Tonnages and Statistics 1991-1996

Commodity	Unit	1991	Share (%)	1992	Share (%)	+/- (%)	1993	Share (%)	+/- (%)	1994	Share (%)	+/- (%)	1995	Share (%)	+/- (%)	Jan-Sept 1996	Share (%)	Projected 1996	+/- (%)
Coal	Tonnes	8895320	7.4	6341356	9.7	-28.7	6314092	10.3	-0.4	2765183	6.7	-56.2	3591567	7.8	29.9	1994546	6.7	2659395	-26.0
Oil Products	Tonnes	17993489	15.0	9128728	14.0	-49.3	14199721	23.3	55.5	11899081	28.6	-16.2	16288729	35.4	36.9	10503519	35.3	14004692	-14.0
Basic Metals	Tonnes	1301278	1.1	889798	1.4	-31.6	823441	1.3	-7.5	440894	1.1	-46.5	483084	1.0	9.6	388529	1.3	518031	7.2
Scrap Metals	Tonnes	1486561	1.2	843757	1.3	-43.2	699926	1.1	-17.8	472200	1.1	-32.0	498309	1.1	5.5	437902	1.5	583869	17.2
Fertilisers	Tonnes	4615485	3.8	3853987	5.9	-16.5	3440864	5.6	-10.7	1861627	4.5	-45.9	2704834	5.9	45.3	1969460	6.6	2625947	-2.9
Cement	Tonnes	5532212	4.6	4998220	7.6	-9.7	4623106	7.6	-7.5	3347234	8.1	-27.6	3391532	7.4	1.3	1978657	6.7	2638209	-22.2
Grain	Tonnes	952813	0.8	712245	1.1	-25.2	951530	1.6	33.6	952865	2.3	0.1	1425980	3.1	49.7	859101	2.9	1145468	-19.7
Flour	Tonnes	2188725	1.8	1809856	2.8	-17.3	1997106	3.3	10.3	1653503	4.0	-17.2	1042923	2.5	-36.9	505197	1.7	673596	-35.4
Ore	Tonnes	2618780	2.2	2404545	3.7	-8.2	2359959	3.9	-1.9	2003333	4.8	-15.1	803851	1.7	-59.9	492931	1.7	657241	-18.2
Non-Ferrous Metals	Tonnes	948021	0.8	789157	1.2	-16.8	729172	1.2	-7.6	433117	1.0	-40.6	246132	0.5	-43.2	182867	0.6	243823	-0.9
Chemicals	Tonnes	3363762	2.8	1805720	2.8	-46.3	1291864	2.1	-28.5	684992	1.6	-47.0	1048656	2.3	53.1	678828	2.3	905104	-13.7
Aggregates	Tonnes	46820085	39.0	18563931	28.4	-60.4	15479262	25.4	-16.6	8115831	19.5	-47.6	9649473	20.9	18.9	6980647	23.5	9307796	-3.5
Vegetables	Tonnes	2451600	2.0	1766970	2.7	-27.9	656220	1.1	-62.9	256860	0.6	-60.9	212490	0.5	-17.3	46620	0.2	62160	-70.7
Cotton	Tonnes	3169968	2.6	2229312	3.4	-29.7	2016912	3.3	-9.5	1803552	4.3	-10.6	1722673	3.7	-4.5	1017408	3.4	1356544	-21.3
Other	Tonnes	17745538	14.8	9295847	14.2	-47.6	5448449	8.9	-41.4	4869674	11.7	-10.6	2965904	6.4	-39.1	1712971	5.8	2283961	-23.0
Total:	Tonnes	120080758	100.0	65433469	100.0	-45.5	61025618	100.0	-6.7	41659946	100.0	-31.9	46076137	100.0	10.9	29749377	100.0	39665836	-13.9

Tonne-Kilometres	Unit	1991	1992	+/- (%)	1993	+/- (%)	1994	+/- (%)	1995	+/- (%)	Jan-Sept 1996	Projected 1996	+/- (%)
Total:	T x Km x 10^6	72400	50600	-30.1	36400	-28.1	18900	-48.1	16800	-11.1	15500	20667	23.0

Train-Kilometres	Unit	1991	Share (%)	1992	Share (%)	+/- (%)	1993	Share (%)	+/- (%)	1994	Share (%)	+/- (%)	1995	Share (%)	+/- (%)	Jan-Sept 1996	Share (%)	Projected 1996	+/- (%)
Diesel-Hauled	Km x 10^6	56.3	86.7	27.4	78.5	-51.3	22.4	77.5	-18.2	20.2	74.5	-9.8	17.7	75.3	-12.4	12.3	74.5	16.4	-7.3
Electric-Hauled	Km x 10^6	7.1	10.9	5.9	16.9	-16.9	4.8	16.6	-18.6	5.5	20.3	14.6	4.6	19.6	-16.4	3.3	20.0	4.4	-4.3
Other	Km x 10^6	1.5	2.3	1.6	4.6	6.7	1.7	5.9	6.3	1.4	5.2	-17.6	1.2	5.1	-14.3	0.9	5.5	1.2	0.0
Total:	Km x 10^6	64.9	100.0	34.9	100.0	-46.2	28.9	100.0	-17.2	27.1	100.0	-6.2	23.5	100.0	-13.3	16.5	100.0	22.0	-6.4

Wagon-Kilometres	Unit	1991	Share (%)	1992	Share (%)	+/- (%)	1993	Share (%)	+/- (%)	1994	Share (%)	+/- (%)	1995	Share (%)	+/- (%)	Jan-Sept 1996	Share (%)	Projected 1996	+/- (%)
Diesel-Hauled	Km x 10^6	2494	88.1	1164	81.2	-53.3	969	82.2	-16.8	786	75.3	-18.9	588	73.4	-25.2	402.6	72.9	536.8	-8.7
Electro-Hauled	Km x 10^6	337	11.9	270	18.8	-19.9	210	17.8	-22.2	258	24.7	22.9	213	26.6	-17.4	149.7	27.1	199.6	-6.3
Other	Km x 10^6	0.0117	0.0	0.0126	0.0	7.7	0.013	0.0	3.2	0.0081	0.0	-37.7	0.0078	0.0	-3.7	0.0066	0.0	0.0088	12.8
Total:	Km x 10^6	2831	100.0	1434	100.0	-49.3	1179	100.0	-17.8	1044	100.0	-11.5	801	100.0	-23.3	552	100.0	736	-8.1

Loco-Kilometres	Unit	1991	Share (%)	1992	Share (%)	+/- (%)	1993	Share (%)	+/- (%)	1994	Share (%)	+/- (%)	1995	Share (%)	+/- (%)	Jan-Sept 1996	Share (%)	Projected 1996	+/- (%)
Diesel-Hauled	Km x 10^6	106.4	87.3	56.8	81.0	-46.6	50.7	80.2	-10.7	25.9	70.8	-48.9	30.2	76.3	16.6	21.1	74.6	28.1	-6.8
Electro-Hauled	Km x 10^6	9.7	8.0	7.3	10.4	-24.7	6.0	9.5	-17.8	6.5	17.8	8.3	5.5	13.9	-15.4	4.0	14.1	5.3	-3.0
Other	Km x 10^6	5.8	4.8	6.0	8.6	3.4	6.5	10.3	8.3	4.2	11.5	-35.4	3.9	9.8	-7.1	3.2	11.3	4.3	9.4
Total:	Km x 10^6	121.9	100.0	70.1	100.0	-42.5	63.2	100.0	-9.8	36.6	100.0	-42.1	39.6	100.0	8.3	28.3	100.0	37.7	-4.7

Source UTJ

Fig3.4.2-1 UTJ Freight Tonnes Index By Commodity (1991=100)

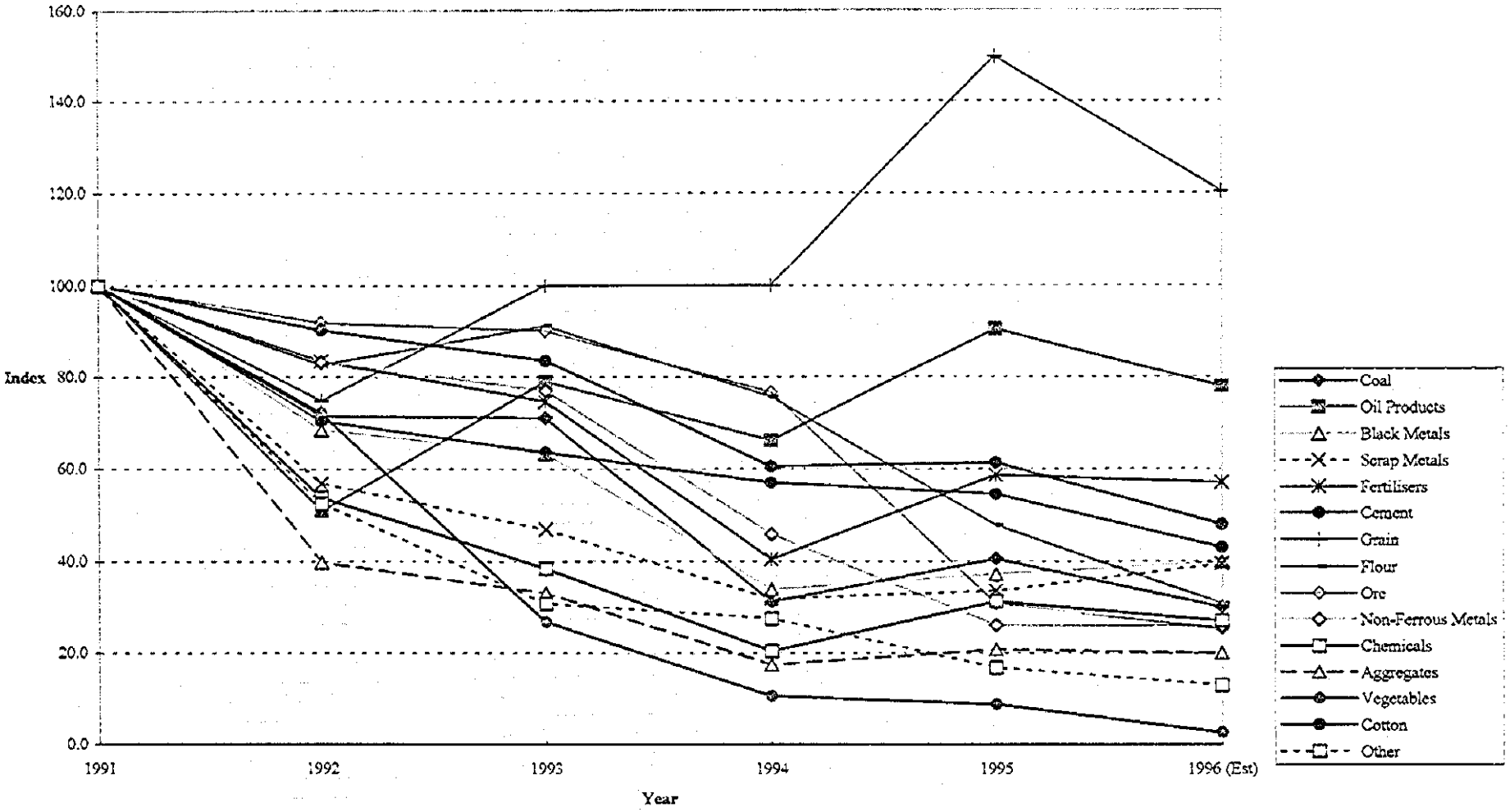


Fig3.4.2-2 UTJ Freight Kilometres (1991=100)

Fig3.4.2-3 UTJ Freight Train Kilometres (1991=100)

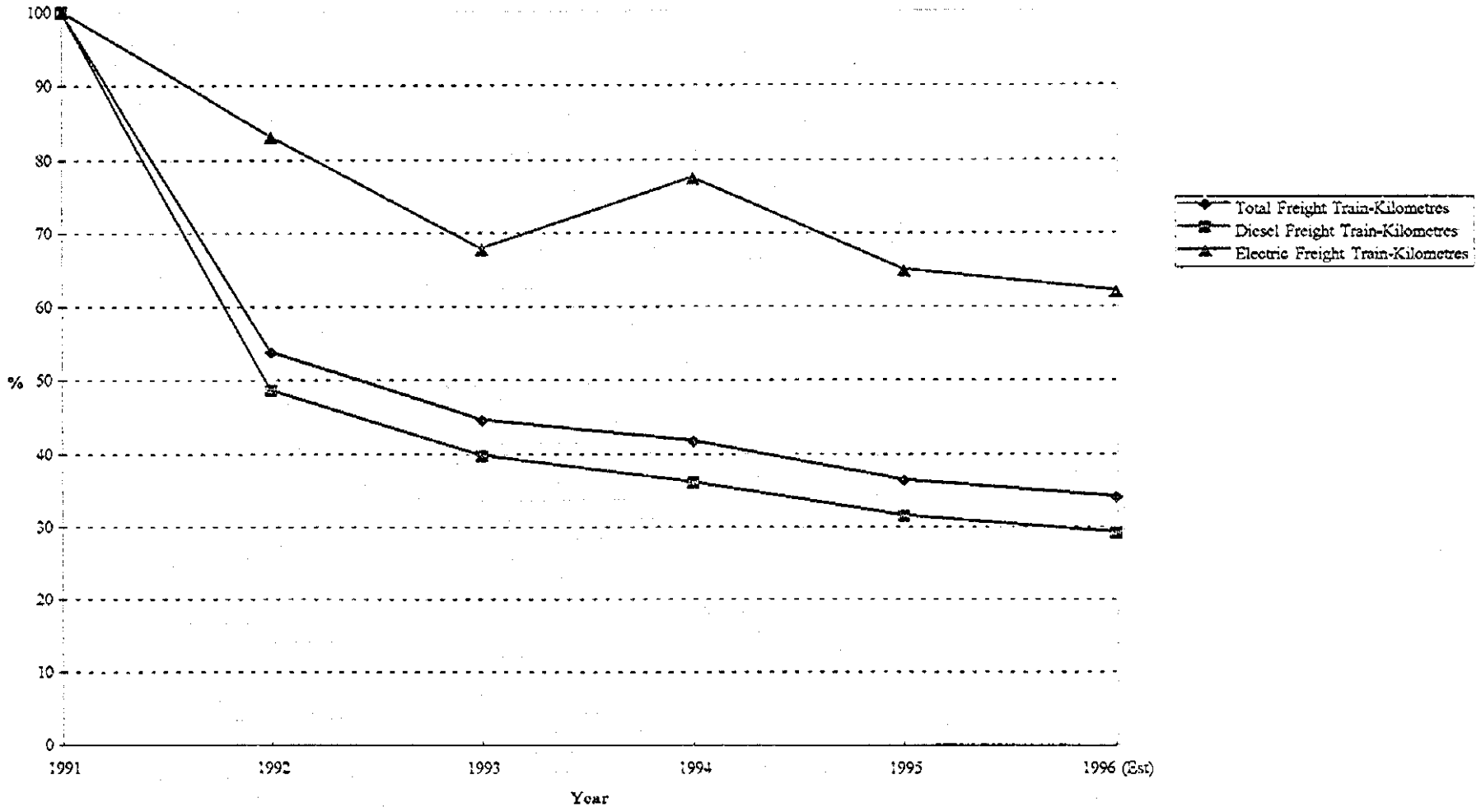


Fig3.4.2-4 UTJ Freight Wagon Kilometres (1991=100)

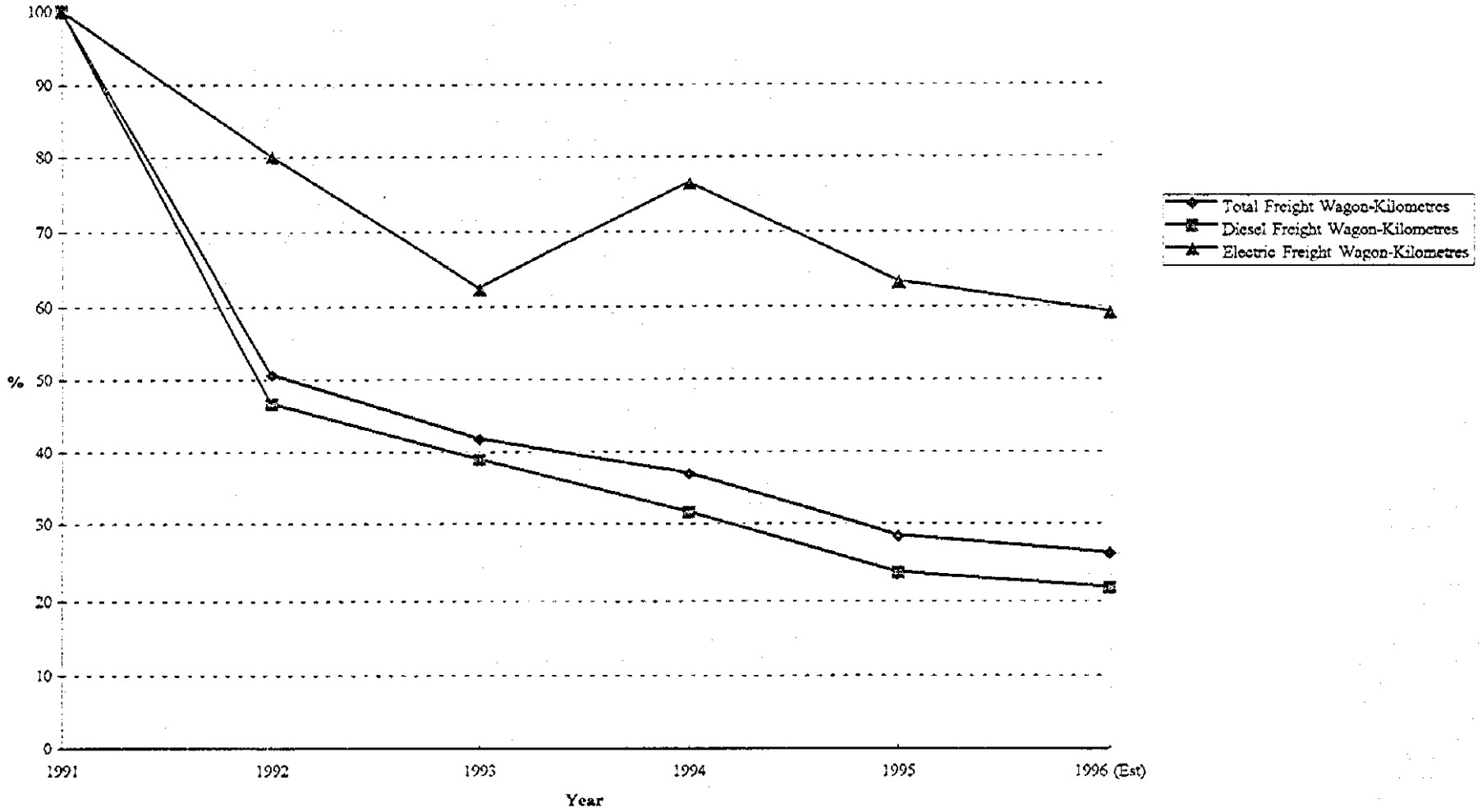


Fig3.4.2-5 · UTJ Freight Locomotive Kilometres (1991=100)

Fig3.4.2-6 - UTJ Tonne-Kilometres per Wagon-Kilometre

Fig3.4.2-7 - UTJ Tonne-Kilometres per Train-Kilometre

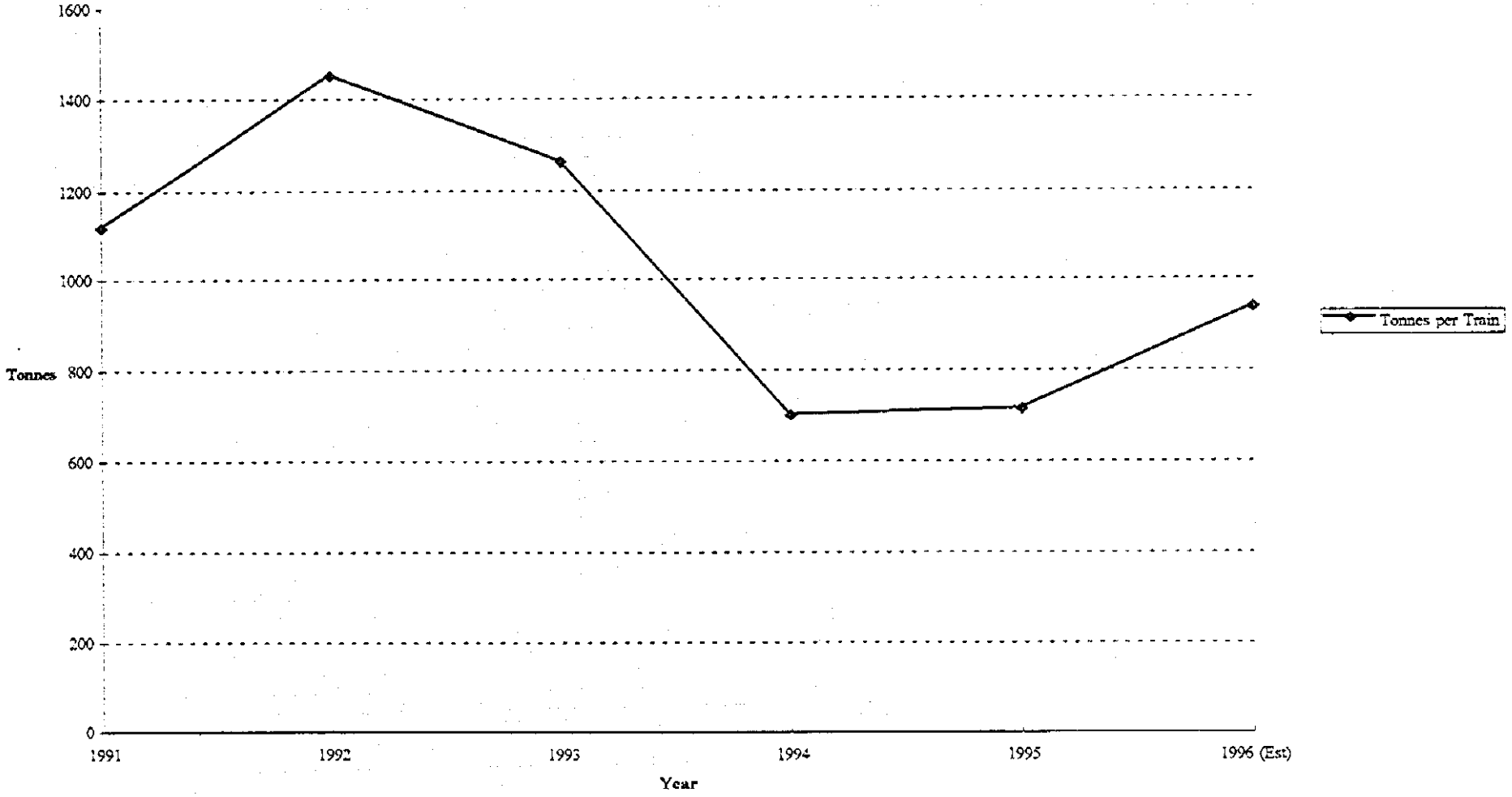


Fig3.4.2-8 - UTJ Wagon-Kilometres per Train-Kilometre

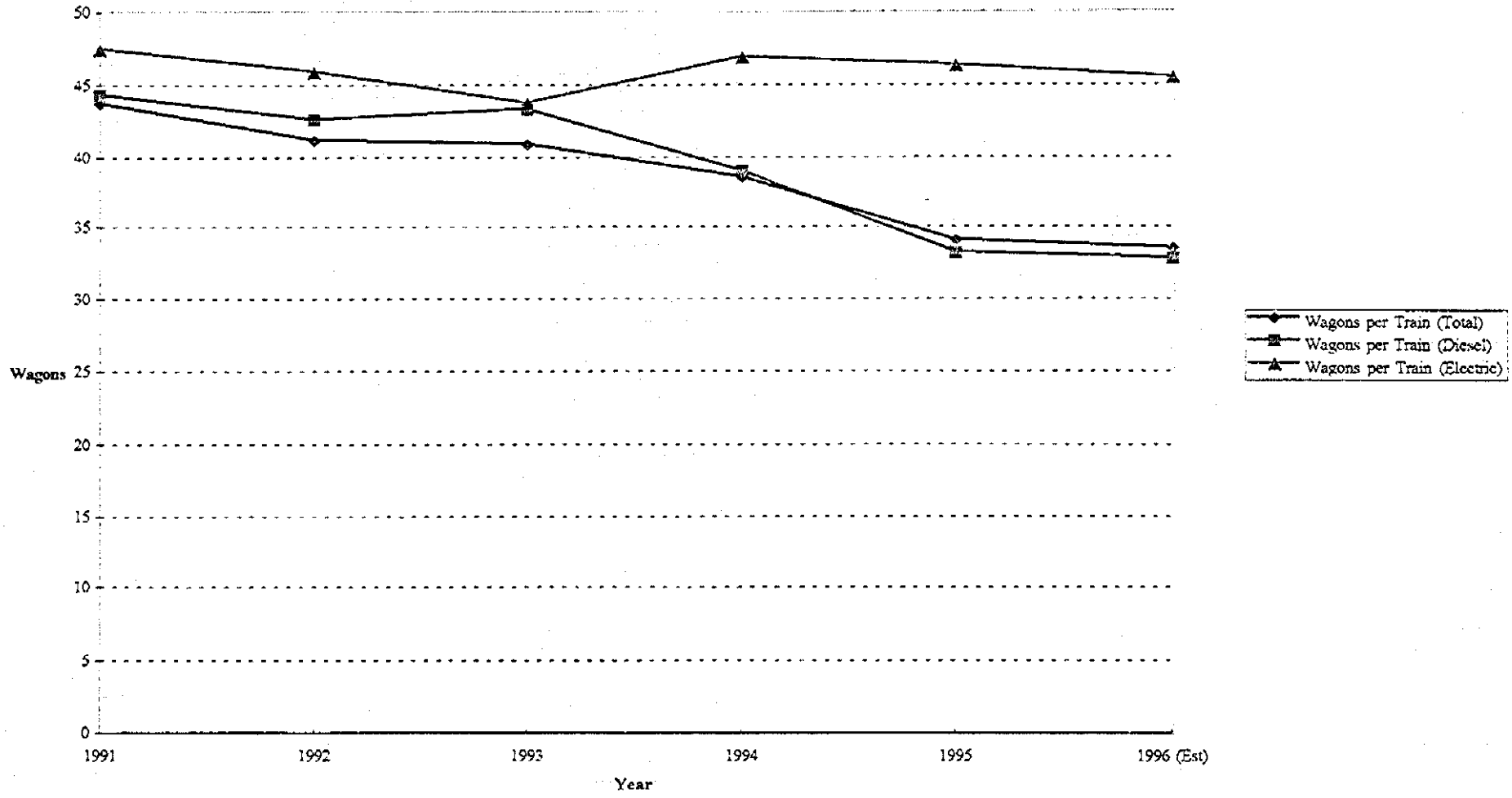
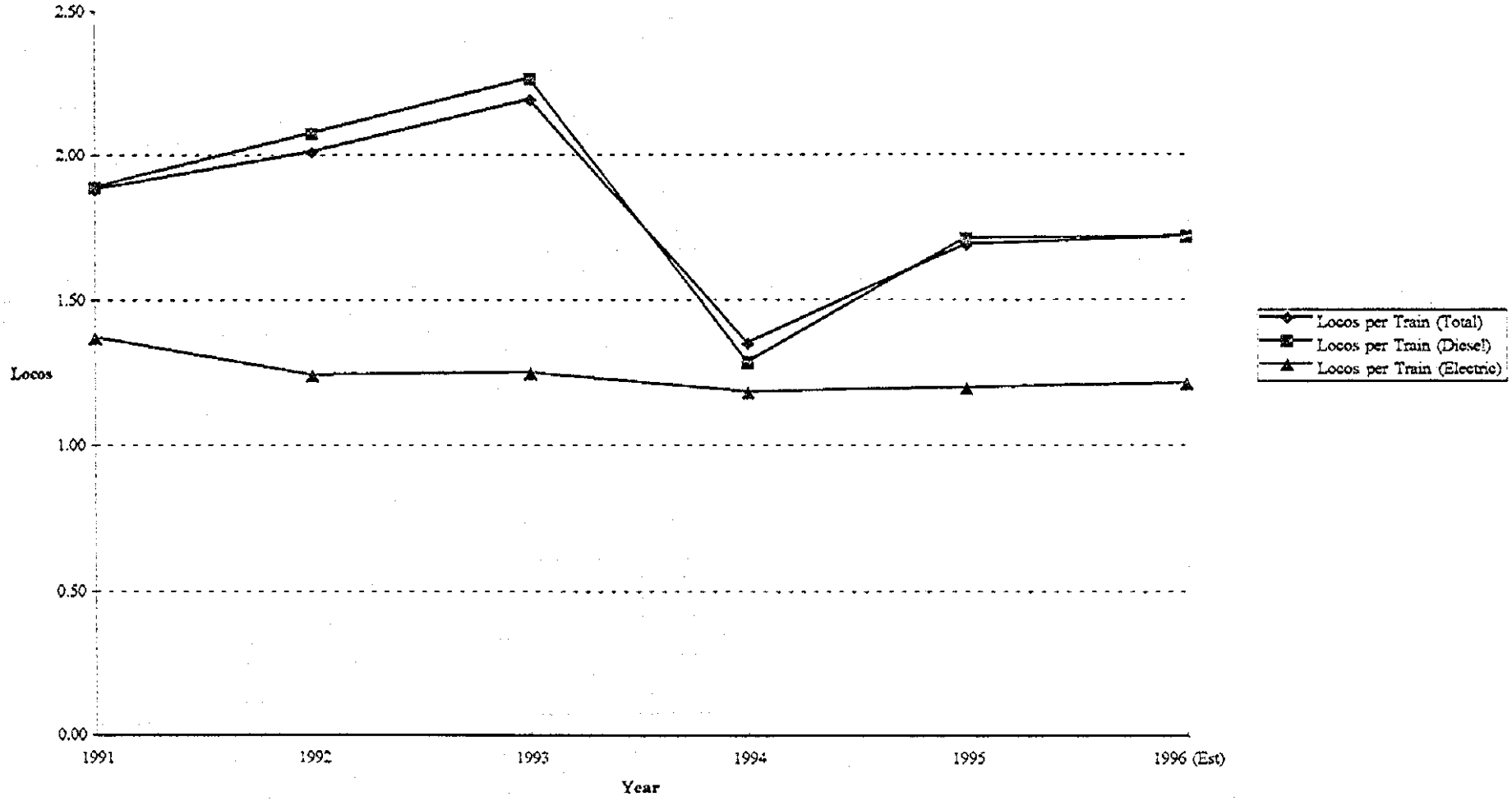


Fig3.4.2-9 · UTJ Loco-Kilometres per Train-Kilometre



7) Finally, Fig3.4.2-9 shows loco-kilometres per train-kilometre. Again, it would be erroneous and simplistic to assume that this necessarily indicates locomotives per train; for example it could reflect the fact that diesel locomotives may have to run light over a long distance for refuelling purposes. Nevertheless, it remains a graphic portrayal of how much more efficient electric locomotives are. Indeed, averaging out the performance over the six years, it would tend to indicate that for every 100 diesel locomotives only 70 electrics would be needed to undertake the same work.

(6) In response to the decline in freight traffic, the operational wagon fleet has also been trimmed as shown in the following table[27]:

Table 3.4.2-4 UTJ Freight Wagon Fleet, 1994-1996

Wagon Type	1994 (No.)	1995 (No.)	1996 (No.)
Box Wagons	4996	3774	3304
Flat Wagons	2860	2335	2016
Gondolas	4761	3743	3521
Refrigerators	447	289	322
Tank Wagons	4569	4258	4015
Other	4627	3356	3724
Total:	22263	17755	16902

Source: UTJ

(7)

1) Among the thorny problems faced by UTJ's freight business is that of tariffs. A complex structure has evolved from the SZD system. International and Inter-CIS tariffs are regulated by a Commission created in January 1994, composed of representatives from the railway administrations of member states. Member states were initially the CIS republics, but the scope of the Commission is being broadened to include countries such as China. The Commission meets at frequent intervals (often monthly) to set tariffs in accordance with an annual policy, although it is believed that the old SZD 1989 price-list 10-01 still forms the basis of much of the policy, with tariffs bound to the exchange rate of the Som to the Rouble (and adjusted for inflation).

2) Within Uzbekistan, UTJ is free to set its own tariffs, which it is quick to claim are the lowest in the CIS. The tariffs vary by commodity, and, uniquely among the Republics, are related amongst other things to the value of the goods transported. Thus aggregates now attract the lowest tariff, whereas in the days of SZD they had one of the highest tariff rates. Tariffs, however, are not directly related back to the cost of service provision.

3) Payment from all forwarders within Uzbekistan is taken in Soms. Payment to foreign administrations, however, is made in scarce hard currency - normally US dollars or Swiss francs. This is also true of reciprocal charges from foreign administrations using UTJ

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27 There are, in addition, wagons owned by industrial enterprises for own use, but thought to number no more than 6,000.

infrastructure.

4) Profits from the freight business are used to cross-subsidise the passenger business. It is unlikely that this will continue in the medium to long term, as freight tariffs will have to undergo a real decrease if rail is to remain competitive with other modes.

(8) Further details on freight revenues and costs can be found in Chapter 6. The following table gives summary reported data:

Table 3.4.2-5 UTJ Freight Revenues

Description	Unit	1994	1995	Forecast 1996	Q1 1996
	(1)				
Freight Revenues	Som x 10^6	1975	7206	6596	1649
Of Which International	$ x 10^6	8.0	30.0	35.0	8.5

Source: Ministry of Transport and Communications, Republic of Uzbekistan

Notes: (1) Current prices. These differ slightly from UTJ's own figures.

(9) It is acknowledged that the permanent way has been suffering from several years of deferred maintenance. In 1995 it was being reported that 1265km of track needed renewal together with 59,000 defective sleepers. There are concerns that safety is being compromised. Nevertheless, there has been no obvious effect on performance: in 1994 and 1995 90% of scheduled freight services ran, and 100% at the beginning of 1996.

(10) Table 3.4.2-6 lists the investments which UTJ is planning in the freight sector for 1997. The projected budget for capital investment in 1997 sets aside 4.75 billion Soms, against 2 billion in 1996.

(11) Longer term aspirations include continuation of new line construction, further electrification (it had once been hoped that the entire network would have been electrified by 2005, although that will not now happen), and two new tank repair workshops at Bukhara and Andijan. Inevitably, information technology will play an increasing role in administrative and supervisory functions[28].

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[28] UTJ's Headquarters Dispatch Centre in Tashkent is an absolute delight for railway historians. Centred round a disused but lovingly preserved route panel, the current operation combines technologies from every period of railway history, with equipment to monitor train movements ranging from superb state-of-the-art on-line PCs, to a simple telephone and a map.

Table 3.4.2-6 UTJ Freight Investments 1997

Description	1991 Base Prices (Soni x 10^3)	Contractual Prices (Soni x 10^3)
UTJ Budget		
Bekabad - Border Station Improvements	1100	55000
Khodja-Davlet – Border Station Improvements	1100	55000
Boldyr' - Border Station Improvements	680	34000
Station No. 449 – Improvements	680	34000
Arys to Uzbekistan – Electrification etc	800	40000
Khavast to Kokand – Double-Tracking Uzbekistan Section	650	32500
Alty to Aryk – Centralisation of Switch Control	500	25000
Tashkent to Samarkand – Installation of Fibre-Optic Telecomms Cable	2050	102500
Termez to Dushanbe – Dispatch Centre Centralisation	320	16000
Chardjou to Kungrad - New Cables	950	47500
Kungrad to Jasliyk – New Cables	750	37500
Electrification Works	44039	2612340
Total from UTJ Funds:	**53619**	**3121340**
State Budget		
New Line - Navoi-Uchkuduk-Sultanuizdag-Nukus	316000	15800000
New Line - Guzor-Boisun-Kumkorgan	225200	11260000
Total from State Funds:	**541200**	**27060000**

Source: UTJ

(12) UTJ's passenger business has also suffered decline in total, as shown in Table 3.4.2-7 and Fig3.4.2-10 to 3.4.2-13. The total picture does, however, disguise some marked differences between the passenger markets. Commuter traffic has bucked the economic trend by increasing since 1991. International passengers have fluctuated but passenger kilometres have decreased; this may be a reflection of the fact that fewer through trains/coaches have been running to international destinations from Uzbekistan's provinces. The domestic long-distance trains have seen a dramatic loss in patronage, particularly in 1995, for which various explanations are advanced from increased tariffs to shortages of serviceable rolling-stock. There is a strong suspicion in the study-team that international trains have been increasingly used to convey domestic passengers, presumably as a cost-saving measure.

(13) Operation tends to mirror that of the former Soviet Union. Suburban services are a mixture of MU and loco-hauled trains, running up to 150km from the city. There is significant morning and evening peak activity, which has been hampered by a shortage of rolling-stock. The long-distance domestic and international services are long, loco-hauled trains normally running overnight. In 1995, the passenger fleet was as shown in Table 3.4.2-8, which highlights the emphasis on overnight trains.

Table 3.4.2-7 UTJ Passenger Carryings and Statistics, 1991-1996

Passengers	Unit	1991	Share (%)	1992	Share (%)	+/- (%)	1993	Share (%)	+/- (%)	1994	Share (%)	+/- (%)	1995	Share (%)	+/- (%)	Jan-Sept 1996	Share (%)	Projected 1996	+/- (%)
International Passengers																			
Transit:	Pass x 10^3	4.0	0.0	1557.0	6.7	38825.0	1508.0	6.5	-3.1	855.0	3.4	-43.3	512.0	3.1	-40.1	375.0	3.1	500.0	-2.3
Incoming:	Pass x 10^3	1683.0	8.8	2162.0	9.3	28.5	1921.0	8.3	-11.1	1376.0	5.5	-28.4	936.0	5.6	-32.0	955.0	8.0	1273.3	36.0
Outgoing:	Pass x 10^3	1710.0	8.9	2082.0	9.0	21.8	1919.0	8.3	-7.8	1878.0	7.5	-2.1	1293.0	7.8	-31.2	1370.0	11.4	1826.7	41.3
Total:	Pass x 10^3	3397.0	17.7	5801.0	25.0	70.8	5348.0	23.1	-7.8	4109.0	16.3	-23.2	2741.0	16.5	-33.3	2700.0	22.6	3600.0	31.3
Domestic Passengers																			
Long Distance:	Pass x 10^3	6944.0	36.1	6103.0	26.3	-12.1	6111.0	26.4	0.1	6955.0	27.7	13.8	2633.0	15.9	-62.1	1302.0	10.9	1736.0	-34.1
Suburban:	Pass x 10^3	8875.0	46.2	11300.0	48.7	27.3	11709.0	50.5	3.6	14082.0	56.0	20.3	11228.0	67.6	-20.3	7971.0	66.6	10628.0	-5.3
Total:	Pass x 10^3	15819.0	82.3	17403.0	75.0	10.0	17820.0	76.9	2.4	21037.0	83.7	18.1	13861.0	83.5	-34.1	9273.0	77.4	12364.0	-10.8
Total Passengers Conveyed:	Pass x 10^3	19216.0	100.0	23204.0	100.0	20.8	23169.0	100.0	-0.2	25146.0	100.0	8.5	16602.0	100.0	-34.0	11973.0	100.0	15964.0	-3.8

Passenger-Kilometres	Unit	1991	Share (%)	1992	Share (%)	+/- (%)	1993	Share (%)	+/- (%)	1994	Share (%)	+/- (%)	1995	Share (%)	+/- (%)	Jan-Sept 1996	Share (%)	Projected 1996	+/- (%)
International Passenger-Kilometres																			
Transit:	Pass-Km x 10^6	6.0	0.1	372.0	6.6	6100.0	294.0	5.4	-21.0	212.0	3.9	-27.9	157.0	6.3	-25.9	125.0	8.0	166.7	5.2
Incoming:	Pass-Km x 10^6	744.0	13.0	492.0	8.7	-33.9	343.0	6.3	-30.3	214.0	4.0	-37.6	116.0	4.6	-45.8	139.0	8.9	185.3	59.8
Outgoing:	Pass-Km x 10^6	846.0	14.8	956.0	16.9	13.0	906.0	16.7	-5.2	773.0	14.4	-14.7	307.0	12.3	-60.3	237.0	15.2	316.0	2.9
Total:	Pass-Km x 10^6	1596.0	27.9	1820.0	32.2	14.0	1543.0	28.5	-15.2	1199.0	22.3	-22.3	580.0	23.2	-51.6	501.0	32.1	668.0	15.2
Domestic Passenger-Kilometres																			
Long Distance:	Pass-Km x 10^6	3653.0	63.9	3109.0	55.0	-14.9	3133.0	57.9	0.8	3392.0	63.2	8.3	1235.0	49.4	-63.6	523.0	33.5	697.3	-43.5
Suburban:	Pass-Km x 10^6	470.0	8.2	724.0	12.8	54.0	733.0	13.6	1.2	778.0	14.5	6.1	683.0	27.3	-12.2	538.0	34.4	717.3	5.0
Total:	Pass-Km x 10^6	4123.0	72.1	3833.0	67.8	-7.0	3866.0	71.5	0.9	4170.0	77.7	7.9	1918.0	76.8	-54.0	1061.0	67.9	1414.7	-26.2
Total Pass-Kms Conveyed:	Pass-Km x 10^6	5719.0	100.0	5653.0	100.0	-1.2	5409.0	100.0	-4.3	5369.0	100.0	-0.7	2498.0	100.0	-53.5	1562.0	100.0	2082.7	-16.6

Source: UTJ

Fig3.4.2-10 - UTJ Passenger Numbers 1991-1996

Fig3.4.2-11. - UTJ Passenger-Kilometres 1991-1996

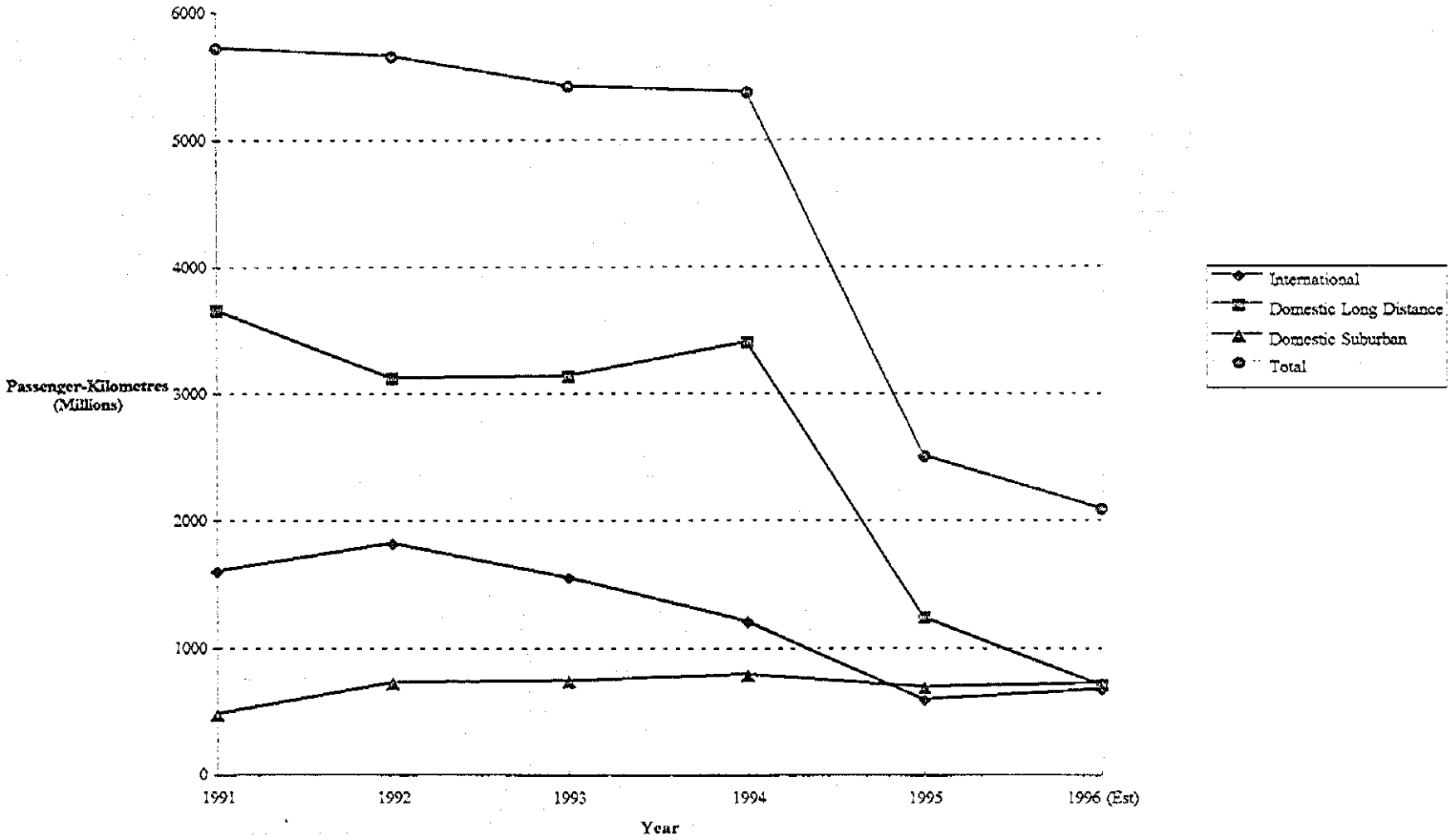


Fig3.4.2-12 - UTJ Passenger Numbers - Market Distribution 1991-1996

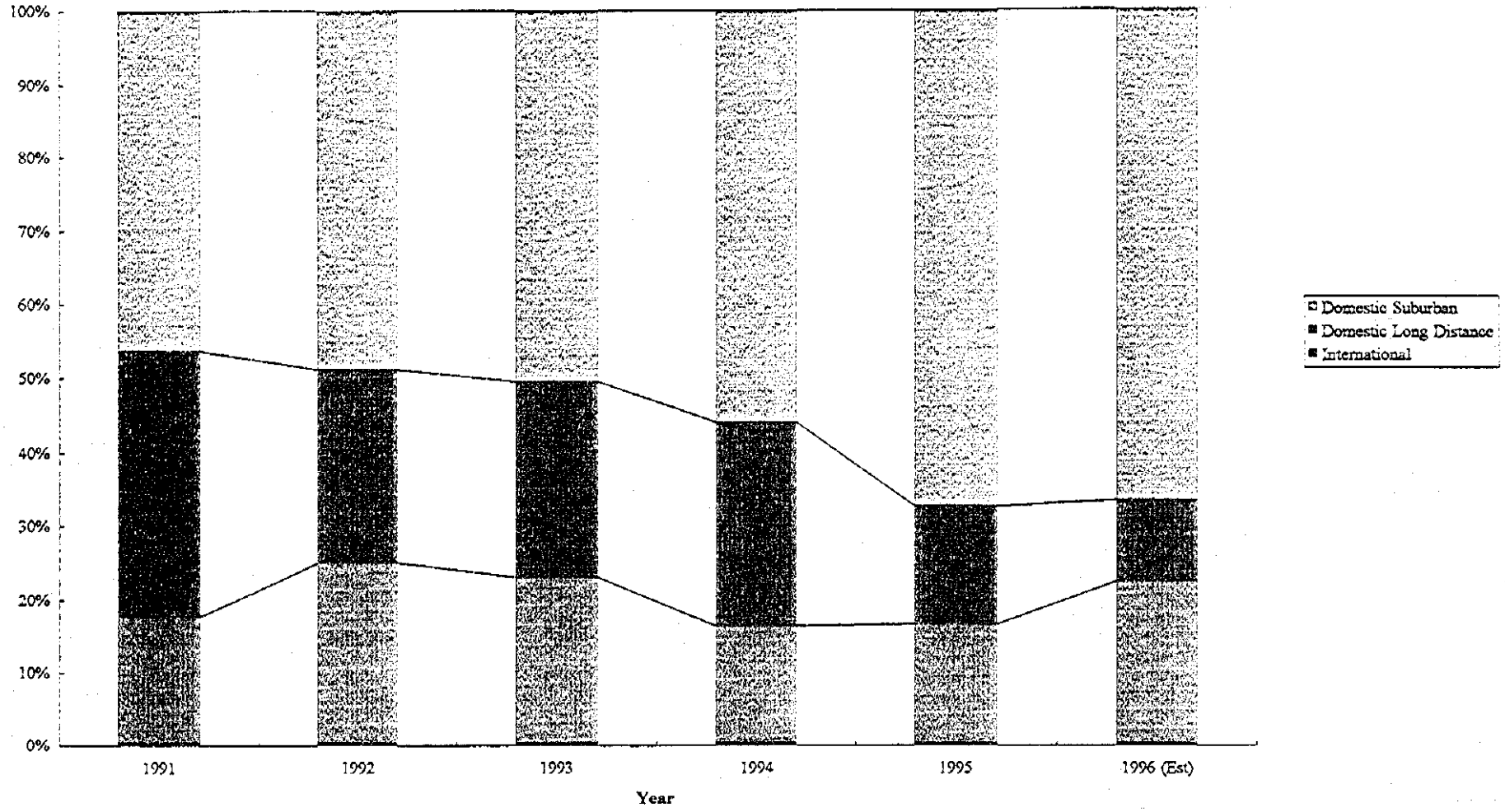


Fig3.4.2-13- UTJ Passenger-Kilometres - Market Distribution 1991-1996

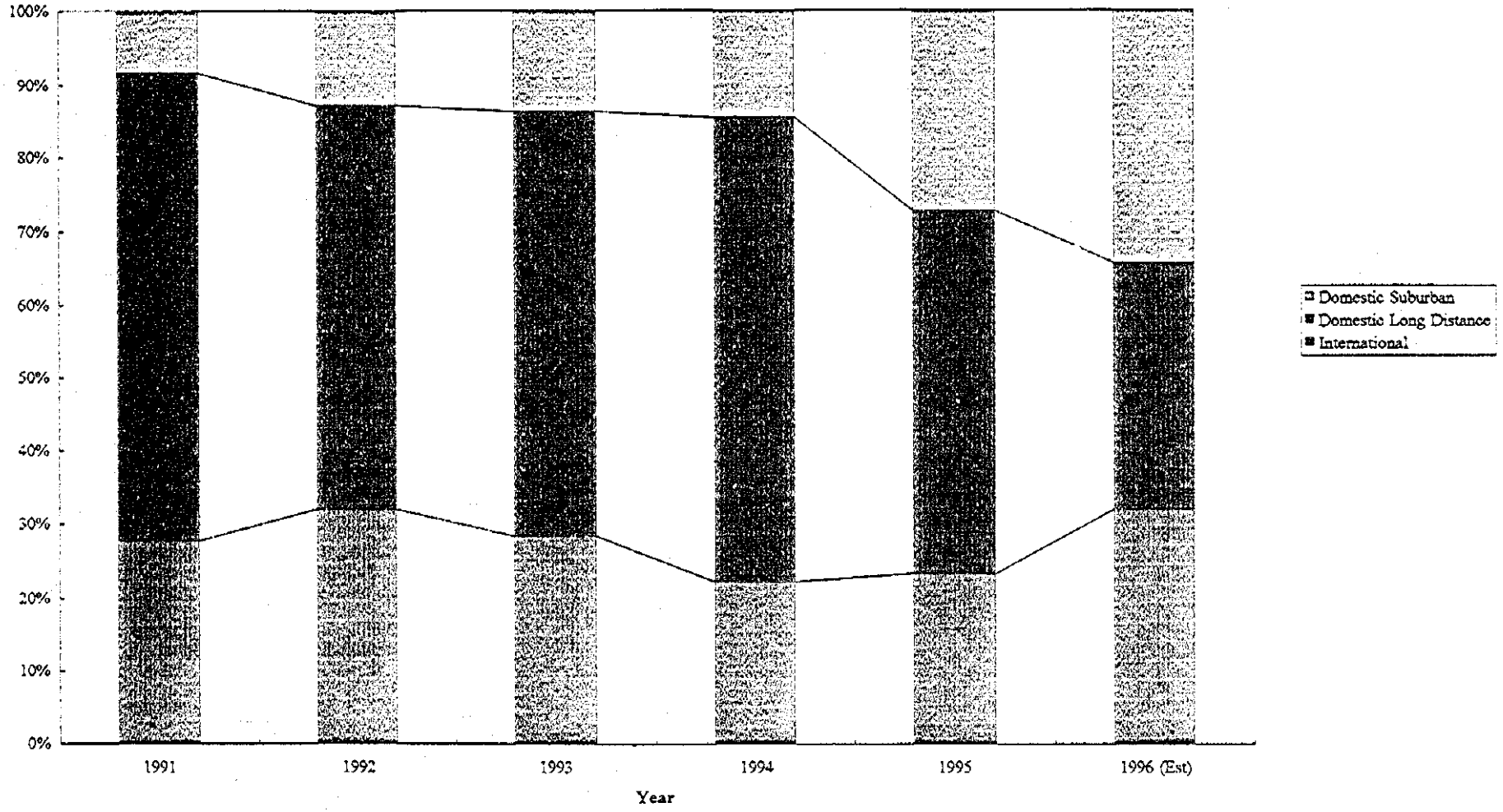


Table 3.4.2-8 UTJ Passenger Fleet, 1995

Vehicle Type	1995 (No.)
Luxury Sleeper	29
Compartment Sleeper	512
Non Compartment Sleeper	741
Mixed Seated	51
Restaurant/Dining	71
Mail/Luggage	63
Electric Multiple Unit (1)	66
Other	40
Total:	1573

Source: OECF

Notes: (1) Figure given is coaches, not units

(14) Performance data for 1994 and 1995 suggest that around 98% of the timetabled passenger service was operated, although no split between the businesses is available. A snapshot of the performance of international and domestic long-distance services during December 1996 is contained in the following table:

Table 3.4.2-9 UTJ Performance of International and Domestic Long-Distance Trains, Dec 1996

Indicator	Measure
Total Trains Run	573
Total Coaches Run	6000
Average Coaches per Train	10
Coach-Kilometres	9037000
Average Coach Journey Length (km)	1506
Passenger-Kilometres	215306000
Total Passengers	158750
Of which Free or Concessionary	30038
Average Passenger Journey Length (km)	1356
Average Capacity of Train	476
Average Capacity of Coach	45
Average Passengers per Coach	24
Average Load Factor	0.52

Source: Study Team Calculations; UTJ

(15) Fares are cheaper than both bus and air travel. For other-than-suburban traffic (commuter fares are based on a zonal system), tariffs are constructed by means of a tapered rate per kilometre, the rate reducing in bands (initially) of 10 kilometres. To this is added a supplement for the class of travel undertaken, the classes being: Seated, Open Sleeper, 4-Berth Sleeper and 2-Berth Sleeper. For international traffic, the allocation of revenues between administrations is undertaken according to the terms of an agreement made in March 1995 by the CIS railway authorities. As in the freight sector, settlement of dues

between administrations is made in hard currency (usually Swiss francs) although the passenger pays in Soms. Some example domestic fares are given in the table below:

Table 3.4.2-10 UTJ Example One-Way Passenger Tariffs

From Tashkent To:	Km	Compartment Sleeper Feb 1995 (Som)	Open Sleeper Feb 1995 (Som)	Compartment Sleeper Dec 1996 (Sum)	Open Sleeper Dec 1996 (Som)
		(1)	(1)	(1)	(1)
Gulistan	118	68	43	197	118
Djizak	197	86	55	355	206
Samarkand	310	106	67	456	269
Margilan	414	124	79	629	380
Namangan	429	115	73	629	380
Navoi	466	134	85	443	275
Karshi	504	134	85	475	295
Bukhara	559	152	97	508	316
Termez	837	191	121	732	461
Urgench	1078	248	157	889	559
Nukus	1242	275	175	1016	642
Kungrad	1318	293	187	1402	862

Source: UTJ

Notes: (1) Current prices

Curiously, there appears to have been a substantial uplift in the tariff-rate to destinations in the Fergana Valley, with Kokand and Andijan also showing higher comparative rates in 1996 than in 1995. The differential between classes has also increased slightly in relative terms.

(16) Summary revenue figures are given in Table 3.4.2-11. Of interest is the evident real rise in tariffs which occurred in 1995 (consumer inflation for the year being a less large 305%), raising average income per passenger to 73 Som from 6 Som the previous year. It is also important to note that passenger income accounts for only around 13% of UTJ's receipts (q.v. freight income in table 3.4.2-5), although the figures here differ slightly from UTJ's own (see Chapter 6).

Table 3.4.2-11 UTJ Passenger Revenues

Description	Unit	1994	1995	Forecast 1996	Q1 1996
	(1)				
Passenger Revenue	Som x 10^6	137	1052	951	238

Source: Ministry of Transport and Communications, Republic of Uzbekistan

Notes: (1) Current prices. These differ slightly from UTJ's own figures.

(17) The passenger business is cross-subsidised by the freight business. The likelihood that this arrangement will cease poses particular problems for UTJ's management. They are reluctant to increase tariffs (even if the Government were to permit it), and they would like to explore the possibility of contributions either from the Government (by means of direct subsidy or changes in the taxation regime), or else from other indirect beneficiaries such as employing enterprises whose staff need the railway to commute to and from their place of work. Local Government may also be targeted for contributions.

(18) Some of the investments referred to under the freight sector will, of course, also benefit the passenger business. Developments specific to the passenger business are known to be the construction of a new passenger coach repair workshop, with aid from the Japanese OECF, construction of a new passenger terminal at Kokand, and extension of the computerised ticketing system to all manned stations on the network by the end of 1997.

(Currently only 60% of the stations which sell tickets have automated equipment. Once the entire network is on line, not only will accurate management information be generated, but also it will permit UTJ to regulate tariffs in response to demand - by, for example, introducing premium pricing for periods of peak demand such as at weekends.)

(19) Taking UTJ as a whole, the level of investment hoped for beyond 1997 is detailed in the following table. The amounts are Soms at 1991 prices; to obtain 1996 prices it would be necessary to multiply the figures by a factor of about 50, or even 60, times.

Table 3.4.2-12 UTJ Future Investment Level Aspirations

Description	Unit	1998	1999	2000
	(1)			
UTJ Funds -- Electrification	Som x 10^6	108	150	128
UTJ Funds – Other	Som x 10^6	35	40	43
State Funds	Som x 10^6	625	705	795
Total	Som x 10^6	768	895	966

Source: UTJ

Notes: (1) 1991 prices.

CHAPTER 4 DEVELOPMENT PLAN

4.1 DEVELOPMENT PLAN OF UTJ

4.1.1 New line construction

UTJ has three lines which penetrate foreigen countries, the first one runs to Aral region via Turkmenistan, the second to Termez • Kunkurgan region via Turkmenistan also, and the third one to Fergana region via Tudzikistan. Payment of foreign currency is necessary by UTJ, because these three lines run in foreign countries. Construction of three lines which run only in respective domestic region without any running in foreign territories were planned in three regions. For the tow lines other than that in Fergana region, budgetary measures were taken aiming at their completion in 2000.

As for the line in Fergana region, because of construction difficulties caused by mountainous district, route selection, construction method, fund plan etc. are now under consideration. Also its completion time is not decided yet. Outline of the new line construction plans is shown in Table 4.1.1-1 and Fig 4.1.1.

Table 4.1.1-1 Outline of New Line

	1	2	3
The Section	Guzar ～ Boisun ～ Kunkragan	Navoi ～ Uchikuduk ～ Sultanuizdag～Nukus	Arigren～ Pap
Resolution	New line Construction 323(1995-8-17)	Improvement & New line construction 394(1993-8-6)	New line Construction The project ,including the sele ction of the route, con- structio n methods, possibi- lity, funds etc, were ex- amined in 1994
General planner	UTJ	Traffic Research Institute UTJ	
Sub-planner	Kazak State railway Research institute Traffic Research Institute		
Construction company	ransstroy Ministry of Energy, Ministry of Communication	State Uzbeki Transstroy Road Construction Bureau Ministry of Energy Ministry of Communication	
Construction period	1995～2000year	1995～2000year	
Founds source	State Budget 500 mil. Sum N123-1996,3,27	State Budget 650 mil. Sum N123-1996,3,27 N398-1996,11,13	
Route length	223.1Km	796.2Km(Include sections to be improved)	165.5Km
Number of station	15	33	14
Max. Gradient	9‰	9‰	12‰
Station yard length	300 m	400 m	300 m
Max. Speed	110Km/h	110Km/h	110Km/h
Gradient at station	2.5 ‰	0 ‰	2.5 ‰
Kind of track	Single	Single	Single
Train operation (Turnaround)	Freight Train 7 Passenger Train 5	Freight Train 20 Passenger Train 7	Freight Train 15 Passenger Train 5
	After completion, Uzbekistan trains Do not run in Tudjikistan Territory	After completion, Uzbekistan trains do not run in Turkmenistan territory.	After completion , Uzbekistan trains do not run in Turkmenistan territory.

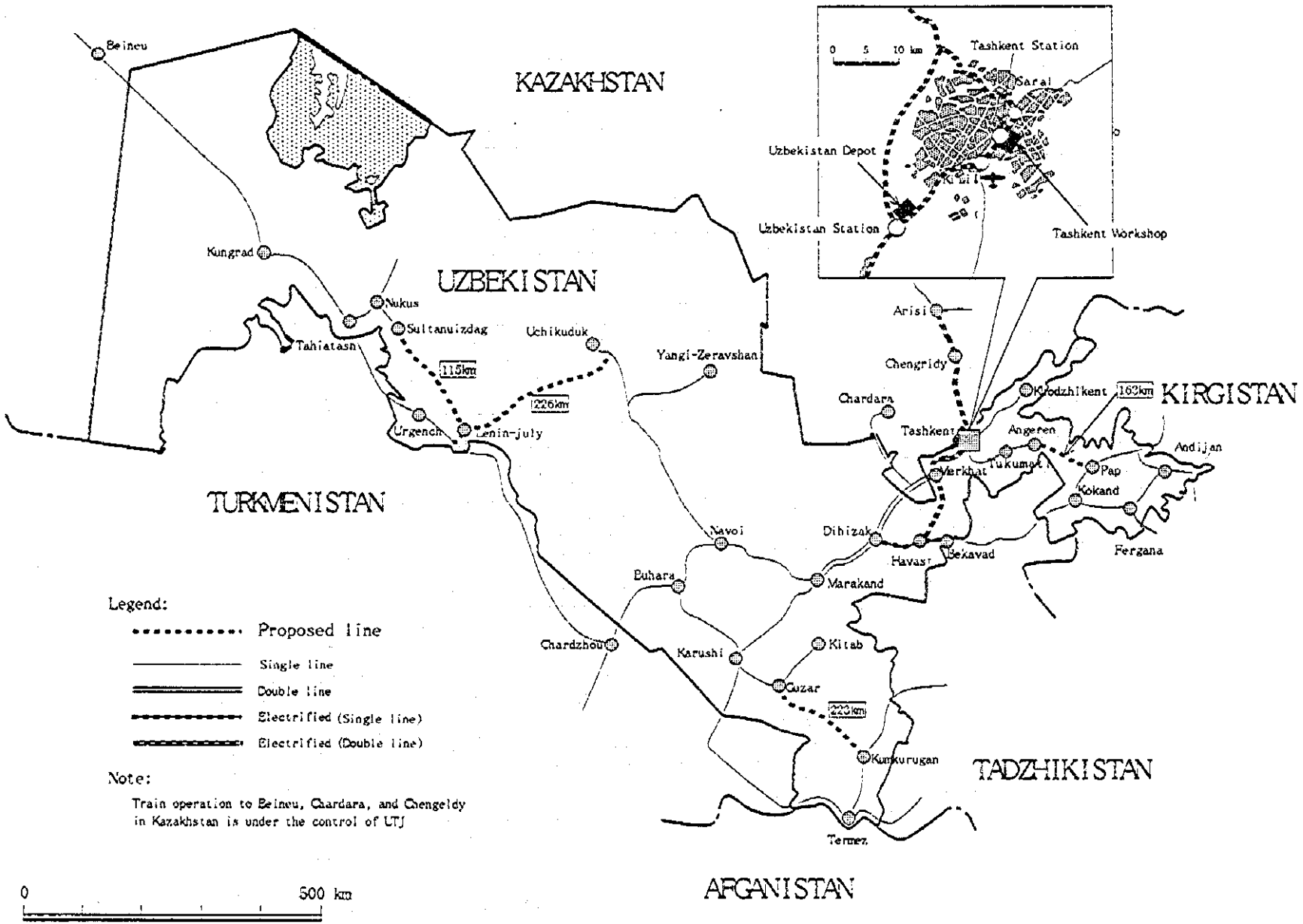


Fig.4.1.1 Outline of New Line

4.1.2 Electrification plan

(1) Electrification plan

UTJ main lines are partially electrified (9.8 % of total route length), and electric railcar trains are operated in the suburbs, also freight trains and a part of long distance passenger trains are electric locomotive hauled.

All main lines of UTJ have been decided to be electrified, for saving fuel expenditure of diesel locomotive traction. Aiming at the completion in 1997, electrification of lines between Dihizak and Marakand, Dihizak and Mehunat, Sakar and Hozikent (D.C.→A.C.) are now under construction.

Construction company are Uzbekistan National Transport Construction Association and Ministry of Energy in Uzbekistan

For the electrification, so far UTJ has expended 194 mil. Sum. for 6 years from 1991.

Moreover, lines between Marakand and Buhara, Buhara and Karshi, Karshi and Marakand are now under electrification plan.

Hereafter, for the electrification, 370 mil. US$ will be necessary for 6 years from 1997.

After the completion of electrification, all trains on electrified lines will be electric locomotive hauled (a part of suburban trains will be changed to electric railcar train), without speed up and additional train operation, for mainly change of diesel traction.

The line route between Bekabvad and Kokand is in Tudgikistan territory, and will be electrified by Tudzikstan authority and not by Uzbekistan.

Outline of electrification plans is shown in Table 4.1.2-1 and Fig.4.1.2

Table 4.1.2-1 Outline of Electrification

1) Present Operation

Section	Distance
Chengridy ~Tashkent	78.0 km
Tashkent ~Havast	151.7 km
Havast ~Dihizak	89.5 km
Havast ~Bekavad	39.7 km
Total	358.9 km

Note; Saral~Hodikent line is under construction for alteration from D.C. to A.C.,
So it is not included in present operation.

2) Under construction

Section	Distance	Period	Train Operation	Rolling Stock
Dihizak~ Marakand	130km	1997	All trains will be hauled by electric locomotives.	EL 20set=34
Dihizak ~ Mehunat	131km	1997	All freight trains & long distance passenger trains will be hauled by electric locomotives. Short distance trains will be electric railcar trains	
Saral ~ Hozikent (DC->AC)	65km	1997	All freight trains will be hauled by electric locomotives. All passenger trains will be electric railcar trains.	EL 6set =12 EC 50

3) Electrification Plan

Section	Distance	Period	Train Operation	Rolling Stock
Kizil ~ Tukumati ~ Angeren	114km	2005	All freight trains & long distance passenger trains will be hauled by electric locomotives	
Marakand ~Buhara	231km	2005	All freight trains & long distance Passenger trains will hauled by electric locomotives. Short distance trains will be electric railcar trains.	
Marakand ~Karushi	139km	2005	//	
Karushi ~ Buhara	157km	2005	//	

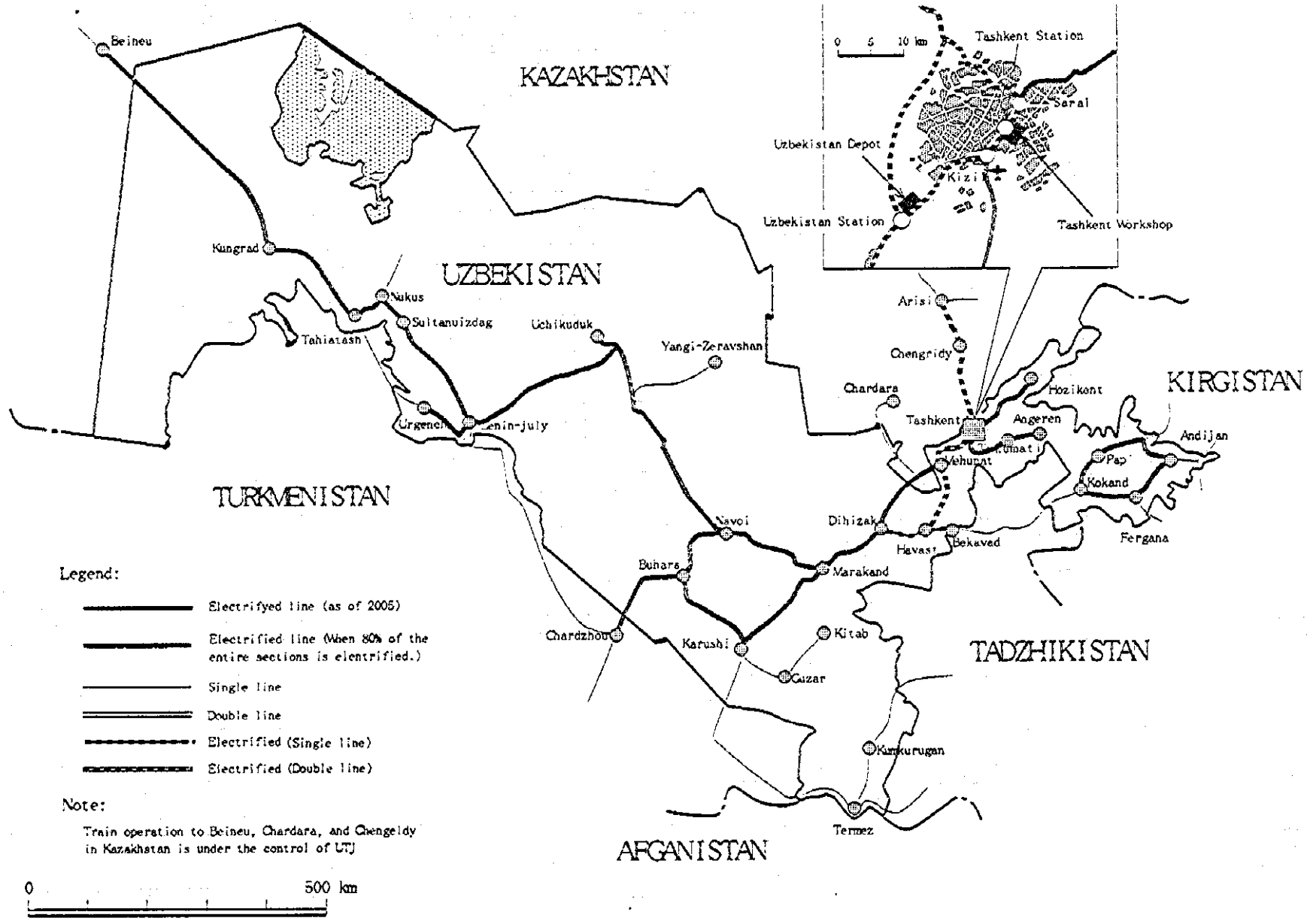


Fig.4.1.2 Outline of Electrification

(2) Review of electrification plan

Current electrified sections of UTJ main lines are Chengridy～Tashkent～Havast～Dihizak section and Havast～Bekavad one, being 358.9km and 98%of total commercial route length. In these electrified sections, electric locomotive hauled freight trains and long distance passenger trains are operated, besides electric rail-car trains are also operated in the suburbs.

UTJ has decided to electrify its main lines to save expense of diesel traction, aiming at the completion of electrification in 1997, sections of Dihizak～Marakand (130km) and Dihizak～Mehunat (131km) are now under construction for electrification , and also Salar～Hozikent (65km) section is now under construction for modification from direct current system to alternating current system.

Furthermore, electrification of sections of Kijil～Angeren (14km), Marakand ～Buhara (231km),Marakand ～Karushi (139km), and Karushi～Buhara (151km) have been commenced, aiming at the completion in 2005.

As for the above said first stage of electrification plan, fund plans, construction plans, the construction executor and train operation plans have already been fixed.

Although the second stage of electrification plan has not been decided yet, sections of Urgench ～Kungrad ～ Beineu, Kokand～Andijan, and Navoi～Uchikudak～Nukus～Beineu partially containing the new line now being constructed, are in consideration as the second stage. They would be about 2800km and 80% of the whole line in total.

Since 1991, 194 Billion Sum has been expended for the electrification of three lines to be completed in 1997. Moreover, for the electrification of four lines to be completed in 2005, about 367 billion $ will be necessary, excluding new rolling stock procurement.

Bekavad～Kokand (150.9km) rout which runs to Fergana region thorough Tazikistan territory was planned to be electrified by UTJ at the beginning, but it has been excluded from UTJ's own project because of the foreign line to be electrified by Taskistan.

It is taken for granted that the new domestic line to Fergana region being under construction planning by UTJ, leads to exception of Bekavad ～Kokand (150.9km) section from UTJ's electrification plan.

The first stage of electrification does not aim at train speed up, increase of transport capacity, improvement in train service, but mainly replacement of diesel locomotives with electric ones, for saving of fuel expenses.

It should be desirable that total merits of electrification, such as improvement of transport service by train speed up, operation rate of locomotives and rail-cars, and frequent service by short electric rail-car trains etc. will simultaneously be sufficiently utilized.

Though some difficult problems like track maintenance would occur, modification of short direct current section to alternate current system, would be effective as a measure which realize the merit of train through operation, like decrease of replacing time of rolling stock for the different electric system, and improvement in train operation rate by rolling stock common operation etc., and moreover, train operation plan which would be effective for recovery of the investment should be examined.

The completion time of electrification, procurement and operation time of rolling stock should be matched, though the time schedule would be unavoidable to be late from fund conditions and so on.

As for after the second stage of electrification, the investing money amount and its recovery should be sufficiently examined on the necessity of electrification of non-frequent train operation sections.

4.1.3 Rolling stock procurement plan

The realization of the following rolling stock procurement plan by foreign loan is desired.

	Number	mil .US$
Electric railcar	M(12),T(6)	9～10
Electric locomotive VL65(1 section)	10 sections	20
Electric locomotive (GEC Alsthom)(2 sections)	20～24 sections	25
Spare parts		10～15

4.1.4 Foundry shop and related shops reconstruction plan of Tashkent Workshop

In order to cope with the environmental problem possibly caused by foundry shop and related shops of Tashkent Workshop located in city center, the shop reconstruction is planned as follows. The early realization of this reconstruction plan by foreign loan is being desired.

(1) Translocation of Foundry shop including non-ferrous work ;32.4 mil.US$

(2) Translocation of Steel casting shop and close down of its stock yard for mixed material of ore and solvent. ;46.5 mil.US$

(3) Translocation of Foundry shop and Steel casting shop ; 60.o mil.US$

4.1.5 Rolling stork repair workshop construction plan

(1) Passenger coach repair workshop. (68 mil. US$)
Thanks to the OECF loan, the construction work is going to start

(2) Electric locomotive and railcar repair workshop
(Foreign currency 25～30 mil.US$)
It is now under feasibility study by the JICA. Foreign loan for the construction is desired.

(3) Other than the above, the construction of the following three workshops to repair freight wagons by foreign loan is desired.

1) Tank wagon repair workshop near Buhara, along with procurement of 500 tank wagons (80 mil. US$)

2) Repair workshop for covered, open and flat wagons at Andijan, along with procurement of 500 wagons. (80 mil. US$)

3) Repair workshop for hopper wagon at Havast, along with procurement of 500 hopper wagons (80 mil. US$)

4.1.6 Other important plan

Track rehabilitation project by foreign loan of 60 mil. US dollars is planned in 1998

4.1.7 Attitude of Tashkent city toward the project

Tashkent city supports the construction project for electric locomotive repair workshop. The area of 189,000 m^2 adjacent to Tashkent Workshop could be given even tomorrow. And, the workshop could continue to use this area for 100 years or more.

4.2 TASHKENT CITY DEVLOPMENT PLAN

Tashkent city has the General Development Plan 2010 which includes the following transportation fields.

(1) Establishment of joint enterprise with foreign company which manufactures and repairs street car and trolley bus.

(2) Construction of manufacturing factory of engine for automobile.

(3) Construction of manufacturing factory of modern tractor the license of American company.

(4) Manufacturing of new type airplanes, Iljushin 76MTF and Iljushin 114, designed by Russia.

CHAPTER 5 ENVIRONMENTAL ASPECTS

5.1 NATURAL CONDITION OF UZBEKISTAN

5.1.1 Geographic context

Uzbekistan is located between 37 ° and 45 ° north latitude and 56 ° and 73 ° east longitude in Central Asia, and has a total area of 447,800 km^2. Uzbekistan borders Afghanistan, Kazakstan, the Kyrgyz Republic, Tajikistan, and Turkmenistan, and is divided into 12 primary administrative units (oblasts) and, in the far western portion of the country, the semi-autonomous Republic of Karakalpakstan. Twelve oblasts are Andijan, Namangan, Fergana, Tashkent, Syrdarya, Dihizak, Navoi, Samarkand, Kashkadarya, Surkhandarya, Buhara, and Khorezm (Fig.1of Appendix 5-1).

5.1.2 Topographic conditions

Uzbekistan is mostly flat-to-rolling sandy desert with broad, flat, intensely irrigated river valleys along the courses of the two major rivers, the Amu Darya and the Syr Darya. The largest Central Asian desert, the Kyzlkum, covers the major part of the lowlands of the west. The Tien-Shan and Gissar foothills and spurs stretch from the east to south, and the inter-mountain valleys lie between them. Uzbekistan is landlocked but borders the Aral Sea in the west (Fig.2 of Appendix 5-1).

5.1.3 Meteorological condition

Uzbekistan is situated in the center of the Eurasian continent, far from seas and oceans. More than 85 percent of the territory of Uzbekistan consists of desert and semi-desert. The main factor affecting climate in the area is the considerable influx of solar radiation. Because of the interaction of three factors --- solar radiation, general atmospheric circulation, and topographic relief --- the climate of Uzbekistan is continental with large diurnal and seasonal variations in temperature.

There are three main climatic zones in Uzbekistan: deserts and dry steppes, foothills and mountains:

(1) Deserts and dry steppes

Nearly all of the plains territory of Uzbekistan are within the desert and steppe zones less than 400 m above sea level. Average precipitation occurs in March and April, while August and September are months of minimum rainfall. Winter snowfall is usually 2 to 11 cm. The frost-free period lasts 190 to 200 days per year. The growing season begins in early March in the south of the country, and in late March or early April in the north. Summers on the steppes and deserts are long, hot, cloudless, and dry. The hottest months are July and August.

(2) Foothills

The foothill zones surrounding the Tien-Shan mountains range from 300 to 1,000 m

above sea level. Annual precipitation in the foothill zone reaches about 400 mm. As in the deserts and steppes, rainfall is at maximum in March and April and at a minimum in August and September.

The frost-free period normally ranges from 210 to 240 days per year.

(3) Mountains

The mountainous climate zones range between 1,000 to 4,000 m above sea level. Precipitation in these zones occurs year-round but is greatest in May and June. In some mountainous regions average annual precipitation is above 800 mm. In some years, the western slopes of the Tien-Shan mountains can receive as much as 2,000 mm of precipitation. Snowfall is about 500 cm per year, and mountain passes are usually closed from September to May. There are areas at elevations of 3,500 to 4,000 m where the snow-cover lasts year round.

5.1.4 Hydrological condition

(1) Network of rivers and streams

Nearly all of the surface water of Uzbekistan is found in the drainage basins of the two important rivers of the region: the Amu Darya and Syr Darya. Both these rivers traverse international boundaries.

The upper watershed of the Amu Darya is situated mainly in Tajikistan, and there are a few tributaries in the northwestern part of Afghanistan. Downstream, the Amu Darya crosses the territories of Uzbekistan and Turkmenistan. The upper basin of the Syr Darya is mainly in the Kyrgyz Republic, from where the river flows through the territories of Tajikistan and Uzbekistan, and in the lower reach passes through Kazakstan. Within Uzbekistan, the Amu Darya and its tributaries pass through the oblasts of Surkhandarya, Samarkand, Buhara, Navoi, Kashkadarya, Khorezm and the Karakalpakstan Republic. The Syr Darya and its tributaries pass through Andijan, Namangan, Fergana, Djizak and Tashkent. Both the Syr Darya and Amu Darya terminate in the Aral Sea.

Most of the flow in these rivers is generated in their headwaters. The mean annual flow of the Amu Darya is about 75 km^3, and that of the Syr Darya about 35 km^3, for a total annual runoff of 110 to 120 km^3.

(2) Dams and control structures

The Amu Darya and Syr Darya Basins have approximately 30 major tributaries. More than 20 large and middle-sized reservoirs and 60 canals of different sizes have been constructed in the two basins since the 1950s. The main purpose of these facilities is to serve irrigated agriculture. As a result of this construction, the region's water system is one of the most complicated in the world.

(3) Aral Sea

The Aral Sea was once the fourth-largest lake in the world with surface area of 66,000 km^2 and a volume of 1,000 km^3. The average annual evaporation from the surface of the sea was approximately 60 km^3, which balanced the annual inflow from the Amu Darya and Syr Darya Rivers, groundwater inflow and precipitation.

To supply water for irrigation, numerous irrigation projects were constructed to divert water along the Amu Darya and Syr Darya in Turkmenistan, Uzbekistan and Kazakstan. This reduced flows into the Aral Sea from 50 to 70 km^3 per year to no more than 20 km^3 per year at present, even in the most favorable years. Currently, water loss through evaporation from the lake is 33 to 36 km^3 per year. As a result, the Aral Sea has shrunk to about half its former size, splitting the sea into two parts; the "Little Aral" in the north, fed by the Syr Darya, and the "Big Aral" in the south, fed by the Amu Darya.

(4) Groundwater

Uzbekistan has 94 aquifers, some of which are shared with one or more Central Asian Republics. These shared aquifers create the potential conflicts in the use of groundwater resources. Conflicts are usually caused by :

- Lack of proper groundwater accounting and registration of installed pumps;
- Lack of proper groundwater assessments in design studies and failure to protect other groundwater users when new users begin operation;
- Absence of limits on groundwater withdrawal, especially in dry years when over-extraction affects aquifers in neighboring states or has an effect on trans-boundary rivers; and
- Lack of international agreements to effectively manage shared groundwater resources.

According to experts at the State Committee for Nature Protection, Uzbekistan has potential groundwater reserves estimated to be 50.6 million m^3/day. The quantity of approved reserves --- in other words, the quantity of water that can be safely extracted without jeopardizing the potential yield of the aquifer --- is 20.5 million m^3/day (Table 1 of Appendix 5-1).

5.1.5 Biological resources

Uzbekistan has 630 vertebrates: 99 mammal species, more than 410 species of birds, 57 reptile species, 3 amphibians, and 79 fish species. The 1984 Red Book features 22 species of mammals, 31 species of birds, 5 species and subspecies of reptiles and 5 fish species. Uzbekistan was estimated to contain 4,000 species of higher plants, of which 400 species are identified as rare and disappearing.

5.2 ENVIRONMENTAL REGULATION OF UZBEKISTAN

5.2.1 Legislation

In the short time since independence, Uzbekistan has enacted several laws to address environmental problems and others that affect management of natural resources. These laws are:

(1) On the State and Sanitary Control - 1992;

(2) On Environment Protection - 1992;

(3) On Water and Water Use - 1993;

(4) On Land - 1990, revised in 1991, 1993, 1994, 1995;

(5) On Specially Protected Natural Area - 1993;

(6) On Air Protection - 1981, revised in 1994;

(7) On Protection and Use of Wild Life - 1991, revised in 1993;

(8) Decision Oliy Majalisa (Parliament) of the Republic of Uzbekistan(RU) "On Confirmation of State Committee of the RU on Natural Protection" - No.232-1, 1996;

(9) Decision of the Council of Ministers of the RU "On Implementation Payment System for Exceeding of Disposal Norms of Pollutant in Nature and Waste Placing" - No. 303, 1992;

(10) Decision of the Cabinet of Ministers of the RU "On Confirmation of Degree on Nature Protection Funds" - No.246, 1993;

(11) Decision of the Cabinet of Ministers of the RU "On Hunting and Carrying Out Hunting and Fishing Activities on the Territory of the RU" - No.906, 1991;

(12) Decision of the Cabinet of Ministers of the RU "On Measure for Strengthening the Protection of Wild Life and Flora and Fauna and Use Management" No.600, 1993, revised in 1995; and

(13) Decision of the Council of Ministers of the RU and Rates for Calculation of the Amount for Damage done to the Forest Community by Enterprises, Institutions, Organizations and Citizens Harvesting Wild Fruits, Berries, Medicinal Plants, and Raw-Materials without Permission" - No.104, 1987, revised in 1995.

5.2.2 Environmental standards

(1) Water

Water quality standards in Uzbekistan are specified in terms of the maximum permissible concentration (MPC) allowable for any given pollutant. Different standards apply to water for drinking water supply and fisheries. Table 2 of Appendix 5-1 contains a partial list of these standards.

(2) Wastewater

Water quality standard for the discharge to municipal sewage systems in Uzbekistan is specified in terms of MPC allowable for any given pollutant. Table 3 of Appendix 5-1 contains a partial list to these standard.

(3) Air

Limited permissible concentration (LPC) in Item 8 of the USSR decree on the atmospheric air protection (approved 22nd August, 1984) is used as air quality standards in Uzbekistan. Table 4 of Appendix 5-1 contains a partial list of LPC.

5.2.3 Institutions responsible for environment

The chief agency responsible for environmental protection is the State Committee for Nature Protection (Goskompriroda). Among other things, this committee is responsible for ecological review of projects, monitoring and protection of air and water quality and overview of water resource use, formulation and enforcement of environmental law, and monitoring the disposal of solid wastes. The committee maintains regional offices in each oblast.

The Nature Protection Committee collects fees for resource use, and changes for permitted levels of wastes and fines for pollution offenses at the oblast levels. Moneys generated from these sources go to the Nature Protection Fund, and are used to support costs of environmental protection activities; 75 percent of the collected moneys is used at the oblast level on local project ; and 25 percent is sent to the national level fund for use on special projects (e.g., redistributed back to the oblasts for special projects, or used to address regional national level projects). A national level Board, which is comprised of members from the Goskompriroda as well as several other state agencies, meets twice a year to decide how the funds should be spent.

5.2.4 International conventions

Uzbekistan is a signatory to important international agreements. Among these are agreements with multilateral entities, notably the United Nations, and several bilateral agreements. Uzbekistan is discussing agreements with its neighbor republics concerning water resources and the Aral Sea. Conventions subscribed and under consideration are:

(subscribed)
- Framework Convention of the United Nations on climate changes;
- Convention on biodiversity;
- Brazil Convention on control over transborder transportation and elimination of hazardous wastes:
- Vienna Convention on ozone protection;
- Montreal Protocol on substances that destroy ozone; and
- Convention on desertification control, especially in Africa.

(under consideration)
- Convention on assessment of the impact on the environment in a transborder context;
- Conventions on water-bog areas having international importance;
- Convention on transborder air pollution over long distances;
- Convention on the trade of wildlife and flora and fauna species that are about to disappear;
- Convention on protection and use of transborder flows of international lakes; and
- Convention on the transborder impact on industrial accidents.

5.3 PROTECTED AREA

Uzbekistan inherited a system of parks and protected areas from the Soviets that includes two national parks, one biosphere reserve, seven state reserves, one scientific reserve for the propagation of rare animals, one ornithological special reserve, seven special state reserves, one geological reserve and two state nature monuments. Three of the six special state reserves were established in 1992 after Uzbekistan became an independent republic.

Parks and protected areas in Tashkent oblast are:

- Chatkal: State Biosphere Reserve: 45,155 ha: Mountain ecosystem of the western Tien-Shan range. Tien-Shan brown bear, Menzbirer's marmot, wild boar, Siberian goat.
- Ugam-Chakal: National park: 574,600 ha: Mountain ecosystem of western Tien-Shan, optimal utilization of nature resources and recreation.

5.4 WATER

5.4.1 Water supply system

Approximately 31 percent of potable water supplied to communities in Uzbekistan comes from surface sources. The total design capacity of potable water supply systems is 6.8 million m^3 /day. Present use is estimated to be 6.4 million m^3 /day, with 4 million m^3 /day from groundwater and 2.4 million m^3 /day from surface water sources as shown in Table 5 of Appendix 5-1.

Tashkent City is the largest in the supply of potable water in Uzbekistan. In 1990, it accounted for one-third of the total municipal and industrial water supply capacity of the country. The fraction of population covered by potable supply systems is higher in Tashkent City (94%) than any oblast in the country, except for Syrdarya. Water supply coverage ranges from a low of 67 % (in the Republic of Karakalpakstan) to 95 % (in Syrdarya oblast).

Rates of potable water consumption in Uzbekistan are high with average daily consumption ranging between 400 and 500 l/person/day. These data include treated water that is supplied to industrial users (which accounts for about 25% of all potable water) and losses due to leakage in piping systems. Leakage losses are estimated to range 11 to 30%.

Water consumption rates are lowest in Karakalpakstan, averaging about 250 l/day, and highest in Tashkent City, at 750 l/day. This reflects the fact that few water users are metered and water charges are not based on the quantity of water used. It is estimated by the State Committee for Nature Protection that potable water use would be reduced by 15 to 20% if water meters were installed and water were priced according to quantities used.

5.4.2 Water pollution

(1) Surface water quality

The principal sources of water pollution in Uzbekistan are industry (especially mining, metallurgy and chemicals), agriculture and human settlements. There are 16 mines in the headwaters regions of Uzbekistan, including seven gold mines, two coal mines, one tungsten mine, one sulfur mine, and one quartz and four limestone quarries. There are other mines in upstream riparian countries. Many mines have associated mills, tailing storage or metallurgical facilities. Metallurgical facilities, refineries, and chemical plants around the country contribute to surface and groundwater pollution.

A wide range of pesticides and other agrochemical have been used in Uzbekistan in the past three decades, and at least 50 different pesticides are currently in use. In recent years, the quantities of pesticides used in Uzbekistan has decreased, due to a national policy to move away from class I toxic compounds in response to a growing public health concern and due to economic difficulties since independence.

Numerous cities in Uzbekistan provide only partial treatment of domestic sewage. Untreated and incompletely treated sewage is often discharged into surface waters, carrying large biological oxygen-demanding (BOD) loading, nutrients and pathogens.

Water quality of surface streams is monitored for a wide range of substances. The most common pollution problems are associated with salinity, metals, nitrogen and phosphorous nutrients, oil products, and biodegradable compounds. Numerous rivers in Uzbekistan have seriously polluted. The State Committee for Nature Protection has identified these, among which are the Chirchik and Akhangran Rivers and their related watersheds within the Syr Darya Basin, and the Zerafshan River and other tributaries of the Amu Darya. Highly polluted rivers in Tashkent oblast are shown in Table 6 of Appendix 5-1 with their pollution sources, and pollutants.

Much of the pollution in the surface waters of Uzbekistan originates in other countries, and both the Syr Darya and Amu Darya rivers also carry numerous types and quantities of pollutants when they leave Uzbekistan and enter downstream countries. Pollutants in the flows of the Syr Darya and Amu Darya were deposited in the Aral Sea. Surface water quality is, therefore, very much an international issue among the Central Asian Republics.

(2) Groundwater quality

Groundwater is highly polluted from industrial sources, especially mine tailings and industrial waste storage and improper solid and hazardous waste disposal, as well as from agricultural chemicals. Salinity, hardness, and concentrations of heavy metals, pesticides, nitrates and other substances are increasing. Only 65 percent of total approved groundwater reserves meet drinking water standards.

The basins with the worst groundwater pollution problems are the valleys of the Chirchik, Akhangran, and Zerafshan Rivers and Fergana Valley. Table 7 of Appendix 5-1 summarizes the pollution problems in Tashkent oblast, including major pollution sources and the pollutants involved. The groundwater pollution problems in these areas mirror surface water pollution with respect to many types of pollutants and their industrial and agricultural sources.

5.5 WASTEWATER

As shown in Table 8 and Table 9 of Appendix 5-1, each of more than 280 municipalities and enterprises in Uzbekistan produces in excess of 100,000 m^3 of wastewater per year. In addition to municipal wastewater treatment plants, enterprises producing wastewater are the food processing, construction and transportation industries. Several mining, machine building, metal working enterprises also produce amounts of wastewater. Nearly 40 % of all large wastewater producers are in Tashkent oblast or Tashkent City.

In 1990, the capacity of all wastewater treatment plants in Uzbekistan amounting to about 3.5 million m^3/day, with the treatment capacity of Tashkent City accounting for 48% of this total. Overall, the capacity of the potable water supply systems in Uzbekistan are about double that of the wastewater treatment systems. Only the oblasts of Navoi, Fergana, and Tashkent had wastewater treatment capacities in 1990 that exceeded 50% of potable water supply capacities.

Some municipal wastewater treatment systems have a design capacity that exceeds current actual operations by a comfortable margin. Others are operation at or beyond their design capacity, including the plants. Wastewater treatment plants that are forced to operate in an overloaded state typically function poorly, achieve ineffective levels of treatment, and thus provide a continued pollution threat to receiving waters. Fines for discharge of pollutants in Uzbekistan are shown in Table 10 of Appendix 5-1.

5.6 AIR

5..6.1 Energy and power

Uzbekistan possesses substantial reserves of fossil fuels (Table 11 of Appendix 5-1) and products enough to satisfy its own demands and to export to neighboring countries. In the regions of Syrdarya,, Navoi, Tashkent, Fergana and so on, thermal power stations are used to generate electrical energy. These stations use mainly natural gas, but some can also burn oil and coal mined in Uzbekistan.

Approximately 30% of total industrial emissions into the atmosphere of Uzbekistan are produced by thermal power stations. None of thermal power stations in Uzbekistan is equipped with sulfur dioxide removal units. Only some use technologies that reduce emission of nitrogen oxides. Ashes collection is not efficient, and collected ashes are not reused. Most thermal power stations in the country do not meet environmental norms and require modification of removal technologies. Investment activity in this regard is poor.

The main environmental concerns in the energy industry are purification of sulfur dioxide, particulate, and nitrogen oxides from waste gases; utilization of ashes; and reduction of thermal pollution of receiving waters.

Since independence, Uzbekistan has come to rely much more on the production of oil and gas condensate as well as natural gas, and has reduced its extraction and use of coal. Since 1991 extraction of oil and gas condensate has more than doubled, natural gas extraction has increased by 16 %, and coal extraction has declined by nearly 50 %.

5.6.2 Air pollution

Air pollution in Uzbekistan is caused principally by industrial activities associated with chemical and metallurgical industries, automobile traffic in the larger cities, and the burning of fossil fuels for the generation of electrical energy and the system of centrally supplied heat and hot water. Data describing emissions caused by some of these activities are available for certain locations in Uzbekistan; estimates for total emissions for Tashkent city, Tashkent oblast and Uzbekistan are also available (Table 12 of Appendix 5-1).

Heating, hot water, and electrical power are supplied by central facilities in Tashkent, Angren, Dihizak, Navoi, Fergana, and a few others. All facilities used for these purposes are thermal plants, and are capable of burning coal, gas, or a heavy oil called mazut. These fuels produce different amounts of atmospheric pollutants and have different air pollution control technologies, which themselves have different operational costs. The economic changes that have occurred in Uzbekistan in recent years have had an effect on relative energy prices and pollution control costs. Virtually all significant users of fossil fuels in Uzbekistan have sought ways to respond to these price changes, causing shifts in both the total amount and mix of fossil fuels consumed, as well as the quantities of pollutants produced.

Fossil fuel use has declined since independence, and resulting emission from fuel plants have also declined. For example, the heating and power plants serving the city of Tashkent show a reduction in total fuel consumption and significant declines in SO_2 and NO.

Emission in Tashkent City have been steadily declining for the major air pollutants (Table 13 of Appendix 5-1).

5.7 WASTE

5.7.1 Industrial pollution control and hazardous waste management

Approximately 1.5 km^3 of liquid industrial and municipal waste and more than 100 million tons of solid waste are generated in Uzbekistan each year, according to the State Committee for Nature Protection.

5.7.2 Municipal solid wastes

More than 230 domestic and suburban solid waste sites in Uzbekistan store about 30 million m^3 of municipal waste. Sometimes, industrial waste as well as construction waste are also placed in these municipal sites. According to State Committee for Nature Protection, the construction and operation of these sites are usually improperly done, and sanitary regulations and ecological requirements of storing and treating wastes are not observed. This situation is made worse by the unavailability of special equipment for collecting, transporting and processing municipal wastes, as well as monitoring waste disposal sites.

In Tashkent City, approximately 1.5 million tons of municipal wastes are collected each year. Municipal wastes collected in Tashkent City were transported to one of two

sites that serve a waste processing factory outside the city. At present, preliminary sorting of municipal wastes is not well organized, and the Tashkent waste processing factory --- built in 1977 with a capacity of 420,000 m^3 /year and retrofitted in 1991 with biological processing techniques but without thermo-processing required by technology --- is shut down. Information on the municipal waste situation at other cities in Uzbekistan is not readily available.

Despite the fact that the waste-processing facilities in Tashkent are not functioning properly (or at all), some materials are recycled elsewhere. A plant in Tashkent recycles paper collected mainly by elderly people in return for items such as soap and shampoo. In Angren, plant produces recycled cardboard products of poor quality. Two separate plants in Tashkent recycle aluminum and glass.

(From 5.1 to 5.7, "An Environmental Profile of the Republic of Uzbekistan (by Mac McKee and Molly Curtin, 1996, DAI, Tashkent)" is a main reference)

5.8 TASHKENT WORKSHOP

5.8.1 Water supply

At present, the Tashkent Workshop is provided water from two artesian well #1 and #2 which are located in the territory of the Tashkent Workshop. Each well is equipped with pump ATH-10, with pumping rate of 85 m^3/hour. Allowed 100% capacity of pumping from two wells is 4,892 m^3/day (1,094,000 m^3/year), and actual water intake from two wells is 3,553 m^3/day (945,000 m^3/year) (in Table 1 of Appendix 5-2). Furthermore, allowed water supply from municipal water supply system is 567 m^3/day (153,000 m^3/year) and actual water intake from municipal water supply system is 236 m^3/day (86,000 m^3/year) (in Table 1 of Appendix 5-2).

The water from wells and municipal water supply system goes into industrial, domestic and fire extinguishing water pipelines. From these networks, water reaches to its consumers, listed in Table 2 of Appendix 5-2.

5.8.2 Wastewater

The breakdown of wastewater which goes to municipal sewage system (3,737 m^3/day, 937,000 m^3/year) is shown in Table 3 of Appendix 5-2 and these contents are:

- Industrial wastewater (579 m^3/day) goes to the treatment facility to reduce the oil content from wastewater. And the treated wastewater goes to municipal sewage system. Recovery of oil products is 60 tons/year.
- Comparatively clean industrial wastewater after cooling of equipment (2590 m^3/day) directly goes to the municipal sewage system.
- Domestic (fecal) wastewater (567 m^3/day) goes to municipal sewage system.

The existing treatment facility were constructed in 1959, and then were repaired and a biological treatment facility was removed. The full capacity is 730 m^3/day, and actual

treated rate is 579 m^3/day. But the quality of treated water is not required for discharging into the municipal sewage system. Proposed waste-water treatment facilities are under way.

5.8.3 Air pollution

Tashkent Repair Workshop has 372 sources of pollutants. The maximum allowable rates for the Tashkent Workshop are approved by the State Committee on Nature Protection in 1992.

The allowed annual emission of pollutants into atmosphere are 1286.6 tons per year. The permit is valid till August 27th 1997.

Total emission into air at Tashkent Workshop (indicated on a notice board of Tashkent Workshop) are:

year	total emission (tons)	year	total emission (tons)
1990	3347	1993	1463
1991	3214	1994	564.3
1992	2177	1995	672

Emission of each pollutant into air at Tashkent Workshop is shown in Table 4 of Appendix 5-2. Data of 1993 are actual values, but there is discrepancy between above data and those in Table 4 of Appendix 5-2. Data of year 2000 and year 2005 are prospect and suggested allowable values, respectively. Considering data in Table 4 of Appendix 5-2, suspended solid, nitrogen oxides, carbon monoxide should be drastically reduced in future.

Emission of pollutant from each work place of diesel locomotive work shop, foundry factory and so on in 1992 and in 2000(prospect) is shown in Table 5 to Table 8 of Appendix 5-2.

Steel casting shop, foundry shop, power plant room and engine testing room mainly emit pollutants.

5.8.4 Waste

The solid waste collection is regulated by an "Instruction on procedure for collection, storage and transfer for final disposal of industrial waste for Tashkent Repair Workshop". Wastes from Tashkent Repair Workshop are shown in Table 9 of Appendix 5-2 by kind.

The waste of ferrous and non-ferrous metals is used for the needs for the Tashkent Repair Workshop and transferred to the reproducing plant. The oil and grease waste are sent to the oil products storage base (oil base). The glass waste are sent to glass factory. Non-ferrous metal slag is sent to the other reproduction plant. Small pieces of wood and cloth are sold to public. Construction waste, burned soil and slag from ferrous metals production are all sent to municipal waste dump site for domestic solid waste site.

The cost for disposal of 1 ton waste is 1,645 sum. Details are:

- transportation	130 sum
- coupon for disposal	105 sum
- load and unload cost	1,410 sum
- total	1,645 sum

5.9 UZBEKISTAN DEPOT

5.9.1 Water supply

At present, the Uzbekistan Depot is provided with water from two artesian wells #4 and #5 which are located in the territory of the Depot and which are in the list of Tashkent Distantsiya (water supply system and sanitary technical units of Uzbekistan Railway).

The well #4 is equipped with pump ÝÖÂ 8-36-107, with pumping rate of 36 m^3/hour, with 24 hours/day schedule. The water production is 864 m^3/day; 315,400 m^3/year. The well #5 is equipped with pump ÝÖÂ10-63-65 with pumping rate 63 m^3/hour, 1512 m^3/day and 551,900 m^3/year.

The water from well goes into industrial, drinking, and fire extinguishing water pipelines. From this network, water reached to its consumers, listed in Tables 1 and 2 of Appendix 5-3. In accordance with permission on special water consumption #453, issued 18/02/1992, the intake of water is allowed no more than 1118.1 m^3/day (408,000 m^3/year).

After completing of construction and introduction into practice of new shops, the water consumption at the Depot will increase significantly and it will not match, and two existing well cannot fully provide water for the needs of new line of locomotive facility. Calculated demand for already introduced facilities is 1443.5 m^3/day (527,000 m^3/year).

5.9.2 Wastewater

The wastewater of Uzbekistan Depot comes from water use for industrial needs and for domestic needs. After processes of local treatment facilities for industrial wastewater containing oil products, treated wastewater goes into the municipal sewage system in the volume of 5.52 m^3/hour (maximum), 132.6 m^3/day or 48,400 m^3/year. Other wastewater directly enters into the municipal sewage system. Because of low performance of this local treatment facility, a new wastewater treatment facility is constructed.

The new sewage system, which will begin to be operated in 1997, is as follows;

- industrial wastewater with oil products flow to pumping station from which it is pumped to the local treatment facility (oil trap), production rate is 10 l/sec, then to the reservoir (capacity 50 m^3).
- after that water is pumped to the flotation unit, treated wastewater goes into municipal sewage system.
- oil products from oil trap and flotation unit are sent to oil-collecting well for utilization (storage).

5.9.3 Air pollution

As a result of work on the territory of the Uzbekistan Depot, 101 sources of emission was found in Table 3 of Appendix 5-3).

At present, TP-3 shop is constructed, but some sections are not operating, the reconstruction of TP-1 and TO-3, and boiler rooms are under way (in Table 4 of Appendix 5-3).

The main working operations in the Uzbekistan Depot that cause significant emission into atmosphere are:

- Wood-working. The works are carried out in wood-working shop. Wood dust comes into atmosphere at 13.85 tons/year (7% of the total emission of the Depot). The shop equipped with ventilation system which is connected to cyclones of Gidrodrevroma. Only 3 machines out of existing 6 are lined to this system. The calculations showed that wood dust exceeds MPE (Maximum permitted emission) by 43.8 times.

- Metal-working. Metal-working equipment is installed in all industrial shops and sections. Most of tool-grinding machines are equipped with gas-treatment equipment of "ÝÈË-900" with effectiveness of treatment of 95% which allowed to decrease the emission into the atmosphere of abrasive metal dust to 0.844 tons/year.

- Welding. It is represented by gas welding, gas cutting , electric welding, semi-automatic welding. Welding works are conducted in special rooms as well as on posts/ sections on the whole territory of the Uzbekistan Depot. Pollutants are oxide of manganese, oxide of iron and nitrogen oxides.

- Painting. On the territory of the Uzbekistan Depot there are a few sections for painting: electric engine painting section, polymeric materials painting section, automatic coupling and parts painting section. Only the electric engine painting section is equipped with ventilation. In this case xylene and white-spirit exceed MPE in the Depot: xylene by 31.9 times; white-spirit by 7.38 times.

- Production of concrete blocks, and sand drying. The emission of sand dust into atmosphere is 55.6 tons/year which is 31.4 % of total emission, and that of broken rocks is 27.38 tons/year which is 13.8 % of total emission.

- Polymer section: Its input into total pollutant emission is not big, but calculations showed the excess from MPE for phenol by 13.3 times.

- Babbit section: In the babbit section the excess for inorganic dust is produced by 26.5 times as a result of grinding of bearings.

- Rheostat section of shunting locomotives tests also gives excess by all components, coming into the atmosphere during its working operations: CO by 3.6 times, nitrogen oxides by 539.3 times, volatile hydrocarbons by 10.2 times, ash (organic dust) by 63.7 times.

All above mentioned shops and sections are environmentally hazardous. As for other sections, their emission are below or close to the MPE.

5.9.4 Waste management

The detail of waste management was not obtained form the Uzbekistan Depot. The majority of solid wastes is buried in the territory of the Uzbekistan Depot.

5.9.5 Working environment

(1) Noise

Noise levels in the working place for the Uzbekistan Depot are shown in Table 5 of Appendix 5-3. Noise levels and octave lines are expressed in dB and in Hz, respectively. Maximum allowable levels of each octave line and A weighting are:

107 dB for 32 Hz, 95 dB for 63 Hz, 87 dB for 125 Hz, 82 dB for 250 Hz, 78 dB for 500 Hz, 75 dB for 1,000 Hz, 73 dB for 2,000 Hz, 71 dB for 4,000 Hz, 69 dB for 8,000 Hz and 80 dB for A weighting.

Noise levels exceed the maximum allowable levels in the following work places:

- TP-1 shop --- pneumatic press for rubber and plastics, equipment test stand, whetting machine, during shunting locomotive working
- Tool room including testing grinding machine
- Machine shop --- planing machine, tool grinding machine, lathe, mechanic scissors
- Compressor repair shop --- compressor test
- TP3 shop --- bogie assembling section
- Shop for automatic coupling repair sets
- Electric equipment shop --- tool grinding machine
- Electric machine shop --- planing machine, surface marking machine, circular saw, rocking type saw

(2) Inside air pollution

Inside air pollutants were measured under 100% capacity of equipment for Uzbekistan Depot. Results are shown in Table 6 of Appendix 5-3. The maximum concentration of pollutants in work place are:

Carbon monoxide --- 20 mg/m^3; nitrogen dioxide --- 2 mg/m^3; welding aerosol 4 mg/m^3; aerosol of manganese --- 0.2 mg/m^3; chromium anhydride --- 0.01 mg/m^3; metal dust 6 mg/m^3; aerosol of lead --- 0.01 mg/m^3; wood dust --- 6 mg/m^3; sulfur anhydride 10 mg/m^3; hydrochloric acid --- 5 mg/m^3; acrolein --- 0.2 mg/m^3.

Air pollutants in some work places exceed the maximum allowable concentration:

- Carbon monoxide --- work place and in the middle of automatic coupling repair section
- Nitrogen dioxide --- work place and in the middle of automatic coupling repair section
- Welding aerosol --- work place and in the middle of automatic coupling repair section
- Lead aerosol --- boring of lead plain bearings and boring of bronze parts(in mechanic shop), melting furnace for babbit pigs and bearing boring (in calcium casting section)
- Metal dust --- boring of lead plain bearing (in mechanic shop), grinding by manual grinding machine (in automatic coupling repair section)

- Chromium anhydride --- work place and in the middle of automatic coupling repair section
- Abrasive dust --- tool grinding machine (in mechanic shop and tool shop)
- Wood dust --- lathe, marking machine and circular saw (in electric machine shop)

CHAPTER 6 CURRENT CONDITION OF U T J

6.1 PROLOGUE

Uzbekistan is a young country. In the overwhelmingly torrential collapse of Socialism in 1980s, many new countries were born in former USSR. Uzbekinstan is one of them and was born on the day of September 1st, 1991. Uzbekistan and its people have been struggling with making new systems in the new country, and the effort is on the way. The nation and its people must always consider old and new, in everything. The rail of Uzbekistan is all the same with other cases in Uzbekistan. People of Uzbekistan has experienced the change of nation. The rail of Uzbekistan has experienced the three changes, i. e., from National Rail of USSR to Uzbekistan Railways via Central Asian Railways. Here the relation between the nation and the rail shall be explained briefly.

6.1.1 History of U T J

(1) From Soviet Railway Organization (SZD) to Central Asian Railway (CAR)

With the break up of USSR(Dec.,1991), the Soviet Railway Organization was broken up in Feb. 1992, and CIS (Commonwealth of Independent States) and CAR (Central Asian Railway) were born respectively. CIS maintained the CAR as a complete unit. But CAR was a little bit different from the former SZD concerning its property or assets. CAR operated the rail having organization and rolling stocks but without immovable properties. Immovable properties belonged to corresponding countries. CAR administered the railways of Uzbekistan, Turkimenistan, Tajikistan, Kyrgistan (a part), and Kazakhstan (a part; the territory of Alma-Ata division).

(2) Gradual withdrawal of each nation from CAR

The wave of independence washed the organization of CAR, and each component (nation) began withdrawal from CAR and became independent. From 1991 to 1994 Kazakhstan, Turkimenistan, Kyrgistan, Tajikistan, departed CAR and only Uzbekistan is remained.

(3) The birth of Uzbekistan Railways (UTJ = Uzbekistan Temir Jullary)

Nov. 7th, 1994, The Presidential Act (President Karimov) was published and CAR was converted to UTJ. Its organization, function, etc. were clarified by the government and it became under control of the Ministry of Transport & Communication by the another Presidential Act on Nov. 14th, 1994.

6.1.2 Rules and regulations of U T J

(1) What is UTJ

UTJ is a state owned company and this system is prepared only when it came to July 7th, 1995. Till then the rules and regulations of UTJ hadn't been prepared. UTJ is a joint-stock

company, whose stock should be shared by the state (51%) and the UTJ itself(including companies under control of UTJ, 49 %). But the stocks haven't been issued yet

(2) Relationship between the state and UTJ

The governmental organization relating to UTJ is as follows.

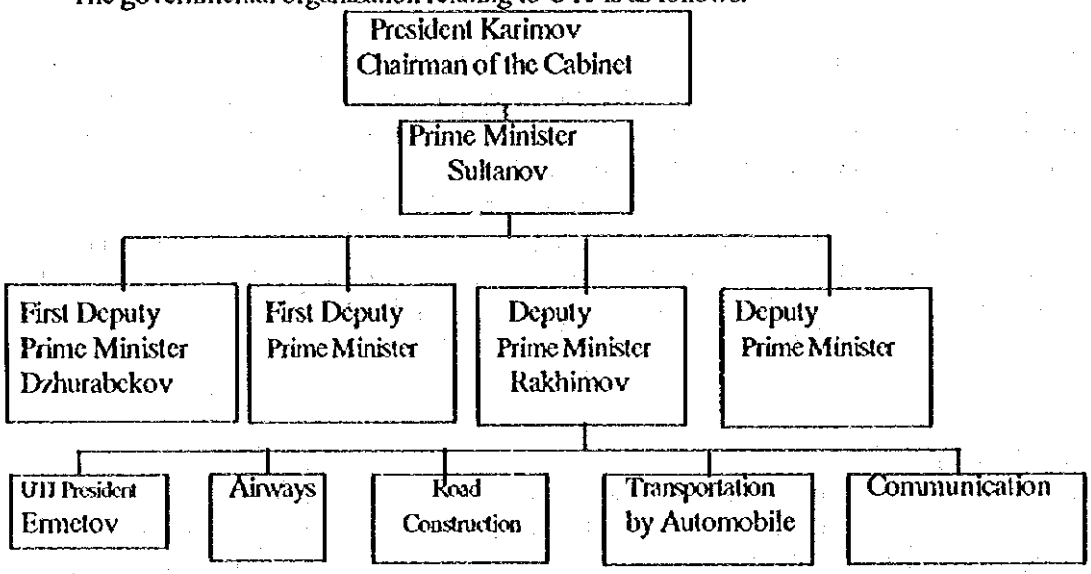


Fig. 6.1.2-1 Cabinet members and the situation of the UTJ in it

From Fig. 6.1.2-1, UTJ is a cabinet member and the President of UTJ, Ermetov joins the cabinet meeting.

6.1.3 The organization of Uzbekistan Railways (UZBEKISTAN TEMIR JULLARY)

UTJ comprises 37 companies or organizations (UTJ (1) + railway divisions (5) + companies (31)). UTJ president is the chairman of the board of UTJ and is responsible to the cabinet of Ministers for the proper administration and performance of UTJ.

(1) The organization of UTJ and its employee number

The UTJ organization is show below Fig. 6.1.3-1

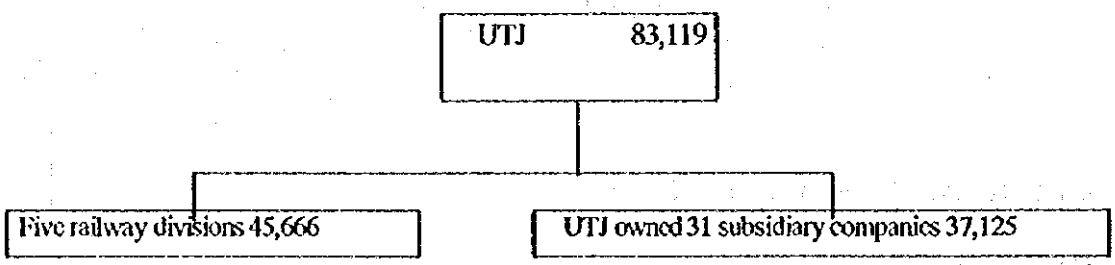


Fig. 6.1.3-1 All the UTJ Organization

The five railway divisions are mentioned below.

① Tashkent division based in Tashkent	15,305
② Fergana division based in Kokand	9,661
③ Buhara division based in Kagan	10,090
④ Priaral division based in Kungrad for the north	4,943
⑤ Karshi division based in Karsh in the south	5,667
Total	45,666

UTJ owned 31 subsidiary companies are as follows;

1..Workshop enterprise "Uzzheldorremmash" based in Tashkent which owns all the railway repair workshops in Uzbekistan 2,574

2..Supply enterprise "Jheldortopsnab" based in Tashkent for supply of diesel fuel, oil and petroleum products 7

3.."Srejheldorsnab" supply company based in Tashkent responsible for railway procurement activities 166

4..Medical enterprise "Jheldorfarmatsiya" based in Tashkent for the supply of medical products to railway units 146

5..Supply enterprise "Dorors" based in Tashkent;supply of food and other consumer goods 4,893

6..Security guard enterprise based in Tashkent 1,534

7..Railway construction unit based in Tashkent 1,625#

8..Electrification construction management based in Tashkent for electric traction power projects 20

9..Management of UTJ administration buildings in Tashkent (included in #)

10..Construction management for railway construction on behalf of other agencies; based in Tashkent. Also includes; 526

11..Structural inspection unit 7

12..Track maintenance staff 1,426

13..Computer center for passenger and freight operations 280

14..Design institute "Tashjheldorproject" based in Tashkent 136
(This institute is a small railway unit for minor railway projects and does not form a part of the larger and independent Design Institute which undertakes large design contracts for UTJ).

15..Information and computer center based in Tashkent (included CTC Center) 31

16..Railway electrical and mechanical workshops in Tashkent 139

17.. Recreation centers 44

18.. Refrigerator van depot 15 3,334

19. .Refrigerator van depot 2 4,703

20.. Company printing center 48

21.. Environment protection center 41

22.. Engineering students 205

23.. Staff of technical school 41

24. .Catenary erection train 151

25.. Electric traction construction train 115

26.. Railway education department students 5,650

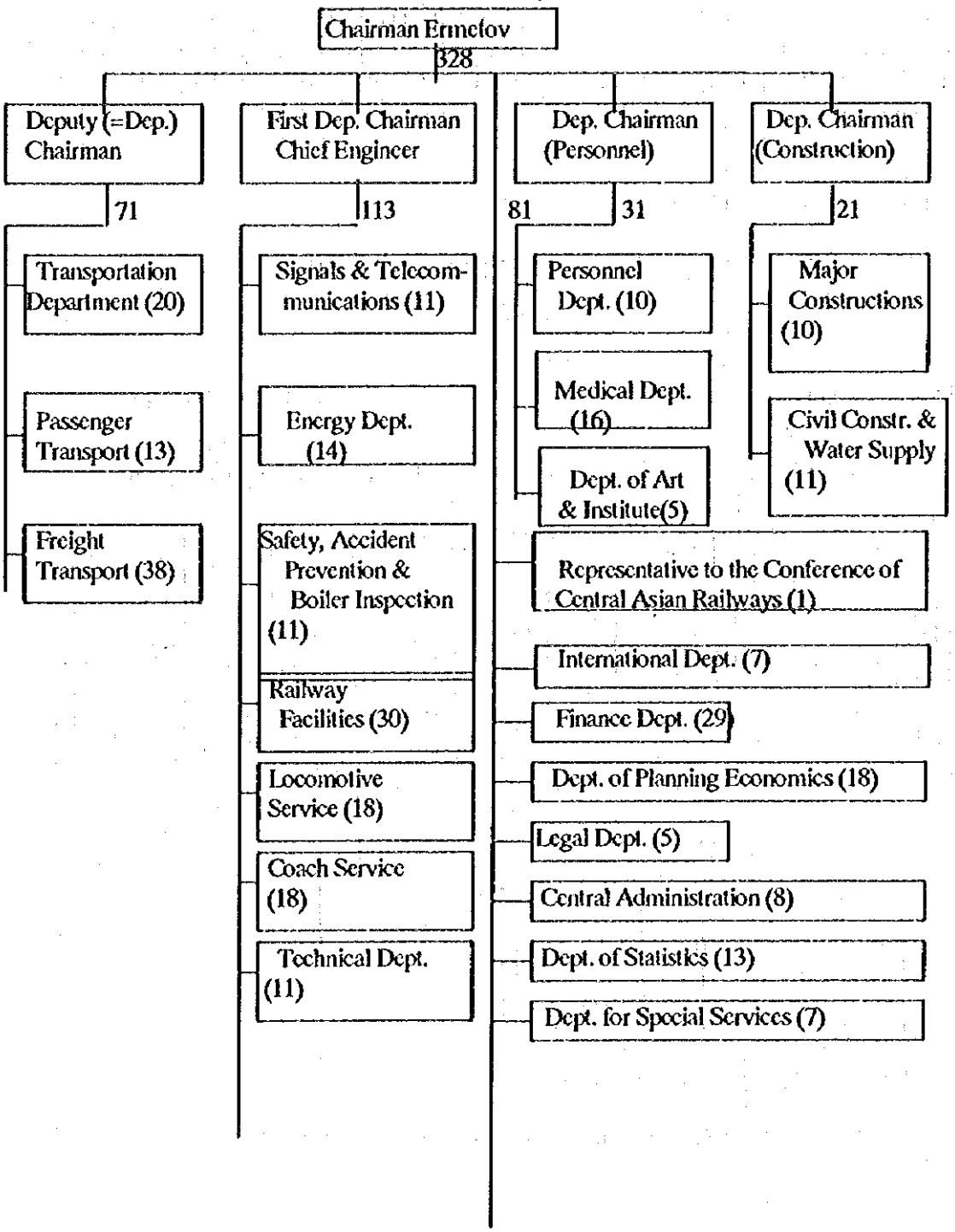
27.. Medical services to railway community	7,428
28 ..Signalling & telecommunications department	392
29.. Buhara marble production unit	142
30.. Ballast production & rail welding team	356
31.. Building materials production in Ahangaran	643
Total	37,125

Then the all the total of UTJ members are 45,666 + 37,125 = 82,791.

(On March 1st, 1995)

6.1.4 UTJ Headquarters

UTJ's headquarters is sited at Tashkent and it organization is as follows.

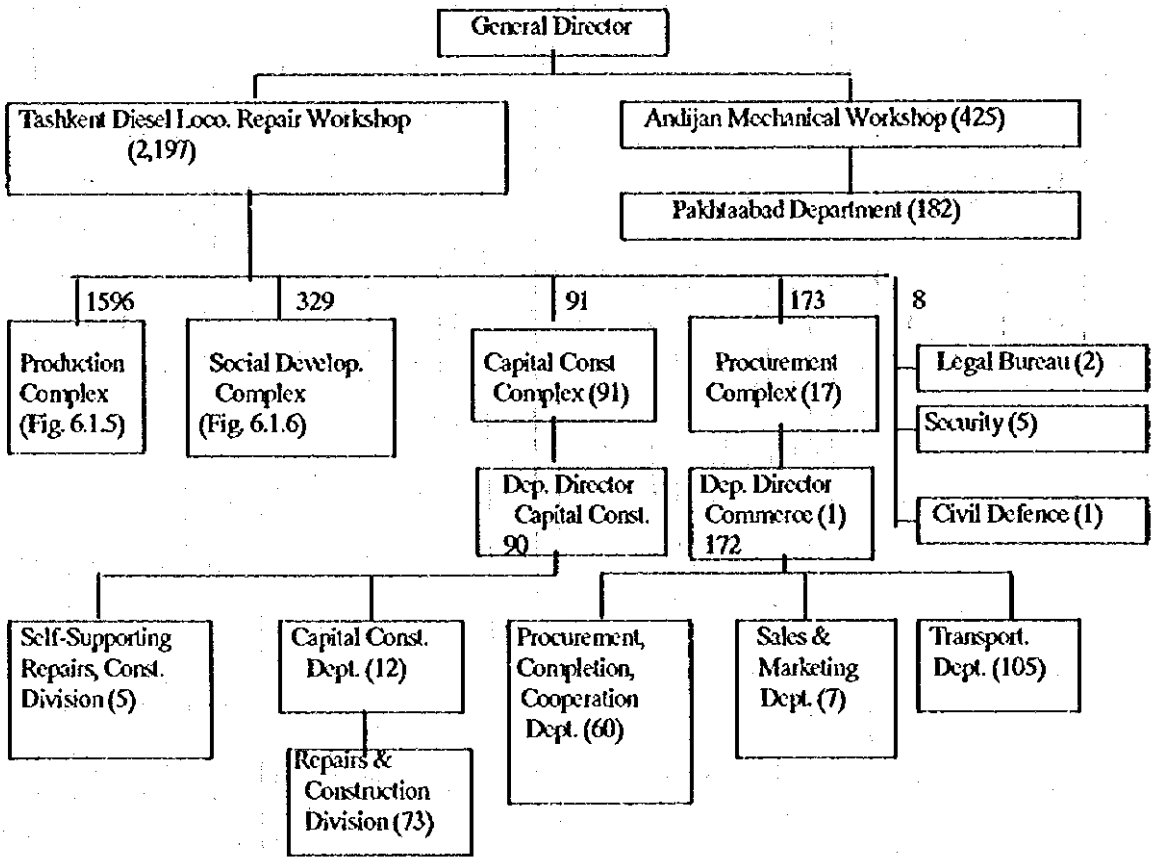


6.1.5 Tashkent Workshop

As is explained in the above section, Tashkent Workshop is in the independent companies section, i.e., among the 31 subsidiary companies of UTJ, and it is called "Uzzheldorremmash". Uzzheldorremmash consists of three workshops (Tashkent Workshop, Andijan mechanical workshop, and Pakhtaabad Dept.). This company has approximately 2,800 workers and Tashkent Workshop is approximately 2,200 workers, and more than 3/4 of the total workers of the company.

(1) The organization of Uzzheldorremmash

The brief organization of Uzzheldorremmash is shown below (Fig. 6.1.5-1)



Const. = Construction, Dept. = Department

Fig. 6.1.5-1 The organization of "Uzzheldorremmash"

Production Complex organization is shown in Fig. 6.1.5-2

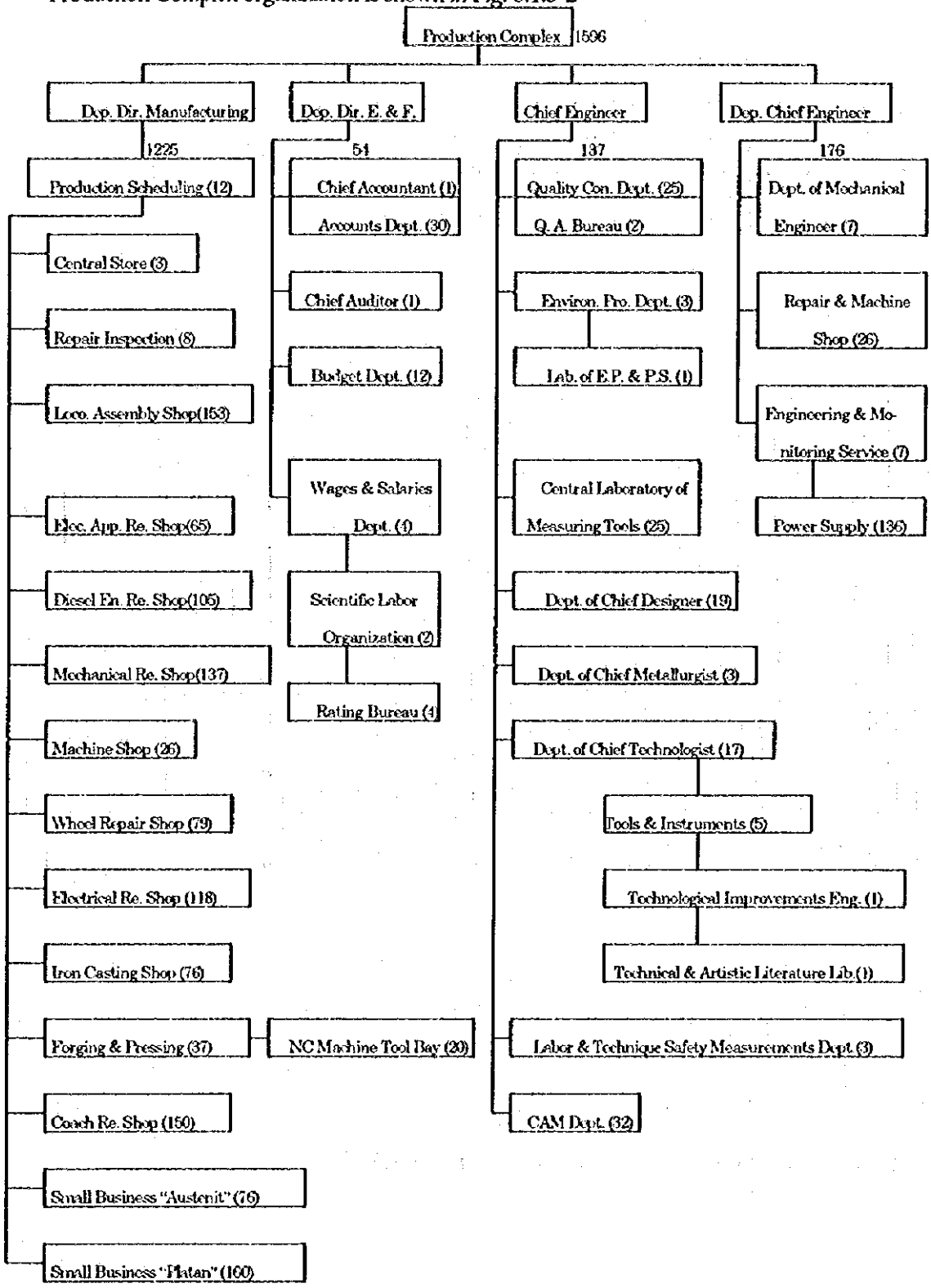


Fig. 6.5 The Organization of Production Complex

Abbreviations: Dep. Dir.= Deputy Director,
E. & F. = Economics & Finance,
Q. A. = Quality Assurance,
Environ. Pro. Dept. = Environmental Protection Department,
Lab. of E. P. & P. S. = Laboratory of Environmental Protection & Production Sanitary,
Elec. App. Re. Shop = Electrical Apparatus Repair Shop,
Diesel En. Re. Shop = Diesel Engine Repair Shop

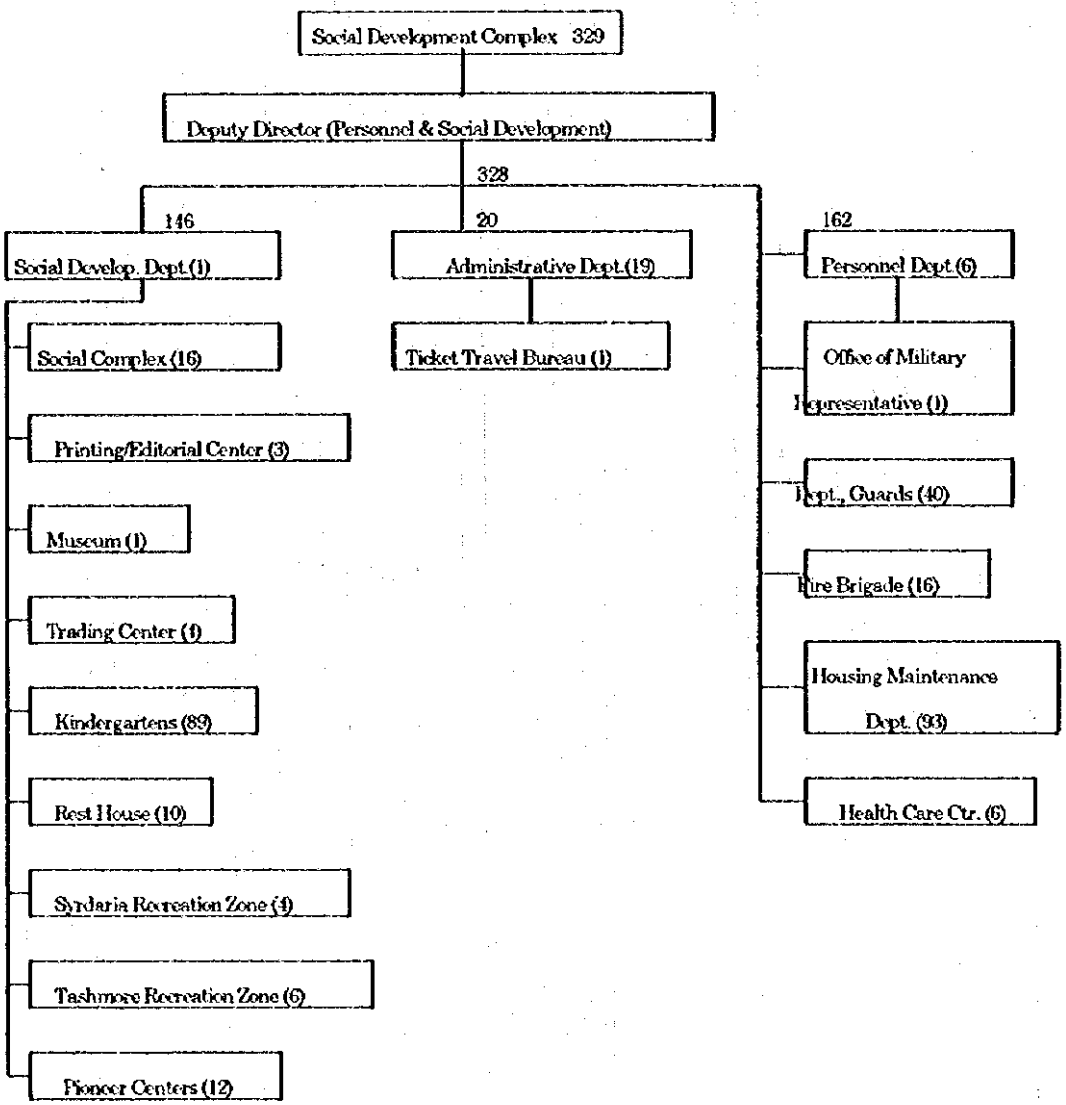


Fig. 6.1.5-3 Organization of Social Development Complex

(2) The profile of Tashkent Workshop

The present organization (Jan. 1st, 1996) of Tashkent Workshop is explained in the above section and its warp and woof is below.

1) Brief history

• In the time of USSR: The Workshop was responsible for the repairs of DL (Diesel Locomotives) and production of spare parts of DL. From 1992 the Workshop began the overhaul of TM2 (DL for switching yard work). The overhaul works became more and more important in the Workshop. Spare parts or preparatory goods were delivered by USSR.

• After the collapse of USSR: The Workshop became a part of CAR (Central Asian Railways). In 1993, Association was born. Association stands for the Russian "Uzzheldorremmash"{ Uz zhel (= rail) dor (= way) rem (=repair) mash (=machinery)}. Association is the union of the three workshops (Tashkent Workshop, Andijan Workshop and Pakhtaabad Workshop). The main work share of the three is as follows;

Tashkent Workshop···repair of DL.,

Andijan Workshop···making jacks, etc. tools for repairing Locos,

Pakhtaabad Workshop···repairing FC (freight cars including lorry cars).

• 1994 the Worshop began repairing PC and also making articles for daily life.

2) Present state of the Workshop

• Equipment; Up to 1991, the equipment of the Workshop was delivered by USSR, but now there is no delivery.

For example,

① forging machines, pressing machines, are too old to be fully used,

② hammers are the products of 1900 to 1960, and out of use,

③ the shops of cast iron & cast steel are totally depreciated, have low productivity and make pollution,

④ woodwork shop is essential for PC repair but the equipment is not enough and also very old, some of them is as old as 1902.

As stated above, all are caused by the shortage of funds. The equipment is keenly requested to be renewed immediately.

• Level of materials & parts, abilities of workers, wage system, etc.; After the collapse of USSR, relations with the former manufacturers were stopped, many skilled workers went out of Uzbekistan, and many materials and parts were from foreign countries, as its result. The Tashkent Workshop was obliged to face with such conditions, but had to maintain its technical level.

Wages and bonuses were coming close relation with the levels of qualities of the products. Association paid the serious consideration to the leveling up of the workers and had many educational seminars, etc.

3) The new start and the development plan of the Tashkent Workshop

The Workshop started the plan in 1993 in the following concept.

• From DL repair to EL repair; The Workshop set the two stages for the future. The first stage was planned to acquire the ability of repairing electric machines and bogies up to 1995.

The second stage was planned

① to accomplish a technological document for the EL repair, and

② to begin the new repair using the new system based on the technological document.

And they (① & ②) would be accomplished between 1995 and 1998.

The above plan is still in action, but the plan hasn't been progressing as proposed, because of many hindrances, mainly that of economic conditions, i. e., delayed payments after the completion of DL repair, insufficient or delayed credits. Such money deficiency totally decreased the planned profit which would have been invested to the new systems. As for the other important matter, the base of the new plan was clear, but its each concrete item and its persecution procedure (such as who, what, when, how, and how much) were vague and not effectively decided.

- Plan of facilities (rearrangement of buildings, construction of new one, and other facility investment); In the site of the Workshop there are buildings half completed or in the stage of planning. All these buildings shall be rearranged considering the following items;

① The disposal plant for polluted water shall be sited in the center of the Workshop.

② Construction of a deep well which would be necessary for the future water supply.

③ Renewal of rail tracks in the workshop shall be done more than 8 km and as for the No. 11 track line, it shall be electrified and be used for trial runs of repaired cars and locomotives.

④ Construction of a ware house of heavy oil for fuel shall be necessary, to save the fuel cost (Heavy oil is cheaper than natural gas, in Tashkent).

⑤ The administration building shall be completed up to 2000 (now being stopped completion).

⑥ The apartment houses shall be constructed.

The total area of the workshop is 315,000 m^2, and the Workshop has an agreement with the city Tashkent in 1993 that in the case of enlarging the Workshop, 18.9 ha land which is neighboring the Workshop shall be allowed to the Workshop's use.

3) Reconsideration of the development plan fit for the new conditions

The plan has made some discrepancy in 3 years and it shall be examined newly to be fit for the present conditions. Main items are;

- Repairing PC would become decreased comparing the plan.
- The affordable abilities shall be converted to FC repairs (esp. 2 storied FC and making parts for PC repairs.
- Repairing hopper cars for cement or flour shall be considered.
- Remodeling of compartment cars to those for sightseeing use which was proposed by the ministry of tourist will be available.

The above items shall be the main change of the plan.

4) Andijan Workshop and Pakhtaabad Workshop

Andijan Workshop produces jacks, etc., tools for repairing Locos, and it is going well.

Pakhtaabad Workshop is promising in the following reasons.

① Only 1/2 of its land is used.

② There is no other large scale factory near the Workshop, then it would be easier to have the cheaper labor.
③ Between Andijan and Pakhtaabad the rail is connected in good condition and in Fergana basin there are oil fineries which are not inferior to those of Europe. Therefore, the basin's infrastructure and fundamentals of industry are ready.
④ Fergana basin has much population and has 60% of the national agricultural products.
⑤ Kokand has many large scale enterprises.
⑥ In Asaka near Andijan there ara a car factory by the state and a Korean company.
⑦ There are many enterprises neighboring Pakhtaabad and Andijan stations.

All the items above, they would be the freight sources and many FC would be necessary then. It means Pakhtaabad Workshop has the privilege in near future.

6.1.6 Organization of the Uzbekistan Depot

In the early stage of this study, Uzbekistan Depot was one of the alternatives of EL repair workshop. Therefore, the study was also applied to this depot.

Uzbekistan Depot's organization is shown below (Fig. 6.1.7)

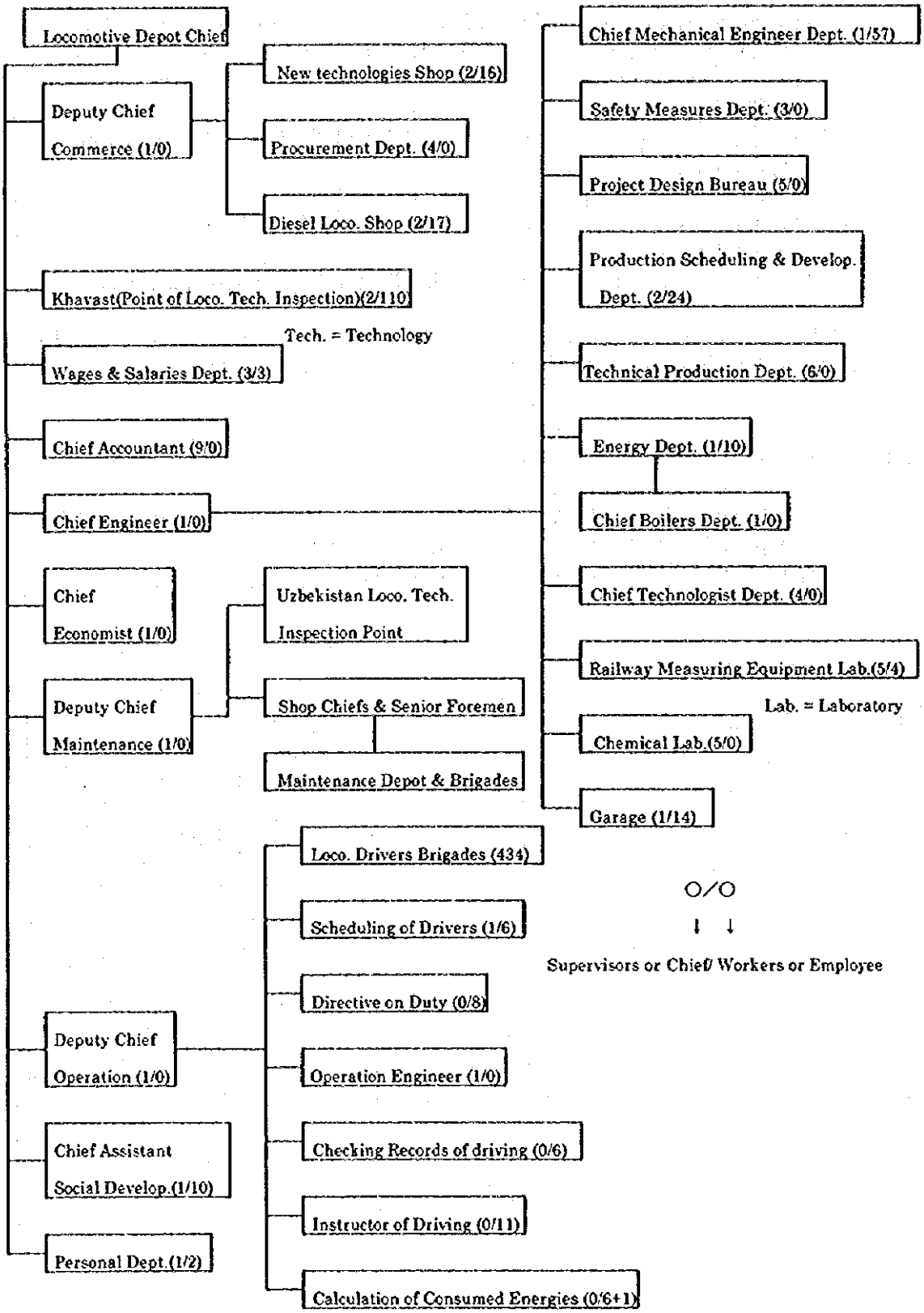


Fig. 6.1.6-1 The Organization of Uzbekistan Depot

6.2 · FINANCIAL CONDITION OF UTJ

(1) As with all accounting systems everywhere in the world, different reports are generated depending on the use to which the information is put. Items of revenue or expenditure can be included or excluded from reports according to the requirements of the recipient. Thus, for example, revenue figures supplied by UTJ to the Government may differ (for perfectly valid reasons) from those circulating internally. Discrepancies within this study-report are likely to be a reflection of this fact.

(2) The framework of UTJ's financial accounting system remains firmly based on that of SZD, as laid down by the Soviet MPS in 1985. This system, in common with all state-owned railways in both planned and market economies, concentrates heavily on costs and measures of output. Revenue details take up just 1½ pages of the 18-page annual report.

(3) Even though UTJ has been in existence as a separate legal entity for a little over two years, it has not yet been required to produce the kind of accounting documentation which would be more familiar to people coming from a capitalist system. As a result, Profit and Loss Accounts, Balance Sheets, and Cash Flow Statements do not exist in a format recognisable to a western accountant.

(4) Summary results for 1991-1995 are given in the following table, together with projected outturn results for 1996 and forecast results for 1997. The financial year runs from 1 January to 31 December. Actual results for 1996 are not expected to be published until March/April 1997.

Table 6.2-1 UTJ Summary Financial Results (All Figures Sums x 10^3, Current Prices)

Description	1991	1992	1993	1994	1995	1996 Projected	1997 Forecast
Total Revenue	**1881**	**21062**	**206078**	**2475422**	**11712657**	**24773395**	**27572346**
Of which:							
Freight/Passenger	1545	18191	175469	2111815	5958190	14322933	17121882
Subsidiary Activities	334	2833	29318	315212	4101108	8324136	8324136
Miscellaneous	2	38	1291	48395	1653359	2126328	2126328
Total Costs	**1567**	**13723**	**130702**	**1014394**	**7942679**	**19513621**	**25000000**
Of which:							
Traffic Costs	1261	11340	107318	796861	4031872	12771968	-
Subsidiary Activities	306	2383	23384	217533	3910807	6741653	-
Less Financing Activities (1)	-	-	-	-	529256	3673247	-
Total Profit Before Tax	**421** (2)	**7719** (2)	**75415** (2)	**1514806** (2)	**3240722**	**1586529**	**2572346**

Source: UTJ

Notes: (1) Financing activity is the net of dividends/loan interest paid/received, and gains/losses from currency exchange.

(2) Totals do not add in source.

(5) A slightly different presentation of the 1994 and 1995 figures is given below. It will

be noted that taxes and provision for investment in 1995 substantially reduced retained profit compared with the previous year.

Table 6.2-2 UTJ Summary Annual Report, (All Figures Sums x 10^3, Current Prices)

Description	1994	1995
Sales	**2479128**	**10214814**
Less VAT	*-19011*	*-155516*
Less Export Tax	*-4*	
Net Income from Sales	**2460113**	**10059298**
Less Cost of Sales	*-1014394*	*-6424462*
Gross Operating Profit	**1445719**	**3634836**
Plus Miscellaneous Income	91301	1653359
Less Miscellaneous/Admin/Overhead Costs	*-22214*	*-1518217*
Profit Before Interest and Tax	**1514806**	**3769978**
Plus Dividends Received		386
Plus Interest Received		5181
Plus Currency Exchange Gain		206808
Plus Miscellaneous Financing Gains		532
Less Interest Paid		*-108*
Less Currency Exchange Loss		*-742055*
Profit Before Tax	**1514806**	**3240722**
Less Profit Tax	*-361548*	*-1211801*
Less Other Taxes and Provisions (1)	*-124189*	*-1828165*
Total Retained Profit	**1029069**	**200756**

Source: UTJ

Notes: (1) In 1995, a provision for capital investment of 1.764 billion Soms was charged to this line. See Chapter 3 for investment plans.

(1) On the costs side, a summary split is given in Tables 6.2-3 and 6.2-4, showing respectively costs for operational and subsidiary activities. There are two specific points to note. First, there is a comparatively low proportion of labour costs[1] to total costs, running at about 16%. In track maintenance, however, labour costs account for 82% of the total which might suggest that in this department at least there is a need

[1] Labour costs do not, however, include contributions to pensions and social insurance.

Table 6.2-3 UTJ: Financial Report of Railway Transport Activity for 1995

Actual Costs for Operational Activities - 000 Som

Operational Activity Costs by Department	Labour Fund	Materials	Fuel	Electricity	Other	Total
Passenger Traffic	17223	23005	2581	9682	20288	72779
Including Coach Maintenance by Depot	3518	21666	9	1118	2570	28881
Freight Traffic	41554	1951	252	15142	80482	139381
Traffic Operation	91470	7435	1764	51087	116433	268189
Locomotives	178470	111014	985570	173499	381004	1829557
Including Traction Current				142887		142887
Including Electricity for EMUs				8087		8087
Including Powering of Diesel Locomotives			961447			961447
Including EL Maintenance	10064	9070		6897	698	26729
Including EMU Maintenance	1260	1793		204	10	3267
Including DL Maintenance	27910	37203	17918	1108	8633	92772
Including DMU Maintenance						0
Rolling Stock	228862	103690	71853	15085	759854	1179344
Including Depot Maintenance of Refrigerated Wagons	6370	7026	932	3429	2295	20052
Including Depot Maintenance of Passenger Coaches	359	959		6	402	1726
Track	133450	42867	12472	7976	592877	789642
Including Maintenance of Track and Fixed Devices	84849	9094	1476	151	7640	103210
Including Protection of Track from Snow/Water/Sand	95	393			7	495
Civil Constructions	2878	3430	1793	1499	107896	117496
Signalling and Telecommunications	64431	10261	2494	44953	112668	234807
Electrification and Energy Supply	14923	4745	1549	935	61765	83917
Traffic by Foreign Railways on CIS Territory						0
Railway Departments	7432	2044	1054	1183	24855	36568
General Railway Management	38185	2695	529	1919	42481	85809
Total:	818878	313137	1081911	322960	2300603	4837489
Including Payments to Maintenance Fund					930356	930356
Credit Interests						0
Payments to Social Insurance Fund					323132	323132

Table 6.2-4 UTJ : Financial Report of Railway Transport Activity for 1995 (2)

Actual Costs for Subsidiary Activities- 000 Som

Subsidiary Activity Costs	Labour Fund	Materials	Fuel	Electricity	Other	Total
Overhaul Repair	63445	314128	10336	4064	98939	490912
Industrial Production	90231	178128	63623	272695	167933	772610
Fuel Department	3041	990	688	236	10727	15682
Procurement Department	4045	5444	1975	730	77362	89556
Station Chiefs Department	17645	1722	543	11477	30130	61517
Construction Works - Contract Basis	172	33		110	240	555
Construction Works - Economic Method	565	584	23	7	1449	2628
Housing - Communal Department						0
Other Non-Industrial Departments	92959	119605	60590	37011	177684	487849
Including Upkeep Costs of Train Brigades and Conductors						0
Total:	**272103**	**620634**	**137778**	**326330**	**564464**	**1921309**
Including Reflected Costs (Line 060 of Form 2)	212950	440736	116210	323248	482226	1575370
Latter Including:						
Freight Wagon Depot Repair	14324	122358	455	2920	45345	185402
Repair Fund Payment					35324	35324
Credit Interest Payment					33	33
Social Insurance Payment					95260	95260
Total Costs of the Railway:	**1090981**	**933771**	**1219689**	**649290**	**2865067**	**6758798**
Including Reflected Costs (Line 060 of Form 2)	1031828	753873	1198121	646208	2782829	6412859
Cost Price of Repaired/Manufactured Spare Parts etc						56517
New Spare Parts and Hardware Manufacturing						0
Total Costs of the Whole Period:	**144205**	**17212**	**8026**	**13294**	**1335480**	**1518217**
Including Traffic Costs	106373	3317	553	5202	981223	1096668
Other Funds Not Included in Labour Fund Payment	235888					235888

for capital investment. The second point is that fuel and electricity make up 28% of all UTJ's costs, the proportion rising to 63% in the Locomotive Department. Of this 63%, no less than 83% is fuel for the diesel locomotive fleet. Taken as a whole, this would tend to imply that investments targeted at staff reductions are likely to be a lower priority in general than the replacement of fixed assets with newer, more efficient equipment.

(3) Digging further into the accounts reveals the information contained in Tables 6.2-5 and 6.2-6. As expected, the cost of diesel operation is noticeably higher in comparison to the other forms of traction.

Table 6.2-5 Operational Costs of Different UTJ Traction Types (Passenger)

Traction Type	Operating Cost (Sums x 10^3) 1995	(%)	Pass-Kms (10^6) 1995	(%)
Diesel Locomotives	225105	87.2	2008	80.4
Electric Locomotives	25328	9.8	241	9.6
Electric Multiple Units	7865	3.0	249	10.0
Total	258298	100.0	2498	100.0

Source: UTJ; Study Team calculations

Table 6.2-6 Operational Costs of Different UTJ Traction Types (Freight)

Traction Type	Operating Cost (Sums x 10^3) 1995	(%)	Tonne-Kms (10^6) 1995	(%)
Diesel Locomotives	571442	81.0	11184	66.4
Electric Locomotives	134449	19.0	5647	33.6
Total	705891	100.0	16831	100.0

Source: UTJ; Study Team calculations

(4) Details of operating revenues are shown in Table 6.2-7. These do not include income from sources such as cloakroom and porter services, commission on sale of tickets, rental from station kiosks/barbers/restaurants, and nor do they include income from UTJ's ancillary activities such as housing, manufacturing and so on. It should also be noted that the revenue figures differ from those in Table 6.2-1 for the reasons stated in Clause 6.2.1. Attention is again drawn to the fact that UTJ is predominantly a freight railway, with freight income accounting for 93.5% of 1994 traffic revenues, and 89.4% in 1995, the decrease in proportion again being reflective of the large increase in passenger tariffs during 1995.

Table 6.2-7 UTJ Operating Revenues, (All Figures Sums x 10^3, Current Prices)

Description	Income 1994	Income 1995
Freight		
Traffic Income	1912926	7634067
Other Direct Income (1)	61690	704807
Total	**1974616**	**8338874**
Passenger		
Traffic Income	146627	962745
Baggage Income (2)	*-10948*	12923
Mail Income	1520	10808
Total	**137199**	**986476**
Grand Total	**2111815**	**9325350**

Source: UTJ

Notes: (1) Includes, for example, handling charges.

(2) It is not known why this is a negative amount in 1994.

(5) Placing total traffic costs and operating revenues together shows the extent of cross-subsidy from the freight to the passenger business, as detailed in Table 6.2-8. Unfortunately, a breakdown by traction-type of the revenues is not available, and this can lead to misleading conclusions. For example, the average unit revenue from the passenger business makes it seem that Electric Multiple Unit (EMU) operation covers its costs. This is probably not the case, given the low fares charged on the suburban commuter network.

Taken as a whole, the 1995 revenues of UTJ's railway operating activities cover costs by a factor of 145%. As with all accounts, however, care must be exercised in interpreting these figures as they both include and exclude items which a reader, used to different railway accounting systems, might assume to be absent or present.

Table 6.2-8 UTJ Reconciliation of Traffic Costs and Revenues (All Monies in Current Prices)

Description	1994	1995
	(1)	(1)
Freight – Electric Traction		
Tonne-Kilometres (10^6)	6764	5647
Traffic Costs (Sums x 10^3)	133434	1103932
Cost per 000 Tonne-Kilometres (Sums)	19.7	195.5
Freight – Diesel Traction		
Tonne-Kilometres (10^6)	12104	11184
Traffic Costs (Sums x 10^3)	443547	3215687
Cost per 000 Tonne-Kilometres (Sums)	36.6	287.5
Freight – All Traction		
Tonne-Kilometres (10^6)	18868	16831
Traffic Costs (Sums x 10^3)	576981	4319619
Traffic Revenues (Sums x 10^3)	1912926	7634067
Cost per 000 Tonne-Kilometres (Sums)	30.6	256.6
Revenue per 000 Tonne-Kilometres (Sums)	101.4	453.6
Freight Cost Recovery Rate (%)	**331.5**	**176.7**
Passenger - Electric Traction		
Passenger-Kilometres (10^6)	642	241
Traffic Costs (Sums x 10^3)	38874	145332
Cost per 000 Passenger-Kilometres (Sums)	60.6	603.0
Passenger - Diesel Traction		
Passenger-Kilometres (10^6)	4419	2008
Traffic Costs (Sums x 10^3)	171160	1393086
Cost per 000 Passenger-Kilometres (Sums)	38.7	693.8
Passenger - Electric Multiple Unit		
Passenger-Kilometres (10^6)	305	249
Traffic Costs (Sums x 10^3)	9846	76120
Cost per 000 Passenger-Kilometres (Sums)	32.3	305.7
Passenger - All Traction		
Passenger-Kilometres (10^6)	5366	2498
Traffic Costs (Sums x 10^3)	219880	1614538
Traffic Revenues (Sums x 10^3)	146627	962745
Cost per 000 Passenger-Kilometres (Sums)	41.0	646.3
Revenue per 000 Passenger-Kilometres (Sums)	27.3	385.4
Passenger Cost Recovery Rate (%)	**66.7**	**59.6**

Source: UTJ; Study Team Calculations

Notes: (1) These are all costs, including the operational costs detailed in Tables 6.2-5 and 6.2-6. Revenues exclude handling, mail and baggage charges.

(10) All departments charge depreciation as a cost. It is calculated in accordance with regulations published in October 1990 by the Government of the Soviet Union, and is based on a straight percentage charge of the initial cost, depending on the type of the equipment. In general, the charges in the 1995 accounts are quite small, suggesting either that assets are amortised over a long life, or, more probably, that many of them have already been fully written down. For example, depreciation on electric locomotives amounted to only 4.8 million Sums (book life is 30 years), and on diesel locomotives to 55 million Sums (book life of around 20 years)[2].

(11) In addition to depreciation, and under instruction from the Ministry of Finance, a maintenance fund has been created into which each department charges an amount equivalent to one twelfth of the cost of the fixed assets for whose maintenance the department is responsible. Thus, in 1995, some 28 million Sums were accrued by the Locomotive Department for electric locomotive maintenance, and 79 million Sums for diesel locomotive maintenance. The fund is designed to ensure that maintenance will always be undertaken even if costs go over budget; it could, however, be argued that the existence of such a safety net gives no incentive to managers to stay within their budgets in the first place if they know that they can always be bailed out. Furthermore, the existence of the fund does not guarantee that the actual cash will be available when needed - see Clause 6.2.13.

(12) For UTJ, tax liabilities account for between 19% and 21% of total income. There are effectively eleven types of tax payable by enterprises. These are:

1) VAT. The rate set during 1995 was 17% of sale. This is paid centrally by UTJ headquarters. Payable during 1995 was 754 million Sums, and during the first nine months of 1996, 294 million Sums. As these figures do not seem to relate directly to revenue from sales, it would appear to be the case that there is some form of exemption in force.

2) Profit Tax. This was charged at 37% during 1995; the rate is believed to have risen subsequently to 38%. A liability of 1.2 billion Sums was declared by UTJ for 1995, but only 220 million for the first three quarters of 1996, suggesting that profits are down substantially. Again, this tax is paid centrally.

3) Property Tax. Document suggest that is chargeable at 2% of "fixed asset cost", but it is not clear whether this relates to purchase cost or book value. The amount payable in 1995 was 96 million Sums, implying a property valuation of 4.8 billion Sums which seems a little on the low side. Payment is dealt with by individual enterprises, rather than centrally.

4) Land Tax. Again, the responsibility for payment lies with the constituent units of UTJ, and rates depend on local circumstances. A total of 32 million Sums was payable in 1995.

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[2] These amounted to around 11.6 times the charge in 1994, which gives a perspective on UTJ's view of the rate of inflation during the year.

5) Vehicle Ownership Tax. Just under 4 million Sums was paid by UTJ's component enterprises for ownership of road vehicles, the rate depending on vehicle capacity.

6) Road Maintenance Tax, which is set at 1% of sale volume.

7) Import Taxes, levied according to the appropriate regulations in force at the time. Only 40,000 Sums was paid in 1995.

8) Local Taxes, which cover council services such as rubbish collection, was set in 1995 at 0.4% of Profit Tax and therefore cost 4.8 million Sums. By 1996, the rate had increased to 2% of Profit Tax, and therefore a liability of 43 million Sums was raised over the first nine months of the year.

9) Water Use Payments. The basis of payment apparently varies according to the source, but accounted for 2 million Sums in 1995, and 7 million Sums for the first three quarters of 1996.

10) Miscellaneous Taxes. These are levied from time-to-time, and cost UTJ just over 2 million Sums in1995.

11) Penalties for late or non-payment of taxes, of which UTJ incurred again just over 2 million Sums in 1995.

(13) The published accounts do not provide any indication of cash flow. However, the 1995 ministerial report makes reference to a 'receivables burden' of no less than 3.4 billion Sums which UTJ was seeking financial assistance to liquidate. This suggests that customers are taking up to four months to settle their bills (longer if the problem is confined mainly to the freight business). This is clearly a major problem for UTJ, made even worse by high inflation: when the company finally does receive what it is owed, its value is significantly less than when the sale was originally made[3]. There are no corresponding details on UTJ's payables, but one would expect a similar picture to emerge. Indeed, the same ministerial report cites poor cash flow as a contributory factor to a growing maintenance backlog.

(14) In summary, therefore, whilst UTJ has historically had a profitable and sound financial foundation, it is today facing difficulties and challenges which will not become any easier as it adjusts to a more market-driven economy. Restructuring of the business will throw up further areas and activities which are unprofitable and which will face closure if other sources of financing such as grant or subsidy are not obtained. These problems are particularly acute in the passenger sector.

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[3] Reference was made in Chapter 3 to the added difficulty of obtaining hard currency for settlement of accounts with foreign administrations. This has given rise to instances of barter trade, both internationally and domestically, whereby, for example, the consignor gives over a proportion of the consignment in payment for the transport services.

6.3 TRAIN OPERATION

Although freight transport in UTJ has largely decreased recently, freight train operation rate accounts for about 70% of the whole train operation kilometer, and passenger train operation ratio only about 30%.

Train kilometer of passenger and freight trains are as shown in Table 6.3.1 and Fig6.3.1

Table 6.3-1 Train Operation Kilometer Unit :Millon

	1991	1992	1993	1994	1995
Passenger Train	14.6	13.4	12.9	11.5	10.7
Freight Train	63.4	33.3	27.2	25.7	22.5

6.3.1 Passenger train

In the suburban sections about 150km around Tashkent, electric rail-car trains of eight ~six cars are operated, and in the other sections, passenger trains of about twenty coaches.

In almost all of electrified sections, passenger trains are electric locomotives handed, in the other sections containing some parts of electrified ones, all trains are diesel locomotive hauled.

Scheduled operating speed is low, 40~60km per hour . Almost all of passenger trains are long distance trains like international ones etc., and domestic trains are few.

As for the trains starting from and arriving at Tashkent station, fifty-one trains out of fifty-three are international trains like the one bound for Moskva at Tashkent North Station mainly handling north wards trains, and at Tashkent South Station mainly handling south wards trains, except only one international train bound for Russian territory via south courses, the other twenty-six trains are domestic ones starting from and terminating at stations in Uzbekistan.

6.3.2 Freight train

Main trunk lines for freight transport are Tashkent~ Buhara and Tashkent~ Kokand · Andijian lines in Fergana valley.

Heavy and long freight trains are composed of fifty- seven freight cars, in special sections, seventy-one cars, of which weight ranges eighty to hundred and twenty tonnes, and hauled by large capacity locomotives of three or two sections unit.

As a rule, they are hauled by electric locomotives in electrified sections, and by diesel locomotives in non-electrified sections. Scheduled speed is low,35 km per hour.

6.3.3 Number of trains by section

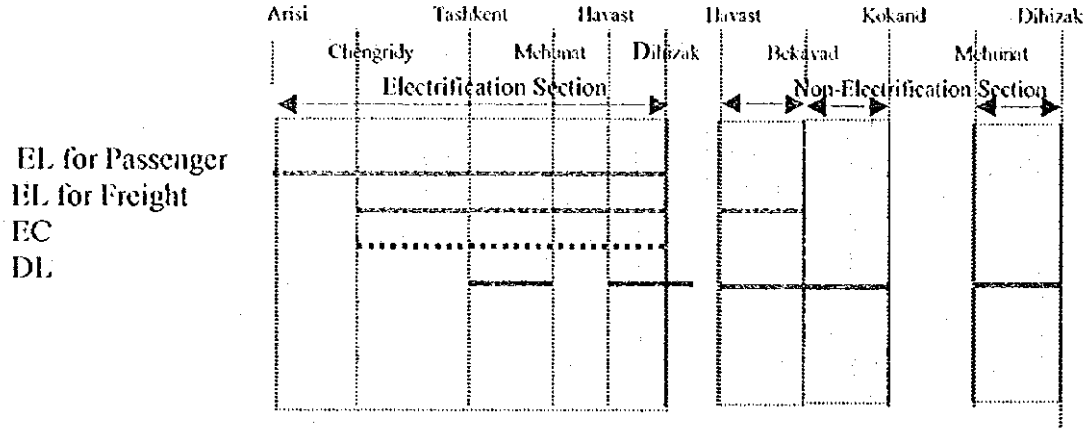
Number of trains by main section are shown in Table 6.3.3-1

Table 6.3.3-1 Number of Trains by Main Section

Item / Station Name	Freight Train		Passenger Train						Total Train	
			Long Distance		Short distance		Total			
	Up	Down	Up	Down	UP	Down	UP	Down	Up	Down
Tashkent	5	5	18	18	15	15	33	33	38	38
Uzbekistan	23	23	18	18	14	14	32	32	55	55
Mehunat	18	18	7	7	4	4	11	11	29	29
Havst	20	20	3	3	1	1	4	4	24	24
Dihizak	20	20	15	15	0	0	15	15	35	35
Marakand	12	12	7	7	4	4	11	11	23	23
Buhara	7	7	7	7	2	2	9	9	16	16
Farab										
Mehunat	5	5	12	12	1	1	13	13	18	18
Dihzak										
Marakand	10	10	6	6	1	1	7	7	17	17
Karusi	20	20	15	15	0	0	15	15	35	35
Buhara										

6.3.4 Operating sections

Electric locomotive, diesel locomotive and electric rail-car operating sections are shown in the flowing Figure



6.4 ROLLING STOCK

The number of rolling stock owned by UTJ at the end of December 1996 are as follows.

(1) Number of rolling stock by type

1) Diesel locomotive (DL)

Use	Type of loco.	Number of loco.	Number of section
Main line operation	3TЭ10M	122	366
	2TЭ10Л	31	62
	2TЭ10B	76	152
	2TЭ10M	185.5	371
	2TЭ116	48	96
	2TЭ10Ч	5	10
	TЭ1170	15	15
	Sub -- total	482.5	1,072
Shunting operation	TЭM2	178	178
	ЧMЭ3	127	127
	Sub – total	305	305
Total		787.5	1,377

2) Electric Locomotive (EL)

Type of loco.	Number of loco.	Number of section
3BJI80C	27	81
2BJI60K	20	40
BJI80C	6	6
BJI60K	28	28
Total	81	155

3) Electric railcar (EC)

Type of car	Number of set	Number of car
ЭP9E	33	66

(2) Main Characteristic of Electric Locomotive

Type / Description	ВЛ60К	ВЛ65	ВЛ80С
Wheel Arrangment	Co-Co	Bo-Bo-Bo	Bo-Bo
Weight (ton)	138	138	96
Length between Automatic Coupler center of one section (m)	20.8		16.42
Width of Car-body (m)	3.48		3.48
Height from Top of Rail Hear to Sliding Surface of Lowered Pnatograph (m)	5.1		5.1
Height of Working Range of Pantograph Sliding Surface from Top of Rail Head (m)	5.5 ~7.0		5.1~7.0
Traction Motor Out Put on Shaft: - One Hour Rating (kw) - Continuous rating (kw)	 4,140 3,670	 4,650	 3,080 2,710
Out Put of One Traction Motor (kw)	775		790
Pantograph Type Weight (kg) Dimension L-W-H (mm)	Л-13Ч 290 3280-2260-1900		Л-13Ч 1 290 3280-2260- 1900
Bogie Type Weight (kg) DimensionL-W-H (mm)	3-Хоска я 33,600 7445-2830-1285		 21,120 4800-2814-1160
Wheel Base (mm)	2300+2300		3000
Diameter of Wheel Tread (mmϕ)	1250	1250	1250
Gear Ratio	88:23=3.82		88:21=4.19
Distance between Bogie Center (mm)	8100		7500
Power Transformer Type Weight (kg) L-W-H (mm)	овдэ-6000/257 12,330 2692-2000-3065		овдэ-5000/2567 8,000 2000-2600-2760
Main Controller Type Weight (kg) L-W-H (mm)	экг-8ж 1,480 2750-880-735		экг-8ж 1,480 2750-880-735
Rectifier Type Weight (kg) L-W-H (mm)	вчк60-4л 400 1000-620-1280		вчк-400Т-02 225 1120-472-630
Traction Motor Type Weight (kg)	тин-Б412К 4,850		тин-514 4,282
Blower Type	Д8-19N6,7		Д8-19N6,7
Compressor Type Weight (kg) L-W-H (mm)	КТ-6 646 740-1255-1105		КТ-6 646 740-1255-1105
Battery Type Weight (kg) L-W-H (mm)	НК-125 5.4 330-128-70		НК-125 5.4 330-128-70

ВЛ 6 5 will be imported in near future.

(3) Main Characteristic of Electric railcar

Type		ЭР 9 Е		
Standard formation		Tc+M+T+M+T+M+T+M+M+Tc 10 –car unit		
Train length (10 car unit)		201.81 m		
Train weight (10 car unit)		486.5 ton		
Total traction out put on shafts: one hour rating		3,640 kw		
Average acceleration		0.6 m/s/s (up to 60 km/h) stratght		
Brake system Averag decelaration		Electropneumatic 0.8 m/s/s		
Total seating capacty		1022		
Type		Tc	M	T
Tare weight		39.0 t	59.5 t	37.0 t
Weight of body with equipment		25.0 t	31.2 t	23.5 t
Diameter of wheel tread		950 mm	1,050 mm	950 mm
Seating capacity		88	110	108
Wheel base			2,300 mm	
Type of traction motor, number			PT-51D × 4	
Traction motor	Suspension One hour rating Continuous rating		Frame type 728 kw 560 kw	
Start up mode	Motor current Wheel rim power		375 A 960 kw	
Reduction ration			73:23= 3.17	
Weight Total of electric equipment			18,650 kg	
Moter and phase splitter			8,300 kg	
Transformer and rectifier with cooler			6,590 kg	
Line breaker and relays unit			2,125 kg	
Electric wires			1,635 kg	
Electric radio equipment and automatic locomotive signalling equipment with automatic braking system		1,100 kg		1,850 kg
Pantograph dimension	Type Weight L-W-H mm		Д-1В 320 kg	
Bogie	Type Weight L-W-H mm	КВЗ-ДНИ/Э 7,000 kg 3920-2218-1040	КВЗ-5/3 1400 kg 4100-2300-1070	КВЗ-ДНИ/Э 7,000 kg 3920-2218-1040
Phase converter	Type Weight L-W-H mm		РФ-1А 300 kg	
Traction motor	Type Weight L-W-H mm		PT-51D 2,000 kg 1148-949-797	
Compressor	Type Weight L-W-H mm		ЭК-7В 118 kg	

6.5 ROLLING STOCK MAINTENANCE

(1) Rolling stock maintenance system

UTJ performs periodical maintenance of rolling stock based on the railway standard of the former Soviet Union : No.N70H-No.28S which was enacted in August 25 1986.

UTJ, however, has considered to modify the standard in consideration of the aged rolling stock.

There are no electric locomotive and electric railcar repair workshop in Uzbekistan and their overhaul has been entrusted to Russia or Ukraina. However, it has been interrupted since 1995 owing to financial difficulty. Then, Uzbekistan Depot caries out TP-4, which has been temporary ruled, and includes TP-3 and a part of KP-1. While, experimental KP-1 of electric locomotive in Tashkent Workshop is scheduled to complete by coming March, 1997. Contents of the periodical maintenance are as follows.

1) Electric locomotive

	Period	Necessary time	Works in charge
TO-1	Daily check	0.5-1(hours)	Each station or depot
TO-2	2 days check	2-3(hours)	Nominated depot (Uzbekistan, Havast)
TO-3	Abolished in 1995		
TP-1	30 days inspection	18-21(hours)	Uzbekistan Depot
TP-1P	60 days inspection	32-72(hours)	Uzbekistan Depot
TP-2	Abolished in 1986		
TP-3	2 years inspection	4-8(days)	Uzbekistan Depot
TP-4	4 years inspection	15(days)	Uzbekistan Depot
KP-1	6 years overhaul	Under trial	Tashkent Workshop
KP-2	12 years overhaul	Under trial	Tashkent Workshop

2) Electric railcar

	Period	Necessary time	Works in charge
TO-1	Daily check	0.5-1(hours)	Each station or depot
TO-2	2 days check	2-3(hours)	Nominated depot (Uzbekistan, N. Tashkent)
TO-3	Abolished in 1995		
TP-1	120 days inspection	18-21(hours)	Uzbekistan Depot
TP-2	Abolished in 1986		
TP-4	4 years inspection	10(days)	Uzbekistan Depot
KP-1	6 years overhaul	Under trial	Tashkent Workshop
KP-2	12 years overhaul	Under trial	Tashkent Workshop

3) Diesel locomotive for main line

	Period	Works in charge
TO-1	Daily	Each station or depot
TO-2	48 hours check	Nominated depot (Uzbekistan, Tashkent, Havast)
TO-3	17 days inspection	Each depot
TP-1	6 months inspection	Each depot
TP-2	Abolished in 1986	
TP-3	13.5 months inspection	Nominated depot (Tashkent, Kokand, Andijan)
KP-1	4.5 years overhaul	Tashkent Workshop
KP-2	9 years overhaul	Tashkent Workshop

4) Diesel locomotive for shunting

	Period	Works in charge
TO-1	Daily check	Each depot
TO-2	48 hours check	Nominated depot (Uzbekistan, Tashkent, Havast)
TO-3	30 days inspection	Each depot
TP-1	6 months inspection	Each depot
TP-2	Abolished in 1986	
TP-3	2 years inspection	Nominated depot (Tashkent, Kokand, Andijan)
KP-1	7.5 years overhaul	Tashkent Workshop
KP-2	15 years overhaul	Tashkent Workshop

5) Outline of entrusted overhaul to foreign countries for EL and EC

(a) Necessary transport days are 22 days/one way

(b) Necessary days and cost for overhaul

		KP-1	KP-2
Necessary days		22	24
Cost(10^3US$)	EL	140	156
	EC	109	118

Each figure shows case of 1 section for EL and 1 unit(M+T) for EC

Reference: Cost of overhaul in Uzbekistan (10^3US$))

① Assumed cost by UTJ

	KP-1	KP-2
EL	80	92
EC	68	76

② Estimated cost by Study Team

	KP-1	KP-2
EL	112	125
EC	87	94

The Study Team empirically estimated that the KP cost in Uzbekistan will be 80% of the entrusted KP cost in foreign country

(2) Location and rolling stock in charge of workshops and locomotive depots

1) Location of workshops and locomotive depots

Uzbekistan Railways have one workshop and eleven locomotive depots for repair of locomotive. Location of these workshop and depots is shown in Figure 6.5-1.

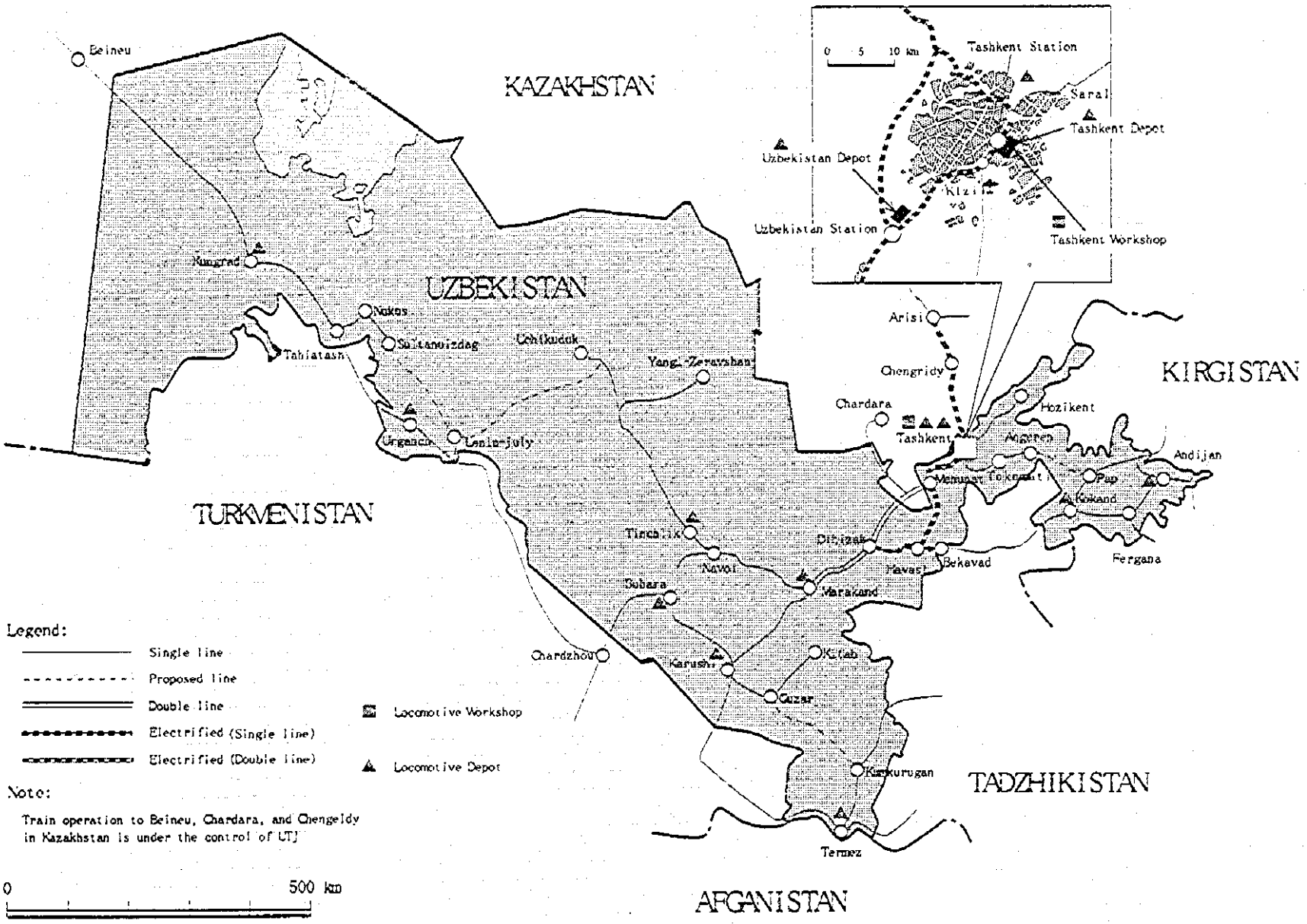


Fig. 6.5 - 1 Location of Locomotive Workshop and Locomotive Depot

2) Number of rolling stock by type in charge of locomotive depot

Locomotive depot	Type of rolling stock		Number of rolling stock
Uzbekistan	EL	3ВЛ80С	27
	EL	2ВЛ60К	20
	EL	ВЛ80С	6
	EL	ВЛ60К	2
	EC	ЭР9Е	33
Tashkent	DL	3ТЭ10М	39
	DL	210М	53
	DL	ТЭП70	14
	DL (shunting)	ТЭМ2	100
	DL (shunting)	ЧМЭ3	4
	EL	ВЛ60К	26
Kokand	DL	3ТЭ10М	19
	DL	2ТЭ10Л	8
	DL	2ТЭ10В	25
	DL (shunting)	ЧМЭ3	27
Andijan	DL	2ТЭ10Л	10
	DL (shunting)	ЧМЭ3	31
Samarkand	DL	3ТЭ10М	31
	DL	2ТЭ10М	9
	DL	2ТЭ116	48
	DL	2ТЭ10Л	5
	DL	ТЭП70	1
	DL (shunting)	ЧМЭ3	23
Buhara	DL	3ТЭ10М	25
	DL	2ТЭ10М	9
	DL	2ТЭ10В	5
	DL (shunting)	ЧМЭ3	20
Tinchlik	DL	2ТЭ10М	3
	DL	2ТЭ10Ч	13
	DL	2ТЭ10В	5
	DL (shunting)	ЧМЭ3	11
	DL (shunting)	ТЭМ2	1
Karshi	DL	3ТЭ10М	8
	DL	2ТЭ10М	12
	DL	2ТЭ10Ч	6
	DL	2ТЭ10В	19
	DL (shunting)	ТЭМ2	22
Termez	DL	2ТЭ10Л	1
	DL	2ТЭ10В	30
	DL (shunting)	ТЭМ2	26
Urgench	DL	2ТЭ10М	14
	DL	2ТЭ10Л	3
	DL	2ТЭ10В	16
	DL (shunting)	ЧМЭ3	11
	DL (shunting)	ТЭМ2	3
Kungrad	DL	2ТЭ10М	50.5
	DL	2ТЭ10В	1
	DL (shunting)	ТЭМ2	26

3) Repair works in charge

(a) Locomotive depot

Depot No.	Depot name	Type of Rolling stock	Works in charge
ТЧ- 1	Tashkent	DL	TO-2, TO-3, TP-1, TP-3
ТЧ- 3	Kokand	DL	TO-2, TO-3, TP-1, TP-3
ТЧ- 4	Andijan	DL	TO-2, TO-3, TP-1, TP-3
ТЧ- 5	Samarkand	DL	TO-2, TO-3, TP-1
ТЧ- 6	Buhara	DL	TO-2, TO-3, TP-1
ТЧ- 7	Tinchlik	DL	TO-2, TO-3, TP-1
ТЧ- 8	Karshi	DL	TO-2, TO-3, TP-1
ТЧ- 9	Termez	DL	TO-2, TO-3, TP-1
ТЧ- 10	Urgench	DL	TO-2, TO-3, TP-1
ТЧ- 11	Kungrad	DL	TO-2, TO-3, TP-1
ТЧ- 12	Uzbekistan	DL EL EC	TO-2 TO-2,TP-1,TP-1P,TP-3,TP-4,KP-1 TO-2, TP-1, TP-4, KP-1

(b) Tashkent workshop

Type of rolling stock	Works in charge
DL	KP-1, KP-2
EL	KP-1, KP-2 (Under trial until March 1997)
EC	KP-1, KP-2 (Under consideration)

(3) Tashkent Locomotive Repair Workshop (the Tashkent Workshop)

The Tashkent Workshop is located in next door to Tashkent station in the southeast. It is the only diesel locomotive repair workshop not only in Uzbekistan but in the Central Asia.

It was established in 1899 as the repair workshop of steam locomotive and passenger coach. After that, it has performed repair of diesel locomotive from the 1920's to the 1960's. At present, it carries out repair of rolling stock, repair of industrial machinery, manufacture of freight wagon and so forth.

The Tashkent Workshop has approximately 314,000 m^2 of land. Present layout of the workshop is shown in Figure 6.5-2.

In the Figure, main buildings for repair works are shown by the capital letter, namely, the main repair shop, the wheel shop and the electric rotating machine shop.

At present, several buildings which are colored blue are available for electric locomotive and railcar repair, and further, the coach shop will be available in future, because it will be transferred to new passenger coach repair workshop.

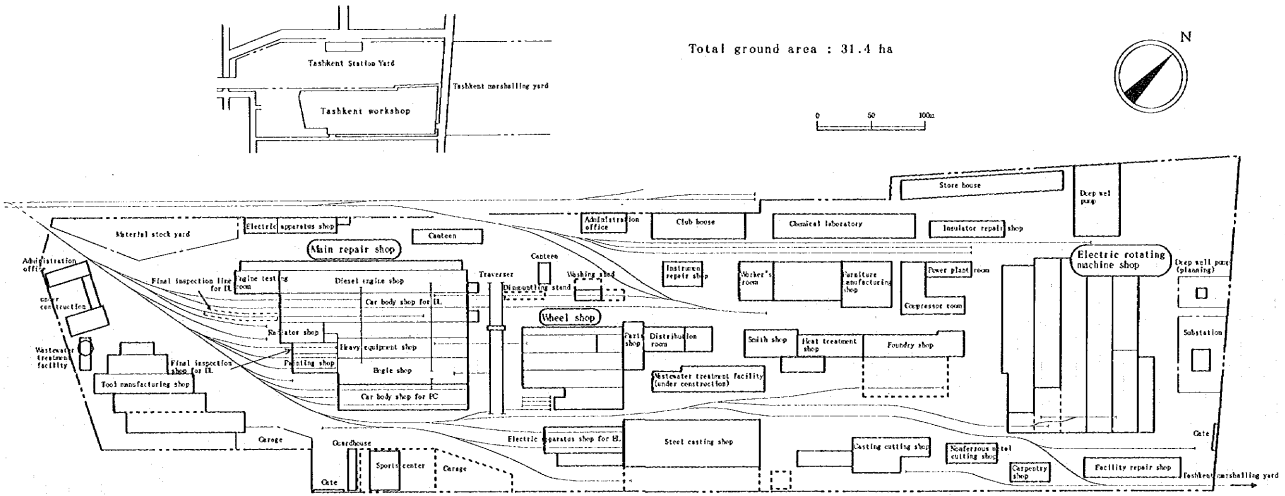


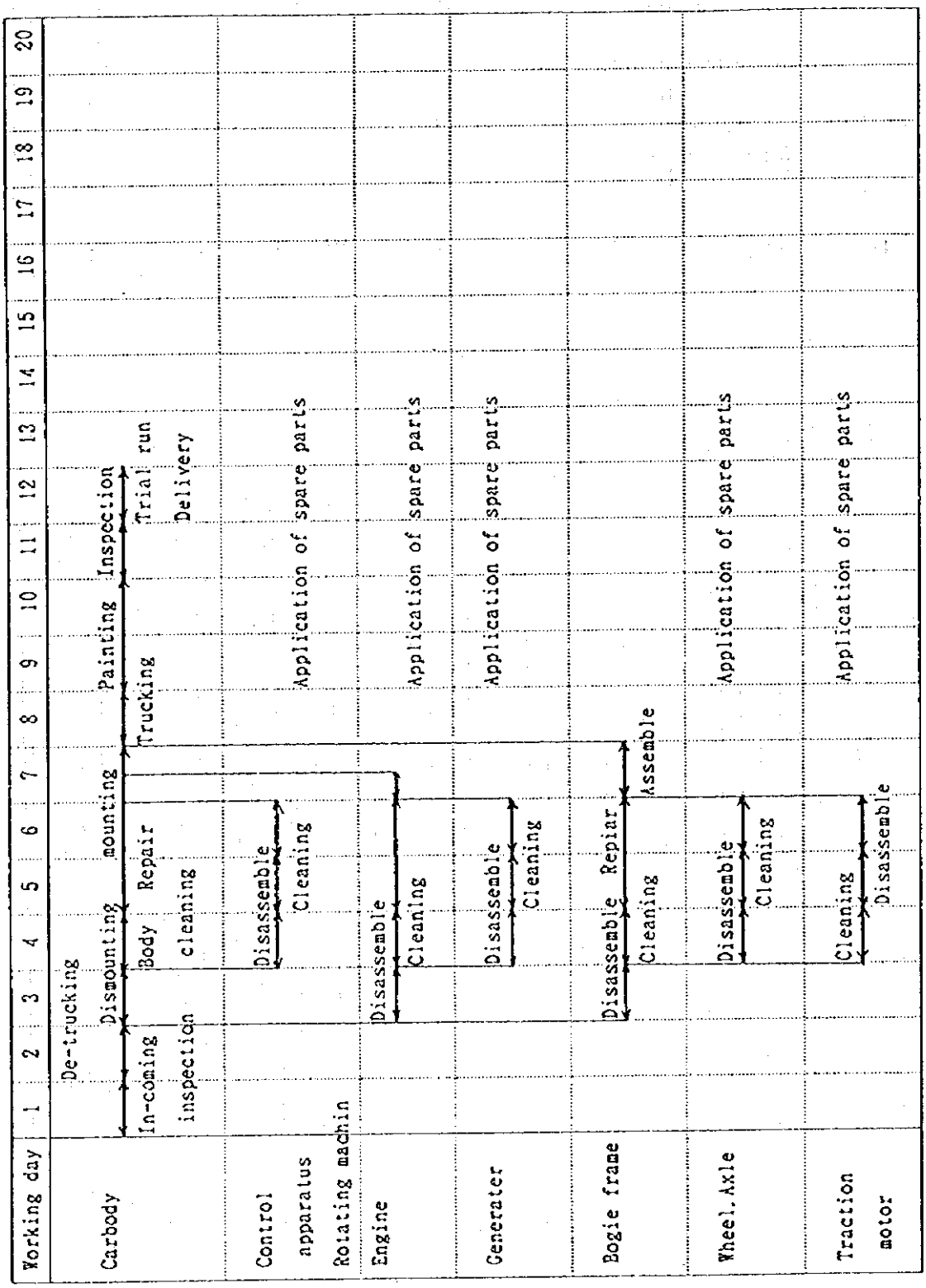
Fig. 6.5 - 2 LAYOUT OF TASHKENT WORKSHOP

The number of sections of diesel locomotive overhauled by the Tashkent Workshop in 1996 is as follows.

Description	KP - 1	KP - 2	Total
UTJ	67	47	114
Industrial Enterprise	9	5	14
Tajikistan	11	2	13
Kirgizstan	3	-	3
Kazakhstan railway	4	8	12
Total	94	62	156

The overhaul process of KP-1 for DL in the Tashkent Workshop is shown in Fig. 6.5-3.

Fig. 6.5-3 Repair Time Schedule for DL KP-1 at Tashkent Workshop



(4) Uzbekistan Depot

The Depot is located in approximately 17 km southwest of Tashkent, with a total area of approximately 230,000 m^2, and is surrounded by agricultural land widely. Present layout of the Depot is shown in Figure 6.5-4

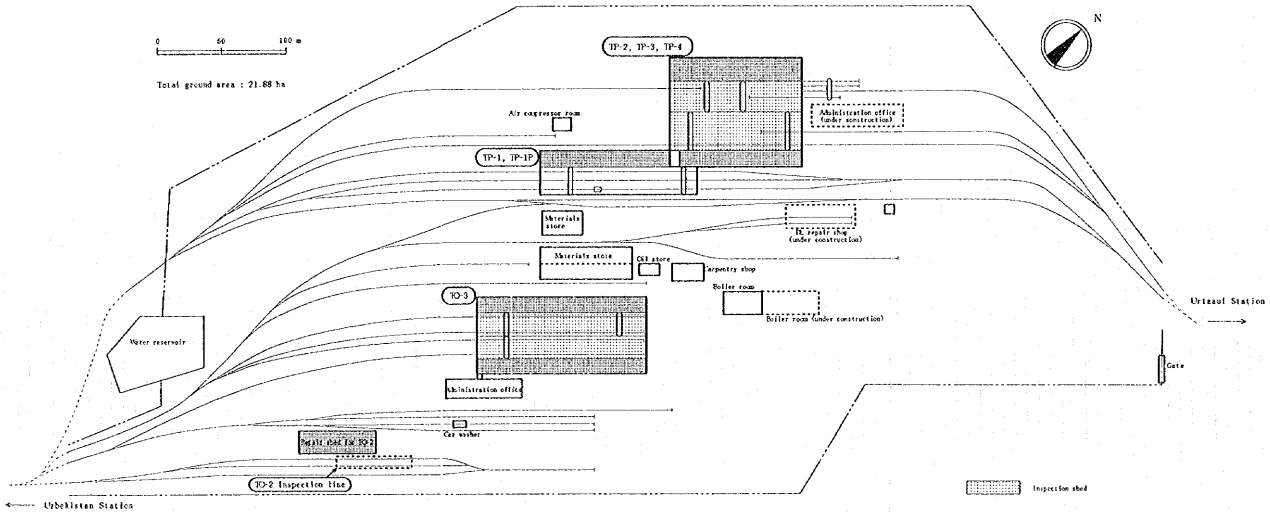


Fig. 6.5 -4 LAYOUT OF UZBEKISTAN DEPOT

As mentioned above, the Uzbekistan Railways have one locomotive workshop and eleven locomotive depots. The Depot is the only electric locomotive depot in the Uzbekistan Railways. It was established in 1978, with three branch depots, that is, Havast, Hozikent and Tashkent which is in located Tashkent station yard. Periodical maintenance in charge of the Depot is mentioned in 6.5-(2)-3)-(a)

The number of sections of electric locomotive and electric railcar overhauled by the Depot in 1996 is as follows.

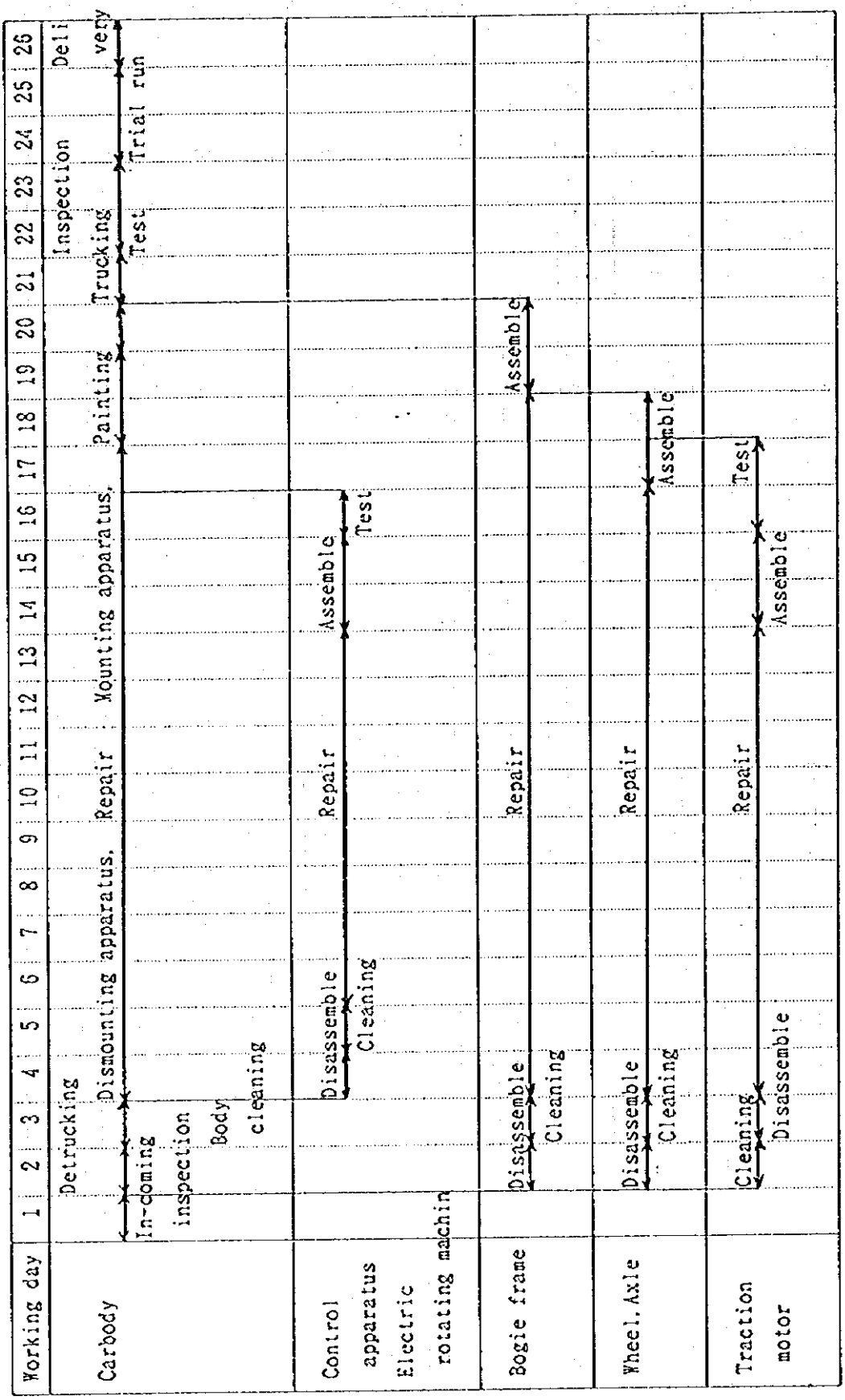
Type	TO - 3	TP - 1	TP - 1P	TP – 3	TP - 4	*KP – 1
Electric locomotive	126	339	23	21	26	6
Electric railcar	990	156	-	-	1	9

* : Conducted in Russia

Recently, the Depot is trying to begin new business using its facilities and skill, such as production of welding wire and repair of mining diesel locomotive.

The inspection process of TP-4 for EL in the Depot is shown in Fig. 6.5-5

Fig. 6.5.-5 Repair Time Schedule for EL KP-1 at Uzbekistan Depot.



CHAPTER 7 DEMAND FORECAST

7.1 GENERAL AND METHODOLOGY

(1) "Traffic forecasts are particularly difficult in countries such as those Central Asian countries where transformations are taking place and where there is still uncertainty on when economic recovery will start and which form it will take. Road transport is expected to benefit more in the event of an economic recovery than rail transport. The latter may even continue to regress on certain lines and it is unlikely that the peak levels recorded around 1989 will be reached before many years, if ever."[1]

(2) Although over 18 months have elapsed since that comment was written, the situation described remains true today. Considerable uncertainties exist in all countries within the Central Asian region, and to make dogmatic assertions about the shape and size of the transport industry in 2010 is folly of a high degree. Those who claim otherwise make fraudulent claims.

(3) In an ideal world, a number of techniques exist to aid the forecaster in his/her task. For simplicity, they can be categorised into two types: bottom-up, and top-down.

1) Bottom-up techniques involve the collection of substantial amounts of disaggregated data at the lowest practicably measurable level which is also consistent with the constraints of available time, resources and computing-power.

Typically they involve the development of sophisticated models, drawing on base data such as Origin and Destination (O & D) Surveys, to predict trip generation, distribution, flow assignments and modal shares. Over time, the models can be honed and re-calibrated to reflect what actually happens as against what was originally predicted.

2) Top-down analysis starts at the macro-level, and normally incorporates methods such as elasticity measurement, whereby rates of change in transport activity are correlated against rates of change in other variables such as GDP, industrial output, average income and so on. Forecasts of the latter can then be used to predict what effects are likely to follow in the transport market. It should be recognised that such techniques have limited value in transitional or otherwise unstable economies.

(4) In present-day Uzbekistan, bottom-up methods are not a credible option for a number of reasons:

1) First, concepts such as O & D data are not well understood. Why, indeed, should they be? This was not the way in which demand was managed. Information of this nature has never been collected.
2) Secondly, what information does exist forms an unreliable basis for forecasting.

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[1] EBRD, Central Asia Outline Transport Strategy, Final Report, 1995 (European Bank for Reconstruction and Development)

This is because it was originally collected for an entirely different purpose, and cannot therefore be considered either relevant or complete for predictive purposes. Two examples serve to illustrate the problem.

The railway ticketing system does not generally allow for through-booking. If a passenger's journey requires a change of train, he/she will normally have to purchase a separate ticket at the interchange point. Thus, someone travelling from Nukus to Andijan will buy one ticket in Nukus to Tashkent, and another ticket in Tashkent to Andijan. The railway management accounting systems therefore have no means of knowing how many people travel from Nukus to Andijan.

It is also the case that a proportion of people travel illegally without buying tickets, preferring instead to offer the coach attendant an inducement to allow them on board. The true extent of this phenomenon is not known, but it is thought to be sufficient to distort official figures. (It is interesting to note that Russia recently refused to accept international trains emanating in Tadjikistan on account of the high degree of ticketless travel.)

3) Thirdly, fully comparable data from competing modes would need to be obtained, particularly for air, bus and car journeys. Whilst information about the first two should in theory be available, data on car-trips does not exist except in aggregate form (e.g. numbers of cars per day using a given road).

This, of course, is not to suggest that a start should not be made to build up such a bank of information. Indeed, the sooner it is started, the better. Unfortunately, it is wholly outside the scope, timescales, budget and resources of this project to initiate the exercise. It will be a minimum of five years before sufficiently robust O & D data has been assembled for reliable prototypical models to be hypothesised and calibrated.

(5) Top-down forecasting methods would seem to provide a more attractive avenue for the forecaster, but even these do not come without their own particular caveats:

1) Independent Uzbekistan is only just over five years old. Even in a perfect world, five years is barely long enough to undertake statistically significant trend analysis.

2) The upheaval in the economy in the immediate period since 1991 has given rise to extraordinary[2] one-off forces and effects, likely to be of as much interest to Chaos Theorists as to Economists. To isolate the variables relevant for forecasting is nothing if not a challenging task. The complications include the fact that there have been three separate currencies (the Rouble, the Som Coupon and the Som), that the annualised rate of inflation has at times topped 4,600% per annum, and that official exchange rates have seldom reflected the true and lesser value of the national currency.

3) Even the Government is not in a position to make predictions about the Uzbek economy. Their step-by-step approach to reform, whilst driven as much by political as economic considerations, enables a degree of learning by experiment. It must be

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[2] In the true sense of extraordinary i.e. out-of-the-ordinary or unprecedented.

recognised that Government economists, trained to be experts in managing a planned economy, are themselves having to learn new theories and techniques about the functioning of market economies; their task is made all the harder by the fact that in the interim they have to understand the dynamics of a transitional economy, about which there is no plentiful source of expertise to draw upon (least of all from the so-called advanced western economies)[3]. Not even independent analysts are prepared to commit to predictions covering more than about two years into the future.

4) The Uzbek railway company (UTJ) has only existed in its present form for just over two years. Prior to this, from Uzbekistan's independence in 1991, it operated more or less as the Central Asian Railway division of the former Soviet Union's Ministry of Railways (MPS). Moreover, in the years between 1991 and 1996, UTJ yielded control, at differing times, of the railways of Turkmenistan, Tadjikistan and Kyrgyzystan. This means that historical data needs to be adjusted and restated to take account of these changes if any meaningful trend analysis is to be undertaken.

(6) Nevertheless, with the data that does exist, supported by professional judgments about how both the general and transport economies are likely to perform, a prediction of railway traffic-levels in the year 2010 can be attempted.

(7) That, however, is only the first step; the translation of traffic-levels into an assessment of the required number of locomotives is itself an exercise beset by pitfalls[4]. For the sake of comparison, the table below gives an indication, for a selection of railway administrations, of the number of locomotives per 100 route-kilometres of track[5]. The reader is also asked to refer to Table 3.4.1-5 in Chapter 3 for another yardstick of locomotive fleet size, which also indicates that Uzbekistan is currently excessively provided for.

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3 For an interesting commentary on the development of macro-economic skills for officials within Uzbekistan, the reader is invited to refer to the bulletins of the UNDP's Macro-Economic Policy Training and Analysis Project. The first of these bulletins was published in August 1996.

4 For example, the assessment will need to take account, inter alia, of: the extent of improvements in operational efficiencies; the increased availability of locomotives arising from their being maintained locally rather than in Russia; the increased reliability produced by replacing old diesel locomotives with new electric ones; the higher performance specification of modern electric locomotives in terms of acceleration, maximum speed, and hauling capacity, and the extent to which these are compatible with braking distances imposed by the signalling system; the number of routes which will have been electrified and the number of new lines likely to have been constructed; the opportunities which may present themselves for peak-smoothing; etc. etc.

5 It is fully acknowledged that this is a blunt and potentially misleading yardstick, as it fails to take account of degree of non-loco-hauled working, traffic density, different characteristics of freight and passenger train operation, geographical and other factors affecting train speeds, and so on.

Table 7.1-1 Operational Mainline Locomotives per 100 Route-Kilometres

Railway	Operational Locomotives	Route-Kms	Locos per 100 Route-Kms
SBB Switzerland	933	2973	31
SNCB Belgium	977	3368	29
OBB Austria	1157	5294	22
KNR South Korea	579	3081	19
NS Netherlands	533	2757	19
AZR Azerbaijan (1)	387	2122	18
UZ Ukraine (1)	4010	22564	18
DB Germany	6994	40209	17
LG Lithuania	303	1811	17
UTI Uzbekistan (1)	564	3483	16
ER Egypt	739	4751	16
FS Italy	2368	15941	15
SNCF France	4500	31841	14
(SZD Former Soviet Union)	21260	147359	14
PKP Poland	2930	24313	12
Kazakhstan	1620	13826	12
TDDY Turkmenistan (1)	233	2187	11
LDZ Latvia	303	2670	11
BR Bangladesh	287	2745	10
OSE Greece (Standard Gauge)	156	1565	10
UPRR United States	3540	36480	10
RZD Russia	7696	90000	9
Perumka Indonesia	563	5961	9
ICR United States	387	4320	9
EVR Estonia	86	1018	8
CFM Moldova	112	1328	8
CSX United States	2500	30014	8
PR Pakistan	590	8163	7
KTMB Malaysia	114	1648	7
CN Canada	1922	28720	7
Conrail United States	1372	19630	7
KCSR United States	308	4690	7
FNM Mexico	1244	20506	6
TCDD Turkey	612	10386	6
SRT Thailand	244	3865	6
RENFE Spain	803	12781	6
MTZ Mongolia	105	1815	6
Tadjikistan	29	511	6
CP Canada	1677	29100	6
BNSF United States	2841	52800	5
RAI Iran	236	7192	3
BCh Belarus	128	5488	2

Source: Various including: UIC; Janes World Railways (1996-97); International Railway Journal; EBRD; OECF; PCI

Notes: (1) It is believed that a proportion of these fleets may, in fact, have been mothballed or scrapped. In Turkmenistan, only 84 of the 233 locos are actually functioning, yielding a ratio of just 4 locos per 100 route-kilometres.

(8) What is very clear from this table is that a high density of locomotives is normally associated with well-developed, extensive networks which operate a relatively

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(8) What is very clear from this table is that a high density of locomotives is normally associated with well-developed, extensive networks which operate a relatively

intensive passenger service alongside freight services. The predominantly freight railways, such as those in North America, operate with a much lower density of locomotives. It is significant that Kazakhstan, Turkmenistan, Tadjikistan, and Russia all have a proportionately smaller locomotive fleet than Uzbekistan, as indeed did the former Soviet Union when traffic levels were considerably higher.

7.2 BRIEF REVIEW OF OTHER RELEVANT TRANSPORT FORECASTS

(1) Reference was made in Clause 7.1.1 to the EBRD 1995 Study, whose remit also sought to make predictions of transport demand in the Central Asian region. As already quoted, it considers generally that road transport is likely to recover more strongly than rail. Among its other conclusions are:

1) Under both low and medium scenarios of economic growth, transport activity in the region will not generally have recovered to 1990 levels by the turn of the century, as shown in the table below:

Table 7.2-1 Central Asia: Transport Activity in 1999 as % of 1990 and 1993 Levels (1)

Country	Pass-Kms (% of 1990)	Tonne-Kms (% of 1990)	Pass-Kms (% of 1993)	Tonne-Kms (% of 1993)
Low Scenario				
Kazakhstan	69	47	99	97
Kyrgyzystan	31	32	107	124
Turkmenistan	93	44	111	100
Central Scenario				
Kazakhstan	76	56	110	115
Kyrgyzystan	36	36	124	139
Turkmenistan	107	49	128	112

Source: EBRD - Central Asia Outline Strategy, 1995

Notes: (1) The study was intended to include Uzbekistan, but insufficient data were made available to the study-team.

2) The report quotes a study by Lufthansa Consulting GmbH which predicts that international traffic at Tashkent Airport will grow by 10% to 13% per annum from 1995 until 2005, and thereafter at an average 6%. CIS traffic will recover slowly. Passenger numbers will rise from 1.81 million in 1995, to 3.84 million in 2005, although regional traffic will only increase from 0.49 to 0.67 million. Total cargo and mail handled will rise nearly 50% from 23,500 tonnes to 35,600 tonnes. Unfortunately, these forecasts have already proved optimistic.

(2) The World Bank, in a report published in September 1993[6], predicts that transport demand will change "substantially". It believes that "total demand can be expected to decline because transport prices will be tied more closely to costs, and will thus

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[6] Uzbekistan: An Agenda for Economic Reform, World Bank, Washington, 1993.

increase in relative terms; moreover the reform process will create a less specialized and monopolistic structure, thus diversifying trade patterns, and, in general, shortening distances between buyers and suppliers. Overall, the current decline of about 30% may last over the longer term....interregional road transport and the use of containers are likely to grow....Conversely, the modal share of rail transport may be expected to decline. Air transport is likely to remain at its current depressed level." This would appear to be a robust analysis in the light of subsequent events.

(3) UTJ has produced its own predictions of demand over the next few years, as shown in the following table.

Table 7.2-2 - UTJ Forecasts of Rail Traffic Demand

Unit	Note	1995 Actual	1996 Jan-Sept	1997 Forecast	1998 Forecast	1999 Forecast	2000 Forecast
Tonne-Kms (10^9)	(1)	23.5	15.5	19.5	20.0	20.5	21.0
Tonne-Kms (10^9)	(2)	23.5	15.5	17.7	18.1	18.6	19.0
Tonnes (10^6)	(2)	46.1	29.7	40.5	41.4	42.4	43.3
Pass-Kms (10^9)	(1) and (2)	2.50	1.56	2.00	2.03	2.07	2.10

Source: UTJ

Notes: (1) Forecast provided 12/96
(2) Forecast provided 1/97

Assuming a continuation of the linear growth this would indicate that freight traffic in 2010 would comprise 26 billion tonne-kilometres on the more optimistic forecast, or 23 billion tonne-kilometres in the less optimistic scenario. These represent respectively 71% and 63% of 1993 levels. Tonnage would reach 52.8 million tonnes, or 87% of 1993 levels. Passenger-kilometres would rise to 2.43 billion, 45% of 1993 levels. It is noteworthy that these projections are very closely in line with those forecast in Section 7.4 of this report, arrived at completely independently.

(4) In 1995 the Japanese Overseas Economic Co-operation Fund (OECF) published a study regarding the construction of a passenger coach repair workshop in Uzbekistan. Again, faced with a dearth of data, the study team found forecasting difficult. The main conclusion was that in 2010 UTJ would be conveying 36.1 million passengers per annum (156% of the 1993 level).

(5) The UNDP Human Development Report of 1996 considers that "the volume of rail passengers is expected to increase by 10% by the year 2000 due, in main part, to high costs of other forms of public transportation."

(6) Strong and Meyer (1996, op. cit.) quote a study by Travers Morgan and Booz Allen Hamilton which suggests that under a median forecast of future economic activity for