India

Calcutta Metro Railways (Phase II) Construction Project

Report Date : November, 2002
Field Survey : August, 2001

1. Project Profile and Japan's ODA Loan

Location map

Metro rail train entering a station

1.1. Background

As India shifted toward a more industrialized economy, the population had been concentrated in the large cities, but the public transport infrastructure had not kept pace with the population's increasing needs. In an effort to address the issue of insufficient public transport infrastructure and to sustain economic growth in large cities, the Government of India established the Metropolitan Transport Project in Ministry of Railways[1] in 1969.

Subsequently, the Urban Railway Transport Development Plan, a master plan targeting the cities of Delhi, Calcutta, Mumbai and Chennai[2], was prepared in 1969. This project, which provides for the construction of a metro railway in Calcutta, was recognized under the Master Plan as the only viable option to address Calcutta's harsh traffic problems.

Initially, the metro railway development plan for Calcutta was developed with the assistance of Soviet experts, who suggested the urgent commencement of this project. Due to a lack of funds and the local contractor's insufficient construction machinery, however, the project was not implemented as initially scheduled. Construction including land acquisition for Metro line sections, particularly in commercial areas, was severely delayed due to difficulties in securing detour routes for surface traffic. To accelerate for early completion, therefore, the Government of India requested Yen Loan assistance.

[1] Metropolitan Transport Project was established for conducting Feasibility Study of the Project.
[2] Mumbai and Chennnai was called at the time of appraisal as Bombay and Madras respectively.

1.2. Objectives

To construct a metro railway that will provide an efficient, rail-based mass transportation system for corresponding to the increasing transport demand.

1.3. Project Scope

Procurement of equipment and material, and mechanical and civil works required to construct a metro railway structure in Calcutta (from work section 5 to 9), with Yen Loan allotted to a part of the foreign currency portion of the project.

1.4. Borrower / Executing Agency

The President of India / Ministry of Railways, Railway Board (Metro Railways Calcutta ("MRC"))

1.5. Outline of Loan Agreement

Loan Amount / Loan Disbursed Amount	4,800 million yen / 4,671 million yen
Exchanges of Notes / Loan Agreement	August 1982 / February 1983
Terms and Conditions Interest Rate Repayment Period (Grace Period) Procurement	 2.75 % per annum 30 years (10 years) Partially Untied
Final Disbursement Date	March 1992

2. Results and Evaluation

2.1. Relevance

The Government of India, through the organization called the Metropolitan Transport Project, prepared the Urban Railway Transport Development Plan in 1969 to address urban transport problems. Both this master plan and the ministry's Sixth Five-Year Plan (1980-1985) addressed the need for this project.

At the time of appraisal, the population of Calcutta had already reached 9.2 million people and was increasing at a rate of 2.7 % per annum (as of 1980). One of the most serious constraints in Calcutta's transport sector was that road surface accounted for only 6 % of the total land in Calcutta Metropolitan District (CMD). It is generally recognized, however, relocating the population residing along an existing road in order to widen the road surface is extremely difficult and costly. Accordingly, it was determined that the most effective way to ease Calcutta's heavy traffic problems would be to build an overhead or underground transport system.

Calcutta's residents realize that traffic congestion will not be resolved without more efficient means of mass transit. In this sense, the metro railway constructed under this project is a key

piece of infrastructure, and its capacity should be continuously improved to accommodate increasing numbers of passengers.

Both Transport Master Plan reports[3] for CMD address the importance of effectively integrating the metro facility with other means of transportation to achieve further utilization of its capacity. And work on a metro railway extension from Tollygunge Station to New Garia has already started. Consequently, this project and its objective can be considered still relevant.

2.2. Efficiency

2.2.1. Project Scope

Yen Loan assistance covered part of the entire metro railway infrastructure (civil and associated electrical works from section 5 to 9, totaling 5.027 km (including 6 stations) out of 17 sections). According to the Project Completion Report (PCR), the project was implemented as per the envisaged original scope. Construction equipment procured during the project that was not familiar to the Indian contractor, was adequately utilized under Japanese instruction and guidance.

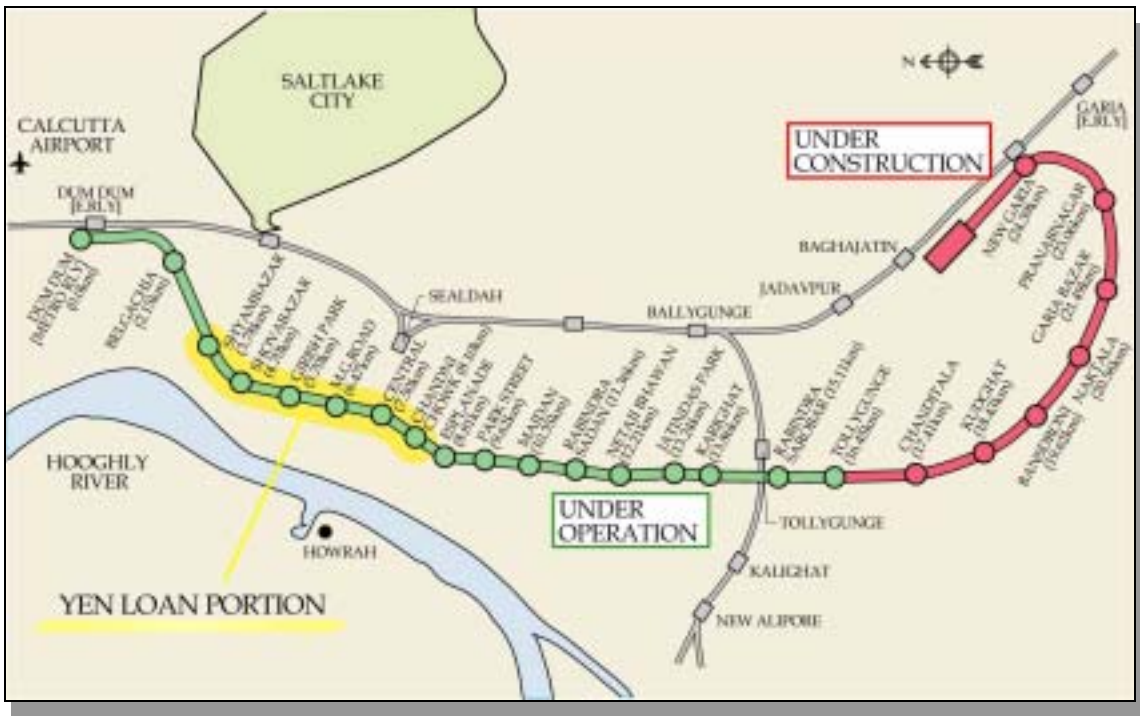

Figure 1 Calcutta's metro railway line and stations

2.2.2. Implementation Schedule

Metro railway construction was carried out by the local contractor. There was a considerable time over-run in the project's civil works (scheduled for completion in August 1987, but actually completed in June 1996), and the reasons for this were summarized by the executing agency as follows:

[3] Master Plan for Traffic and Transportation in Calcutta Metropolitan Area 2001-2005, July 2001. Draft prepared by Calcutta Metropolitan Development Authority and Integrated Multi-modal Public Transport Plan for Calcutta, January 2000. Final Report prepared by State Government of West Bengal, Transport Department / Rail India Technical and Economic Services.

- Delay in land acquisition
- Long processing time for importing construction machinery
- Ineffective and time-consuming technical transfer of construction skills
- Existence of old buildings (vulnerable to vibration) along the work site
- Existence of complicated network of underground sewerage and water mains beneath the work site
- Limited availability of working space due to congestion of the roads, and limited working hours for lengthy transportation of construction material
- Strike by contractor's employees
- Interruption of construction works due to rain and long rainy season

2.2.3. Project Cost

According to PCR, this project was completed with a large cost over-run, mostly a result of the above implementation delay. In addition, the price index rose nearly 3 times from 1981 (base level 100) to 1994 (310.9). PCR also pointed out that a shortage of construction materials in the market had the effect of increasing their cost.

Furthermore, additional works necessary to divert underground utilities (water mains, sewerage and so on) and to prepare extra road-decking works to maintain a four lane-road during the construction stage also contributed to the cost over-run. It should be noted, in this regard, that those sections where Yen Loan was used faced the greatest delays and cost escalation.

2.3. Effectiveness

In order to examine the extent to which the project achieved its objective of "providing an efficient and non-polluting rail-based mass rapid system," this report will now look at how the metro railway infrastructure has been utilized and how effectively railway service has been provided since the system was commissioned.

(1) Train operation

According to the executing agency, train operation is "still on the way" to full utilization. The number of trains running and the total hours of operation have been on the increase, as shown in the Table 1 below. These trends are explained by continuously increasing passenger demand for the metro railway and improved operation by the executing agency.

Table 1 Train operation indicators

	Average number of trains (no. / weekday)		Interval between trains(minutes) peak / off-peak	Average hours of train operation (hours / weekday)		Operating time (from X:X to X:X)
	Planned	Actual	Actual	Planned	Actual	Actual
1995/1996	112	92	n.a	75	61	7:20-21:53
1996/1997	120	119	15 / 20	80	79	7:20-21:53
1997/1998	132	130	10 / 15	88	87	7:20-21:53
1998/1999	142	136	10 / 15	95	91	7:00-21:53
1999/2000	142	137	10 / 15	95	91	7:00-21:53
2000/2001	153	153	10 / 15	102	102	7:00-22:18
2001/2002	167	167	8 / 15	148	-	7:00-22:18
Afterwards[1)]	280-300	-	5 / 10 (till 2005)	187-240	-	
			3 / 7 (till 2010)			

Source : Metro Railway Calcutta (MRC)
Note : Figures are the weekday average for the whole line.
Note : [1)] Planned figures

(2) Train Passenger

The number of train passengers has been lower than initially projected. As seen in Table 2, actual passenger volume has remained around 10% of the demand initially forecasted. In other words, demand which was forecasted in the Feasibility Study assisted by the Soviet Union was overestimated, perhaps because conditions were not properly examined. The executing agency and a SAPS study undertaken by JBIC in 1996 have pinpointed several important conditions assumed at the time of initial forecasting that are not presently true. The following conditions were used to support the original passenger projections:

- Much higher population and economic growth rates for Calcutta city than actual
- Operation of north-south line (i.e. the present metro line) with crossing east-west line, which was also to be realized at later stage
- Shorter train running interval than actual
- Inadequate traffic projection model applied during initial planning
- Feeder (bus) services from and into metro stations assumed at the time of initial planning

Both Transportation Master Reports for CMD clearly point out the importance of tighter integration of the metro railway line with other means of transport (particularly bus and mini-bus services) and conclude that the existence of competitive bus services running on and along all or part of the metro railway line has been major factor in preventing further metro rider-ship. Presently, buses provide nearly door-to-door service for passengers.

The elimination or diversion of competitive bus route services became difficult. During the project implementation delays, a number of bus operators formed commercially viable service routes on or along the metro alignment, and were reluctant to shift their routes after the metro was completed.

Table 2 Train passenger indicators

	Yearly passenger traffic (million/year)		Average daily passenger traffic (thousand / weekday) [1]		Yearly volume of transportation (thousand persons x km)
	Planned	Actual	Planned	Actual	Actual
1995/1996	667	43.7	1,880	146.5	362,440
1996/1997	678	62.6	1,910	221.1	561,350
1997/1998	688	69.1	1,940	233.4	631,150
1998/1999	699	57.1	1,970	192.7	523,330
1999/2000	710	55.8	2,000	188.7	526,560
2000/2001	717	70.6	2,020	238.9	657,300
2001/2002	724	80.0 [2]	2,040	258.0 [3]	-

Source : Metro Railway Calcutta (MRC)

Note : [1] Available from MRC is average figure for seven days. To make a comparison with planned figure (weekday figure), given figures are multiplied by 122-125% (123.5 middle value taken here), which is an experienced multiplier by MRC.

Note : [2] Expected figures and [3] Figure from April to July 2001.

According to the executing agency, drops in passenger volume experienced in 1998/99 and 1999/00 can be explained by a metro charge increase applied in June 1998[4]. However, passenger volume soon recovered in 2000/01 and even surpassed previous higher levels, a phenomenon that was accounted for by increases in the fares for other means of transport, particularly bus and mini-bus services, in November 1999. For example, bus fares were revised upward from Rs. 1.75 to 2.50 for journeys less than 6 km.

The executing agency considers the maximum carrying capacity to be 60,000 passengers per hour for one direction, assuming 2.4 minutes between trains (recognized as a future target) and 300 (rated capacity) passengers per coach. Based on this carrying capacity and the present operating hours (15.3 hours), the maximum number of daily passengers is 918,000. Accordingly, the current utilization level of metro railway is about 26 %.

However, if capacity is calculated using the number of trains running per day (the present average is 153 lines), maximum daily carrying capacity is 367,200. Current utilization level in this case reaches 65 %, which is good as per the international standards. During peak times (business commuting hours), many heavily crowded coaches were observed during the post-evaluation survey.

With more frequent operation (i.e. shorter intervals), administrative arrangements to facilitate more integration with other transport means, and the completion of the extension to New Garia station, the executing agency expects for yearly passenger volume to increase to 100 million passengers in 2005 and 170 million in 2010.

(3) Coach Mobilization

It is found that the train coaches deployed by the executing agency have been properly utilized with lesser maintenance requirement period. By improving coach mobilization, the executing agency has adequately met increasing passenger demand.

[4] Before June 1998, MRC charged Rs. 2.0 for travel under 5 km journey, but increased that to Rs. 3.0, the rate as of August 2001.

Table 3 Train coach mobilization

	Number of cars owned (average units)	Number of cars mobilized (average units)	Average time required for maintenance (day / train) [2)]	Maximum speed / rated speed (km / h)
1995/1996	144	100	140	55 / 30
1996/1997	144	100	144	55 / 30
1997/1998	144	108	143	55 / 30
1998/1999	144	116	172	55 / 30
1999/2000	144	120	164	55 / 30
2000/2001	144	124	94	55 / 30
2001/2005 [1)]	144	128-144	85	55 / 30
Afterwards [1)]	232	232	60	55 / 30

Source : Metro Railway Calcutta (MRC)
Note : [1)] Figures are of projection or target.
Note : [2)] Average maintenance day includes those days when train coaches were available but not required for service.

(4) Project FIRR re-calculation

Using the original cost estimate and assumed fare rate, the FIRR was calculated at 4 % in the appraisal report. In actual terms, however, annual O&M costs before depreciation have been exceeding annual revenue. It is evident that the recalculated FIRR would be negative. Financial performance and cost structure of the executing agency are discussed in the Financial Status (2.5.3) section.

In order to allow Calcutta's metro railway to benefit a large segment of the population, the executing agency admits that it keeps fares low. As a result it is not able to recover even its running expenditures. However, the main concern here is the amount of social benefit, which we were unable to quantify during this survey.

Given the current volume of passenger and train utilization, the project cannot be judged appropriate to produce the social benefits initially expected. However, the project metro line is considered important in forming an effective transport system in Calcutta that is still affordable to a wide range of passengers. It is recommended that the assumptions or conditions presumed in the initial projection be properly realized in order to attract further rider-ship and to enhance the utilization of metro.

2.4. Impact

This project was expected to ease congestion by providing travelers a more efficient, alternative means of public transport.

(1) Change in modal split

The contribution by surface public transport (buses, trams, taxies and others), recorded at 88.6 % in the year 1981/82, decreased to 80.3 % in the year 2000/01. One of the reasons behind the shift was the significant deterioration of the tram service.

Taking into account the fact that no major rationalization and diversion of the existing bus service routes has been undertaken to promote further metro rider-ship, however, it may safely

be said that such a change in modal split can be slightly attributed to the availability of metro line.

Table 4 Modal distribution of public transit use within Calcutta (average weekday)

(Unit : thousand passengers)

	1981 / 82	1998 / 99		2000 / 01		2010 / 11	
	Composition (%)	Passenger	(%)	Passenger	(%)	Passenger	(%)
Buses	65.5	10,650	60.1	11,510	60.7	13,100	55.7
Tram / LRT	12.5	160	0.9	200	1.1	500	2.1
Taxi / other	10.6	3,280	18.5	3,500	18.5	4,700	20.0
Ferry	3.3	220	1.2	240	1.3	400	1.7
Railway	8.1	3,215	18.2	3,270	17.3	4,200	17.9
Metro	-	193	1.1	239	1.3	600	2.6
Total	100.0	17,718	100.0	18,959	100.0	23,500	100.0

Source : Master Plan for Traffic and Transportation in Calcutta Metropolitan Area, 2001-2025
Note : Figure in 2010/2011 is a projection.

(2) Road congestion

As shown in the Table 4, the number of passengers for all modes of traffic has been increasing, a trend that is expected to continue. The numbers of bus, taxi and other passengers (particularly those using auto-rickshaw) are also expected to grow, following the increasing number of motor vehicles on existing roads in Calcutta. In addition, the number of registered motor vehicles, including buses and trucks, has grown at a rate of 5.3 % per annum since 1995. According to the 1991 census, Calcutta's population (defined as CMD) reached 12.07 million, maintaining a high annual growth rate of 1.9 % from 1981.

Both the Calcutta Metropolitan Development Authority (CMDA) and the Transport Department in State Government of West Bengal (SGWB) have admitted that road surface congestion remains most important issue to be attacked by the transport sector of Calcutta. At present, therefore, it may be difficult to conclude that the metro line has contributed to the easing of traffic congestion in central Calcutta.

(3) Social impacts (land acquisition and relocation)

Since the main metro line was designed to run beneath the heavily commercialized districts of Calcutta, it was necessary to ask the owners of shops and properties to relocate. The executing agency stated that these business owners were reluctant to lose their business opportunities and were opposed to relocation. Opposition by concerned local residents caused the construction works of the project to be delayed, so the Government of India enacted the Metro Railway Construction Act to expedite the acquisition process for the land and property.

A SAPS study undertaken by JBIC indicated that, before this Act, around 800 cases were brought to court. Even after enactment, the number reached to 200 cases. It is reported that it took several years to settle each case. According to the executing agency, there were a few that were appealed to the Supreme Court. However, they were ultimately decided in favor of the executing agency.

The SAPS study also indicated that the lack of coordination and cooperation between the central government (Ministry of Railways) and the State Government was a major cause for

difficulties in the land acquisition process. Poor coordination and cooperation were particularly observed in administrative procedures to accept applications for land and property expropriation.

(4) Environmental impact

It is reported by the executing agency that air pollution attributed to vehicle exhaust gases has been mitigated to a certain extent after completion of project.

(5) Other impacts (fostering Indians' pride)

The Ministry of Railways and the executing agency admit that the construction and operation of the Metro railway Calcutta has fostered the Indians' pride as well as their technological capability, which has been utilized in the India's second metro line in Delhi.

2.5. Sustainability

2.5.1. Operations and Maintenance

The executing agency is an independent Public Sector entity in the Ministry of Railways. Operation and Maintenance (O&M) for the Calcutta metro line infrastructure and properties is divided among all sections within the executing agency except for the Finance & Accounting section. Each section's chief engineer or manager reports to the General Manager or Chief Administrative Officer.

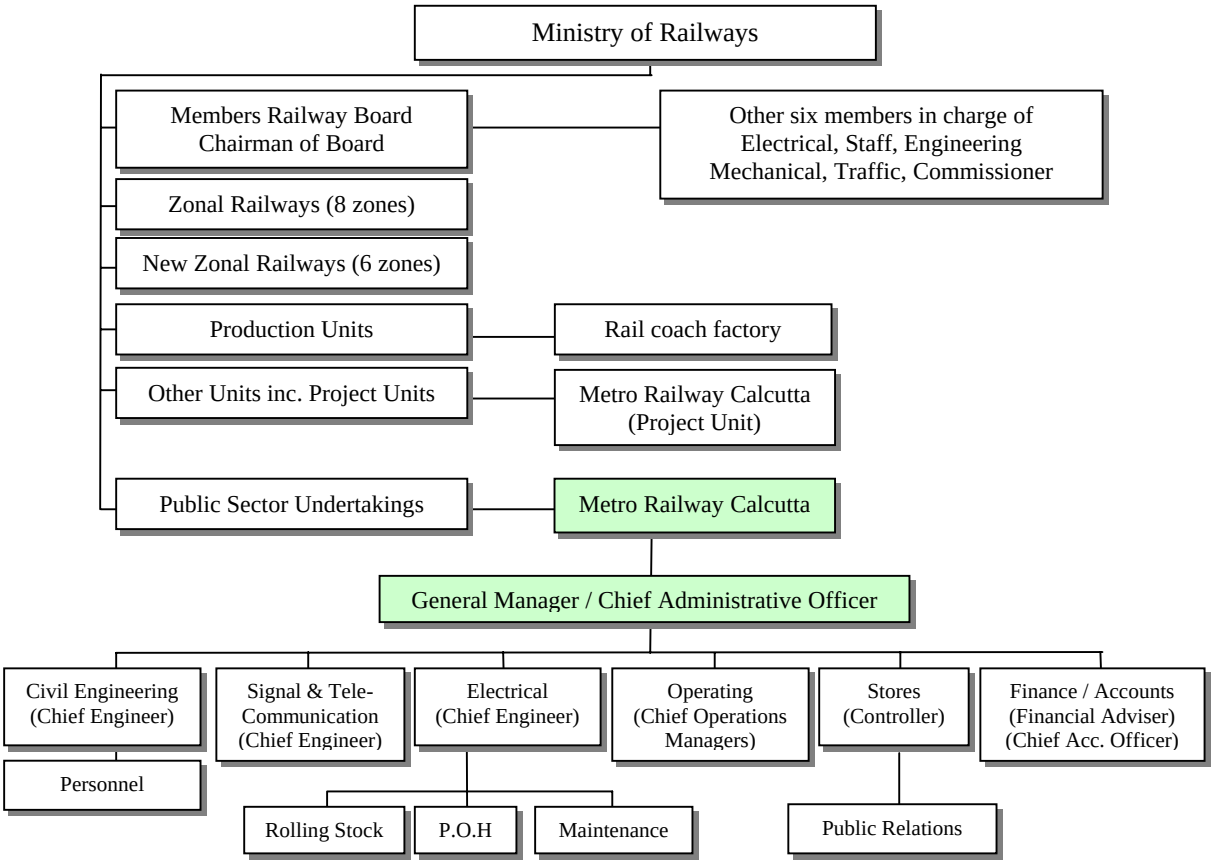

Figure 2 Position of MRC and O&M body and organization chart

a) Operation (Train Running)

Operation of the metro railway system has been overseen by the Operating section. The operation and allocation of metro trains (i.e. management of intervals between trains) are scheduled with particular reference to recent passenger volume records. Though the design capacity assumes a 2.4-minute interval, in practice the interval has been 8 minutes at peak times. This is explained, according to the executing agency, by the lower (compared to the optimistic original plan) passenger volume and the number of coaches owned.

b) Maintenance

Other technical sections, including Civil Engineering, Signal & Tele-communication, and Electrical, have responsibility for maintenance, procurement and installation of the corresponding equipment and facility. The Stores section is in charge of procurement and custody of spare parts. Each section has established a corresponding maintenance group.

Coaches

Maintenance work for coaches has been managed by the Electrical section at the maintenance depot, and been satisfactorily performed to correspond to increasing passenger demand, judging from the decrease in the average required time at the maintenance factory.

It was reported, however, that 40 coaches (5 trains) were stabled during the year 1998/99 and 1999/2000 with compressor defects because no spare parts were available. To ensure timely availability of spare equipment, the executing agency has promoted the localization of spare equipment manufacturing. This has helped reduce the amount of time required for maintenance.

Short-term coach maintenance comprises the following: daily trip check and 10-day, 30-day and 6-month inspections. The 30-day and 6-month inspections focus on the tightness check (for bolt and cable connections). After trains run over 300,000 km or for more than 5 years, they are to be transferred to the Periodic Overhaul workshop (POH), where all electrical equipment is replaced with newly procured or repaired equipment.

Tunnel Structures

The Civil Engineering section is in charge of taking care of all tunnel structures. Two maintenance bases are now established to improve tunnel maintenance and inspection works. One of the issues the executing agency faced regarding tunnel structures was water leakage from expansion joints, fine cracks and pores in the concrete walls, ceiling and floor. Accordingly, the executing agency took measures to solve the problem,using non-shrinkable grout to seal the leaking points. It is reported by the executing agency that leakage has been stopped fully at most of the leakage locations.

Ballast track

The Civil Engineering section is also in charge of maintenance for the entire ballast track and concrete bed. The executing agency has been replacing M-7 type track with M-1A type track, which is more durable and needs less maintenance. The executing agency also reports that it exchanges worn-out rails and repairs rail joints regularly.

c) Staffing

After the present metro line was fully commissioned in 1995, the personnel redeployment plan has been implemented in phases. In the Electrical section, which is responsibile for coach maintenance, many personnel were additionally recruited in the year 1997/98. Staff increases in the Electrical section, due to the induction of the POH workshop, were reasonable, taking into account the increasing number of trains running, decreased interval time, and the resultant needs for maintenance.

The Civil Engineering section, however, also increased its staff. According to the executing agency, this increase corresponded to the railway extension project. The new staff members have since been transferred to sections where the need for additional civil engineering has been recognized (particularly electric section).

Table 5 Number of staff in the executing agency

(Unit : persons)

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01
General Administration	16	16	31	39	40	40
Operating (traffic)	376	376	450	458	459	459
Electrical	631	631	1,350	1,400	1,442	1,442
Civil engineering	143	143	174	258	258	258
Signal & tele-communication	126	126	184	194	195	195
Finance & accounting	55	55	63	70	70	70
Stores	32	32	94	105	105	105
Personnel	25	25	28	33	33	33
Medical	16	16	22	26	26	26
Securities	206	206	295	295	295	295
Total	1,626	1,626	2,691	2,878	2,923	2,923

Source : Metro Railway Calcutta (MRC)

2.5.2. Technical Capacity

Staff who were transferred from other Indian Railways or newly recruited from schools have no previous experience with or expertise in metro coach maintenance and the O&M system, as the equipment mobilized in the metro is very different from conventional Indian Railways coaches. Although the executing agency used the existing training facility owned by Indian Railways, subsequently a training school for operating staff and signal / tele-communication and electrical maintenance staff was established in September 1998.

Regular training courses are being held for the initial training (newly recruited and ex-staff of Indian Railway), periodic refresher courses and the upgrading training, all of which contribute to technical capacity improvement. Furthermore, on-the-job training programs are regularly programmed and implemented.

2.5.3. Financial Status

The only materials available to evaluate the financial performance of the executing agency is a simplified income-loss statement. It does not have individually recorded assets and capital accumulations. This implies that the executing agency has no responsibility for repaying the capital borrowed for the construction of the metro railway infrastructure. Accordingly, the loss statement does not include depreciation or amortization costs. Even for the running expenditure incurred by the executing agency, there has been no clear rule of its recovery through revenue. Instead, the Government of India provides subsidies to make up the gap between revenue and running expenses.

Tariff revision is controlled by the Ministry of Railways from time to time , keeping in view the overall price index and financial situation of the Ministry, and is subject to the approval of Parliament.

As explained, passenger volume has been much smaller than initially projected. Furthermore, the metro fare has been kept lower than its running cost recovery level. With such a suppressed

revenue condition, the operating ratio[5] during the year 2000/01 is 2.53, much bigger than 1.90 of the year 1995/96 when the metro was commissioned.

Table 6 Revenue-expenses performance

(Unit : millions Rs.)

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02
Salary related cost	70.6	109.2	202.0	245.6	276.2	289.7	306.5
Energy (traction)	28.6	37.6	55.5	65.2	75.1	83.4	105.3
Energy (other than traction)	81.6	111.7	139.6	166.9	202.5	214.3	210.8
Contractual payment	21.4	28.8	43.9	56.6	93.5	130.9	119.0
Other expenses	20.4	43.2	41.4	87.7	135.1	150.6	132.9
Total expenses	222.5	330.4	482.4	622.1	782.5	868.9	874.6
Revenue (passenger service)	115.2	171.4	192.0	232.5	255.0	319.5	330.0
Revenue (other activities)	1.9	2.8	4.5	9.1	14.3	24.4	52.0
Total revenue	117.1	174.2	196.5	241.6	269.3	343.9	382.0
Operating ratio	1.90	1.90	2.46	2.58	2.91	2.53	2.29

Source : Metro Railway Calcutta (MRC)
Note: Figure 2001/02 is provisional.

There are several factors that explain such a sluggish financial performance. The executing agency must address its vertically divided budget requesting procedure and the lack of incentive for cost reduction. The two largest running expenses are for power/energy and for salaries.

On the other hand, the executing agency has been keen on implementing actions to generate further passengers and revenue, as follows:

- Issuance of different configuration of tickets -- whole day ticket, weekly ticket, fort-nightly ticket and monthly ticket -- to suit various types of passenger requirement
- Intensive marketing planning such as commercial exploitation plan and metro properties lease plan
- Expedition of likely possibilities, such as commercial advertisement informing passengers of new schedules, and public relation activities
- Study being processed by an outside consulting firm on the optimization of fare structure and intervals between trains, improvement of access to the metro station, and identification of most profitable metro network

The executing agency has been also working with the coordinating authority (State Government) in an effort to look at the entire transport sector in Calcutta for more rider-ship into the metro line. A SGWB steering committee, on which the executing agency has a seat, has made the following recommendations :

- Systematic integration of the metro line with other transport means, (existing bus or mini-bus routes running upon and along the metro alignment to be removed or diverted and re-formed as feeder bus services)
- Urban re-development plan for Dum Dum Station area, including provision for a bus terminal and station building
- Extension of the metro line from Tollygunge Station to the suburban railway line at New Garia, to create a southern gateway to central Calcutta (foundation work in progress)

[5] Operating ratio = running expense divided by revenue.

3. Lessons Learned

For construction projects in densely populated areas, factors that could potentially affect technical feasibility and reliability of schedule should be carefully examined to avoid severe delays in the implementation stage. Sound coordination among the responsible transport authorities is a key factor for sufficient utilization of the metro railway. When a project requires various authorities to work together, proper coordination is imperative to enlist the commitment of all the concerned stakeholders for efficient and timely execution. In particular, discussion with inhabitants in the areas for relocation should have been commenced earlier with the initiative of relevant authorities.

Comparison of Original and Actual Scope

Item	Original Plan	Actual
Project Scope		
(1) Construction of metro railway	Section 5, 6A, 6B, 7, 8 and 9	As planned.
Length : total	16.43 km	
: Yen loan portion	5.027 km	
Gauge :	1,676 mm	
Station : total	17	
: Yen loan portion	6	
including the following works;		
* Diaphragm walls and road decking works	For Section 7 & 8	
* Earth works in excavation	For all section	
* Box works (inc. waterproof works)	Ditto	
* Transfer of laid structures	Ditto	
* Railroad laying works	Ditto	
* Back filling / road restoration works	Ditto	
(2) Procurement		Not confirmed.
1) Construction machinery	(units)	
Skip	25	
Bulldozer	10	
Backhoe	15	
Crane truck	6	
Pump car	6	
Mixer car	30	
2) Construction materials		
Steel materials	55,000 tons	
Cement	240,000 tons	
(3) Operator/construction Supervisor		Not confirmed
1) Operator for procured construction machinery	408 M/M	
2) Construction supervisor	810 M/M	
Implementation Schedule		
(1) Tender	Sep. 1982 - Mar. 1983	Sep. 1982 - Mar. 1983
(2) Tender evaluation / contract negotiation	Apr. 1983 - Aug. 1983	Apr. 1983 - Jun. 1984
(3) Civil Works	Sep. 1983 - Aug. 1987	Sep. 1983 - Jun. 1996
Completion of diaphragm walls	Jun. 1985	Sep. 1989
Comp. of earthworks in excavation	Mar. 1986	Dec. 1994
Comp. of box works	Jun. 1986	Apr. 1995
Comp. of railroad laying works	Feb. 1987	Sep. 1995
Comp. of Back filling / road restoration works	Aug. 1987	Jun. 1996
(4) Electricity/tele-communication works	Feb. 1986 - Jun. 1987	Apr. 1994 – Sep. 1995
(5) Test run	Aug. 1987 - Dec. 1987	Sep. 1994 – Sep. 1995
(6) Commissioning	Dec. 1987	Sep. 1995
Project Cost		
Foreign currency	6,200 million yen	4,671 million yen
Local currency	24,900 million yen	120,692 million yen
Total	31,100 million yen	125,363 million yen
ODA loan portion	4,800 million yen	4,671 million yen
Exchange Rate	Rs.1 = 27.04 yen	Rs.1 = 27.04 yen (Rate is as of 1982)

Independent Evaluator's Opinion on
Calcutta Metro Railway (Phase-II) Construction Project

K.K. Gupta

1. With the industrialization of the country after independence, the population tended to grow rapidly in the metro cities. To efficiently solve the transport congestion problem of Calcutta with minimum obstacles to urban economic and social activities, it is agreed that the underground rail-based mass transport system was recognized as the only viable option, considering various constraints most important of which was a paucity of open space.

2. Calcutta Metropolitan Transport Project under Ministry of Railways was initiated in 1969, where the North-South corridor of Calcutta was selected as most priority route. The work started during the year 1973. The project was originally planned with the assistance of Former Soviet Union experts, but due to various problems encountered, the progress was severely stagnant. Later on, the assistance by Japan's ODA was sought for early completion of the project not to enhance the traffic congestion in Calcutta.

3. It is also recognized that there is still need to further extend metro network in Calcutta (line extension : on-going) to gain full benefits of the system.

4. The project has successfully provided an efficient rail-based mass transit system in the area of Central Calcutta. It is supposed that the project had achieved its objectives such as easing road congestion, saving fuel use, suppressing traffic accident and environmental pollution. Without the metro in this area, it is inevitably admitted that there would have been severe traffic chaos, stagnating urban economic and social activities.

5. As indicated in the evaluation report, however, it is agreeable that the project has not successfully gained maximum positive impacts due to following most important reasons;

    a. Longer train running interval than initial planning
    b. Existence of duplicate transport facilities (mini-bus and bus) on the same alignment of metro with better connection and door-to door operation between passengers' house and office

6. The present distribution of public transport passenger trips within Calcutta shows that only 1.3 % of the entire passenger traveled by metro during 2000-2001, whereas the buses carried 60.7 % of passenger and other modes such as taxis, auto etc. carried 18.5 %. Another observation for reason of this is that metro is operating only in a limited area of 18 km, whereas buses and other modes are operating all over the city of Calcutta.

7. As the metro network extends from Tollygunj (present end station) to Garia in the on-going phase, the passenger carried by metro may show an increase. It is recognized that extension of metro network and connection with the existing rail line is an very desirable action to gain full benefits from the system.