Table 4.3.11 Bus Lines Parallel to Different Sections of Supertram Line 1

Section	Station		Line Number by Type of Service					Total
	From	To	CTA	Minibus	Student	A/C	GCBC	
1	Ramses	Ghamra	41/, 44/, 46/, 54/, 69//, 78, 130, 178, 300/, 330, 400, 400/, 500, 500/, 510, 529, 600, 611, 710, 811, 812, 828, 940, 940/, 943, 943/, 949, 955, 998	14, 26, 26/, 27, 30, 32, 35, 35/, 38, 39, 39/, 105, 105/, 124, 128, 132	1, 4, 10, 27, 28, 30	355, 356, 357, 791	735, 792, 792/, 796, 797, 974	**61**
2	Ghamra	Demerdash	41/, 44/, 46/, 54/, 69//, 78, 130, 178, 300/, 330, 400, 400/, 500, 500/, 510, 600, 611, 710, 812, 828, 940, 940/, 955, 998	14, 26, 26/, 27, 30, 32, 35, 35/, 38, 39, 39/, 105, 105/, 124, 128, 132	1, 4, 10, 27, 28, 30	355, 356, 791	735, 792, 792/, 797	**53**
3	Demerdash	Mansheyet El Sadr	828					**1**
4	Mansheyet El Sadr	Mansheyet El Bakry	35, 35/, 39, 41, 43, 44, 46, 46/, 47, 48, 51, 58, 130, 300, 315, 330, 828, 937, 941, 941/, 948	31, 39, 131, 229	10, 30		303, 307, 501	**30**
5	Mansheyet El Bakry	Teacher's College	35, 35/, 39, 41, 43, 44, 46, 46/, 47, 48, 51, 53, 58, 130, 300, 315, 330, 828, 937, 941, 941/, 948	31, 39, 131, 229	10, 30		303, 307, 501	**31**
6	Teacher's College	Heliopolis Club	53, 400, 400/, 500/, 945/, 949, 955	20/, 21, 26/, 35, 35/, 39, 40	2, 2/, 19	355, 356, 357	797	**21**
7	Heliopolis Club	Girls' College	54/	26/, 39, 40	2, 2/, 19		797	**8**
8	Girls' College	Marwa City	54, 62/, 939	26/, 39, 40	1, 2, 2/, 19			**10**
9	Marwa City	Cairo Stadium	54, 62/, 939		1, 2, 2/, 19			**7**
10	Cairo Stadium	Madinet Nasr Cinema	57, 60/, 62/, 71, 178	14, 39/	19			**8**

Source: JICA Study Team

Table 4.3.11 Bus Lines Parallel to Different Sections of Supertram Line 1 (Continued)

Section	Station		Line Number by Type of Service					Total
	From	To	CTA	Minibus	Student	A/C	GCBC	
11	Madinet Nasr Cinema	Azhar University			19, 23			**2**
12	Azhar University	Osman Buildings	39, 69//, 80, 179, 346, 600, 611, 855, 939, 959, 995	32, 33, 65, 132	2, 2/, 24, 28, 31		602, 704, 727, 731, 733, 735	**26**
13	Osman Buildings	Ebeid Street	69//, 80/, 179, 346, 600, 855, 939, 959, 969, 969/, 995	32, 33, 65, 132, 133			727, 735	**18**
14	Ebeid Street	Darayeb	59, 69//, 80/, 346, 600, 855, 938, 939, 969, 969/, 995	32, 132, 133		361		**15**
15	Darayeb	Madinet Nasr	59, 69//, 346, 600, 855, 969, 969/, 995	132, 133		361		**11**
16	Madinet Nasr	Zomor	59, 69//, 346, 600, 855, 969, 969/, 995	132, 133		361		**11**
17	Zomor	Hay El Aasher	60/, 69, 80/, 178, 179, 346, 611, 939, 993	30, 33, 65, 65/, 132, 133		361	602, 704, 727, 731, 733, 735, 792	**23**
18	Hay El Aasher	Ring Road	60/, 69, 80/, 178, 179, 346, 611, 939, 993	30, 33, 65, 65/, 132, 133		361	602, 704, 727, 731, 733, 735, 792	**23**

Source: JICA Study Team

Table 4.3.12 Bus Lines Intersecting with Different Sections of Supertram Line 1

Section	Station		Line Number by Type of Service					Total
	From	To	CTA	Minibus	Student	A/C	GCBC	
1	Ramses	Ghamra						0
2	Ghamra	Demerdash						0
3	Demerdash	Mansheyet El Sadr	39, 41, 43, 47, 937, 941					6
4	Mansheyet El Sadr	Mansheyet El Bakry	53, 400, 400/, 500, 500/, 932, 932/, 940, 940/, 945, 945/, 949, 955, 968, 973, 973/	20/, 21, 26, 26/, 27, 35, 35/, 40, 92, 124	12	355, 356, 357, 791, 794	797	33
5	Mansheyet El Bakry	Teacher's College						0
6	Teacher's College	Heliopolis Club	500, 932, 932/, 940, 940/, 945, 968, 973, 973/	26, 27, 92, 124	12	791, 794		16
7	Heliopolis Club	Girls' College	919, 919/	105, 105/				4
8	Girls' College	Marwa City						0
9	Marwa City	Cairo Stadium	59, 60, 69, 362	32, 132, 134			792, 792/	9
10	Cairo Stadium	Madinet Nasr Cinema						0
11	Madinet Nasr Cinema	Azhar University	57, 59, 60/, 71, 178, 600, 700, 912, 938, 950, 950/, 969, 969/, 990, 995, 998, 998/	14, 30, 39/, 65, 65/, 133, 135		359, 361	723, 796	28
12	Azhar University	Osman Buildings	60, 71, 178, 700, 912, 993	14, 134		359		9
13	Osman Buildings	Ebeid Street	60/, 67	65/			792, 792/	5
14	Ebeid Street	Darayeb	69					1
15	Darayeb	Madinet Nasr						0
16	Madinet Nasr	Zomor						0
17	Zomor	Hay El Aasher						0
18	Hay El Aasher	Ring Road						0

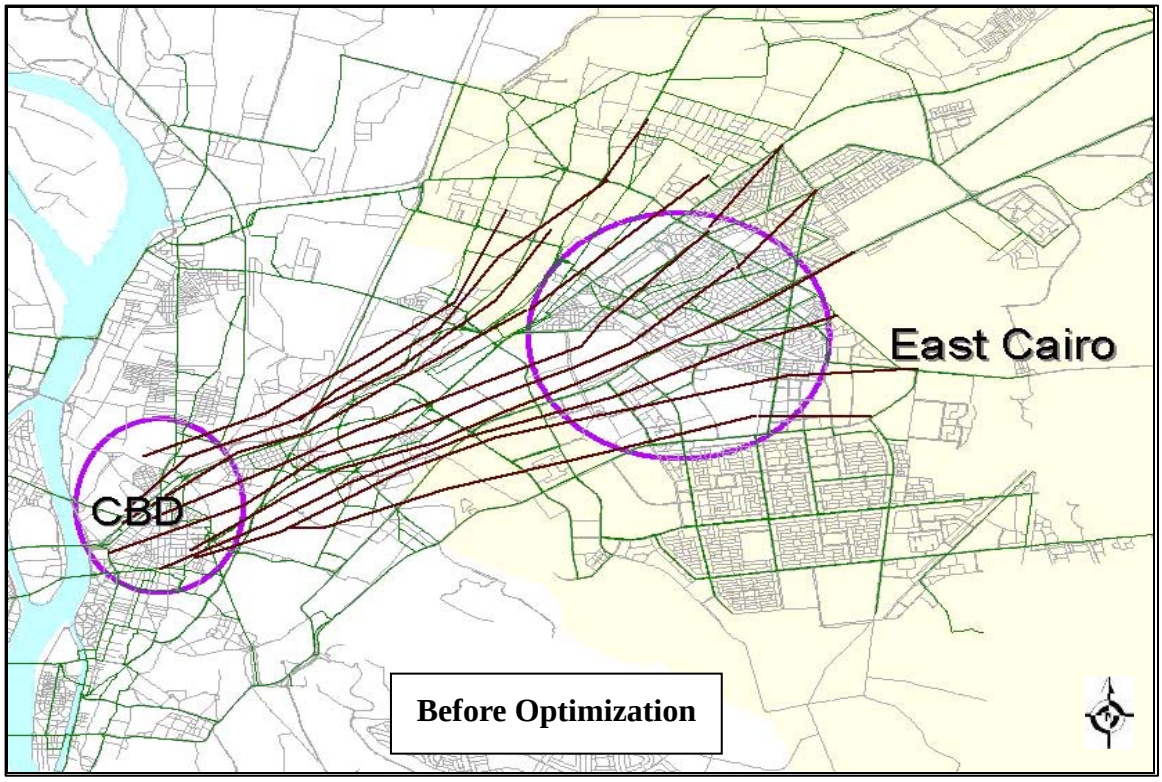
Source: JICA Study Team

Table 4.3.13 Number of Bus Lines Running in Parallel or Intersecting with Supertram Line 1

Section No.	Supertram Section		Length (km)	No. of Bus Lines		Total Bus Lines
	From Station	To Station		Parallel	Intersect	
1	Ramses	Ghamra	1.72	61	0	61
2	Ghamra	Demerdash	1.09	53	0	53
3	Demerdash	Mansheyet El Sadr	1.21	1	6	7
4	Mansheyet El Sadr	Mansheyet El Bakry	2.32	30	33	63
5	Mansheyet El Bakry	Teacher's College	0.87	31	0	31
6	Teacher's College	Heliopolis Club	0.58	21	16	37
7	Heliopolis Club	Girls' College	1.12	8	4	12
8	Girls' College	Marwa City	0.77	10	0	10
9	Marwa City	Cairo Stadium	1.14	7	9	16
10	Cairo Stadium	Nasr Cinema	1.19	8	0	8
11	Madinet Nasr Cinema	Azhar University	0.68	2	28	30
12	Azhar University	Osman Buildings	1.28	26	9	35
13	Osman Buildings	Ebeid Street	1.05	18	5	23
14	Ebeid Street	Darayeb	1.31	15	1	16
15	Darayeb	Madinet Nasr	1.29	11	0	11
16	Madinet Nasr	Zomor	1.60	11	0	11
17	Zomor	Hay El Aasher	1.39	23	0	23
18	Hay El Aasher	Ring Road	1.39	23	0	23

Source: JICA Study Team

The concept of optimized bus operation is shown in Figure 4.3.22. This figure, whose content is illustrative and not necessarily reflective of actual services, depicts before and after optimization scenarios. Under the before case, both bus (lower-capacity mode) and rail (higher-capacity mode) services are duplicative, providing competitive, rather than complementary, services. Under the after case, operational efficiencies have been achieved in that a feeder area for the higher-capacity mode has been established and served by lower-capacity modes with a view to encouraging complementary, intermodal operation. This is not meant to suggest that all lower-capacity services paralleling higher-capacity services should be eliminated; this is clearly not reasonable. However, some services could be optimized thus achieving operational efficiencies.



Source: JICA Study Team

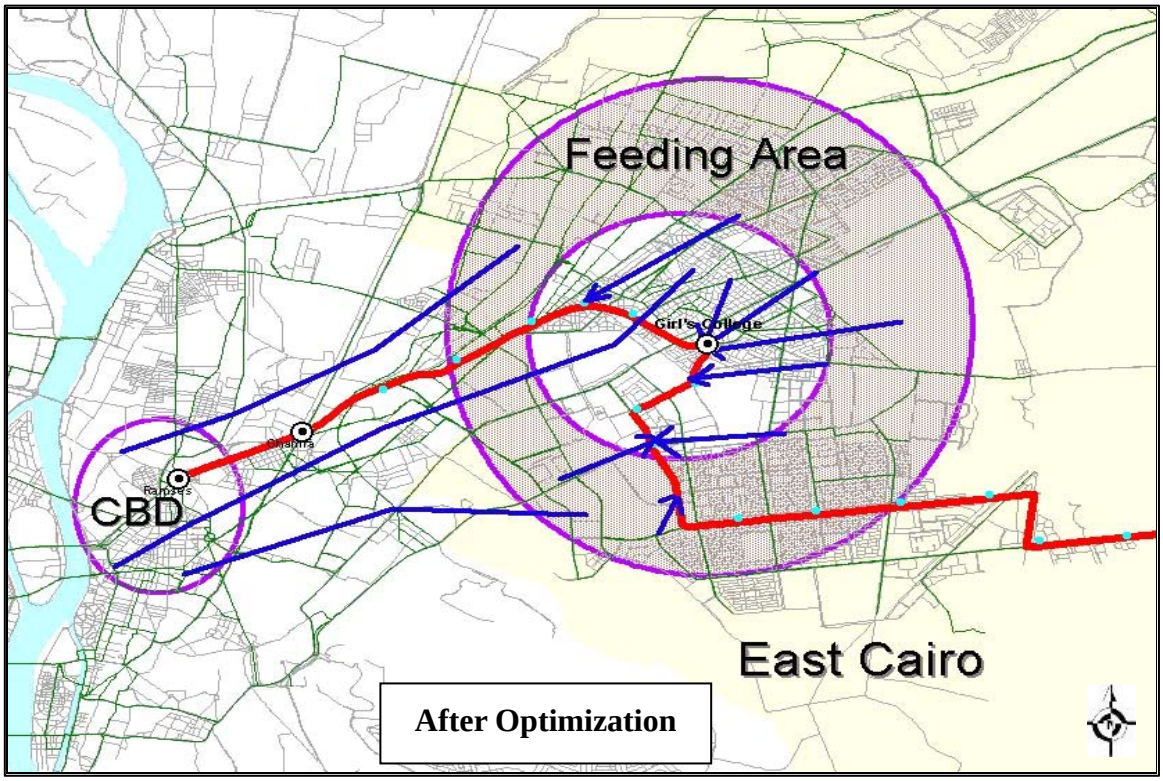


Figure 4.3.22 Conceptual Depiction of Bus Optimization Strategy

Considering these basic principles, the reorganization of bus network around Supertram Line 1 should include three core groupings:

- **Group 1:** Local rerouting or extension of existing lines in the vicinity of Supertram station in view of making lines stop as near as possible to the stations thus facilitating a modal transfer.

- **Group 2:** Diversion of some bus lines which are duplicative vis-à-vis Supertram Line 1. The route of Supertram starts at Ramses square → Ramses Street → Ahmed Lotfy Street → Sayed El Merghany Street → Khedr El Toony → Yoosef Abbas Street → Ali Ameen Street → Mostafa El Nahhas Street → Madinet Nasr (existing terminal) → Maspero and ends at the Ring Road. However, some bus lines serving local demand between stations should remain. The bus supply, which is competing with Supertram should be redistributed to others sectors which are currently not served, or under-served.

- It should be emphasized again that more than 60 bus lines originated from East Cairo region are operating along Ramses street. Diverting some of them to other corridors is expected to reduce the overlapping with Supertram and attract more passengers to CTA on a high-demand corridor such as Geish Street.

- **Group 3:** Cutting and rerouting of bus lines operating between parts of the Supertram catchment area and Cairo CBD in order to connect these sectors to the nearest suitable Supertram station whenever this will result in time saving for the travelers to reach the city center (optimization of the travel time for public transport users as a whole). Moreover, this will improve the service by redistributing the vehicle-kilometers saved in order to increase the frequency.

The following criteria may be considered in addition to the abovementioned principles, especially when reorganizing broader elements of the bus network.

- Creation of new local lines to feed a rail-based mode (Supertram) in view of facilitating the access to the Supertram for local residents and to relieve people from walking or using their cars to reach the station.
- Combining two lines terminating at the station of a rail-based mode when two lines terminate at opposite sides of the station of a rail-based mode. Combining these two lines into a single and more frequent new service can procure operating cost savings and serve bilateral demand without transfers.
- Combining two one-way routes of the same line in the same road in order to improve the concentration within the network.

Please refer also to further discussion on this topic presented in section 4.6.3.

(2) Bus Route Optimization: Initial Culling

The main objectives of the bus optimization exercise can be summarized as consisting of:

- Enhance the general level of CTA service in East Cairo as possible within the mandate of the supertram feasibility study;
- Improve intermodal integration with Supertram Line 1; and,
- Define a realistic series of bus service improvements which recognize an optimized routing strategy, yet retain sensitivity toward local norms and expectations.

As noted in Section 4.3.6, East Cairo bus routes are classified into four groupings based on their relative alignments vis-à-vis Supertram Line 1. Initially about 50 CTA regular, minibuses, students, air-conditioned and GCBC bus routes were culled from the total East Cairo system in close working consultation with the CTA. Considerations in the selection process included:

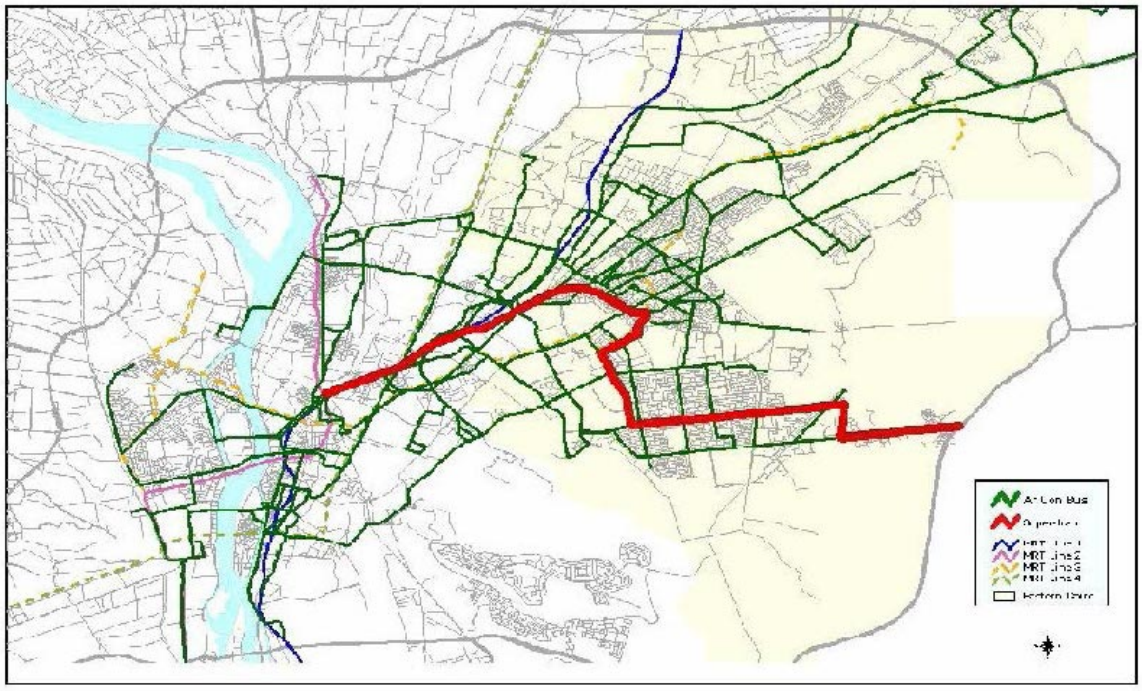
- Examination of the alignments using the CREATS GIS system.
- Some routes, such as Category 4 (peripheral) routes were removed from further examination as these fall outside of the supertram catchment area and tend to be longer-distance routes serving other areas of the metropolitan area.
- Many routes contained in Category 1 (parallel) and Category 2 (intersecting) require no further action as these already provide good service to their respective route hinterlands, and to the potential supertram buffer area.
- Some existing 25 Piaster routes in all route categories may not be candidates as passengers do not wish to (or cannot afford to) transfer to the supertram, which is considered a premium system.
- Some Category 1 (parallel) routes are candidates for optimization, but not all. Alternative bus services must still be maintained paralleling the supertram, due to patronage on/off patterns, and given that fact that Metro Line 1 is understood to be currently operating at near-capacity ridership conditions roughly between central Cairo and Roxy.
- While it is tempting to change many bus routes for the benefit of the supertram, it must concurrently be recognized that the supertram is only one element of a complex East Cairo public transport network.
- Some routes, in all categories, fulfill specific social functions and cannot be relocated.

These were carefully examined and potential line modifications devised in accordance with the three groupings noted previously. In summary:

- Group 1: Thirteen routes were extended to feed Supertram Line 1.
- Group 2: Twenty-six routes were diverted to reduce overlapping of parallel alignments between the supertram and bus routes.

- Group 3: Eleven bus routes were curtailed.

The 50 initial cull of routes is depicted in Figure 4.3.23, with specific modifications noted in Table 4.3.14.



Source: JICA Study Team

Figure 4.3.23 Initial Culling of 50 Routes

Table 4.3.14 Modifications to Initial Culling of 50 Routes

Line No	Service	Length (Km)	Group	Line Name	Bus Rerouting Action
74	Regular	7.44	**1**	Mesala / Amireya / Hadaeq El Qobba	**Extend** bus line to intersect with Supertram at Mansheyet El Bakry Station.
331	Regular	8.49	**1**	Madinet El Herafeyeen / Haron El Rasheed / Roxy	**Extend** bus line to intersect with Supertram at Teacher's College Station.
550	Regular	10.29	**1**	Ezbet El Haggana / Roxy / Hadaeq El Qobba	**Extend** bus line from Hadaeq El Qobba to intersect with Supertram at Mansheyet El Bakry Station.
919	Regular	33.17	**1**	Madinet El Salam (Especo) / Gamea Amr	**Divert** bus line near Ghamra to intersect with Supertram at Ghamra Station.
926	Regular	18.16	**1**	Hay El Sabea / Tahreer / Bolaq El Dakroor	**Divert** bus line near Ghamra to intersect with Supertram at Ghamra Station.
973/	Regular	27.03	**1**	Madinet El Nahda / Roxy / Ataba (Gohary)	**Divert** bus line to intersect with Supertram at Mansheyet El Bakry Station.
976	Regular	11.37	**1**	Nozha (Hegaz) / Mazalat	**Divert** bus line from Roxy to intersect with Supertram at Teacher's College Station.
993	Regular	27.8	**1**	Moasaset El Zakah / Heliopolis / Zahraa Madinet Nasr	**Divert** bus line from Heliopolis to intersect with Supertram at Girls' College Station.
23	Minibus	12.39	**1**	Masaken Ain Shams / Saray El Qobba	**Divert** bus line from Roxy to intersect with Supertram at Teacher's College Station.
123	Minibus	14.29	**1**	Masaken Ain Shams / Hadaeq El Qobba Square	**Divert** bus line from Roxy to intersect with Supertram at Teacher's College Station.
65	Minibus	22.34	**1**	Zahraa Madinet Nasr / Salah Salem / Gamea Amr	**Divert** bus line near Ghamra to intersect with Supertram at Ghamra Station.
3	Students	9.52	**1**	Madina El Gameaeya (Moubarak) / Abbaseya / Darrasa	**Extend** bus line to intersect with Supertram at Koleyet El Banat El Eslameya.
799	GCBC	17.07	**1**	Cairo Airport (2) / Roxy / Qolaly	**Divert** bus line from Roxy to intersect with Supertram at Teacher's College Station.

Table 4.3.14 (Continued) Modifications to Initial Culling of 50 Routes

Line No	Service	Length (Km)	Group	Line Name	Bus Rerouting Action
46/	Regular	14.64	**2**	Masaken El Helmeya / Abdel Moneim Ryad (2)	**Divert** bus line after passing 23rd of July St. to Lotfy El Sayed St. - Port Said St. - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
54/	Regular	19.45	**2**	Almaza / Ramses / Bolaq El Dakroor	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
80/	Regular	19.12	**2**	Zahraa Madinet Nasr / Ataba (Gohary)	**Divert** bus line after passing Madina El Gameaeya to Ahmed El Zomor St.
178	Regular	25.53	**2**	Zahraa Madinet Nasr / Ramses / Abu Wafya	**Divert** bus line after passing Ramses to Esaaf - Galaa St. - Ataba - Giesh St. - Abbaseya - Khalifa El Zaher - Ahmed El Zomor St. to Ring Road.
400/	Regular	17.64	**2**	Makhbaz El Aaly / Roxy / Abdel Moneim Ryad (2)	**Divert** bus line after passing Roxy to Khalifa El Maamoon St.(beside Teacher's College Station) - Abbaseya - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
500	Regular	18.23	**2**	Makhbaz El Aaly / Nozha / Abdel Moneim Ryad (2)	**Divert** bus line after passing Roxy to Khalifa El Maamoon St.(beside Teacher's College Station) - Abbaseya - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
500/	Regular	18.72	**2**	Makhbaz El Aaly / Hegaz Street / Abdel Moneim Ryad (2)	**Divert** bus line after passing Roxy to Khalifa El Maamoon St.(beside Teacher's College Station) - Abbaseya - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).

Table 4.3.14 (Continued) Modifications to Initial Culling of 50 Routes

Line No	Service	Length (Km)	Group	Line Name	Bus Rerouting Action
529	Regular	33.8	**2**	Nozha El Gadeeda / Moneeb	**Divert** bus line after passing Ghamra to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
611	Regular	21.17	**2**	Zahraa Madinet Nasr / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
940	Regular	29.57	**2**	Madinet El Salam (Especo) / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
943	Regular	33.56	**2**	Sooq El Oboor / Port Said / Abdel Moneim Ryad (2)	**Divert** bus line after passing Ghamra to Port Said - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
943/	Regular	30.9	**2**	Madinet El Nahda / Port Said / Abdel Moneim Ryad (2)	**Divert** bus line after passing Ghamra to Port Said - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
949	Regular	24.73	**2**	Cairo Airport (2) / Tahreer / Giza Square	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
955	Regular	22.18	**2**	Haykstep / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
998	Regular	14.48	**2**	Maahad El Khedma El Egtemaeya / Abbaseya	**Divert** bus line alignment after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
26	Minibus	16.16	**2**	Roxy / Tahreer / Giza Square	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.

Table 4.3.14 (Continued) Modifications to Initial Culling of 50 Routes

Line No	Service	Length (Km)	Group	Line Name	Bus Rerouting Action
27	Minibus	13.11	**2**	Cairo Airport (1) / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
30	Minibus	15.62	**2**	Zahraa Madinet Nasr / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
32	Minibus	12.69	**2**	Hay El Thamen / Abbaseya / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
35	Minibus	8.13	**2**	Nozha (Hegaz) / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
35/	Minibus	20.24	**2**	Masaken El Helmeya / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
39	Minibus	15.68	**2**	Almaza / Masr Wel Sudan / Abdel Moneim Ryad (2)	**Divert** bus line after passing Girl's College to Salah Salem - Abbaseya - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
39/	Minibus	22.05	**2**	Almaza / Tahreer / Gameat El Qahera	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
124	Minibus	13.56	**2**	Roxy / Abbaseya / Abu El Reesh	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
132	Minibus	24.71	**2**	Zahraa Madinet Nasr / Abbaseya / Abu El Reesh	**Divert** bus line alignment after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.

Table 4.3.14 (Continued) Modifications to Initial Culling of 50 Routes

Line No	Service	Length (Km)	Group	Line Name	Bus Rerouting Action
30	Students	23.25	**2**	Zahraa Madinet Nasr / Abdel Moneim Ryad (2)	**Divert** bus line after passing 23rd of July St. to Lotfy El Sayed St. - Port Said St. - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
69//	Regular	17.75	**3**	Hay El Thamen / Gameat El Azhar / Ataba	**Divert** bus line from Ataba - Geish St. - Abbaseya - follow its route till Madina El Gameiya then **Curtail** the line at Koleyet El Banat El Eslameya.
179	Regular	22.01	**3**	Zahraa Madinet Nasr / Gameat El Azhar / Qesm El Hadaeq	**Curtail** bus line from Zahraa Madinet Nasr to Koleyet El Banat El Eslameya.
346	Regular	25.86	**3**	Zahraa Madinet Nasr / Zawya El Hamra / Imbaba	**Curtail** bus line from Zahraa Madinet Nasr to Koleyet El Banat El Eslameya.
600	Regular	28.52	**3**	Hay El Thamen / Ramses / Bolaq El Dakroor	**Divert** bus line from Bolaq El Dakroor - Abdel Moneim Ryad (2) - Ataba - Geish St. - Abbaseya then **Curtail** the line at Koleyet El Banat El Eslameya.
855	Regular	26.11	**3**	Hay El Thamen / Magra El Oyoon / Moneeb	**Curtail** bus line from Hay El Thamen to Koleyet El Banat El Eslameya.
939	Regular	24.36	**3**	Zahraa Madinet Nasr / Zahraa Ain Shams	**Curtail** bus line from Zahraa Madinet Nasr to Girls' College St.
995	Regular	26.58	**3**	Hay El Thamen / Sayeda Zeinab / Zahraa Masr El Qadeema	**Curtail** bus line from Hay El Thamen to Koleyet El Banat El Eslameya.
26/	Minibus	12.09	**3**	Koleyet Banat Ain Shams / Giza Square	**Curtail** bus line from Girls' College to Ramses Station.
33	Minibus	17.23	**3**	Zahraa Madinet Nasr / Ataba (Gohary)	**Divert** bus line near Ghamra to intersect with Supertram at Ghamra Station then **Curtail** the line at Koleyet El Banat El Eslameya.

Table 4.3.14 (Continued) Modifications to Initial Culling of 50 Routes

Line No	Service	Length (Km)	Group	Line Name	Bus Rerouting Action
133	Minibus	16.59	**3**	Zahraa Madinet Nasr / Ataba (Gohary)	**Divert** bus line near Ghamra to intersect with Supertram at Ghamra Station.
727	GCBC	25.7	**3**	Zahraa Madinet Nasr / Hadaeq Square / Shobra El Kheima	**Curtail** the line from Ring Road to Koleyet El Banat El Eslameya.

Source: JICA Study Team

(3) Bus Route Optimization: Refinement

The 50 bus lines were introduced to the CREATS Transport Model to estimate, in conjunction with Supertram Line 1, the effect of that plan on some evaluation measures. Performance indicators such as the number of passengers, passenger-kilometer and passenger-hour are compared before and after applying the rerouting of 50 bus lines. The values of these indicators for the candidate bus lines are summarized in Table 4.3.15 on the level of three groups defined previously.

Table 4.3.15 Performance Measures: Culled 50 Bus Lines

Group	No of Bus Lines	Without Rerouting (A)*			With Rerouting (B)*			Factor (B/A)	
		Pass No	Pass- Km	Pass-Hr	Pass No	Pass-Km	Pass-Hr	Pass No	Pass-Km
1	13	88	1035	31	107	1232	36	1.22	1.19
2	26	294	2587	89	319	2866	100	1.09	1.11
3	11	173	1828	59	62	465	19	0.36	0.25
Total	**50**	**555**	**5450**	**179**	**488**	**4563**	**155**	**0.88**	**0.84**
Supertram		**272**	**2905**	**91**	**316**	**3392**	**106**	**1.16**	**1.17**

Source: JICA Study Team
*Note: * Performance indicators are expressed in a daily basis in thousands*

The following can be noted:

- The average trip length (pass-km divided by number of passengers) has decreased from 9.8 to 9.4 km.
- The average trip time (pass-km divided by pass-hour) decreased from 19.4 to 19.1 minutes.
- The ridership of 39 bus lines has decreased 22% and 9% for Groups 1 and 2, respectively.

- Similarly the productivity measure of pass-km has increased 19% and 11% for Groups 1 and 2, respectively.
- However, Group 3 (curtailing and diverging of 11 bus lines) suffered from a sever drop in its ridership (64%) and pass-km (75%).
- Consequently, the overall ridership and pass-km decreased 12% and 16%, respectively.
- It should be noted that the initial plan has a significant positive effect on Supertram Line 1 represented by an increase of 17% and 16% in its ridership and pass-km, respectively. However CTA as a composite entity is negatively affected as a result of introducing Group 3.

Therefore, in consultation with the CTA, it is decided to exclude Group 3 modifications (eleven lines) and enter into the next level of the refinement process using 39 lines.

It is noted that, for reporting purposes, the documentation focuses upon core groupings of routes. For example, and initial 50 lines followed by 39 lines followed by, ultimately, the final recommended number of lines. It is noted that several sub-variants of these core groupings were also tested using the CREATS model to ascertain micro-scale impacts of various route-specific optimization options.

The CREATS model was used to again test the 39 route system, with resulting performance indicators depicted in Table 4.3.16.

Table 4.3.16 Performance Measures: Refined 39 Bus Lines

Group	No of Bus Lines	Without Rerouting (A)*			With Rerouting (B)*			Factor (B/A)	
		Pass No	Pass- Km	Pass-Hr	Pass No	Pass-Km	Pass-Hr	Pass No	Pass-Km
1	13	88	1035	31	101	1133	34	1.15	1.09
2	26	294	2587	89	287	2665	93	0.98	1.03
3	0	173	1828	59	174	1817	59	1.01	0.99
Total	**39**	**555**	**5450**	**179**	**562**	**5615**	**186**	**1.01**	**1.03**

Source: JICA Study Team
*Note: * Performance indicators are expressed in a daily basis in thousands*

It can be noted that the analysis is moving in the desired direction. The overall increase of ridership and pass-km amounts to 1% and 3%, respectively. It is further noted that the average trip length and average trip time slightly increased. In other words, the average trip length increased from 9.8 to 10.0 kilometers and the average trip time has increased from 19.4 to 19.9 minutes.

The performance measures of Group 3 are almost identical before and after applying the rerouting plan, which is not necessarily applicable as we are dealing

with an integrated transport system. The modification in one of the transport system components would affect some or all other components.

Based on previous analysis, investigations focused on positive changes in terms of route and system ridership. This resulted in a further refinement containing 20 bus lines, which were again tested using the CREATS Transport Model. Table 4.3.17 shows the results of comparison between performance measures before and after applying this bus rerouting plan.

Table 4.3.17 Performance Measures: Optimized 20 Bus Lines

Group	No of Bus Lines	Without Rerouting (A)*			With Rerouting (B)*			Factor (B/A)	
		Pass No	Pass- Km	Pass-Hr	Pass No	Pass-Km	Pass-Hr	Pass No	Pass-Km
1	7	88	1035	31	98	1120	34	1.11	1.08
2	13	294	2587	89	318	2949	103	1.08	1.14
3	0	173	1828	59	168	1750	57	0.97	0.96
Total	**20**	**555**	**5450**	**179**	**584**	**5819**	**194**	**1.05**	**1.07**

Source: JICA Study Team
*Note: * Performance indicators are expressed in a daily basis in thousands*

The following can be concluded:

- The average trip length has increased from 9.8 to 10.0 km and the average trip time has increased from 19.4 to 19.9 minutes.
- The ridership and pass-km for the modified bus routes have increased 5% and 7%, respectively.
- Group 1 revealed the maximum improvement ratio in terms of ridership, e.g. the number of passengers increased 11%, while Group 1 exhibited the maximum improvement (14%) in terms of pass-km.

(4) Bus Route Optimization: A Multi-modal Perspective

The previous discussion is devoted to the bus route performance indicators of different bus rerouting schemes working in conjunction with Supertram Line 1. However, the evaluation of these schemes should also address their effect on Supertram Line 1. The approach to selecting the optimum bus rerouting plan is based on optimizing ridership and pass-km of CTA feeder service and Supertram Line 1 for different bus rerouting schemes.

Table 4.3.18 depicts findings of the simulations, which lead to several conclusions:

- The initial bus rerouting plan (50 bus lines) reveals the maximum benefit for Supertram Line 1, represented by an increase of 16% and 17% for number passengers and pass-km, respectively. Nevertheless, the ridership and pass-km of CTA feeder service are dramatically affected by loosing 12% and 16% of its ridership and pass-km, respectively. Moreover, the total number of passengers using both systems has decreased 3%, while pass-km has decreased 5%. This would suggest the exclusion of the initial rerouting plan.
- The effect of intermediate plan (39 bus lines) is positive for different performance measures and gives more benefit to Supertram Line 1 (6%) rather than CTA bus feeder service (1%).

Table 4.3.18 Comparison of Ridership; Bus Optimization Process

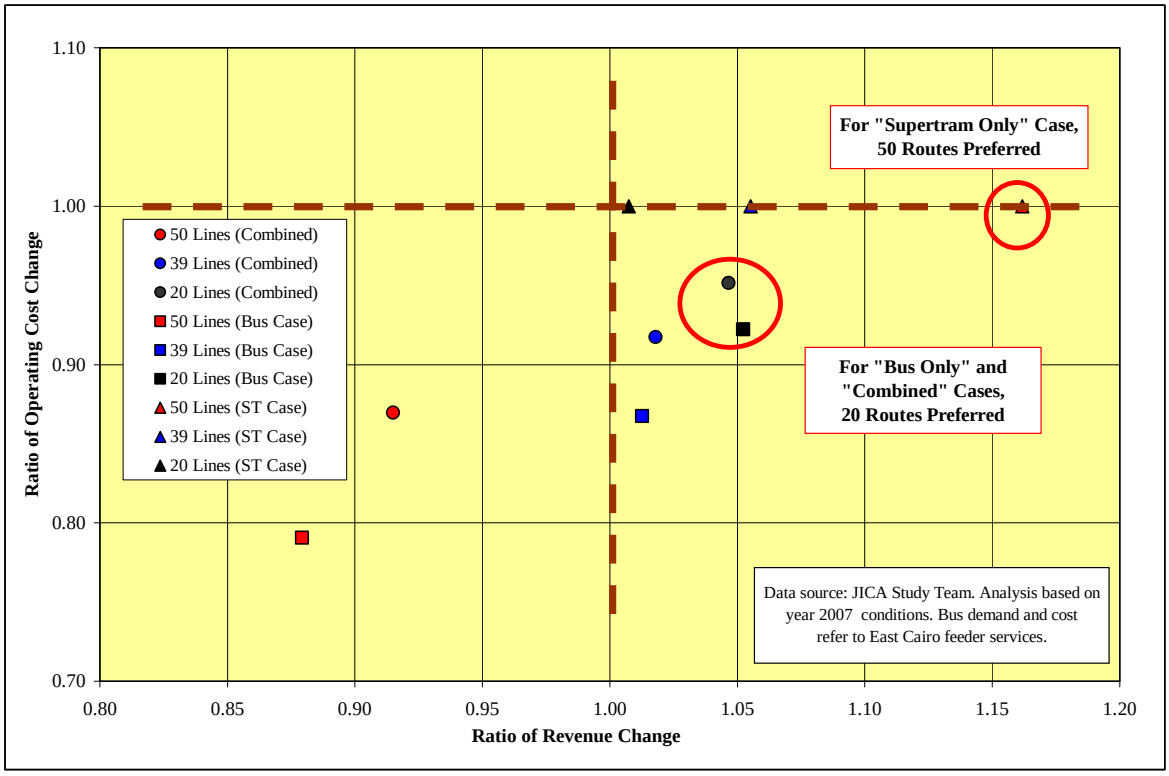
Item	Performance Measure	Rerouting Action			
		Before	G1&G2&G3	G1 & G2	W/O All Negative
			50 Lines	39 Lines	20 Lines
CTA Feeder Service	Pass No	555	488	562	584
	Pass- Km	5450	4563	5615	5819
Ratio	Pass No	1.00	0.88	1.01	1.05
	Pass- Km	1.00	0.84	1.03	1.07
Supertram	Pass No	272	316	287	274
	Pass- Km	2905	3392	3054	2884
Ratio	Pass No	1.00	1.16	1.06	1.01
	Pass- Km	1.00	1.17	1.05	0.99
CTA Feeder Service and Supertram	Pass No	827	804	849	858
	Pass- Km	8355	7955	8669	8703
Ratio	Pass No	1.00	0.97	1.03	1.04
	Pass- Km	1.00	0.95	1.04	1.04

Source: JICA Study Team
Notes: Performance indicators are expressed in a daily basis in thousands. Third column (Before): No bus rerouting plan is applied. Fourth column (G1&G2 &G3; 50 Lines): Groups 1, 2 and 3 of bus rerouting are applied. Fifth column (G1 & G2; 39 Lines): Group 3 is excluded from the analysis. Sixth column (W/O all negative; 20 Lines): Lines with negative effect are excluded.

- On the other hand, the final plan (20 bus lines) affected both systems positively with more benefit for CTA bus feeder service (5%) and some increase of Supertram ridership (1%).
- It should be mentioned that the objective is to maximize the ridership of both systems, which is obtained by applying the final plan (4%) compared with 3% in case of intermediate plan.

The impact can also be explored in terms of revenue and cost. Two caveats are noted in this regard: firstly, cost must reflect the most recent available actual operating cost as calculated under CTA accounting systems, while revenue is

based on future years ridership. Thus, while some temporal inconsistencies are unavoidable, their application is consistent across all routing plans. To achieve this comparison, the extent of alternative route systems, and the before condition, were costed in terms of current average operating cost per route kilometer. Revenue was derived based on current average bus yields and forecast supertram fare levels. A ratio of passengers carried (vis-à-vis the before condition) was compared to a ratio of operating cost (vis-à-vis the before condition) (Figure 4.3.24). Several conclusions emerge:



Source: JICA Study Team

Figure 4.3.24 Comparison of Relative Cost and Relative Revenue Bus Optimization Process

- When considering the impact of optimization scenarios on only supertram ridership, the introduction of 50 bus lines is preferred as highest relative ridership increase (positive "ratio of revenue change") is achieved at no additional cost to the supertram (spare capacity available, no intensified service needed).
- From the perspective of the bus system, and the combined bus plus supertram system, the 50 bus line option is least attractive, and the 20 bus line option most attractive in the sense that relative revenue is maximized.

A stated goal is that conditions should be maximized for both the feeder bus and supertram. Thus, ridership, revenue and cost indicators would suggest that the 20 route option is superior. A further favorable indicator is based on practical operating considerations. The implementation of some 20 routes is, within the

current framework of the CTA, seen as being possible and achievable. However, considerable doubt exists whether or not the CTA could install double that number within a reasonable time period.

Full detail regarding the 20 route plan are provided in Table 4.3.19. These changes are illustrated in Figure 4.3.25 on a route-by-route basis, for the pre and post change alignment. Changes for each route are highlighted. All route changes were reviewed in detail with the CTA. As part of this analysis and review procedure, full-size plotted/ printed graphics of each route, both before and after adjustment, were developed for the CTA using the capabilities of the CREATS GIS system. Thus, Figure 4.3.25 (and the subsequent Figure 4.3.26) are only intended as compact summaries for reporting purposes.

What the costing analyses also points out is that there are implications in terms of organizational structuring of the supertram and its feeder bus system. If the supertram and its feeder buses operate as separate entities under a single jurisdictional umbrella, such as the CTA, it is likely that segregated cash flow streams will be maintained for bus and LRT operations (assuming the current organizational model is followed). However, if both the supertram and the feeder bus system are a single entity, regardless of jurisdictional umbrella, then cash streams will likely be combined, that is, revenues will flow into, and costs taken from, “the same pot”. From a financial point of view, accounting would be simplified, however, it is equally likely that the feeder bus network would then be structured for maximum utility of the supertram, rather than the more widespread good of both the supertram and East Cairo. Issues related to intermodal services, and ticketing strategies, are further discussed in the subsequent Section 4.4, *Intermodal Issues and Opportunities*.

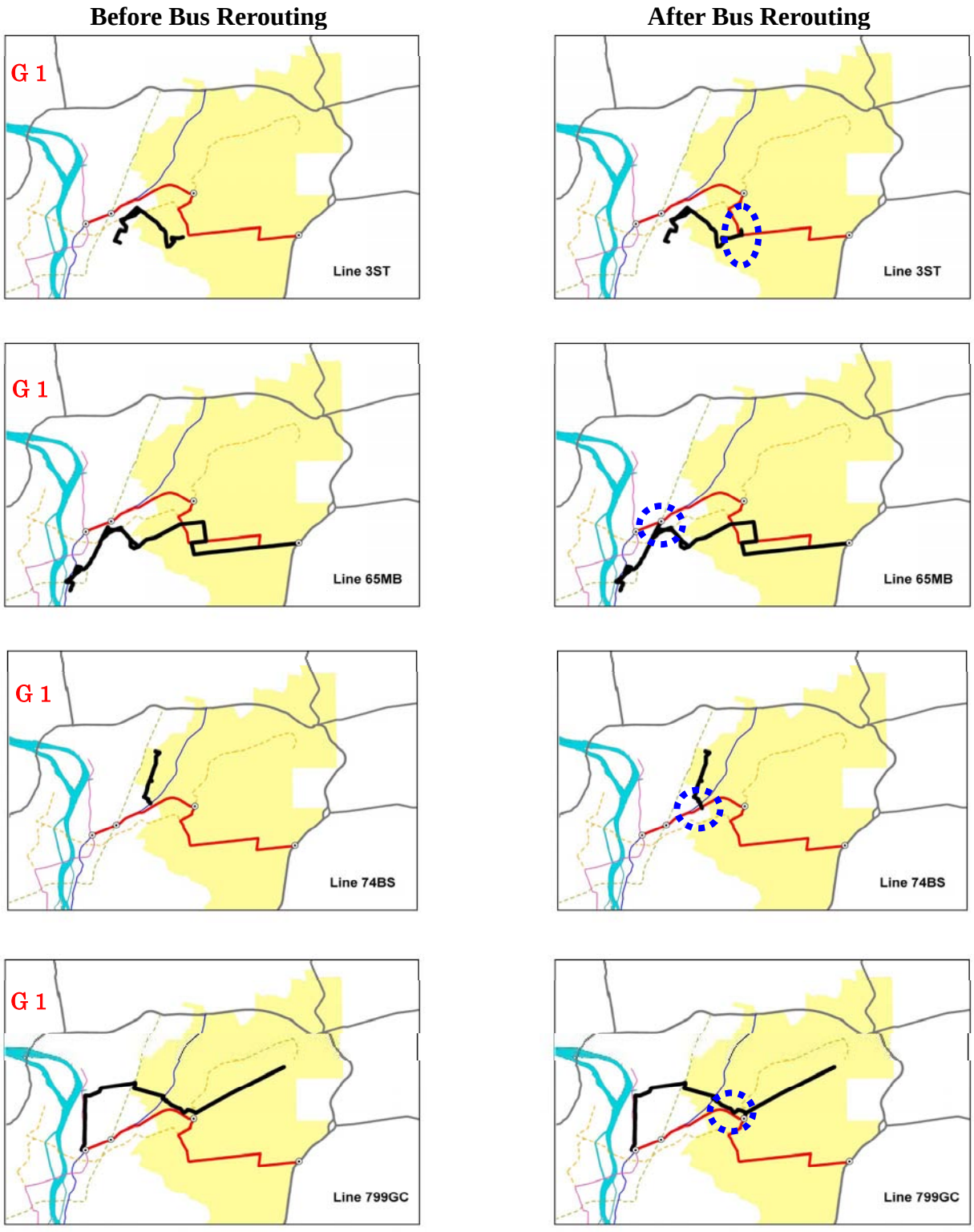
Table 4.3.19 Routing Changes: Optimized 20 Bus Lines

Line No	Service	Length (Km)	Line Name	Bus Rerouting Action
74	Regular	7.44	Mesala / Amireya / Hadaeq El Qobba	**Extend** bus line to intersect with Supertram at Mansheyet El Bakry Station.
926	Regular	18.16	Hay El Sabea / Tahreer / Bolaq El Dakroor	**Divert** bus line near Ghamra to intersect with Supertram at Ghamra Station.
976	Regular	11.37	Nozha (Hegaz) / Mazalat	**Divert** bus line from Roxy to intersect with Supertram at Teacher's College Station.
993	Regular	27.8	Moasaset El Zakah / Heliopolis / Zahraa Madinet Nasr	**Divert** bus line from Heliopolis to intersect with Supertram at Girls' College Station.
65	Minibus	22.34	Zahraa Madinet Nasr / Salah Salem / Gamea Amr	**Divert** bus line near Ghamra to intersect with Supertram at Ghamra Station.
3	Students	9.52	Madina El Gameaeya (Moubarak) / Abbaseya / Darrasa	**Extend** bus line to intersect with Supertram at Koleyet El Banat El Eslameya.
799	GCBC	17.07	Cairo Airport (2) / Roxy / Qolaly	**Divert** bus line from Roxy to intersect with Supertram at Teacher's College Station.
46/	Regular	14.64	Masaken El Helmeya / Abdel Moneim Ryad (2)	**Divert** bus line after passing 23rd of July St. to Lotfy El Sayed St. - Port Said St. - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
54/	Regular	19.45	Almaza / Ramses / Bolaq El Dakroor	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
80/	Regular	19.12	Zahraa Madinet Nasr / Ataba (Gohary)	**Divert** bus line after passing Madina El Gameaeya to Ahmed El Zomor St.
400/	Regular	17.64	Makhbaz El Aaly / Roxy / Abdel Moneim Ryad (2)	**Divert** bus line after passing Roxy to Khalifa El Maamoon St.(beside Teacher's College Station) - Abbaseya - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).

Table 4.3.19 (Continued) Routing Changes: Optimized 20 Bus Lines

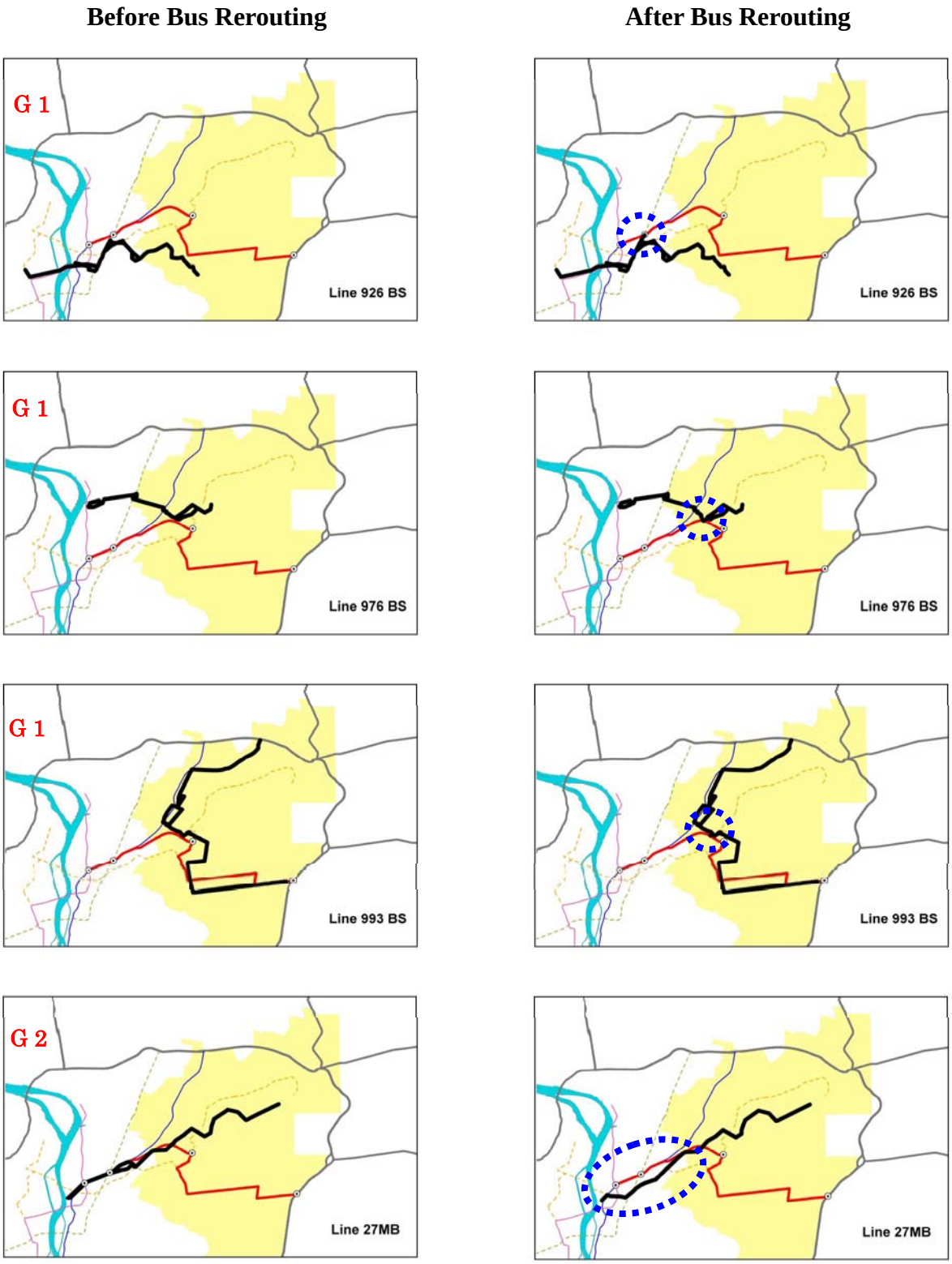
Line No	Service	Length (Km)	Line Name	Bus Rerouting Action
611	Regular	21.17	Zahraa Madinet Nasr / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
949	Regular	24.73	Cairo Airport (2) / Tahreer / Giza Square	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
27	Minibus	13.11	Cairo Airport (1) / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
30	Minibus	15.62	Zahraa Madinet Nasr / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
32	Minibus	12.69	Hay El Thamen / Abbaseya / Abdel Moneim Ryad (2)	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
39	Minibus	15.68	Almaza / Masr Wel Sudan / Abdel Moneim Ryad (2)	**Divert** bus line after passing Girl's College to Salah Salem - Abbaseya - Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2).
39/	Minibus	22.05	Almaza / Tahreer / Gameat El Qahera	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
124	Minibus	13.56	Roxy / Abbaseya / Abu El Reesh	**Divert** bus line after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.
132	Minibus	24.71	Zahraa Madinet Nasr / Abbaseya / Abu El Reesh	**Divert** bus line alignment after passing Abbaseya to Geish St. - Ataba - 26th of July St. to Abdel Moneim Ryad (2) then follow its route.

Source: JICA Study Team



Source: JICA Study Team

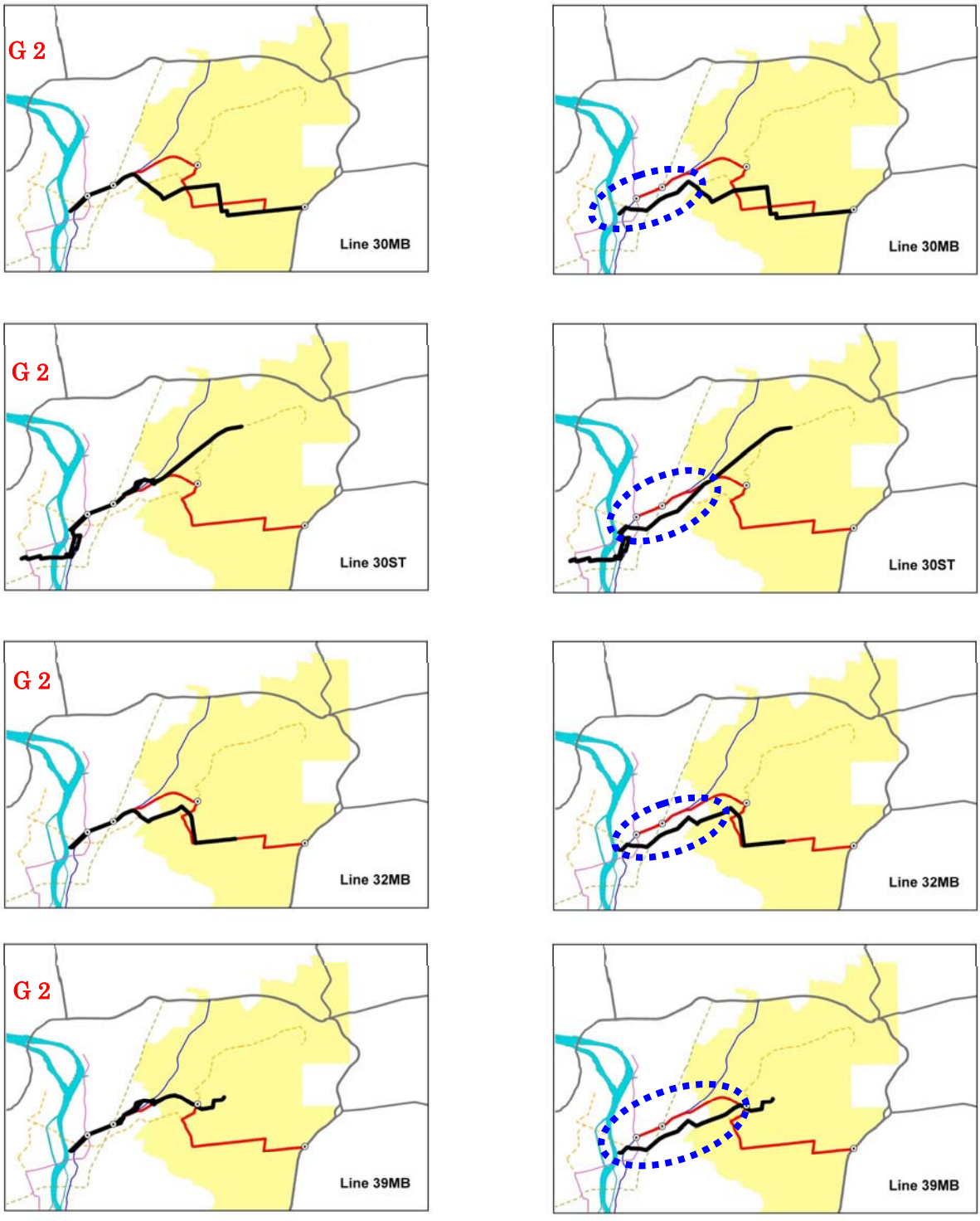
Figure 4.3.25 Depiction of Routing Changes: Optimized 20 Bus Lines



Source: JICA Study Team

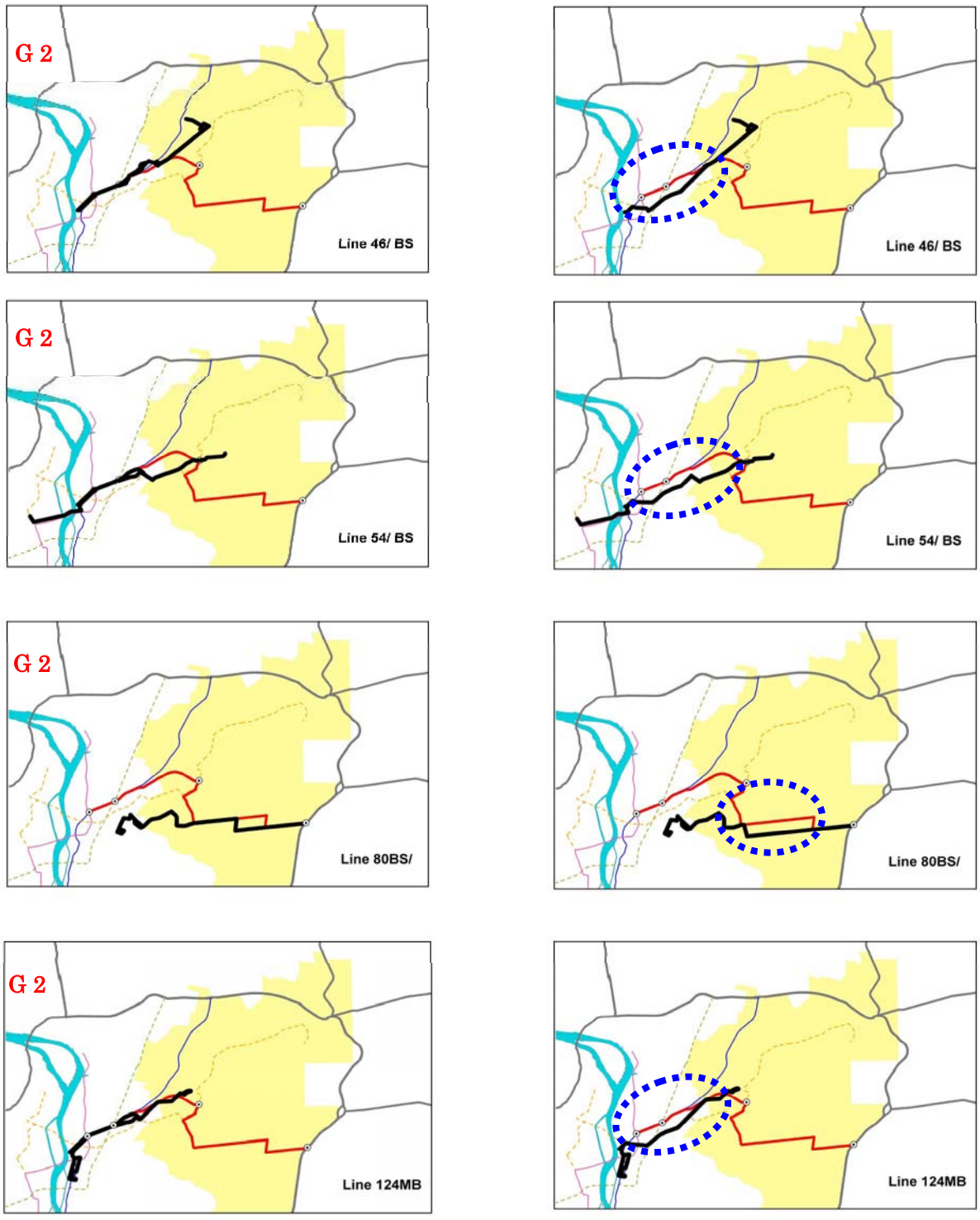
Figure 4.3.25 (Continued) Depiction of Routing Changes: Optimized 20 Bus Lines

Before Bus Rerouting **After Bus Rerouting**



Source: JICA Study Team

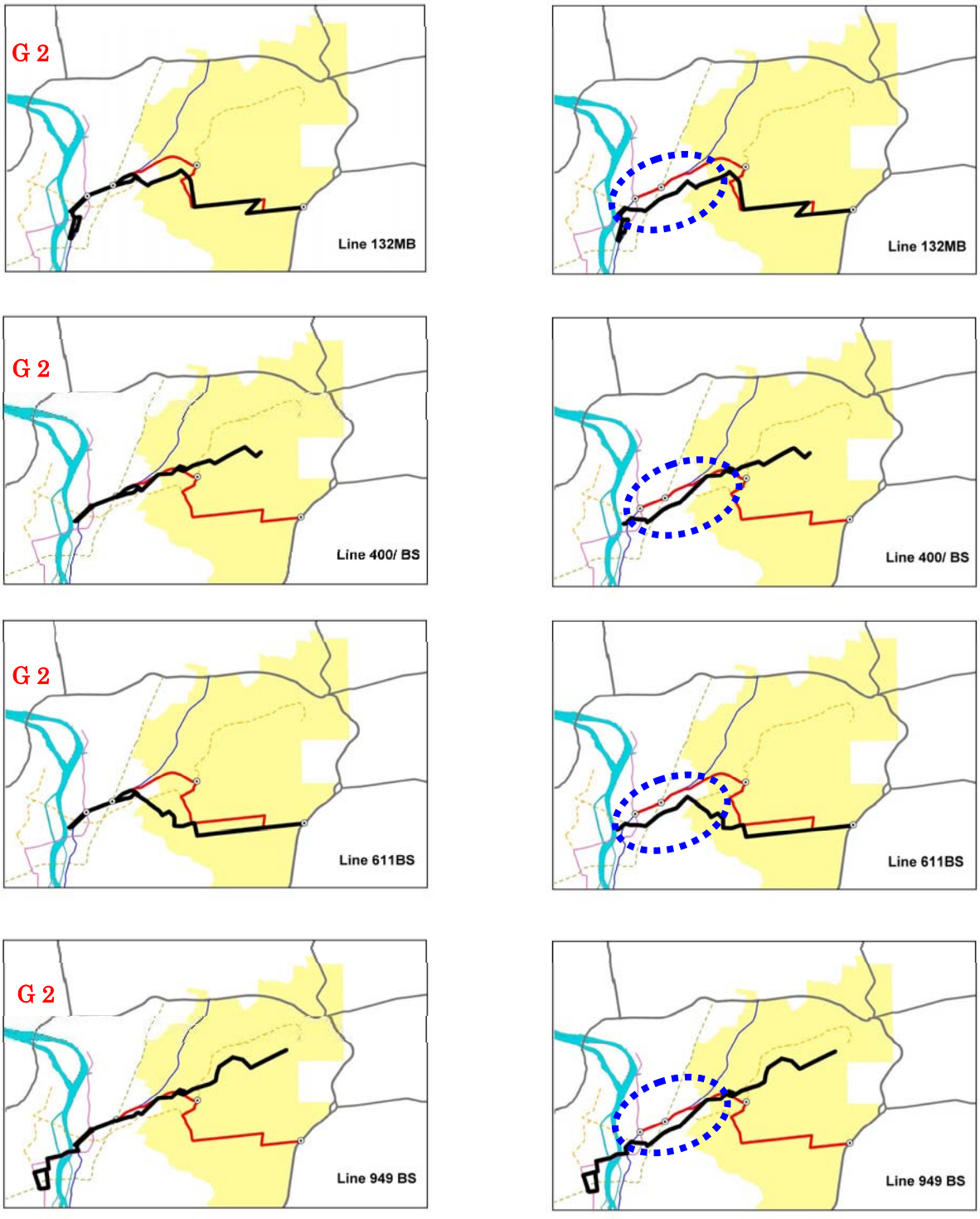
Figure 4.3.25 (Continued) Depiction of Routing Changes: Optimized 20 Bus Lines
Before Bus Rerouting **After Bus Rerouting**



Source: JICA Study Team

Figure 4.3.25 (Continued) Depiction of Routing Changes: Optimized 20 Bus Lines

Before Bus Rerouting | **After Bus Rerouting**



Source: JICA Study Team

Figure 4.3.25 (Continued) Depiction of Routing Changes: Optimized 20 Bus Lines

4.3.8 The East Cairo Optimization Plan

As stated, the main objectives of the bus optimization exercise are to:

- Enhance the general level of CTA service in East Cairo as possible within the mandate of the supertram feasibility study;
- Improve intermodal integration with Supertram Line 1; and,
- Define a realistic series of bus service improvements which recognize an optimized routing strategy, yet retain sensitivity toward local norms and expectations.

Previous sections describe the analytical techniques, methodologies and conclusions employed to fulfill these objectives. In addition to frequent liaison with staff and senior management of the CTA, a series of PowerPoint presentations were made to the Technical Working Group for Program B and the Steering Committee. These presentations were followed by robust, technical and productive discussions. Many valuable questions, clarifications and insights were exchanged. Consensus was reached regarding several key strategic guidelines in terms of Supertram Line 1 feeder bus services. These guidelines have been fully integrated into follow-on work tasks, including finalization of the recommended East Cairo feeder system.

Considerations and conclusions which influence the form and content of the Study Team's recommended plan are:

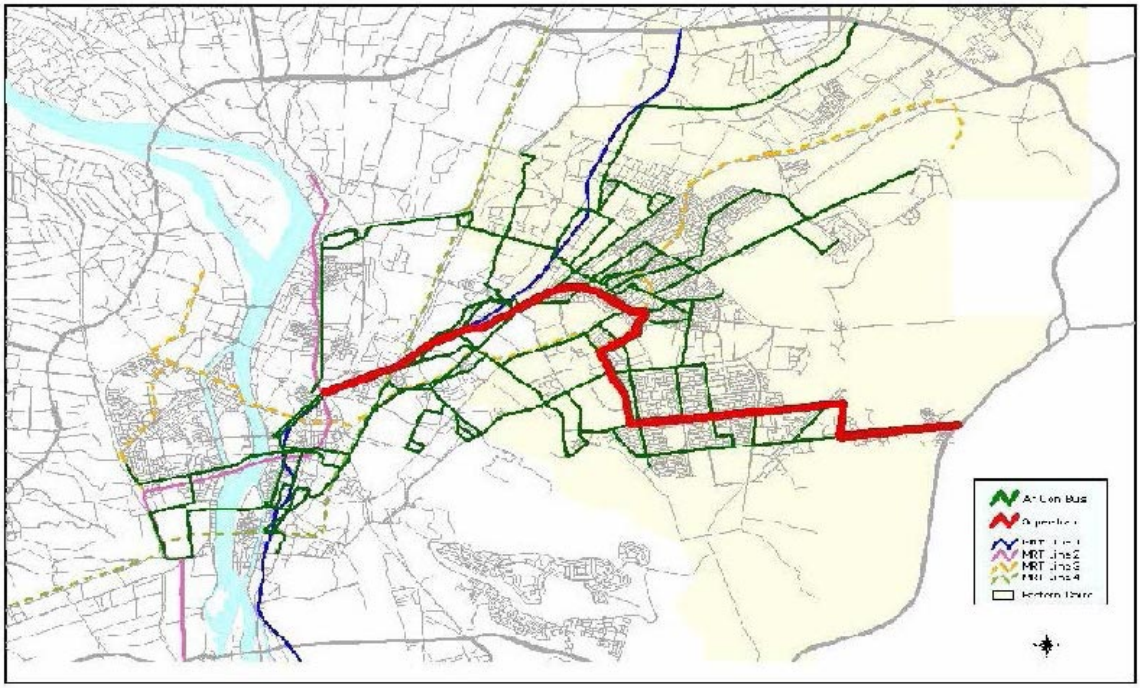
- There is merit to adopting a feeder bus network for Supertram Line 1.
- Recommendations regarding optimized bus services should, within a Supertram Line 1 intermodal connotation, be considered indicative in nature since the previously noted bus operations reviews, and changes thereto, must be based on existing (year 2003) services. However, the supertram can, at earliest, be operational only by year 2007. Thus, in the intervening four years, considerable evolution of the existing bus network, and perhaps the CTA itself, can be expected. Indeed, some bus route changes have already been noted at time of writing (October, 2003) from the analytical period (April 2003). Feeder bus services should be addressed with certainty and confidence once the supertram is closer to actual operation.
- Passengers on existing standard (25 Piaster) routes are likely not candidates (or cannot afford to) transfer to the supertram, which is considered a premium public transport system. The core of the 25 Piaster routes should therefore be maintained largely as currently existing.
- Any improvement in the East Cairo bus system should focus on the expansion of the existing (modest) air conditioned bus network. These improvements should serve both the supertram and East Cairo in general. Linkage with supertram is possible both with longer-distance routes (likely via full sized buses as per current practices) and shorter, possibly shuttle, routes with potential service by air conditioned minibuses. The introduction of premium air conditioned bus services is also seen as having inherently greater potential

(compared to standard bus services) of catalyzing mode-switching of current private car users.

- Maximum flexibility for the CTA in terms of allocating rolling stock to air conditioned and non-air conditioned routes based on actual ridership is needed. The likely approach is to overlay new premium routes on the identified long distance feeder network with fine-tuning in accordance with opening of the Supertram. This is a logical prerogative for any public transport operator, and meets the strategic goals of the CTA.
- The Supertram and its air conditioned feeder bus system should be marketed as an integrated premium system. Thus, joint ticketing and unified fare policies must be put in place (this issue is further discussed in Chapter 2, Section 4.4 and Attachment C of this report).
- Proposed additions to the bus network should be reasonable in scope and within local capabilities. An addition of say 20 to 25 routes, which will require on the order of 150 new buses, is seen as realistic and achievable. However, the introduction of 40 or 50 new routes, with commensurate expansion of the bus fleet, is seen as too challenging in terms of local operational capabilities, and for the marshalling of requisite funds.

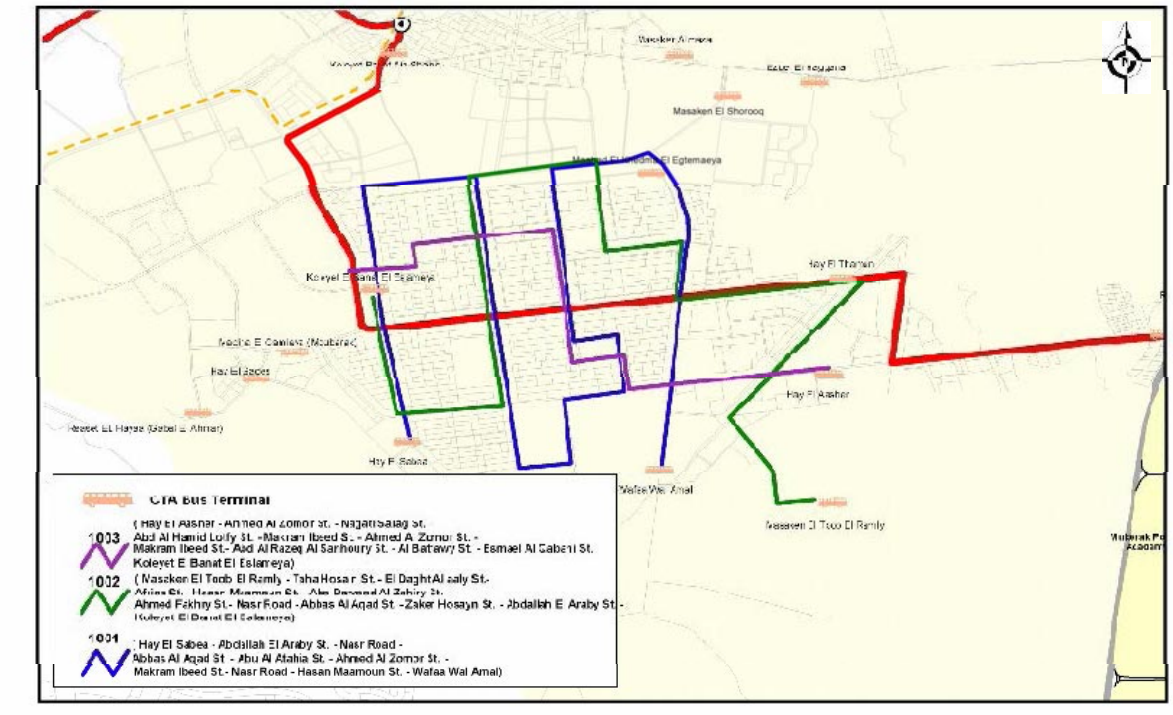
The recommended plan for bus optimization in East Cairo includes three elements.

- Technical reviews confirm the merit of optimizing 20 bus routes within East Cairo. In light of stated considerations, new air conditioned services using full size buses, at the standard 2 LE fare, should be layered onto the identified (and optimized) existing 25 Piaster routes. This is consistent with governmental objectives in that premium services may be offered assuming that transport options for low-income residents of the metropolitan area are not jeopardized. The proposed routes are intended to serve both East Cairo and to enhance intermodal connectivity with the supertram, thus, from an implementation perspective, realization can proceed at the earliest opportunity (Figure 4.3.26).
- The residential component of Madinet Nasr lying approximately between Abbas al Aqqad Street and the Ring Road is slated for rapid population growth. Indeed, new housing developments, and intensification of existing residential pockets, is already accelerating. Most residential buildings tend to be three to five stories high; thus, in absolute terms, represent a considerable population, but in a somewhat dispersed pattern bleeding beyond the 800 meter supertram buffer area. To encourage utilization of the supertram, three shuttle routes, anchored to CTA bus terminals, are proposed within this area (Figure 4.3.27). Service would likely be via air conditioned mini buses. The intent of the proposed routes is to enhance supertram access, although passengers could also use these services for traveling between various precincts of Madinet Nasr/Heliopolis. Implementation of the shuttle routes would likely be more linked with actual implementation of the supertram, although could be earlier should government reach a policy decision in terms of enhanced public transport service.



Source: JICA Study Team

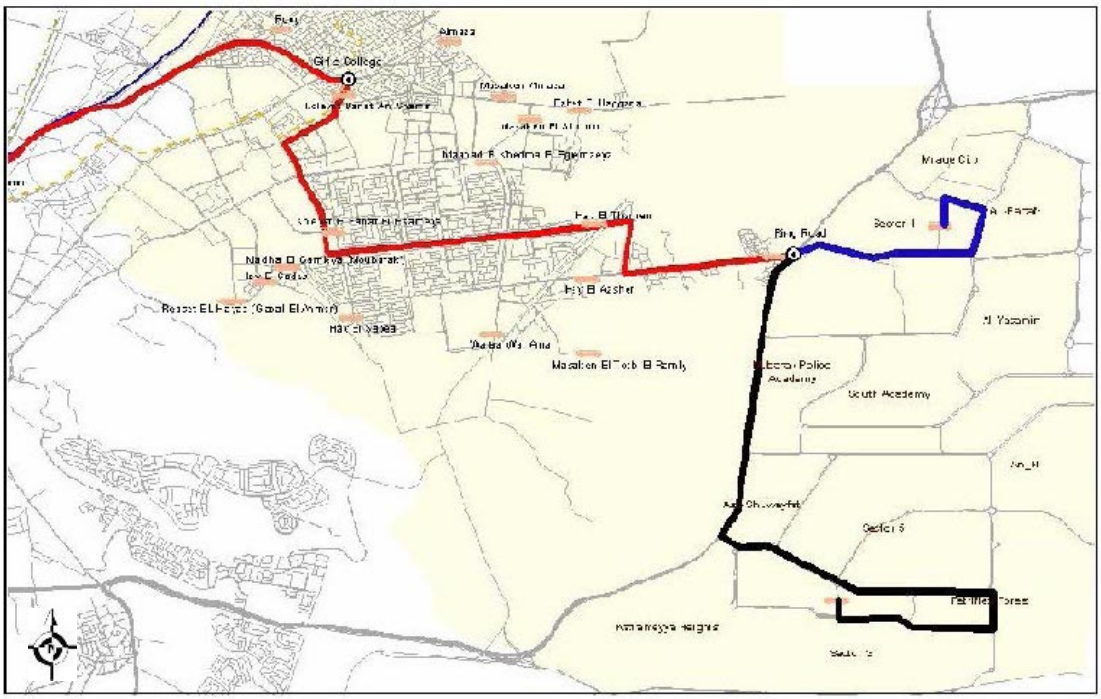
Figure 4.3.26 Recommended Plan: 20 Optimized Bus Routes in East Cairo



Source: JICA Study Team

Figure 4.3.27 Recommended Plan: Three Shuttle Routes in Madinet Nasr

- The third element of the recommended plan relates to New Cairo. This urban conurbation, whose size is expected to ultimately reach approximately three quarters of a million persons, obviously represents a considerable impact upon supertram ridership. However, the speed of New Cairo population growth, and indeed the spatial distribution thereof, remains flexible and subject to market mechanisms. From the perspective of the supertram, two issues are obvious. Firstly, the Ministry of Housing has expressed considerable interest in the extension of the supertram beyond its currently suggested Ring Road terminus station into New Cairo. In fact, the Study Team was informed during September of 2003 that the Ministry has committed to this extension. Secondly, until such an extension is complete, an interim series of feeder bus services must be implemented to serve the residents of New Cairo. At present, limited bus service is provided from the existing Ring Road bus terminal (which will be incorporated and enlarged within the LRT Ring Road station concept) into New Cairo; private operators also link some areas, such as Rehab, with Madinet Nasr and Heliopolis. The extent of the feeder bus activity, as stated, will be totally dependent upon actual New Cairo development by year 2007 (the assumed supertram opening year). Thus, it is assumed that, in the first instance and as an absolute minimum, air conditioned feeder bus services are needed which mirror the existing routes (Figure 4.3.28). Given that implementation of the New Cairo feeder routes are totally dependent upon actual implementation of the supertram, any final decision regarding the extent and intensity of services can only be taken at a later time.



Source: JICA Study Team

Figure 4.3.28 Recommended Plan: New Cairo Feeder Bus Routes First Stage (Absolute Minimum)

4.4 INTERMODAL ISSUES AND OPPORTUNITIES

4.4.1 Introduction

There exists, at present, no organized integration of the public transport system in Greater Cairo. While CREATS has previously, on one hand, pointed out this shortcoming, the absence of an integrated system, on the other hand, offers a unique opportunity for Cairo in that highly efficient state-of-the-art technologies could be introduced over time under largely controlled conditions. This also paves the way for developing a public transport system that takes full advantage of private sector participation.

However, it should be understood that the full extent of these advantages will only become apparent over the long-term and will require further detailed analysis and study as regards the specific implementation. But it cannot be denied that the development of Supertram Line 1 offers, in that context, an interesting first step in the right direction. It will also allow estimating and evaluating the effects of and determining the conditions for introducing an integrated public transport system in the Greater Cairo Region.

Although public transport integration implies a wide variety of elements that need consideration, this section will address three issues that are directly relevant; to wit:

- Intermodal terminals and stops and passenger information technology;
- Integrated ticketing and distribution systems;
- Human resources development (training and re-orientation of personnel).

The adopted approach is as follows:

- Section 4.4.2 quantifies the relative benefits of intermodality within the Cairo context using the capabilities of the CREATS model. The ticketing strategy and fare levels proposed at the time of initial operation of the supertram in year 2007 are also presented. Thus, the year 2007 system should be seen as the first step, realistic in terms of local practices, norms and expectations, which ultimately leads to the more advanced systems noted in Section 4.4.4.
- Section 4.4.3 reinforces the need for public transport information dissemination within the intermodality framework and several options for near-term solutions.
- Section 4.4.4 presents a view to the future; that is, the longer term possibilities that exist for Cairo in terms of intermodality and ticketing systems. It should be emphasized that this review is not intended to be exhaustive, detailing all technologies, applications or theories that are presently available.

It is noted that considerably more detailed discussions regarding the physical form and content of proposed intermodal terminals is presented in the following

Section 4.5, while human resources development is addressed in detail in Chapter 5.

4.4.2 Integrated Ticketing

Several essential questions are addressed in Section 4.4.2 which relate to an immediate horizon, that is, the anticipated opening date of the supertram – year 2007. This section firstly reviews the empirical benefits of integrated ticketing, and then proceeds in defining a realistic and practical year 2007 system which can, ultimately, evolve to more sophisticated technology as described in Section 4.4.4. Further discussion is also presented in Section 4.6.4.

(1) Ridership Sensitivity to Fare Structure and Fare Levels

Public transport patronage is influenced by numerous direct and indirect catalysts, both internal and external to the service. The most obvious parameters include such considerations as quality of service, amount of fare paid and type of service provided. As previously examined in Subsection 3.5.2, cascading impacts upon supertram patronage are obvious depending on types and structures of competing services, and the extent of coordinated services. This section will examine a further important subset: the type and amount of fare structure imposed upon public transport users. Two case studies are presented. The first re-capitulates a review of comprehensive fare strategies for all modes within Cairo, as conducted during Phase I investigations. The second examines the more direct potential for integrating fares in East Cairo between the supertram and its designated feeder bus system.

1) The CREATS Master Plan Perspective

The CREATS Transport Master promulgated a series of policy and infrastructure recommendations. To provide additional insight into likely quantitative benefits associated with enhanced intermodality, the CREATS transport model was applied to test the sensitivity of public transport utilization to two stimuli:

- Conversion of public modes fare structure to a single, common system; and,
- Changes in the absolute amount of fare levied.

During the conduct of Phase I, and using the full capabilities of the CREATS Transport Model, three different types of fare structures existed in the formal public transport sector. These were distance proportional (metro), flat (trams) and route specific (public bus). The latter case somewhat combines flat and distance proportional concepts in that pricing for a given bus line, for example, could vary depending on length, perceived service or type of equipment provided. The testing of future Master Plan public transport scenarios carries the implicit assumption that base year fare structure is retained, although fare amounts, expressed in terms of constant year 2001 Piasters, change in line with forecast real economic growth.

Thus, the average public transport trip yield increases roughly by a factor of 1.5 between the base year and target year 2022.

The weighted average public sector fare for the recommended CREATS Master Plan year 2022 condition is on the order of 6.6 Piasters per kilometer. The test that was performed consists of two elements: (a) that all public sector operations use a common, distance proportional fare structure, and (b) the average unified public fare ranges from five to 10 Piasters per kilometer.

Findings indicated that:

- Systems which apply a flat tariff, or close approximation thereof, attract more ridership under a distance-proportional scenario. In case of trams/supertrams and the Wings, for example, ridership increases and average trip distance also changes. This suggests that these modes become much more attractive to shorter (cheaper) trips, and, in case of tram/supertram, may actually be attracting car trips from wealthier suburbs such as Heliopolis and Madinet Nasr.

  The overall level of public transport usage changes in line with adjustments in ticket price, but not dramatically so. Public ridership for the Master Plan is some 15.56 million boardings per day in year 2022, which grows to 16.46 million under a unified five Piaster/km scenario, and decreases to 15.07 million under a 10 Piaster/km unified fare scenario. Overseas experience suggests that each 10 percent increase in fare will result in a three percent loss in ridership; however, these statistics may be of questionable validity in Cairo given the high degree of transit captive patronage. It is also of relevance to note that in case of buses, the private sector (shared taxi) average single-journey fare was, during 2001, about twice the CTA bus base fare, and considerably higher than the average public bus single-journey fare (58 Piasters versus 25 Piasters and 34 Piasters, respectively).

- The use of a unified fare suggests that overall public sector ridership will increase at similar fare levels. Public ridership for the Master Plan, which totals 15.56 million per day under a weighted average fare of some 6.6 Piasters per kilometer, still increases to some 15.9 million persons per day under a slightly higher, but unified, average fare of seven Piasters per kilometer.

- Private sector (shared taxi, cooperative minibus) ridership also varies even though the fare is assumed to remain constant for all scenarios tested. As public fare is decreased (and ridership increases), private sector boardings decrease slightly given that public services have become economically more attractive. As public sector prices increase (and ridership decreases), private sector boardings tend to increase as pricing benefits now accrue to the private sector. In general, private sector boardings decrease under a unified fare scenario as more, and shorter, trips are diverted to the public sector.

The interested reader is urged to consult the CREATS *Phase I Final Report* for additional detail and discussion.

2) Integrated Fares in East Cairo

The specific case focuses on the impacts upon forecast year 2007 ridership and revenue of having (a) a single joint fare for both the supertram and its designated feeder bus system, and (b) impacts of varying this fare. The CREATS model was used to evaluate both scenarios (Table 4.4.1).

Table 4.4.1 Forecast 2007 Daily Modal Demand Under Alternative Fare Systems Supertram Line 1 and Feeder Bus System

Fare Structure	Average Fare[(1)] (Piasters)	Supertram Passengers (000)	Bus Passengers (000)[(2)]	Revenue (000 LE)	Percent Transfer[(3)]
Base Case (Separate, Flat)	65	284.0	*	184.6	*
Integrated (Distance, Integrated)	65	301.6	286.0	362.4	9.9
Integrated (Distance, Integrated)	50	340.8	422.9	351.9	17.6
Integrated (Distance, Integrated)	55	331.1	359.0	352.1	15.1
Integrated (Distance, Integrated)	70	228.8	147.9	249.8	8.7

Note:
(1) For combined system, rounded to nearest five Piasters.
(2) All riders on buses including those transferring to supertram.
(3) As percent of supertram ridership
Source: JICA Study Team.

Several findings emerge from these tests:

- A conversion of fares on supertram and its feeder bus system from separate, flat structures to integrated structure, each yielding a similar average fare of some 65 Piasters, will catalyze about a six percent increase in supertram ridership.
- Decreasing the integrated fare below an average of 65 Piasters increases ridership, but reduces revenue yield. Conversely, increasing the integrated fare above the average of 65 Piasters decreases both patronage and revenue.
- The optimum year 2007 fare (in terms of constant Piasters) for the combined system hovers near 65 Piasters, a finding very similar to optimized fare analyses for only the supertram.
- Variation in price structure impacts the percent of supertram riders transferring from the bus system, ranging to near 20 percent.

An interesting comparison can also be made of modeling sensitivity to observed patronage of premium air conditioned bus services, for which the fare is some 2 LE. In case of the supertram, sensitivity tests clearly confirm that if such a fare is applied to the supertram system, it would, in terms of the CREATS model, result

in considerably reduced patronage. Firstly, it should be noted that the typical air conditioned bus trip is considerably longer than the typical trip on supertram, which tends to be of a more shorter, intra-urban nature. Secondly, any change in fare structure for transfers between CTA systems (bus, supertram) will benefit only that subgroup of riders using such services (which range up to some 20 percent of supertram ridership). The remaining 80 percent can easily be negatively impacted. For example, an increase in joint CTA fares (which may in fact be a reduction of separate CTA fares) will increase the net trip cost for those persons walking or using the Metro and shared taxis in conjunction with the supertram. Diversion to other (cheaper) modes is the expected result. Such competition can be particularly intense in the supertram alignment where considerable competition exists from Metro within the Ramses – Roxy corridor (during mid-2003, the Metro adopted a 75 Piaster flat fare scheme).

In fairness, it should be noted that mathematical models have some difficulty in off-setting qualitative factors such as perceived comfort. Thus, it is still conceivable that the supertram, as a premium system located in an upper-income precinct of the metropolitan area, can likely continue to attract ridership at fares in excess of 65 Piasters assuming the service is punctual, clean and well maintained.

3) Synopsis

Fare sensitivity analyses carry three important implications for the public sector. From the composite Master Plan perspective, it may be surmised that (a) the use of a common fare policy is likely beneficial in terms of ridership; (b) that a distance-proportional fare applied uniformly to all public operators can be a catalyst for increased ridership, and (c) that opportunities exist for increasing (commercializing) absolute fare levels with modest impacts upon ridership.

From the more limited East Cairo perspective with a focus on intra-CTA ticketing integration, it may be surmised that (a) the use of a common fare policy is somewhat beneficial in terms of supertram ridership; (b) patronage of the combined system is sensitive to average fare level and competing services, and (c) the intermodal mix of supertram patrons is of key importance in determining the perceived average trip cost and, ipso facto, total revenue yield.

In conclusion, the integration of fares does indeed offer benefits to users of public transport systems; however, to be truly effective, integrated systems should be applied to the sector as a whole, rather than isolated components thereof. Thus, the application of integrated ticketing for the supertram and its designated feeder bus system, both of which are likely to fall under the jurisdictional umbrella of the CTA, offers great potential both as a promising start to intermodality, and as a first step toward the wider application of this concept throughout Greater Cairo.

(2) Ticketing Strategies

Both quantitative and qualitative analyses confirm the desirability of integrated ticketing and that the supertram can service as an excellent opportunity to

implement such a concept in Cairo. The core question is how to design a year 2007 system which meets local expectations and practices while concurrently retaining potential for a transition in future to more high-tech approaches as noted in Section 4.4.4. Key considerations in this regard are discussed in following subsections.

1) Fare Collection System

Several core types of fare collection systems can be employed:

- Pay on entry, which is the most common approach used for buses. In Cairo, this can take several forms. In case of air conditioned premium services, for example, the driver processes the fare while passengers board. In case of standard services, a conductor collects the fare after boarding.
- Barrier, typically involving some form of turnstile ingress/egress and segregated platform. Tickets are generally sold external to the barriers. This type of control is frequently used by urban rail systems, to include the Cairo Metro.
- Barrier free design, or honor system. No barriers to system entry or exit exist, with roving inspectors spot-checking compliance of passengers to ensure that a valid ticket or pass is used for that journey. This approach is widely used in Europe and North America.
- On-board validation, or the system used at present on the Heliopolis Metro where on-board conductors issue tickets (literally, provide receipts) in return for the boarding fare.

The fare collection system for the supertram must reflect two realities. Firstly, in case of (feeder) buses, it is unlikely that on-board automation of fare collection equipment will occur in the near future. Thus, the issuance of paper tickets (receipts) is likely to continue. Secondly, for the supertram, passenger convenience and maximized revenue (minimized fare evasion and fraud) are core targets. Since supertram stations are fixed, some form of barrier system is realistic (refer Section 3.5.3 and Section 4.5 for illustrations).

2) Ticket Media

Ticket media can encompass a wide range including paper tickets (receipts), tokens, magnetic tickets, and smart cards. It is expected that, in the longer term, Cairo public transport systems will evolve toward more high tech solutions such as smart cards. However, in the near term, paper tickets (receipts) are anticipated to remain the most common media for bus systems. In case of supertram, given a barrier design, a likely choice is magnetic tickets, similar to technology currently used by the Cairo Metro. Magnetic strip tickets can be used for a variety of payment options, can be used to validate system entry or departure, and provide a passenger activity profiles to enhance the planning of services. As magnetic tickets are used at system entry and exit, fare evasion and revenue fraud is minimized. However, the study team would add that final discussions regarding ticketing hardware should be integrated with the Supertram Line 1 bidding process to take advantage of the latest then-available technology.

Section 4.3.8 contains a recommendation for an integrated service consisting of the supertram and a series of designated 20 long-distance air conditioned feeder services designed to benefit both East Cairo and the supertram, three short-distance shuttle routes within Madinet Nasr, and feeder routes between Ring Road station and New Cairo. Thus, for this system, a CTA-CTA one transfer trip is possible (bus to supertram or supertram to bus), and, for a much smaller proportion of trips, a CTA-CTA-CTA two transfer trip (bus to supertram to bus). Given the differences in ticket media, an integrated approach is needed. The absolute amount of fare is discussed in the following subsection (3); however, from a ticket issue point of view, several possibilities must be provided for.

For discussion purposes, it is initially assumed that some form of revenue sharing arrangement is needed. That is, even though both services will likely fall under the jurisdictional umbrella of the CTA, the bus company and supertram company will wish to share revenue accruing from passengers which ride both a feeder bus and the supertram.

- A trip without transfer. If the journey involves only the supertram, a magnetic ticket is purchased, and used for entry to as well as exit from the system as currently done with the Cairo Metro. If the journey involves only a designated feeder bus (these are also accessible to passengers which do not desire to use the supertram), a paper ticket is purchased upon boarding the bus as per present practices. No revenue sharing procedures are required.
- A trip involving one CTA-CTA transfer. If boarding a designated feeder bus first (all designated feeder routes for the supertram are considered air conditioned premium service, as is the supertram itself), the driver will issue, upon receiving payment of the unified fare, a (likely color coded) receipt for the bus portion of the trip plus a magnetic strip ticket used for boarding of the supertram (the latter from a supply of pre-issued tickets carried on the bus). If the supertram is boarded first, the procedure is reversed. Alternatively, entry to the feeder bus is permitted upon presenting proof of journey via the supertram and a (likely color coded) receipt is issued. The unique identification of these tickets (via say color or pre-coding of the supertram magnetic tickets) is needed for revenue sharing calculations.
- A trip involving two CTA-CTA transfers, such as feeder bus to supertram to feeder bus. The procedure would be similar to the single transfer approach, but at boarding the initial bus and after receiving payment for the appropriate unified fare (being higher than the single transfer fare), the driver would issue a second (presumably color coded) receipt which allows boarding the second bus after completion of the supertram journey. The unique identification of these tickets (via say color or pre-coding of the supertram magnetic tickets) is needed for revenue sharing calculations. Few passengers are expected to use two transfers.
- A trip involving a CTA mode and a non-CTA mode. There is no history in Cairo of any integrated ticketing or revenue sharing among different operators, despite repeated attempts and/or suggestions. Until such time as a unified approach is adopted, operationally and politically, it must practically be assumed that ticket procedures in year 2007 will be as at present; that is,

separately purchased for each mode/operator. In the longer term, of course, the Study Team continues to urge the adoption of a unified and integrated public transport system in Cairo.

There are two options for simplifying the ticketing media outlined above.

- The first relates to technology. The designated feeder buses have a magnetic ticket issuing device installed on-board. This is eminently doable, and prevalent on many bus systems worldwide. In Cairo, however, it is still considered an innovation and, if employed on the feeder buses, represents a marked departure from technology employed on other elements (i.e. non-feeder buses) of the fleet. Whether or not a magnetic ticket is issued on a feeder bus, or at a supertram station, becomes immaterial as the magnetic strip would contain all trip and fare information, for all segments of the journey, whether or not a transfer is involved, and, if so, how many transfers.
- The second option relates to organizational strategy. Under this approach, the supertram and the designated feeder buses are considered part and parcel of the same system, and are placed under the control of a single operating entity, regardless of the jurisdictional umbrella. Thus, revenue sharing is no longer a concern as all income flows into "the same pot". Depending on technology, only some form of "proof of purchase", or a unified magnetic ticket, is needed for control purposes.

3) Types of Equipment

The types of equipment used in fare collection and distribution systems can include turnstiles, passenger operated automatic ticketing machines, fareboxes, validators, ticket processing units and other equipment such as addfare machines.

Figure 4.4.1
Automated Ticketing Machine

In terms of technology required to process system entry and exit, such as turnstiles, little difficulty is foreseen. However, within the Cairo context, automated ticketing machines, such as depicted in Figure 4.4.1, present considerable challenges. The advantage of these devices as a labor saving tool are unquestioned; further, with their flexible programming, a wide range of different tickets can be sold with absolute control on incoming revenue. However, in Egypt, there is only limited availability of

Piaster coins, while notes, particularly smaller denominations, are typically in decrepit condition. It is unlikely that any automated ticketing machine, regardless of sophistication, would accept the majority of LE notes for payment. Thus, it is virtually a given condition that a "human interface" will be required in terms of ticket issue until such time as the currency supply is reformed, or more automated techniques of payment (such as credit cards) establish themselves. In case of the supertram, on-site ticket sales must therefore be accomplished via a manned ticketing booth sited external to the system barrier. Of course, tickets should also be available from other locations such as CTA offices, the proposed public transport information centers, or via bulk sales to, for example, major employers and/or Ministries. The sale of tickets at subsidiary locations, such as news kiosks, should also be considered.

(3) Fare Strategies

The investment needs for Supertram Line 1 are substantial. The management and operation of the supertram, to ensure maximum benefit of this investment, must follow an innovative path of commercialized operation within the framework of a public-private sectors partnership. Toward that end, the fare strategy must:

- **Firstly strive to create an efficient and effective operation capable of meeting the social and public policy needs of Greater Cairo with as little public subsidy as possible. Such a goal is not meant to imply that subsidization of service is not desirable, only that for a given policy goal, the amount of subsidy needed should be as small as possible. Second, should aspire to make the supertram as commercial as possible, and responsive to potential private sector participation and capital, thereby freeing scarce public resources for other purposes.**

The following sections detail the recommended ticketing strategy for the supertram.

1) Supertram Fare Level and Structure

Two types of commercial tickets are seen as being realistic for the supertram:

a. A single-journey ticket and a multi-journey ticket/pass.

The single trip ticket would, as the name implies, permit a single boarding of services. Two types of multi-journey tickets could include weekly (or say 12 boardings) and monthly (or say 50 boardings) passes.

Public transport fares vary across a broad range with year 2001 surveys confirming that shared taxi and metro modes are among the most expensive choices (ignoring the premium aircon bus services generally priced at 2 LE; however, trip lengths on air conditioned buses tend to be considerably longer than any of the other urban modes). This holds true for both single journeys and multiple journeys, as, for example, two consecutive modes. For single journeys, average year 2001 Cairo Metro and shared taxi fares hovered between 55 and 60

Piasters (however, as of mid-2003, the metro fare structure was modified to a flat fare of 75 Piasters, thus increasing the average noted in year 2001). Formal bus sector statistics yield averages of 31, 40 and 46 Piasters for CTA bus, GCBC bus and CTA minibus services, respectively. Thus, public transport fares are imbalanced and politically constrained.

b. Current investigations suggest that the initial year 2007 supertram single-journey supertram fare should be set at a flat rate of 75 Piasters expressed in terms of constant year 2003 currency.

Modeling investigations confirm that an average fare of approximately 65 Piasters maximizes revenue. However, the nominated 75 Piaster fare (in constant year 2003 terms) is more logical for several reasons:

- The ability of passengers to assemble 65 Piasters is difficult, due to limitations in the stock of Egyptian coins and notes. A 75 Piaster fare can, on the other hand, be readily assembled.
- On offset of 10 Piasters from the optimized revenue fare, whose determination relies on modeled travel disutility, can readily be justified on qualitative grounds: the supertram, as a modern LRT vehicle, exhibits a high degree of comfort and convenience.
- The fare is consistent with the new year 2003 Cairo Metro fare (flat fare, 75 Piasters), an urban rail system which shares a common corridor along the western extreme of Supertram Line 1.

The feasibility investigations for the supertram are based in constant year 2003 terms, thus, should be seen as a conservative approach. Even under this scenario, operating revenues exceed operating costs (which exclude interest and depreciation). The Study Team is also noting (below) that fare levels should be indexed for inflation and that, in general, the supertram should be as commercial as possible.

- **Thus, it is very likely that the single-journey supertram fare expressed in terms of a year 2007 (the anticipated year of opening) base would be on the order of 1 LE or 1.25 LE. It is strongly urged that, as the opening date of the supertram draws closer, further reviews be conducted as to the actual fare implemented. This review should be sensitive toward then-existing economic realities, competition from other modes and market conditions. Any form of interference, such as a political cap on fare structure, is discouraged in the strongest possible terms unless, as part of that capping, revenue streams are guaranteed which replace lost marginal income.**

Multi-journey tickets would be sold at a reasonable discount from single-journey prices, possibly 10-15 percent for weekly tickets, and 20-25 percent for monthly tickets on a per-ride basis.

- It is logical that the initial year multi-journey supertram weekly fare be set at 8 LE (equivalent of a discounted 12 boardings), and monthly fare at 30 LE

(equivalent of a discounted 50 boardings), both expressed in constant year 2003 terms.

Multi-journey tickets would, of course, be subject to the same market mechanisms as single-journey tickets.

2) Supertram Concession Tickets

A further consideration relates to concession tickets, that is, privileged passengers whose price structure reflects their status, employment, age or physical condition. Such discounts are widely available at present, although not uniformly on all operators. The goals are understandable; the Government of Egypt strives to give certain benefits to some segments of society, or to its (possibly underpaid) employees. However, the Study Team would disagree that passing this responsibility unilaterally to public transport operators, as is being done at present, is an equitable or efficient approach. No one would disagree that special favors for sub-groups such as the handicapped or infirm are a responsibility for all sectors of society. However, alternative strategies should be adopted in other cases, for example, police and military. No one is questioning that they have fulfilled valuable services to their country, and richly deserve rewards. The operator could continue to carry these persons at reduced rates; however, would be reimbursed for doing so. For example, handicapped, infirm and socially deprived becoming the responsibility of the Ministry of Social Affairs; police and fire fighters of the Ministry of Interior; as well as armed forces and veterans of the Ministry of Defense. Closely linked is the current policy regarding treatment of employees (whether public, private or operator). This must be seen as a matter of commercial policy.

- **In terms of the supertram, it is proposed that the nominated ticket structure (commercially priced single journey or multiple journey tickets) serve as the basis of operation. In that light, any organization, whether private or public sector, Ministry or not, is free to negotiate a contract of carriage for its employees or its charges with the supertram operator based on commercial, competitive prices.**

A fairly direct way of addressing this is for the purchaser (say a Ministry) to purchase a given quantity of commercially priced tickets from the supertram operator. These would possibly be given some amount of bulk discount, the final total of which is subject to ultimate negotiation between supertram operator and purchaser. The purchaser would then distribute these tickets to its employees or its charges either free or for some discounted amount; that is a matter of internal company policy.

- The important point in this regard is that the supertram operator must be allowed to function as a commercial entity providing complex and costly urban public transport services, rather than as an implementer of social policy.

There remains one additional group: students. It is questionable whether a single sponsoring entity can be defined to reimburse all categories of students, other than

the Ministry of Education. Two options exist for addressing this issue. Appropriate allowance for internal cross-subsidy could be made to account for this market sub-group. However, the likely impact is some marginal increase in fares for all other users. Alternatively, a specified contract to carry students with reimbursement, based on unit costs of carriage benchmarked as efficient, can be adopted. This implies that reimbursement for the carriage of students is seen as a direct social obligation of the state, and purchases of bulk discount tickets from the supertram operator would be as with other Ministries or large employers.

3) Integrated Fare Level and Structure

The previous section proposes the core supertram fare structure, that is, passengers boarding/alighting from the supertram per se. However, under the intermodal strategy, it is highly desirable that transfers to/from the designated feeder bus system be facilitated using various techniques, including joint ticketing. However, if history teaches any lessons, it is that integrated ticketing between separate operators is unlikely within the Cairo context, despite best efforts. However, in the case of the supertram, a unique opportunity for integrated ticketing is presented between the supertram and feeder buses, both of which are foreseen at present as being under the jurisdictional umbrella of the CTA. Thus, initial efforts in this regard should be seen as the first step in that intra-agency integrated ticketing can be adopted, paving the way for more widespread application between different operators.

Three types of interactions are foreseen, as discussed previously in this section.

- A trip without transfer. If the journey involves only the supertram, the indicated price structure (75 Piasters in year 2003 terms, possibly 1 or 1.25 LE in year 2007 terms) applies. If the journey involves only a designated CTA air conditioned feeder bus (these are also accessible to passengers which do not desire to use the supertram), a single ticket price of 2 LE would apply as per current practices.
- A trip involving one CTA-CTA transfer, either feeder bus to supertram, or supertram to feeder bus. The cumulative fare, in 2003 terms, would be 2.75 LE. However, it is tendered that, as a feeder bus service, additional ridership is gained for the bus mode due to the convenience of a supertram interchange, attractive fare and premium service. Thus, the one-transfer fare should be capped at the premium bus service fare, that is, 2 LE. An approach for revenue sharing will be needed between bus and supertram, if desired. Alternatively, if the supertram and its feeder buses are operated as a jurisdictional entity, revenue sharing is not needed as all income “goes into the same pot”.
- A trip involving two CTA-CTA transfers, say feeder bus to supertram to feeder bus. The cumulative fare, in 2003 terms, would be 4.75 LE. As noted, few passengers are likely to use the double interchange option on CTA, but nevertheless some form of pricing incentive should be applied. For purposes of the current presentation, 3 LE is suggested.

Multi-journey tickets could be sold at a reasonable discount from single-journey prices, possibly 10-15 percent for weekly tickets, and 20-25 percent for monthly tickets on a discounted per-ride basis.

4) Indexing

While public transport fares have increased over the past decade, the rate of increase has considerably lagged that of the consumer price index. The revenue base for public transport operators therefore continues to erode in real terms concurrent with increasing absolute operating costs. This is highly problematic for public transport operators when, on one hand, ticket revenue is stagnating (indeed declining in real economic terms) while, on the other hand, costs for maintenance, spare parts (particularly those purchased overseas in hard currency) and other labor-intensive activities continue to increase in absolute terms.

- Supertram fares should be linked with the consumer price index, or annual inflation rate, to ensure that the operator revenue base does not erode temporally in real monetary terms.

Adjustments in fares might be accomplished every, say, three years. This has the advantage over an annual approach in that a sense of continuity is maintained and, in a more practical sense, single trip fares can be more readily fine-tuned to the most commonly used supplies of coins and notes.

5) Joint Scheduling

Previous sections have discussed the integrated nature of ticketing between the supertram and the CTA feeder bus system. A broader question emerges: should the schedules of the supertram and its buses also be coordinated (for example: feeder bus arrives at 10:30 hours, supertram departs at 10:35 hours). There is unarguably merit to such an arrangement, which has indeed been adopted by a number of operators overseas.

In Cairo, integrated scheduling should be seen as a longer term goal commensurate with increasing intermodality and technology. For the present, several points argue against the likelihood of coordinated scheduling under a year 2007 scenario.

At present, there are no timetables (nor indeed route maps, information, etc) for public bus services in Cairo. Indeed, even if such timetables existed, adherence is seen as problematic. All buses operate in mixed traffic, and are thus subject to delays catalyzed by traffic congestion, unruly driving practices and police control at intersections. Until more bus priority facilities are realized, and modern traffic-actuated signalization possibly with transit priority phasing implemented, little hope is seen of operating buses in mixed traffic according to a strict schedule. Year 2007 supertram operation suggests headways ranging from three to 10 minutes, depending on time of day. The CTA bus feeder system will likely operate at a daily average of 15 to 20 minute headways. It is suggested that, for initial start-up, feeder buses be marketed as “a bus every 15 minutes” (or possibly

more frequently during peak hours), as opposed to the dissemination of detailed run schedules, with operational performance unlikely to meet expectations. In summary:

- For the supertram, time tables are indispensable and, in the medium future, an automated arrival notification system at intermodal (and major) stations should be envisaged.
- Time schedule integration with the Cairo Metro at intermodal terminals can easily be marketed, given that both systems operate at low headways. During peak demand periods, walk time between the supertram and the metro is roughly equivalent to service headway, thus guaranteeing minimal waiting times.
- Time schedule integration should be actively pursued for the feeder bus system, although this will be difficult for the reasons stated.
- Once the supertram is operational, frequency of service for the feeder buses should be adjusted according to average supertram headway at the major stations with the objective of minimizing waiting times. Thus, more intense feeder bus service is likely during peak demand periods. Feeder operation will be further enhanced and made more reliable if the implementation of on-street bus priority treatments is actively pursued. Typical examples of such treatments are documented in *Volume II* of this report as part of the Metro Line 4 corridor project. The Study Team urges that such bus priority treatments be gradually promoted over time throughout the entirety of Greater Cairo as a primary technique for enhancing the quality of public transport.
- Schedule integration with regular CTA routes will be virtually impossible due to the volume of routes and conditions previously noted. This is not seen as being problematic as earlier investigations confirm that the main passenger transfer preference is between supertram and air conditioned feeder buses.

4.4.3 Information Dissemination

A central source of information for public transport services in a large urban area such as Cairo plays an important role in the retention and expansion of patronage and considerably enhances intermodality. Public transport, faced with increasing competition from private modes of transport, is not an easy product to “sell”; certainly it cannot be marketed efficiently unless the potential user can easily determine what service is offered, where it can be obtained and how much it costs.

Key steps in the creation of a cohesive policy is to both increase the capability of individual operators, and to move information dissemination toward a multi-modal context. At present, information dissemination (in whatever forms it may exist) is, much as services, structured totally along modal lines. Yet, the overall public transport system is extensive. If no information exists for some elements of the public transport system, it is not possible to even begin to plan for multi-modal trips.

At present, and with the exception of the Cairo Metro, there exists practically no information regarding formal public transport services. There is a pressing need to prepare such information for formal services, in particular for the feeder (indeed the entire urban) bus system and Supertram Line 1. It is suggested that initially the CTA focus on "the basics", that is, build a solid, functional information system upon which, at a later date, more sophisticated approaches may be built.

- Printed information. The initial priority should be the development of an area-wide route map for CTA services[1]. The map should be of sufficient detail to permit the user to trace each route by number designation. A CBD inset on the same map is desirable as is general information about using the transit system. The CBD inset should clarify which routes use which terminal. The map should include the Heliopolis Metro and CTA tram, and, of course, ultimately Supertram Line 1.
- The second priority should be development of pocket-size route pamphlets, one route per pamphlet (for bus, ferry, and tracked systems). Information presented should include routing superimposed on major travel streets and cross-streets, schedule milestones (if appropriate) at intermediate and termini check points, as well as major items of interest along the route. The options for intermodal transfer should be noted, being of particular importance for Supertram Line 1 at Ramses, Ghamra, Girl's College and Ring Road stations.
- Signage. It is highly desirable to implement a signage program at stops and, in cooperation with other operators, at terminals. This plan should be viewed as an expansion of the CTA program which currently provides upgraded bus stops. The key information which should be conveyed is which route stops here, where is it going and a time element (schedule and/or begin/end of service). Signage at terminals should be more comprehensive in terms of descriptive layout, multi-lingual content, operator designations and display of information. In terms of Supertram Line 1, it will be necessary that each station be supplied with, at minimum, a display depicting the supertram alignment, stations, major points of interest along the way, operating schedule, and alignments of feeder bus services (Figure 4.4.2).

Figure 4.4.2 A Need for Information at Supertram Stations and Terminals

- Public involvement. The role of public transport is to provide mobility for Cairenes. The scale and complexity of public transport systems requires

1 It is understood that several years ago such a map existed, but was discontinued.

well-trained professionals to ensure appropriate execution of route planning and operation. The potential role of citizen inputs to these decision making processes should not be overlooked. The value of citizen input is already reflected in the development and evolution of shared taxi routes - which represent essentially a pact between vehicle owners and vehicle users. Public transport operators may well be able to harness such input to plan and/or assess route structures and operations via community/neighborhood meetings and on-board origin-destination surveys.

The next step is to evolve toward more wide-reaching techniques, that is, the establishment of a Public Transport Information Service (PTIS). Most of the requisite steps do not require quantum changes in existing policies, only a recognition of, and support for, the importance of proper information systems. Within each of the participating operators, an Officer should be designated with overall responsibility for the coordination and planning of information services. Upon implementation of the PTIS, the Officer will be responsible for successful day-to-day operation, liaison with senior management and ensuring that all transport information is up-to-date. The PTIS can include various components:

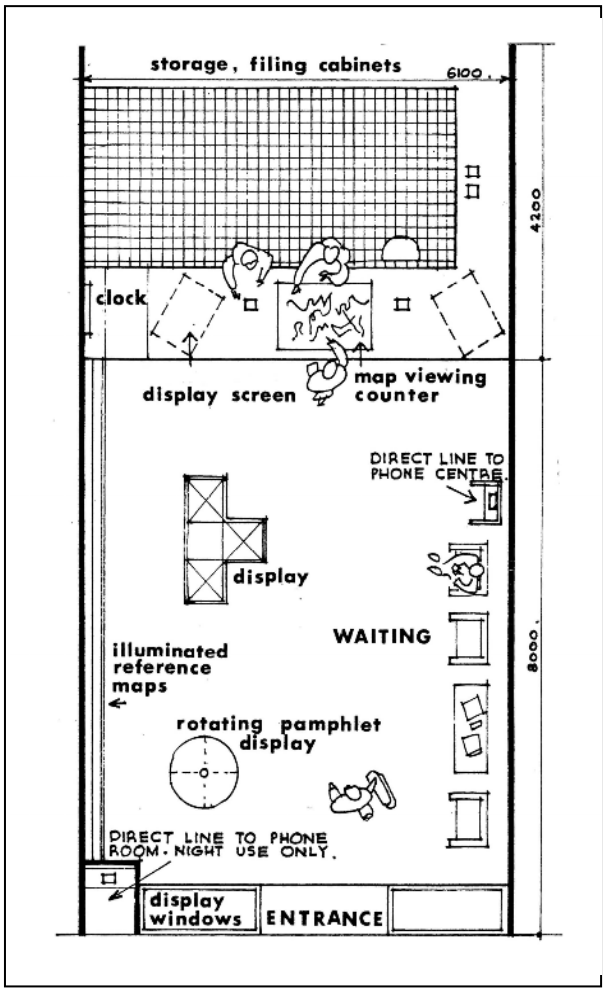


Figure 4.4.3 Indicative Layout Walk-in Information Center

- A limited number of staffed, walk-in centers sited at strategic activity points such as, for example, the supertram intermodal Ramses, Ghamra, Girl's College and Ring Road stations. An indicative layout for a walk-in center is shown in Figure 4.4.3. This requires a prominent location either within an existing office or store building, or as a special facility. The main function would be personal, face-to-face interaction with the public and dispensing public transport information both to existing users and potential users. Center staff should furnish and dispense (a) timetables for routes and lines of all modes of public transport in Cairo, (b) information on transport routes, (c) information on fare structure, (d) transport maps for distribution and inspection, (e) promotional literature, (f) available services with particular attraction for tourists, (g) information which

cannot be readily obtained from standard information handouts; and, (h) directions for further enquiries.

- The use of computers and the internet is rapidly growing in Egypt. Properly designed web sites can be invaluable in providing public transport information to users and potential users. Tokyo, as an example, has particularly advanced this art in the form of web pages and downloadable information files for personal computers. A variety of multi-lingual sites exist, with an English language example housed at *http://www.jorudan.co.jp/english/norikae*. By entering trip origin and destination, the system finds the most efficient routing and modal options among the myriad of public transport services available in Tokyo. Key parameters such as travel time, expected waiting time and trip cost are provided. While it is unlikely that Cairo would require such a sophisticated system in the near future, web page content can nevertheless be readily be tailored to address the most pressing questions posed by system users. Such preferences need to be established via on-board surveys of passengers.
- A telephone information center whose only function is to answer telephone enquiries regarding public transport. The telephone center can therefore be located at any site where adequate space and telephone facilities are available. Trained telephonists manning the center should be in a position to provide (a) information on routes and lines for all modes of public transport in Cairo, (b) information on fare structure, and (c) directions for further enquiries including those not specifically related to public transport services. Modern equipment will be required to ensure efficient operation of the telephone center including an automatic call distribution system and a call queueing system.
- The key components of the PTIS would be walk-in centers, telephone centers and web sites. These can be supplemented by further secondary information centers. Such unmanned facilities, designed to furnish user-oriented information in the form of displays and printed pamphlets, can be located in key shopping centers, tourist information bureaus, post offices, major transport terminals/stations and other prominent locations.

As part of the overall marketing program, the provision of an “information bus” should be investigated. The bus would:

- Feature information racks, necessary storage areas, displays and manned information counter in a modified interior;
- Dispense information, timetables and route maps for all public transport services;
- Be staffed by persons knowledgeable of all public transport services;
- Make scheduled appearances at employment centers, major hotels, shopping centers, exhibitions/festivals, and sports events.
- Make guest appearances at institutions of learning and provide lectures/exhibits about public transport, and,
- Be decorated with a color scheme or mural setting it apart from other units in the fleet.

Effective public transport information dissemination in Cairo can be achieved.

4.4.4 A View to the Future

(1) The role of Intermodal Terminals and Stops

It has been stressed on many occasions that the efficiency of intermodal terminals and stops is a critical intermodal success-factor. Public decision makers, researchers and transport experts and professionals all agree on this. But they also agree that at present, the theory has not yet been put into widespread concrete action.

One of the possible reasons why "intermodal public transport" has not yet been realized in Cairo and other places might be that intermodal transport is not seen as a part of a transport system, but as a goal in itself. While it is in the nature of the intermodal definition to concentrate on the physical interaction of transport modes at intermodal terminals and stops, the more comprehensive system's view puts the accent on the easy transfer of passengers between all public transport modes, focusing on the integration of all "hard" and "soft" components of the public transport network. In addition to the physical lay-out of terminals and stops, information management in these terminals, ticket distribution systems and platform accessibility are equally important and in many cases are determining factors for the terminal's lay-out.

In the system's view on public transport, intermodal terminals and stops are one of many elements contributing to the efficiency of the public transport system and its design, location and operational structure is determined by its role inside the public transport system as a whole.

From a system's perspective, concerning "*…the longer distance public mode trip:*

- *You need to plan it.*
- *You need to pay for it. And,*
- You need to improve the quality of Intermodal transfer when that is possible."[2]

These three basic concepts are translated in three physical and operational actions, namely[3]:

- Passenger transfer facilities in terminals and infrastructure interconnectivity;
- Ticketing distribution and fare collection systems;

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[2] *"Passenger travel in the I-95 Corridor Coalition Region: Where do we travel? How do we travel? And why?"* Report submitted by Matthew a. Coogan, Consultant in transportation As the final report for "Passenger project #1: "Passenger issues verification and outreach" to the Intermodal Program Track Committee; The i-95 corridor coalition, October, 2001 ; p 5

[3] *"Passenger travel in the I-95 Corridor Coalition Region: Where do we travel? How do we travel? And why?"* Report submitted by Matthew a. Coogan, Consultant in transportation As the final report for "Passenger project #1: "Passenger issues verification and outreach" to the Intermodal Program Track Committee; The i-95 corridor coalition, October, 2001 ; p 5 - 7

Passenger information systems.

The focus on passenger and information management rather than concentrating on infrastructure development and integration have proven its benefits in both the developed and developing world. The examples discussed in *Attachment C* to this report of successfully integrated public transport systems are proof of the effectiveness of the system's approach.

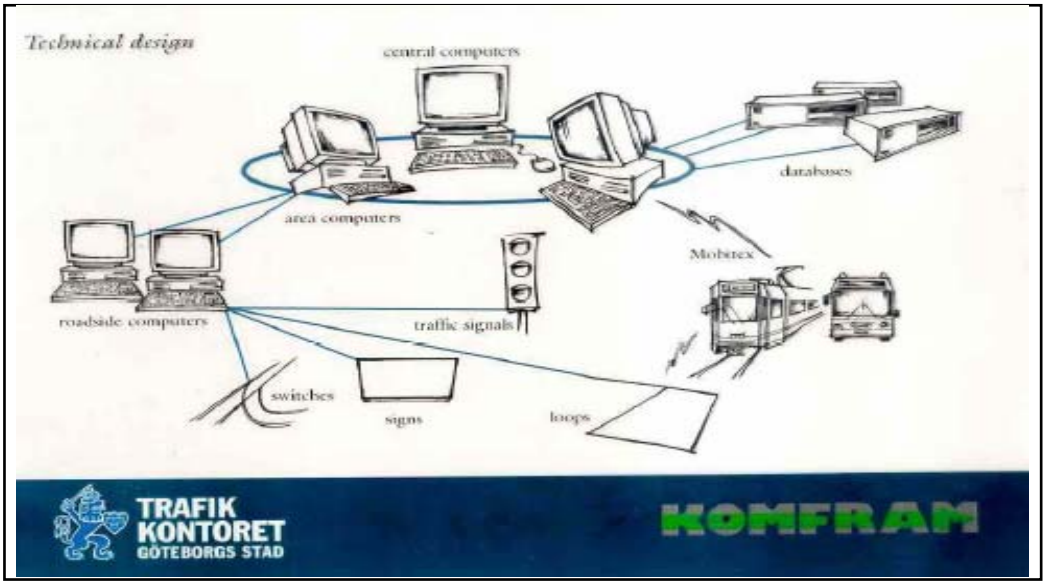
In this context, increased attention is paid to what is called Intelligent Transport Systems (ITS) to manage the flow of passengers and vehicles through the public transport network. In the ITS-operational system, intermodal terminals and stops have an important bi-directional information-hub function. Information on vehicle and passenger movements is collected at these locations and transferred to a centralized computer system (Figure 4.4.4) where this information assists the public transport system managers to make corrections wherever necessary. But information is also in real time transmitted to passengers providing updated information on arrival and departure times of services, delays and interconnecting travel conditions, helping passengers to easily transfer between modes.

Source: Presentation by the Working Group on ITS; European Commission, Citizen's Network Benchmarking Initiative, Brussels, 25/02/02

Figure 4.4.4 Information Control Center

ITS applications are also important tools to guarantee the efficient flow of public transport vehicles in urban traffic by controlling traffic flows at intersections, providing priority right of way to public transport vehicles approaching these controlled intersections (Figure 4.4.5). The issue is further discussed in the CREATS Phase I report[4].

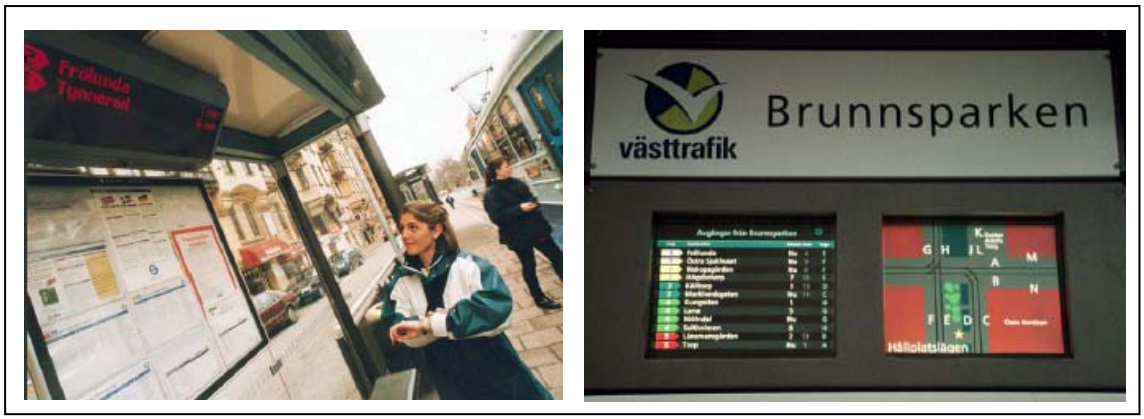
[4] See also for a comprehensive application of traffic control with public transport priority: "TABASCO: Telematics applications in Bavaria, Scotland and Others", project financed by the European Commission under the R&D program; project number TR1054.



Source: Presentation by the Working Group on ITS; European Commission, Citizen's Network Benchmarking Initiative, Brussels, 25/02/02

Figure 4.4.5 ITS System Layout and Components

The increased role of ITS has a direct impact on terminal design where the focus is increasingly on efficient platform access, highly visible information panels, passenger information centers and automated ticketing areas (Figure 4.4.6).



Source: Presentation by the Working Group on ITS; European Commission, Citizen's Network Benchmarking Initiative, Brussels, 25/02/02

Figure 4.4.6 Bus Stop and Terminal Information Panel

(2) Integrated Ticketing

An important goal of both Program A and Program B is to develop new public transport services which efficiently integrate into the existing public transport offer in the Greater Cairo Region. As stressed throughout this chapter, efficient integration requires several conditions, one of which is the development of an integrated ticketing system that facilitates the transfer between transport modes.

One important decision for the near future will thus be the selection of the optimal integrated ticketing technology, taking into account the operational, regulatory and social conditions in Greater Cairo. When selecting the technology, it is also important to realize that the technology will have to be transferred to the other components of the public transport system.

Source: Presentation by the Working Group on ITS; European Commission, Citizen's Network Benchmarking Initiative, Brussels, 25/02/02

Figure 4.4.7 Public Transport Smart Card

The first applications of integrated ticketing were fully paper-based and operations were identical to traditional ticketing. Integrated tickets were at that time simply an additional type of ticket, complementing the range of tickets available in the public transport networks. All operations (distribution, validation, control, etc.) were identical to a traditional paper ticket and in most cases, the validity of these integrated tickets were limited to specific routes and / or combinations of transport modes (e.g., metro and bus).

Since then, integrated ticketing technology has come a long way, from paper-based tickets with manual control to modern smart tags with automated control systems. Examples of the latter can be found in Basel, Geneva, Rome, Nice and San Sebastian among others (Figure 4.4.7).

The efficiency of the smart card depends heavily upon operations at terminals and bus stops, and on the vehicles itself. The advantage of the smart card is that it excludes as much as possible human intervention, reducing therewith the risk of human error and deliberate fraud.

The smart card should not only be viewed as a replacement for the paper ticket, but is also becoming a method of payment. A simple application is the use of the smart card as a "money purse", a system that is operational on the buses and trams in Bremen since 2002. Passengers charge their smart card inside the vehicles or at dedicated kiosks in terminals and near

Source: INTERCEPT Project

Figure 4.4.8 Smart Card Terminal in Bremen

stops and use this card to pay their travel, even single trips. The terminals for charging the smart cards and for payment by smart card are charged is visualized in Figure 4.4.8 and Figure 4.4.9.

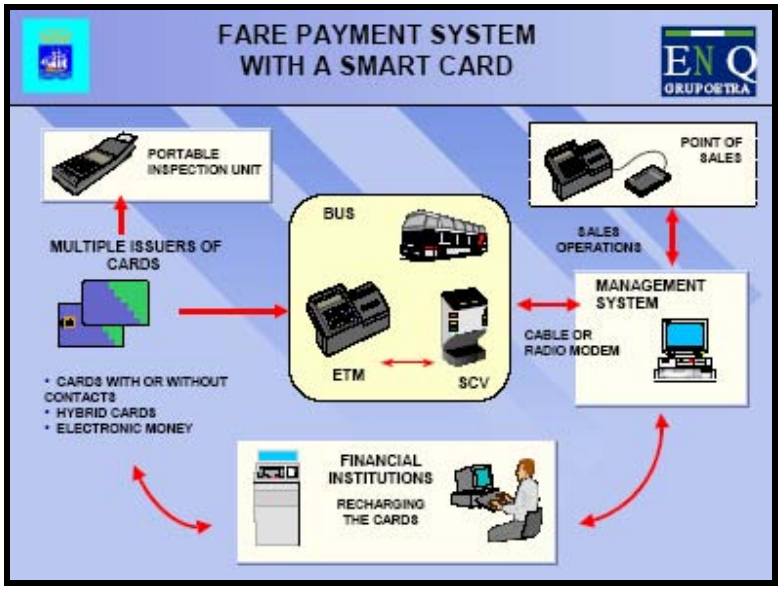
Source: INTERCEPT Project

Figure 4.4.9 Payment by Smart Card in Bremen

While in the simple application, the card still needs to be charged before use; more modern smart cards also allow automated payment. An integrated system has as its core usage (public transport, other) linking with card issuers, financial institutions and system managers (Figure 4.4.10).

The full scale introduction of smart cards and other modern applications for ticket validation and fare collection will take time in Cairo and will need further detailed research. It is, however, important to prepare for it and as far as possible, make provisions for its future implementation when designing and developing terminal infrastructure. It is also important to design and implement a comprehensive human resources development plan that prepares future managers and personnel to efficiently and effectively use these innovative technologies.

Several smart card technologies are presently available in the market. Four general types can be distinguished: the Electronic Paper Ticket, the Check-in/Check-out system, the Walk-in/Walk-out approach and finally, the Be-in/Be-out method[5].



Source: Presentation by the Working Group on ITS; European Commission, Citizen's Network Benchmarking Initiative, Brussels, 25/02/02

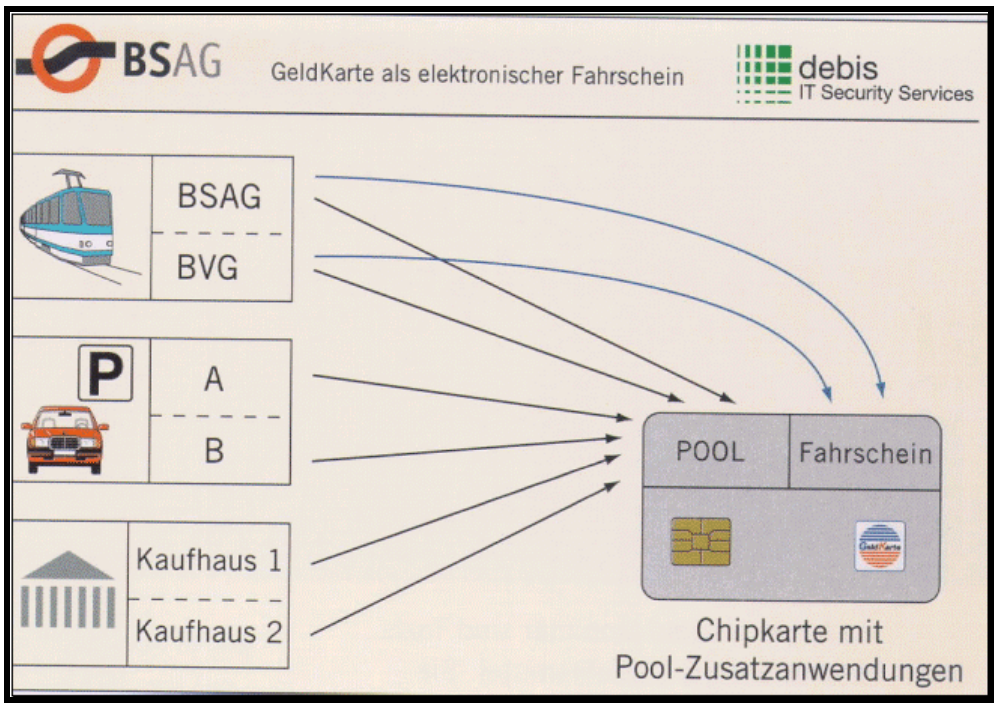
Figure 4.4.10 Design of Smart Card Automated System

[5] See for a detailed discussion: "*State of the Art in Electronic Ticketing*"; M.Eugenia G.Valdecasas Vilanova, Regine Endsuleit and Jacques Calmet; Interner Bericht 2002-7, Institut für Algorithmen und Kognitive Systeme Universität Karlsruhe (TH)

The Electronic Paper Ticket (EPT) is one of the first smart tag technologies and does not take (yet) full advantage of the available technology. The EPT maintains the paper ticket principle and only slightly facilitates validation and ticket purchase procedures. Although more modern versions of EPT can be charged at banks and ATM machines[6], many applications still need physical cash transactions.

The EPT can also provide complementary services such as parking payment (facilitating park-and-ride) and the collection by the operators of travel behavior information but this information or applications remains limited as compared to more modern technologies. Human intervention is still critical during control and validation of the ticket on the vehicle, reducing efficiency and performance of the system.

Providing complementary services by smart cards remains an important element, given that in many cases, it contributes to facilitating the transfer between modes or improves the quality of services. In Barcelona, e.g., the smart card is offered by RENFE *Cercanias* (sub-urban railway operator) to stimulate Park and Ride. The smart card serves simultaneously as payment system for the railways, the parking and as key to access the protected car park area[7] (Figure 4.4.11).



Source: INTERCEPT project

Figure 4.4.11 Smart Card for Transit, Park-and-Ride Utilization and Payment

[6] The original versions could only be charged at dedicated machines in terminals and stops. Charging of the ticket still required cash or credit card transaction. These locations for charging the EPT were called Points of Sale (POS)

[7] See for more details on the system: **INTER**modal **C**oncepts in **E**uropean **P**assenger **T**ransport, Project funded by the European Commission Research & Development Program; Project nº TR5004

A more advanced technology is the Check-in/Check-out system (CICO) which was the first system making use of automated fare collection by calculating the fare price on the basis of distance and time. By inserting the smart card when entering the public transport system and inserting once more the card when leaving the system, the total fare price is calculated and the information transmitted to a central information system where the bank account attached to the card is deduced with the fare price. Special fares are applied through using special cards that calculate fares differently according to the conditions of the special fare.

Although having many advantages over the EPT, the validation at the check-in point as well as the methods to avoid fraud are more complex and several technologies are available. In spite of several additional advantages for both transport operators and passengers, implementing the CICO system remains similar to the EPT approach.

The Walk-in/Walk-out (WIWO) approach is one of the latest technologies, presently tested in Geneva (Switzerland) and planned to be fully operational over the entire city in 2008. The basic application is similar to the CICO method (using time and distance to calculate the fare level), but eliminates complicated validation procedures when entering and exiting the public transport system and consequently the related validation equipment. Validation and control is based upon the *walk through* principle, where sensors check the smart card whenever a passenger enters or exits a vehicle. This system may be applied in fixed platforms (stations) and moving platforms (buses).

This system, based upon magnetic fields and radio wave communication substantially facilitates ticket validation as well as control because there is no longer a need for validation and control equipment.

Finally, the Be-in/Be-out (BIBO), presently tested in Basel and Geneva (Switzerland), method is similar to the WIWO concept but applies a different application of the magnetic field[8]. The main advantage of BIBO over WIWO is that the necessary technology is simpler and less costly.

(3) Human Resources Management

In the developed world, human resources development is no longer considered a critical issue, given that public transport operators over the years have developed the necessary expertise to operate and manage integrated public transport systems.

This does not mean that expertise development and expert knowledge is not considered as a minor issue. On the contrary, public as well as private transport operators have established at various levels of management and operations objective expertise thresholds and provide training and re-orientation courses whenever new technology is introduced in the public transport system or important changes have emerged in management or operations.

[8] While WIWO uses a line-based magnetic field, checking the crossing by smart cards to determine entering and existing the transport system, the BIBO approach is zone-based, using frequent signals to determine the location and time a passenger is inside the public transport system.

Human expertise and system knowledge are becoming increasingly important factors in the efficient function of public transport systems. While the last century, innovative technologies and infrastructure development have contributed to reduce travel times during the last century, average travel times are no longer shrinking in spite of continued efforts to improve public transport systems. On the contrary, research has demonstrated that on many public transport systems, travel times become longer again and traveling more complicated and uncomfortable, in spite of continued improvements using the latest technologies and smart systems. "*Rather than lack of technological breakthroughs, it has been operational difficulties, lagging infrastructure development, and lack of coordination among transportation modes that are largely to blame for the lack of progress in transportation performance.*"[9].

Although the constantly increasing demand is partly to blame for the malfunctioning of many public transport systems, many other problems can be cured by a more elaborated and structured human resources development program that is considered as a fully integrated and necessary component to offer efficient public transport. Information exchange to increase operators' expertise was already an important topic in the European Commission's Green Paper on public transport[10], emphasizing the importance of knowledge for the efficient functioning of public transport systems.

A comprehensive human resources development program should focus on all components relevant to the efficiency of public transport and comprise:

- Various levels of knowledge about technologies, techniques and systems
- Management methods, tools and technologies
- Operational techniques, tools and technologies.

Public transport operators in the developing world are gradually transforming from what can be called an "employee-based" structure towards a "technology-based" approach. This implies that the number of employees is reduced and in many cases their tasks replaced by new technologies.

But the introduction of these new technologies still requires personnel to manage and operate these technologies, offering the possibility to operators to re-assign staff and avoid lay-offs. But re-assigning staff to manage and operate these new systems and techniques requires comprehensive training programs that build the necessary expertise and guarantee frequent updating and improvement of this expertise.

[9] "*Progress in Intermodal Passenger Transportation: Private Sector Initiatives*"; Andrew R. Goetz and Timothy M. Vowles; Department of Geography and Intermodal Transportation Institute University of Denver, 2002; p. 3

[10] "*THE CITIZENS' NETWORK: Fulfilling the potential of public passenger transport in Europe*", European Commission, Directorate General for Transport, Brussels. A similar vision was expressed in the ECMT paper on public transport development: "*Urban Travel and Sustainable Development*" OECD-ECMT, Paris 1995

A comprehensive and integrated human resources training program inside the public transport operator has therefore a double function, notably:

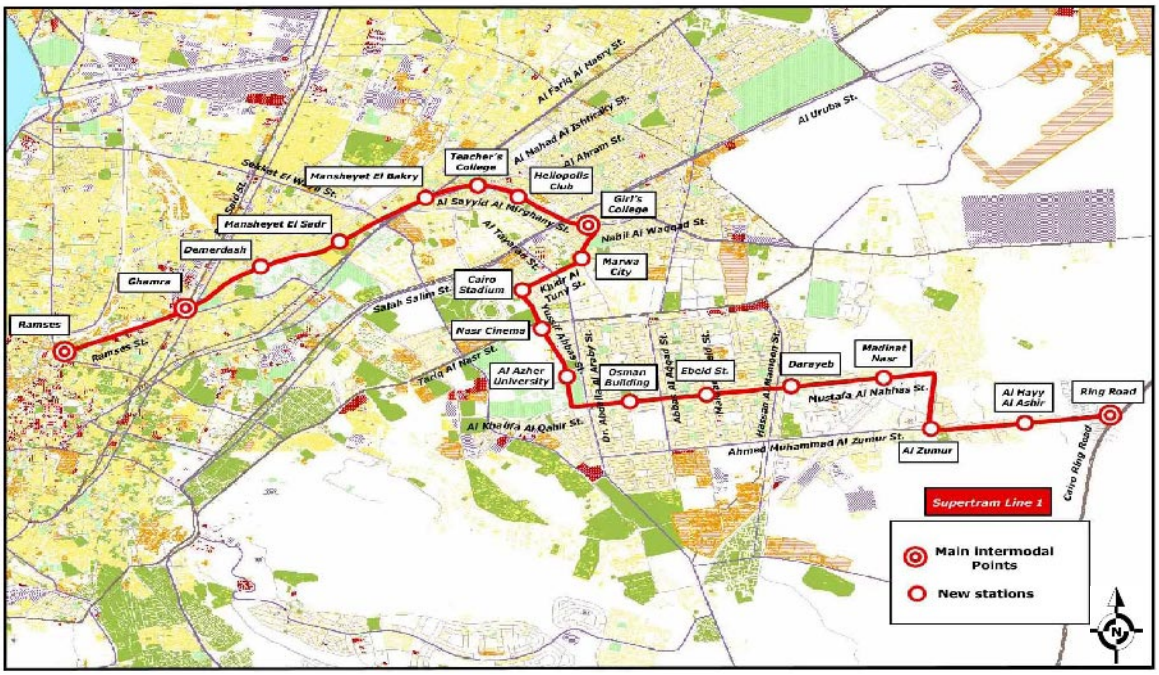
- Building the necessary expertise among re-assigned and new personnel to manage and operate the new technologies and system applications;
- Sustain and enhance the acquired expertise to improve efficiency in management and operations:

This concept is fully in line with the CREATS point of view that efficient (public) transport can only be achieved if equal attention is devoted to the development of three components, namely the **hardware** (infrastructure and equipment), the **software** (techniques and technologies) and the **humanware** (expertise and know-how). And without trying to reduce the importance of both the hardware and the software components, it can be argued that ***both hardware and software improvements will be either unsuccessful or will generate sub-optimal results if their introduction is not accompanied by a comprehensive and structured human resources development program***.

Human resources development in the Cairo context is detailed in the subsequent Chapter 5 of this report.

4.5 CONCEPTUAL DESIGN OF INTERMODAL STATIONS

Supertram Line 1 features 19 stops, as depicted in Figure 4.5.1 and discussed in Chapter 3 of this volume. From an intermodal perspective, there are different terminals and stops according to their location and function[1]. Based upon their functional classification, the line will have four intermodal terminals and 15 regular stops. While the regular stops have a limited intermodal function, the four terminals are each important interconnecting points with other major public transport services (bus, tram, shared taxi, ENR and Cairo Metro) as well as private modes.



Source: JICA Study Team and CTA

Figure 4.5.1 Supertram Route Alignment and Station Locations

During CREATS Phase I, four types of intermodal terminals were identified. A *primary interconnecting point* constitutes a central point in the various public transport networks and incorporates all public transport services. A s*econdary interconnecting point* is similar to the primary type but the number of connections is less. A *network interconnecting point* links two different networks, for example the Cairo Metro to inter-city bus service. Finally, at the extremes of the Cairo public transport networks, there are the "*park and ride interconnecting points"*. These terminals offer the possibility to private vehicle owners to abandon their cars at secured locations and commute to their final destinations by public transport.

The four designated intermodal terminals of Supertram Line 1 and their functional classifications are:

[1] See for a more detailed discussion on the types of Intermodal terminals: *Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt - Phase I Final Report, Volume III – The Transport Master Plan*, op. cit.

- Ramses Terminal as primary interconnecting point;
- Ghamra Station as primary interconnecting point;
- Girl's College Station as secondary interconnecting point; and,
- Ring Road Terminal as park and ride interconnecting point.

In addition to the engineering components, each of these four terminals has been examined in detail based on their interconnectivity with other public transport systems. The final objective is to streamline Supertram Line 1 with the different available and future public transport services along the Supertram Line 1. Conceptual designs for the four intermodal terminals, and a typical layout for other stations, are presented in following subsections.

4.5.1 Ramses Terminal

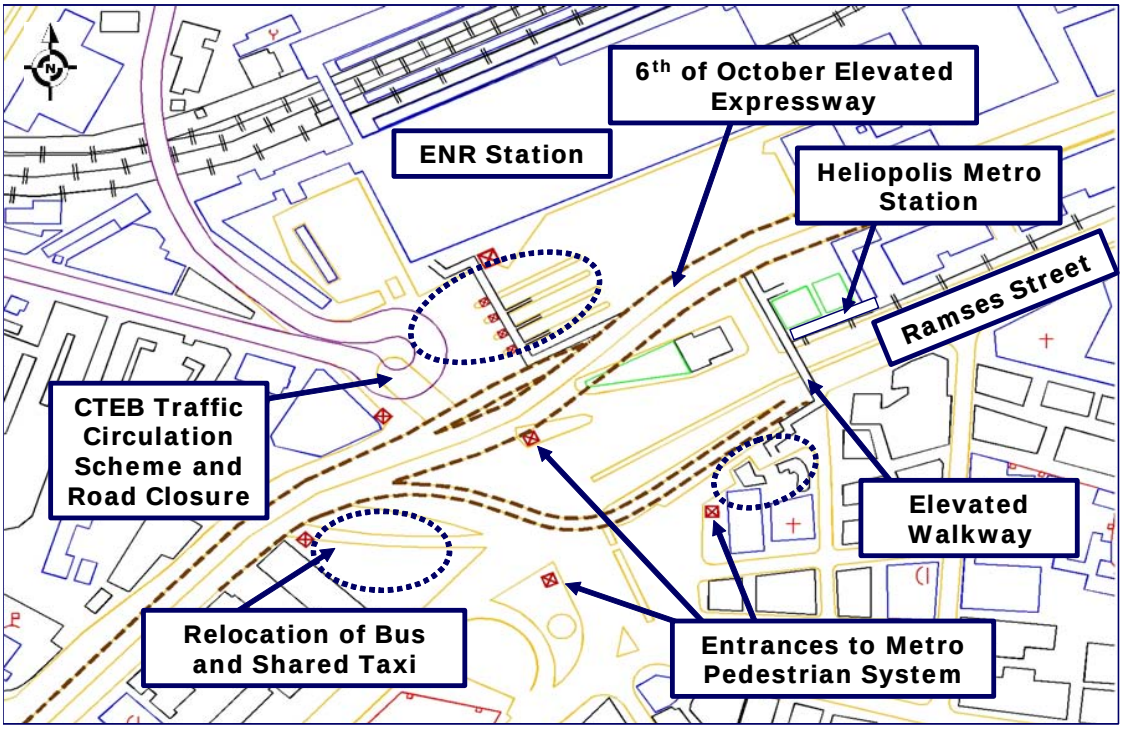
Located at the western extreme of Supertram Line 1 within Ramses Square, Ramses Station is seen as a critical element in terms of operational success of the proposed LRT system.

(1) Background

The existing Heliopolis Metro Ramses terminus station is located within the heavily utilized Ramses Square area. The station configuration is inadequate for use by a modern LRT system, such as Supertram Line 1, from a number of perspectives, including inadequate platform space, inadequate platform length and a lack of pedestrian amenities. The current location is seriously constrained to the south by Ramses Street and to the north by the NAT building complex (Figure 4.5.2).

Figure 4.5.2
Ramses Square Terminus Station; Heliopolis Metro

A number of transport facilities exist within Ramses Square including one of the main ENR stations, elevated pedestrian walkways, and entrances to the underground Cairo Metro (Mubarak Station, Metro Lines 1 and 2). At time of writing, a series of changes are being implemented under the auspices of Cairo Governorate involving road closures and the relocation of shared taxi and CTA bus facilities from within the Ramses Square area to a new public transport terminal located immediately north of the ENR rail tracks. Major road facilities within the square include Ramses Street and the elevated 6th of October Expressway to include westbound on and eastbound off ramps (Figure 4.5.3).



Source: JICA Study Team

Figure 4.5.3 Major Transport Elements: Ramses Square

Demand forecasts (refer Chapter 3) confirm that Ramses Station will retain its current dominant role vis-à-vis supertram loadings within the early years of operation, and remain second only to Ring Road station (the eastern terminus of the line) in terms of year 2022 boarding demand. At that time, some 74,500 daily boarding movements are expected, with the vast majority (60,000 persons per day) entering the supertram after an initial journey on the Cairo metro (Table 4.5.1).

Table 4.5.1 Year 2022 Boarding Passenger by Principal Access Mode
Ramses Station – Supertram Line 1

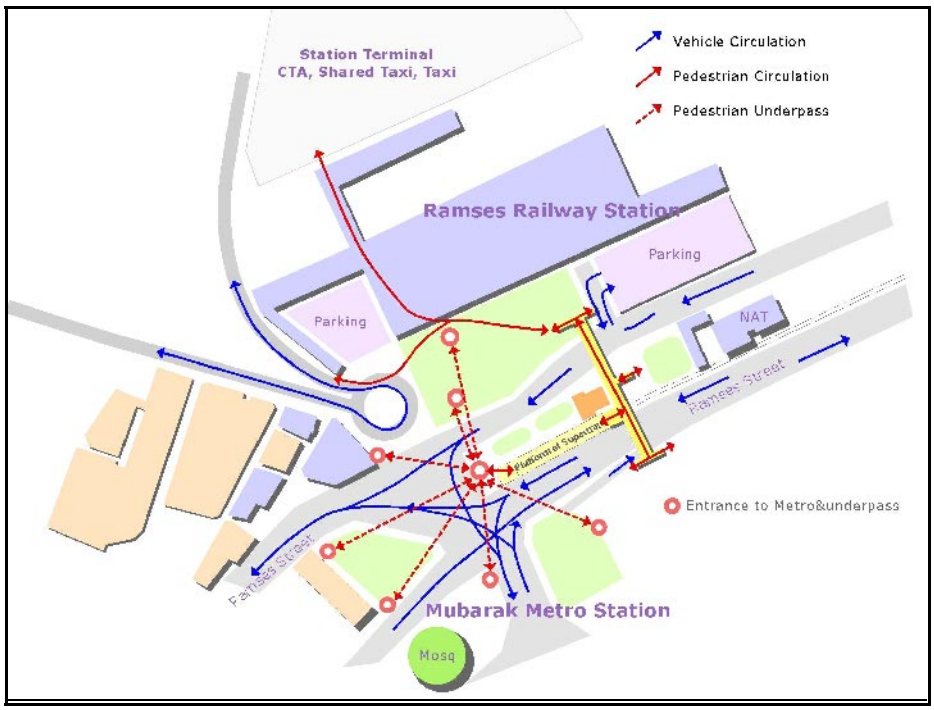
Access Mode	Daily Passengers(1)
Walk	9,000
Shared Taxi	2,000
Urban Bus	3,500
Cairo Metro	60,000
Total	74,500

Note: (1) Number of daily persons boarding Supertram Line 1 in the outbound direction, stratified by type of mode used to access the supertram.

Data source: JICA Study Team

Thus, in terms of station planning, adequate pedestrian capacity for movements between the metro and Supertram Line 1 are vitally important. The locations of entry points of the metro (stairs to the underground Mubarak Station) are seen in critical terms. However, other avenues of pedestrian movement must also be considered. In particular, the elevated series of walkways around the periphery of Ramses Square are seen as a particular asset as these offer, in parallel with multiple metro entry points, excellent opportunity for the movement of people

to/from the various public transport services with minimal need to cross busy streets and roads within Ramses Square (Figure 4.5.4).



Source: JICA Study Team

Figure 4.5.4 Major Circulation Opportunities

The placement and extent of the LRT station must also, of course, be of adequate dimension to accommodate the proposed length of the supertram (65 meters), offer opportunity for track switching of inbound and outbound trains, and be able to safely accommodate a crush load of two full trains: 600 waiting passengers and 600 exiting passengers. Furthermore, any LRT facilities must be cognizant of physical constraints posed by other existing form of transport including columns/supports for the 6th of October Expressway, as well as alignment and facilities of the underground Metro Line 1 and Mubarak station.

(2) Issues

Several core issues are addressed in the conceptual design of the new Ramses Square station of Supertram Line 1.

1) Location

Given the inadequacy of the existing Heliopolis Metro terminus station, several alternative options for sitting the Ramses square LRT station were reviewed between the Study Team, the Technical Working Group, and the Steering Committee. These options include:

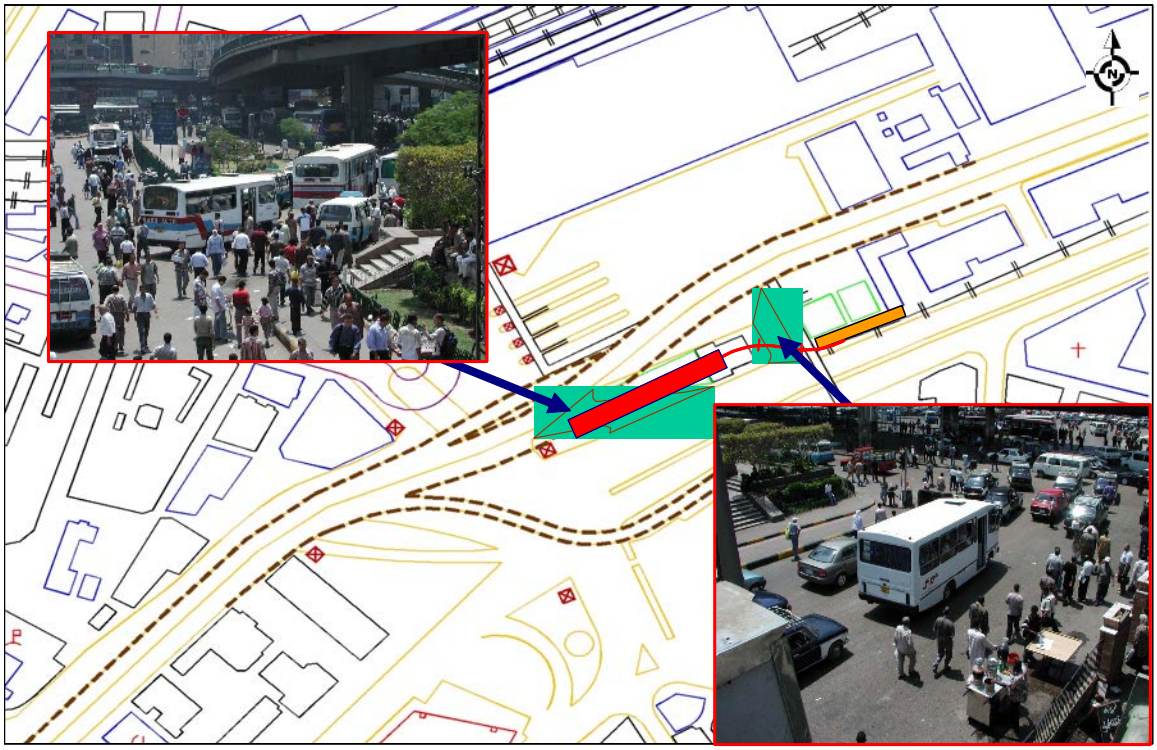
- Placing the station adjacent to the ENR station, in what will be part of the area vacated by shared taxis as part of the Cairo Governorate road-based public transport relocation scheme. This would involve a northbound track transition

after the NAT complex and a grade-separated road crossing. This option was rejected for several reasons: (a) vertical separation for the LRT is not possible due to the presence of 6th of October Expressway columns and supports; (b) conversely, lowering of the road is seen as impractical due to connections with the westbound on-ramp of 6th of October Expressway; (c) extensive underground foundations and utilities are located in this area; and, (d) the likelihood of any solution being very expensive.

- Placing the LRT station under Ramses Street, roughly below the current location of the Heliopolis Metro terminus station. This was rejected due to (a) high cost, (b) extensive underground foundations and utilities in this area; (c) interference with the alignment of Metro Line 1; and, (d) difficulties in establishing passenger connections with the core pedestrian facilities of Ramses Square.
- Extending the track westward and constructing an elevated LRT station roughly in proximity to the existing Ramses II statue. This was rejected due to (a) high cost; (b) inability to install columns and foundations due to the underground alignment of Metro Line 1; (c) visual impacts; and (d) gradual elevation of LRT track to reach the above-ground station is very difficult as the track envelope impinges onto the NAT buildings complex envelope.
- Placing the station several hundred meters east of the current terminus and beyond the influence of the NAT buildings complex. This was rejected as, for all practical purposes, the intermodal function of the LRT has been destroyed. Passengers wanting to interact with the metro, for example, would now face a long, circuitous walk between the supertram and metro access stairways. For all supertram passengers, extensive interaction with road traffic is foreseen under this scenario, which is undesirable from both the traffic (delays, accidents) and passenger (safety, convenience) points of view.
- Extending the track westward and placing the station into an "island" roughly in proximity to the existing Ramses II statue. This was accepted as the preferred approach, but catalyzes the following issues.

2) Slip-road Closures

Extension of the tracks into the "Ramses Island" will require the closure of two slip roads. These are now used for a variety of purposes. While the easternmost is an optional route for access to the westbound 6th of October Expressway on ramp, many other uses are frivolous. Traders set up shop within the roads, public transport vehicles consume considerable road space for stopping and loading/unloading passengers while unruly pedestrian flows often clog the streets (Figure 4.5.5). In the views of the Study Team, and in light of the considerable re-doing of Ramses Square circulation (including a road closure west of the ENR station, refer Figure 4.5.3), the closure of the slip-roads should be implemented. The Supertram will eventually carry some 430,000 persons per day; more than could ever be carried by the two slip roads in question. This action is an excellent opportunity to implement the CREATS slogan: Move people, not vehicles.



Source: JICA Study Team

Figure 4.5.5 Closure of Two Slip-roads to Implement Preferred LRT Station Option

3) Statue of Ramses II

Located within the envelope of the proposed LRT station is a statue of Ramses II. This archeological treasure was placed into the square a number of years ago; however, vibration and air pollution, among other factors, are contributing to the deterioration of this statue. It is the understanding of the Study Team that approval for removing this statue has been issued by Cairo Governorate, but that the actual relocation (possibly to vicinity of the new Egyptian National Museum) is pending and the responsibility of the Ministry of Culture. While the Study Team expects that, for a number of reasons, the statue will soon be relocated, the date for this action is uncertain. In order not to jeopardize the supertram concept, two alternative station alignments were prepared; one with and one without the station. These are subsequently presented. However, it is the clear preference of the Study Team that the station design without the statue be implemented.

4) The Ramses Square Committee

The Study Team was informed that a committee, under the chairmanship of the Ministry of Housing, Utilities and Urban Communities, was formed during latter 2003 to solve many of the obvious transport problems in the Ramses square area. This is seen as a commendable collaborative effort and the combining of diverse plans into a single solution. Pending concepts include, among others, the Cairo Governorate relocation of surface public transport facilities, demolition of an ENR structure and widening of the 6th of October Expressway in the westbound direction. The Study Team has worked closely with representatives of the

Committee, and during September of 2003, submitted complete drawings of the alternative (with and without statue) Supertram Line 1 Ramses station concepts to the Committee. These drawings are in AutoCad format compatible with the CAPMAS grid coordinate system.

(3) The Concept

As indicated previously, the Study Team prepared two alternative designs for the Ramses LRT terminal:

- With the Ramses II statue (Figure 4.5.6). As shown, the station area "fits", however, with several undesirable features. A narrowing of south platform is required, as is a slight intrusion beyond the Ramses Street curbline. The statue envelope abuts the northern platform, which could be problematic. The west ticket processing/entry/exit area is too close to the metro access stairs to permit proper passenger flows and queueing; thus, the stairs will need to shifted northward (and widened).
- Without the Ramses II statue (Figure 4.5.7). This is, in the opinion of the Study Team, the preferred solution.

Several points are noted regarding the preferred layout (refer Figure 4.5.7):

Source: JICA Study Team

Figure 4.5.6 Ramses Station of Supertram Line 1 (With Ramses II Statue)

- The station is located in a constrained area which eliminates the possibility of having a back station; that is, tracks to the west of the station for switching or storing trains. Thus, storage must be at-platform, and switching east of the station.
- A central platform at a terminal point such as Ramses station can be convenient for passengers in terms of choosing the right train. However, crush loading (600 persons waiting, 600 persons alighting) would require a central platform

dimension that is not compatible with available space. Thus, lateral platforms are provided. The installation of variable-message signage for announcement of next departure platform is therefore needed.

- As noted previously, both slip roads will require closure thus placing the LRT station on what is essentially a pedestrian island. Passenger movement to/from the LRT station is therefore possible without a need to cross any street. The elevated walkway to the east of the station (which will require raising to accommodate catenary wiring and, of course, modernization) links the station with both sides of Ramses Street, while the all-important metro access steps west of the LRT station links the supertram and the metro. The steps will require widening, as shown, to accommodate the expected high passenger flows. Reviews of Mubarak station as-built drawings suggests that no impediment to such widening exists, nor does the widening impinge on 6th of October Expressway footings.
- Processing areas for ticket purchase, system entry and system exit are located at both platform ends. The eastern processing area is elevated and a part of the modernized pedestrian walkway, while the western processing area lies adjacent to the widened metro steps.
- The implementation of the preferred design catalyzes a pedestrian island, with numerous opportunities for pedestrian precincts, landscaping and other pedestrian amenities. The entire concept is expected to considerably beautify Ramses Square.

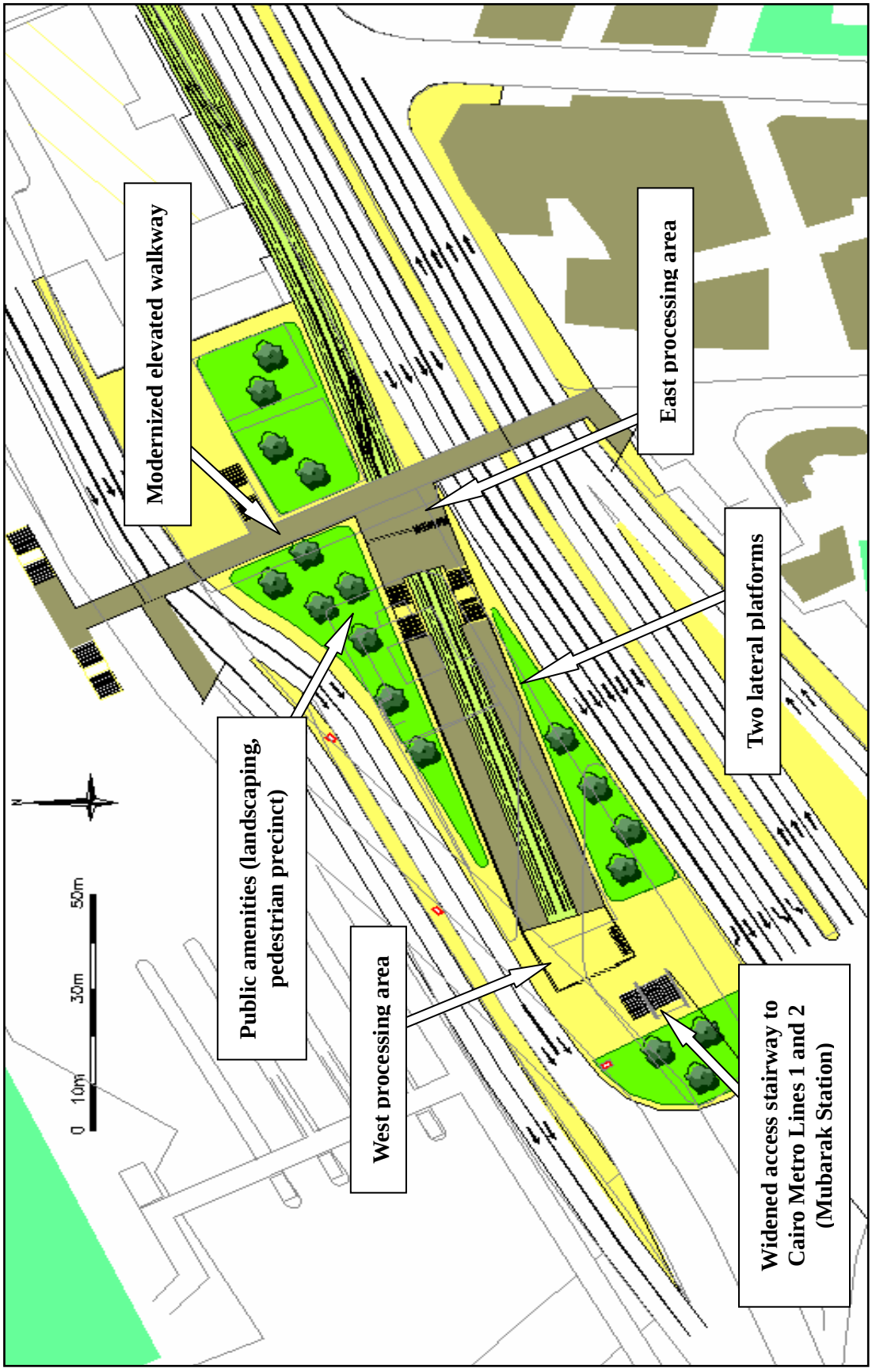


Figure 4.5.7 Preferred Concept for Ramses Station of Supertram Line 1 (Without Ramses II Statue)

4.5.2 Ghamra Station

Located near the western extreme of Supertram Line 1, Ghamra Station connects Metro Line 1, Supertram Line 1 as well as bus and shared taxi services operating along Port Said Street. It will also serve, in the longer-term future, the proposed Metro Line 4.

(1) Background

Ghamra station is the next station to, and some 1.7 kilometers east of, Ramses station of the Heliopolis Metro. It physically abuts the Ghamra station of Metro Line 1. Severe physical constraints preclude any major changes in facilities at this location without considerable financial expenditure. The supertram station is constrained on the south by a walled on-ramp to the 6th of October Expressway, and on the north by the alignment of Metro Line 1. Vertical constraints also exist due to the Port Said road bridge, as well as structure and supports of the 6th of October Elevated Expressway.

Demand forecasts (refer Chapter 3) confirm that the majority of passengers boarding the supertram will do so after transferring from the Cairo metro. During year 2022, some 21,500 daily boarding movements are expected, with 15,000 persons per day entering the supertram after an initial journey on the Cairo metro, and a further 3,100 via buses and shared taxis operating along Port Said Street (Table 4.5.2)

Table 4.5.2 Year 2022 Boarding Passenger by Principal Access Mode Ghamra Station – Supertram Line 1

Access Mode	Daily Passengers(1)
Walk	3,400
Shared Taxi	1,000
Urban Bus	2,100
Cairo Metro	15,000
Total	21,500

(1) Number of daily persons boarding Supertram Line 1, stratified by type of mode used to access the supertram.
Data sources: JICA Study Team

(2) Issues

Two core issues exist at this station.

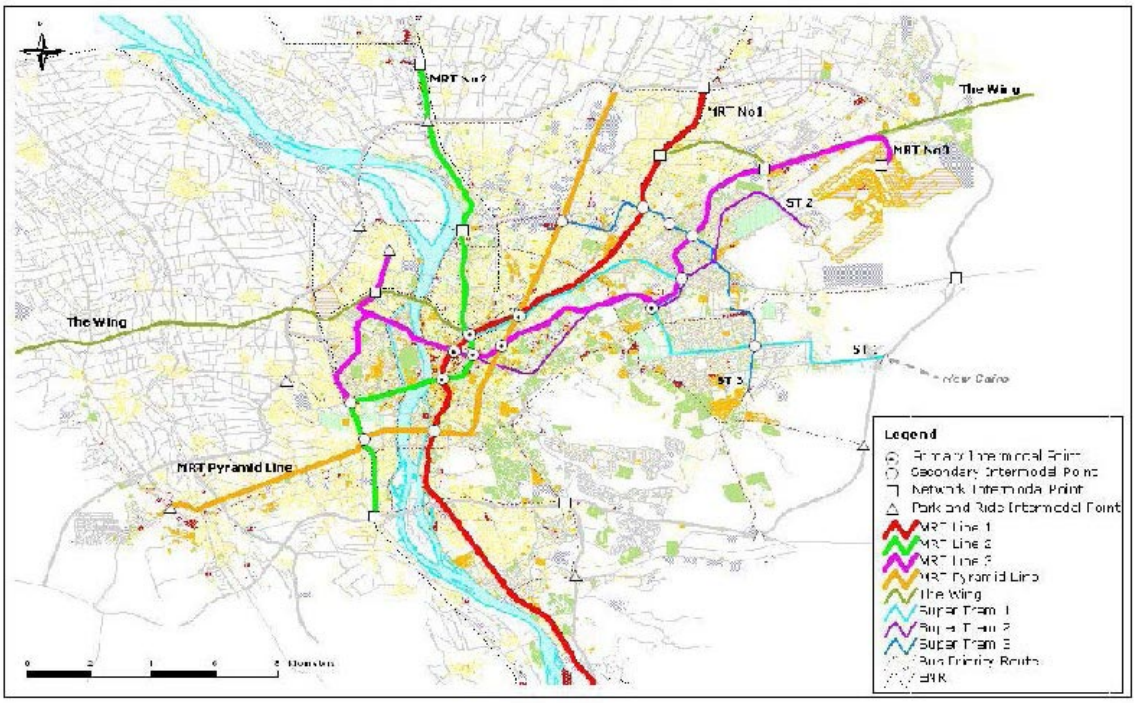
1) Passenger Movements

At present, even though being immediately adjacent, there is only limited opportunity for passengers transferring between what will be the supertram and Metro Line 1. Routings are circuitous, and involve an ascent to the Port Said Street Bridge. Furthermore, bus and shared taxi operations on the Port Said Bridge tend to be chaotic as little order is maintained in terms of where public transport

vehicles stop, persons walk, etc. As a result, through traffic along Port Said Street is often blocked by double and triple stopped buses as well as shared taxis, often in both directions of travel. The walking environment for passengers is thus very limited and unsafe.

2) Intermodality

In the long term future, Ghamra station will be served by Metro Line 4 (the Pyramid Line) (Figure 4.5.8). Metro Line 4 will follow the Port Said Street corridor, and, in the general area of Ghamra station, will probably be located underground due to the presence of two tracked urban transport systems located at grade, and overhead road facility bridges.



Source: JICA Study Team

Figure 4.5.8 Year 2022 Principal Public Transport Elements
CREATS Transport Master Plan

Given the large variance in potential final location and design of the Metro Line 4 station, focus is, for purposes of the current feasibility study, directed to station facilities as they exist at present. That is, the supertram station, metro station and Port Said Street public transport services.

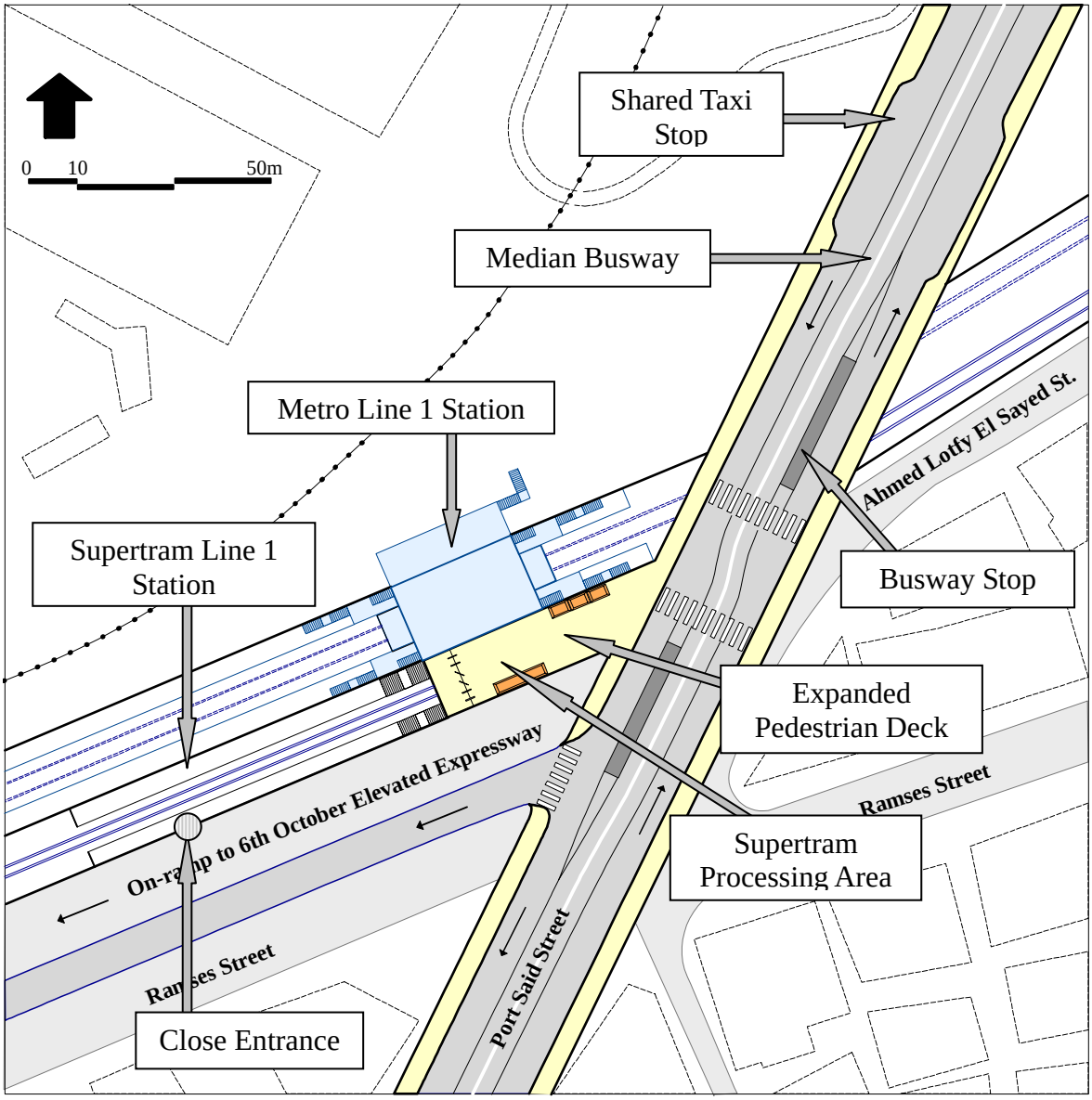
One of the objectives of Program A of the current Phase II CREATS efforts is, given the temporal uncertainties inherent to construction of Metro Line 4, to review the feasibility of implementing an intermediate series of traffic improvement measures designed to enhance road operations within the Metro Line 4 corridor. This includes, of course, Port Said Street. The vicinity of Ghamra

station is integrated with this analysis, details of which are contained in *Volume II* of the *Final Report*.

(3) The Concept

The recommendations for Ghamra Station of Supertram Line 1 are fully consistent with recommendations of the road improvement and traffic management strategies derived within the frame work of Program A. Key elements include (Figure 4.5.9):

- As recommended within Program A, the cross-sectional profile of Port Said Street is realigned to allow for a median busway, one lane in each direction, plus two moving traffic lanes in each direction. The median bus lanes are intended for use by full-sized urban buses only; directional bus stops are provided on the Port Said Street Bridge. Recessed shared taxi bays are located north of the bus bays, one for each direction along Port Said Street. This location for the shared taxi bays is dictated by the presence of the 6th of October Expressway ramp located to the south of the bus bays. Widened pedestrian footpaths are provided, as are marked pedestrian crossings adjacent to the stairways leading to the supertram and metro stations. The stairways are located on the west side of the Port Said Street bridge.
- The pedestrian area to the west of Port Said Street bridge must be expanded via the construction of a pedestrian deck above the alignment of the supertram, and as an extension of the Port Said Street western footpath. From this deck, stairs will lead to the metro station and the supertram platforms. The processing area for the supertram is located on the pedestrian deck.
- Given that the supertram station will be cordoned, one set of existing steps, which are little used, leading from the northbound platform to an area under the 6th of October Expressway on-ramp, will be closed. Thus, the passenger focus for Supertram Line 1 is the pedestrian deck, from which direct connection is possible with Metro Line 1 and road-based public transport services.



Source: JICA Study Team

Figure 4.5.9 Preferred Concept: Ghamra Station and Environs

4.5.3 Girl's College Station

Girl's College station is located within the built up and heavily commercialized core of Heliopolis.

(1) Background

The existing station at Girl's College is served by both the Heliopolis Metro and CTA Tram. Tracks, which are located within the road median, diverge at this intersection with service direction Madinet Nasr branching from Sayed El Merghany Street and continuing along Ahmed Tayseer Street. The intersection of these two roads is complex and signal (police) controlled; congestion is a frequent

problem due to the interaction of road traffic, trams and pedestrians. Tram service does not have any form of priority signalization; thus, at the four major conflict points with road traffic, delays are frequent (Figure 4.5.10). All traffic movements are allowed at the intersection, a situation complicated by short frontage roads along Merghany Street along which parking is prevalent. In fact, both roads enjoy a considerable right-of-way, however, significant portions thereof are consumed by road-side parking and other activities.

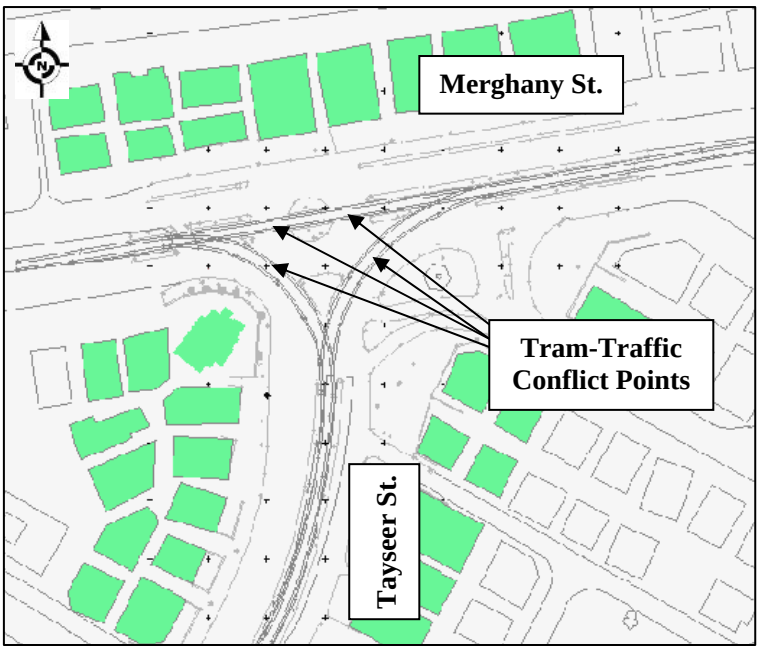
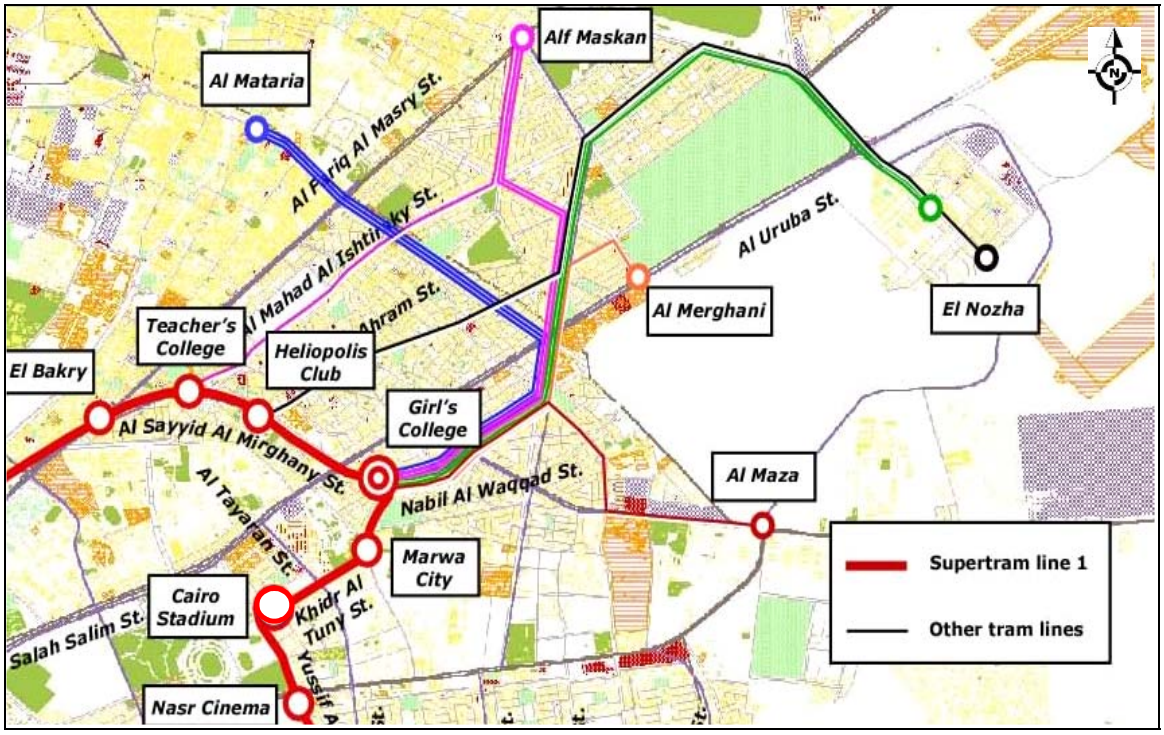


Figure 4.5.10 Existing Intersection Layout

As existing tram lines use outdated technology, the rolling stock of Heliopolis Metro and CTA Tram will not be able to use the new state-of-the-art supertram line. The existing tram lines will therefore be curtailed and reorganized so as to feed the more efficient Supertram line at specific intermodal points: Teacher"s College, Heliopolis Club, and most important, Girl's College. Supertram Line 1 will bisect the intersection along a west-south axis, while remaining elements of the tram system will traverse east of the intersection (Figure 4.5.11).

A critical issue at this location is therefore how to plan for the transfer of passengers between the supertram and tram network. Furthermore, Metro Line 3 will pass under this location in a roughly north-south direction, with a station located under the intersection complex. Any treatments at this location must therefore be consistent with the alignment and design of Metro Line 3.



Source: JICA Study Team

Figure 4.5.11 Reorganization of Heliopolis Metro and CTA Tram Lines

Demand forecasts (refer Chapter 3) confirm that Girl's College Station will accommodate some 22,400 daily boarding movements, with the vast majority (14,000 persons per day) entering the supertram after an initial journey on either the Cairo metro or remaining elements of the Heliopolis Metro/CTA Tram (Table 4.5.3).

Table 4.5.3 Year 2022 Boarding Passenger by Principal Access Mode
Girl's College Station – Supertram Line 1

Access Mode	Daily Passengers(1)
Walk	5,100
Shared Taxi	1,100
Urban Bus	2,200
Heliopolis Metro	7,500
Cairo Metro	6,500
Total	22,400

(1) Number of daily persons boarding Supertram Line 1, stratified by type of mode used to access the supertram.
Data sources: JICA Study Team

(2) Issues

1) Intersection Solution

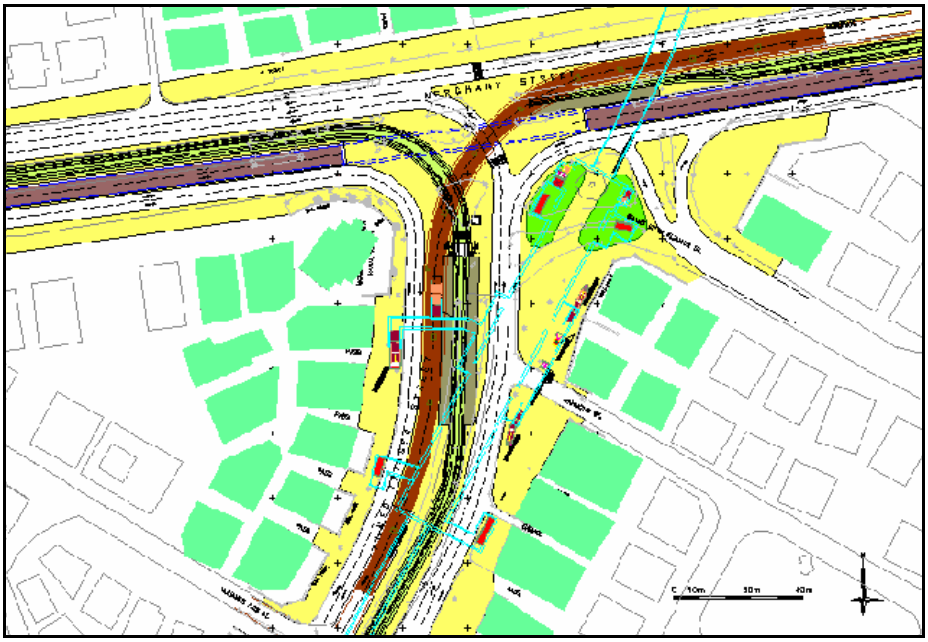
Two core intersection solutions were considered.

- Elevated supertram line. This option directly links intersection solution with station solution, in that Supertram Line 1 would have to be elevated along its approaches to the intersection and an elevated station constructed within the intersection area. This has the advantage that essentially no modification of intersection traffic flows is needed, and that the terminus station of the tram system could be placed at ground level under the supertram station for easy vertical interchange between supertram and tram. However, this solution was rejected for three reasons: (a) high cost, (b) visual intrusion posed by an elevated LRT station in the midst of an up-scale urban environment; and, (c) foundations and footings for this concept would likely clash with Metro Line 3 design.
- At-grade supertram line. This is the preferred intersection solution, as discussed in Chapter 3. The goal is to maintain an at-grade alignment for the supertram, and only grade-separate those road traffic movements which conflict with the supertram. Specifically, westbound left turns from Merghany Street to southbound Tayseer Street, and eastbound through movements along Merghany Street. The northbound left turn movement from Tayseer Street to Merghany Street is not seen as a critical movement in the sense that it does not intersect with the planned alignment of the supertram.

2) Station Location

A series of options in regard to station location were reviewed under the at-grade supertram scenario.

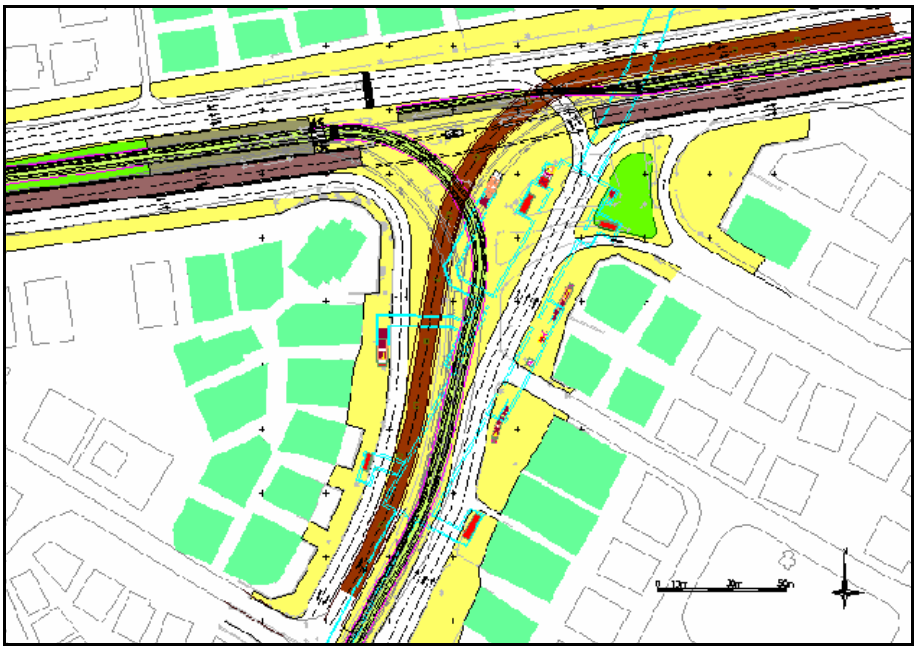
- The supertram station is located along Tayseer Street, at approximately the same location as the current tram station. The initial variant for the Heliopolis Metro terminus was to maintain a platform to platform capacity with the supertram station by also continuing the tram along its current alignment to a point adjacent to (and east of) the proposed supertram northbound platform. However, this was ultimately rejected as physical constraints do not permit a sufficient cross-section for a full-sized tram platform. Furthermore, maintaining a supertram station cordon (controlled entry and exit) under a platform to platform scheme introduces additional design complexities. Thus, the Heliopolis Metro “end of line” platforms are placed along Merghany Street east of Tayseer Street (Figure 4.5.12). The main disadvantage of this solution is that transferring passengers must now cross a road (northbound left turn movement along Tayseer Street) when walking between tram and supertram stations. Further, in order to achieve full-length supertram platforms within a skewed right-of-way, a reduction of track radius is needed.



Source: JICA Study Team

Figure 4.5.12 Initial Concept for Station Locations

The preferred solution overcomes these concerns by placing the supertram station along Merghany Street west of Tayseer Street. This offers the further advantage that the tram line can now be extended westward, and the station placed west of Tayseer Street. Thus, track radii are improved, and transferring passengers no longer cross a road. A further important advantage of this option is that tram and supertram stations are located outside of the Metro Line 3 construction envelope (Figure 4.5.13).



Source: JICA Study Team

Figure 4.5.13 Preferred Concept for Station Locations

3) Metro Line 3

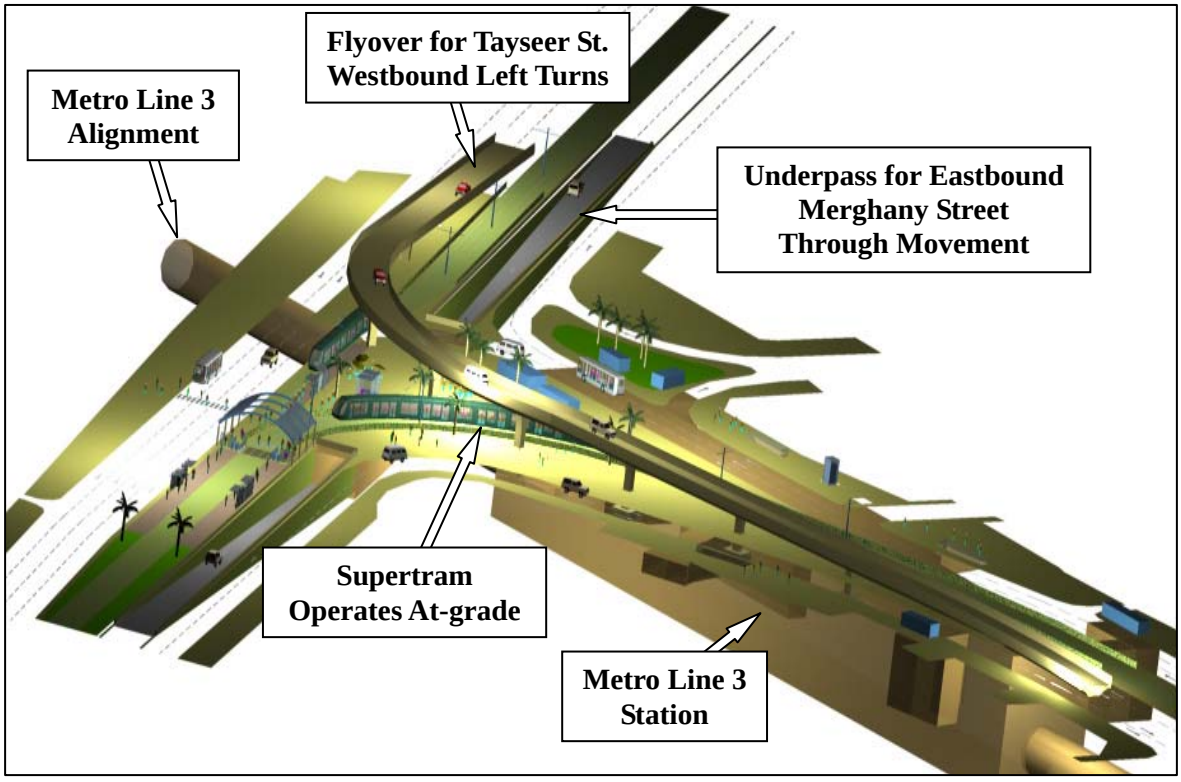
As noted, Metro Line 3 passes under this intersection in a roughly north-south direction, with a station located under the intersection complex roughly parallel to Tayseer Street. Any treatments at this location must therefore be consistent with both the subterranean alignment and design of Metro Line 3, as well as the planned three major stairway access points and several engineering systems such as surface ventilation. These have been integrated into the design of Girl's College Station to ensure consistency with Metro Line 3 plans.

It might further be argued that, in an ideal sense, the Metro Line 3 and Supertram Line 1 stations should be built at the same time. A concern is that if the supertram is built first, operation will likely be interrupted once construction of Metro Line 3 proceeds. However, this may be unavoidable. The preferred option depicted in the previous figure carries an important added advantage in this regard: should construction proceed according to different schedules, and if the supertram is constructed first, reconstruction needs of the supertram following construction of Metro Line 3 are minimal given that both the tram and supertram stations are outside of the metro construction envelope.

(3) The Concept

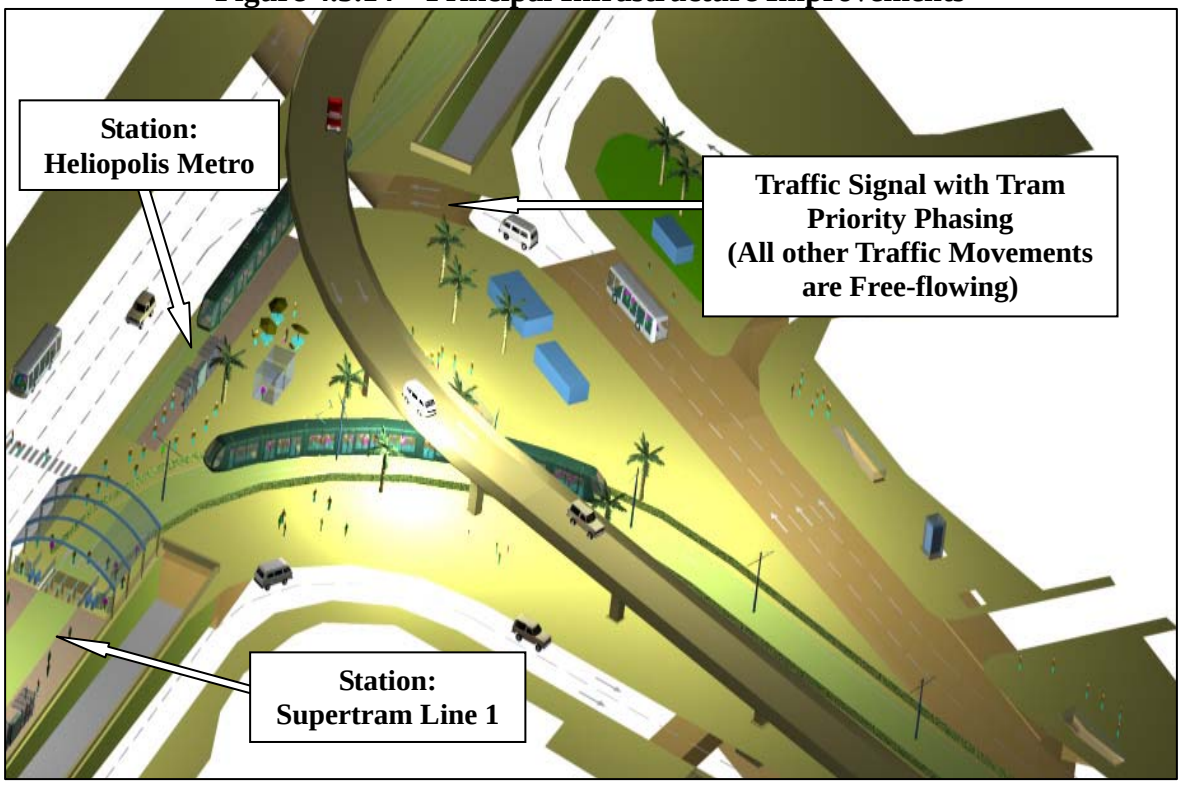
The preferred concept embodies several considerations.

- Grade separation for road traffic is accomplished by elevating the westbound left turns from Merghany Street to southbound Tayseer Street, and constructing an underpass to accommodate eastbound through movements along Merghany Street. Both treatments can be achieved within constraints posed by the subterranean Metro Line 3 alignment (Figure 4.5.14). Concurrently, to realize these treatments, a redesign of road space within the intersection is needed resulting in the absorption of frontage lanes and loss of parking within the immediate intersection area.
- Road traffic will, under the proposed plan, enjoy free-flow conditions for all movements passing the intersection, with one exception. That is the northbound left turn movement along Tayseer Street, which intersects with the westward extension of the Heliopolis Tram track, then merges with westbound flow along Merghany Street. This can readily be handled via the installation of a traffic responsive signal system, to include a tram priority cycle (Figure 4.5.15).
- The entire core area has, with the inclusion of landscaping and pedestrian amenities, been transformed from the present anarchic state to a pedestrian-friendly precinct free from conflict with road traffic (Figure 4.5.16). Public transport interchange is optimized. Passengers transferring between Supertram Line 1, Heliopolis Metro and Metro Line 3 can do so totally within the pedestrian precinct without crossing any roads. The provision of zebra crossings will further enhance interchange with adjacent bus stops and facilitate road crossings by pedestrians (Figure 4.5.17).



Source: JICA Study Team

Figure 4.5.14 Principal Infrastructure Improvements

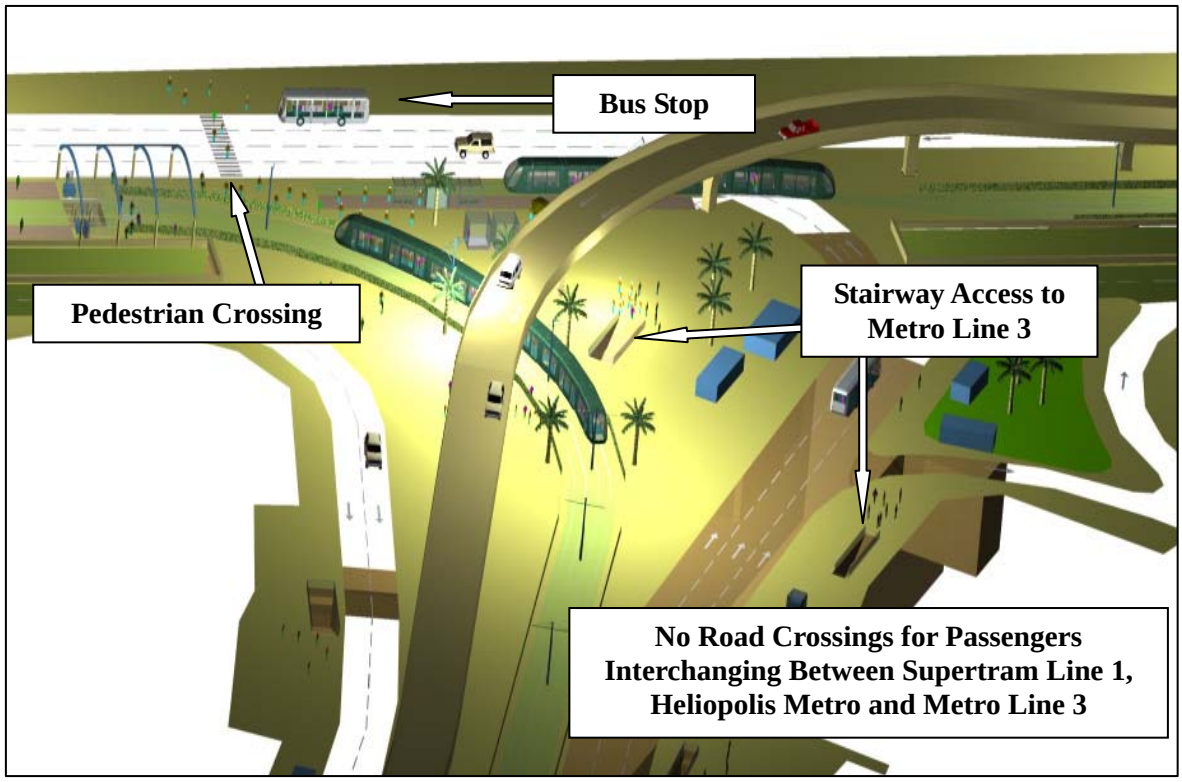


Source: JICA Study Team

Figure 4.5.15 Improved Intersection Traffic Pattern

Source: JICA Study Team

Figure 4.5.16 A Pedestrian Precinct Realized



Source: JICA Study Team

Figure 4.5.17 Enhanced Public Transport Interchange

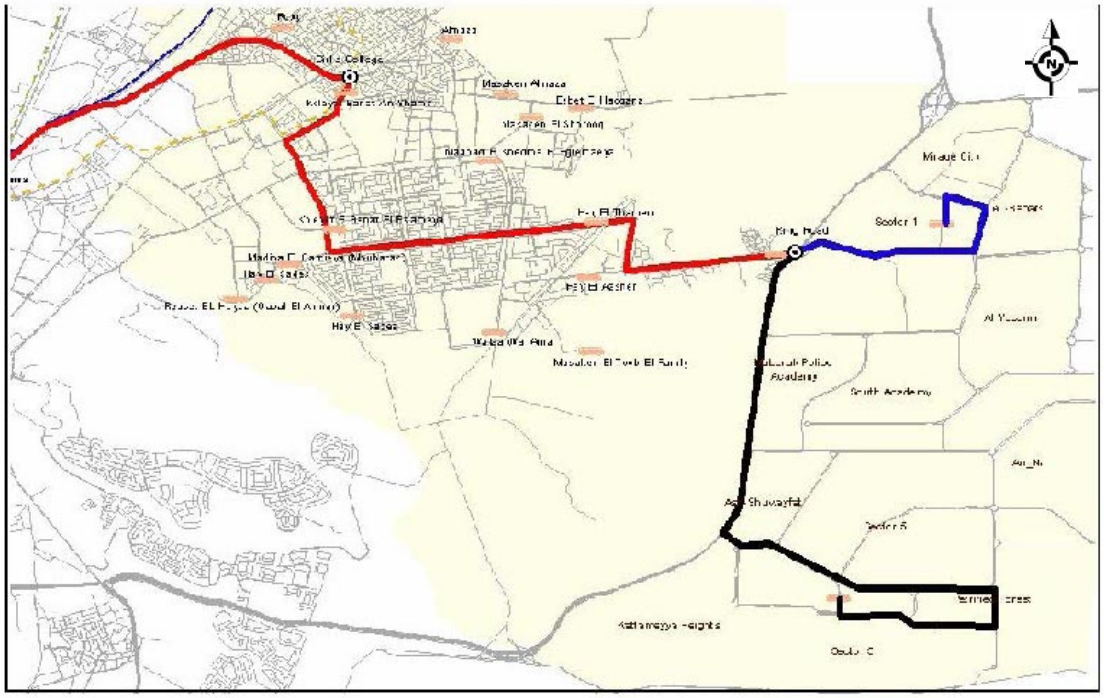
4.5.4 Ring Road Station

Ring Road station is the eastern terminus of Supertram Line 1, and is located in eastern Madinet Nasr near the intersection of Ahmed Mohamed El Zomor Street with the Cairo Ring Road.

(1) Background

The current site for this station is vacant land, with exception of the Ring Road CTA bus terminal on the north side of Zumor Street (Figure 4.5.18). Demand forecasts (refer Chapter 3) confirm that Ring Road Station will emerge as the highest load point for Supertram Line 1 by year 2022. This is fueled by a variety of catalysts, including continuing growth in Madinet Nasr in areas which are currently vacant, intensification of existing land uses and, primarily, accelerating growth in New Cairo. This urban conurbation, whose size is expected to ultimately reach approximately three quarters of a million persons, obviously represents a considerable contributor to supertram ridership. However, the speed of New Cairo population growth, and indeed the spatial distribution thereof, remains flexible and subject to market mechanisms. From the perspective of the supertram, two issues are obvious. Firstly, the Ministry of Housing has expressed considerable interest in the extension of the supertram beyond its current Ring Road station into New Cairo. Secondly, until such an extension is realized, an interim series of feeder bus services must be implemented to serve the residents of New Cairo. At present, CTA bus service is provided from the existing Ring Road bus terminal (which will be incorporated and enlarged within the LRT Ring Road station concept) into New Cairo (Figure 4.5.19); private operators also link some areas, such as Rehab, with Madinet Nasr and Heliopolis. The extent of the feeder bus activity, as stated, will be totally dependent upon actual New Cairo development, but will ultimately be considerable. Year 2022 demand forecasts, which assume that feeder bus services are provided to New Cairo and, in general, the Ring Road corridor, show the strong reliance of boarding passengers upon shared taxi and bus modes (Table 4.5.4). The park-and-ride potential is also noted; not surprisingly so, given the strategic location of Ring Road station adjacent to the Cairo Ring Road, a major, grade separated and access controlled facility.

Figure 4.5.18 : Ring Road Station Site



Source: JICA Study Team

Figure 4.5.19 Existing CTA Bus Routes: Ring Road Bus Terminal – New Cairo

Table 4.5.4 Year 2022 Boarding Passenger by Principal Access Mode
Ring Road Station – Supertram Line 1

Access Mode	Daily Passengers(1)
Walk	9,400
Shared Taxi	38,800
Urban Bus	34,000
Park and Ride	15,000
Total	97,200

(1) Number of daily persons boarding Supertram Line 1, stratified by type of mode used to access the supertram.
Data sources: JICA Study Team

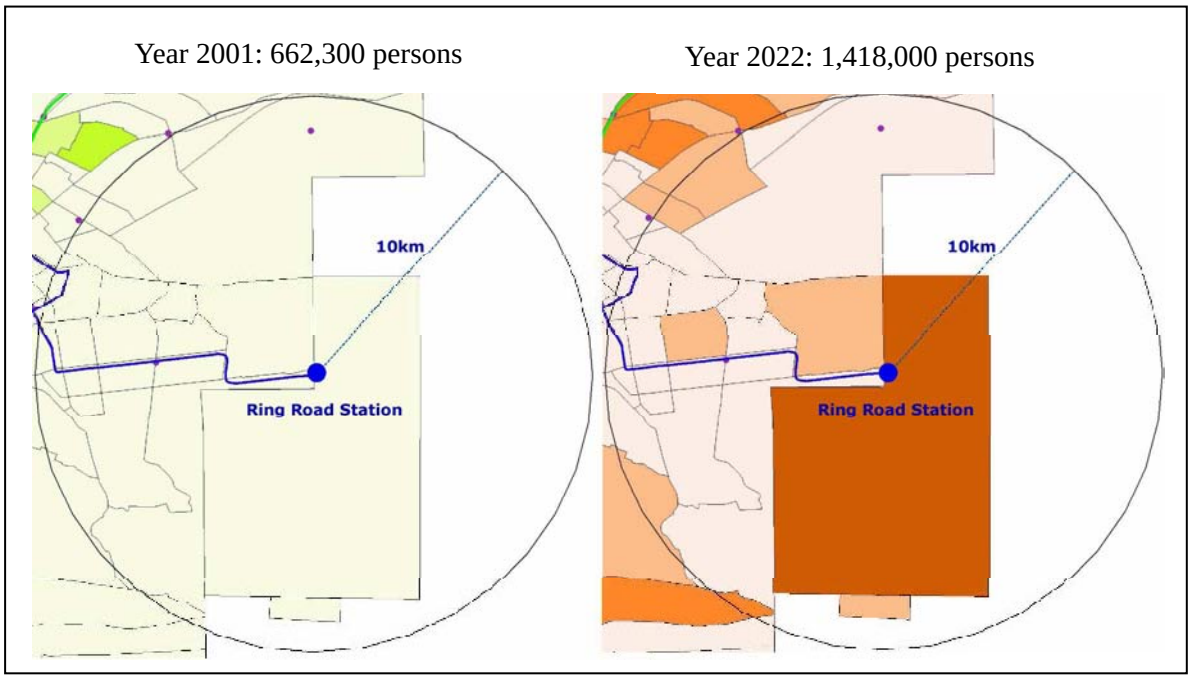
(2) Issues

Several core issues are addressed in the conceptual design of the new Ring Road station of Supertram Line 1.

1) Potential for Multi-use Development

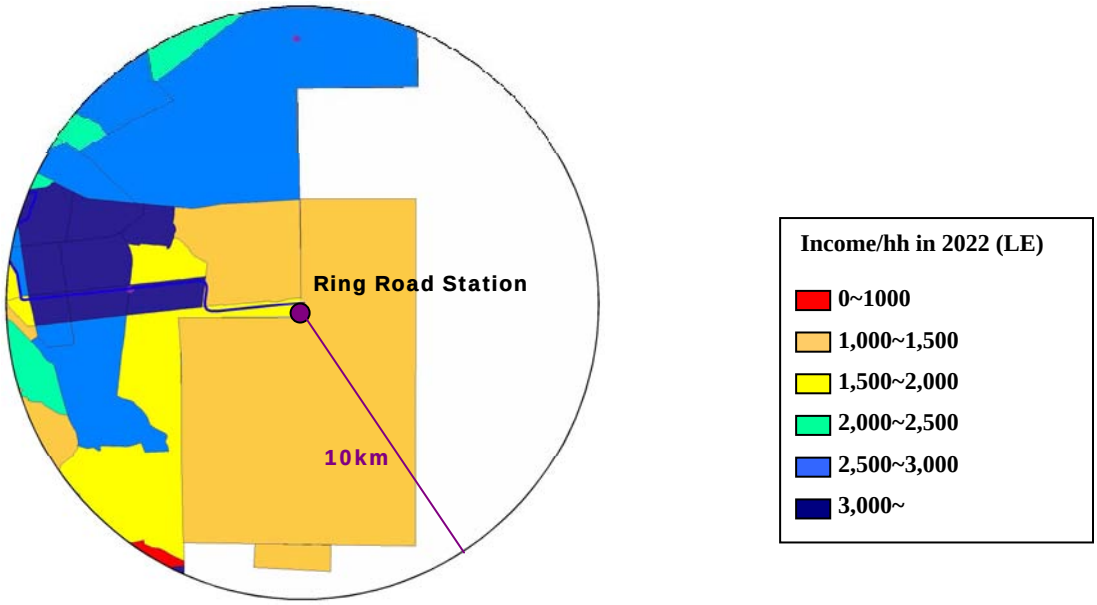
The Study Team considers Ring Road station as an excellent opportunity for realizing a multi-use development combining both transport and commercial functions.

- Population within a 10 kilometer radius of the station is expected to more than double during the CREATS planning period, growing from some 663 thousand in year 2001 to 1.42 million in year 2022. The concentration of population within New Cairo and southeastern Madinet Nasr is particularly noted in year 2022 (Figure 4.5.20).
- The population within the influence area can be considered as generally falling within higher income ranges (Figure 4.5.21).
- Thus, when considering purchasing power, the middle to higher income population consists of some half-million persons by year 2022. This would be considered the primary candidates for upper-end commercial purposes (Table 4.5.5).



Source: JICA Study Team

Figure 4.5.20 Population Distribution Within Ring Road Station Influence Area: Years 2001 and 2022



Source: JICA Study Team

Figure 4.5.21 2022 Income Distribution Within Ring Road Station Influence Area

Table 4.5.5 2022 Target Population for Ring Road Station Shopping

Household Income (LE/month)	Total Population	Shopper Target Population
Under 1000	0	
1000~1500	830,020	
1500~2000	91,995	
2000~2500	65,099	65,099
2500~3000	185,086	185,086
Above 3000	245,760	245,760
Total	1,418,959	495,945

Source: JICA Study Team

It is conceivable that the type of shopping center should be a large suburban shopping mall. Firstly, there is a no constraint on area since Ring Road station will be located on what is at present a vacant area. Secondly, the station has large parking supply for park and ride spaces which could be available for customer parking during evening hours and on weekends. Thirdly, transport infrastructure, in particular the supertram and the Ring Road, offer excellent options linking shopping facilities with the customer hinterland. Based on typical Japanese criteria, a 500,000 person target population can support approximately 5 ha of total commercial floor area. The kinds of shops included in this development would be clothing and general apparel; appliances; restaurants/coffee shops; supermarket and Cineplex.

In addition to the core shopping center, there exists ample opportunity for the provision of small-scale commercial activities, sited in vicinity of the bus as well as shared taxi terminals. Typical uses are kiosks, coffee shops, newsstands and similar uses. The previous intermodality section in this chapter also recommends

the establishment of a series of walk-in public transport information centers. The main function at these sites would be personal, face-to-face interaction with the public and dispensing public transport information both to existing users and potential users. Center staff would furnish and dispense (a) timetables for routes and lines of all modes of public transport in Cairo, (b) information on transport routes, (c) information on fare structure, (d) transport maps for distribution and inspection, (e) promotional literature, (f) available services with particular attraction for tourists, (g) information which cannot be readily obtained from standard information handouts; and, (h) directions for further enquiries. Ring Road station offers excellent potential for including this modestly sized facility within the station complex.

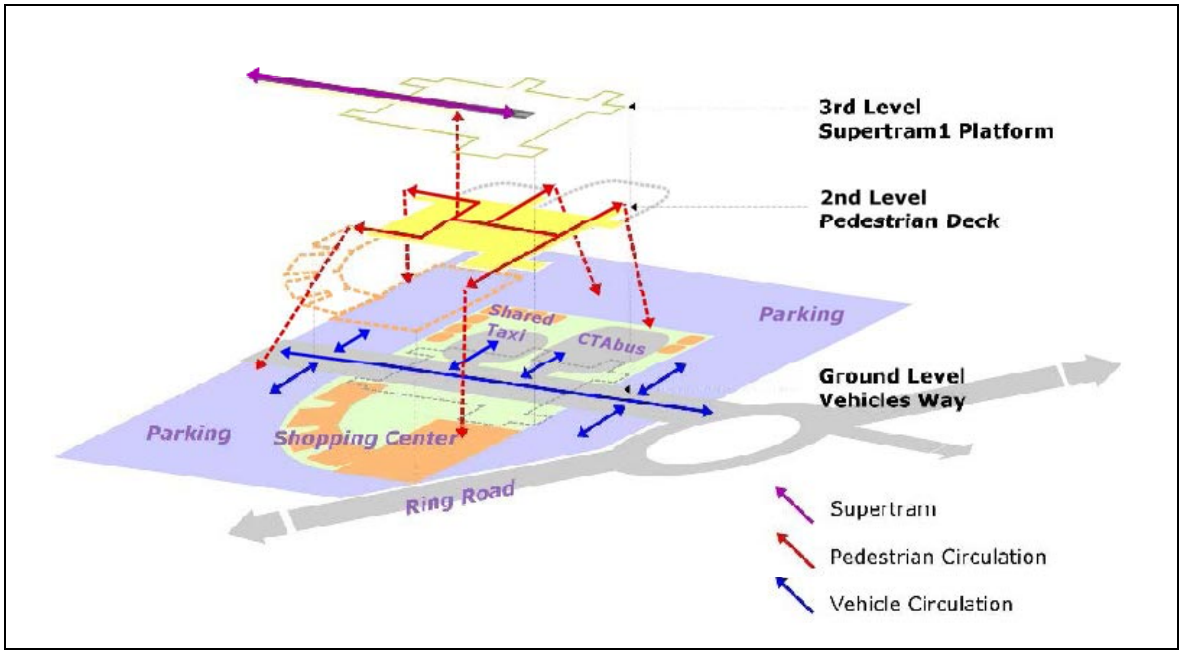
2) Feeder Systems

Passenger demand forecasts confirm that, by year 2022, shared taxis, urban bus services as well as park and ride facilities must be provided for. During the peak hour, some 3,500 supertram patrons will arrive by shared taxi and a further 3,100 by bus. Using an average station headway of 7.5 minutes per bus, and five minutes per shared taxi, as well as average occupancies of 48 and 12 passengers, respectively, yields a requirement of eight bus bays and queue space for 24 shared taxis. The peak hour during the morning peak period is forecast to catalyze a parking need of 1,400 spaces, and an aggregate morning total of near 4,000 park and ride spaces. A total of 5,000 spaces is programmed to also account for needs of the shopping center. The additional 1,000 spaces are assumed as concurrent use during daytime hours; however, during evening and weekend hours (peak shopping times), a considerable number of the park and ride spaces should also be available for use by shoppers.

3) Circulation Concept

The combination of busiest station on Supertram Line 1, thousands of parking spaces, pronounced bus and shared taxi activity as well as a presence of a shopping center confirms that a large number of pedestrians will be traveling between, and within, these activity precincts. To avoid conflicts between vehicles and people, to enhance safety and to maximize operational efficiencies, several considerations are important in terms of defining a site circulation concept (Figure 4.5.22).

- Ground level precincts are largely reserved for vehicles. These include through movements along Zumor Street, vehicles entering/departing the park and ride lots, vehicles frequenting the shopping center, as well as buses and shared taxis entering/leaving the shared taxi terminal and bus terminal.



Source: JICA Study Team

Figure 4.5.22 Site Circulation Concept

- Pedestrians walking between and within transport activity precincts, or frequenting the shopping center, must be able to do so without crossing streets and with minimum interaction with vehicles. Thus, an elevated pedestrian deck is proposed spanning both sides of Zumor Street and providing connection with the bus terminal, shared taxi terminal, supertram station, park and ride lot and shopping center. Conveniently located stairs, and strategically sited elevators for handicapped and elderly, are a must.
- The pedestrian deck clearly implies a need for an elevated supertram station (the only elevated station on the system). An elevated supertram alignment will also be necessary to accommodate the potential future extension of the supertram to New Cairo, which will require bridging the Ring Road proper and the Zumor Street interchange complex. Furthermore, a grade separated LRT alignment will ensure interference free (between LRT and road vehicles) operation along the track branching from the mainline into the proposed supertram depot (as discussed in the second following section).
- The supertram station and track system, if constructed at the same level as the pedestrian deck, would literally bisect the deck and block pedestrian movements unless pedestrians physically walk across the track. This is undesirable from a safety and supertram operations point of view. The supertram station must therefore be slightly elevated above the pedestrian deck; in effect, pedestrians would walk below the supertram complex, and reach the actual platforms via stairs or elevators.

4) Implementation Strategy

An innovative new approach to financing and implementation of Ring Road station is highly desirable to facilitate realization of this flagship undertaking. Following points would considerable enhance this process:

- The core supertram facilities (tracks, station, fixtures, systems, etc) would be provided for within project costing, potentially sourced via international donors or lending agencies.
- A governmental entity, or public-private partnership group, provides financial resources for land, parking and public transport feeder facilities.
- The private sector is responsible for commercial development.
- Joint development ("transit oriented development") principles are applied in terms of asset development, management, revenue sharing and sustainability.

5) Land Requirements

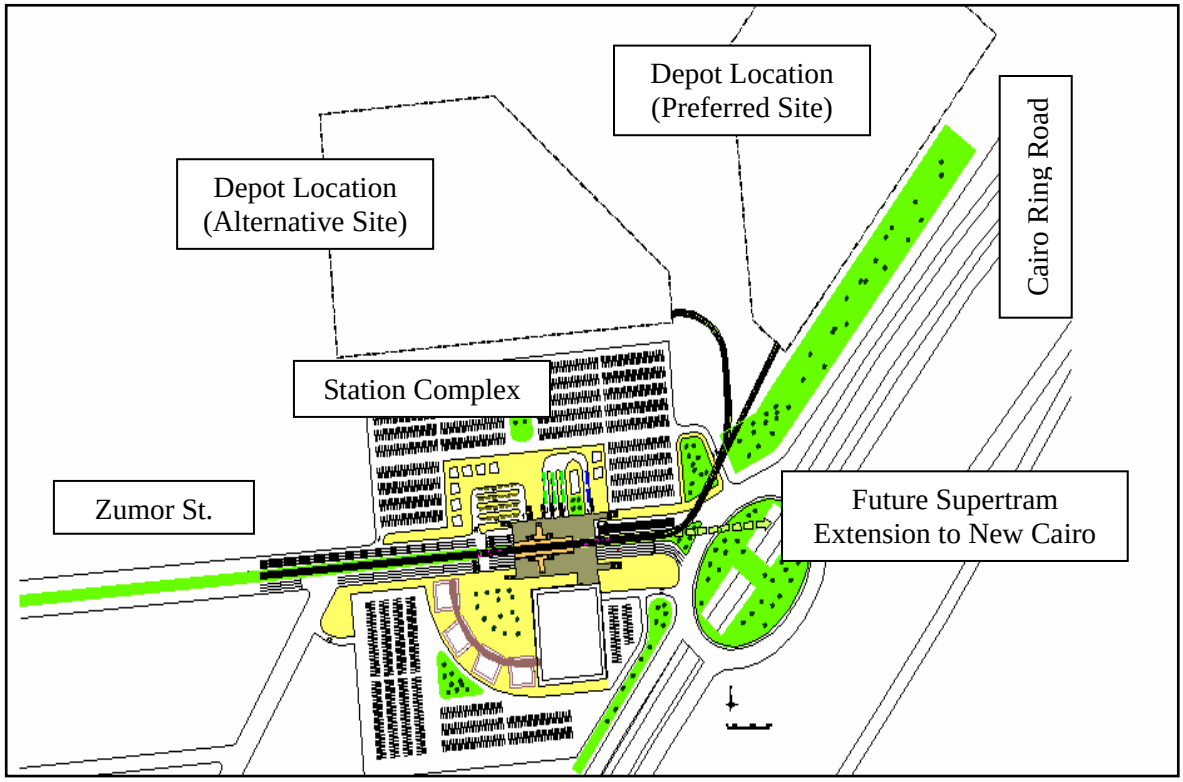
Implementation of the supertram will not require any land acquisition with two exceptions:

- Reservation of about 75,000 square meters of land for the Supertram Line 1 depot, as discussed in Section 3.5; and,
- Reservation of land for the Ring Road station complex. The entire site, to include the supertram station, pedestrian amenities, public transport feeder facilities, "park-and-ride" parking area, as well as commercial/shopping development, will require on the order of 200,000 square meters.

In light of the rapid expansion now occurring in southeastern Madinet Nasr, the Steering Committee and Study Team both confirm an urgent need for the immediate reservation of land for the depot and Ring Road station. Toward that end, the Study Team made a series of presentations to Cairo Governorate, as well as the Madinet Nasr Company for Housing and Construction, to clarify supertram land needs and to discuss potentially available sites. Based on these discussions, it is understood that approximately 300,000 square meters of now-vacant land, large enough to accommodate both the Ring Road station complex and the depot, could possibly be made available at the station site. That is, immediately northeast of and near the intersection of Ahmed Mohamed El Zomor St. with the Cairo Ring Road. During October, 2003, the Study Team, under the auspices of the Technical Working Group and the Steering Committee, suggested in writing that efforts now proceed, under the leadership of Cairo Governorate, for the reservation of land for purposes of accommodating the Ring Road station complex and Supertram Line 1 depot at this preferred site.

In support of this request, the Study Team submitted drawings of the Ring Road station concept and alternative depot locations to representatives of Cairo Governorate (Figure 4.5.23). These drawings are in AutoCad format compatible with the CAPMAS grid coordinate system.

Details of site content are now presented in the following section.



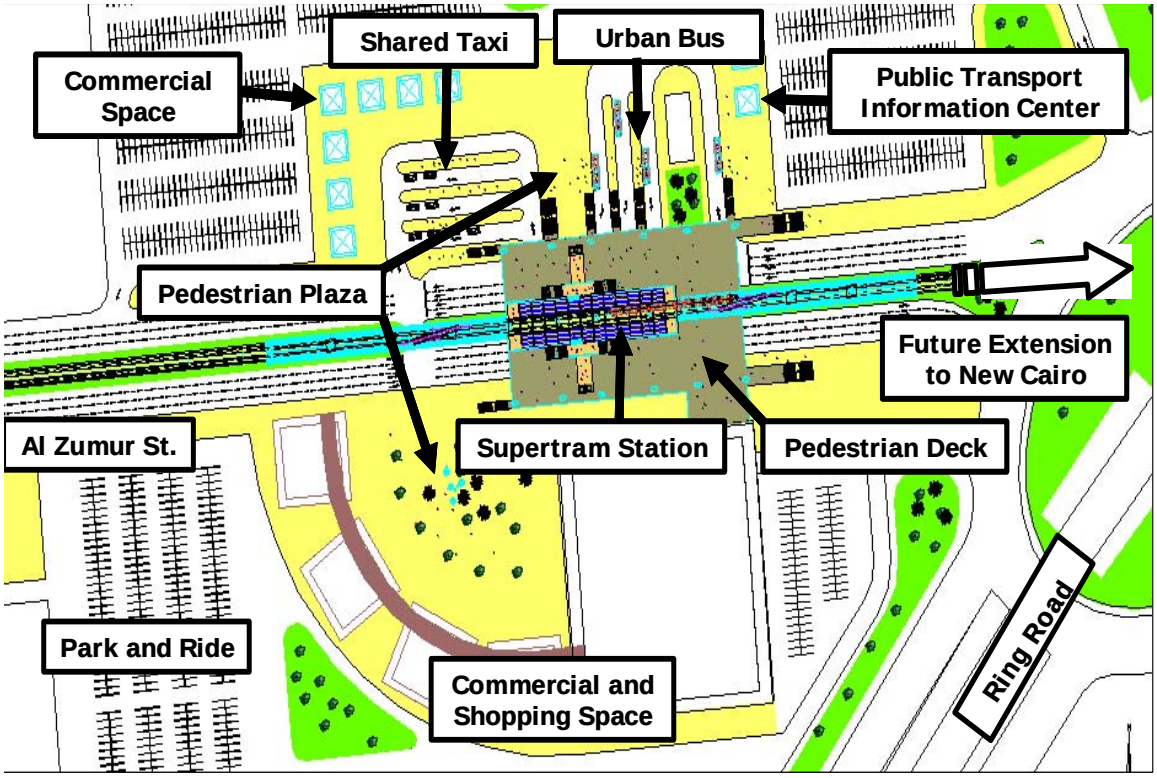
Source: JICA Study Team

Figure 4.5.23 Spatial Requirements of Ring Road Station and Supertram Depot

(3) The Concept

The station includes several major elements (Figure 4.5.24).

- Transport: The principal road facilities are Zumor Street and the Ring Road. Public transport facilities encompass the supertram station, shared taxi terminal, urban bus terminal and public transport information center. Parking is provided via park and ride spaces, as well as spaces for commercial activities.
- Pedestrians: Planning for the convenience and comfort of pedestrians has been a major input to station design. Facilities include a pedestrian deck, pedestrian plazas north and south of Zumor Street, stairways and elevators linking various activity precincts, landscaping and other pedestrian amenities. In short, moving between different elements of the station can be done with minimum interaction with road traffic.
- Commercial: The bulk of commercial and shopping space is allocated to the south of Al Sumur Street. To the north, and near the bus/shared taxi terminals, are a series of small-scale commercial establishments.



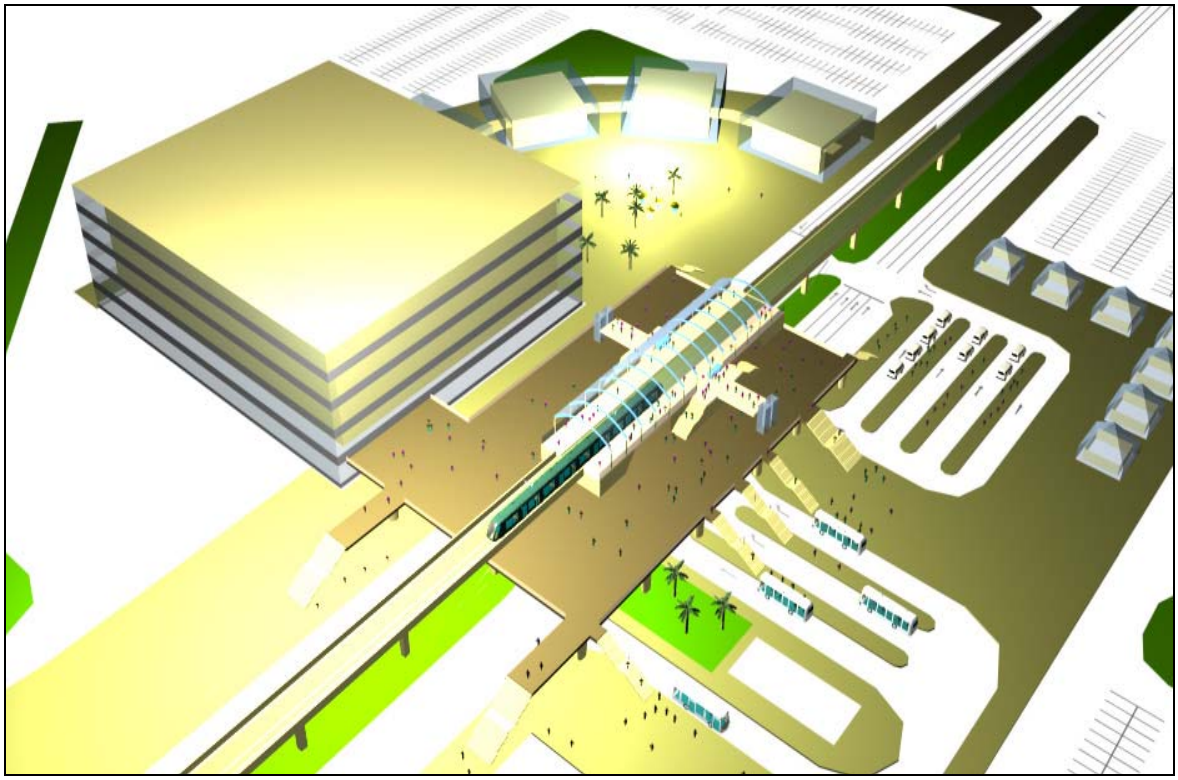
Source: JICA Study Team

Figure 4.5.24 Principal Components – Ring Road Station

The supertram is elevated on the western approach to the station, with the actual station being above grade over both the ground level vehicular precinct and the pedestrian deck. Processing areas for the station are located at the level of the pedestrian deck and, following system entry, platforms are reached via stairways or elevators. Lateral platforms are provided; the installation of variable-message signage for announcement of next departure platform is therefore needed.

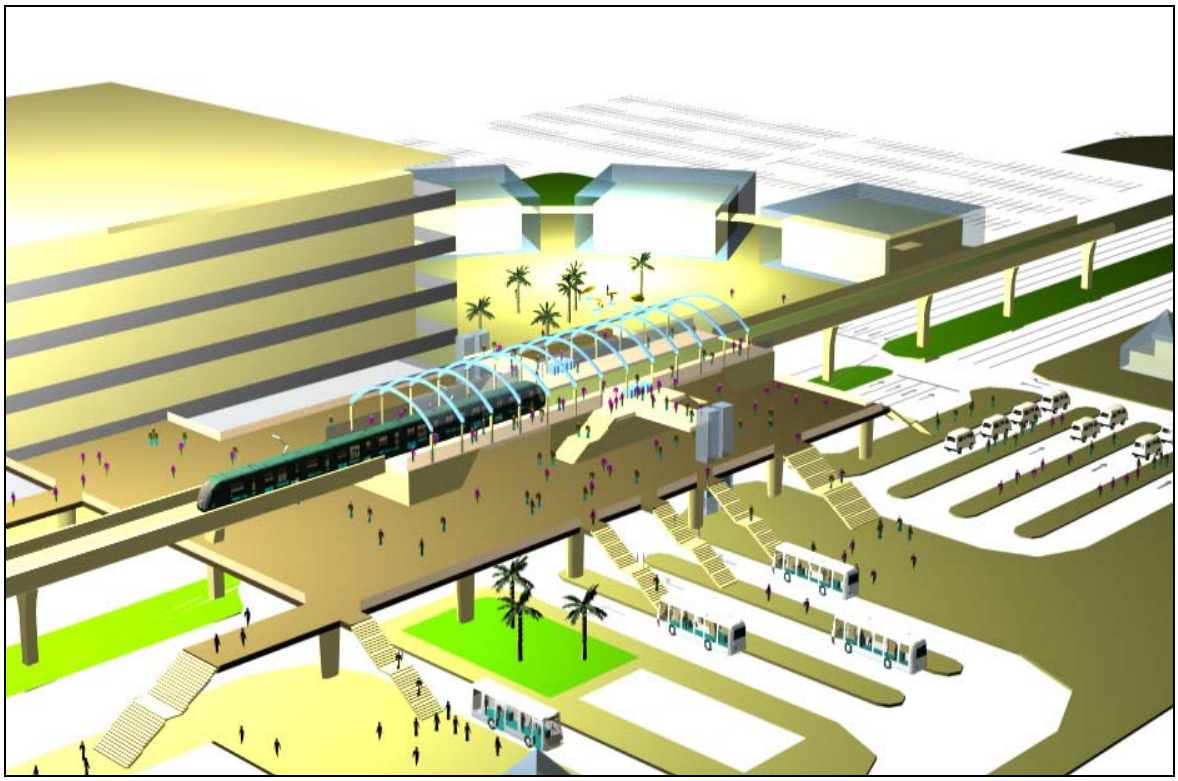
The station is fitted with a rear maneuvering area, which may be used to store two trains. Two track crossovers, one before and one after the station, are provided to allow all train movements. Tracks within the rear maneuvering area may readily be continued as part of the future extension of the supertram to New Cairo, or switched northward for access to the supertram depot.

A series of renderings depict the proposed layout of the station complex. Figure 4.5.25 is an aerial view looking down at the station, with the commercial high-rise south of Zumor Street, and the bus/shared taxi terminals north of Zumor Street. The elevated supertram station appears above the pedestrian deck. Figure 4.5.26 focuses on the public transport element: the supertram station above the pedestrian deck, which in turn is above the ground level vehicle precinct (cars, buses, shared taxis). Figure 4.5.27, in turn, narrows the view to the supertram station, platforms as well as processing area located at the pedestrian deck level.



Source: JICA Study Team

Figure 4.5.25 Aerial View of the Ring Road Station Multi-use Development



Source: JICA Study Team

Figure 4.5.26 Principal Public Transport Elements of Ring Road Station

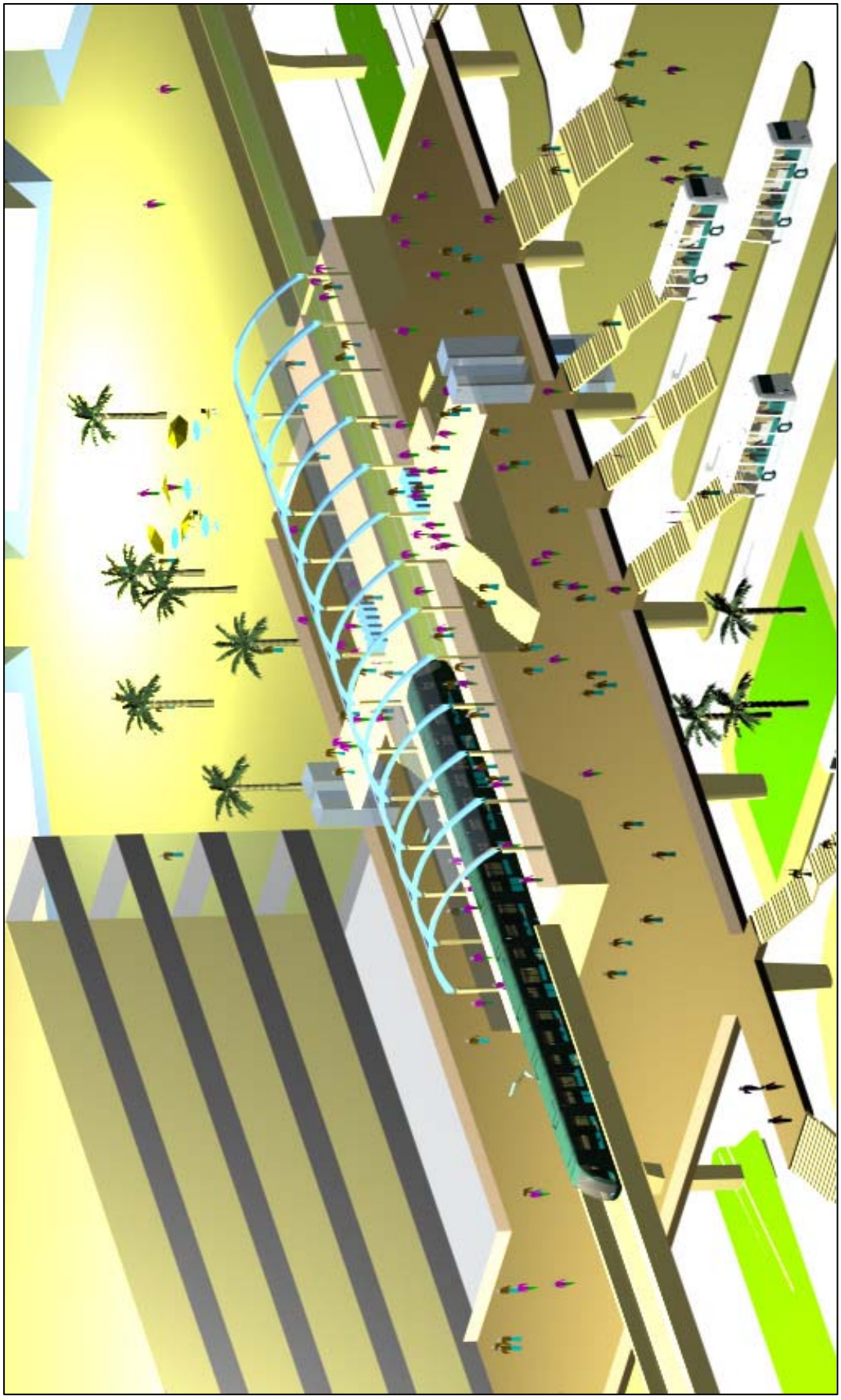


Figure 4.5.27 Supertram Line 1 – Ring Road Station

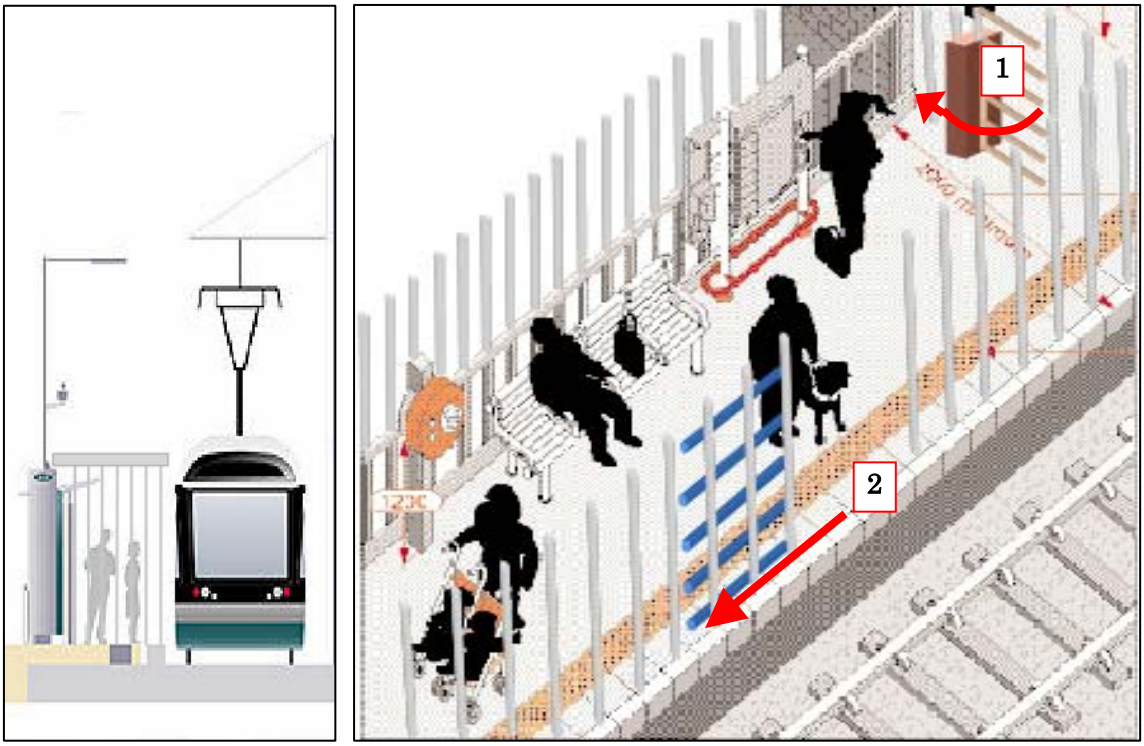
4.5.5 Prototype Station Layout

Previous sections have focused on four important intermodal stations: Ramses, Ghamra, Girl's College and Ring Road. The majority of remaining stations will retain their current focus: that is, stations located within the median of roadways. It is therefore of interest to review a prototypical median station layout.

Several changes will have to be instituted from current station designs. These relate not only to providing a passenger-friendly environment appropriate to a modern LRT system, but also ticketing and security issues. In Section 4.4, it is noted that the preferred ticketing approach is to move ticket purchase and validation off-vehicle. It is further concluded that a barrier free design, or honor system, in which no barriers to system entry or exit exist, is not appropriate for local conditions. Thus, some form of barrier system is required. Magnetic strip ticketing, with turnstile platform ingress and egress, is deemed the most logical approach.

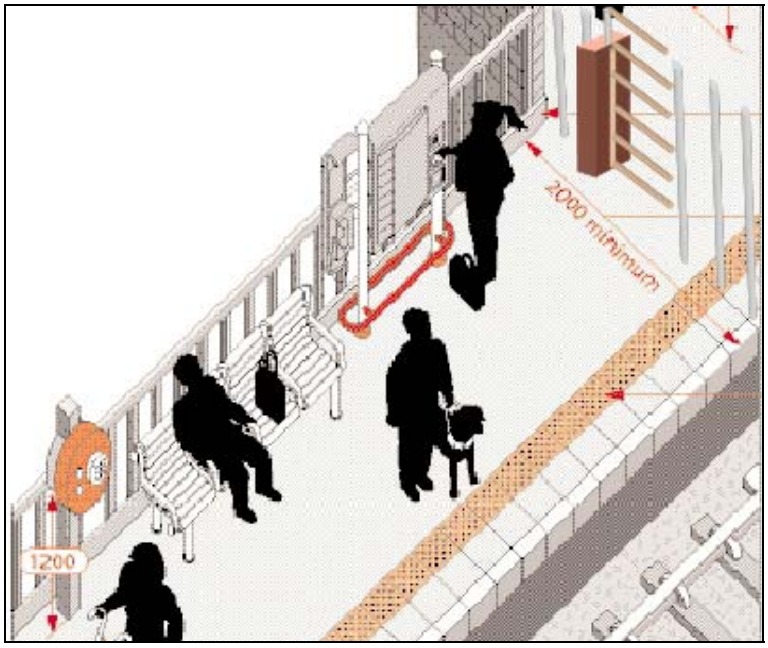
Several options exist for the resulting requisite securing of the platform cordon, that is, limiting system ingress/egress to designated locations.

- Secure barrier system. This system is the most efficient in terms of reducing fare evasion, and the cost of controls, thanks to turnstiles which control platform ingress and egress. The disadvantage of the system is that it has an inherent cost, and is difficult to implement at some supertram stations due to scarcity of cross-platform space. As the platform width of stations is typically limited within a 2-3m range, it would be necessary to secure the cordon with a thin barricade construction with barrier-controlled entrances (please refer item (1) in Figure 4.5.28). At the same time, access to the trains must be controlled by automatic sliding doors (please refer item 2 in the graphic), which open when the supertram arrives and stops with its entrances exactly in front of the doors. In this way, fraudulent access from the tracks can be avoided. However, this system has, from an operational perspective, two drawbacks. Firstly, the supertram driver must stop the train at the exact designated location so that train doors match with platform doors. Secondly, in an Egyptian environment, maintenance is a concern given that a high degree of fine particulates and sand in the air are likely to adversely impact the mechanism of exposed sliding platform doors.
- Modified barrier system. The principal reason for providing barrier gates facing the track is to prevent persons from illegally crossing the tracks and stepping onto the open platform, thus avoiding fare payment. The previous secure barrier system achieves this goal. Under a modified barrier system, the supertram station could be equipped with automatic ticket barriers as is the case with the previous example. However, in order to limit the use of barricades around the stations, the access to the platform could be supervised by a policeman who patrols the platform, as it is currently the practice on the metro lines in Cairo (Figure 4.5.29). However, this raises two concerns. Firstly, the supertram is now dependent upon manpower-intensive enforcement, whether by regular police or by a special supertram police. Secondly, the opportunity for fare evasion or other irregularities has been introduced.



Source: JICA Study Team

Figure 4.5.28 Secure Barrier System



Source: JICA Study Team

Figure 4.5.29 Modified Barrier System

- Pit barrier system. The third option differs from the previous two in how illegal crossings of the track can be avoided. Under the secure barrier system, mechanical devices assume this role. Under the modified barrier system, reliance is placed upon police supervision. Both these techniques have their drawbacks. A third option is to install pits under the supertram tracks at each

end of the station area. These are to physically prevent pedestrians from illegally crossing the tracks and gaining access to platform faces. This system also has its drawbacks in that effort is required to ensure that the pits do not fill with garbage. Some form of supervision is also desirable, but the requirement is not as intense as under the modified barrier system.

The final choice regarding a preferred security system must not be made immediately, but can be the subject of further review and discussion prior to initiation of the final design process. At present, the consensus of the Study Team is to adopt the pit barrier system which, while not perfect, is doable.

Figure 4.5.30 depicts a prototypical median station with pit barrier system. Several features are noted:

- Pit barriers control track-side access by pedestrians, while more conventional barrier systems secure the station edge parallel to the street. Turnstiles and barriers control platforms ingress and egress. The use of a magnetic stripe ticket is mandatory for platform access.
- A pleasant, pedestrian friendly station is seen as totally appropriate and fitting in light of the modern, convivial image presented by the supertram.
- The station features passenger amenities, limited seating, protection from the elements and information. Possibilities exist for the presence of vending machines.
- Bus stops should be strategically sited to facilitate interchange between the supertram and its designated feeder bus services (or any bus, for that matter). Pedestrian crossings, possibly signalized, are needed to ensure that passengers can reach the supertram station safely and quickly.

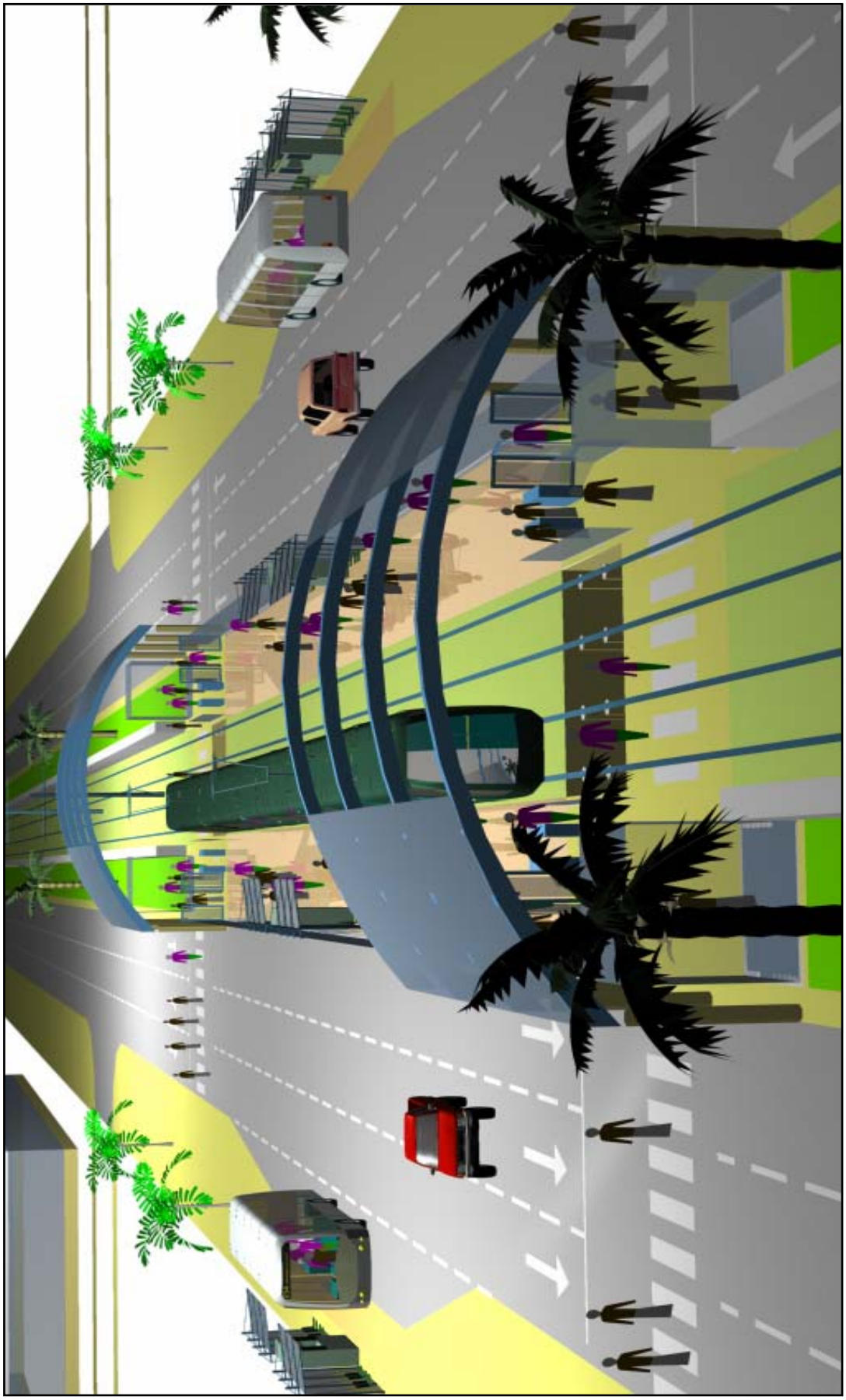


Figure 4.5.30 Prototypical Median Station Concept

4.6 FURTHER TECHNICAL DISCUSSIONS

Previous sections of this chapter have presented East Cairo network optimization and integration investigations in considerable detail. Discussions have focused upon remaining elements of the existing tram network, shared taxi services, urban bus services, intermodal issues and opportunities as well as conceptual design of key intermodal stations. This documentation is sensitive to continuing technical discussions between the Study Team as well as members of the Steering Committee and other Egyptian technical experts. Considerable modifications of *Volume III* of the draft *Final Report* (submitted during October, 2003) were, for example, undertaken in response to Committee comments and Study Team responses thereto dated January 25, 2004. This process culminated in the submittal of a revised draft *Final Report* during mid-July 2004.

Following the procedures indicated above, additional discussions were undertaken with the Committee relative to *Volume III*; specifically, an expressed desire to provide further clarification of various elements of technical reviews which had, in the opinion of the Committee, not been fully documented as part of the January modifications. These are contained in this Section 4.6 of the report using a series of generic and topical headings. Appropriate references to these sections have been inserted in the main report.

4.6.1 Shared Taxi Area Licensing

The crux of the discussion relates to more refined boundaries for the licensing areas, and implementation approaches.

The CREATS approach to area licensing is, indeed can only be, strategic in nature as technical rationale is a contributory, not deterministic, aspect of defining an area licensing scheme. The initial implementation step should be a political decision that the current approach to providing shared taxi services can indeed be modified, and under what circumstances. Perhaps the proposed Central Transportation Authority for Cairo is the vehicle to sponsor such an effort. Only once political and tactical consensus is obtained, and appropriate administrative/enforcement bodies/policies put in place, can the actual restructuring proceed with any hope of success. An absolutely key ingredient is the continuous involvement of the drivers union, or some similar organization, to ensure that the needs and aspirations of the shared taxi industry are fully integrated into the reorganization process. The Study Team would expect that a core issue in this regard, other than the administrative aspects such as the revised relationship between government and the industry, is the ability of the shared taxi owners to continue earning a livelihood. They will most likely insist that current revenue streams not be diminished. This will entail a looped negotiating process which in itself will lead to the gradual formation of acceptable boundaries and, indeed, number of zones.

Thus, only a synthesis of political will, reorganized administrative structures, adoption of a hierarchy of urban transport services and desires of the shared taxi industry can lead to the formation of a more definitive area licensing scheme.

In addition, the Team would mention that the formation of area licensing boundaries is not only dependent on the above points and discussion in Section 4.2.3, but also the evolution of other forms of urban transport. CREATS has, as part of the area licensing process, noted that for an areal limitation to be effective, conventional urban bus services should focus on major corridors of travel, which would then not be available for shared taxi operations. In return, the shared taxi industry is, within the framework of an area licensing scheme, given additional privileges in terms of operation within a defined geographic boundary. The pilot area may well therefore be that precinct of the metropolitan region where other forms of urban transport begin adhering to the concept of integrated, multi-modal services. Perhaps, again, the Central Transportation Authority can play an important role in catalyzing such a course of action.

4.6.2 Quantitative Overview of Demand Profile

The Study Team, during the course of Phase I, published a series of reports (progress, technical, final) which contain considerable detail of the existing demand profile as well as the CREATS model and its components. The Phase II effort is a continuation of Phase I in the sense that additional focus is dedicated to identified projects and programs. Section 4.3.3 thus presents only a brief synopsis of bus demand, but with further detail of the transport model and overview of demand presented in Chapter 1 of Volume IV of this Final Report. However, to ensure completeness of discussion in Volume III, a review of travel characteristics is again presented in this section.

In the creation of the transport model, the major input was the existing travel characteristics [2] .The backbone of the understanding of the existing travel characteristics was the Household Interview Survey of almost 57,000 households, nearly 1.6% of all the households within the Study Area. Survey results suggested that there were 21 million daily linked trips within the CREATS Study Area[3].

Before discussing the travel profile or characteristics of trip makers, it is necessary to appreciate the basic socio economic character of Careens. An important aspect of this character is the distribution of economic activity. In this study there are five classes of household economic activity namely:

[2] Refer to *Progress Report 2 in Phase 1 - Progress Report (2) Vol. I: Current Urban Transport Status for the Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt*, prepared for the Japan International Cooperation Agency and the Higher Committee for Greater Cairo Transportation Planning, by Pacific Consultants International, et. al., November 2002.

[3] The CREATS Study Area is defined in *Phase 1 Final Report - Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt, Volume III (Transport Master Plan)*, op. cit. A trip as defined for this study exclude walk trips within the living complex for traditional and frequent purposes such as going to super market or to the mosque. A trip is included in this analysis if it is longer than 10 minutes.

- Class 1~Low;
- Class 2~Low-Medium;
- Class 3~Medium;
- Class 4~High-medium; and
- Class 5~High.

These five classes of economic activity correspond to monthly household income levels of less than 300 LE per month, 300-500 LE per month; 500-1,000 LE per month; 1,000-3,000 LE per month and greater than 3,000 LE per month respectively.

The distribution of the 3.5 million households within the Study Area between these five economic classes is presented in Table 4.6.1. In fact 65% of all households are within the two lower classes of economic activity. These households as is shown in Table 4.6.2 tend to make fewer trips. The people in households in the highest class of economic activity make 58 % more trips per day than those in the lowest class of economic activity.

Table 4.6.1 Percent Distribution of Households by Economic Class

Economic Class	Percentage of Households
1	30.9
2	34.6
3	16.7
4	13.8
5	4.0
Total	100.0

Source: JICA Study Team

Whilst the number of trips from the households in the highest economic class is higher, the number of people in these households is lower as shown also in Table 4.6.2. In essence there are fewer people per household in the highest economic class yet these same households make considerably more trips.

Table 4.6.2 Trips per Household by Economic Activity Class

Economic Activity Class	Trips per Household	Household Size
1	5.0	4.00
2	5.7	4.06
3	6.6	4.01
4	7.4	4.04
5	7.9	3.73
Average	6.0	4.00

Source: JICA Study Team and CREATS Home Interview Survey

Households in the higher economic activity classes also have a greater tendency to own one or more vehicles as is presented in Table 4.6.3.

Table 4.6.3 Percent of Vehicle Distribution by Household Class

Vehicle Ownership	Economic Activity Class				
	1	2	3	4	5
No Vehicle	93.9	83.7	61.6	10.2	6.3
One Motorcycle	2.8	3.8	2.7	10.7	3.8
One Car (including pickup)	2.3	9.9	31.7	64.3	63.8
More than one Vehicle	0.1	0.9	2.5	9.6	23.6
Other Vehicle other than Car	0.9	1.7	1.5	5.2	2.5
Total	100.0	100.0	100.0	100.0	100.0

Source: JICA Study Team

There are some 21 million person trips, made each day in Cairo by many different modes as is presented in Table 4.6.4. Often a single trip consists of more then one leg. For example a person traveling into central Cairo by Metro may first access the station using a Shared Taxi. Thus this is a single trip with two legs. In another example to complete a trip, a person may use two Shared Taxis changing from one vehicle to another on route; this is also a single trip with two legs. The individual legs of a multi leg trip are referred to unlinked trips. There are 25 million unlinked daily trips which when linked together equate to the 21 million linked trips in Cairo.

The distribution of unlinked and linked trips by mode is shown in Figures 4.6.1 and 4.6.2 respectively. It is shown in these figures that the highest proportion of trips is by walk mode.

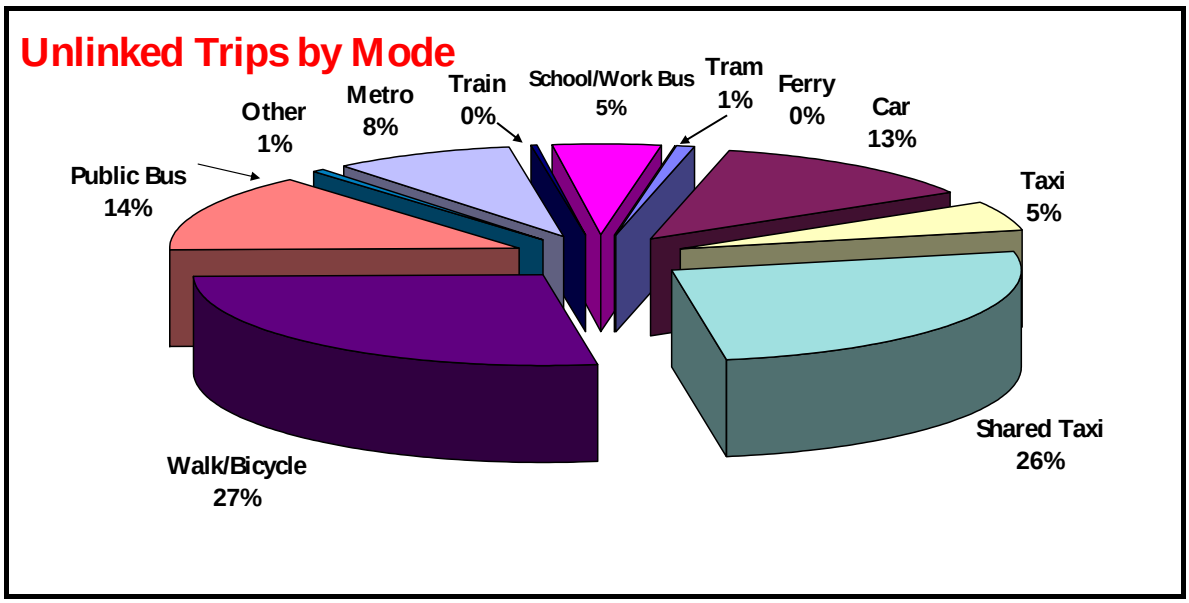
Whist in Figure 4.6.3 and Figure 4.6.4 the proportion of trips by mechanized mode is presented respectively for unlinked and linked trips. The same presentation is depicted in Figures 4.6.5 and Figure 4.6.6 for unlinked and linked trips by major mode. The major mode of mechanized linked trips is shared taxi with a 25% share. This is an even higher share, 36% of the unlinked trips. The car share of linked trips at present is 18%.

Currently car and taxi represent only 29% of linked person trips with the remaining trips are using the various public transport mode.

Table 4.6.4 Comparison of Unlinked and Linked Mechanized Trips by Major Mode

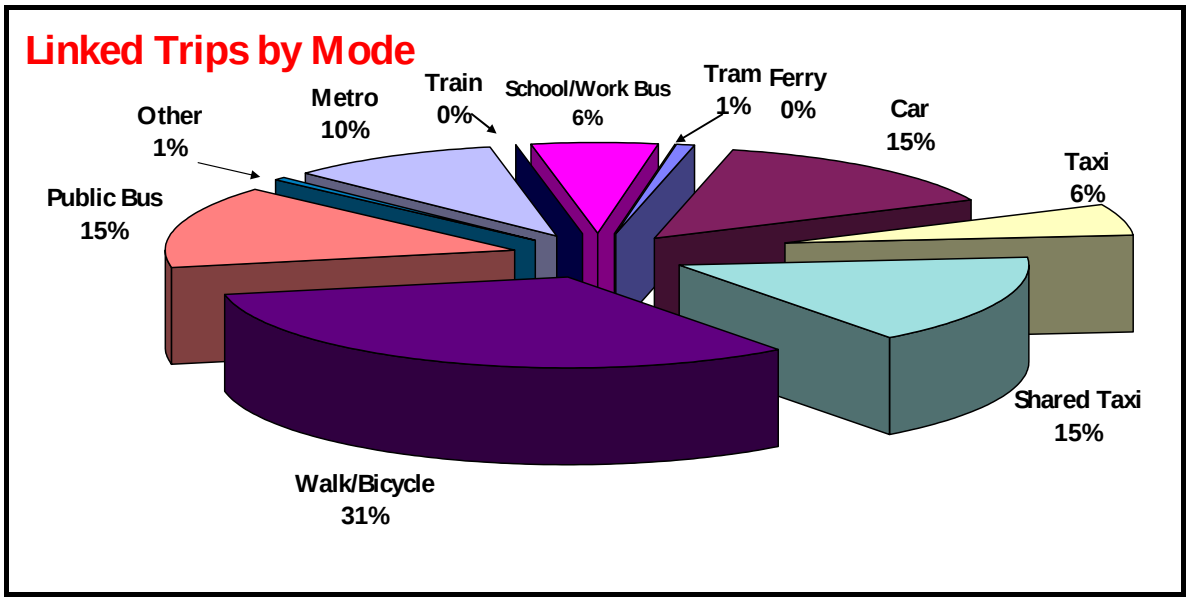
Mode of Travel	Linked Trips	Unlinked Trips
Walk	6,676,244	6,676,244
Bicycle	50,480	60,065
Motorcycle	129,400	134,749
Car Driver	2,069,202	2,130,696
Car Passenger	669,725	697,214
Pickup for Passenger	60,889	159,112
Taxi	1,153,993	1,284,847
Shared Taxi	3,422,550	6,507,758
Public Minibus	374,339	425,826
Public Bus	2,514,470	2,858,548
Public Bus A/C	181,483	199,452
Co-Op Minibus	114,469	125,645
Work Car	96,582	110,587
Work Bus	635,526	698,760
School Bus	556,209	564,967
Truck	22,063	45,632
Nile Ferry	6,514	11,469
Tram	45,604	57,032
Heliopolis Metro	103,025	118,339
Metro	2,006,266	2,060,621
ENR Train	48,823	77,948
Animal Drawn	7,399	7,757
Other	25,038	42,603
TOTAL	20,970,291	25,056,305

Source: JICA Study Team



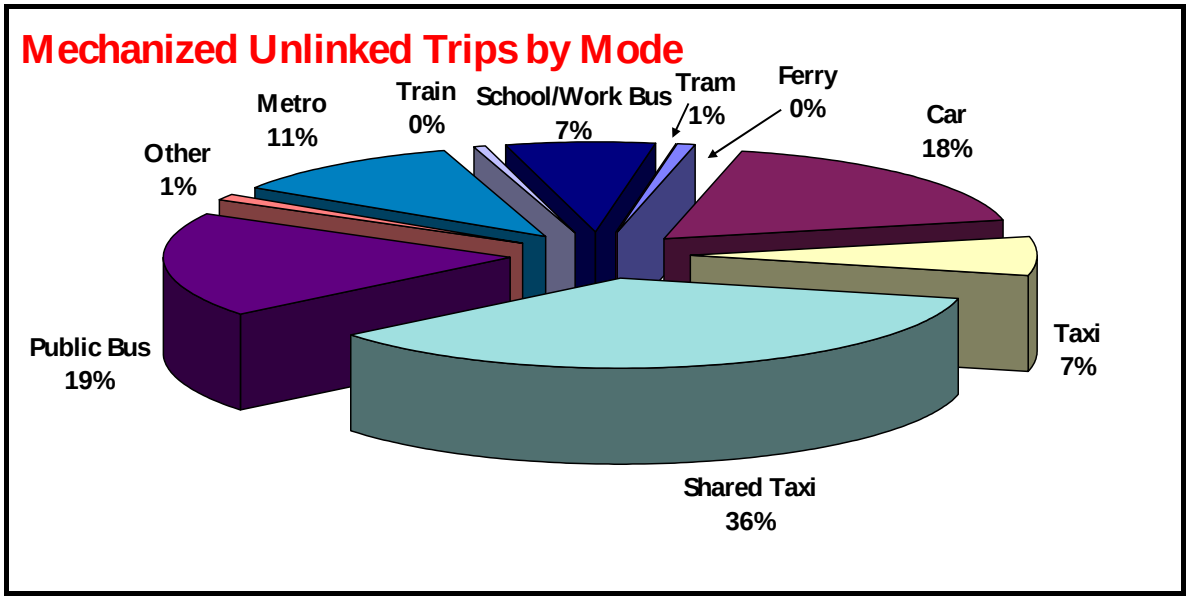
Source: JICA Study Team

Figure 4.6.1 Unlinked Trips by Mode



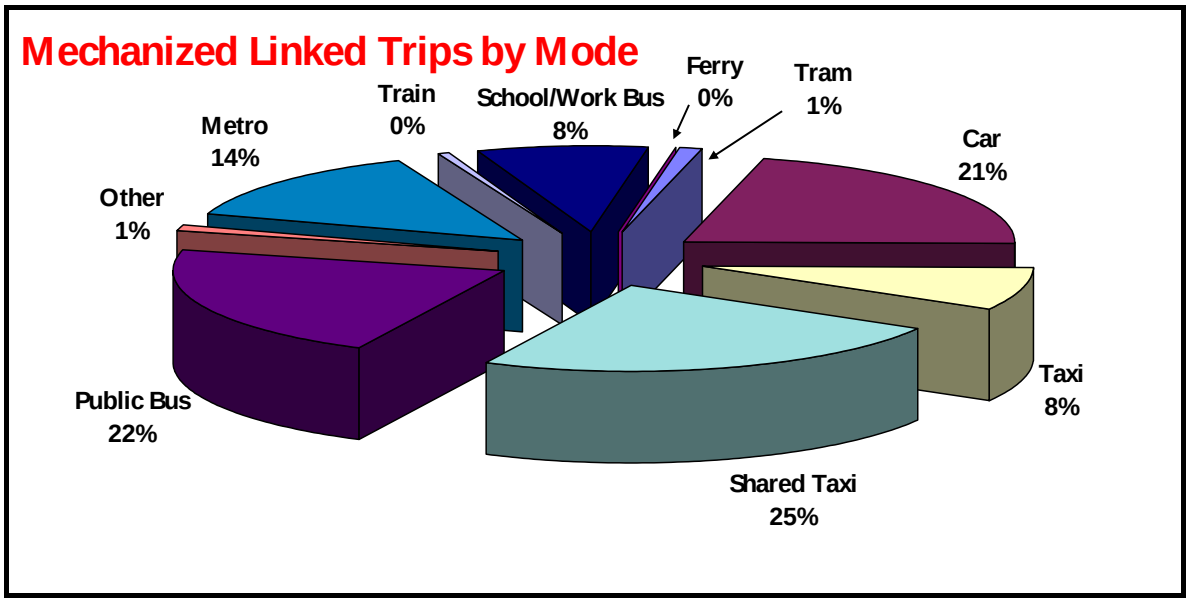
Source: JICA Study Team

Figure 4.6.2 Linked Trips by Mode



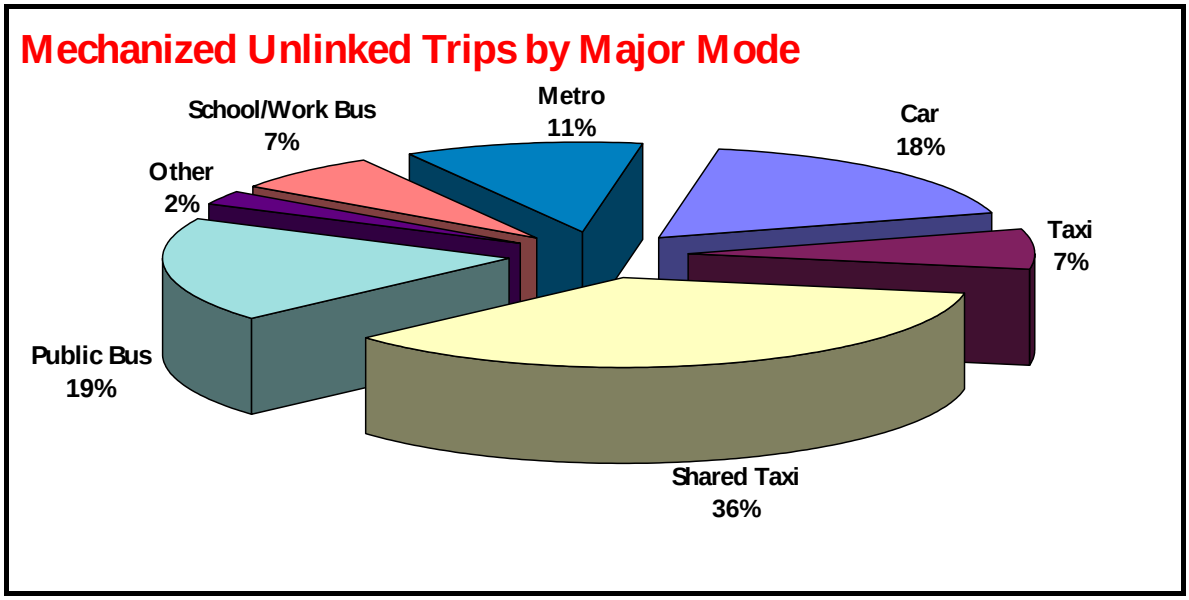
Source: JICA Study Team

Figure 4.6.3 Mechanized Unlinked Trips by Mode



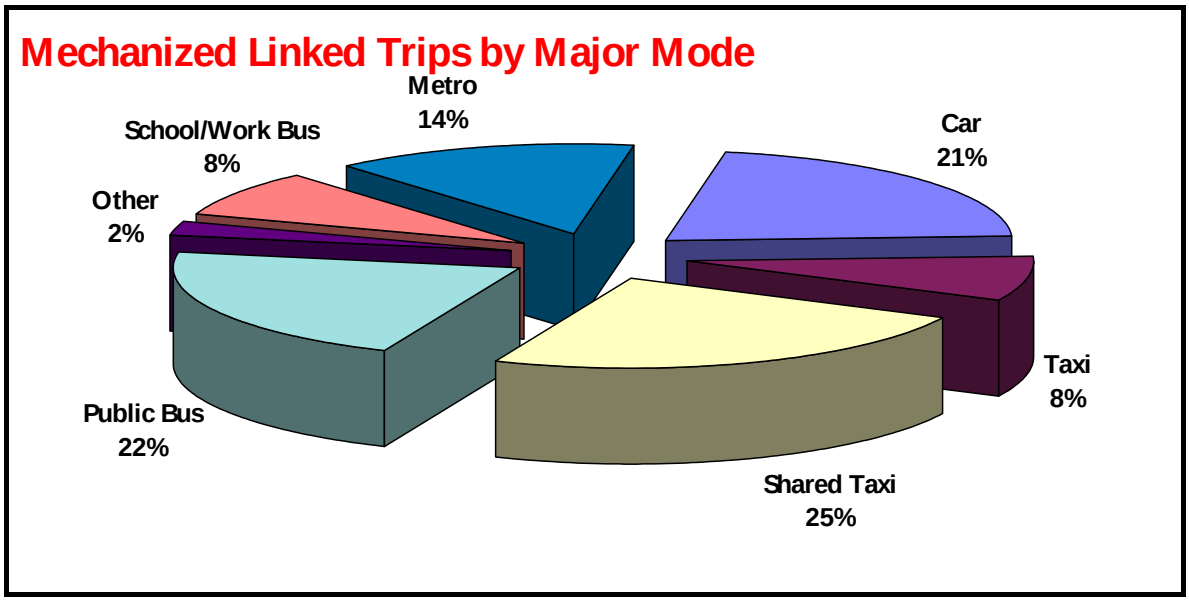
Source: JICA Study Team

Figure 4.6.4 Mechanized Linked Trips by Mode



Source: JICA Study Team

Figure 4.6.5 Mechanized Unlinked Trips by Major Mode



Source: JICA Study Team

Figure 4.6.6 Mechanized Linked Trips by Major Mode

The average length of any trip is presented in Table 4.6.5 by all modes. The average trip length across all modes is 8.2 km. If a person is making a walk trip, this is on average a shorter trip with the overall average of 2.7 km. as many walk trips are intra zonal trips (70%), the effective average trip length is likely even shorter than this. The person who makes a walk trip will not necessarily follow

the shortest road distance. For public transport trips by shared taxi the average trip length is approximately 10 km. which is shorter than the metro trips which are just over 14 km.

Table 4.6.5 Average Linked Trip Length in Kilometers

Mode of Travel	Average Trip Length
Walk	2.7
Bicycle	6.4
Motorcycle	9.0
Car Driver	10.7
Car Passenger	8.2
Pickup for Passenger	10.6
Taxi	6.7
Shared Taxi	10.1
Public Minibus	9.2
Public Bus	10.1
Public Bus A/C	21.3
Co-Op Minibus	11.4
Work Car	14.3
Work Bus	18.4
School Bus	7.3
Truck	9.1
Nile Ferry	14.1
Tram	8.1
Heliopolis Metro	8.3
Metro	14.4
ENR Train	25.1
Animal Drawn	4.3
Other	8.8
Average	8.2

Source: JICA Study Team The travel distance is estimated from the transport road network for every possible combination of origin and destination internal to the Study Area.

4.6.3 Bus Optimization Procedures and Route Passenger Loadings

Bus route optimization procedures are presented in Section 4.3.7. This discussion point focuses on whether or not there exists a need to develop, as part of the optimization process, detailed load profiles of those existing bus routes seen as being candidates for optimization.

Recommendations regarding optimized bus services should, within a Supertram Line 1 intermodal connotation, be considered indicative in nature since bus operations reviews, and changes thereto, must be based on existing (year 2003) services. However, the supertram can, at earliest, be operational only by year

2007. Thus, in the intervening four years, considerable evolution of the existing bus network, and perhaps the CTA itself, can be expected. Indeed, some bus route changes have already been noted at time of documentation (October 2003) from those of the analytical period (April 2003). This point is also noted in the Steering Committee Minutes of Meeting of 23 September: "… investigations should focus on the core issue, that is, the implementation of the supertram. Analyses pertaining to feeder buses should be seen in an indicative light, given that the supertram will likely not be operational until year 2007. Feeder bus issues can only be addressed with confidence once the supertram is nearer to completion".

One of the very strong inputs the Team received from the Committee and the CTA is that passengers on existing standard routes are not candidates (or cannot afford to) transfer to the supertram, which is considered a premium public transport system. The existing standard routes should therefore remain as is. In other words, passengers on existing standard route structures are not seen as candidates for using (transferring to/from) the supertram. Thus, conducting a lengthy and expensive load profile survey of numerous existing routes can only be considered as interesting in terms of defining travel patterns of passengers not seen as being clients for the supertram, but certainly not required to achieve the stated objectives of the mission.

The Study Team concurs that existing standard routes should remain as are. Instead, the core of the CREATS feeder bus recommendation consists of new air conditioned premium bus services, thus placing them on-par with the premium service supertram. These can best be evaluated using a tool such as the CREATS model. It should be noted that CREATS Transport Model, which is based on dividing the study area into 525 traffic zones, was used to evaluate the model results of different bus route optimization alternatives.

In conclusion, feeder bus services can only be addressed with certainty and confidence once the supertram is closer to actual operation. When might be an opportune time to conduct load profile surveys? The Study Team would estimate six to twelve months prior to opening of the supertram depending on the structure of the then-existing route network, and of the CTA itself.

4.6.4 Integrated Ticketing

Section 4.4.2 presents, in the first instance, an overview of study-area wide impacts upon public transport ridership due to integrated ticketing, based on investigations conducted during Phase I. Subsequently, the presentation focuses upon integration needs of the supertram and other systems, in particular its feeder buses. The discussion point relates to whether or not additional information regarding benefits of integration should be presented in the Phase II report, and the linkage of joint ticketing policies of the supertram with that of other metropolitan operators.

The academic evaluation of joint ticketing in Cairo has been conducted numerous times. This includes Phase I of CREATS (using the full capabilities of the CREATS transport model), as well as various earlier studies among them the

DRTPC/Systra Fare Policy Study of 1995. The conclusions of these efforts, as well as a vast amount of international literature, confirms that integrated ticketing, as part of a multi-modal approach to the provision of public transport services, is positive in the sense that implementation should be pursued. Section 4.4.2 very briefly summarizes such conclusions, based on study area-wide evaluations conducted as part of Phase I. It is not necessary to once again repeat or redo yet more academic tests of this topic within the framework of the feasibility study; the expected conclusions are well known and accepted.

Instead, the feasibility study must focus on what is reality; that is, how can efforts move forward from an academic base to actual implementation? The fact is, that despite best efforts, serious steps toward a metropolitan-wide integrated ticketing system in Cairo have not happened even though the benefits of such a move have amply been demonstrated via CREATS Phase I and earlier studies. Furthermore, it is unlikely to happen in the foreseeable future. Why? Firstly, there is little institutional cooperation among the different agencies planning and operating public transport services. Secondly, current fare policies of the individual modes do not facilitate cooperation among the various operators. Fares and subsidy structures of the different modes are set in isolation of each other. The pending creation of the Central Transportation Authority for Cairo will, once established within a secure political and organization framework, serve as a catalyst for ushering in metropolitan-wide unification of services, in the true meaning of the term.

The implementation of Supertram Line 1 can, in comparison to creation and full functioning of the Central Transportation Authority for Cairo, proceed very quickly. It is essential therefore that the project not be lumbered with unrealistic constraints (or expectations) such as being responsible for, or linked with, metropolitan-wide reforms involving all operators. However, as previously discussed and as noted in Section 4.4, Supertram Line 1 is a unique opportunity to begin the process of integrated ticketing as an initial step, which will hopefully lead to additional steps over time involving other modes.

One of the main reasons why Supertram Line 1 and its feeder bus system are seen as being particularly promising in terms of the first hesitant steps in Cairo toward intermodal ticketing is that, quite possibly (but not necessarily so), both the supertram and the buses will be lodged under the jurisdictional umbrella of the CTA. This, in essence, overcomes the two noted major hurdles.

Thus, the realization of an intermodal ticketing process, however modest, must absolutely, in light of the fragility of the concept in Cairo, rely on those norms and practices which can be accepted by local operators with a minimum of technical and procedural objections, while concurrently meeting operational goals. The system need not be perfect from an international perspective, but must be quickly doable and acceptable under local conditions and within a framework of reasonable expectations.

This is the concept central to Section 4.4.2; that is, a ticketing system for the supertram and its feeder bus network which is doable given local norms and

practices. More extensive integration (hopefully fueled by the supertram/feeder buses success story) is likely in future; further, advanced technologies are available as discussed in Section 4.4.4. But these broader approaches and technologies can only be introduced over time, under largely controlled conditions, and more likely within the framework of more extensive intermodal ticketing involving the full spectrum of urban public transport operators.

CHAPTER 5

ORGANIZATIONAL AND INSTITUTIONAL REFORM OF THE CAIRO TRANSPORT AUTHORITY (CTA)

CHAPTER 5: ORGANIZATIONAL AND INSTITUTIONAL REFORM OF THE CAIRO TRANSPORT AUTHORITY (CTA)

Previous chapters have dealt with the hardware and software aspects of transport improvements in the East Sector of Cairo, with a particular focus being the implementation of Supertram Line 1. Chapter 5 now addresses the third element of an integrated approach - humanware issues - which is presented within a context of institutional and organizational changes related to the commercialization of the CTA. The underlying structural, institutional, organizational and human resources components of an integrated approach to change are inexorably linked. Structural changes within the organization, critical in terms of transforming the Authority, are closely tied to the possible way this relates to the formation, in terms of organization and staffing, of the company ultimately responsible for operating the new Supertram Line 1, possibly under the jurisdictional umbrella of a commercialized CTA. The necessary development of expertise among the personnel of CTA, Supertram and other modes, having always been seen in an important (if locally lacking) perspective, assumes an even more central role as part of the institutional and organizational restructuring process.

Following an overview discussion of this integrated approach (Section 5.1), analyses are presented at various levels of detail. Initially, as documented in Sections 5.2 through 5.4, the structural reform framework is presented for the CTA as an entity. Subsequently, in Section 5.5, an organizational plan for Supertram Line 1 is defined based on a commercialized approach to the provision of public transport services. The supertram organization, conceived within the jurisdictional umbrella of Cairo Governorate and possibly as an element of a proposed CTA Holding Company, can be seen as a staged element along the path to full CTA commercialization. A human capacity building program, described in Section 5.6, focuses on the conditions for establishing a sustainable training program. The proposed training program, as well as the approach to formally establishing the training program, takes into account Supertram Line 1 development as well as the planned structural changes for CTA. Further, it is anticipated that these steps are only part of a more comprehensive modernization of public transport in Cairo. An implementation plan is subsequently discussed in Section 5.7.

5.1 AN INTEGRATED VIEW ON ORGANIZATIONAL AND INSTITUTIONAL REFORMS

5.1.1 Why an Integrated View?

The institutional and organizational reform of the CTA is one of the most urgent priority programs identified by the CREATS Phase I Transport Master Plan. This issue is complex as clearly stated in the *Phase I Final Report*: "*No single remedy can be expected to comprehensively address such concerns, instead, a more holistic approach is needed. Herein lies the challenge for CREATS; innovative solutions are needed whose practicality can be viewed through the prism of existing realities. The transport strategy embedded in the Master Plan must not only address cornerstone issues such as infrastructure, policies and human resources, but concurrently contribute to an efficient economic structure of the region, strengthen linkages with other parts of Egypt as well as neighboring countries, and provide a base for market-oriented transport activity.*"[1] The concern voiced related to the improvement of transport in Greater Cairo, with an emphasis on public transport as catalyst for guaranteed mobility for all.

Given this wide scope of directly and indirectly related measures needed, CREATS strongly emphasized the importance of simultaneously addressing the hardware, software and humanware components of transport in Cairo. The main objective of this integrated approach is to ensure that changes in one component will be followed, supported and strengthened by changes in the other components therewith ensuring that the return on any investment will be maximized. The integrated approach will also ensure that the implementation logic of the CREATS priority projects and programs is maintained.

The Master Plan identified six fields for priority investments that relate to a wide variety of issues and modes (metro, LRT, cargo transport etc…). One of the six priority fields includes the "*soft measures*" for which the Study Team argued: "*Soft measures as proposed in the priority list are generally less difficult to implement in spite of their substantial short-term benefits. The most important and urgent projects relate to the restructuring and modernization of public transport. These projects should commence as soon as possible to ensure that later investments in hardware and/or software can be successful. The expertise and knowledge of the managers and operators is essential for successful operations in the future*"[2].

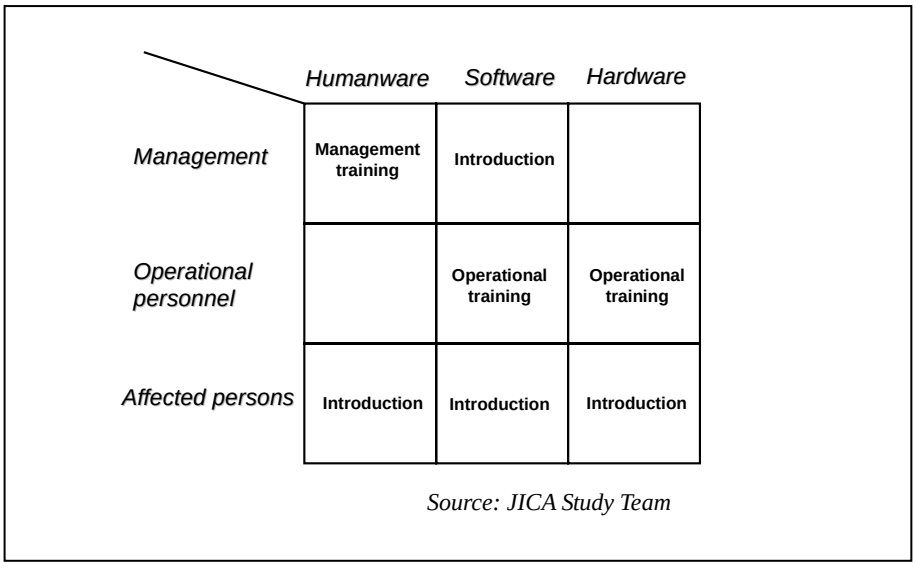
During Phase II of the study, the institutional and organizational reform of the CTA and the development of Supertram Line 1 constitute important parts of Program B. The project was a direct reflection of the integrated approach suggested in the CREATS Master Plan given that the CTA is the largest government provider of public transport services in the metropolitan region and that its role in guaranteeing mobility to all persons is essential.

[1] *CREATS Phase I Final Report; Volume III*, op. cit. Chapter 11, pg. 11-2
[2] *Ibid*. Chapter 11, pg. 11-58

5.1.2 Human Resources Development: An Integral Part of Structural Reforms

The CTA organizational and institutional reforms program proposes a wide range of changes to the existing working environment. These changes affect personnel directly and indirectly and will therefore require measures ensuring that all proposed reforms are understood, assimilated and implemented in a correct manner by all personnel. That implies that a comprehensive human resources development plan needs to be put in place that addresses all components of the proposed reform measures at the humanware, software and hardware levels. This also means that all personnel of CTA will have to be introduced to the new measures and training programs have to be developed which meet the expertise requirements, not only of operational and managerial staff but also of persons indirectly affected by the changes.

As illustrated in Figure 5.1.1, various training courses will be required to ensure that the structural reforms of the CTA will be effective and personnel will adapt to proposed measures. Furthermore, in developing training for managerial and operational staff of CTA, ongoing and existing training programs will have to be taken into consideration to ensure that they remain up-to-date and do not conflict with proposed changes.



Source: JICA Study Team

Figure 5.1.1 Integrated View on CTA Human Resources Development

But CREATS Phase II not only considers CTA reforms, but also addresses the development of Supertram Line 1 (as the core of Program B), the establishment of efficient public transport connections with 6th of October City and 10th of Ramadan Cities, as well as a traffic management program for the corridor along proposed Metro Line 4 (all being components of Program A). Given the introduction of new techniques and technology related to the implementation of Supertram Line 1, of the satellite city connections and of the traffic management program, expertise building and training will constitute an integral part of these developments.

Furthermore, CREATS Phase II is only the first step in a comprehensive reform program according to the recommendations and developments proposed in the CREATS Transport Master Plan. These recommendations and developments do not only focus on infrastructure (hardware) but also address the introduction of new technologies (software) and institutional reforms and attitude changes (humanware). Many of these proposed measures will also require training and expertise building programs to ensure that all personnel will be capable to manage and / or operate the new transport system throughout Greater Cairo.

The Study Team therefore proposes an integrated approach that addresses in the first instance the expertise building needs attached to the CTA reform program, but simultaneously considers training needs related to the development of Supertram Line 1. Under this integrated approach, these direct needs are incorporated in a more comprehensive human resources development program that is capable of growing in a coherent manner with future changes in the transport system while meeting the goals and objectives specified in the CREATS Transport Master Plan.

5.1.3 A Modular Approach for Long Term Sustainability

(1) The Context

It is proposed that the Cairo public transport system undergo an in-depth restructuring and reorganization process. The program foresees over time the introduction of new services such as the supertram; new operational techniques such as modern ticketing technology; as well as a CTA restructuring and organizational reform that includes a re-allocation of staff and the introduction of new transport services. The time is therefore right for developing an adaptive and comprehensive training program to support these dramatic changes at three different levels:

- Level 1: Time-specific training programs supporting the CTA restructuring program and the introduction of Supertram Line 1.
- Level 2: General training programs covering future expertise needs of managerial and operational staff at all levels of the public transport system. These programs can focus on specific topics whenever the need emerges.
- Level 3: Dedicated training programs to support and facilitate the introduction of new services, new technologies and innovative equipment in future;

(2) A Phased Implementation

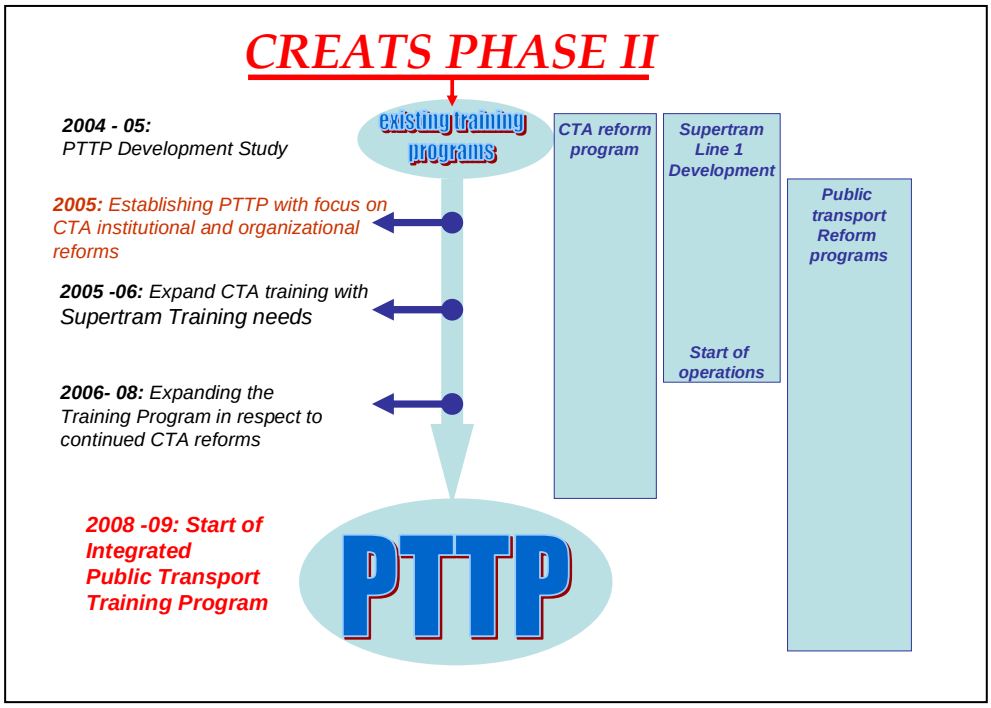
CREATS reports have stressed many times the importance of humanware in the successful transformation of public transport in Cairo into a modern and integrated system. In particular, it was also made clear that the introduction of Supertram Line 1 and other modern public transport systems requires the introduction and use of modern and automated techniques and technology, and that these modern systems can only be beneficial if they are operated and

maintained correctly. The same modern skills will be needed to efficiently function within the context of a restructured and modernized CTA.

The proposed establishment of a modern Public Transport Training Program (PTTP) coincides with two important initiatives that could be considered the starting phase of a long-term modernization program for Cairo's public transport system, namely:

- The CTA restructuring program; and,
- The planned development of Supertram Line 1 and other systems.

Figure 5.1.2 visualizes a possible timeframe for the creation of the future PTTP that takes into account these initiatives.



Source: JICA Study Team

Figure 5.1.2 Timeframe for the Establishment of the PTTP

The development of an integrated PTTP should be started as soon as possible in order to support CTA restructuring and to guarantee that the necessary expertise will be available at the time of Supertram Line 1 implementation. Starting the study early is also imperative because the study could take up to one year and additional time is necessary for approving and realizing the regulatory, financial and operational requirements and to prepare training materials and "train the future trainers".

But the modernization of public transport in Cairo is not complete after Supertram Line 1, the CTA restructuring program or the new public transport services within, for instance, both Wings. Other initiatives and modernization programs will follow to achieve the necessary integration of public transport services. It is therefore advised that the humanware factor, and in particular the building of

expertise is considered and integral part of this modernization program. The establishment of the PTTP should therefore be done parallel with the sequential initiatives that will modernize public transport in Cairo and gradually establish the public transport system of the future.

The Study Team therefore strongly argues for the urgent implementation of a detailed PTTP development study which would determine the context and requirements for establishing a sustainable and comprehensive public transport training program, which can guarantee the availability of the necessary theoretical expertise and practical skills.

(3) A Modular Approach

Transport infrastructure development, combined with technical and technological innovations and organizational restructuring, will create over time a modern public transport system for Cairo. But this system will only work properly of it is managed, maintained, and used by personnel mastering the appropriate know-how.

The lack of well-trained staff is recognized by an increasing number of professionals and public representatives who argue that the growing structural and operational complexity of the public transport system in the Greater Cairo Region implies that sustainable expertise building is an issue that has to be *urgently* attended. Professional training and career re-orientation (accompanied by appropriate re-training programs) will prepare and assist the successful introduction of modern equipment, techniques and technologies in Cairo's integrated public transport system of the future.

A comprehensive human resources development program for public transport should therefore be organized in such a way that cooperation with all the stakeholders is direct and efficient, ensuring that the training programs cover the expertise needs of all personnel managing, maintaining and operating Cairo's public transport system.

To be efficient and effective, concentration and rationalization of training efforts is a key objective. A rational approach will allow training efforts to grow with the public transport organization(s) and over time to expand from a specific and targeted training objective (training personnel for the CREATS Phase II projects) to cover over time all needs and requirements of public transport in the Greater Cairo Region.

To guarantee the quality and efficiency of the training programs and courses for public transport personnel in the long-term future, some important principles will have to be applied. The programs and courses have to be **modular – based**. The modular approach means that the curricula of the training program are split up in independent sessions, which are elaborated with consideration taken to future needs of Cairo's public transport system. The modular approach has several advantages in comparison with a more traditional approach. First, it allows more flexibility, thus securing a training, which answers to the specific needs of the

public transport system now and in the future. Second, it is more efficient, since it allows an individual approach that crosses over individual public transport modes and systems, providing trainees exactly the skills and knowledge in accordance with their professional activities. Third, it allows to easily adjust the training programs to a changing surrounding, and also allows employees to complement earlier knowledge with new know-how or re-train for operating under new conditions. Fourth, it ensures that training courses are developed making use of modules and course parts, (building-block principle), guaranteeing that the training program covers the entire spectrum of personnel. Fifth, that specialized and dedicated training modules can be made available as soon as it is considered opportune to introduce modern learning techniques.

The training programs should be based on the conditions and functioning of Cairo's present and future public transport system. During training, consideration will be given to existing operating conditions and of social and structural conditions of public transport. But the training programs will constantly prepare personnel for the introduction of new operational and managerial equipment, techniques and technologies which are foreseen as part of the public transport modernization efforts. The confrontation of what is and what will be can help personnel to acquire the necessary new expertise or to re-orientate their existing know-how to efficiently perform their professional duties.

5.2 PRESENT ORGANIZATION OF THE CTA

This section presents a profile of the current CTA organization, to include an identification of strengths and weaknesses. This is followed in Section 5.3 by a presentation of comparative case studies of public transport restructuring in other countries. Subsequently, in Section 5.4, proposals for CTA restructuring are presented. These proposals are augmented in Section 5.5 by a more detailed description of an organizational plan for Supertram Line 1 as seen within the context of a commercialized approach to the provision of public transport services. The supertram organization, conceived within the jurisdictional umbrella of Cairo Governorate and possibly as an element of a proposed CTA Holding Company, can be seen as a staged element along the path to full CTA commercialization.

5.2.1 Legal Status of the CTA

A series of decrees have been issued which clarify the legal status of the CTA.

- Presidential Decree N°1360 in 1959 specifies that:

  a) A public authority will be established under the name of Cairo Transport Authority (CTA).

  b) CTA will be independent and manage its own budget.

  c) CTA capital is owned by the government.

  d) CTA will be operating in Cairo Region.

- Presidential Decree N° 1891 in 1964 specifies that:

  a) The CTA is a public enterprise and is operating in Cairo Region.

  b) The aim of the Authority is to offer better service to passengers in Cairo and Giza.

  c) The CTA will be supervised by the army commander which will have the full authority to take any decision concerning the CTA.

  d) CTA balance sheet is included in the army balance sheet.

  e) The Presidential Decree Nº 1360 in 1959 is cancelled.

  f) The Board of Directors has to provide financial supervision. The Central Organization for Information and Statistics will control the financial documents.

  g) The CTA will be funded through (i) income from tickets, (ii) subsidies from the Government and (iii) other organizations or authorities accepted by the Board of Directors such as Ministry of Housing and Ministry of Transport.

- Presidential Decree N°3576 in 1965, stipulates that the CTA will be under the supervision of the Ministry of Transport.

- Presidential Decree N° 141 in 1971, specifies that the CTA is part of the Cairo Governorate and that Cairo Governorate will have the authority to take any decision concerning the CTA instead of the Ministry of Transport.

5.2.2 Legal Status of the GCBC

The Greater Cairo Bus Company (GCBC) was established under **the Presidential Decree N°176 in 1978, which indicates that:**

- The GCBC is a subsidiary company part of the CTA; and,
- The GCBC will offer transportation services in Greater Cairo and the tariffs will be decided by the CTA.

Under the **Presidential Decree N°159 in 1984,** the CTA has the authority to supervise the GCBC which is considered to be included in the CTA.

5.2.3 Organization charts of CTA

The organization chart (Figure 5.2.1) represents the CTA Non-operational Departments, that means mainly the administrative departments; while the organization chart (Figure 5.2.2) shows the CTA Operational Departments which actually operate the buses, minibuses, air conditioned buses, compressed gas buses, CTA tram, Heliopolis Metro and Nile ferries.

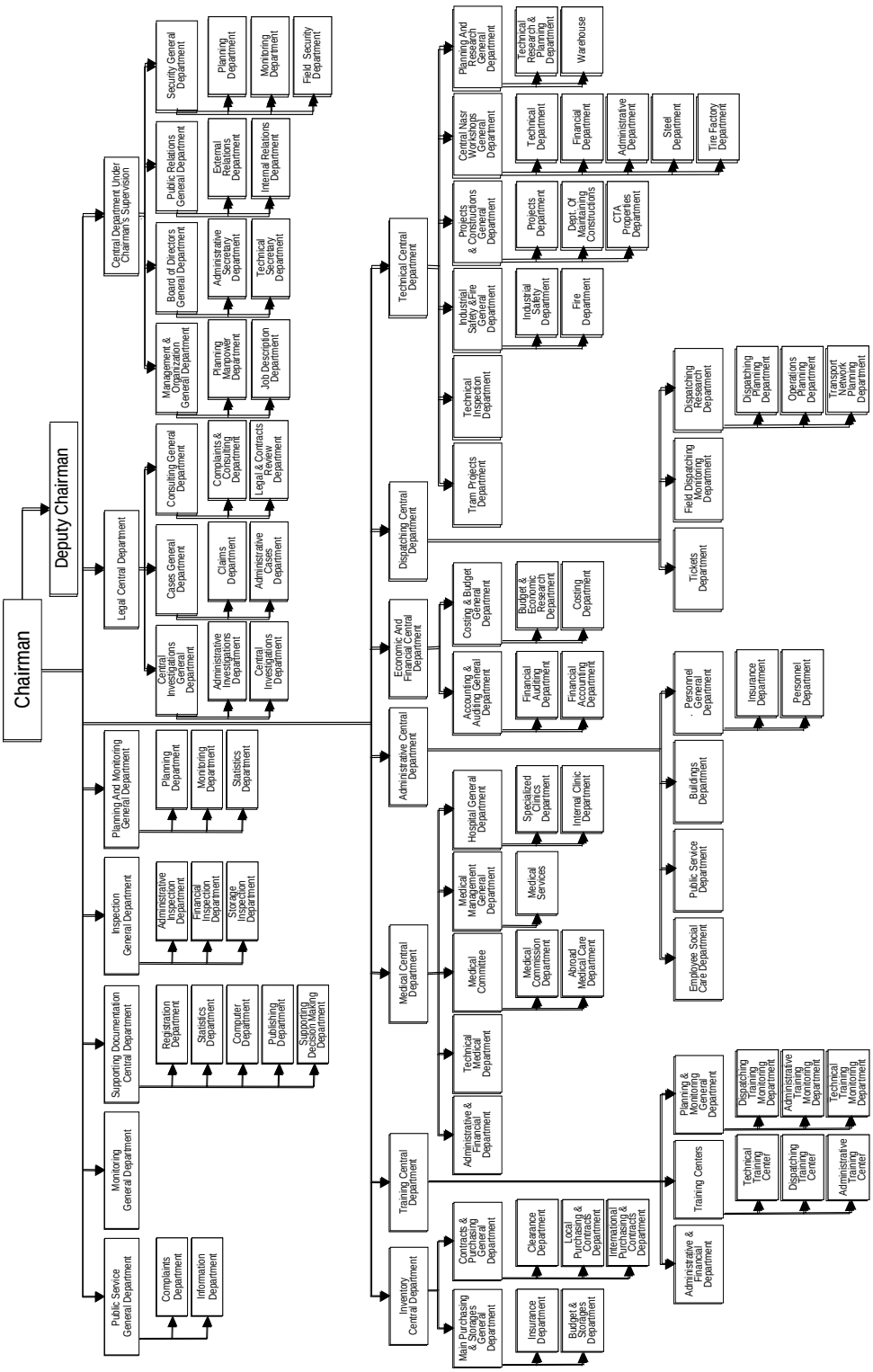


Figure 5.2.1 CTA Non Operational Departments

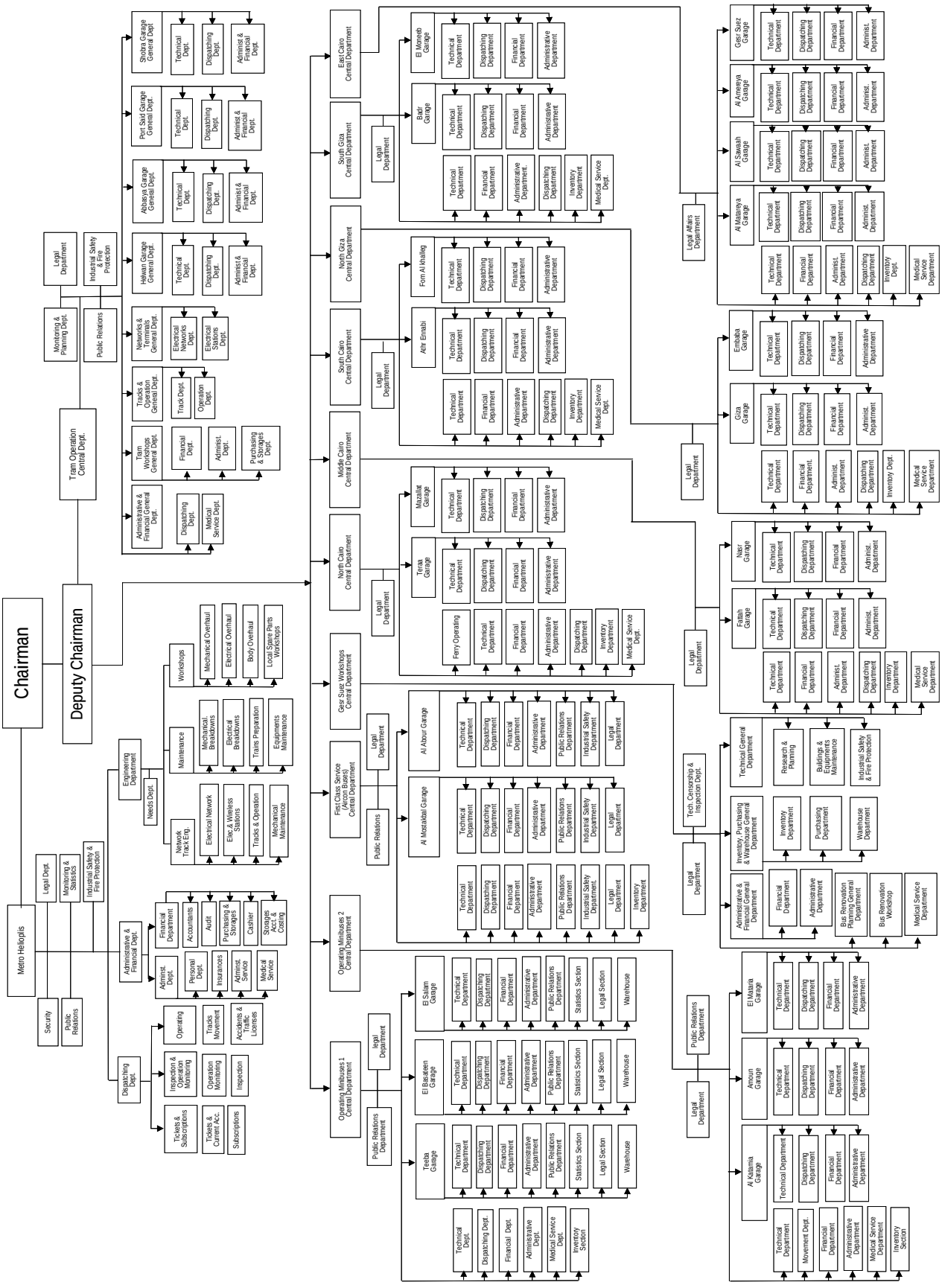


Figure 5.2.2 CTA Operational Departments

5.2.4 CTA Constraints

(1) CTA is Overstaffed

The most recent data available confirm that 45,800 persons are employed at the CTA (Table 5.2.1). The air conditioned bus, gas bus, regular bus and minibus fleet typically placed into operation (estimated at 85 percent of the total fleet) averages near 3,900 units thus suggesting an average of 11.7 employees per active bus. A more refined approach is to remove persons employed in the Heliopolis Metro, CTA Tram and Nile Ferries from the CTA total. This yields, per Team estimates, some 39,000 persons, still a substantial ratio of 10.0 employees per active bus.

Table 5.2.1 Total Number of CTA Employees

Central Department	Administrative	Technical
CTA Headquarters	1913	2328
Nasr Workshops Central Department	182	1252
Gesr Suez Workshops Central Department	118	1057
East Cairo Central Department	377	4150
Middle Cairo Central Department	355	3824
North Cairo Central Department	483	5433
South Giza Central Department	277	3307
North Giza Central Department	323	3049
South Cairo Central Department	312	3010
Tram Central Department	342	2695
Minibus 1 Central Department	332	2715
Minibus 2 Central Department	339	2591
Aircon Bus Central Department	222	1493
Total	**5575**	**36904**
Total	**42479**	
Metro Helioplis	**3323**	
Total	**45802**	

Source: JICA Study Team and CTA

A comparison of staffing levels among international operators was conducted using available records from 107 operators which provide bus services only. The initial finding, based on continental averages, suggests a world-wide average of some 3.5 employees per active bus. However, variations are obvious. For example, lowest ratios are found in Oceania, Europe and North America with typical values of 2.3 to 2.9 employees per active bus. The highest average ratio is Asia, some 5.8 persons per active bus (Figure 5.2.3). The lower ratios in developed countries can most likely be attributed to more modern, automated

systems, higher employee productivity and more stringent fiscal controls due to higher wage structures.

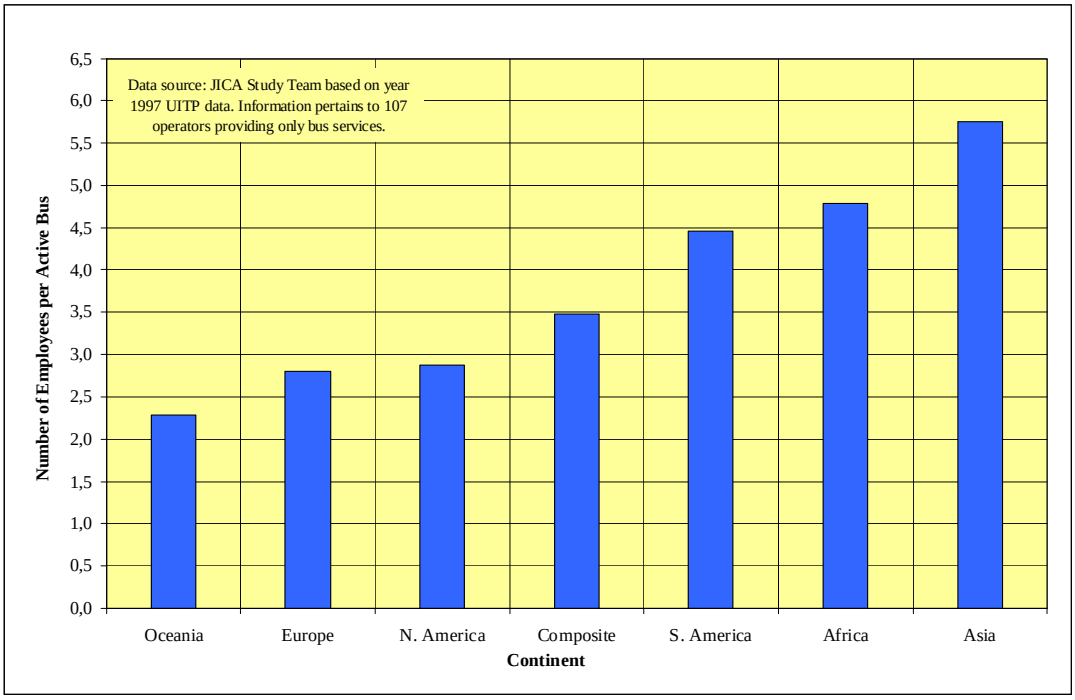


Figure 5.2.3 Average Number of Employees per Active Bus by Continent

Variation is also encountered, not surprisingly, among individual operators. For example, some of the highest ratios noted among the 107 operators are for enterprises in India and Africa: between nine and almost 12 employees per active bus (Table 5.2.2).

Table 5.2.2 Number of Employees per Active Bus
Bus Operators with High Employment

City	Employees	Active Fleet	Ratio: Employees per Active Bus
Bombay (India)	38,072	3,228	11.8
Pune (India)	2,147	202	10.6
Ahmedad (India)	6,101	598	10.2
Accra (Africa)	922	98	9.4
Abidján (Africa)	4,304	476	9.0

Source: JICA Study Team based on UITP data.

However, in general, the relative ratio pattern tends to adhere to continental averages with lowest ratios found for operators in developed countries (Figure 5.2.4). It is also interesting to observe that even large operators can have moderate numbers of employees. For example, Sao Paulo has huge numbers of staff (59,873) and a active buses (11,843), yet the ratio of number of employees per active bus stands at only 5.1.

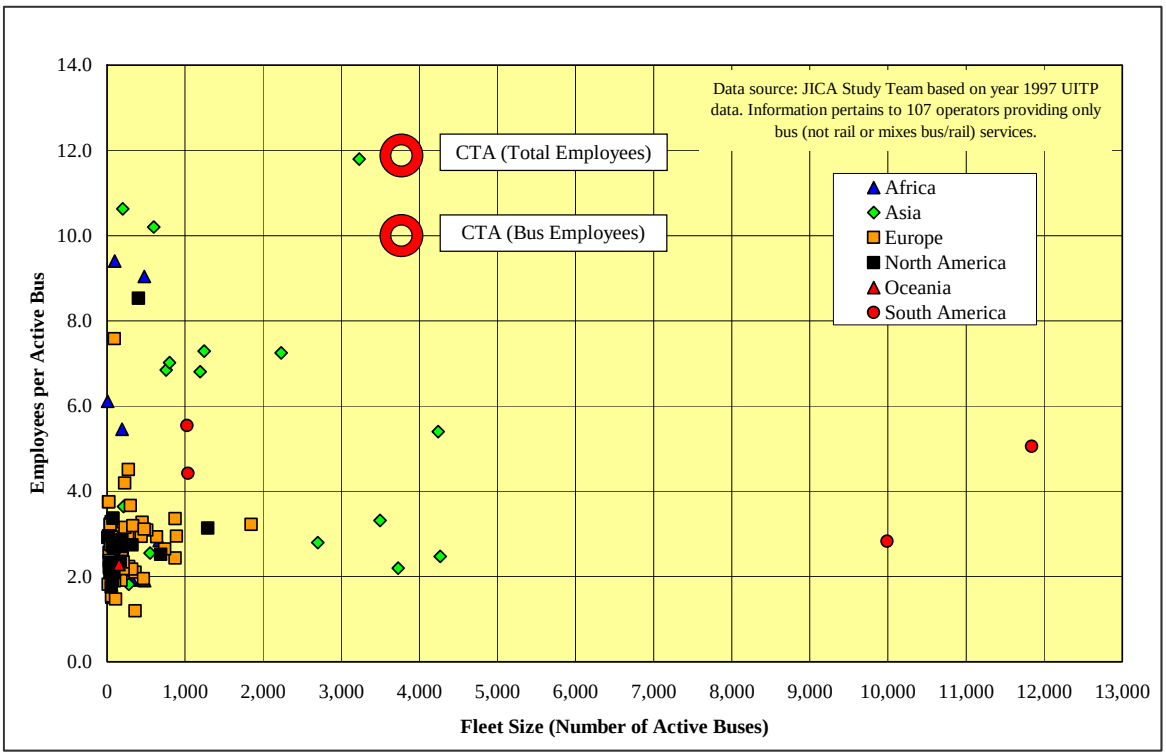


Figure 5.2.4 Average Number of Employees per Active Bus by Operator

What is clear from the international operator comparison is that the CTA ratios, regardless of whether total employees per bus or bus employees per bus are used, are excessive by international standards. In fact, the CTA employees per active bus ratios can be considered among the highest found relative to other international operators.

This leads to the clear conclusion that, based on international precedence, the CTA is overstaffed.

(2) Financial Performance

The CTA, as a government entity, is considerably constrained by existing policies which, from a public transport operations perspective, influence financial performance and cash flow. These policies, in effect, dramatically limit the opportunity for operations-specific management decisions; rather, operations decisions can only be made in accordance with externally (and politically) approved financial procedures. The CTA is thus totally reliant upon Government for financial shortfalls and, along with other Ministries, departments and organizations, must compete each year for scarce domestic resources in the political arena. As a result, near and long-term tactical as well as strategic planning for the provision of urban public transport services (operations, maintenance, fleet modernization) is severely constrained (if not pre-empted) by uncertainties in funding.

Data for the most recently available fiscal year (ending 2002) provide an overview as to CTA financial performance for that period (Table 5.2.3). Key observations include:

Table 5.2.3 CTA Cash Flow Summary: Fiscal Year 2002

Cash Flow[1]		Amount (Thousand) by Operating Entity						
Category	Item	Bus	AC Bus	Minibus	Nile Ferry	CTA Tram	Hel. Metro	Total
Income and Activity	Annual Passengers[2]	597,467	8,618	135,445	2,908	15,931	29,223	789,592
	Annual Revenue Kilometers[3]	170,491	8,627	55,010	473	3,441	2,664	240,706
	Annual Revenue [4]	174,083	17,360	62,447	989	3,956	7,633	266,468
Outlay	Wages[5]	168,334	5,123	28,072	4,802	18,339	27,000	251,670
	Operational Consumption[6]	130,465	6,011	27,939	1,340	12,675	10,020	188,450
	General Consumption[7]	13,740	289	4,507	435	265	1,023	20,259
	Transfer Payments[8]	10,569	37	4,640	2	2,056	1,208	18,512
	Miscellaneous[9]	41,798	80	381	13	4,107	2,439	48,818
	Depreciation[10]	95,130	10,291	16,695	98	4,889	9,328	136,431
	Interest[11]	113,162	0	0	0	0	1,342	114,504
	Total 1 (Without Depreciation and Interest)	364,906	11,540	65,539	6,592	37,442	41,690	527,709
	Total 2 (With Depreciation, Without Interest)	460,036	21,831	82,234	6,690	42,331	51,018	664,140
	Total 3 (With Depreciation, With Interest)	573,198	21,831	82,234	6,690	42,331	52,360	778,644
Shortfall	Revenue Less Total 1	(190,823)	5,820	(3,092)	(5,603)	(33,486)	(34,057)	(261,241)
	Revenue Less Total 2	(285,953)	(4,471)	(19,787)	(5,701)	(38,375)	(43,385)	(397,672)
	Revenue Less Total 3	(399,115)	(4,471)	(19,787)	(5,701)	(38,375)	(44,727)	(512,176)

Source: CTA. Data reflect one fiscal year ending 30 June, 2002.

(1) All monetary items expressed as thousand annual LE.

(2) Thousand annual passengers purchasing single-trip tickets.

(3) Thousand annual fleet kilometers while in revenue-producing service.

(4) Includes income from ticket sales.

(5) Includes wages and salaries for all CTA employees.

(6) Includes spare parts (both domestic and foreign-sourced), fuels and tires.

(7) Includes office supplies, training courses, medicines and supplies for CTA hospital as well as staff recreation services.

(8) Includes taxes and rentals.

(9) Includes compensation for accidents and other specialized outlays.

(10) Includes fleet and fixed facilities. Fleet depreciation based on 100 percent of asset value over first four years, plus 25 percent of annual asset value (per first four years) indefinitely thereafter to account for major vehicle rehabilitation and rebuilding works. Fixed assets based on weighted formula applied indefinitely. Depreciation excludes land value.

(11) Interest to National Investment Bank (priced at approximately 12 percent per annum). CTA may not finance capital purchases via other sources.

- Annual revenue for the CTA aggregated to some 266.5 million LE, derived from ticket sales to 789.6 million passengers.
- Operational costs, that is, outlay excluding depreciation and interest, totaled 527.7 million LE. The largest cost component is represented by wages/salaries, which comprised almost half of operational costs (251.7 million LE). Operational consumption for such items as fuel, tires and spare parts, accounted for a further 36 percent of operational costs (188.5 million LE).
- As indicated, operational outlay, with depreciation and interest excluded, totaled 527.7 million LE. Outlay is increased to 664.1 million LE if depreciation is included but interest excluded, and 778.6 million LE if both depreciation and interest are included.
- Shortfall, that is, revenue less cost, ranged from 261.2 million LE to 512.2 million LE for the fiscal year depending on cost definition. Shortfall can be considered a prime determinant of the annual CTA subsidy request to Government.

- Only in the case of air conditioned buses, and then only in operational cost terms, is positive cash flow achieved: 5.8 million LE. No other CTA entity achieved positive cash flow under any condition during FY 2002.
- As expected, standard bus services dominate CTA activities accounting for 76 percent of passengers transported, 65 percent of revenue, from 69 to 74 percent of costs (depending on definition), and from 72 to 78 percent of shortfall, depending on definition.

Shortfall can also be expressed in terms of coverage, that is, revenue divided by cost. Thus, if income is exactly equal to cost, coverage is defined as a ratio of 1.00. As shown in the previous table, coverage is considerable less than unity given that costs (depending on definition) exceed revenue derived via the fare box. In case of the CTA during FY 2002, coverage hovered near 0.5 if depreciation and interest are excluded; that is, income from ticket sales barely covered 50 percent of operational expenses. Coverage decreased to between 0.3 and 0.4 if interest and depreciation are included. Air conditioned bus services achieve breakeven operation, and not so if all externalities (interest, depreciation) are included. Minibus services also approach unity coverage, but only under similar accounting (Figure 5.2.5).

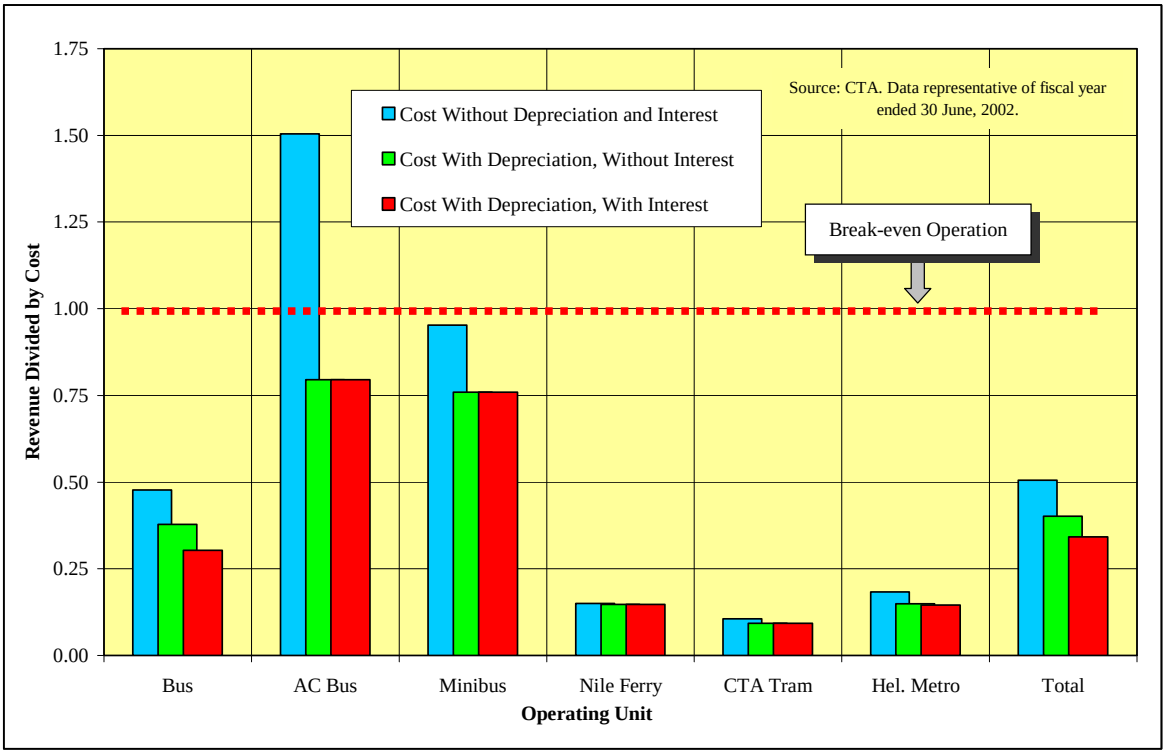


Figure 5.2.5 CTA Financial Performance: Fiscal Year 2002

It is of interest to compare this CTA performance to international expectations derived via information from overseas operators. As a caveat, any comparison of financial performances among international urban operators should be treated with caution due to definitional differences employed in accounting practices. Nevertheless, a review of cost (including depreciation and interest) as well as revenue (excluding subsidy) data from 247 worldwide operators yields an interesting observations (Figure 5.2.6).

- The mathematical coverage ratio average for operators providing only bus services is 0.93; in other words, 93 percent of costs are covered by revenue. In case of operators offering only rail services, the coverage ratio average is 0.78. This is expected as urban rail, being a capital-intensive mode, typically generates a much higher depreciation burden than, say, a bus system.
- The coverage ratio for the CTA was 0.34 (depreciation and interest included) for fiscal year 2002. This coverage is low when compared to even average international expectations.

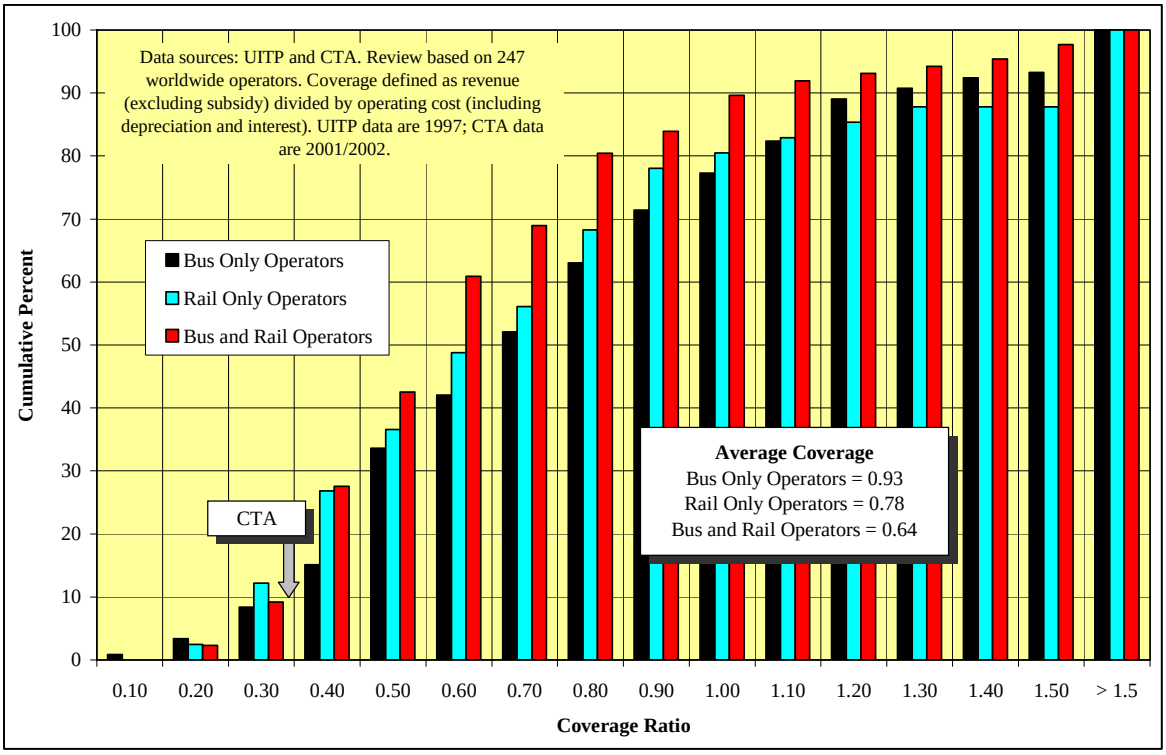
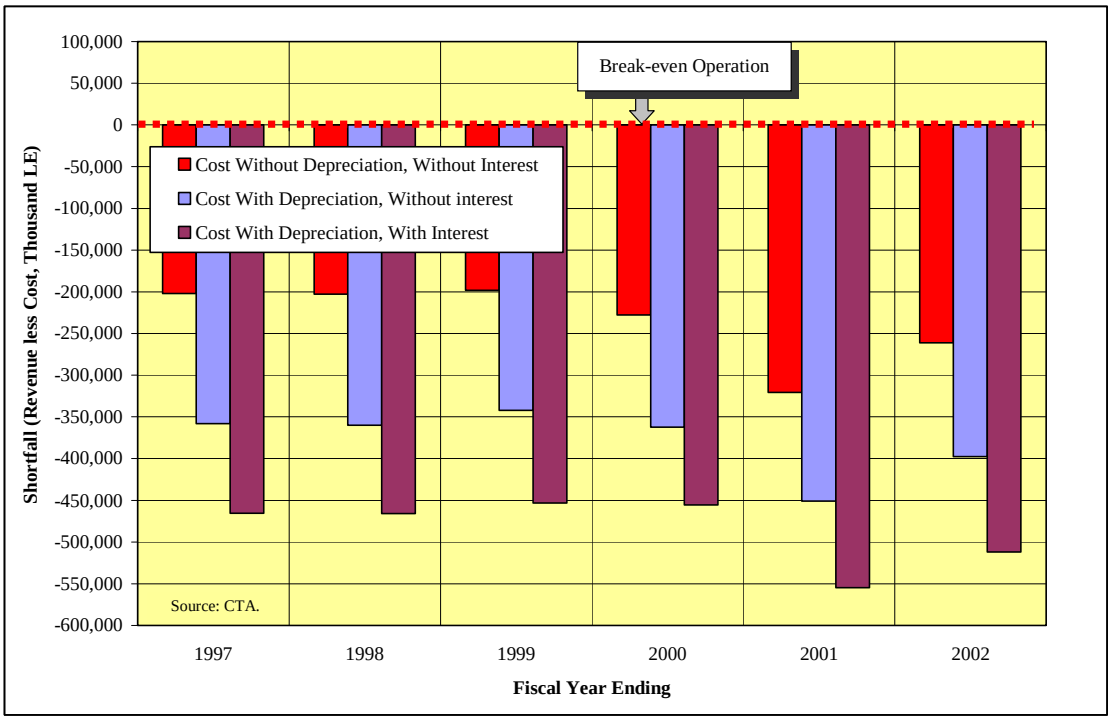


Figure 5.2.6 International Overview
Public Transport Operator Financial Performance

Financial information for the privately operated public transport sector (shared taxis) is not available. Such records would rest with individual owners, which are numerous given the proclivity of the one owner – one vehicle system. The recent explosion of the shared taxi market would support the supposition that revenue is sufficient to generate profit under existing operating practices. Simply put, the fleet would not have expanded as rapidly, and currently absorb more than half of public transport trips, if a profit motive were not satisfied.

As a final point, it is of interest to examine recent historical performance in terms of CTA shortfall since this can be considered a prime determinant of the annual CTA subsidy requirement. As noted previously, the FY 2002 shortfall, that is, revenue derived from ticket sales less cost, ranged from 261.2 million LE to 512.2 million LE for the fiscal year depending on cost definition. A comparison to recent years of record (beginning FY 1997) suggests that (Figure 5.2.7):



Source: JICA Study Team

Figure 5.2.7 CTA Cash Flow Shortfall: Fiscal Years 1997 through 2002

- The operational shortfall, that is, excluding interest and depreciation, increased from 201.8 million LE during FY 1997 to 261.2 million LE during FY 2002, a roughly 30 percent increase from the FY 1997 base over the course of five years.
- Costs involving depreciation and interest increased along similar lines as noted for operational costs. The annual shortfall including depreciation and interest totaled 465.5 million LE in FY 1997, increasing to 512.2 million LE in FY 2002.

These changes are fueled by several factors (Figure 5.2.8). Ridership continues to decline, from 923.0 million annual passengers in FY 1997 to 789.6 million annual passengers in FY 2002; a ratio of 0.86 relative to FY 1997. Revenue kilometers have increased, thus confirming continuing pressure on the CTA to expand its route network to serve, for example, more outlying locations. While revenue has increased from 230.5 million LE in FY 1997 to 266.5 million LE in FY 2002, operational costs (excluding depreciation and interest) have increased by a ratio of 1.29 (from 432.4 million LE in FY 1997 to 527.7 million LE in FY 2002).

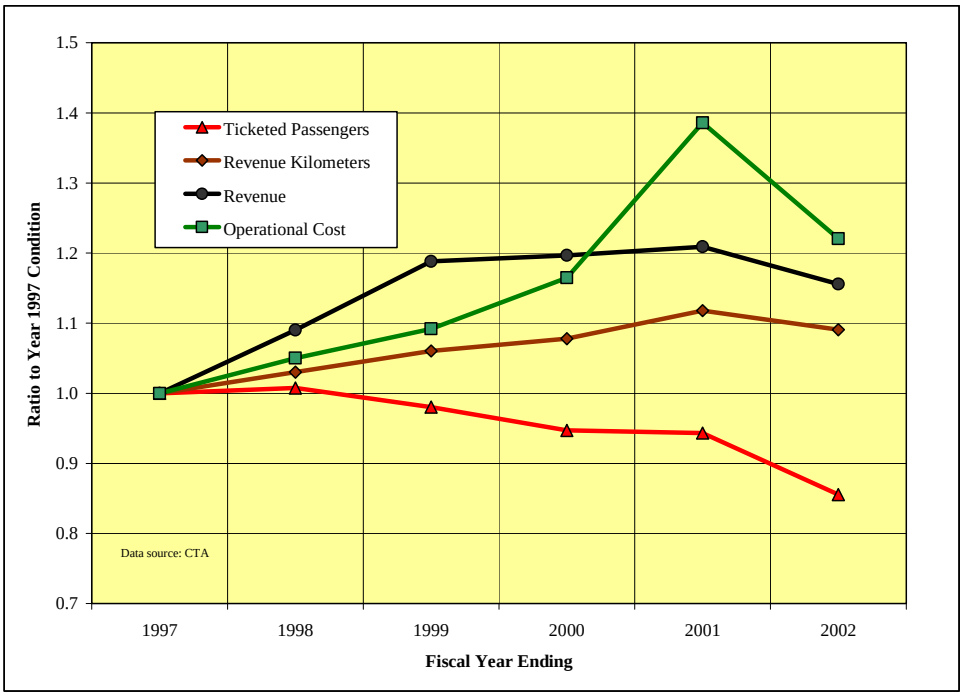


Figure 5.2.8 CTA Performance Indexes: Fiscal Years 1997 through 2002

This review of CTA financial performance leads to several conclusions:

- The CTA is incurring losses for all operating entities, under all definitions of cost. The only exception is air conditioned buses, where positive cash flow is achieved but only if depreciation and interest are excluded from accounting.
- The financial performance of the CTA is low compared to expectations based on a review of international public transport operators.
- The decline in ridership, in combination with growing costs, is catalyzing a need for ever-increasing subsidies from public coffers.

(3) CTA Major Problems

CTA is facing crucial problems: lack of bus and minibus drivers, shortage in spare parts and part of the fleer cannot operate.

The total number of drivers is about 8,000. The CTA has to find 1,000 new drivers each year to train because an average of 1,000 drivers is leaving the CTA each year for different reasons: retirement, professional faults but mainly they go to the private sector where the wages are higher.

The CTA cannot hire enough drivers each year because the low wages paid by the CTA. A lot of drivers go to the CTA because the CTA is offering free training programs to get their minibus or bus driving license. Then they prefer working for the private sector where they can earn twice what they are earning in working for the CTA.

It is less expensive to raise salaries instead of recruitment and training of 1,000 new drivers every year and the fact to keep the same drivers contributes to a rational management of a bus transport company.

Most of the spare parts are imported and the CTA cannot obtain enough financial support from the Ministry of Finance and the Ministry of Planning to purchase the spare parts they need to properly operate.

Table 5.2.4 shows the financial problems that the CTA is facing to operate and the lack of support from the Government. On average, over the last three fiscal years, the CTA receives only some 63 percent of the proposed budget from the Ministry of Finance.

Table 5.2.4 Comparison of CTA Budget Requirement with Allocated Budget

Years	CTA Proposing Budget	Budget allocated by the Ministry of Finance	Percentage of the budget allocated compared to the budget needed
2000/2001	2,043,267,000	1,463,000,000	71.6%
2001/2002	2,089,834,000	1,104,448,000	52.8%
2002/2003	2,351,379,000	1,498,063,000	63.7%

Source: JICA Study Team based on CTA data

In each garage over an average number of 200 minibuses or buses, more than 15 percent of the fleet, cannot operate each day because a lack of drivers and a shortage in spare parts. The rate of absenteeism among the drivers is quite high as well.

The rate of absentees can be reduced by raising salaries because drivers are currently not motivated. In doing that, CTA can generate more revenues and these extra revenues would be higher than the increase needed in the salaries of the drivers.

Salary structure of CTA drivers

25% fixed salary - 75% variable salary

Basic salary:	38 LE
Special Bonus:	57 LE (about monthly 8 LE extra each year since 1995)
Total :	95 LE
40% out 38 LE :	15 LE
Labor Day:	20 LE
New Total:	130 LE

+ More extra variables:
3.5% profit sharing from the selling of the tickets (25 piasters ticket)
3% profit sharing from the selling of the tickets (50 piasters ticket)
Bonus to complete the number of trips supposed to be made: 3LE
Driving efficiency and good bus maintenance: 6 LE

Bonus for good engine maintenance: 15 LE for new buses and 30 LE for old buses

If the driver works at least 28 days per month: 100 LE

A good driver can get a total salary of 500 LE each month based on his performance during the month.

This salary structure shows the level of the basic salary and the complexity of the variables. This bad system leads to increase the number of trips and passengers for the drivers and go against safety regulations.

(4) Inadequate Management in the Operational Central Departments

There is a deficient managerial control in the operational central departments at CTA. The heads of the operational central departments are disconnected from the departments and workers under their supervision thus negatively impacting the flow of information as well as control within the chains of command. This point emphasizes the shortcomings in CTA management.

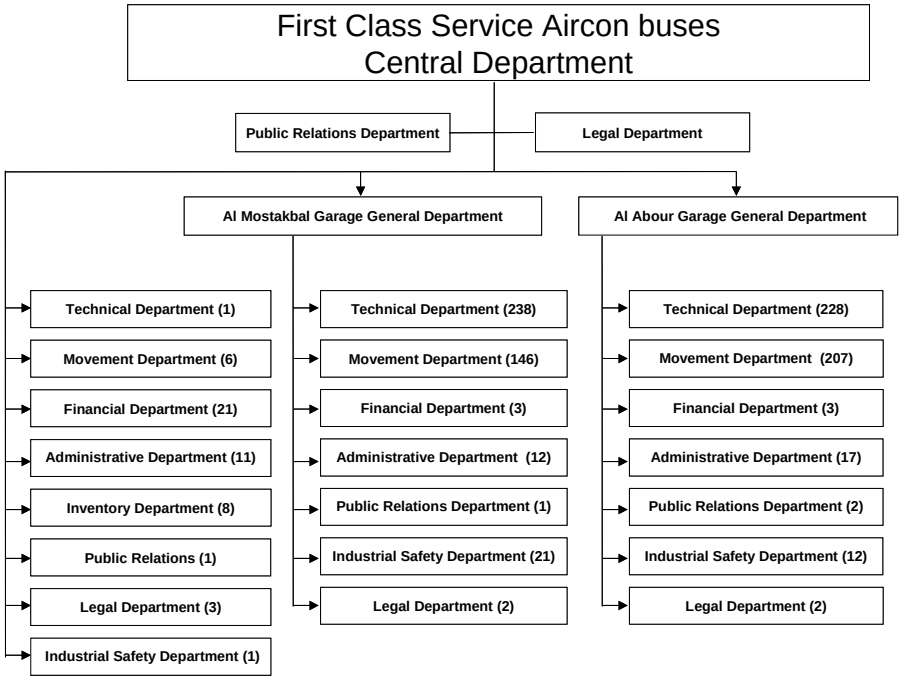
The reporting system is quite insufficient, in each central department there are parallel units directly under the supervision of the head of the central department. These parallel units include the same departments that the departments in each garage and are supposed to supervise the work of the staff working in the garages. That means there is a horizontal supervision and a vertical supervision as well because the staff in each garage is also supervised by the general manager responsible for the management of each garage. This results in an inevitable information deficiency due to overlapping responsibilities, which is exacerbated by the lack of automated data processing equipment.

The management in each central department and each garage is not well-organized because there is no proper reporting system and too many people are dealing with the same thing and it is quite difficult to understand who is doing what. There is a strong lack of efficiency and motivation in the management of the operational departments. The managers know that by the law they will not be fired so they do not feel enough concern about the responsibilities they are holding.

No proper reporting has been elaborated by CTA. A standard reporting system can be developed as to check all the significant tasks performed by the different operational departments in each central operational department. The head of each central operational department would get a better knowledge of the management of its own central operational department and intervene when there is something wrong. The headquarters would also get a better knowledge of the management in all the central operational departments and improve the overall management in each central operational department.

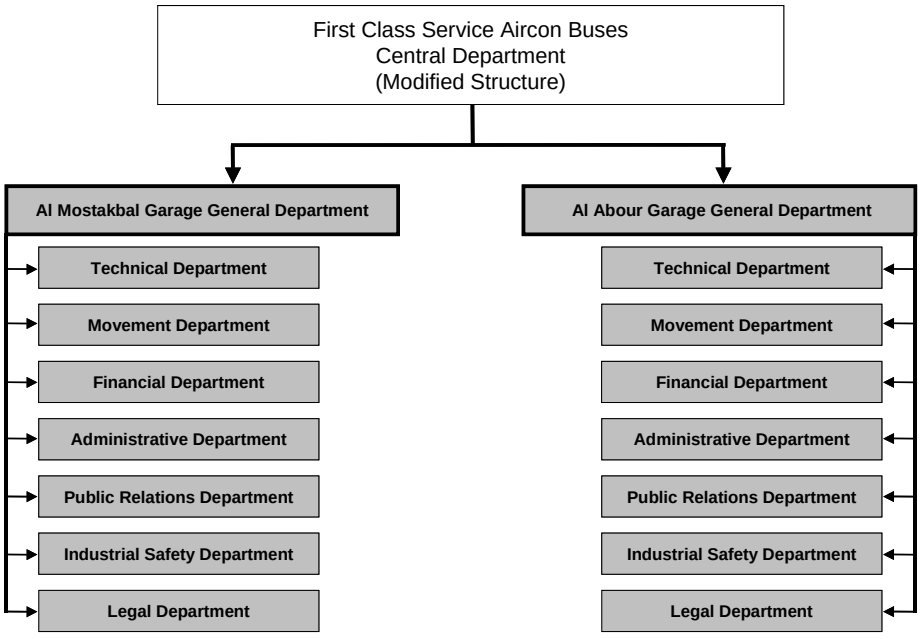
A proposed approach to streamlining the central department organizational structures can be realized via an examination of two departments visited by the Team. Under the existing condition, parallel and duplicative functions can be seen for both the “First Class Service Aircon Buses Central Department” (Figure 5.2.9) and the “Middle Cairo Central Department” (Figure 5.2.11). Modified structures

for these departments, designed to achieve enhanced efficiency, are depicted in Figures 5.2.10 and 5.2.12, respectively.



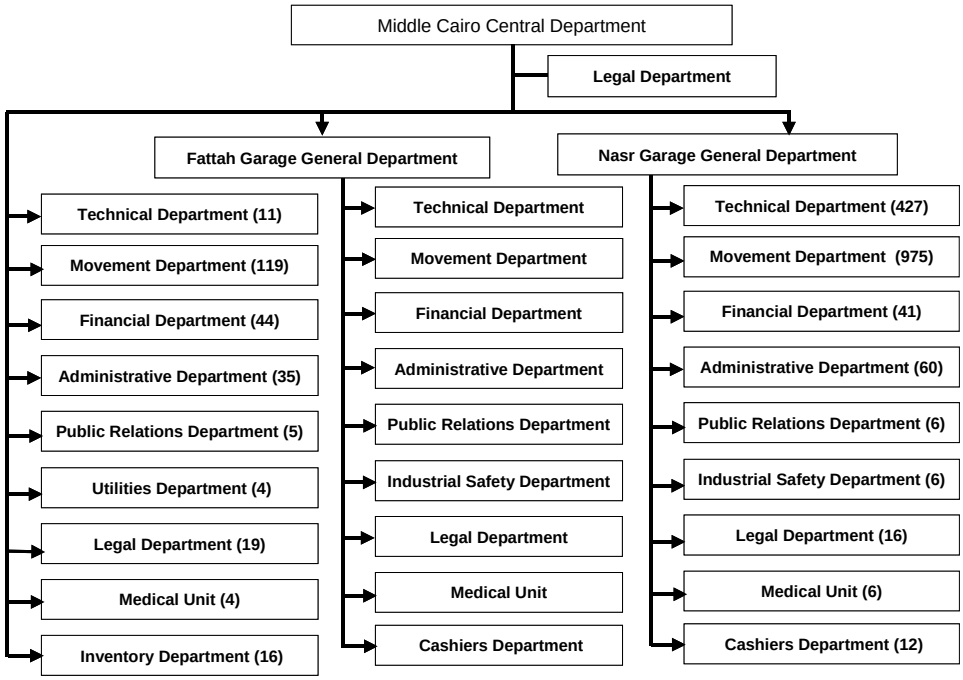
Source: JICA Study Team based on CTA data

Figure 5.2.9 First Class Service Air Conditioned Buses Central Department (Existing Structure)



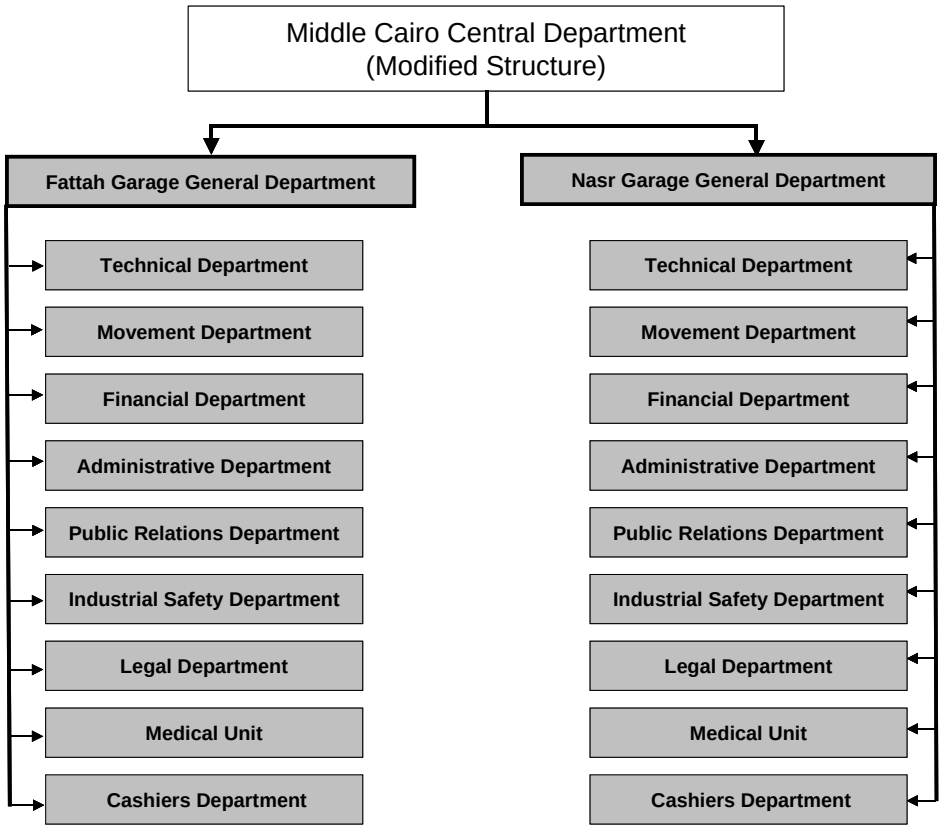
Source: JICA Study Team

Figure 5.2.10 First Class Service Air Conditioned Buses Central Department (Modified Structure)



Source: JICA Study Team based on CTA data

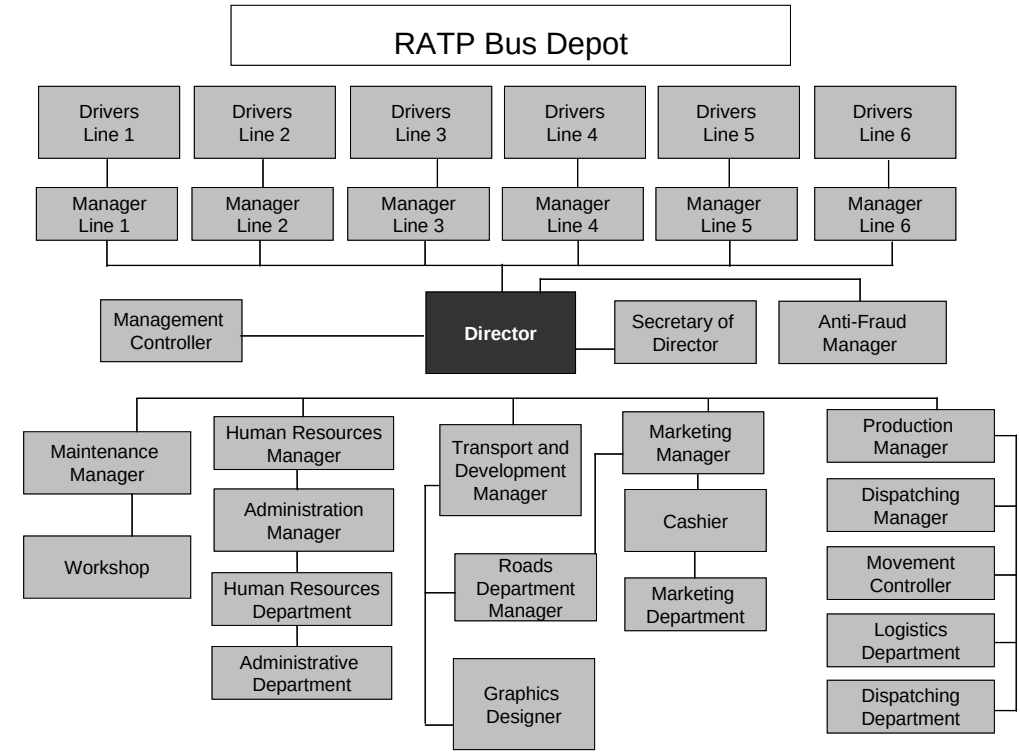
Figure 5.2.11 Middle Cairo Central Department (Existing Structure)



Source: JICA Study Team

Figure 5.2.12 Middle Cairo Central Department (Modified Structure)

As to compare with another kind of configuration, Figure 5.2.13 provides the organizational structure of a depot in the Régie Autonome des Transports Parisiens (RATP) in Paris. Each depot in the RATP is largely autonomous and the Director has to fulfill the objectives defined by the RATP headquarters. The RATP is noticeable for its highly structured institutional organization.



Source: JICA Study Team

Figure 5.2.13 RATP Bus Depot

5.3 COMPARATIVE CASE STUDIES ON THE RESTRUCTURING OF PUBLIC URBAN TRANSPORT

5.3.1 Restructuring of the Municipal Bus Transport in Kalisz (Poland)

In the early nineties, Kalisz City Authority took progressive steps to restructure and privatize public amenity services including public transport.

A joint venture established between the City Authority and a West European partner firm, which managed to meet public demand to improve the quality of service, to secure the new company financially, and to generate profits for dividend and new reinvestment.

The semi-privatization of the Kalisz Municipal Bus Transport led to a more efficient transportation system with a better bus network, increased passenger numbers, increased wages of the employed. The restructuring reduced the need for

buses and the number of employees but alternative jobs were secured for the dismissed workers.

Results and impacts include:

- The introduction of a new management structure with financial and commercial sections, with performance accountability introduced.
- The improvement of the bus network. The length of the network was increased from 175 km to 209 km.
- A reduction of the fleet from 98 to 73 (1994) and to 68 (1997). The number of buses was reduced as a result of the reorganization of the network and the more efficient use of the buses.
- An increase of vehicle kilometers from 385,000 to 441,000 during 1997.
- A reduction of the employees from 366 to 258, which occurred over 3 months during 1997. This change went together with the introduction of an alternative employment policy. The dismissed employees were offered the work in the companies, which are responsible for cleaning the buses and the offices. Some loans were given to dismissed workers to start their own business.
- The introduction of annual contracts as a new system of financial and performance accountability between the Company and the City Authority.
- An increase in wages by 164% from 133.66 ECU to 352.83 ECU per month between 1994 and 1997 (one of the highest average wages in that sector in Poland).
- An increase in passenger numbers from 9,390,000 (1993) to 14,093,000 by 1997. The number of passengers during 1997 reached 20,215,000.
- The overhaul of 22 buses and the purchase of 6 new buses.
- The implementation of reinvestment programs in buildings, energy (ecological boiler house), equipment, high-tech resources and training.
- In 1997, 4.6% of the City of Kalisz' budget was allocated for public transport compared with over 13% in 1991.
- The company was turned from deficit (1993) to profit making (1996) as a result of the dedication of the employees, the foreign partner's know-how, and the support of the city management.

5.3.2 Urban Public Transport Reform in Kazakhstan

This case illustrates how public transport deregulation and liberalization improved public transport service availability and affordability to poor groups, and how these reforms provided entrepreneurial and employment opportunities for poor people. It also shows how government was able to reallocate subsidies from public transport to other social services.

The objectives of the project were to restore and improve public transport capacity, performance, and services to the traveling public in Kazakhstan's major cities by designing and implementing institutional and policy reforms.

In Kazakhstan and other former Soviet Union countries, 90% of the population, many of whom are poor, rely on public transport services for their mobility needs to reach employment centers, and for access to educational and health facilities.

The urban transport project was approved when Kazakhstan was undergoing a transition to a liberalized market economy underpinned by a system of private ownership. The rationale for the project was to mitigate the effect of the prevailing adverse macroeconomic conditions on the performance of public transport system. Before the reform took place, inadequate services, long-waiting time at bus stops, crowded buses, and large government subsidies characterized the public transport in Kazakhstan.

The deregulation and liberalization of the public transport system in Kazakhstan had three distinct benefits for the poor and the traveling public in general.

- Adequate and affordable services to the poor: The main beneficiaries of the deregulation of the public transport system were the traveling public who enjoyed affordable services of acceptable quality. Overcrowding of buses and long delays at bus stops were virtually eliminated. Services became available through the cities within a short walking distance and with negligible waiting time for a vehicle to arrive. The stiff competition in the sector ensured that the fares remain affordable and services were of acceptable quality.
- Reallocation of government subsidies for social services: The government of Kazakhstan was relieved of providing subsidies to provide public transport services, as the private sector proved capable of providing services without subsidies. This allowed the government to reallocate its scarce resources from public transport services to other social services that would benefit the poor.
- Entrepreneurial and employment opportunities for the poor: After decades of central planning and service provision by state-owned corporations, the public transport sector became an entry point for many aspiring, small entrepreneurs. Many people who became unemployed or underemployed because of the transition to a market economy found employment and business opportunities in the liberalized public transport industry.

Policy and institutional reforms capable of unleashing private entrepreneurship and competition can improve the quality and quantity of services available to the poor people.

5.3.3 Restructuring the Delhi Transport Corporation

Mounting losses and poor operational performance of Delhi Transport Corporation (DTC) result in a continuous drain on scarce budgetary resources limiting DTC's ability to expand its fleet. The reforms include:

(1) Unbundling Operations

DTC provides public transport services, using both its own fleet and leasing buses from the private operators under the kilometer scheme. Aside from operating

these buses services, DTC also maintains infrastructure to repair and maintain buses. Finally it also owns land for the purposes of parking buses (at depots) and passenger terminals for providing traffic interchanges.

Given the three distinct activities being performed by DTC, it was recommended that these activities be unbundled into separate profit centers. Such a separation is also expected to reflect the efficiency of delivery of those services and help in identifying areas of concern. This would ensure that each of these services focuses on its core activity without being encumbered with the activities of other wings.

- City bus operations. Greater private sector participation in public buses operations was recommended in Delhi. However, private participation in the public transport sector would have to be preceded by an efficient regulatory framework. Since using its own buses puts a tremendous strain on public funds and public budgets are no longer in a position to finance such capital investments, DTC should save on capital investments by adopting the kilometer scheme and not augmenting its bus fleet. Over time, DTC should phase out its own bus services by not replenishing its fleet and substituting its services by contracted services. With a gradual growth in private sector operations, it should be possible in the long run for the government to withdraw from operation of public buses completely and only regulate the sector.
- Depots and terminals. The ownership and management of the depots, terminals, and bus stations are a natural monopoly and it would be inefficient for a multiplicity of operators to own and manage these infrastructure facilities. Nevertheless, unbundling this activity from bus operations by setting up of a separate corporation would be necessary for it to function as a separate profit center.

  This corporation should enter into contracts with any operator to allow parking within its premises at an appropriate fee. The corporation could also lease out space for such repair facilities either to the Workshop Company or even to a private workshop. Finally, this company could also earn substantial revenues through property development and advertising. However, it is important to recognize that commercial development of the properties allocated to this company could be more remunerative than provision of parking facilities for buses, or interchanges for passengers. Hence, it is recommended that though the company should operate only on commercial considerations, for commercial development of its properties it would need the approval of appropriate regulatory agencies in this sector.
- Repair and maintenance workshops. Management of the workshops and repair facilities is not a natural monopoly; there are several private workshops at which repairs could be carried out and there is no need for public funds to be spent on such facilities. However, given the fact that substantial infrastructure for repairs already exists with DTC, this may be used for the repairs and maintenance of all buses and other motor vehicles.

(2) Regulating Public Transport Services

The restructuring of DTC would help improve their financial performance. The induction of the private sector into the operation of buses would enable improved performance and make available additional capacity. However, to bring about the required improvements and attract private investments in public transport, restructuring of the regulatory oversight in the sector would also be necessary.

Thus, the setting up of an independent regulator for the public transport sector in Delhi is recommended. In addition, it is recommended that the Delhi Government enact the legislation instituting the regulatory authority. The segments of the public transport system such as operation of buses and management of depots or terminals, which have monopoly characteristics, should be subject to regulatory jurisdiction. The proposed activities of the regulator are the following:

- Fixing of fares and fees
- Route and network design
- Route allocation and issue of permits
- Specification, monitoring and enforcement of quality of service standards
- Dispute resolution.

All these recommendations were presented to the Delhi Government and the principles of reform and the strategies outlined were accepted. Subsequently, in October 2002, the Delhi Government announced an Urban Transport Policy where the restructuring of DTC and greater private participation in public transport operations are essential components.

5.3.4 Privatization and Deregulation of Bus Services in Great Britain

In 1985, bus services in British metropolitan areas were 98% in public hands. That year, the British Government began a policy of privatization and deregulation. Today, only 7% of the British public transit system remains in public hands.

The municipalities invited private firms to register to operate any routes they were willing to operate without subsidy. The idea was that as many as possible of the routes would be granted to private bus companies setting their own fares. The remainder would be operated under service contracts by private companies under a competitive bidding process. These service contracts were structured in two basic ways.

In London, the London Regional Transport Authority signed what are called “minimum cost contracts” with many private bus companies. These contracts require the operator to provide a specified level of service in exchange for a fee for service paid by the municipality, and all fare box revenues are turned over to the municipality. Contracts are awarded to the lowest bidder and subject to renewal. In London, London Transport’s subsidies to the bus companies under contract also often included the provision of ticketing equipment and the buses themselves. All competition takes place in the awarding of contracts, while

London's Regional Transport Authority did not allow competition between bus companies along the same routes. This has been called "competitive regulation".

In municipalities outside of London, a second type of contract, "the minimum subsidy contract" was more pervasive. In this type of contract the operator keeps the passenger fares, and winning bids awarded by the city are based on the minimal level of subsidy requested by the company. In the metropolitan areas outside of London, meanwhile, bus contracts were awarded along competing routes if there was more than one company interested in providing service along a given route. This system was called "full deregulation".

The results of the deregulation were complex. Overall, from 1985 to 1995, bus trips fell by 23% nationally, but the fall in ridership was only 3% in London compared to 35% in the metro areas outside London. While some of this decline in rider ship was a continuation of previous trends, outside London rider ship declines were clearly in part the result of the privatization and deregulation. Fares increased in London by 33% but by over 50% outside London. Most analysts attribute the ridership declines to chaotic service changes and the fare increases.

The deregulation led to a 70% reduction in government subsidies in London, and a 49% reduction nationally. The efficiency of public transit services, measured as costs per passenger journey, fell in London by 36%, but by only 2% outside of London. Efficiency improved by switching to minibuses, more efficient use of labor, and the reduction of wages, but outside London the decline in rider ship undercut the benefit of these gains. Wages of bus and coach drivers fell in real terms between 1985 and 1995 by 10%, while in general manual workers salaries increased by 13% in real terms. Ridership surveys among low income groups also showed a decline in use by low income riders.

In the long run, the effects of the privatization on public transit service can best be assessed by looking at the impact on the level of investment. In the first eight years after the privatization and deregulation the purchasing of new buses per year was roughly 35% below public sector purchasing trends in the pre-privatization period. This was partly because profitability for the private companies was low, around 2% per annum. In recent years, however, due to the takeover of the market by a small number of large firms, the larger firms are showing a 4% reduction in costs due to scale, so profitability is up, and so is the purchasing of new buses.

In the end, the privatization under continued government regulation which took place in London had far better results; subsidies were further reduced, ridership was less adversely affected, and efficiency improvements were greater than the full deregulation which took place outside London. Both drove up the fare prices and hurt low income riders. The long term investment consequences of the privatization have not been encouraging.

5.3.5 Conclusion

While providing an interesting international perspective in terms of public transport restructuring, it is concurrently noted that the work environments and

regulations tend to differ among countries. Thus, in the final analysis, solutions defined for the CTA must be tailored to local norms and capabilities.

5.4 PROPOSAL FOR THE ORGANIZATIONAL AND INSTITUTIONAL REFORM OF THE CTA

The Study Team will propose in the next sections the different measures to be taken by CTA for its restructuring.

Besides all activities of designing a business plan for the companies of the CTA Holding Company, special attention has to be paid to the social aspects of this turnaround, in particular to soften the negative aspects of the expected redundancy of employees.

A first estimate of CTA overstaffing is 10,000 people.

5.4.1 CTA Holding Company

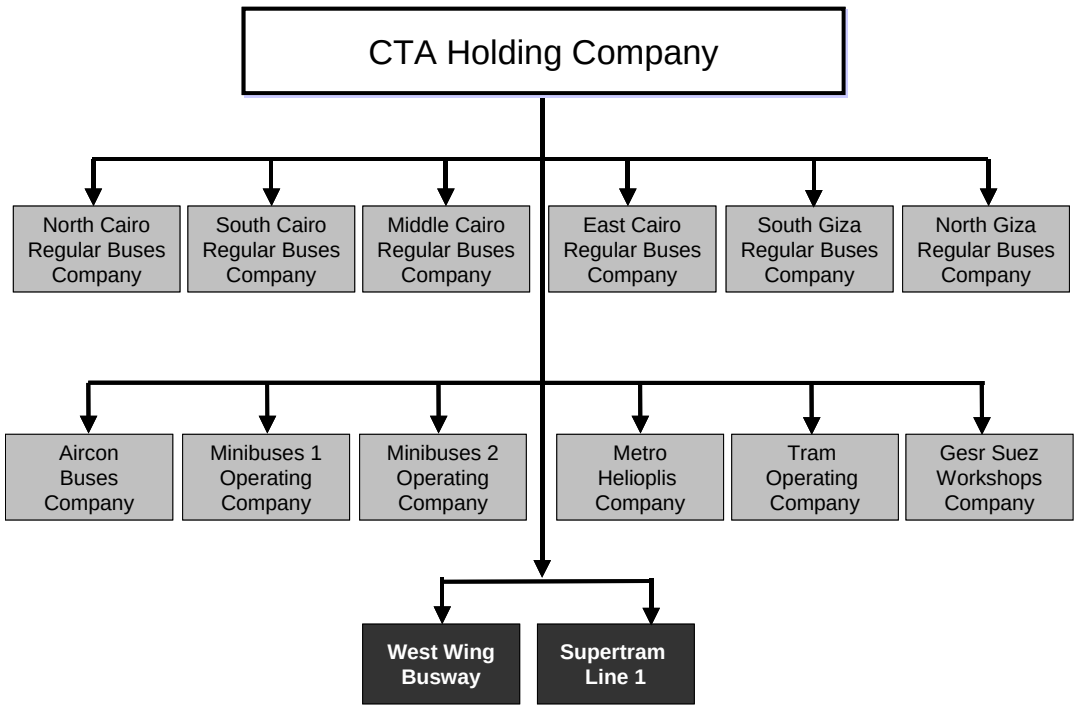
According to the different meetings with CTA senior managers at CTA Headquarters and in the operational departments, the Study Team proposes the following structure to be implemented in the near future (Figure 5.4.1). It is noted that the indicated structure (with exception of the Supertram and West Wing) conforms for discussion purposes at present to the existing CTA organizational makeup (the Nile ferry is included with a bus company). In future, and with creation of the holding company, this need not necessary remain so.

The Study Team will demonstrate the different steps to be taken by CTA to set up this CTA Holding Company in the following sections: set up a regulatory framework, a labor adjustment program, a pool of experts and restructure the different affiliated enterprises.

Similar restructuring of state-owned companies have been put into operation in Egypt for enterprises such as Telecom Egypt and Egypt Air. The Government has a reasonable experience in converting large enterprises into holding companies.

A holding company offers a great flexibility for the Government to determine the future of the different affiliated enterprises. These affiliated enterprises will be operating as private companies.

The proposed structure is similar to a shopping list for the Government to agree on the best strategy which can apply to each affiliated enterprise like concession, franchise, license, privatization, performance contract or management contract. The future of each affiliated enterprise will be different from one affiliated enterprise to another one depending on the objectives of each of them.



Source: JICA Study Team

Figure 5.4.1 A Proposal for a CTA Holding Company

The Study Team has indicated in the previous figure the potential for including new enterprises under the jurisdictional umbrella of the CTA Holding Company, in particular the West Wing Company and Supertram Line 1 Company. These are included for obvious reasons: the West Wing will, for a number of years, operate as a busway while inclusion of the Supertram (LRT) is a logical extension of current practices under which the Heliopolis Metro (tram) is the responsibility of the CTA. However, this is not meant to imply that it must necessarily be so (as pointed out in other sections of this chapter), or that the CTA must necessarily operate these systems. The Study Team is merely suggesting that inclusion under the jurisdictional umbrella is a possibility, subject to the previously indicated flexibility for the Government to determine the future of enterprises affiliated with the CTA Holding Company in terms of commercialization. Regardless of the final political decision in this regard, what is clear is that the Supertram Company cannot replicate the recent historic trend, that is, evolve toward a bloated, inefficient organization. Instead, the company organizational structure must be refined within a streamlined chain of command, with operational departments based on technical needs and requirements. Numerous organizational role models exist in this regard in the form of LRT operators in other countries (these have been duly considered in defining Supertram company structure). Furthermore, the number of staff must determined by technical expertise and actual operating requirements, not patronage or other non-technical “pressures”. These points are extremely important if the Supertram company is to emerge as a viable, sustainable and commercially-oriented organization. The Study Team has correspondingly developed, to considerable but needed detail, a commercial framework for the Supertram organization, both for the near term and the long

term, along with what are seen as realistic staffing levels. This Supertram organization is detailed in the subsequent Section 5.5 of this report.

5.4.2 Regulatory Framework

The Government has to put in place a performance regulatory framework which will promote competitiveness in the bus market and organize tender competitions to procure services on the network from bus operators, allocating subsidy when required.

This regulatory framework will also provide assistance to CTA Holding Company to determine the future of the affiliated enterprises.

The regulatory framework proposed by the Government will have the following principal tasks:

- To design an integrated bus network to respond to Cairo's current and projected needs.
- To organize tender competitions to procure services on the network from bus operators, allocating subsidy where required.
- To monitor customer satisfaction levels and the quality of service provided by bus operators active in the network and enforce compliance with minimum quality standards and with contracts.
- To established a fare policy for the entire Greater Cairo.
- To take overall responsibility for the management of the ticketing system and act as clearing house for that system.
- To manage the provision of coordinated bus passenger information in Greater Cairo.
- To share responsibility with bus operators for the marketing of their services in Greater Cairo.
- To ensure that state-owned land and facilities reserved for buses in Greater Cairo, including transport interchanges, bus depots, park-and-ride sites, etc., are managed in a manner which facilitates equitable access by all operators to these facilities, either by managing these facilities directly or by monitoring their management by another body.
- To ensure a level playing field between all bus operators in the market.
- To promote competitiveness in the bus market. The private operators would be private investors and it is the responsibility of the regulatory framework to allow them to enter the market and define incentives.
- To monitor usage of the public transport network, for example bus passenger numbers.

A transition period of two years is necessary to:

- Allow for the preparation of the necessary legislation.
- Enable public and private operators prepare for a competitive bus market.
- Permit the regulatory body to make the detailed preparations necessary for the introduction of franchising, concession, license, privatization, performance

contract and management contract including a thorough understanding of the bus network and market in Greater Cairo.

The private operators would be private investors. It will be the responsibility of the regulatory framework to allow them to enter the market and define the incentives.

The choice of the members, the powers and the supervision of the regulatory framework have to be decided by the Government.

5.4.3 Labor Adjustment Program

(1) Setting the Scene

The Egyptian Government has decided to start with the restructuring of major state enterprises. The objectives of the Labor Adjustment Program are to facilitate the diminishing of the negative affects of massive redundancy. Special emphasis should be given to all kinds of measures which help the redundant employees to find a new income outside the companies.

The state ownership of enterprises of Egypt has a history of more than 40 years. This means that next to economic reasoning also social and welfare arguments played a role in all decisions that over a long period have been made. These arguments are valid in the short run. In the long run they are counter productive. The workers are paid low. This means that it is not easy to bring productivity at a reasonable level.

In CTA, like the other state owned enterprises, the major problem is the overstaffing. The problem is strengthened by the provision of lifetime job contracts and a strict prohibition of adjusting the labor force to economic developments. Only by not hiring new employees a reduction could be organized. This means a reduction with the side effect of a deteriorating quality level of the human resources, because of insufficient new inputs of qualified staff.

There are certain limitations to be taken into account for the measures to be considered. All changes must be voluntary. A reason for this is the strong job security position of public employees, and the absence of social benefits in case of unemployment. A lay off on employees without an income would bring poverty to those employees and subsequently social unrest to society. The Study Team suggests also assessing it the other way round; if an income facility is available for a reasonable number of years dismissal should be possible. Cooperation of the labor unions is considered important here.

A second limitation is the availability and possible use of existing facilities and financial schemes (early retirement scheme, incentive scheme (small enterprise development program) determined by their conditions.

During the last years it has become more and more obvious that to a large extent the design of the Labor Adjustment Program and the management of its

implementation should be done at the level of the Holding Company rather than at the level of the different companies.

(2) The Social Fund for Development

The Social Fund for Development (SFD) was established by Presidential Decree N°40 of 1991. The Fund is committed to providing a social safety net of programs as a plan to cushion the impacts of the Economic Reform and Structural Adjustment Program on vulnerable groups in Egypt. One of these groups is the workers in public enterprises whose continuing employment is threatened due to restructuring and/or privatization.

The Social Fund for Development has established the Human Resources Development Program which provides its services through the promotion, formulation and implementation of projects on the enterprise level to support both proactive and reactive adjustment measures. The Social Fund for Development responds to the problem of redundancy and encourages employers and their workers to work together in order to develop a plan of action to deal with worker dislocation caused by economic, technological or structural changes.

In 1992, the Canadian International Development Agency (CIDA) and the Social Fund for Development agreed to introduce the Canadian Industrial Adjustment Service model to the Egyptian environment known under the name of Egyptian Labor Adjustment Program.

Its two major programs can be used in the CTA restructuring:

- Enterprise Development Program (EDP) – this program conducts feasibility studies and project evaluations to help create and sustain a small, local cadre of entrepreneurs who aspired to own their businesses. The Enterprise Development Program extends credit and/or grants to target groups, refers small entrepreneurs to credit institutions and assists small enterprises in expanding or improving their activities.
- Labor Mobility and Retraining Program (LMRP) – this program provides workers with financial assistance, training and placement services in restructured or privatized public sector enterprises. To help workers during the transitional period, the Labor Mobility and Retraining Program also provides grant financing to public sector enterprises to cover costs incurred by labor mobility. The type of expenditures financed include early retirement and separation benefits, unemployment insurance and professional counseling.

(3) Pool of Experts

To design measures, schemes and other instruments, a pool of three management experts will:

- Assist redundant employees to leave the company with specific.

- Provide technical assistance for the restructuring and the organizational development of the CTA Holding Company.
- Prepare business plans for the affiliated enterprises.
- Organize training programs with the cooperation of the Training Program Center proposed in section 5.5.
- Initiate new activities.
- Reduce the staff gradually with use of redundancy options and incentives schemes.
- Acquire financial means to support the use of redundancy incentive schemes.

This pool of management experts must develop new commercial activities taking full advantage of CTA assets. CTA owns land and small shops can be built by CTA and rented to redundant staff under certain conditions.

In the early eighties, East Delta Bus Company (EDBC) was the first one to start this concept, it was a success story in Cairo with innovative futuristic (at that time) thoughts and ideas. Based on this previous experience, CTA can develop these new commercial activities.

(4) Selection of the Best Qualified Employees

The CTA restructured affiliated enterprises must have a clean start without any burden from the past.

The management of the restructured affiliated enterprises will select their employees among the 45,800. The selection will be based on motivation, commitment and qualification. Candidates for the restructured affiliated companies will get higher salaries, but will lose their long term job security in the future when the new restructured enterprises have proven to be successful and are privatized. It can be considered to offer those candidates, qualified and willing to step over to the new restructured enterprises, a three to five year employment guarantee.

(5) Redeployment and Retirement Options

The Study Team will now describe the measures to be taken regarding individual employee for whom a workplace is not available in the restructured affiliated enterprises.

Basic for all these measures is that they are voluntary and discussions with the labor unions are necessary to help the employees to choose one of the proposed measures.

1) Early Retirement Scheme

This early retirement scheme is the most important measure for the redundancy problem. That means it must be made so attractive that almost all employees in the relevant age, 50 years and above for men and 45 years and above for women,

will accept an offer in this way. The amount of money which will paid will be related to the age of the employee, the number of years in the enterprise and the labor position/salary group.

Instead a lump sum payment, the payment of this amount can be spread over a long payment period to make this scheme more attractive. With the extended period there is less danger of spending the money in a short time and falling into poverty after that time. Lump sum payment must be given on specials demands in case of a productive investment (self-employment) or a sufficient family income from other sources.

2) Incentive Scheme

Early retirement scheme does not bring a 100 per cent solution to the redundancy problem. For this reason a similar facility should be created for the younger workers. A part of these employees can try to earn an income from other activities such a job outside the company or start their own business.

These sources of income may be seen as less certain than working in a state owned company. Also the contribution to retirement may be less sure. To cope with these barriers an incentive scheme is helpful. This incentive scheme has two functions:

- Payment of an (additional) income during a number of years and extended contribution to the retirement insurance.
- Providing seed capital for the start of new enterprises or buying an existing business.

If the employee plans to set up a business on his own account, under certain conditions he can receive most of the money in a tranche. It must be sure that the business has good chances and a reasonable outlook for an income during a number of years. It should be avoided that these new entrepreneurs put their money in a business that gets bankrupt after a short period.

3) Self Employment

Self employment can be a solution for a certain number of redundant employees. Many of these employees who choose fro self employment may already have a business in a preliminary form. The objective of this scheme is to bring those shops and enterprises in the official economy.

The bigger help that is given to these entrepreneurs is a financial aid. The amount can play an important role as seed capital. Special rules must make sure that the new enterprise is a real project instead of a general way to receive the money in one transfer.

The seed capital and a business plan form a good basis for obtaining further bank loans if these are necessary to finance all the assets and the starting costs.

Furthermore, the existing instruments of the Social Fund for Development towards entrepreneurs are applicable. These instruments are:

- Free consultancy about the viability of the new firm
- Training
- Loan scheme

It is the task of the entrepreneurs to make and to promote the business ideas, to look for a location, to find suppliers and to make contact with potential customers.

The pool of experts have to promote self employment option:

- To introduce self employment as a real choice
- To deliver basic advices on how to set up a business and how to write a business plan
- To train potential entrepreneurs in making their first steps in this field.

This service will restrict itself to those employees which have a strong inclination to start their own business and who want to employ themselves.

4) Outplacement

Outplacement is an activity towards an individual employee enhance his chances on the labor market. These activities are placed in a program which is specially designed for the employees.

Activities can be:

- Education
- Assistance in finding another job
- Training to present themselves to new employers
- Active search in fast growing companies for vacant jobs,…

(6) Labor Law N°12/2003

The new labor law (April 2003), articles N°196 to 201, is more flexible than the previous labor laws concerning overstaffing in public and private enterprises.

According to Article 196: “The employer, for economic necessities, shall have the right to close down the establishment wholly or partially; or shrink its size or activity which might affect the size of labor…”.

(7) Ministry of Public Enterprises

The Study Team would like to point out the experience in early retirement programs of the Ministry of Public Enterprises to reinforce the objective of restructuring CTA.

- Early retirement is a voluntary process; from 1996, 200,000 workers were participating to the Early Retirement Program under the direct supervision of the Ministry of Public Enterprises. The average financial compensation for early retirement is 24.000 LE per worker. A total amount of four billion and a half LE was spent with the Early Retirement Program since 1996, 80 % from the proceeds for privatization and 20 % from dividends through the Restructuring Fund.
- The Ministry of Public Enterprise Sector was supervising 314 companies part of 27 holding companies in 1996, in 2003, 180 companies and 9 holding companies are still in the portfolio of the Ministry of Public Enterprise.
- They had the experience to transfer some workers from one company to another. They transferred workers from Metallic Co. (metal construction) which had labor surplus to SEMAF Company (Subway system) which was suffering from labor shortage.
- There are not fixed rules because negotiations between the Ministry of Public Enterprise Sector and private investors are different from a company to another one. In Asuit Cement Company (Cemax), the investor built a small firm inside the company to fit the excess labor that they had. In Iron and Steel Company, the financial compensation in some cases reached 90,000 LE.

5.4.4 Road to Privatization

(1) Approach

The process of reform is not only limited to two extremes, public monopoly and totally free market. Instead, a variety of regimes are possible which draw on the strengths and capabilities of respective sectors in order to provide a responsive and adequate level of public transport service to the populace. Shown in Figure 5.4.2 are the major regimes, along with various transition catalysts. In essence, the main "axes" of the process are determined by a desire to exert less control (regulation), expend less public funding, or a combination thereof. The main regimes are[3]:

- Public Monopoly: In this regime transport operations are exclusively provided by an operator enjoying a permit from a public agency without having to compete for the permit or having to face service competition from other operators.
- Gross Cost Service Contracting involves the procurement of specified services by a public authority from an operator at a price determined through competitive tendering. Contracts are usually for three to five years. The operator passes all on-bus revenues to the procuring authority and does not take any revenue risk. It requires a secure means of ensuring that the procuring authority actually gets any fares that are paid on the vehicle, and careful

[3] This discussion draws from *Cities on the Move: A World Bank Urban Transport Strategy Review*, by the World Bank, Washington DC, 2001 (draft); and *Review of Urban Public Transport Competition*, for Department for International Development, by Halcrow Fox Limited, 2000.

monitoring to ensure that suppliers actually do provide the service for which they have been contracted.

- Net Cost Service Contracting is similar to gross cost contracting except that the operator keeps the revenue and hence incurs both the revenue and supply cost risks. This increases the incentive to the supplier to provide the service contracted for and obviates the need for complex fare collection and security arrangements. However, it makes modal co-ordination more difficult, and often involves higher net cost for the authorities as the supplier is incurring an extra risk, the revenue risk, against which he is averse, and for which he will require remuneration.
- Management Contracting involves operator responsibility for the management of operation of a system, possibly including service specification, within agreed parameters. Operational assets are usually owned by the authority, though the operator may be responsible for their procurement and maintenance, as well as negotiating labor wages and conditions. Inter-modal coordination is relatively easy to achieve with this device, and so long as the payment arrangements are well structured there is a high incentive to provide high quality of service to attract customers. The weakness is that the competitive pressure may be fairly weak, trade union power relatively strong and costs relatively high.
- Franchising involves the grant of an exclusive right to provide a service meeting a number of general quantity, quality, and price standards laid down by the authority, usually as a result of a competition. The franchise may be for a self-contained area such as a suburban area or geographic sector, but it is also possible to have route franchises - especially with fixed track systems. They differ from service contracts in allowing the contractor a greater degree of freedom to develop the system. The franchisee may have to be paid by the authority to provide service and fare combinations that are not commercially viable.
- Concession involve the granting of an exclusive right to provide a service but without payment by the authority although the authority may attach conditions such as maximum fares or minimum service requirements. In all other respects the concessionaire is acting on his own behalf and not as an agent of the authority. Contracts are usually for rather longer periods often ten years or more, to allow the contractor to benefit from his development of the market.
- Quantity Licensing specifies the number of vehicles allowed to operate a defined type of service, or in a defined area. There may be several operators providing services. This means that the licenses will have a value as a "business asset": a value that may be charged for by the licensing authority, or when the licensee sells it. Where quantity licensing is practiced it will usually be in addition to some form of quality licensing.

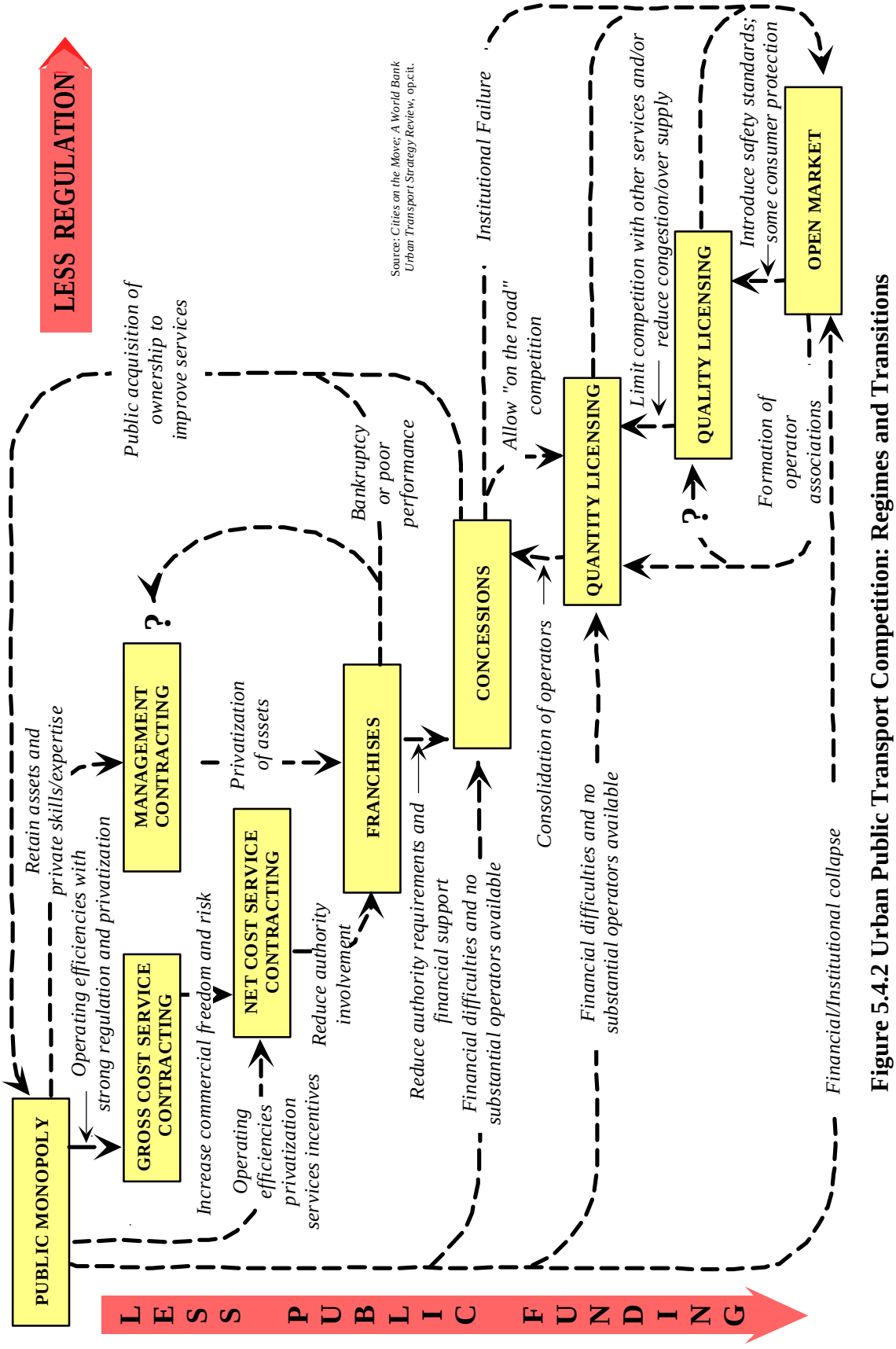


Figure 5.4.2 Urban Public Transport Competition: Regimes and Transitions

- Quality Licensing implies the operation of a public transport service by anyone receiving a license and complying with any conditions attached thereto. These conditions may include vehicle specifications, environmental performance, maintenance standards, type of service to be operated, fares and other practices.
- Open Market implies no restrictions on transport operators except those imposed by general law on business practices, vehicle construction, use of highways and traffic matters.

In general terms, all of the above regimes may be applicable to bus services. In case of rail services, public monopoly, gross and net cost service contracting, management contracting, franchises and concessions may be appropriate. Quantity licensing, quality licensing and open market are typically associated with more informal paratransit operations (such as the Cairo shared taxi system).

(2) Action

- Recent Cairo history confirms that the performance of the private and public bus sectors has diverged. Public services have, by and large, seen an erosion of their patronage base for reasons discussed previously. Private operators, in particular shared taxis, have, on the other hand, experienced an unprecedented boom in patronage. Subsidy needs of the formal sector continue to increase. It has been voiced to the Study Team in a number of instances that public operations should be immediately privatized, hence removed from public coffers. However, it is unlikely that such a radical formula will meet with success due to any number of practical and political constraints. However, a more preferred approach is to design a system that combines the relative strengths of public transport service by both the public and private sectors. There is no reason why public and private sector companies should not co-exist and compete on equal terms in a liberalized market. Indeed, the proposed approach presents a step-wise strategy for a transition approach along the path to privatization.
- The ultimate goal is to provide the best service at the least cost to government developed around a model where the government's eventual role is that of strategic planner, coordinator and regulator, and that the private sector is responsible for the actual operation of services under minimal regulation and in a competitive environment.
- As this goal is not seen as being implementable in the immediate future, a series of steps should be followed which re-shape the current industry into a more effective structure and encourage gradual transition toward the ultimate goal and privatization. Thus, the action blocks in Figures 5.4.2 indicate the different options for the commercialization of CTA according to the future of each affiliated enterprise within the CTA Holding Company. Some examples include:

1) Commercialization

The vital initial step is the depolitization of operations; that is, separation of regulatory and operational responsibilities to reduce adverse effects of

well-meaning (but possibly misguided) governmental intervention in public transport operations. This entails, in the first instance, the reconfiguration of the CTA as a Holding Company, with the important objective of giving more commercial freedom to the affiliated enterprises. The affiliated enterprises would be allowed to borrow money from other sources.

The affiliated enterprises are encouraged to be structured in a similar manner to private companies i.e. with separate business units, whereby it becomes more clear which part of operations is more cost-effective. This gives an incentive to the operator to increase the attractiveness of its service in order to increase the number of passengers. It also reinforces the concept of transport being about people being moved rather than just about vehicles.

2) Service Contracting

All the affiliated enterprises will begin to analyze their own operation, how to make it more efficient, how to minimize costs and maximize revenues and, how to increase accountability. Each affiliated enterprise will be managed and operated independently. The Holding Company will maintain coordination of the system, but responsibility for day-to-day operation, including purchasing and maintenance arrangements, will be the responsibility of the affiliated enterprises. As conditions so permit, some affiliated enterprises could be tendered to the private sector for operation either on a gross cost or net cost service basis.

CTA subsidiary, GCBC, could reasonably follow this model (although, in practice, separation of GCBC into operating units may well be desirable).

The Study Team was informed that, if successful, the goal is to service contract the minibus operation to the private sector on a competitively tendered basis, in what is effectively a net cost service contract. That is, the selected contractor would keep revenue (except for contractual fees), but in turn be responsible for fleet, maintenance and operations. Presumably some form of negotiated route structure and minimum service levels would be adopted (in effect, a broad performance agreement).

In practice the reality seems different. No tender has been made. Manufacturing Commercial Company (MCV), a private sector company, is a pioneer in operating minibuses as of July, 2003 in Cairo under the supervision of CTA. The franchise is based on a daily fee paid by MCV to CTA in giving a percentage of income to CTA, the equivalent of two seats per bus. MCV signed a 5 year franchise contract with CTA. The fees to be paid by MCV to CTA will be revised each year according to certain parameters, for example, the price of spare parts. MCV is operating two bus lines, the first being about 16.5 km in length with 12 minibuses in operation, and the second about 14.5 km in length with 8 minibuses in operation. This means MCV is operating a total of 20 minibuses. CTA operates its minibuses and regular buses on the same lines, thus CTA and MCV are competitors in the corridors served by the lines. CTA operates its minibuses and regular buses on the same lines. CTA and MCV are competitors on these two lines.

MCV made a feasibility study before signing the agreement for the franchise of the two bus lines. To make profits, MCV wanted to charge 1, 5 LE but apparently CTA refused, no more than a pound was accepted by CTA. MCV wanted to operate air-conditioned minibuses as to charge 2 LE but CTA also apparently refused.

The drivers are being tested by CTA because it has the technology for that matter. It is difficult to recruit drivers, they have a total of 45 drivers.

The Study Team recommends this type of franchise to attract private investors because it offers a good level of flexibility for the franchisee. Unfortunately, CTA did not offer this possibility to MCV to make enough profits as to increase the number of minibuses and run air-conditioned minibuses. Under these conditions it will be difficult to attract reliable investors.

These are very encouraging developments, and confirm that CTA management has considerable innovation and foresight, but that considerable political constraints exist.

3) Line by Line Tendering

The formal bus service structure would be redeployed to predominately operate in major corridors, either radial or circumferential, in which higher-order rail systems do not exist. Bus priority treatments, such as bus lanes or busways, could likely be implemented in some corridors or along some critical corridor segments, most likely those where future upgrading to higher-capacity rail modes is likely. Thus, the structure, fleet and intent of formal bus services would be refocused to providing a premium, high-quality service involving both local and express runs within the major corridors.

The affiliated enterprises may, for various commercial reasons, wish to spin-off some of the lines, or bundles of lines within these corridors, on a competitively tendered basis. Based on a rather precise description of the services asked for, a line or a number of lines, are tendered. The selected tenderer is hired as an operator of the vehicles required for the line(s). Details of the tender can also define details such as who supplies the rolling stock, and who incurs revenue risk due to patronage uncertainties. The main advantages of this model are that good integration is maintained and, based on past experience, costs are reduced (as, for example, in the UK). All decisions regarding passenger information, marketing and ticketing remain with the affiliated enterprises.

The main disadvantages is that, in some instances, overseas operators have tended to focus on lines that are profitable, whilst it is more difficult to encourage operators to tender for unprofitable ones i.e. lines which serve areas with lower population densities. The regulatory framework which has to be implemented must also maintain a high degree of involvement in the planning and monitoring of services. Because of the number of separate contracts involved, there will be higher tendering costs.

The Study Team acknowledges that much hesitation will exist to any course of action which implies fairly radical change (perceived or otherwise). It may, therefore, be preferable to undertake the transition to area franchising via a pilot project. Such a pilot project would include setting aside one geographical area and franchising operations within this area. This has several advantages. Firstly, it allows the proposed metropolitan planning bureau or, at present, the governorate, to build up experience of competitive tendering before this practice is used throughout the metropolitan area. Secondly, it gives a clearer indication of the capabilities of the private sector in terms of providing own vehicle fleet, forming an association and, through the tendering process, an insight into performing cash flow analyses.

5.5 SUPERTRAM COMPANY ORGANIZATION

5.5.1 Organizational Plan

The purpose of this section is to present a proposed staffing structure for the Supertram operator. This project of organization is being proposed according to the selected technical options and the anticipated ridership in the near term (years 2007 – 2012) and in the long term (year 2022).

The basis of the following principal management charts are:

- The organization will not be in charge of the design, construction, testing and commissioning of the project,
- In order to ensure proper facility operations, it is suggested to involve future managers during the design of the project; future maintenance managers during the construction of the project; the future maintenance managers; and during the tests, the maintenance staff and the operating staff.
- The staff organization will be in charge of the operation, the maintenance and the management of the system.
- The general operating principals will be a centralized control of all the different tasks.
- The existing tram and the Supertram systems will be operated by different entities.

The recommend general organization for the operation and maintenance of the Supertram is similar to the LRT system organizations used throughout the world.

The staffing of each department has been adjusted according to the selected technical and operational options.

(1) Board of Directors

The functions and responsibilities of the board of directors normally include the following:

- The annual budget,

- The monthly and annual management and financial report,
- The basic functional and operations policies,
- The right to hire and to approve the General Manager,
- The right to approve the persons selected to head the finance department.

(2) General Manager (GM)

The Supertram will be under the responsibility of a General Manager, supervised by a board of directors, who will be responsible for the management of all activities. It will be the General Manager's responsibility to define goals and policies for the system and to oversee their implementation. The GM will review the budget and will control major expenditures. The GM will also be involved in any negotiations with the city or with manufacturers and subcontractors.

The GM will be helped in his/her task by an assistant and a secretary, and will have under his/her responsibility five main departments:

- Maintenance department,
- Operation department,
- Finance department,
- Administration department,
- And a special safety and quality assurance department under his/her direct responsibility.

(3) Maintenance Department

The maintenance department will be supervised by a Maintenance Manager and will include four main functional units:

- Rolling stock,
- Track and civil work,
- Computerized systems,
- Electrical systems.

(4) Operations Department

The operations department will be supervised by an operation manager.

This department will be responsible for operating the Supertram system. It will consist of three main functional units:

- The Studies Operation Division,
- The Central Control Room Division,
- The Line Operational Division.

1) Studies Operation Division

This division will carry out studies concerning operation methods. This will include studies on various equipments such as trains, signaling and power supply, in order to prepare in co-ordination with the training group possible regulation modifications. It will also determine the train time-table and staff lists according to the line's ridership scheduling.

2) Central Control Room division

This division will be responsible for:

- The line train traffic control from the Central Control Room,
- The power supply,
- Managing all the centralized information to include defects to the equipment and management of the central control room staff.

3) Line Operational Division

This division will be responsible for:

- Management of the line staff (supervisors, drivers, ticketing staff, ...),
- Maneuvers on the yard operational tracks,
- Train driving,
- Passenger relations,
- Ticket selling.

(5) Finance Department

The finance department will be supervised by a financial manager approved by the board of directors.

The finance department will be responsible for all fiscal matters related to the Supertram. The main function of this department will be:

- Provision of all accounting and financial management services required by the organization including salary payments, the maintenance of all bank accounts.
- Preparation of a draft budget proposal for review by management and the provision of monthly and yearly financial performance reports.
- Preparation and execution of all approved purchase orders for equipment, materials, and supplies for the Supertram system and the maintenance of detail procurement records.
- Establishment of a library of vendor information and specifications.

(6) Administrative Department

The administrative department will be supervised by an administrative manager.

The administrative department will be responsible for the following tasks:

- Personnel administration, including the maintenance of employment records, recruitment and staffing, and the administration health and other benefit plans.
- Provision of training for employees in non technical disciplines.
- Establishment of a comprehensive safety program, including safety education, and the enforcement of safety procedures throughout the organization.
- Public relations.

(7) Safety and Quality Assurance Department

The safety and quality assurance department will be supervised by an administrative manager who will report directly to the general manager.

The task of this department is to:

- Inform, advise and assist the various operational units of the Supertram system as to quality and safety, within the limits of the legislation currently in force.
- Review and approve permanent and temporary operating and maintenance procedures proposed by the concerned services.
- Carry out incident inquiries with safety personnel in the concerned service.
- Check the compliance of operating and maintenance procedures through audits.
- Keep the General Manager informed about the measures which have been introduced.

5.5.2 Staffing Requirements: Years 2007 - 2012

The purpose of this section is to estimate the staff requirements for the various Supertram departments. The basis of the following assumptions is the opening date of the Supertram line 1 in the year 2007.

(1) General Principles

The basis of the estimates includes:

- Concerning the managers: one person per post.
- Concerning the staff: Equivalence of 1.5 rest day every 5.5 work day (7/5.5 factor); 1.2 absenteeism factor (holidays, illness, refreshing training; and, for operating staff 24 hours per day; 3 shifts per day.

(2) Number of Staff

Tables 5.5.1 through 5.5.6 indicate the suggested number of departmental staff by job category and grade of skill.

The repair of certain equipments can be performed under a service contract. Service contracts will be used primarily for components repairs and overhauls

which are not time-critical to passenger operation. Cleaning will be performed under a service contract.

Table 5.5.1 Near Term Staffing Totals: Management Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
General Manager	1					
Asst. Gen. Manager	2					
Secretary						3
Total Staff by Grade	3	0	0	0	0	3
Department Total	6					

Source: JICA Study Team

Table 5.5.2 Near Term Staffing Totals: Safety and Quality Assurance Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1					
Technician				2		
Secretary						3
Total Staff by Grade	1	0	0	2	0	3
Department Total	6					

Source: JICA Study Team

Table 5.5.3 Near Term Staffing Totals: Maintenance Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1					
Secretary						2
Rolling Stock		1	3	7	20	90
Civil Works		1	1	5	7	9
Track			1	3	4	12
Electromechanical			1	4	8	12
Telecommunication		1	1	11	12	4
Fare equipement			1	3	5	4
Signaling			1	5	8	8
Substation		1	4	7	13	10
Miscl. Equipment			1	6	6	11
Total Staff by Grade	1	4	14	51	83	162
Department Total	315					

Source: JICA Study Team

Table 5.5.4 Near Term Staffing Totals: Operations Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1	1				
Secretary						2
Technical Studies		1	5			3
Telecommunication			1	17		4
Ticket selling/control						85
Line Supervisor		1	1	11	8	16
Train Drivers					70	
Total Staff by Grade	1	3	7	28	78	110
Department Total	227					

Source: JICA Study Team

For the calculation of the driver number, the following has been assumed:

- A working time per day per driver of 8 hours,
- An extra driver time for stabling, maneuvers, refreshing training of 20 %,
- An extra driver time for holidays, illness of 20 %.

Table 5.5.5 Near Term Staffing Totals: Finance Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1					
Secretary						2
Budget		1	1			2
Treasury		1	1	3	5	2
Contracts		1	1	1		
Total Staff by Grade	1	3	3	4	5	6
Department Total	22					

Source: JICA Study Team

Table 5.5.6 Near Term Staffing Totals: Administrative Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1					
Secretary						2
Personnel Admin.		1	2	2	3	4
Recruitment		1	1			2
Safety Training		1	2	4	4	4
Public Relations		1	2	2		2
Total Staff by Grade	1	4	7	8	7	14
Department Total	41					

Source: JICA Study Team

Certain tasks, such as cleaning or security, will be performed under a service contract.

In summary, the Supertram organization will require a total of 617 staff (Table 5.5.7) within an efficient and streamlined Supertram Line 1 Company organization (Figure 5.5.1).

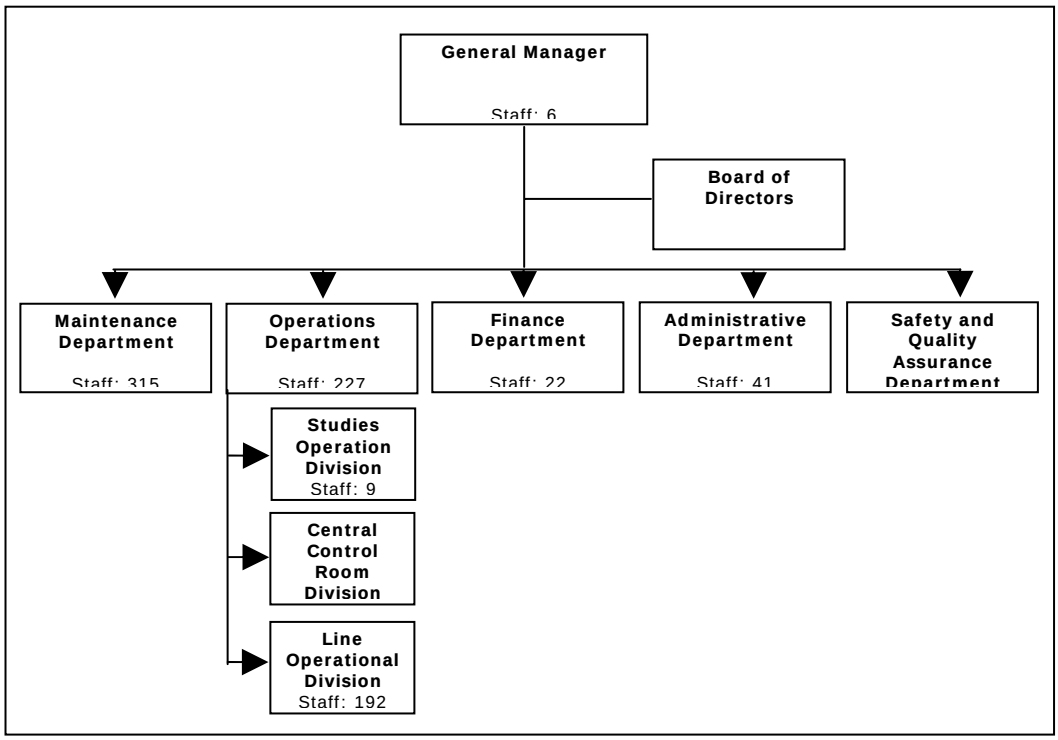
5.5.3 Staffing Requirements: Year 2022

The purpose of this section is to estimate the staff requirements for the various Supertram departments. The basis of the following tabulations is a year 2022 operating condition.

Table 5.5.7 Summary: Supertram Line 1 Near Term Staffing Totals

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Management	3					3
Safety/Quality	1			2		3
Maintenance	1	4	14	51	83	162
Operations	1	3	7	28	78	110
Finance	1	3	3	4	5	6
Administration	1	4	7	8	7	14
Total Staff by Grade	8	14	31	93	173	298
Supertram Total	617					

Source: JICA Study Team



Source: JICA Study Team

Figure 5.5.1 Supertram Company Organization: Years 2007 - 2012

(3) General principles

The basis of the estimates includes:

- Concerning the managers: one person per post.
- Concerning the staff: Equivalence of 1.5 rest day every 5.5 work day (7/5.5 factor); 1.2 absenteeism factor (holidays, illness, refreshing training; and, for operating staff, 24 hours per day; 3 shifts per day.

(4) Number of Staff

Tables 5.5.8 through 5.5.13 indicate the suggested number of departmental staff by job category and grade of skill.

Table 5.5.8 Long Term Staffing Totals: Management Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
General Manager Asst. Gen. Manager Secretary	1 2					 3
Total Staff by Grade	3	0	0	0	0	3
Department Total	6					

Source: JICA Study Team

Table 5.5.9 Long Term Staffing Totals: Safety and Quality Assurance Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager Technician Secretary	1			 3		 3
Total Staff by Grade	1	0	0	3	0	3
Department Total	7					

Source: JICA Study Team

Table 5.5.10 Long Term Staffing Totals: Maintenance Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1					
Secretary						2
Rolling Stock		1	4	10	25	110
Civil Works		1	1	6	8	10
Track			1	3	5	15
Electromechanical			1	4	10	16
Telecommunication		1	1	14	14	4
Fare equipement			1	4	6	4
Signaling			1	6	10	10
Substation		1	4	8	16	12
Miscl. Equipment			1	8	8	14
Total Staff by Grade	1	4	15	63	102	197
Department Total	382					

Source: JICA Study Team

The repair of certain equipments can be performed under a service contract. Service contracts will be used primarily for components repairs and overhauls which are not time-critical to passenger operation. Cleaning will be performed under a service contract.

Table 5.5.11 Long Term Staffing Totals: Operations Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1	1				
Secretary						2
Technical Studies		1	5			3
Telecommunication			1	20		4
Ticket selling/control						120
Line Supervisor		1	1	15	12	20
Train Drivers					95	
Total Staff by Grade	1	3	7	35	107	149
Department Total	302					

Source: JICA Study Team

For the calculation of the driver number, the following has been assumed:

- A working time per day per driver of 8 hours,
- An extra driver time for stabling, maneuvers, refreshing training of 20 %,
- An extra driver time for holidays, illness,... of 20 %.

Table 5.5.12 Long Term Staffing Totals: Finance Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1					
Secretary						2
Budget		1	1			2
Treasury		1	1	3	5	2
Contracts		1	1	2		
Total Staff by Grade	1	3	3	5	5	6
Department Total	23					

Source: JICA Study Team

Table 5.5.13 Long Term Staffing Totals: Administrative Department

Assignment	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Department Manager	1					
Secretary						2
Personnel Admin.		1	2	3	5	5
Recruitment		1	1			2
Safety Training		1	2	5	6	4
Public Relations		1	2	2		2
Total Staff by Grade	1	4	7	10	11	15
Department Total	48					

Source: JICA Study Team

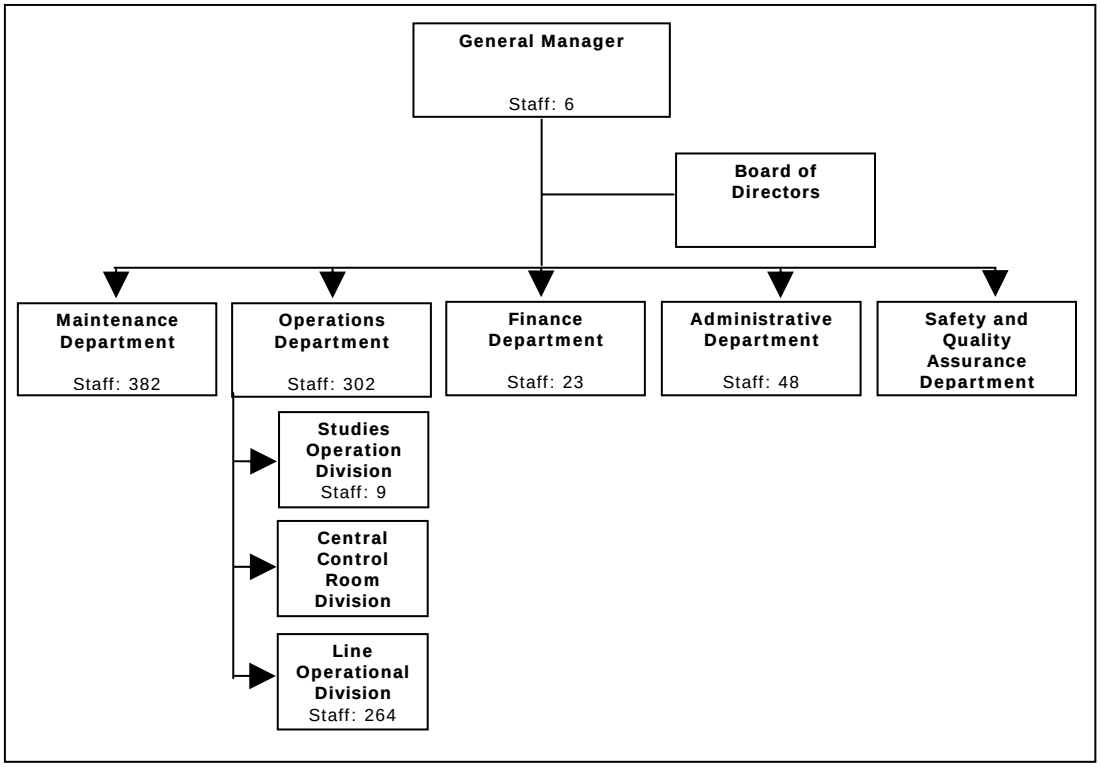
Certain tasks, such as cleaning or security, will be performed under a service contract.

In summary, the Supertram organization will require a total of 768 staff (Table 5.5.14) within an efficient and streamlined Supertram Line 1 Company organization (Figure 5.5.2).

Table 5.5.14 Summary: Supertram Line 1 Long Term Staffing Totals

Department	Number of Staff by Grade					
	Manager	Senior Engineer	Engineer	Senior Technician	Technician	Other Staff
Management	3					3
Safety/Quality	1			3		3
Maintenance	1	4	15	63	102	197
Operations	1	3	7	35	107	149
Finance	1	3	3	5	5	6
Administration	1	4	7	10	11	15
Total Staff by Grade	8	14	32	116	225	373
Supertram Total	768					

Source: JICA Study Team



Source: JICA Study Team

Figure 5.5.2 Supertram Company Organization: Year 2022

5.6 HUMAN RESOURCES DEVELOPMENT PROGRAM

5.6.1 Introduction

Public transport has become very complex and different levels of expertise are necessary to coop with the future introduction of innovative techniques and technologies. Public transport knowledge is no longer limited to the physical transport of passengers, but the complexity has expanded towards a set of interconnected issues:

- Complexity of the regulatory environment;
- Complexity of public transport system operations;
- Complexity of efficient management and mastering the applied management systems;
- Complexity of technology and techniques (including automated systems);
- Complexity of market structures.

Consequently, humanware development (more in particular expertise building) can no longer be limited to basic professional training of personnel directly involved in public transport operations, but has to be gradually extended towards all stakeholders, including public decision-makers and managers in public and private public transport operators (including taxi drivers and operators of private and dedicated bus services). Refer also further discussion in section 5.8.

This section focuses on the conditions for establishing a sustainable training program. The proposed training programs as well as the approach to formally establish the training program takes into account Supertram Line 1 development as well as the planned structural changes for CTA. But it anticipates that both programs are only part of a more comprehensive modernization of public transport in Cairo. The proposed public transport services for the Wings, connecting the satellite cities of 10th of Ramadan City and 6th of October City, and the Corridor Line 4 Traffic Management System, are also components of the modernization effort.

The sustainability quality of the proposed training program therefore requires that attention is paid to the training and re-training needs of all personnel, directly or indirectly involved in public transport inside the Greater Cairo Region. The next paragraphs will first discuss the general context of establishing a sustainable training program for public transport in the Greater Cairo Region and proposes a possible structure and framework content for a comprehensive training program. This is the theory which reflect an optimal situation in a long-term future and does not propose concrete training programs.

In the paragraphs thereafter, the minimum conditions will be reviewed for a training program that is imperative for accompanying the CTA restructuring efforts and to guarantee an efficiently operating Supertram Line 1, once it has been developed.

Finally, the last sections will reflect on the conditions for implementing the proposed training program and in time progress towards a sustainable training program for the entire public transport sector in. It should be emphasized, however, that this Public Transport Training Program (PTTP) is discussed in a conceptual manner.

A detailed and in-depth study will be required to determine the exact structure of the PTTP as well as the detailed content of the individual training modules and sessions. The goal of such study is threefold:

1. ***To study the organizational, administrative, legal and operational conditions of the PTTP;***

2. ***To establish the different training programs, individual curricula and learning tools and develop in detail the content of each class; and,***

3. ***To identify key issues that have to be taken into account during its development. In particular the modular approach should be specified in time, allowing a gradual and needs-based introduction of training programs and educations techniques and tools.***

While the CREATS efforts result in a basic development strategy and a structural review of the overall program, the proposed study will :

- Specify in detail the conditions and needs for the establishment of the training program. This framework includes all structural, regulatory, financial,

operational, technical (equipment) and content (syllabi and training materials) issues that will determine the quality and efficiency of the training program.

- Propose a detailed roll-out plan and implementation time-frame for the concrete establishment of the Public Transport Training Program (PTTP), including preparatory training of future trainers and contracting external trainers (e.g., from national and international universities and transport and management institutes), actual financing of the training program, purchase of training facilities (housing, equipment,…), etc…
- Identify the implications for public transport organizations and services. Direct implications relate to the working hours of personnel, absence from work when following training, etc. Indirect implications predominantly refer to benefits related to increased expertise such as reduction in accidents, increased efficiency, higher quality, reduced operational costs etc.

5.6.2 The Need for a Comprehensive Training Program

(1) Sustainability in Public Transport

Transport infrastructure development, combined with technical and technological innovations will create over time a modern public transport system. But this system will only work properly of it is managed, maintained, and used by personnel mastering the appropriate know-how. The lack of well-trained staff is recognized by an increasing number of professionals and public representatives who argue that the growing structural and operational complexity of the public transport system in the Greater Cairo Region implies that sustainable expertise building is an issue that has to be *urgently* attended. Professional training and career re-orientation (accompanied by appropriate re-training programs) will prepare and assist the successful introduction of modern equipment, techniques and technologies in Cairo's integrated public transport system of the future.

It therefore cannot be stressed enough that expertise building should be considered a vital part of that development and the same attention should be reserved to that issue as to public transport infrastructure development or the introduction of automated and innovative equipment and technology.

Without the adequate expertise available, innovations and improvements will never generate the expected and hoped-for benefits. Independent of the speed of innovation, the establishment of a comprehensive Public Transport Training Program (PTTP) will be(come) indispensable for the public transport system of Cairo.

(2) Imperative Quality Conditions

To guarantee the necessary quality of the training programs and courses for public transport personnel in the Greater Cairo region, some important principles will have to be applied. As was discussed in Section 5.1, the PTTP needs a **modular approach**. The modular approach introduces the necessary flexibility in the

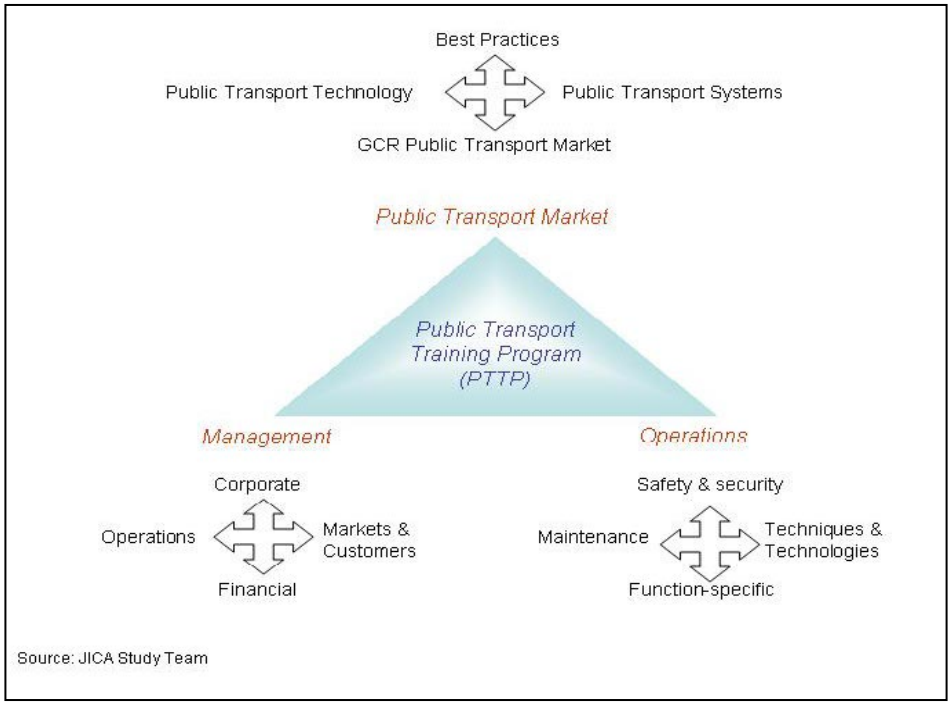
training program that allows to react to specific expertise building needs whenever they occur. In other words, the PTTP can start immediately and grow in parallel with the modernization of the public transport system in Cairo. In order to start in the near future, the PTTP should focus on the existing situation and the results of the various studies regarding Cairo's present and future public transport system. This will prepare personnel NOW for the operational, managerial, technical and technological changes of the FUTURE. The training courses will also have to offer theoretical and practical components. The practical training components include on-the-job training of operational personnel, allowing staff to operate existing equipment and rolling stock more efficiently and to get familiar with new equipment, technologies and services whenever they are introduced.

5.6.3 Human Resources Development: General Framework

(1) The Vision

Human Resources Development is and should be considered as an important catalyst for corporate growth and sustainable business development. In that view, the PTTP should approach its training as any professional organization or private company would do. It should enclose all relevant components of the public transport system, both at the operational and managerial level and also pay the necessary attention to the public transport market and the way it functions.

In its optimal form, the comprehensive training program of the PTTP should develop training programs at three generic levels, namely the *market* (of public transport), and the domains of *management* and *operations* respectively (Figure 5.6.1). It should be stressed here that this vision is a theoretical view on how a comprehensive training program such as the PTTP could operate over a long-term future. This paragraph does not discusses the content of a concrete training program for the PTTP because there is still al long way to go before the point is reached where the need for such extensive up-to-date training becomes necessary. With the future restructuring of CTA and the possible development of Supertram Line 1 and the Wings, only the start is given to a long-term restructuring and modernization of the public transport system in Cairo. It is only when the modernization efforts reach their end, that the training programs of the PTTP should be similar to the structure visualized in Figure 5.6.1.



Source: JICA Study Team

Figure 5.6.1 Framework for Public Transport Training (Long-term Vision)

A first generic group of training programs should relates to the market of public transport. Under optimal conditions, four different components need to be introduced to the trainees with the following therewith related goals:

- *Public transport market in Greater Cairo Region*: introduce good management and operations starts with knowledge of the market, adapted to the responsibilities of personnel at all levels.
- *Best practices*: Informing on best practices and the therewith related efficiency benefits will improve corporate culture and facilitate change.
- *Public Transport Technologies*: being in touch with modern evolutions in public transport technologies and techniques is imperative, even if not all the latest technology and practices are incorporated in Cairo.
- *Public Transport Systems*: Knowledge on how public transport functions and on how the different components interact will help personnel to better understand and appreciate their role in the organization.

A second generic group relates to an efficient management training program that considers the four components of management:

- *Financial management:* where the relevant managerial staff is familiarized with financial management theory, and receives the necessary training in modern techniques and technologies of financial management.
- *Operational management*: where practical training and theory on the functioning of a modern public transport system will ensure that management has the required capacity to manage and control the public transport system they are responsible for.

- *Corporate management*: where management is prepared for the increased complexity of modern organizations and the impact of the privatization and structural reforms of public transport and introduce efficiency and effectiveness as corporate goals.
- *Market and customer management*: where management is prepared for the notion that service quality is the key factor to achieve customer satisfaction and create loyal commuters. Managers will be able to react to market and customer behavior changes and adapt services to their constantly changing needs.

The third group of generic training programs focuses on operations and concentrates on the practical training of personnel in their respective tasks. Operations training relates to four major groups:

- *Operational control*: Where the principle of controlling the work is introduced in future corporate culture. Modernization implies that increased and more efficient control of daily operations will be required and controlling staff will have to be trained.
- *Management of operations*: where managers at the operational level are introduced and trained in methods and techniques to improve day-by-day management of operations.
- *Techniques and Technologies*: where personnel is trained to efficiently operate the equipment to which they are attached and receive the appropriate specialized training that corresponds to the more modern equipment that will be introduced in the future.
- *Function-specific training*: from where everything starts. It is the practical on-the-job training employees receive.

(2) The Context

It is recommended that the CTA undergo a comprehensive restructuring and reorganization program. But also Cairo's public transport system should soon engage in a vast modernization program. The program foresees over time the introduction of new services such as supertram; new operational techniques among which modern ticketing technology; restructuring existing and introduction of new transport services.

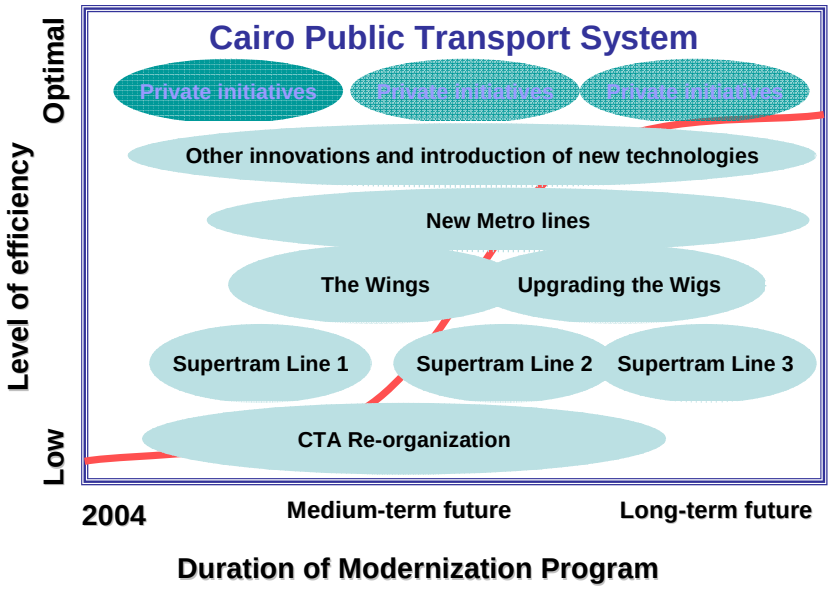
The time is right to introduce an adapted and comprehensive public transport training program (the PTTP) to support these dramatic changes by pursuing excellence at three different levels:

- General training programs covering the existing and future expertise needs of managerial and operational staff at all levels of the organization;
- Dedicated training programs to support and facilitate the introduction of new services, new technologies and innovative equipment; and,
- Time-specific (re-)training programs, emerging as a consequence of present and future re-organization efforts.

Searching for excellence at these three levels will benefit not only the entire present and future public transport system of Cairo but will also facilitate and accompany the introduction of new services and structural changes, as can be seen in Figure 5.6.2. As shown, the modernization program for the public transport system of Cairo is a long term effort and each of the individual components will contribute to increase the efficiency of the overall system. But the figure also demonstrates that this modernization will require innovation, and innovations per definition require personnel to acquire and master the therewith related expertise.

(3) The Need

As can be seen in Figure 5.6.2, the CTA restructuring and the development of Supertram Line 1 will probably occur simultaneously. A Supertram Training Program (STP) is imperative for efficiently operating the new technologies and techniques that will be installed. According to the CREATS vision, the STP structure and content will remain independent from the fact whether the supertram will be attached to CTA or whether the supertram will be operated by a new (to be established) operator or by the (reformed) CTA. In the same way, the CTA restructuring will require adjusted training programs of which the content and structure will be developed on the basis of the needs and requirements attached to the restructuring program and its effects.



Source: JICA Study Team

Figure 5.6.2 Context of the PTTP (long-term vision)

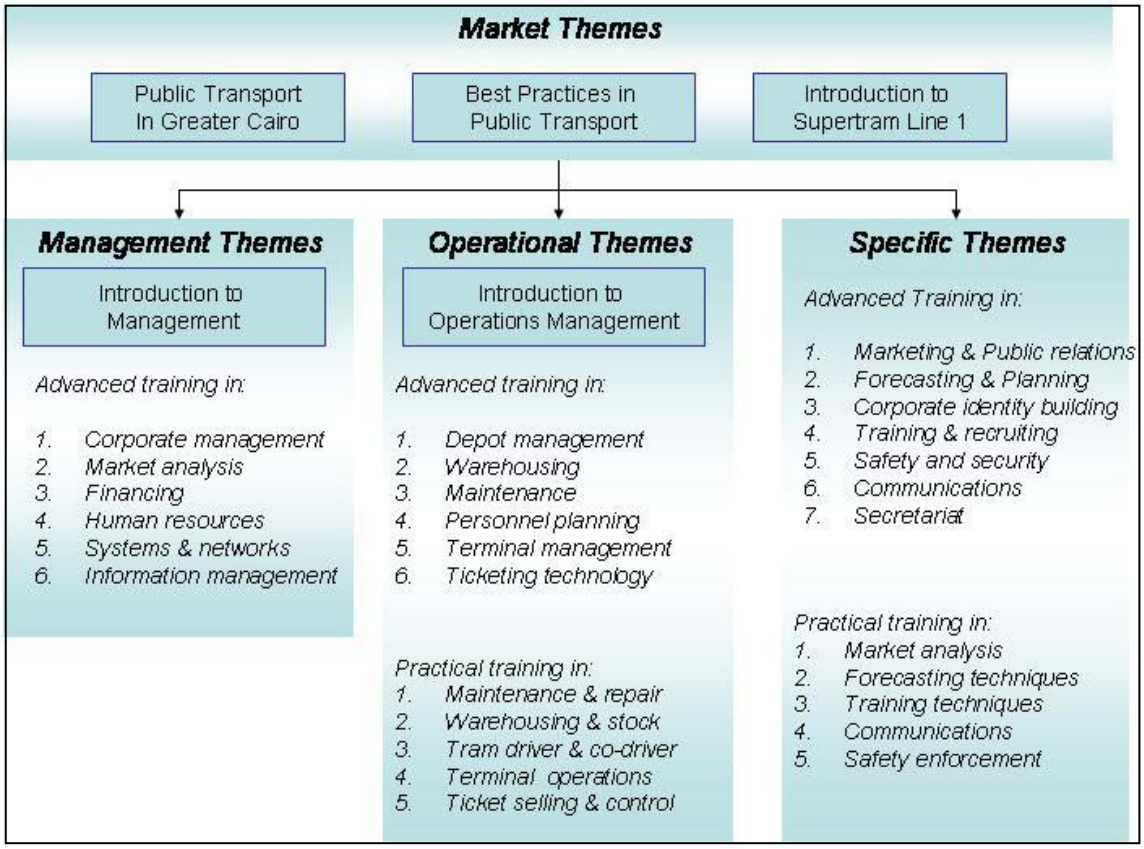
The only determining factor for the PTTP is the expertise needs of Supertram Line 1 once the service will be operational and of CTA once the restructuring process is in motion. The modular approach of the PTTP allows the gradual introduction of training modules that meet the needs of each of these programs and to continue growing with the modernization of the public transport system (*building block principle*).

As discussed in detail in Section 5.5 of this chapter., the Supertram Line 1 organization will need various types of staff with different managerial and operational responsibilities and functions. A total of 768 personnel is initially foreseen to efficiently run the supertram service, including 138 managerial and senior staff, 257 engineers and technicians and 373 other staff. Managers and senior staff will have managerial responsibilities, while engineers and technicians are ensuring day-by-day operations. Both are assisted by a supporting staff, ranging from secretaries and general administrative staff to specialists in training and recruiting or in quality and safety control.

Further, and as discussed in Section 5.4 of this chapter, it is recommended that the CTA undergo, over time, important structural, organizational and operational changes to deal with the evolving public transport market in Cairo. Staff will have to be re-allocated, new equipment, techniques and technologies will be introduced and as a consequence of that, new managerial and functions will be created. This will require new personnel which also has to be trained. The STP and CTA expertise development program both need to reflect this diversity and will have to provide following types of courses:

- General courses for all personnel;
- Courses, oriented towards management and senior staff;
- Technical and practical training on supertram operations;
- Administrative courses for supporting administrative staff; and,
- Specialized training for specific expertise (recruiting, safety, etc…)

It should be noted that the training sessions proposed in the next paragraphs are discussed in a conceptual manner and focus on the supertram and CTA training needs without losing sight of the longer term objective. Although more training programs will in the early stages be required for the supertram, several of these training programs also explicitly cover the needs of the CTA in support of their restructuring program. The proposed structure (Figure 5.6.3) is in line with the general framework previously presented in Figure 5.6.1.



Source: JICA Study Team

Figure 5.6.3 Public Transport Training Program – SL1 Structure

The training program consists of four core groups of training modules each further divided in different specific sub-modules, containing both theoretical and practical training sessions. These are:

- Market themes
- Management themes
- Operational themes
- Specific themes

(4) Market Themes

1) Objective

The objective of the Market Themes training module is to familiarize relevant personnel with the specifications of Supertram Line 1 and the market in which it will operate. Market oriented training should certainly be followed by both managerial and (senior) operational staff. The approach and content of the Market Themes training module makes it also is a good basis for training CTA senior management staff in the content and functioning of the present and future public transport system of Cairo.

A first module discusses the present public transport system in Cairo; a second training module evaluates in general terms how modern and integrated public transport systems operate; a final third module is specifically oriented towards the introduction of Supertram Line 1 and informs all supertram personnel on the role and functioning of this technology within Cairo's public transport system.

If the need should emerge, a similar training course, oriented towards the new CTA, could be developed. This need will undoubtedly emerge one the restructuring program is initiated. It could also be considered to make the courses more generic and therewith accessible to senior staff from different public transport operators.,

Two elements need to be considered in respect to CTA training in the future. A first issue is to determine who can benefit from this training and under what conditions personnel can attend the new training programs. It should be avoided that in the future, the existing problem persists where personnel enters a public transport organization to receive specialized training after which they leave for a (better paid) job in the private sector. This is one of the major problems that CTA is facing with in its ongoing training programs. A second issue is the restructuring of CTA and the impact it will have on its personnel. Personnel will have to be trained for new assignments within the restructured CTA (re-assignment of staff or training new personnel). As part of amortizing the social impact of the CTA restructuring program, redundant staff could acquire new skills via a special skills development program, preparing him or he for to enter an increasingly competitive market place. The issue whether this is the responsibility of the CTA is not discussed here. The possibility is only put forward and should not be seen as a recommendation. It will be the responsibility of the relevant public decision-makers to establish an acceptable policy that deals with the social consequences of the CTA restructuring program.

2) Training Modules

The Market Themes training modules are described in Table 5.6.1.

As can be seen, modules MT-1 and MT-2 are common to CTA and Supertram Line 1, while the next two modules are dedicated to Supertram Line 1 and CTA respectively. In case new programs, services or organizations enter the public transport market, additional training programs can be considered that meet their specific needs.

3) MT-1: GCR Public Transport

Personnel working in public transport need to understand what public transport is about, what its role is and how it functions. Managerial and senior operational personnel will have to be introduced to Cairo's public transport system by following a training program as described in Table 5.6.2.

Table 5.6.1 Market Themes

Code	Module	Content description
MT-1	GCR Public Transport	1. Description of different types of public transport services 2. Review of functioning of different systems 3. Potential of the various systems in the GCR public transport system 4. Review of strength and weaknesses of present GCR public transport system
MT -2	Best Practices	1. System view of public transport and the concept of Integrated functioning of public transport 2. Best practices in European cities (Spain, Germany, Zurich, etc…) and in developing countries (Bogotá, Bangkok, etc…) 3. Relevance for GCR public transport now and in the future
MT -3	Supertram Line 1	1. General description of Supertram Line 1 2. Individual components of Supertram Line 1 3. Feeder services and Supertram Line 1 4. Supertram Line 1 and other public transport services in GCR 5. Future and forecasts for Supertram Line 1 6. Supertram Line 1 and the public transport system of the future
MT -4	CTA restructuring	1. Why a new CTA 2. Description of the reform program 3. Future role of CTA in Cairo's public transport system 4. CTA reforms and the future public transport system in GCR
MT -x	Other programs dedicated to the modernization of the public transport system	1. Why 2. What 3. Where and When 4. How

Source: JICA Study Team

Table 5.6.2 MT -1: Content - GCR Public Transport

Code	Session	Content description
MT-1A	Public Transport services	1. General description of metro lines, LRT, CTA buses, aircon-buses, Nile services, shared taxi, taxi 2. Analysis of relationship(s) between different services
MT-1B	Functioning of services	1. Functional description of metro lines, LRT, CTA buses, aircon-buses, Nile services, shared taxi, taxi 2. Functional review of major lines and connections 3. Functioning of service in general traffic in GCR
MT -1C	Examples of best practice	1. Ridership analyses (evolutions, forecasts, etc…) 2. Contribution of service in respect of general mobility (congestion, accessibility to services, coverage, interconnectivity, etc…)
MT -1D	Relevance of existing and new transport services to the public transport system	1. Review of strong points in different public transport services 2. Review of weaknesses of the public transport services 3. Conclusions on the present functioning of the public transport system

Source: JICA Study Team

4) MT -2: Best Practices in Public Transport

Substantial efforts are made and will continue to be made by public decision makers to transform the present public transport network and to establish a modern and integrated public transport system. Knowledge about modern public transport services as they operate in many other cities is important to prepare for Cairo's public transport system of the future. Personnel needs to be introduced with the various managerial and operational components that make an efficient and integrated public transport system. Knowledge of modern public transport will prepare and facilitate the future introduction of similar techniques, technologies and equipment in the public transport system of the Greater Cairo Region.

Supertram Line 1 is only the first of several innovations that will be introduced over time. For that reason, managerial and senior operational personnel that will work for Sueprtram Line 1 need to be acquainted with integrated public transport systems that have proven their efficiency. This will allow supertram personnel to get the necessary know-how and insights on the functioning of modern and integrated public transport systems and to transfer this expertise to the benefit of Supertram Line 1. To achieve that level of insight, personnel will need to follow a training program of which the details are described in Table 5.6.3. Also CTA will in time engage in an efficiency improvement and modernization program that will introduce new techniques and technologies. Once the introduction thereof is decided, relevant CTA staff could participate in the training sessions or add CTA-specific training sessions to this program.

Table 5.6.3 MT-2 Content - Best Practices in Public Transport

Code	Session	Content description
MT-2A	System view	1. What is a public transport system 2. How does a modern public transport system functions and what are its particularities 3. Introduction to integrated systems for public transport
MT-2B	Functioning of services	1. Technologies and techniques of integrated public transport 2. How does integration works in practice 3. The importance of integrated ticketing
MT 2C	Best Practices	1. Best practices in developed countries 2. Best practices in developing countries 3. Review of similarities and differences
MT 2D	Relevance for GCR	1. Conclusions regarding the reviewed best practices 2. Potential for the public transport system in the GCR and Supertram Line 1/ CTA.

Source: JICA Study Team

5) MT -3: Supertram Line 1

It should go without saying that all personnel involved in Supertram Line 1 should be capable of efficiently executing their individual tasks. Managerial, operational and supporting personnel at all levels needs to have a overall view of the supertram service and on the functioning of the most important components. Particular attention should be paid to the relationship of Supertram Line 1 with other public transport services in Cairo and to the potential contribution to and role of Supertram Line 1 in Cairo's public transport system of the future.

But this knowledge is not exclusive for supertram personnel and should be a guiding principle for all public transport operators. Therefore, similar course should be developed to assist senior staff during the CTA restructuring program, ensuring that all relevant personnel has a broader view on the role of CTA in Cairo's public transport system of the future. A similar table of content can thus being drawn up which will provide training programs that support, assist and strengthen the CTA restructuring and modernization program.

Knowing the system in which one works is a primary condition for its efficient functioning. Therefore, it is suggested that all personnel follows a basic training program that contains the sessions described in Table 5.6.4. The different sessions introduce Supertram Line 1 in general and analyze in more detail the innovative and particular features of the supertram.

(5) Management Themes

1) Objectives

Given that Supertram Line 1 is the first public transport service that will introduce in Cairo an integrated and intermodal public transport service, training in various management themes will familiarize all levels of management with the requirements and technologies for managing and controlling a modern and integrated public transport system such as Supertram Line 1. Because several management topics could also be useful for senior technical staff, some STP - Management Themes modules could also be followed by department managers and senior technical staff.

Directly or indirectly, CTA will be involved in this new integrated public transport service and might, within the context of its own restructuring program, introduce other integrated services, for example in relation to Metro. For that reason, managerial personnel and senior technical staff of CTA also needs to be aware of the particularities of managing integrated public transport systems and could therefore receive theoretical as well as practical training on a variety of relevant managerial issues.

Table 5.6.4 MT -3: Content – Supertram Line 1

Code	Session	Content description
MT-3A	Supertram Line 1 (Module 1)	1. What is Supertram Line 1 2. Basic description of the individual parts of SL1 service (equipment, services, routing and time tables, ticketing technology, depots,…)
MT-3B	Supertram Line 1 (Module 2)	3. Supertram Line 1 market objectives 4. Supertram Line 1 quality objective
MT -3C	Service components	1. Detailed description of SL1 services 2. Functioning of the feeder service 3. Relationship with existing public transport services, in particular CTA bus and metro services
MT-3D	Technical components	3. Railcar technology and functioning 4. Depots and warehouses 5. Ticketing technology
MT -3E	Integration of service	1. Integration in practice 2. The supertram intermodal terminals (role and functioning)
MT-3F	Supertram feeder services	1. Details of the feeder service 2. Feeder service operations 3. Importance of the feeder service in the quality of supertram 4. Supertram Line 1 and other public transport in Cairo
MT- 3G	Supertram ticketing technology	1. Detailed description of the ticketing system 2. Ticketing distribution 3. Ticketing validation and control 4. Importance of integrated ticketing
MT -3H	Supertram Line 1 and the future of public transport	1. Forecasts and prognoses 2. Role of Supertram Line 1 to prepare the public transport system of the future 3. The role of training and introduction to the specialized training modules

Source: JICA Study Team

2) Training Modules: Management Themes

Managing an integrated public transport service such as Supertram Line 1 requires a strict and coordinated management of various activities that include corporate management and strategic planning, financing, administration or human resources. It also requires senior management to have sufficient knowledge on the market conditions and competition operating public transport services in Cairo. It is also important to get knowledge and expertise in the functioning of systems and networks because they constitute the basis of the integrated public transport system of the future.

The Management Themes training modules introduce management and senior technical staff to the various management specializations according to a training program as specified in Table 5.6.5.

Table 5.6.5 Management Themes

Code	Module	Content description
MT-1	General Introduction to Management	1. History of management and why it is needed 2. Strategic Management theories 3. Management types and functions 4. Management in practice: review of best practices
MT-2	Markets & Companies	1. Corporate Management theory and practice 2. Market strategy and practice 3. Management framework for public transport in Cairo
MT-3	Financing	1. Financing theory and practice 2. Financial management of SL1 / new CTA
MT-4	Administration	1. Administration in theory and practice 2. Administration of SL1 / new CTA
MT-5	Human resources	1. Human Resources Management in theory and practice 2. Human resources Management for SL1 / new CTA
MT-6	Systems and networks	1. Theory of systems and networks 2. How to manage the SL1 / CTA system as part of the public transport network of the Greater Cairo Region

Source: JICA Study Team

As can be noted in Table 5.6.5, these training modules are similar for all public transport organizations, including CTA, Supertram, metro and others operating in Cairo's public transport system.

The general content of each module of the management training program is described in the following sub-sections.

3) MT-1: General Introduction to Management

Understanding and appreciating good management requires managerial personnel to comprehend the contribution of particular managerial functions in the functioning of an organization.

The objective of this general introduction to management is to familiarize management and senior technical staff with a variety of management theories and practices and underline the importance of good management in successfully operating an integrated organization. The general introduction to management is given during a training program as described in Table 5.6.6.

Table 5.6.6 MT-1: Content – General Introduction to Management

Code	Session	Content description
MT-1A	History of management	1. The origins of management practice 2. The role of management in business 3. Why management is important
MT-1B	Management theories	1. The early theories on management 2. Vertical management theory 3. Horizontal management theory 4. Modern theories of system's management
MT-1C	Management types and functions	1. Different management functions 2. Basic management structures in private corporations 3. The difference between vertical and horizontal management systems 4. The advantage of system's management
MT-1D	Review of best practices	1. General example 2. Example in the public transport sector 3. Review of relevant publications

Source: JICA Study Team

This session gives managers and senior personnel the necessary basic knowledge to participate in the next training sessions that explore in more detail the role and execution of specific management functions. After a historic review of management and its role in business, different theories and management schools are analyzed in a second session to be translated during the third training session into a practical review of different management types, structures and functions.

In session MT-1D, a review of best practices, supported by a list of milestone publications on various management issues will allow attendees to go into more detail of the various topics discussed during the training sessions. The review of publications will be classified according to different topics such as corporations, strategy and planning, financing, markets and marketing, human resources, etc…

4) MT-2: Markets and Companies

The training module on markets and companies is oriented towards senior management. The different training sessions will argue on the need for a structural and consistent management approach which will be beneficial for the organization. As can be seen in Table 5.6.7, the content of the module MT-2 concentrates on the market, its customers and how to plan for the future.

Table 5.6.7 MT-2: Content – Markets and Companies

Code	Session	Content description
MT-2A	Introduction to corporate management	1. What is corporate management 2. Strategic management theory 3. Strategic planning in practice 4. Strategic Management for SL1 / CTA
MT-2B	Market strategy and practice	1. The importance of market analysis in strategic planning 2. Market analysis techniques 3. Customer satisfaction theory 4. How to approach the market through its customers
MT-2C	Management framework part 1	1. The SL1 /CTA management structure 2. Discussion on the structure 3. Strengths and Weaknesses of present management structure
MT-2D	Management framework part 2	1. SL1 / CTA management in practice 2. Using modern management techniques in the organization 3. Strengths and Weaknesses of present management performance

Source: JICA Study Team

5) MT-3: Financial Management

The financial management is undoubtedly the most critical function because the Financial Department ensures that invoices are issued, suppliers are paid and personnel receive their pay. An equally important role is their financial forecasts to determine whether sufficient financial resources are or will be available to implement the strategies decided by senior management and to realize planned investments.

Given the extreme importance of financial management, the training sessions will be distributed over two days, allowing the personnel responsible for financing to acquire the necessary and adequate training. The detailed sessions are depicted in Table 5.6.8. Coherent and rigid financial management is essential for the (long term) viability of a company or organization. Several techniques are used in corporate financial management and will be discussed during the respective training sessions among which the Cost Benefit Analysis (CBA) and the Financial Viability Assessment (FVA) are commonly used evaluation and control tools. Their relevance is briefly discussed hereafter.

Table 5.6.8 MT-3: Content – Financial Management

Code	Session	Content description
MT-3A	Introduction to financial theory	1. Financial management theory 2. The different fields of financial management
MT-3B	Financial management in practice: Introduction	1. The role of financial management in the company 2. The relationship with strategic business planning 3. The relationship with market analysis and forecasting
MT-3C	Financial management in practice: Theory	1. Budgeting theory and methods 2. Investment theory and financing 3. Forecasting and budget control techniques (CBA & FVA) 4. Alternative financing methods
MT-3D	Financial management in practice: Best practices	1. Detailed analysis of example 1 (CBA application) 2. Detailed analysis of example 2 (FVA application)
MT-3E	Financial department analysis: part 1	1. Analysis of role and functioning of SL1 financial department 2. Discussion
MT-3F	Financial department analysis: part 2	1. Present impact of financial management on the day by day operations of the organization 2. Strength and Weakness of the organization's financial department 3. Potential use of CBA & FVA inside the organization
MT-3G	Practical financial management : part 1	1. Structural analysis of financial department 2. Operational analysis of the organization's financial department 3. Discussion
MT-3H	Practical financial management : part 2	1. Practical example 1 (CBA use) 2. Practical example 2 (FVA use) 3. Conclusions and recommendations

Source: JICA Study Team

In a traditional **Cost Benefit Analysis (CBA),** the costs and benefits of an investment are calculated using relevant indicators which are expressed in monetary value. The traditional CBA considers the following basic costs among other (non-quantifiable) parameters:

- Fixed costs including:
  - Personnel costs,
  - Repair and maintenance costs,
  - Storage costs (warehousing and depots);

  - Vehicle use,
  - Fuel / oil costs;

- Operating costs such as:
  - Equipment purchase,
  - Human resources management (Training programs),
  - Safety and risk management costs,
  - Insurance and capital costs;

- Variable costs (e.g., information and publicity campaigns);
- Development costs, including:
  - research costs,
  - production costs,
  - Direct and indirect construction costs,
  - Acquisition costs;

The *benefits* are evaluated with respect to the increase of operational capacity and / or the reduction of operating costs. Benefits can for example be achieved by increasing the vehicle speed, reduction of travel times (including waiting times) or use of larger transport units to increase capacity. Important parameters to evaluate direct and indirect benefits are:

- Direct Benefits (economic benefits):
  - Savings in operating costs,
  - Savings in transport time costs
  - Safety and efficiency benefits (e.g., reduction of accidents, improved safety control)

- Indirect Benefits (societal benefits):
  - Contribution to regional industrial and economic development;
  - Contribution to environmental development (reduction of pollution);
  - Regional value added via growth pole effects.

The CBA is a mandatory components in the evaluation procedure for transport infrastructure investments in most developed countries in addition to other evaluation procedures such as the Environmental Impact Assessment (EIA).

The *Financial Viability Assessment* is a second analytical method to assess the attractiveness of a project and is commonly used by private investors. Private investors are less interested in the socio-economic impact of the investment and assess the potential of investing on the basis of financial ratios. The Financial Viability Assessment (FVA) extends the CBA analysis and calculates the actual financial value of an investment for the private sector. Complementary to the project's economic risks using the CBA methodology, the FVA analyzes the financial risks using different categories of risk and uncertainty that are outside the control of the (private) investor, and determine the project's overall viability. The FVA fixes the financial ratio's of an investment on the basis of *market risk and unique risk*. The *unique risk* is known as diversified or unsystematic risk (e.g., political decisions) and constitutes an important element of private risk

assessment. In general, the FVA assesses as unique risks among others: planning and permits risk (in particular procedural and administrative delays), environmental impact, regulatory risk (the design rules are changed, ...), absence of minimum required expertise, safety risks due to lack of public control and regulations, etc… The *market risk* (referred to as systematic risk) involves predictable changes and include fore example changes in interest rates, oil prices, GNP growth rate, etc… The market risk is generally known and integrated in the financial evaluation of the investment. Various economic theories and financial formulas exist to estimate the potential impact of market risk on a project. However, market risks also include unpredictable changes which together with the unique risk incite private sector investors to insist upon fast and high return on investment (ROI) in an early stage and make it difficult for the public authorities to attract the private sector to invest in several domains of public transport.

6) MT-4: Administrative Management

The value of a coherent and efficient administration is frequently underestimated. Administration relates to all departments of an organization and is the communication and control channel by excellence between management and operations within any organizational structure. The different sessions that could constitute the administrative management module MT-4 are introduced in Table 5.6.9. Administration will have to focus on practical examples rather than on administrative theory. The overall goal of training module MT-4 is to review with the trainees in detail those issues that allow effective management, control and communication.

7) MT-5: Human Resources Management

It has continuously argued in this report that human resources are the basis for successfully operating the public transport system, now as well as in the future. Infrastructure, technology and techniques are the framework for the future modern public transport system, but it will be the expertise and quality of its human resources that will define the efficiency of the system and the effectiveness of its daily operations.

Human resources management (HRM) includes several detailed specializations such as professional training, workforce loyalty and conflict management, working environment and quality of work, professional career management and opportunity, etc… The human resources management module MT-5, resumed in Table 5.6.10, provides a broad view on the importance of HRM and the different relevant components. Complementary training programs can be found in the Special Themes Program that is discussed further. As can be seen in the above training sessions, HRM includes several issues that are not directly related to day-by-day work but are extremely important for the proper functioning of a company or organization.

Table 5.6.9 MT-4: Content – Administrative Management

Code	Session	Content description
MT-4A	Administrative management theory	1. The role of administration in an organization 2. Review of administrative management theory
MT-4B	Administration in practice	1. Practical example 1 2. Practical example 2 3. Discussion
MT-4C	Administrating the organization part 1	1. Structural analysis of the organization's Administration Department 2. Functional analysis of organization's Administration Department
MT-4D	Administrating the organization part 2	1. Strength and Weakness of the Administration Department 2. Possibilities for change 3. Conclusions and practical recommendations

Source: JICA Study Team

Table 5.6.10 MT-5: Content – Human Resources Management

Code	Session	Content description
MT-5A	Theory to HRM	1. Review of HRM theory 2. The importance of HRM 3. the different components of HRM
MT-5B	HRM in practice	1. How to manage personnel 2. The role of training in the expertise building 3. The role of career building programs 4. Striving towards loyalty of staff
MT-5C	HRM part 1	1. Training personnel in the organization 2. Career development and achieving staff loyalty 3. Social dimension of work
MT-5D	HRM part 2	1. Introduction to conflict management

Source: JICA Study Team

A first important issue relates to developing adequate training, which is very important both for the organization as for the individual person. Training to increase expertise will help staff to function efficiently and to continue growing as organization. Personnel, receiving proper training, will also increase the level of job satisfaction, hence demonstrate increasingly higher levels of loyalty towards the organization. The latter issue is particularly important for CTA and similar public organizations who provide training to staff and see these persons leaving the company to find a job in the private sector. But an efficient training program as proposed in this chapter needs to be complemented by sufficient and attractive career building opportunities to ensure that the expectations of personnel remain high and consequently, their loyalty to the organization intact. Frequently forgotten is the social dimension of work. The social climate and professional and

personal relations directly affect the attractiveness of the job. If the job is not attractive, if social contacts are scarce and corporate hierarchy is too strict, people will be more easily tempted to leave the job for a more attractive alternative. In particular senior management should be aware of these social problems and should have sufficient knowledge and training to handle these problems adequately. Finally, it is imperative to introduce managerial and senior technical staff to conflict management. Conflicts are common in a professional and hierarchically structured work environment and without appropriate action could cause serious damage to the organization. This issue should therefore be taken seriously and measures and structures put in please to minimize the possibility of conflicts and to react appropriately if conflicts emerge. To achieve efficient conflict management, training is indispensable to train senior staff in detecting and analyzing conflicts as well as in mastering techniques on managing and solving conflicts.

8) MT-6: Systems and Networks

Networks and systems are two relatively new managerial theories on how companies and organizations are structured and operate. Management and senior technical staff needs to be aware of the structures and functioning of networks in order to efficiently manage, operate and control integrated public transport services. The content of the training module is presented in Table 5.6.11.

Table 5.6.11 MT-6: Content – Systems and Networks

Code	Session	Content description
MT-6A	Systems theory	1. Systems theory 2. What is a public transport system and how does it work
MT-6B	Theory of networks	1. Network theory 2. Network components and their functioning
MT-6C	Systems in practice	1. Practical example of a public transport system (Europe) 2. Practical example of a public transport system (developing world) 3. The SL1 System
MT-6D	Networks in practice	1. Practical example of a corporate network and its functioning 2. How can the public transport system in Cairo operate as a network and what is integration of networks

Source: JICA Study Team

The theory of and training in systems will not only clearly define the concept of a "system", it will also analyze the terminology which in itself is a source of discussion. Emphasis will of course be on (public) transport, discussing different elements that could be referred to as a system. They are among others:

- The transport system,
- The user system,
- The corporate system, consisting of the operational system and the management system,
- The information system.

Each of these different definitions relates to the problem of transport as follows:

- The ***transport system*** relates to the transport network and the way vehicles are running on the network. It is the overall combination of infrastructure hardware and the way it is used by a variety of users;
- The ***user system*** is the way each individual transport user uses the transport system. These users can be the private sector (corporate users), public authorities (public - transport - system) or the population (private users)
- The ***applied system*** specifically refers to the way the users manage there logistics and mobility needs, and includes two sub-systems: (a) The ***management system*** is the way operations and relations / co-operations with the other users are managed; and, (b) The ***operational system*** is the total set of concrete transport actions that are necessary to move from origin to destination;
- The ***information system*** refers to the technical, technological, and working conditions of the exchange of information, both internal (within the applied system) and external (with other operators, clients, third parties etc… at the level of the transport system).

Systems interact and influence each other at different levels and with different intensities. Consequently, there are more than one transport system interacting with other transport system, and there are more than one sub-systems that inter-relate both to each other and to the various transport systems. Form a system's perspective, it is thus imperative to structure the system's concept as a set of interactions and inter-relations integrated into a *network.*

To understand the network concepts and theories will have to be analyzed during the training session, concentrated but the proposed general line is that there exist two groups of networks. The first is the organizational network, where a network can be described as a fluid, flexible, and dense pattern of working relationships that cut across various intra- and inter-organizational boundaries. The second refers to the electronic and hardware dimension (information and communication networks and for example transport networks) that can be described as a fluid, flexible, dense and structured pattern of interconnections that cut across various intra- and inter-organizational boundaries.

Taking as example public transport in Cairo, the concept of integration should be perceived as a set of relations / interactions that include interactions between users and system's operators, between public transport operators and / or between transport operators and other transport users. All these different relations are part of the Cairo transport system of which "*public transport network*" is a sub-system. GCR-public transport should thus be approached in the training programs as *a set*

of formalized networking relations between all participants of the public transport system with the objective of achieving customer satisfaction in terms of price, product and performance.

(6) STP – Operational Themes

1) Objectives

As discussed in more detail in Section 3.5 of Chapter 3, Supertram Line 1 includes a wide variety of operational functions that are either traditional public transport tasks or are new ones related to the specific characteristics of the LRT service. Operating efficiently Supertram Line 1 requires the necessary expertise in the various operational themes, among which:

1. Maintenance
    a. Rolling stock.
    b. Track and civil work.
    c. Computerized systems.
    d. Electrical systems
2. Warehousing
    a. Warehouse (Depot) management
    b. Stock management
    c. Stock level control and surveillance
    d. Allocation of resources (Drivers & rolling stock)
3. On-site and rolling stock
    a. Ticket distribution, collection & control
    b. Driver and co-driver
    c. Quality control

The above issues are clearly relevant for CTA. While some components could be jointly followed by CTA and supertram personnel, particular themes will have to be developed exclusively for CTA and Supertram Line 1 that deal with the specific technologies used in the respective organizations.

The objective of the Operational Themes training programs is to offer to all operational personnel the necessary expertise to efficiently operate the technology and equipment used in the organization It should be emphasized that the training programs in the Operational Themes group concentrate on practical training rather than theoretical knowledge building. In the future, once a more expanded and comprehensive Public Transport Training Program (PTTP) is operational, programs to increase theoretical knowledge could be introduced although the practical side should always remain dominant. Given the broader importance of some topics, additional training modules will be proposed in the Specific Themes Training Modules where more theoretical and detailed training sessions will concentrate on specially important subjects.

In the next paragraphs, the general approach for the different operational training modules will be discussed. But given the specific character of practical training in

operations, the details of the operational training sessions will have to be defined and detailed for each of the public transport operators individually.

2) Training modules - Operational Themes

The Operational Themes training modules are described in Table 5.6.12.

Table 5.6.12 Operational Themes

Code	Module	Content description
OT-1	Depot Management	1. Theoretical introduction to depot management 2. Description of depot functions and operations 3. Practical training
OT-2	Warehousing	1. Theoretical introduction to warehousing theory 2. Description of warehousing functions and operations 3. Practical training
OT-3	Maintenance	1. Maintenance theory 2. Description of maintenance functions and operations 3. Practical training
OT-4	Vehicle Operator	1. The role of a Vehicle Operator 2. Description of Vehicle operator functions and operations 3. Practical training on the vehicle

Source: JICA Study Team

Each of the modules follows the same training approach. It provides first a general and more theoretical introduction, followed by a more analytical description before concentrating on the practical training in the various operational functions.

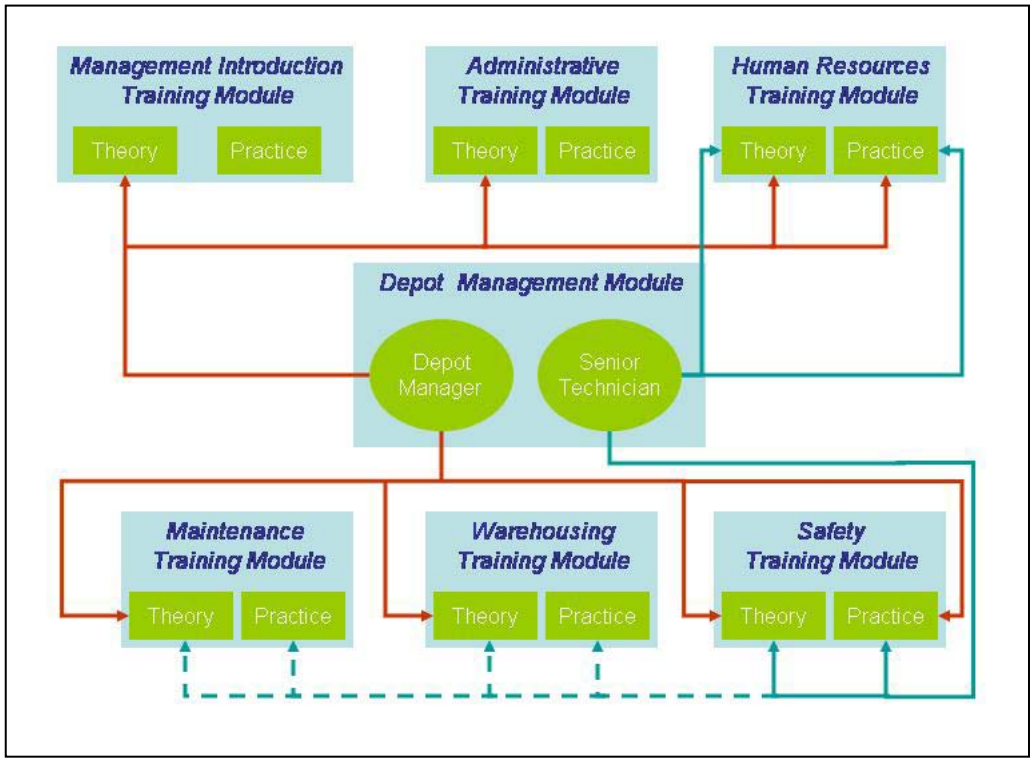
The practical training will focus each detail of individual operations and functions of the public transport vehicle and will be developed exclusively according to the vehicles operating in the public transport system.

The length and conditions of the practical training sessions will depend upon the operational specifications and complexity of individual vehicles. For example, operating Supertram Line 1 trains could be more complex than operating a standard CTA bus. These details can only be determined during the proposed study on the establishment of the PTTP.

3) OT-1: Depot Management

In addition to performing functions on the work floor, the efficiency in functioning of a depot also depends upon the planning of depot activities and permanent control of individual tasks and functions related to the different activities. This means that in addition to depot management training, other management training needs to be foreseen which is part of the Management Themes module. Figure 5.6.4 demonstrates the relationship of the Depot

Management Module (OT-1) with other modules in the Management Themes module.



Source: JICA Study Team

Figure 5.6.4 Depot Management Module Inter-related Training

The Depot Manager should follow some training in three management issues that are relevant to his function, namely a general introduction on management, administrative management and human resources management. The latter course should also include practical training, in particular related to conflict management and social topics. To ensure that the Depot Manager can operate efficiently, it is imperative that he is aware of the functioning of different depot related activities, in particular maintenance and warehousing. If the floor manager is working in the warehouse, he should receive training in the theory and practice of warehousing, while floor managers dealing with equipment maintenance have to receive training in that particular field. Finally, the Depot Manager needs training in safety at work by following Safety at Work training sessions proposed in the Specific Themes Training Module.

The various skills are integrated in a dedicated training program, the Depot Management Module (OT-1). Here, the various components of the profession will be translated into a number of theoretical and practical training sessions, allowing depot managers to efficiently manage the depot and control the various operations executed in the depot or warehouse.

4) OT-2: Warehousing

Warehousing theory and practice includes various specializations which each have their particular role and importance in the efficient functioning of a warehouse.

On the one hand, there is the expertise, which relates to packaging and storage methods while on the other hand, there is the technology that relate to the automation of processes and to the use of computers and communications. A balanced mix of professional warehousing methods and modern technology will ensure that the efficiency of warehousing operations is at the required levels. Establishing the correct mix is essential to optimize the functioning of warehouses within the wider organization.

The proposed OT-2 Warehousing training modules are described in Table 5.6.13.

Table 5.6.13 OT–2 Warehousing

Code	Module	Content description
OT-2A	Warehousing Theory	1. Introduction to Warehousing 2. Warehousing Theory 3. Description of warehousing functions and operations
OT-2B	Packaging	1. Introduction to packaging 2. The role of packaging 3. Description of packaging techniques 4. Packaging in practice
OT-2C	Material handling	1. Introduction to material handling 2. Material handling theory 3. Description of material handling functions and operations
OT-2D	Storage and picking	1. Introduction to material storage and picking theory 2. the importance of storage and picking for warehouse efficiency (e.g., queuing and query theory) 3. Description of storage and picking operations 4. Relevance
OT-2E	Role of computers and communications	1. Role of computers and communications in warehousing 2. Integrating warehousing functions and processes 3. Review of best practices and equipment 4. Practical examples and needs assessment, depending upon the warehouse

Source: JICA Study Team

Warehouse practice is an essential efficiency and cost-saving tool and includes generally following process components:

- Inventory Control
- Storage and picking (order selection)
- Automated inventory replenishment
- Receiving and shipping
- Report Generation (efficiency control programs)

Inventory control involves processes to trace individual parts (called Audit Trails) in the warehouse to determine who received what product at what time and

location, where it was placed and who removed it at what time to what new storage location or to what use. Inventory control applies Query Theory concepts to identify and follow that status of individual products stored in the warehouse. Commonly known query applications are FIFO (first in, first out) and FILO (first in, last out). Query applications reduce lead times of products by optimizing stock levels for individual products. The optimal levels are determined by calculating average consumption of a product and introducing stock level alerts and anticipative ordering systems. Storage location and related picking procedures are important for efficiently functioning warehouses and "put-away" algorithms exist that automatically identify the location for storing in the warehouse and the order in which products are picked.

Depending upon the levels of products leaving the warehouse every day, picking techniques and technology could increase in importance. Picking for example allows to organize batch pick applications on the basis of batch pick plans, therewith improving access at and control over order placements, the status of any product or the identification of lot, order number and other relevant information. It also allows to distinguish between available inventory, assigned inventory and inventory that is not available. Computer and communications technology become increasingly important in warehouse management applications. Of course, computer guided warehousing is at present unthinkable in Cairo's public transport organizations. But while the modernization program evolves and operators gain efficiency through various restructuring processes, more sophisticated techniques will become a subject of discussion. Once this point is reached, the introduction of the above training modules in the PTTP could be considered.

Efficient warehousing practice has several important cost-saving benefits:

- Reduces stock dwell times
- Reduces material repair time
- Reduces personnel needs
- Increases stock control
- Facilitates material purchasing

In other words, costs are reduced at all levels of the organization.

5) OT-3: Maintenance

Maintenance of equipment and infrastructure constitutes an essential component for a public transport operator, whether it is an existing operator such as CTA or a new operator such as Supertam Line 1.

OT-3 Maintenance training modules are proposed in Table 5.6.14.

Table 5.6.14 OT–3 Maintenance

Code	Module	Content description
OT-3A	Maintenance Theory	1. Introduction to Maintenance Theory 2. Maintenance Planning (e.g., Theory of Constraints) 3. Role and importance of Maintenance for the operator 4. Description of basic maintenance functions
OT-3B	Rolling Stock	1. Rolling stock : technical description and functioning 2. Practical training
OT-3B	Infrastructure	1. Infrastructure of the operator (if relevant - theory) 2. Practical maintenance training (if relevant)
OT-3C	Computers and information networks	1. Theory of computer networks (hardware and software) 2. Computer networks: technical description 3. Theory of data maintenance 4. Practical training in computer engineering 5. Practical training in data maintenance
OT-3D	Electrical systems	1. Electrical systems 2. Communications systems 3. Practical maintenance training for electrical systems 4. Practical maintenance training for communication systems
OT-3E	other equipment (various courses)	1. Technical description of equipment (theory) 2. Practical training

Source: JICA Study Team

All personnel of a public transport operator, taking part in the maintenance of rolling stock, infrastructure and the different types of equipment, needs to attend these courses. It should be noted that according to the operator in question, particular maintenance course are necessary and that in the future with the introduction of new services and modern equipment, additional modules will prove necessary. Taking the supertram as a practical example, the OT-3 Maintenance module should include infrastructures and equipments, and comprehensive and in-depth practical training, related to following maintenance components:

- Rolling Stock
- Civil Works
- Tracks
- Electromechanical equipment
- Telecommunications equipment
- Fare collection and ticketing distribution equipement
- Signaling equipement
- Stations and stops
- Miscellaneous equipment

Although not always obvious, efficient maintenance management is an important factor in the operational efficiency of an organization. An example will demonstrate its importance and relevance. In 1999, the Marine Corps Logistics Base at Albany (Georgia, USA) decided to introduce the "Theory of Constraints (TOC)" in their maintenance program for their MK-48 Vehicle. The goals of the test were "*…to decrease cost and work in process, increase throughput, reduce repair cycle time and make schedule, with throughput being the focal point*"[4]. TOC focused on five steps and used a set of management principles and tools that helped to identify efficiency impediments. By removing or improving this constraint, the efficiency of the entire system is improved. The five steps were the identification of bottlenecks in the organization, identifying the constraint, exploiting the constraint, subordinating everything else to the constraint, elevating the constraint and finally going back to the first step. A 2002 efficiency review of the program clearly showed that as a result of introducing TOC, the maintenance cycle (period that the vehicle is immobilized) dropped from 167 to 55 days and the average number of vehicles for which work is in process (WIP status) in the Maintenance Center dropped from 53 to about 18 vehicles. Consequently, adopting the TOC allowed about 20 to 30 more vehicles being used in the field.

The types and specifications of the last module related to non-specified equipment is subject to continued change, depending upon the equipment and infrastructure that is introduced or developed in the future. But independent of the details, it is imperative that the various training programs in the maintenance module concentrate on practical training, rather than theoretical knowledge.

6) OT-4: Vehicle Operator and Co-driver

The goal of the vehicle operator and co-driver training module is to ensure in time that vehicle operators have :

- The capacity to ensure the appropriate operation and maintenance of the tram vehicles;
- The ability to meet public transport legislative responsibilities;
- The responsibility to comply with vehicle design, safety and operational requirements
- The ability to meet customer service expectations (code of good conduct).

Through a theoretical and practical training program, tram drivers and co-drivers need to gain the necessary expertise in:

- Basic vehicle knowledge,
- Operating vehicles,
- Preparing workplace and other working documents,
- Interpreting and maintaining operational schedules,

[4] Wayne Chauncey, Albany Maintenance Center's TOC project leader, in : United States Marine Corps; Public Affairs Office, Marine Corps Logistics Base Albany, GA 31704; Press Release 22-02 , March 5, 2002

- Ticket validation and control,
- First Aid application and accident site response,
- Service Quality (how to respond to passengers)

The first component is a more theoretical program providing drivers and co-drivers the basic technical know-how related to the rolling stock they have to operate. The next three components are dedicated practical programs ensuring drivers to safely handle their vehicles under all circumstances and to uphold operational schedules. It is obvious that these training sessions need to be adapted to the different vehicles operational in the network now and in the future. The fifth component will be immediately important for the supertram but will also become relevant for CTA and other operators. Supertram Line 1 services foresees the immediate introduction of innovative ticketing technology and it has been suggested in the CREATS recommendations to gradually introduce modern ticketing systems in the CTA network. The final objective is the establishment of a single integrated ticket in the entire public transport network in Cairo.

Component 6 in the list above is very important. Drivers and co-drivers will have to follow the "Safety at Work" training module to gain expertise in avoiding accidents or respond efficiently in case of accidents. In particular the training session on "accident site response" will train drivers and co-drivers to efficiently control accident sites until emergency services arrive on site to take over responsibility. Drivers and co-drivers are also constantly in contact with passengers and they have a certain responsibility for them. Whenever an accident happens or a passenger gets sick, drivers and co-drivers have to react efficiently. The First Aid training session will ensure that the proper treatment is immediately given and the sick or injured passengers are treated properly while waiting for the emergency services. The last training component includes practical training to prepare drivers and co-drivers in dealing efficiently with difficult passengers, preventing minor problems to escalate and avoid possible violence towards personnel or other passengers[5].

(7) Specific Themes

1) Objectives

Although several of the Specific Themes training modules could also be considered as part of the group of operational training modules, the importance of subjects proposed in the Specific Themes warrant a separate treatment. Furthermore, both managerial and senior operational staff could follow these training sessions in addition to the group of support personnel, making the

[5] It should be noted that in Europe, violence towards drivers and other personnel of different public transport services is a serious problem. The levels and intensity of violence has a growing negative effect on the quality of public transport services and constantly increase the operational costs because of necessary investments in safety equipment on vehicles and additional security personnel. One of the means to address the problem includes training drivers and co-drivers in conflict management, allowing them as much as possible to avoid conflicts of degenerating or turning violent.

decision even more logical to separate these modules from operational training and group them in a separate training block.

2) Training modules – Specific Themes

The Specific Themes training modules are presented in Table 5.6.15, and discussed in subsequent sub-sections.

3) ST2 – Specific Themes : Control Center

The Supertram Line 1 operations will be the first to be controlled by a Control Center. Control centers generally make use of advanced telecommunications and computer technology and apply complex software programs to monitor and organize traffic. Independent of the level of complexity and automation that will be applied in the beginning of operations, it is essential that all Control Center personnel is convinced of its important role through a set of theoretical and practical studies of the functioning of Control Center in modern and integrated public transport services[6]. Personnel working in the supertram Control Center will have to be introduced with the equipment and technologies that will be installed in the Control Center and should understand their role and functioning as part of the Control Center technology.

But it is very important that training is not limited to some theoretical sessions. On the contrary, the accent should be on practical training with all equipment that is used in the center. Such practical training can be organized by rotating the trainees in the Control Center to master the installed equipment and programs, thus allowing staff to take over functions of other Control Center personnel whenever necessary.

[6] See Section 4.4 of Chapter 4, this report, for some examples on public transport control centers and related technology and equipment.

Table 5.6.15 Specific Themes

Code	Module	Content description
ST-1	Safety at work	1. Safety procedures and techniques 2. First Aid 3. Accident Site Management 4. Detecting danger and efficient response
ST-2	The Control Center	1. The role of control centers, including practical examples 2. Control Center Equipment 3. Functioning of the Control Center 4. Practical training in operating a Control Center
ST-3	The Study Department	1. Importance and role of a Study Department 2. Role of the Study Department and description of different functions 3. Theoretical study of relevant study methods, tools and techniques 4. Practical training for individual components 5. The CREATS tool : theory and practice
ST-4	Quality Control	1. Theory of Quality Management 2. Quality Management techniques and applications 3. Role and importance of Quality Management in services 4. Practical training for individual components
ST-5	Human Resources	1. Human Resources Management Theory 2. Examples in Human Resources Management 3. HRM and the organization 4. Conflict Management theory and practice 5. Practical training in HRM 6. Practical training in conflict management
ST-6	Secretariat	1. Role and functioning of a secretariat (introduction) 2. Basic secretariat training 3. Advanced secretariat training (Senior management assistant) 4. Documentation and archives (theory and practice) 5. Computer theory and training (various programs) 6. Specific training (e.g., receptionist)

Source: JICA Study Team

The need for in-depth training of Control Center personnel should not be underestimated, given the increased complexity of hardware and especially of modern software tools. A Control Center could be used for various tasks such as:

- Dedicated journey planning
- time table scheduling and integration
- Electronic Ticketing management and control
- Geo-Coding of Stops (for buses)
- Passenger information services
- Data management and analysis

It can be expected that in time, control centers will be installed for other organizations in addition to Supertram Line 1. For example, it is not unthinkable that CTA will introduce in the future a control center to monitor its bus traffic and to improve (introduce?) time tables etc… In a more distant future, the entire public transport system of Cairo could be "managed" by a single control center, as is the case for the public transport system of many cities.

The concrete content of the module providing training in the functioning and working of control centers could be constantly adapted to these changes. That is a clear example why a modular approach is imperative in the establishment of the PTTP.

4) ST3 – Specific Themes : Study Center

The Study Center is an important component for the future of public transport in Cairo and its introduction was argued in the CREATS recommendations. The training program for staff attached to the Study Center will have to be both theoretical and practical various study components such as

- market analysis
- performance analysis of equipment and processes
- traffic forecasting
- Feasibility studies
- Needs assessments
- CREATS public transport tool.

5) ST4 – Specific Themes : Quality Management

One of the important features of Supertram Line 1 and an issue that is also strategically important for the new CTA and other public transport operators is the concept of quality management and the introduction in the organization of a special department that will be responsible for the safety and quality of operations. The responsibilities of this department include among others:

- Inform, advise and assist the various operational units on quality of services.
- Review and approve permanent and temporary operating and maintenance procedures proposed by the concerned services.
- Check the compliance to quality of operating and maintenance procedures through audits.
- Keep the General Manager informed about the measures which have been introduced.

In order to efficiently execute these tasks, personnel in the quality and safety department need to be introduced to the theories and principles of Quality Management and will need appropriate training allowing them to assess the quality of individual operations and to make qualitative assessments of public transport operations.

The training program should not focus on the theory of Quality Management and the review of tools, analytical methods and quality control tools, but should provide sufficient practical training to translate this theoretical knowledge into practical use.

6) ST5 – Specific Themes : Human Resources Management

All through the CREATS project, the importance and role of human resources has been emphasized. It is thus logical that during training, sufficient attention is paid to this topic, independent whether this program is focused on Supertram Line 1, the new CTA or on the public transport system as a whole.

Human Resources Management includes three major components:

1. General HRM issues related to the functioning of personnel within the organization (employment contracts, remuneration schemes, retirement schemes, etc…)
2. Training as tool for
    a. Promoting and stimulating loyalty of personnel,
    b. Re-assignment of personnel and introduction of new technology,
    c. Staff reduction programs (lay offs)
3. Conflict management
    a. Office design and lay-out (social dimension)
    b. Personal relations and corporate hierarchy conflicts
    c. Conflict management techniques

The overall role of human resources management is to ensure that personnel relations in the organization positively contribute to the overall efficiency of operations and that personnel is and remains loyal to the company. Loyalty and a positive spirit can is not only achieved by an appropriate remuneration system. Providing modern and high quality training can also contribute. The training programs should be accessible to all personnel and should allow individuals to increase their personal knowledge and therewith generate a better chance for promotion.

An important element in HRM is the management of conflicts. Conflicts can arise at different levels and can have various causes. Conflicts can also be personal or structural and generate different types of problems. Management staff needs to be familiarized to the different types and forms of conflicts and has to be trained in identifying causes and finding practical solutions to solve and prevent conflicts.

7) ST6 – Specific Themes : Secretariat

The last Special Themes training module is related to the functioning of secretariats. It includes theoretical and practical training in the most important tasks of a secretariat, including

- reception and telephone standard operator
- secretary and Management assistant

- archives and documentation management
- database and information management systems
- computers and software applications
- specialized tasks for administrative and supporting personnel

The training modules are predominantly practice-oriented but some theory will be necessary for the sessions related to archives and documentation management, database and information management and computer and software applications.

5.6.4 Preparing the implementation

(1) Introduction

The proposed PTTP considers the needs of all entities involved in the public transport system of Cairo and is modular-based in order to allow the gradual development in line with the modernization of public transport in Cairo. In a first phase, the proposed PTTP will offer supertram personnel the necessary theoretical and practical training that will be required for each of the staff involved in Line 1 management, operations, maintenance and control as well as for supporting personnel. It also allows the training and re-training of CTA personnel during its restructuring process. Using modular training modules as building blocks, the PTTP can be expanded whenever the need arises. Efficient training originates from a combined effort / investment at the level of hardware, software and humanware:

- The *hardware component* consists of modern training locations, modern computers, printers and plotters, adapted training materials, etc…;
- The *software component* comprises of up-to-date syllabi and other dedicated computer programs for modern training;
- The *humanware component* includes the use of skilled trainers that are capable of providing modern training and have the necessary vocational skills.

As was previously argued, it is recommended to conduct an in-depth study related to the conditions and requirements of establishing the PTTP. Given the long-term functionality of the PTTP and the urgent need for training in the context of the CTA restructuring process and the possible development of Supertram Line 1, the establishment of the PTTP requires a practical approach with several sequential phases:

- Identification of the framework components and Resources Needs Assessment Program;
- Establishment of a Roll-Out Plan;
- Human Resources and Expertise Building Program;
- Technical Assistance Program.

The *identification of the framework components* phase allows to specify the specific structural and regulatory conditions for establishing and operating the

PTTP and to determine the specific role and functions of it. This phase includes among other components the definition of role of the PTTP, the identification of necessary regulatory changes, the specification of the managerial and operational structure, etc…. Once the structure and function is clear, the practical needs have to be identified and specified in detail. The *Resources Needs Assessment* component determines in the first place the necessary hard- and software components and therewith related investment costs as well as the annual operational costs. Secondly, the assessment makes explicit the required professional expertise (humanware) and specifies the necessary training programs to guarantee the sustainability of this expertise.

Based upon the results of the first phase, a detailed *Roll-Out Plan* can be developed during the second phase of the study. The Roll-Out Plan will describe in detail the individual steps and processes for a concrete implementation of the PTTP. In a third phase, the necessary expertise will be determined and the quality conditions for a sustainable training program specified during the *Human Resources and Expertise Building Program*. The fourth phase consists of the implementation and start-up phase of the training facility, and foresees ongoing *Technical Assistance Program* that will bring in the necessary outside expertise to assist local experts and responsible persons in concretizing the PTTP.

The four phases of the preparatory study are described in more detail hereafter.

(2) Phase 1: Review of Framework Conditions and Needs Assessment Program

1) Inception Phase

At the beginning of the study, a kick-off meeting with representatives of the relevant organizations and stakeholders will

- Give the various stakeholders the opportunity to express their view(s) related to the role, function and operations of the PTTP;
- Identify specific requirements of the PTTP;
- Establishment of the methodological and practical approach and the participatory role of each stakeholder in the process of establishing the PTTP;
- Clarify and validate the different actions to be undertaken during the PTTP preparatory and development phase.

The meeting will provide an agreed upon plan, reflecting the results of the discussions (*Inception Report*). This plan will be used as the foundation for the next steps of the study.

2) Review of framework conditions

The review of the framework conditions is a critical phase for the development of the PTTP and includes following steps:

- Assessment of the political and regulatory requirements for the PTTP, taking into account the future establishment of the PTTP;
- Analysis of priorities and needs of the PTTP taking into account the gradual establishment of the PTTP in accordance with actual training needs in the future;
- Identification of the role and responsibilities of relevant stakeholders;
- Identification of available internal and external materials and syllabi and first assessment of future needs;
- Assessment of available expertise (both inside and outside the public transport environment) and first assessment of future needs;
- Assessment of available infrastructure and first assessment of future needs.

The *political and regulatory issues* are a very important first element of attention. In this section, recommendations have to be formulated on the ownership of the PTTP, the involvement of public stakeholders, the relationships between different partners, etc... The necessary political decisions have to be taken and the regulations put in place to allow the concrete implementation of these recommendations. Also programs have to be designed for the training of public transport personnel and regulatory decisions have to be taken regarding validation and certification of these training programs.

As regards the *operational conditions*, the framework has to be set for a modern, flexible, modular and practical training centre for all personnel. At the same time, provisions have to be incorporated that define the acute needs of training CTA personnel in the context of their restructuring program and of Supertram Line 1 once its development has been decided. This analysis will also have to determine the operational relationship with other existing training and education facilities in Cairo either inside the public transport environment (e.g., the existing training facilities of CTA) or outside (e.g., the universities).

Setting the *financial framework* of the STP is an important element for its future sustainability. The financial framework will determine the level of public funding and the origin(s) of these funds. Various levels of self-sustainability through private funding could be considered which could strengthen the long-term sustainability of the PTTP. The self-sustainability through private participation will certainly have to be considered. Private funding could be organized through training programs for third-parties, selling training materials etc…

3) Needs Assessment Program

Once the framework conditions have been clarified and fixed, a detailed “Needs Assessment Program” (NAP) will identify the needed investments in hardware and software and the requirements in terms of human expertise. The NAP will specify and validate these needs via a comparison with a selection of relevant examples of public transport training centers in the developed world.

This *Benchmark Analysis* will include the assessment of the number and categories of personnel and staff, their required expertise, training materials and syllabi, office equipment and computerized training hardware and software etc… Through this benchmarking activity, the minimum necessary requirements for establishing a modern and state-of-art training center can be specified and validated.

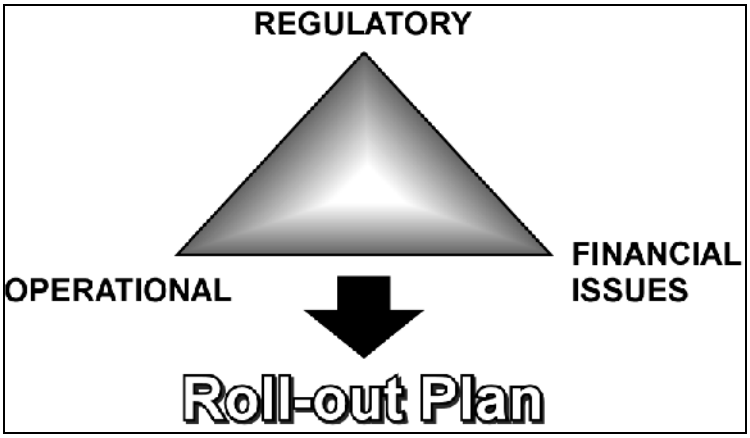
The Needs Assessment Program will:

- Specify, through discussions and interviews with relevant experts and professionals, the exact needs in terms of training know-how of available training staff, necessary training materials and other operational requirements can be determined.
- Validate, trough benchmarking with a number of other training centers selected in conjunction with the Egyptian counterpart representatives, the requirements set forward for establishing the PTTP.
- Discuss with relevant public authorities and other organizations to reflect on the functioning of the PTTP and its time-based development.

(3) Phase 2: Roll-Out Plan and Validation

After collecting and validating the detailed information on all critical issues that will determine the shape and structure of the PTTP, a "Roll-Out Plan" can be developed along three key issues, visualized in Figure 5.6.5.

In the Roll-Out Plan, all requirements identified in the first phase of the study will be translated into practical steps for concrete implementation. Solutions will be proposed for all legal, financial, operational and human resources problems. The careful selection at the beginning of the right expertise, training tools and techniques will proof its value during gradual expansion of the PTTP.



Source: JICA Study Team

Figure 5.6.5 Critical Issues in the PTTP Development Program

The Roll-Out Plan will describe in detail the practical steps for formalizing / realizing among other issues to be determined during the study:

- The establishment of the PTTP and the conditions of gradually expanding the PTTP in accordance with future needs (the building block structure),
- the official validation, certification and recognition of the training programs, taking into account the establishment of other programs in the future (modular training programs),
- The responsibility for the organization and its operations,
- The necessary expertise will be available and establish a framework for guaranteeing the availability of sufficient trainers,
- The equipment is state-of-the-art and meets the needs of the PTTP,
- The financing of the PTTP.

The quality and realism of the draft roll-out plan will be evaluated and validated via:

- Discussions with relevant stakeholders. These discussions will aim to determine the exact need for training courses that guarantee the necessary expertise.
- Preparatory and follow–up interviews with technical experts. These discussions will focus on the conditions for establishing the future training center.

The optimal design / lay out of the PTTP will thus be decided in close cooperation with both public transport experts and relevant public authorities in the GCR.

(4) Phase 3: Human Resources and Expertise Development Program

Guaranteeing the quality of the PTTP requires all future staff to perfectly master their training program(s) and have in-depth knowledge about the tools and techniques of modern training at their disposal. Al key persons that will be involved in the PTTP should be skilled in modern training (vocational training program) and from the beginning trained in using the tools and techniques available in the PTTP. The establishment of a "*training the trainers program*" will ensure that training staff will have the necessary knowledge for training both now (in the context of the possible development of Supertram Line 1 and the planned CTA restructuring) and in the future (further modernization of public transport in Cairo).

The "training the trainers program" will have to be developed around three main fields which are:

- Vocational Training: general requirements and conditions of teaching;
- Function – Specific Training: detailed training, directly related to their individual training programs, including the use of available training materials;
- Knowledge Training: In-depth training in the content of individual programs.

(5) Phase 4: Technical Assistance - Establishment of the PTTP

Foreign experts will provide the necessary direct technical assistance during the establishment of the PTTP. This assistance includes among others:

- Identification of necessary equipments (computers, printers, projectors, practical training materials, etc…);
- Identification of necessary training materials (syllabi, computer-based training programs, etc…) including content specifications;
- Installment and testing of the equipment and training materials;
- Familiarization of staff with new equipment and training materials and with the content of the different training programs.

Support will also be provided in the selection of training staff. In collaboration with the responsible authorities and experts, the best selection procedure will be determined to guarantee the necessary quality levels of future training staff. In that context, one element that will receive the necessary attention is the relationship with universities and training institutes in Cairo. In particular for theoretical training in various aspects of management and of public transport.

One critical component where technical expertise is essential is the identification of the conditions for the PTTP to transfer into its organization the existing public transport training facilities and to introduce in the organization a framework according to which the PTTP can grow alongside and accommodate the necessary training facilities for the modernization program of the public transport system of Cairo.

The technical assistance can also foresee a preliminary evaluation of the potential and assess ways to become self-sustainable in the longer term future. This preliminary assessment could include:

- Designing the framework for a financial and investment plan that satisfies the conditions to become self-sufficient. This financial plan will evaluate the possibility of alternative financing structures;
- Review methods to find support by private companies;
- Propose potential partners for strategic alliances and co-operations agreements;
- Organizational and operational structures of an independent training institute; and
- Conceptual development of a corporate transformation program that could be applied by PTTP management to evolve towards an independent and self-sustainable training institute for all personnel taking part in the public transport operations in the Greater Cairo Region.

(6) Syllabi and Other Training Material for the Introduction Module

1) General Description of the Training Materials

Training session equipment includes a wide variety of materials among which:

- Slide-presentations and visual supports,
- professional equipment for practical training,
- Dedicated syllabi,
- Manuals and technical documents supplied by equipment providers,
- Academic books and publications,
- Computer based training materials for individual training and post-training review.

In the beginning, the PTTP only needs basic training materials. Slide presentations could be used in each session and will be complemented with dedicated syllabi, professional manuals and technical documents . The first goal is to allow personnel to familiarize with the equipment they will manipulate or the techniques they will apply.

Wherever possible and relevant, academic publications could be used during more advanced training sessions, in particular for management training. It can in that context be considered to create wherever possible, a direct link with the universities and allow advanced trainees access to university classes to gain additional and in-depth expertise. Academic works could also provide examples and descriptions of best practices as well as a bibliography, listing relevant books and publications on the topic(s) discussed.

In the future, and once the development warrants it, modern course materials such as computer based training and simulation programs can gradually be introduced. It is made explicit here that the introduction of these modern training tools should be organized and implemented over time and should not be considered in the first years of the PTTP, when its operations will concentrate on restructuring existing training programs and on assisting in the CTA restructuring program and Supertram Line 1 development.

It is only once professional training becomes an integrated part of a modern public transport system in Cairo, various computer-based tools could be introduced to stimulate the “learning by doing” approach that ensures personnel to maintain and test its expertise. These programs provide a very flexible type of study, with which the trainee can set his or her own pace of learning. Computer-based training technology includes:

a. Mission / Task simulators that provide environments in which:

- A complete job can be exercised;
- The level of complexity can be managed by the succession of exercises;
- It is possible to go “to far” allowing mistakes that would cause disaster when done in reality;
- Training conditions can be varied in as many ways as required and exercises that are not mastered can be repeated indefinitely.

b. Interactive training programs, which provide

- A written explanatory text on the content of the training session
- Practical examples on the topics studied
- Training exercises to evaluate the level of knowledge gained
- Exercises to be submitted to the lecturer
- A final test, consisting of multiple choice questions. The simulation software registers the results of this test and allows trainers and lecturers to evaluate his trainees.

c. Distant learning courses via internet, where the internet site contains

- *Pre-testing* to check how much trainees already know. The results of the Pre-test are recorded and can be checked by the tutor.
- *Theoretical lessons* into the subject, which basically could be seen as an interactive syllabus.
- *Exercises* to be made by the trainee to test his/her ability to understand the theory and to get some practice.
- *Post-test* to assess the knowledge and understanding of the subject. The results of the Post-test are recorded and can be checked by the tutor.

Interactive and Internet training is the most flexible method to reach that goal. Even when these people are professionals and/or managers, interactive learning methods can give them new opportunities, even when they have no time to attend regular courses. The courseware can be studied in the classroom, at home or on the job. The equipment only includes a PC with CD-ROM and an internet connection. If the distant learning is organized via internet, even the use of CD-Rom technology can be avoided, but a stable and high-speed data transmission connection should be available at an affordable price.

2) The "Learning by Doing" approach: Training for the Future

The "learning by doing" principle is an important element for the future. The principle has its origins in constructivism and empirical learning theory. In that philosophy, learning and training are considered as a constructive process, where the participant commits itself to solve realistic problems of increasing levels of difficulty either individually or as a member of a group. Feedback of the results in both directions (from teacher / trainer to student / trainee and vice-versa) constitutes an important success feature in the process. Although the principle can be introduced from the beginning, it becomes a crucial training element once computer-based training has become a part of the training programs.

Course participants at that time will be actively involved in the learning process and their expertise will be monitored via different techniques such as integrated questionnaires and a-priori as well as a-posteriori tests of the course materials. Using Internet based and stand-alone computer-based training programs will allow trainees to individually approach advanced and follow-up courses and interactively test heir expertise and knowledge. The "*learning by doing*" principle

could also include **familiarization and professional training visits**. These visits are in the first place foreseen for the future trainers but could in time expanded to particular staff.

3) Extending the Training Program : The Modular Approach

The long-term objective of the PTTP is to contribute to the continuity of the future public transport system in Cairo as an efficient and effective service to the public. This continuity can only be achieved by ensuring that the expertise and quality is at a level necessary to manage and operate a modern public transport system. Training is therefore an essential component of a modern public transport system. The proposed approach for the development of a sustainable training program (the PTTP) will generate quantifiable and non-quantifiable benefits that cannot be underestimated.

Introducing modularity into the PTTP will reduce over time the total cost of training and allow a more efficient allocation of scarce financial resources by public authorities. Modularity will also reduce operational and managerial costs of public transport operators because the number of dedicated training programs will reduce as "economies of scale" (training programs serving more than one operator) become possible. Training will also contribute to increase the level of commercialization and privatization of public transport services. It will allow introducing modern equipment and technologies that will generate more efficient and safer operations, hence reducing operational costs for public authorities and public transport operators.

The social benefits are not to be neglected either. Increased efficiency reduces the negative environmental effects of transport, . In addition to increasing mobility for the people of Cairo, improving the public transport system will benefit directly public decision-makers and indirectly again the population of Cairo because less financial resources will have to be invested in dealing with the consequences of traffic accidents, pollution, congestion and other problems of inefficient public transport. The resources that come available could be invested in other social programs such as housing, health and other basic needs of people.

If in the long-term future, the training program for public transport in Cairo could become self-sustainable, the initial investment by public authorities will be worthwhile, given that over time, the quality and efficiency of public transport in Cairo will increase thanks to the increased expertise of its personnel.

As an overall conclusion, it can be argued that the future modernization of the public transport system in the Greater Cairo Region can only be really successful if it is supported and sustained by a comprehensive human resources development program. This program will have to be developed and over time adapted in accordance with the existing and future needs, the latter emerging from the transformation of present public transport into a modern and integrated public transport system. Developing human resources is, however, not a goal in itself. It needs to support the gradual modernization of the public transport system of Cairo. Therefore, training modules have to be

installed only and whenever the need emerges. This is the true spirit of the *"building block development"*.

4) The Concepts of a Building Block Development

The building block approach, which becomes possible if the PTTP uses modular training programs, is particularly adapted for the situation of public transport training in Cairo.

The building block approach has several important benefits in relation to the changes in Cairo's public transport system:

- The PTTP can be developed as soon as the proposed development study has been completed and in the beginning, focus on integrating existing training programs and establishing a number of general courses which are urgently needed and will be identified during the development study.
- Once fully operational, the PTTP can grow and once the restructuring of CTA is engaged, assist in that effort by providing re-training and career re-orientation training as well as training attached to new jobs that will be created as a consequence of the modernization of the organization.
- The same approach is possible for Supertram Line 1. Once the program is decided and the construction works are on the way, the issue of training its staff becomes relevant. With the expected introduction of new techniques, technologies and equipment, dedicated training courses will have to be developed.
- The training program that will be developed to support the expertise building needs for the supertram can immediately become a basis for the creation of new professional courses, oriented towards CTA staff and personnel of other public transport operators. More generic versions of these training programs could be considered a perfect basis for more comprehensive training of personnel, working in the various public transport organizations and operators.
- The building-block principle will guarantee that the PTTP is always able to provide the necessary and up-to-date training for new or modernized services introduced in Cairo's public transport system. Each time a new service emerges or particular modernization programs drastically change the structure of the public transport system in Cairo, the specific needs of additional training can easily be identified and the necessary "building blocks" (training modules) developed.

5.7 IMPLEMENTATION PLAN

5.7.1 CTA Restructuring

(1) Justification

There is inherent conflict of interest in having a single entity, the CTA, function as the owner, planner, regulator, and operator of a bus company.

The primary role of the Government is to represent the people's interest, and protect the public welfare. With respect to bus services, this means the creation of an environment that allows and assures that adequate and efficient service is provided at affordable rates. Government's primary role should therefore be strategic planning, setting standards, and appropriate regulatory regimes. The private sector is well suited for the operation of services under minimal regulation and in a competitive environment.

The most cost-effective and efficient – measured in terms of levels of service and cost to government – are those where government provides strategic planning, sets the standards of service and regulates compliance, and the private sector (or public private partnership) provides the service. As to maximize bus transport in Greater Cairo Region, the study team made the proposal to convert CTA into a Holding Company with a series of affiliated enterprises.

The benefits of involving the private sector derive primarily from the private sector's incentive to reduce costs and increase income – thereby maximizing profits – and access to private capital. A public company like CTA does not have the same incentive to increase ridership and income by being more attentive to customer demands or institute cost-saving procedures. CTA has many more employees than is necessary to run an efficient operation; employee costs are a major problem for CTA.

A strong commitment by the central government as well as the Cairo Governorate is indispensable for the implementation of CTA restructuring process. Under such a political initiative, the following administrative setting is recommended:

(2) Deregulation of CTA Business

Under the holding company structure, CTA business territories need to be more flexibly expanded in running related commercial business other than regulated bus and transport serves, thereby enhancing competitiveness of CTA. This calls for deregulation, including:

- To lift bans over CTA entering into commercial service, real estate and leisure/service, etc;
- To introduce efficiency-oriented management to reduce operations and maintenance cost to the affiliated companies;

- To approve a more flexible fare system responsive to the competitors' strategy as well as price indixes; and
- To pursue flexible schemes for privatization, concession, franchise, license, performance contract or management contract for each affiliated entity within the Holding Company.

(3) Regulatory Framework

Regulatory mechanisms have to be administered by a regulatory body established specifically to regulate transport activities and regulation through enforcement of the covenants of a specific contract or franchise with an individual bus operator. This last regulation is the easiest to implement during the transition from public ownership and operation to operation involving the private sector. It is more flexible and allows conditionality to be matched to the conditions and objectives of the service.

(4) Availability of Funds

Different options may be pursued:

- Establish a trust fund with a loan from a multi-lateral agency or other donor financing.
- Develop a plan acceptable to donors to supplement the resources of the Social Fund for Development (SFD).
- Bank bridge loans to CTA holding company or its affiliated enterprises to be paid out of the privatization proceeds. CTA may have assets that could be pledged for labor force restructuring financing.
- Asset sales: land, buildings, equipment, buses, and inventories.
- Leasing, rentals and subletting: unused sections of land and buildings.

The donors will need to be convinced that the labor force restructuring being financed would result in actually carrying out near-term privatization. The trust fund would likely disburse separately for each labor force restructuring, to be reimbursed with the proceeds of the resulting, or any other privatization. The trust fund would be also used in areas as training and new skills development, counseling, job placement and microfinance activities.

(5) Establishment of a Technical Support System

It will be difficult to restructure CTA without a pool of experts. They would have three main functions:

- To provide technical assistance for the restructuring and the organizational development of the CTA Holding Company. The restructured companies must have a clean start without any burden from the past.

- To assist the implementation of the employees rationalization program with specific financial assistance.
- To organize training programs.

This technical assistance will have to be funded by the donor community.

A team of three full time international experts in management, business development, finance and accounting during a period of time of two years will cost approximately 2.5 millions US Dollars.

This pool of expert would be the preparation and the evaluation arm of the Labor Adjustment Program. This unit would provide advice on options to and managing the lump sum cash compensation withdrawal, provide advice and assistance on starting up businesses and perform due diligence for the Labor Adjustment Program financing.

They will also provide advice on the restructuring of CTA Holding Company and its affiliated enterprises as to improve their management performance. The affiliated enterprises have to operate the same way that private operators, they need to make profits.

(6) Utilization of Social Fund for Development

Another limitation is the availability and possible use of existing facilities and financial schemes (early retirement scheme, incentive scheme, enterprise development program).

These financial schemes are proposed by the Social Fund for Development which is financed by the donor community but they may also be financed by the trust fund.

The Social Fund for Development (SFD) was established in 1991 is mainly providing loan for small enterprises and financial compensations for early retirement programs. This Social Fund for Development can provide assistance to CTA in its restructuring and its early retirement program. A Labor Adjustment Committee is established to implement an early retirement program or an incentive program to help early retired people and employees under the incentive program either to find another job or to set up a small enterprise through the Small Enterprises Training Program.

According to previous early retirement schemes with the Social Fund for Development and the Ministry of Public Enterprises, the average financial compensation for an employee part of an early retirement scheme is 25,000 LE and 10,000 LE for an employee part of an incentive scheme.

(7) Encouragement of Private Sector Participation

A competitive market in provision of public bus services is a favorable ground where both CTA and private operators can pursue more rational and cost-efficient

operation and management, which eventually benefits the general public. The Study Team recommends franchising to attract private investors because it offers a good level of flexibility for the franchisee, but with freer reign to maximize attractiveness to the private sector. The initial steps have already been taken in this regard.

Manufacturing Commercial Company (MCV), a private sector company, is a pioneer in operating minibuses in Cairo as of July 2003, and under the supervision of the CTA. The franchise is based on a daily fee paid by MCV to CTA in giving a percentage of income to CTA, the equivalent of two seats per bus. MCV signed a 5 year franchise contract with CTA. The fees to be paid by MCV to CTA will be revised each year according to certain parameters, for example, the price of spare parts. MCV is operating two bus lines, the first being about 16.5 km in length with 12 minibuses in operation, and the second about 14.5 km in length with eight minibuses in operation. This means MCV is operating a total of 20 minibuses. CTA operates its minibuses and regular buses on the same lines, thus CTA and MCV are competitors in the corridors served by the lines.

(8) Pilot project in an Affiliated Enterprise

The Study Team proposes a pilot project in one of the affiliated enterprises of the Holding Company to fully reorganize and implement a new management similar to efficiently managed bus transport companies observed in other countries .

This pilot project financed by the donor community would be managed by a technical assistance team. The objective of the project would be for this affiliated enterprise to face competition and realize suitable profitability at low cost, and to develop managerial and organizational methods. Special attention should be directed to evaluating the efficiency of the management and its leadership abilities.

The purchase of new buses would be important to promote the name of the donor. The implementation of the most recent systems to operate efficiently buses would be the priority in this pilot project.

Training programs would be prepared for development of the staff's skills at the different levels.

This pilot project would serve as the model for, and subsequently be transferred to, the other affiliated enterprises under the CTA Holding Company.

Pre and post restructuring elements are summarized in Table 5.7.1.

Table 5.7.1 CTA Pre-restructuring and Post-restructuring

BEFORE CTA RESTRUCTURING	AFTER CTA RESTRUCTURING
• CTA is overstaffed – over 10,000 employees. • According to the accounting system, all the bus lines, the minibuses lines, the Nile Ferries and the tram lines are not making profits. • Lack of operational buses because a shortage in spare parts. • CTA does not have enough drivers because many drivers after their training paid by CTA go to the private sector where the salaries are more substantial. • More than 15% of the buses and minibuses cannot operate. • Significant rate of absenteeism among the drivers. • CTA is facing financial problems and a lack of support from the Government: in year 2000/21001, the percentage of the budget allocated compared to the budget needed to run CTA was 71.6%, in year 2001/2002 52.8% and in year 2002/2003 63.7%. • Inadequate management in the Operational Central Departments and insufficient supervision from CTA Headquarters. • Non adequate reporting system within CTA. • No regulatory framework.	• Implementation of CTA Holding Company • The affiliated enterprises in the Holding Company will be the previous restructured Operational Central Departments. • More qualified staff working in the affiliated enterprises. • The affiliated enterprises will become more performant and be managed like private operators. • The affiliated enterprises will compete against each other and in the bus market. • More flexibility for the Government to decide about the future of the affiliated enterprises: contracts, franchise, concession, license, privatization,… • Implementation of a performant regulatory body. • Less funding from the Government. • More new buses in the bus market. • Better services to the passengers. • More safety, better maintenance of the buses. • Pilot project to maximize the performance of one affiliated enterprise. This pilot project would be duplicated to the other affiliated enterprises.

Source: JICA Study Team

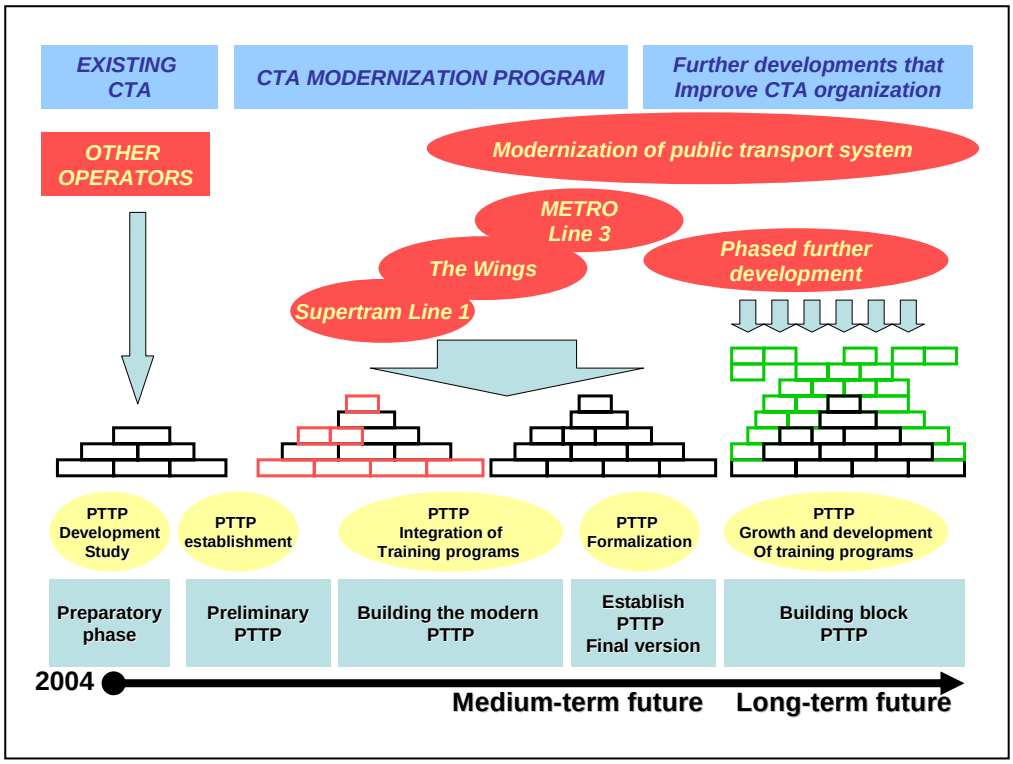
5.7.2 Public Transport Training Program (PTTP)

(1) Preliminary Implementation Timeframe : Building the PTTP

The establishment of a public transport training program that covers all operators and other parties related to Cairo's public transport system is a long-term and dynamic project. As was discussed in detail in section 5.6, the PTTP has a modular content, allowing substantial flexibility in developing comprehensive training programs for various target groups.

But in order to efficiently respond to a constantly changing public transport environment, and to react to explicit needs of various operators, both existing and new ones that will emerge in the future, the entire structure of the PTTP needs to

be equally flexible, hence the recommendation for a "*building block structure*". The principle of the building block structure for Cairo's public transport system is visualized in Figure 5.7.1.



Source: JICA Study Team

Figure 5.7.1 Concept of the Building Block Structure for PTTP

As can be observed, the first step is to conduct a detailed study in which all issues, relevant to the PTTP are identified, analyzed and categorized. Considering that detailed information, the study can establish a detailed road-map that can be used as a structural guideline for establishing the PTTP and to develop it over time in respond to changing demand. Finally, the study can establish detailed guidelines on the study content and necessary syllabi and education materials, including modern computer-based education tools.

But most of all, it is important to establish as quickly as possible the PTTP as an operational entity, even if the legal and structural framework of the PTTP is not yet formally established or totally clear. This pre-PTTP will be a first step in the rationalization of training for the public transport sector and will:

- Incorporate the existing training programs of various public transport operators in Cairo. For example, a first step could be to link training programs for CTA bus drivers and other personnel with training programs of other operators that are similar.
- Provide a consistent structure for public transport training and therefore, pave the way to develop new training programs as soon as the CTA restructuring program is initiated or the construction of Supertram Line 1 has advanced and the service is ready to operate.

- Allow to compare the recommendations of the proposed development study with the reality of providing training for the public transport sector in Cairo to include, for example, the high-priority Metro Line 3. This "permanent" benchmark will allow the PTTP to grow in the most optimal manner in accordance with actual needs.

Once the PTTP has been established in its first constellation, the initial set of training programs can gradually be expanded in two complementary ways. The first is to continue integrating existing training programs which in the beginning phase have not been included and re-adjust the original program whenever this is deemed necessary to optimize the training courses. The second method is to start developing training programs that are not yet available but which are considered necessary for increasing the efficiency of operations. One of the first sets of training programs that could be considered is the set of training programs on the public transport market and training courses related to "safety on the job".

Developing training programs that deal with the market conditions of public transport on the one hand, and the public transport market of Cairo on the other hand are interesting to be developed, given that these themes are generic and are beneficial to all relevant personnel working in the public transport sector, independent of their affiliation to one or another operator and / or organization. These training programs could be used as a preparatory phase to the CTA restructuring program, the modernization of the metro, the development of supertram LRT service or the introduction of modern technologies and techniques (such as integrated ticketing).

At a certain moment, the CTA restructuring program or the concrete development of Supertram Line 1 will commence. Other planned infrastructure developments could be initiated, such as the public transport operations within the Wings. Each of these initiatives will generate a particular need for new and more accurate training programs which should be integrated within the PTTP program.

This adjustment phase can equally be used to consider other relevant issues. For example, discussions can be held with the various institutions and organizations of higher learning in Cairo to assess their possible contributions, e.g., by developing joint courses or having professors participating in particular training courses (e.g., on the public transport market or management themes).

It is important during this phase to pay attention to the structural, operational, regulatory and legal elements related to the PTTP. It is highly recommended to use this period to work towards the optimal framework under which the PTTP will function in the future. One of the questions that will undoubtedly arise is whether or not the PTTP will have to be attached and governed by the proposed entity that will be responsible for public transport in the Greater Cairo Region (see recommendations of the Master Plan).

Issues that have to be considered are, among others to be determined in the development study:

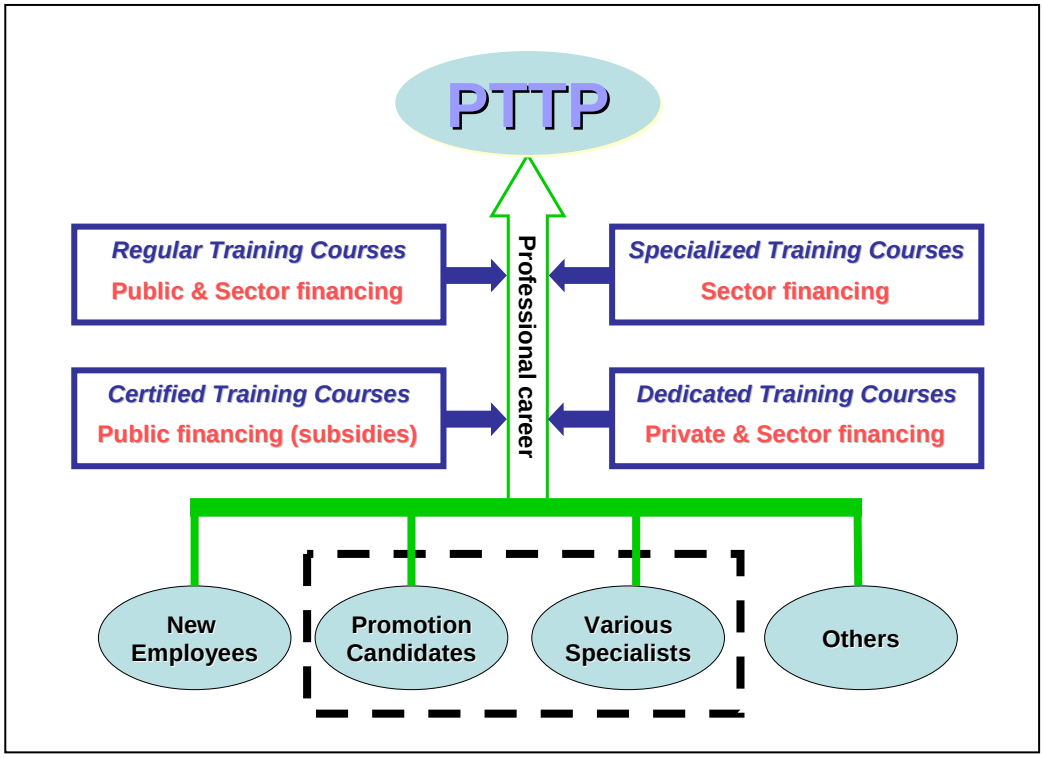
- The relationship between the PTTP and the public authority (or as long as a single entity has not yet been established the relevant public authorities) responsible for public transport in Cairo ;
- The financing of PTTP operations and the issue of self sustainability. The possible relationship and cooperation with institutions and organizations of higher learning in Cairo should also be viewed in this context;
- The statute of the trainers and their remuneration;
- The statute of the trainees; one particularly important issue in this context is the way the company to which they belong will consider the absence of the person during the training sessions.
- The statute of the training programs; It should be made clear what training programs will be mandatory and for whom they will be mandatory, what training programs need to be attended for promotion purposes etc…
- The legal framework that combines all issues into a new law that establishes the legal and regulatory context for its operations.

At a certain point in the medium term future, the pre-PTTP will have evolved to a point where it has reached a strong and workable organizational structure. At that point in time, a formal and legally organized PTTP can be established.

From that point on, and once the PTTP is formalized, further growth of the PTTP will be determined by the practical needs of the public transport sector. Given the wide scope of training programs that at that time will be available in the PTTP, it is reasonable to assume that only few new training programs will need to be developed. It can also be assumed that most of these new training programs will be highly specialized and will deal with very specific topics, emerging from the introduction of modern equipment, technology, techniques and services. As can be seen in the previous Figure 5.7.1 in the last building block, these training courses build upon the existing basis of training programs and could even create an imbalance within the training program structure.

(2) Self sustainability and privatization

Once the PTTP has been formalized, the question becomes relevant whether on the one hand the PTTP should become self sustainable and privatized and on the other hand how the new and increasingly specialized training courses will be financed and who will benefit from them. At that moment, it is essential that the future self-sustainability of the PTTP is considered and plans are proposed on how to finance the PTTP by securing future financial revenues (Figure 5.7.2).



Source: JICA Study Team

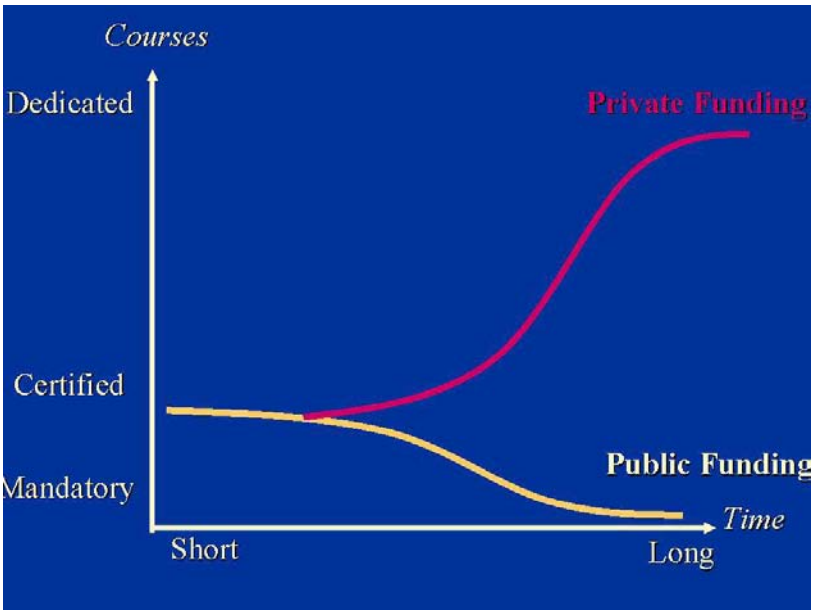
Figure 5.7.2 PTTP Training Programs and Financing Sources

At that point in the future, the PTTP will offer different groups of training programs, each of these programs serving a particular purpose. These groups are:

- *Certified training programs*: these are mandatory training programs which staff is legally obliged to follow before they can exercise their profession.
- *Regular training programs*: these are training programs which staff is obliged to follow. Although not legally mandatory, the public transport operator requests its staff to follow the course before exercising his or her profession.
- *Specialized training courses*: are training courses that are not mandatory or that the operator does not request staff to follow. However, for a large number of professions, this training is necessary to exercise the job and it is "understood" that people applying for that job have followed this specialized training. These courses are primarily followed by persons planning to apply for such a job or by people wishing to have a promotion. These courses are in the beginning of the PTTP activities not a priority, because they are most of the time related to components that are part of a modern and integrated public transport system. A particular example is professional activities related to the public transport control center such as terminal operator, traffic scheduler, etc….
- *Dedicated training courses*: highly specialized courses, predominantly related to one specific type of profession or one particular sort of equipment or technology. These courses will only be necessary in the longer term future, once sophisticated equipment is introduced in the public transport system.

As demonstrated in the previous Figure 5.7.2, financial sustainability for the PTTP in the longer term could be achieved through a combination of public subsidies, sector contributions and private funding.

Subsidies should, in the longer term future, only be given to the PTTP to guarantee only those courses that are mandatory by law. All other courses are beneficial to the sector and the trainees and should be financed by private funding and sector contributions through tuition fees. The mandatory and certified courses will remain public funded because they are essential for a good functioning of the public transport sector. This approach will benefit in particular the public sector's budget, because its annual contribution to the PTTP will gradually decrease as the share of the private and sector contributions increases (Figure 5.7.3).



Source: JICA Study Team

Figure 5.7.3 Financing Structure for PTTP Self-sustainability

Essential for the future sustainability of the PTTP is the financial independence of the training center. For that reason, the proposed study to determine the conditions for establishing the PTTP should propose a detailed strategy that includes:

- A financial plan for the implementation of a sustainable professional training center (the PTTP) that identifies the financial needs when operating without public financial support. This long-term financial strategy should in particular evaluate alternative financing structures that could attract private investors;
- Identify potential partners for strategic alliances and co-operations agreements that would in a first phase reduce operating costs;
- Investigate and propose for the longer term planning practical financial structures that allow to integrate private partners (public private partnership constructions), taking into account regulatory, social and other factors;
- Introduce modern control systems to improve budget allocations and control and monitor spending, considering the cost of equipment (copying and printing

facilities, audio-visual equipment, hard- and software), personnel (training and administration), curricula (yearly development /revision), energy consumption, facilities (classrooms, workshops).

(3) Preliminary budget

A first budget estimation for the study related to establishing the PTTP is provided in Table 5.7.2.

Foreign expertise will be required to conduct the study related to the establishment of the PTTP. The concrete realization of the PTTP will be the role and responsibility of a team of local experts. This expert team should consist of representatives of relevant public authorities, operators (such as CTA) and academic experts in public transport. They will be assisted in their task by foreign experts, allocated to the expert team in the context of a technical assistance program, which is complementary to the study.

The estimated cost for the study on the conditions for establishing a comprehensive training program for Supertram Line 1 and for determining the conditions to transform this training program into a sustainable training program for the entire public transport sector of Cairo is US$750,000. Once the study is completed and the implementation phase initiated, technical assistance will be necessary and is tentatively budgeted at US$120,000 for the entire period. It should be noted that the assistance consists of short term missions and does not require the permanent presence of foreign experts at the site.

Table 5.7.2 Budget Estimation for Establishing PTTP

Item	Goal	Time* (months)	Budget (US$)
Framework Conditions	Identification of general framework for establishing PTTP	1	60,000
Needs Assessment	Identification and specification of necessary materials (syllabi, classroom equipment, computers, teaching materials etc…) and human resources (trainers and other administrative and supporting staff)	2	120,000
Detailed Analyses	Analysis of the structural, operational and financial conditions related to the establishment of the PTTP	5	450,000
Roll out plan	Development and specification of roll-out plan for PTTP including assessment of the potential for self-sustainability	4	120,000
Technical assistance	*Technical assistance during the concrete establishment of the STP and during the start-up phase*	*8*	*120,000*
TOTAL		**18**	**870,000**

** It should be noted that the time, specified in the table relates to actual calendar months and reflects in no way the number of professional man-months needed for executing the works.*

Source: JICA Study Team.

During the study phase, a detailed and oriented Needs Assessment should be conducted that will specify and quantify the resources necessary for establishing and efficiently operating the PTTP. These resources include both human resources and other resources. It is only after having specified in detail all necessary resources that a final investment budget could be established.

It is thus at present impossible to specify the total cost related to establishing a sustainable training center for Cairo's public transport sector. But on average, and based upon expert opinion assessment, a total budget for establishing and running a professional and modern training center varies between 3 million and 5 million US$, depending for the most part upon the quantity of sophisticated materials purchased, the number and types of syllabi to be produced, the number of professional training equipment purchased and the need for housing the training centers. These issues will therefore have to be clarified during the proposed study.

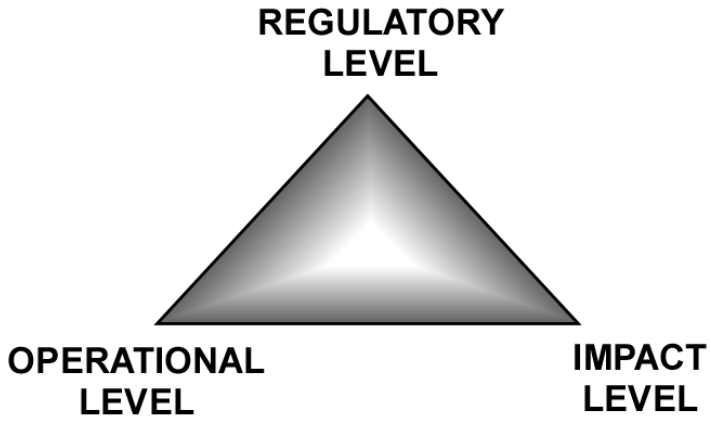
(4) Expected benefits of the PTTP

Every major investment requires an in-depth feasibility study to estimate the costs and potential benefits and to determine the long-term viability of the training center. However, quantifying all the benefits of providing professional training in public transport is difficult if not impossible and will not take into account a number of non-quantifiable benefits.

When assessing the benefits of a sustainable training center, it is imperative to recognize that the center provides training with the objective of improving the expertise and know-how of public and private professionals and by doing this ameliorate the quality and performance of public transport in Cairo. In that view, the long-term benefits of establishing the training program will be achieved on the qualitative level rather than on the quantitative level.

But in spite of this, quantitative and financial analyses are imperative during the proposed establishment study. It is the combination of the qualitative and quantitative benefits that will in the end determine the long-term viability of the training center and will draw up a reasonable financial plan for the short, the medium and the long term.

The establishment of a comprehensive training center for public transport will generate qualitative and qualitative benefits in three major fields demonstrated in Figure 5.7.4.



Source: JICA Study Team

Figure 5.7.4 Qualitative Benefits of the STP and PTTP

The *first* level of benefits can be found at the regulatory level. It is imperative that the public authorities responsible for the public transport sector introduce adapted rules and regulations according to which the sector can operate efficiently. It should therefore be considered to open several of the proposed training courses also to public decision-makers and persons in the public administration, allowing them to base future decisions on an adequate knowledge of the sector.

The direct and indirect regulatory benefits over time could be summarized as:

- Better knowledge at the level of public decision makers and administrative staff, responsible for public transport development in Cairo;
- Introduction of new and/or improved legislation that is in accordance with modern standards and requirements of public transport services;
- Introduction and application in public transport of quality standards and therewith related control and certification processes; and,
- Better privatization of public transport by using minimum quality requirements for private companies and persons active in public transport.

The above described qualitative effects will indirectly generate cost savings due to improved public administration and decision making processes, better and more efficient budgeting, and reduced public participation via further privatization of public transport services presently under public responsibility.

The *second* level of effects can be found in public transport services itself. Training will prove to be a very important means for increasing professionalism in the public transport sector. Increased expertise will assist operators to get better efficiency levels in day-by-day operations and to reduce operating costs. Increased knowledge will also allow the use of computer technology and modern materials that will further reduce personnel costs, necessary stocks, reduce transport costs (fuel and transport time), etc... Finally, increasing expertise of individual operators will lead to integrated public transport services which will allow operators to expand activities while at the same time further reduce operating cost.

The possible benefits will not remain limited to the transport sector itself but will transcendent to the population as a whole. Because public transport is and will always be a *service to the people*, improvements in public transport will have positive societal and environmental effects (*third level*). Increasing the efficiency of public transport operations will help reducing the number of unnecessary car travel in Cairo and simultaneously increase the use of Cairo's public transport system.

Training therewith helps reducing congestion and pollution and increasing safety of traffic through:

- Reducing professional accidents when operating public transport equipment;
- Reducing road accidents through reductions in private transport, better management of public transport systems and higher expertise of personnel responsible for operating public transport services;
- Using better public transport equipment and integrated services;
- Paying attention to noise pollution via better route planning and use of environment friendly public transport modes.

Sustainable training will also assist to realize further improvements that will generate positive effects on living conditions and urban planning, for example

- Replacing old and badly maintained equipment and maintain it according to acceptable environmental standards;
- Better coordinating public transport activities and better and expertise-driven selection of the locations for warehouses, terminals and other public transport facilities;
- Better accessibility of public transport services trough more integrated planning of services and better selection of the location for and development of new transport infrastructure;
- Improved mobility of public transport services via a better selection organization of transport routes, using optimal routing programs and other state-of-the-art technology that avoids highly congested traffic spots.

5.8 FURTHER TECHNICAL DISCUSSIONS

Previous sections of this chapter have addressed the organizational and institutional reform of the CTA. Discussions have focused upon an integrated approach involving existing as well as revised structures of the CTA, the proposed supertram company and human resource needs. This documentation is sensitive to continuing technical discussions between the Study Team as well as members of the Steering Committee and other Egyptian technical experts. Considerable modifications of *Volume III* of the draft *Final Report* (submitted during October, 2003) were, for example, undertaken in response to Committee comments and Study Team responses thereto dated January 25, 2004. This process culminated in the submittal of a revised draft *Final Report* during mid-July 2004.

Following the procedures indicated above, additional discussions were undertaken with the Committee relative to *Volume III*; specifically, an expressed desire to provide further clarification of various elements of technical reviews which had, in the opinion of the Committee, not been fully documented as part of the January modifications. These are contained in this Section 5.8 of the report using a series of generic and topical headings. Appropriate references to these sections have been inserted in the main report.

5.8.1 Human Resources Training

The crux of the discussion relates to clarification as to the role of the supertram training program within the wider CTA and Cairo public transport human resources programs.

The Supertram training program is considered as a preparatory phase to establish a comprehensive training program for CTA (as the largest public transport operator in Cairo) and, in a final phase for the public transport sector as a whole, as depicted in Figure 5.1.2 of the report.

The CTA is at present an inefficient, out-dated and extremely costly transport operator. Expertise development and training are core components of any strategy to modernize this organization and to establish a functional and efficient operator. Many of the discussed training modules are basic elements of a comprehensive public transport training program that are not only useful for CTA staff, but for all persons active in the sector. In terms of integrating Supertram, CTA and general training (as done in the chapter), substantial savings could be generated if training is considered from the perspective of the public transport sector as a whole and not from the perspective of transport modes or operators individually. As much as possible generic training programs useful for all should be designed which can be followed by CTA staff and later by all in public transport in need of training.

It is the strong opinion of the Study Team that human resources development are an essential component, and training an undeniable need, if a successful, efficient and modern public transport system is to be realized in Cairo.