

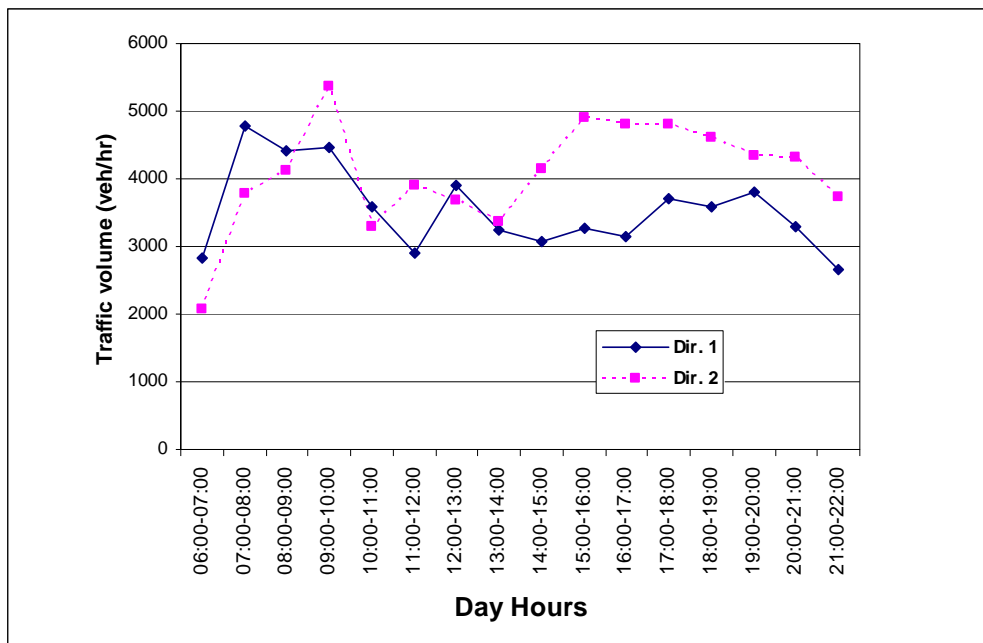
### **2.1.6 Traffic Count Data Analysis**

JICA Study Team has already collected the screen line traffic count data and some link traffic count points. The collected link traffic count data were for a period of only 16 hours and will be extended later to 19 hours as discussed earlier. Therefore, the analysis in this section will consider only the screen line data. Only two Screen Line (SL) locations will be addressed in this report, namely, SL1 and SL2. Appendix 4 presents the graph of other locations.

Note) JICA Study Team will submit separately an appendix by the end of October 2009, which will incorporate 19 hours traffic count period.

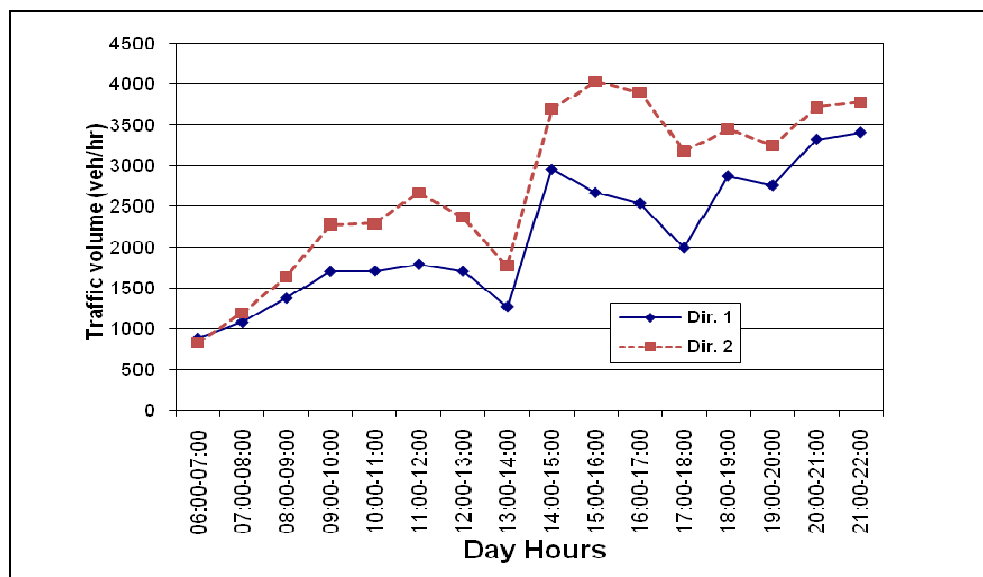
#### **(1) Ring Road at Maadi Bridge (SL1)**

- Figure 2-8 and Figure 2-9 show the traffic fluctuation during the survey period for each direction in the first and second survey days.
- The maximum hourly volume for the second direction from Autostrad road to Marioteyya Canal lies between 9:00 am and 10:00 am in the first survey day and from 3:00 pm to 4:00 pm in the second survey day, which is a Friday. The maximum hourly volume in these two peak hours are 5,370 and 4,023 vehicles for the two survey days, respectively.
- It is noticed that the traffic volume in the second day is generally increasing during the survey hour except from 1:00 pm to 2:00 pm since it is a usual Friday pray time.
- Figure 2-10 illustrates the average traffic composition in this location. It can be concluded that the majority of the traffic composition is private cars (sedan/wagon) with a percentage of about 63 % followed by taxi with 11%.



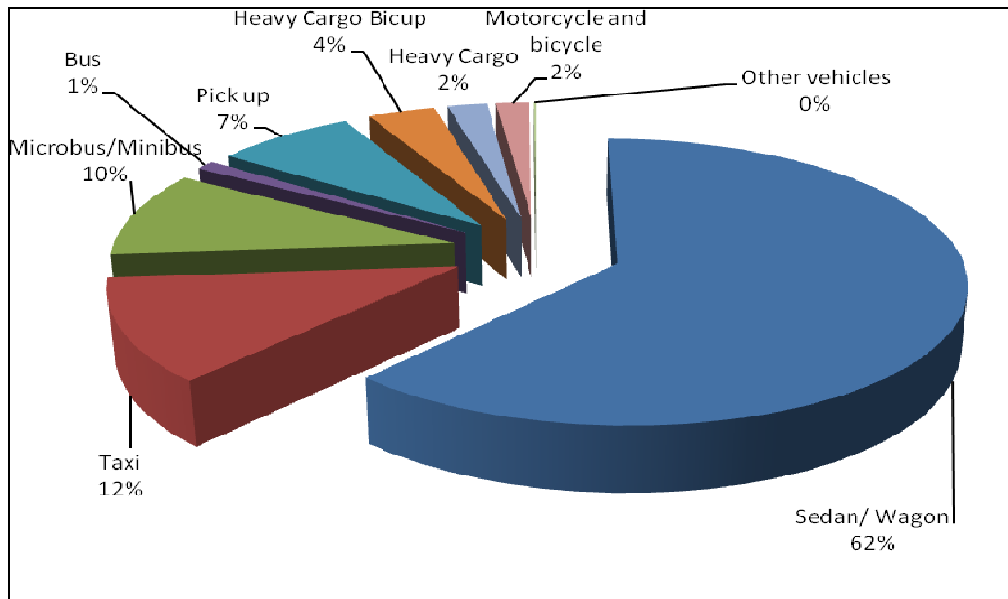
Source: JICA Study Team

**Figure 2-8 Traffic Volume Fluctuation for Both Directions at Maadi Bridge (SL1) (First Survey Day)**



Source: JICA Study Team

**Figure 2-9 Traffic Volume Fluctuation for Both Directions at Maadi Bridge (SL1) (Second Survey Day)**

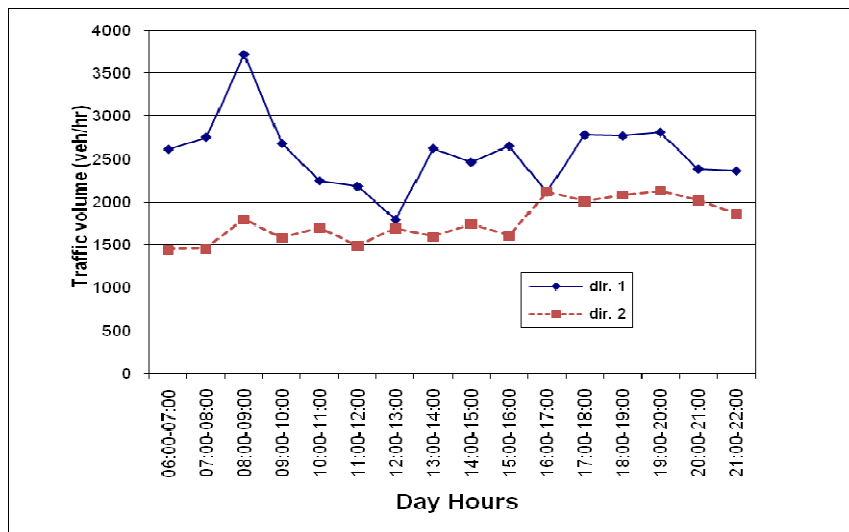


Source: JICA Study Team

**Figure 2-10 Average Traffic Composition at Maadi Bridge (SL1)**

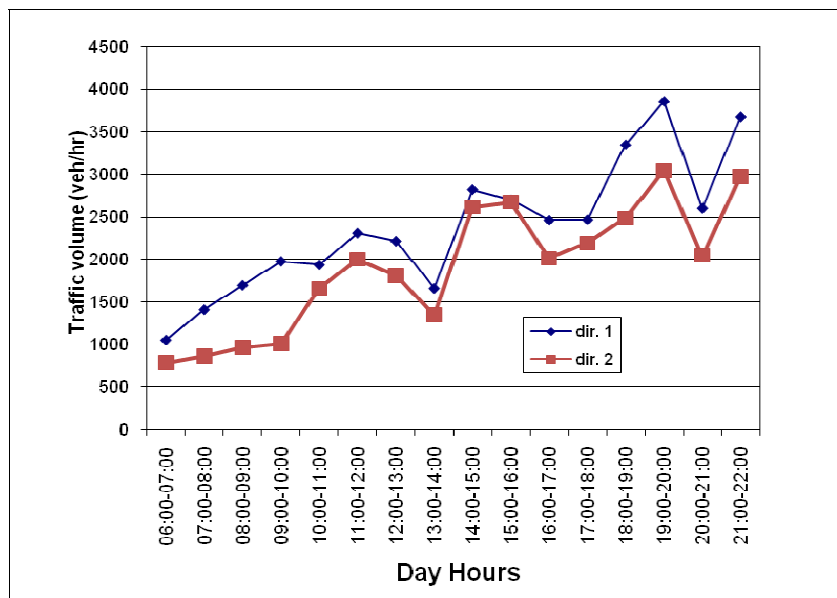
**(2) Abbas Bridge (SL2)**

- Figure 2-11 and Figure 2-12 show the traffic fluctuation during the survey period for each direction in the first and second survey days.
- The maximum hourly volume for the first direction from Giza to Cairo is between 9:00 am and 10:00 am in the first survey day and from 7:00 pm to 8:00 pm in the second survey day, which is a Friday. The maximum hourly volume in these two peak hours are 3,719 and 3,854 vehicles for the two survey days, respectively. It is noticed that the traffic volume in the second day is generally increasing during the survey hour except from 1:00 pm to 2:00 pm as it is a usual Friday pray time, and from 8:00 pm to 9:00 pm.
- Figure 2-13 illustrates the average traffic composition at this location. It can be concluded that the majority of the traffic composition is private cars (sedan/wagon) with a percentage of about 53% followed by taxi with 23%.



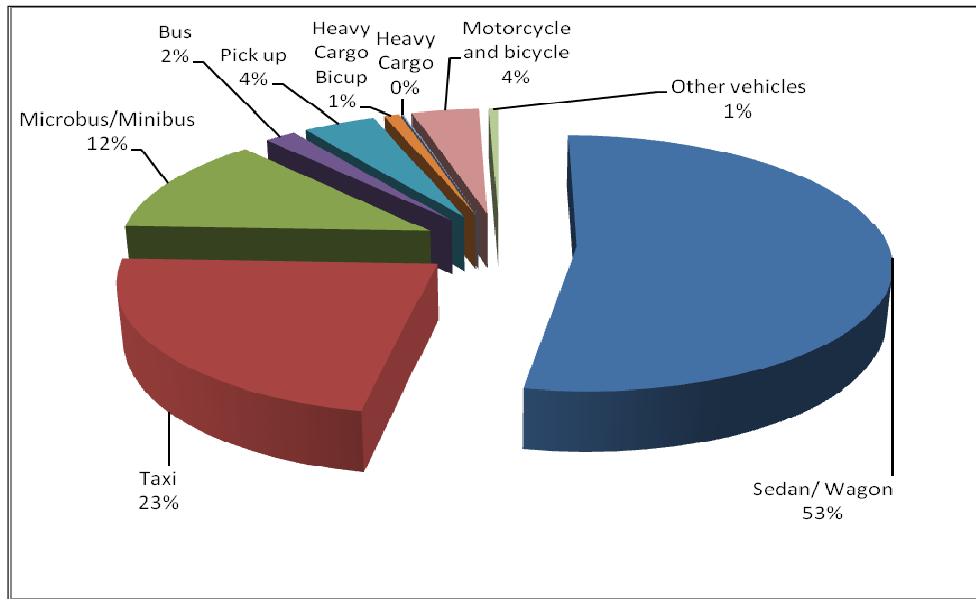
Source: JICA Study Team

**Figure 2-11 Traffic Volume Fluctuation for Both Directions at Abbas Bridge (SL2) (First Survey Day)**



Source: JICA Study Team

**Figure 2-12 Traffic Volume Fluctuation for Both Directions at Abbas Bridge (SL2) (Second Survey Day)**



Source: JICA Study Team

**Figure 2-13 Average Traffic Composition at Abbas Bridge (SL2)**

### 2.1.7 Interview Survey

#### (1) Sample Size and Used Forms

As stated before, the main purpose of the interview survey is to calibrate a modal choice model to measure the user's willingness to pay for a new metro service that would be safer and more time saving. For that purpose, two interview survey forms, revealed and stated preference, were designed. The revealed survey forms consist of two forms: one for private car users and the other for the public transport users. Figure 2-14, Figure 2-15 and Figure 2-16 show the English versions of these forms while Appendix 7 shows the Arabic versions. The targeted sample size was 2000 for each of the revealed and stated preference survey, although sample size for the Revealed Survey was finally changed to 3,000 instead of 1,000.

#### (2) Survey Locations and Dates

The interviews for the revealed preference survey were conducted at four locations. These locations consist of public bus and private terminals and metro stations at the influence area of Metro Line 1 and 2. Specific locations are as follows:

**Table Revealed Preference Survey Locations**

1.	Saraya El-Qubba Metro stations. It has also public bus and private terminals.
2.	Metro station, private parking and public vehicle terminals at Ramsis Square.
3.	Private parking and public vehicle terminals at Abdul Monem Riyadh Square.
4.	Metro station, private parking and public vehicle terminals at Ataba and Opera Squares.

As far as the stated preference survey is concerned, the locations were at the influence area of the two proposed alternatives of Metro Line 4. These locations are as follows:

1. Abdul-Monem Riyadh Squares.
2. Ramses Square
3. Attaba and Opera Squares
4. El-Sayedah Aisha Bridge
5. Port Said Street at Bab El Shaaria Square
6. Port Said Street at Mostorod Bridge
7. Zaker hussain Street
8. Pyramids Road

<b>Revealed Preference Survey (RPS) : Car Users</b>															
JICA Preparatory Survey on Greater Cairo Metro Line No.4															
A	Sample ID Number	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>													
B	Survey Date and Time (month/day) (hours/min)	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <small>month day</small>	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <small>(hour) (min)</small>												
C	Survey Location (Sheiakha/Kism)	<input style="width: 100px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <small>(Zone Code)</small>													
Q1.	Trip origin      Where did you start this trip?	<input style="width: 100px; height: 20px;" type="text"/> <small>(Zone Code)</small>													
	<input style="width: 400px; height: 20px;" type="text"/>														
Q2.	Trip destination      Where do you go this trip?	<input style="width: 100px; height: 20px;" type="text"/> <small>(Zone Code)</small>													
	<input style="width: 400px; height: 20px;" type="text"/>														
Q3.	Trip purpose	<input style="width: 20px; height: 20px;" type="checkbox"/>													
	1) To Working Place      2) To School      3) To Home 4) Business                5) Shopping      6) Medical 7) Selling /Delivering    8) Social         9) Recreational    10) Others														
Q4.	Total travel time	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> minute													
Q5.	Parking charge	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> piastres													
Q6.	What public transport alternative exists for your trip? If not, skip to Q7.														
	a) Public transport mode name:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>													
	b) Walk time to term./stn. from origin	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> minute													
	c) Waiting time	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> minute													
	d) In vehicle Time	<input style="width: 20px; height: 20px;" type="text"/> minute													
	e) Necessary number of transfer:	<input style="width: 20px; height: 20px;" type="text"/> times													
	f) Walk time to term./stn. from destination	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> minute													
	g) Total necessary cost by the public transport:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> pounds													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: left; padding: 2px;">Travel Mode</th> </tr> </thead> <tbody> <tr> <td style="width: 33%;">1) Shared Taxi</td> <td style="width: 33%;">2) Bus</td> <td style="width: 33%;">3) Metro</td> </tr> <tr> <td>4) Private Bus</td> <td>5) Minibus</td> <td>6) Tram</td> </tr> <tr> <td>7) ENR Train</td> <td></td> <td></td> </tr> </tbody> </table>				Travel Mode			1) Shared Taxi	2) Bus	3) Metro	4) Private Bus	5) Minibus	6) Tram	7) ENR Train		
Travel Mode															
1) Shared Taxi	2) Bus	3) Metro													
4) Private Bus	5) Minibus	6) Tram													
7) ENR Train															
Q7.	Would you use public transport if services are improved?														
	<input style="width: 20px; height: 20px;" type="checkbox"/>														
	1) Yes      2) No														
Q8.	Identify the importance of the following services characteristics ( 1= not important, 2 = important, 3=Very important)														
	1) Travel Time	<input style="width: 20px; height: 20px;" type="text"/>	2) Travel cost	<input style="width: 20px; height: 20px;" type="text"/>	3) Number of transfers	<input style="width: 20px; height: 20px;" type="text"/>									
	4) Comfort	<input style="width: 20px; height: 20px;" type="text"/>	5) Security	<input style="width: 20px; height: 20px;" type="text"/>	6) Safety	<input style="width: 20px; height: 20px;" type="text"/>									
	7) Access/Egress	<input style="width: 20px; height: 20px;" type="text"/>													

Source: JICA Study Team

**Figure 2-14 Revealed Preference Survey Form for Car Users**

<b>Revealed Preference Survey (RPS) : Public Transport User</b>															
JICA Preparatory Survey on Greater Cairo Metro Line No.4															
A	Sample ID Number		<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>												
B	Survey Date and Time (month/day) (hours/min)	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> month day	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> (hour) (min)												
C	Survey Location (Sheiakha/Kism)	<input style="width: 150px; height: 20px;" type="text"/>	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> (Zone Code)												
Q1.	Trip origin      Where did you start this trip?	<input style="width: 100px; height: 20px;" type="text"/>	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> (Zone Code)												
	Location (Sheiakha/Kism)	<input style="width: 150px; height: 20px;" type="text"/>													
Q2.	Trip destination      Where do you go this trip?	<input style="width: 100px; height: 20px;" type="text"/>	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> (Zone Code)												
	Location (Sheiakha/Kism)	<input style="width: 150px; height: 20px;" type="text"/>													
Q3.	Trip purpose	<input style="width: 20px; height: 20px;" type="text"/>													
	1) To Working Place      2) To School      3) To Home														
	4) Business      5) Shopping      6) Medical														
	7) Selling / Delivering      8) Social      9) Recreational      10) Others														
Q4.a-	Current mode	<input style="width: 20px; height: 20px;" type="text"/>													
b-	Walk time to term./stn. from origin	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
c-	Waiting time	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
d-	In vehicle time	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
e-	Walk time to term./stn. from destination	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
f-	Number of transfers	<input style="width: 20px; height: 20px;" type="text"/>													
g-	Total travel cost	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	piastres												
Q5.	Is there another alternative public transport mode? If not, skip to Q6.														
a)	Alternative transport mode name:	<input style="width: 40px; height: 20px;" type="text"/>													
b)	In vehicle time by the alternative transport:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
c)	Total necessary cost by the alternative transport:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	piastres												
d)	Necessary number of transfer:	<input style="width: 20px; height: 20px;" type="text"/>	times												
e)	Walk time to term./stn. from origin	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
f)	Walk time to term./stn. from destination	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
g)	Waiting time	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	minute												
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Travel Mode															
1) Shared Taxi	2) Bus	3) Metro													
4) Private Bus	5) Minibus	6) Tram													
7) ENR Train															
Q6.	Identify the importance of the following services characteristics (1= not important, 2 = important, 3=Very important)														
	1) Travel Time	<input style="width: 20px; height: 20px;" type="text"/>	2) Travel cost	<input style="width: 20px; height: 20px;" type="text"/>	3) Number of transfers	<input style="width: 20px; height: 20px;" type="text"/>									
	4) Comfort	<input style="width: 20px; height: 20px;" type="text"/>	5) Security	<input style="width: 20px; height: 20px;" type="text"/>	6) Safety	<input style="width: 20px; height: 20px;" type="text"/>									
	7) Access/Egress	<input style="width: 20px; height: 20px;" type="text"/>													

Source: JICA Study Team

**Figure 2-15 Revealed Preference Survey Form for Public Transport User**



State Preference Survey (SPS)						
JICA Preparatory Survey on Greater Cairo Metro Line No.4						
A	Sample ID Number					
B	Survey Date and Time (month/day) (hours/min)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
		month	day	(hour)	(min)	
C	Survey Location (Sheiakha/Kism)	<input style="width: 150px;" type="text"/>		<input type="text"/>	<input type="text"/>	
				(Zone Code)		
Q1.	Trip origin	Where did you start this trip?		<input type="text"/>	<input type="text"/>	
				(Zone Code)		
	<input style="width: 150px;" type="text"/>	Location (Sheiakha/Kism)				
Q2.	Trip destination	Where do you go this trip?		<input type="text"/>	<input type="text"/>	
				(Zone Code)		
	<input style="width: 150px;" type="text"/>	Location (Sheiakha/Kism)				
Q3.	What is the Purpose of your trip?				<input type="checkbox"/>	
	1 ) To Working Place	2 ) To School	3 ) To Home			
	4 ) Business	5 ) Shopping	6 ) Medical			
	7 ) Selling / Delivering	8 ) Others				
Q4.	Please fill following blank boxes about your today trib					
	Travel Mode	1st Mode	2nd Mode	3rd Mode	4th Mode	5th Mode
	Fare Type					
	Fare (I.E.)					
	Walk Access Time (min)					
	Waiting Time (min)					
	Boarding Time (min)					
	Walk Egress Time (min)					
	Transfer Location					
	Travel Mode					
	1 ) Bicycle/ Motorbike	2 ) Passenger Car	3 ) Shared Taxi			
	4 ) Minibus	5 ) Bus	6 ) Private Bus			
	7 ) Metro	8 ) Tram	9 ) ENR Train			
	10) Taxi	11 ) Others				
	Fare Type					
	1 ) Single Ticket	2 ) Student Pass	3 ) Ordinary Pass			
	4 ) Governmental Pass	5 ) Others				
	Transfer Location					
	1 ) ENR Station	2 ) Bus Terminal	3 ) Metro Station			
	4 ) Major Square	5 ) Tram Station	6 ) Others			
Q5.	A new transport mode which connects Cairo and place, provides you comfortable, convenient and faste service compared to existing public transport modes. If such a new public transport is introduced, do you use the new mode					
	1 ) Yas		2 ) No			
Q6.	If Your ansuer in q,5 is " yes", how much would you pay extra fare for travel time reduction of todays trip by the new public transport ?					
	1 ) By 25% of travel time of This trip					
	2 ) By 50% of travel time of This trip					
Q7.	Identify the importance of the following services characteristics ( 1= not important, 2 = importatnt, 3=Very important)					
	1) Travel Time	<input type="text"/>	2) Travel cost	<input type="text"/>	3) Number of transfers	<input type="text"/>
	4) Comfort	<input type="text"/>	5) Security	<input type="text"/>	6) Safety	<input type="text"/>
	7) Access/Egress	<input type="text"/>				

Source: JICA Study Team

**Figure 2-16 Stated Preference Survey Form**

Figure 2-17 shows the locations at which both the revealed and stated preference surveys were conducted.

The interview survey continued for seven days which started from 15th June 2009. Table 2-6 shows the survey dates at each location.

**Table 2-6 Survey Day and Date for Each Interview Survey Location**

Day	Date	Location name	Survey type	Location Code
Monday	2009/6/15	Saraya El-Qubba	RP	1
Tuesday	2009/6/16	Abdul-Monem Riyadh Squares	RP, SP	2
Wednesday	2009/6/17	Ramsis Square	RP,SP	3
Thursday	2009/6/18	Ataba and Opera Squares	RP,SP	4
Sunday	2009/6/21	El-Sayedah Aisha Bridge	SP	5
		Port Said Street at Bab El Shaaria Square	SP	6
Monday	2009/6/22	Port Said Street at Mostorod Bridge	SP	7
		Zaker Hussain Street	SP	8
Tuesday	2009/6/23	Pyramids Road	SP	9

Source: JICA Study Team

Note: RP-Revealed Preference, SP-Stated Preference

### (3) Training

JICA Study Team assigned 15 persons to conduct the interview survey. A meeting was held with the interviewers before starting the survey. The training program included explanation of the main purpose of the survey that should be illustrated for the interviewees. In addition, the interview form questions were explained and discussed with the trainees in details. Accordingly, some words of the asked questions were modified to that the interviewed persons have clearer understanding. Some interviews were conducted with the trainees in the office during the training program. Accordingly, some comments and instructions were issued to each surveyor to ensure correct answers for the asked questions.

### (4) Data Processing

The first set of encoded data in each form includes interview location, origin, destination, used mode, and fare type. Three input data sheets were designed for inputting information using Microsoft Soft-Access software. The input data were first checked against some illogical answers of the interviewed persons and against data entry error. Some illogical tests include data range checking that differs according to the form question. As for stated preference form, the additional fare that can be paid by the user for 25% trip time saving should be smaller than or equal to that of the 50% time saving. Table 2-7 shows a comparison between the number of the total interviewed persons and the validated number of interviews after the data checking process.

**Table 2-7 Comparison Between the Numbers of the Total Interviewed Persons Before and After Data Checking**

Ser.	Form type	Total interviewed persons	validated number of interviews	% excluded interviews
1	RP – transit users	1623	1544	4.9
2	RP – car users	554	532	4
3	SP	2419	2322	4

Source: JICA Study Team

Note: RP-Revealed Preference, SP-Stated Preference

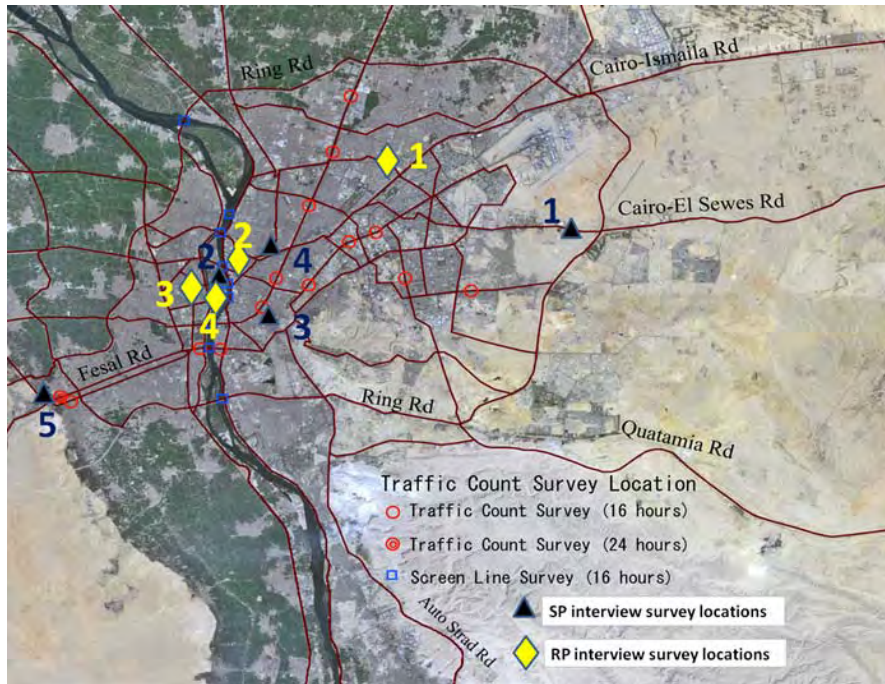
Table 2-8 shows the distribution of the total number of interviews among the aforementioned different interview locations.

**Table 2-8 Distribution of the Total Number of Interviews Among Different Interview Locations**

Location code	RP				SP	
	Number				Number	%
	Public	Private	Total	%		
1	337	108	444	21		
2	292	169	460	22	417	18
3	271	58	329	16	309	13
4	644	197	843	41	279	12
5					335	14
6					343	15
7					283	12
8					265	11
9					91	4
Total	1544	532	2076	100	2322	100

Source: JICA Study Team

Note: RP-Revealed Preference, SP-Stated Preference



Source: JICA Study Team

**Figure 2-17 Locations of Interview Survey**

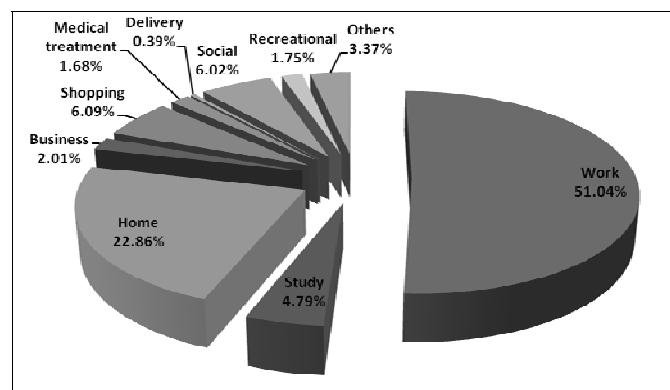
**(5) Data Analysis**

The collected data for the interview survey was analyzed. The main findings of these analyses are as follows.

**a) Revealed preference interview**

< Public vehicle users >

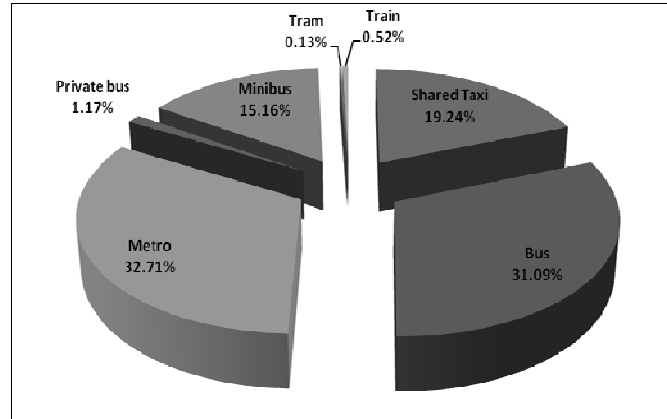
Regarding the trip purpose, the majority are work trips (51 %) followed by “Back to home trips” (23 %). Figure 2-18 depicts the distribution of the interviewed samples.



Source: JICA Study Team

**Figure 2-18 Distribution of the Interviewed Sample of Public Transport Users According to Trip Purpose**

Figure 2-19 depicts the distribution of the chosen sample based on the public mode of transportation.

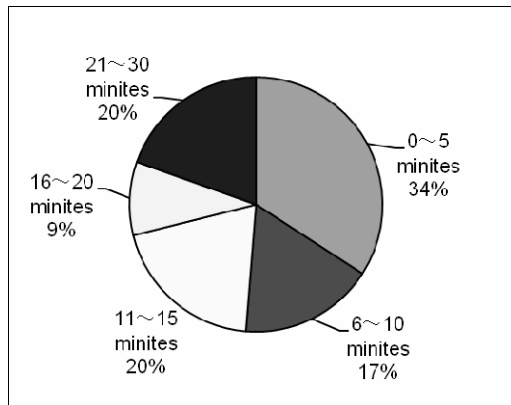


Source: JICA Study Team

**Figure 2-19 Distribution of the Interviewed Sample of Public Transport Users According to Used Public Mode Type**

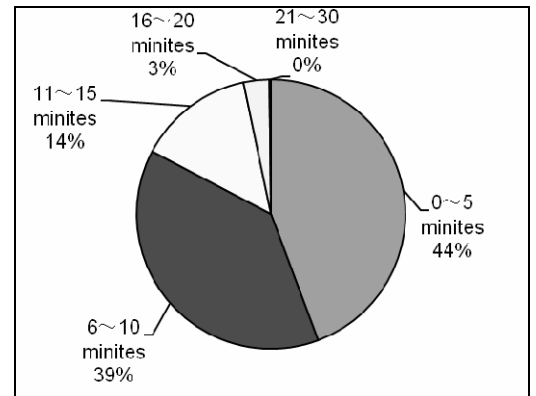
As for the trip characteristics by the used mode, Figure 2-20 to Figure 2-25 show pie charts that summarize the main results. These results can be stated as follows:

- Majority of the users (44%) walk for five minutes to reach the used mode from their origin. The average walking time to the mode is 8.4 minutes.
- The average waiting time for the used mode is about 14 minutes.
- Most of the “In vehicle time” for the users ranges between 30 and 60 minutes. The average “In vehicle time” for all users is 44 minutes.
- Majority of the users (52%) walk for 5 minutes to reach their final destination from the mode. The average walking time to the mode is 7.6 minutes.
- Most of the users (65%) use only one mode during their trips from origin to destination.
- The average transportation cost is about 1.4 LE and the cost range for the majority of the users is between 0.5 and 1.0 LE.



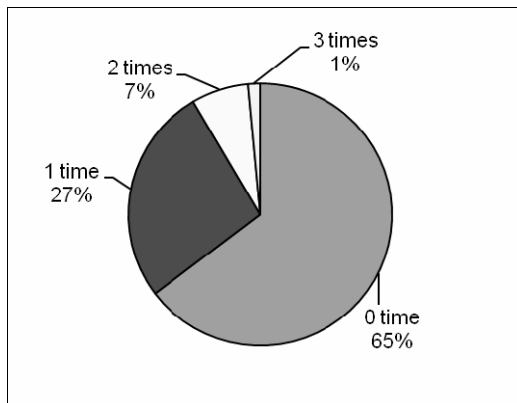
Source: JICA Study Team

**Figure 2-20 Distribution Based on Waiting time**



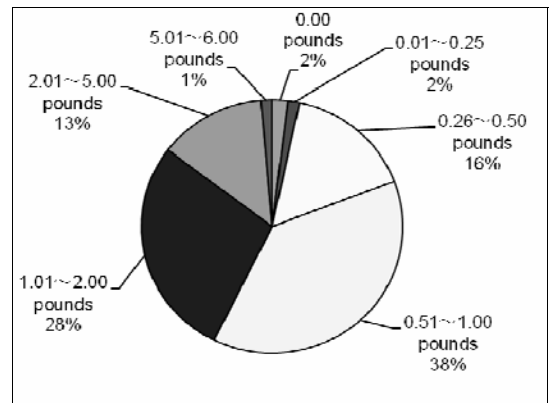
Source: JICA Study Team

**Figure 2-21 Distribution Based on Walk to Mode Time**



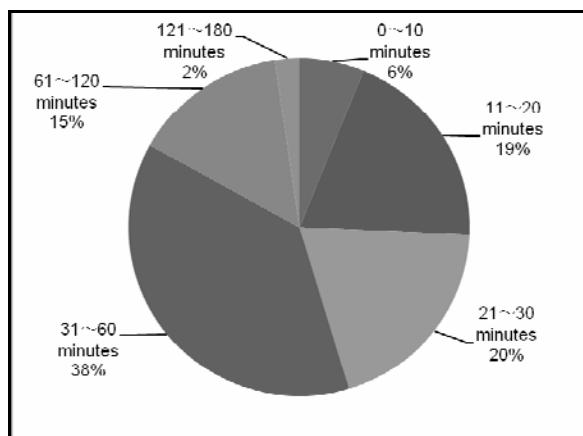
Source: JICA Study Team

**Figure 2-22 Distribution Based on Number of Mode Transfer**



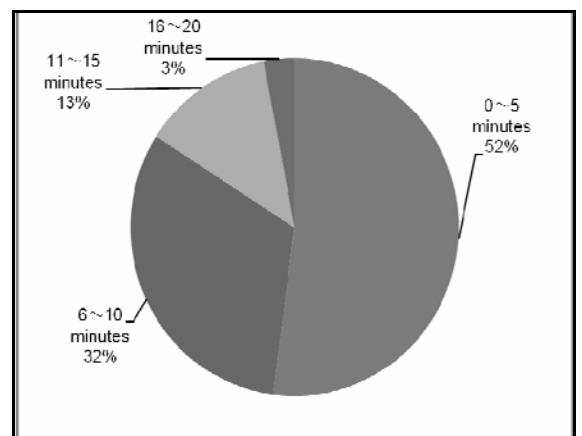
Source: JICA Study Team

**Figure 2-23 Distribution Based on Travel cost**



Source: JICA Study Team

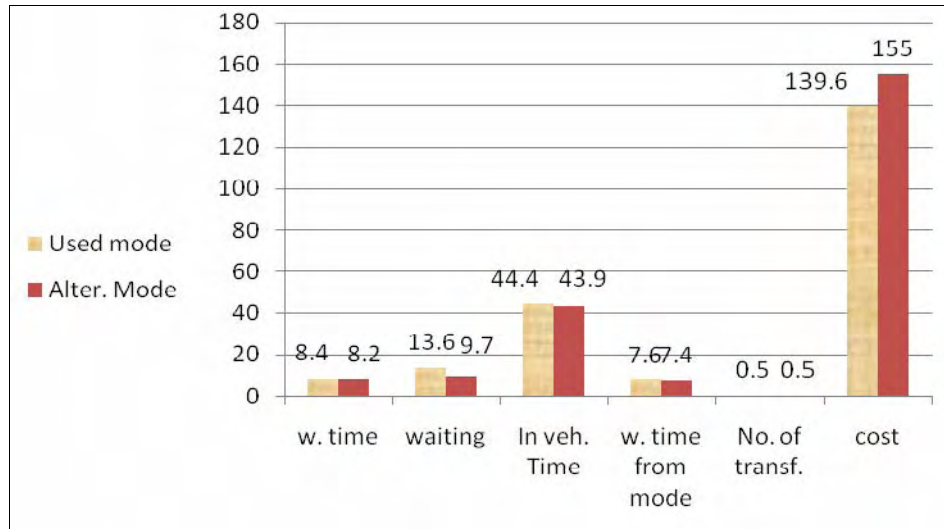
**Figure 2-24 Distribution Based on "In vehicle" Time**



Source: JICA Study Team

**Figure 2-25 Distribution Based on Walking Time from Mode**

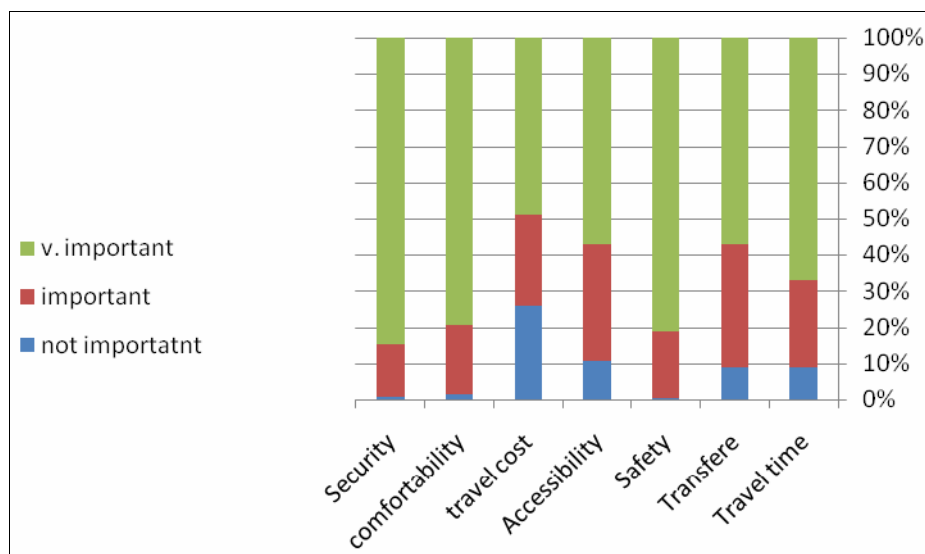
Figure 2-26 illustrates a histogram for the comparison between the characteristics of the user trips for both the used and alternative modes. This figure shows that the most important factor in selecting the mode is the mode cost where the average cost for the used mode is only about 1.4 LE compared to 1.55 LE for the alternative mode.



Source: JICA Study Team

**Figure 2-26 Comparison Between the Trip Characteristics of the User Trips for both the Used and Alternative Modes**

As far as the relative importance of the trip characteristics is concerned, Figure 2-27 shows the percentage distribution of the interviewed persons about their opinions on each item. It can be concluded from this figure that safety and security are the most important issues from the user's point of view.

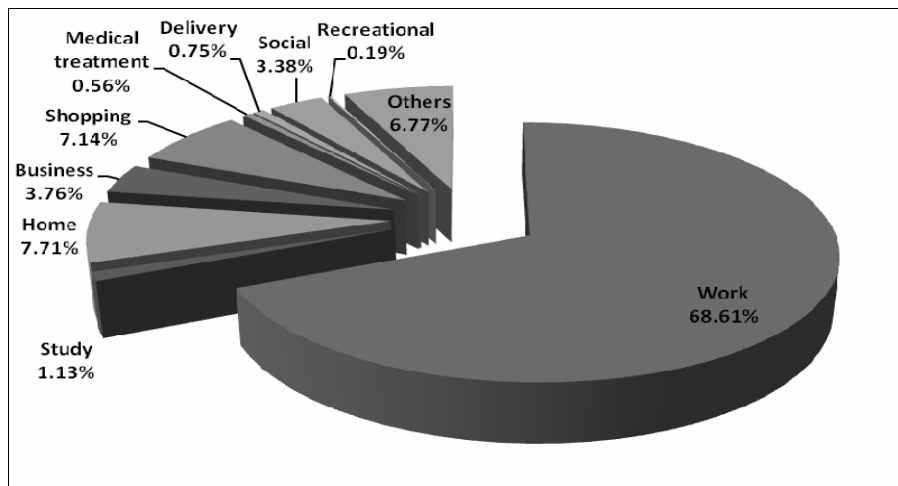


Source: JICA Study Team

**Figure 2-27 Percentages of Interviewed Public Mode Users Regarding Their Opinions in Each Trip Characteristic Item**

< Car users >

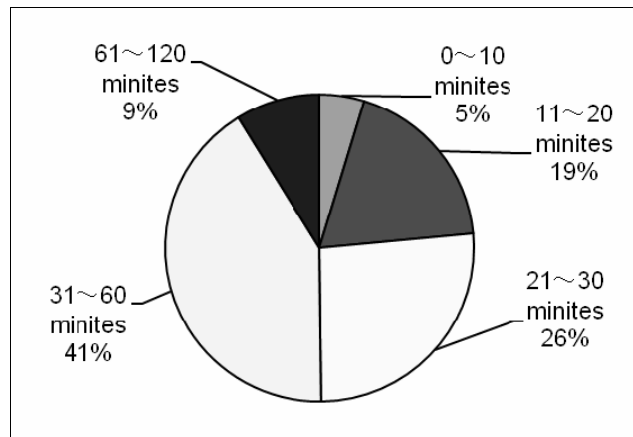
Regarding the trip purpose, the majority are work trips (68.6 %) followed by “Back to home trips” (7.7 %). Figure 2-28 depicts the distribution of the interviewed samples based on the trip purpose.



Source: JICA Study Team

**Figure 2-28 Distribution of Interviewed Sample of Car Users According to Trip Purpose**

The average travel time was 38.5 minutes while most of the trip time ranges between 31 and 60 minutes as shown in Figure 2-29.

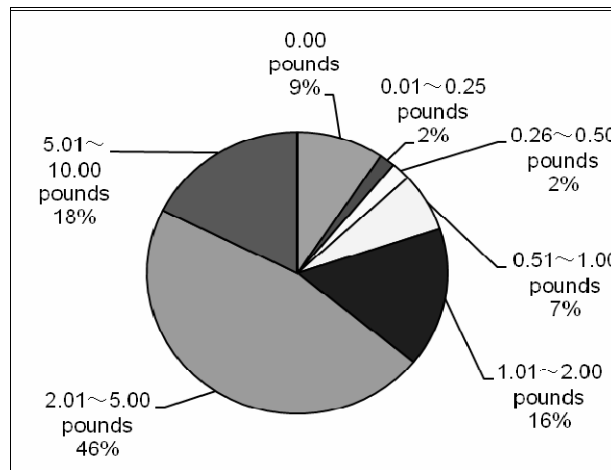


Source: JICA Study Team

**Figure 2-29 Distribution of Interviewed Sample of Car Users According to Trip Time**

The average parking cost is 3.52 LE. The parking fees for 46% of the interviewed sample range between 2.01 and 5.00 LE as shown in Figure 2-30.

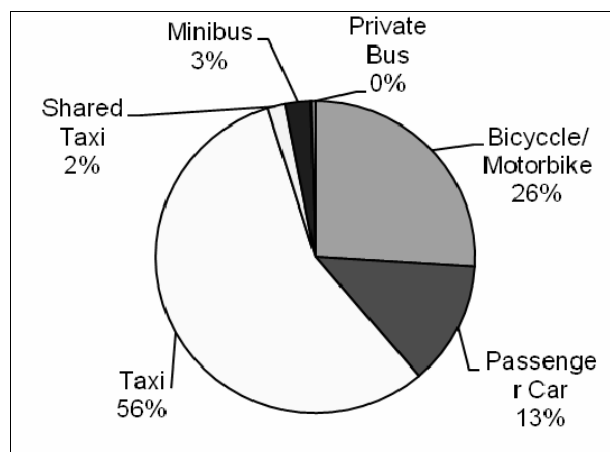




Source: JICA Study Team

**Figure 2-30 Distribution of Interviewed Sample of Car Users According to Parking Fees**

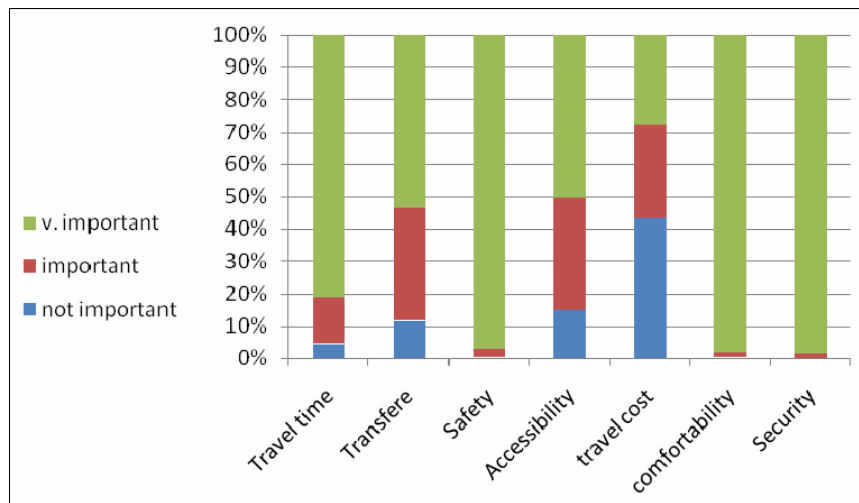
As for the alternative available public mode of transport, Figure 2-31 shows that the majority prefer using taxi (56%) while 85% of the car users are willing to use the public transport modes if the service is improved.



Source: JICA Study Team

**Figure 2-31 Distribution of the Interviewed Sample of Car Users According to Other Available Alternative Mode**

As far as the relative importance of the trip characteristics is concerned, Figure 2-32 shows the percentages of interviewed persons about their opinions in each item. It can be concluded from this figure that safety, security and comfort are of great importance for the users in selecting their preferred mode of transport.

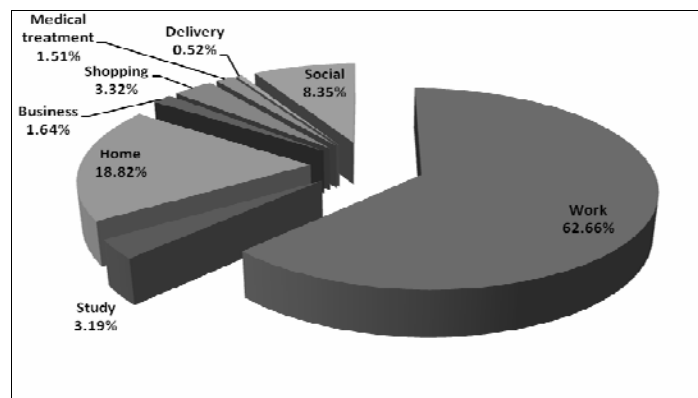


Source: JICA Study Team

**Figure 2-32 Percentages of Interviewed Car Users Regarding their Opinions on Each Trip Characteristic Item**

Regarding stated preference (SP) survey, Figure 2-33 depicts the distribution of interviewed sample according to the trip purpose. The figure shows that majority of the trip purpose is work trips with a percentage of about 63%.

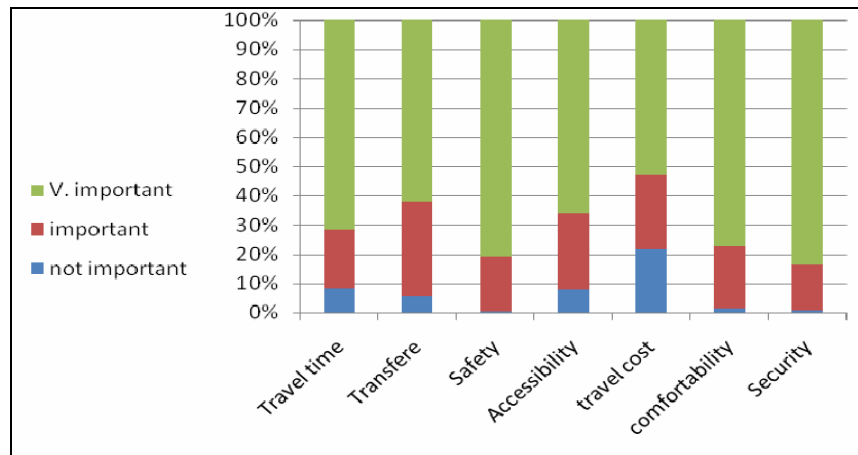
About 83 % of the interviewed persons are willing to use the improved public mode and can afford to pay for a higher fare.



Source: JICA Study Team

**Figure 2-33 Distribution of Interviewed Sample of Public Users According to Trip Purpose**

The average additional fare that can be paid for 25% time saving is 31 piaster. This value reached 66 piaster in the case of 50% time saving. As far as the relative importance of the trip characteristics is concerned, Figure 2-34 shows the percentages of interviewed persons about their opinions on each item.



Source: JICA Study Team

**Figure 2-34 Percentages of Interviewed Public Users Regarding their Opinions on Each Trip Characteristic Item**

### 2.1.8 Interview Survey for Tourist

The objective of the interview survey for tourist is to recognize their willingness to take the public transport mode in the future in case its service is improved.

#### (1) Survey Location

Survey location will be at tourist spots such as the Pyramid, Egyptian Museum, Old Cairo, Khan Al-Khalily, Citadel, etc.

#### (2) Sample Size and Survey Form

The sample size will be 250 interviews. JICA Study Team designed a form for the questionnaire to be used in this interview. The form, shown in Figure 2-35, consists of 1) personal profile (basic), 2) trip of the day, and 3) opinion on the public transport service.

<b>Interview Survey to Tourist</b>					
JICA Preparatory Survey on Greater Cairo Metro Line No.4					
A	Sample ID Number			<input type="text"/>	
B	Survey Date and Time (month/day) (hours/min)	<input type="text"/>	<input type="text"/>	<input type="text"/>	
		(month)	(day)	(hour) (min)	
C	Survey Location			<input type="checkbox"/>	
	1) Pyramids	2) Egyptian Museum	3) Old Cairo		
	4) Han Al-Halili	5) Citadel			
D	Gender	1) Male	2) Female	<input type="checkbox"/>	
E	Age	1) <14	2) 15-39	3) 40-59	4) >60
				<input type="checkbox"/>	
Q1.	Where were you come from?			<input type="checkbox"/>	
	1) Egypt	2) Africa except Egypt	3) Europe		
	4) America	5) Middle East	6) Asia		
	7) Australia				
Q2.	How many days do you stay in Cairo?			<input type="text"/>	
				(days)	
Q3.	Where do you stay?			<input type="checkbox"/>	
	1) Hotel	2) Apartment	3) Relative's house	4) Others	
Q4.	What kind of transport mode do you use?			<input type="checkbox"/>	
	1) Tour bus	2) Private car	3) Taxi		
	4) Shared taxi	5) Public bus	6) Metro		
	7) Tram	8) ENR train	9) Others		
Q5.	How many hours is it taken from your staying place to this place?			<input type="text"/>	
				(hour) (min)	
Q6.	If a new transport mode, which provide you comfortable, convenient and faster service compared to existing public transport modes, do you use the new public transport?			<input type="checkbox"/>	
	1) Yes	2) No			
Q7.	Identify the importance of the following public transport service characteristics.				
		Not important	Important	Very important	
1)	Travel time	1	2	3	
2)	Travel cost	1	2	3	
3)	Comfort	1	2	3	
4)	Security	1	2	3	
5)	Safety	1	2	3	
6)	Others (Please specify)				
		(	)		

Source: JICA Study Team

**Figure 2-35 Tourist Survey Form**

## 2.2 Urbanization and Socio-Economic Development Trends within the Study Area until 2050

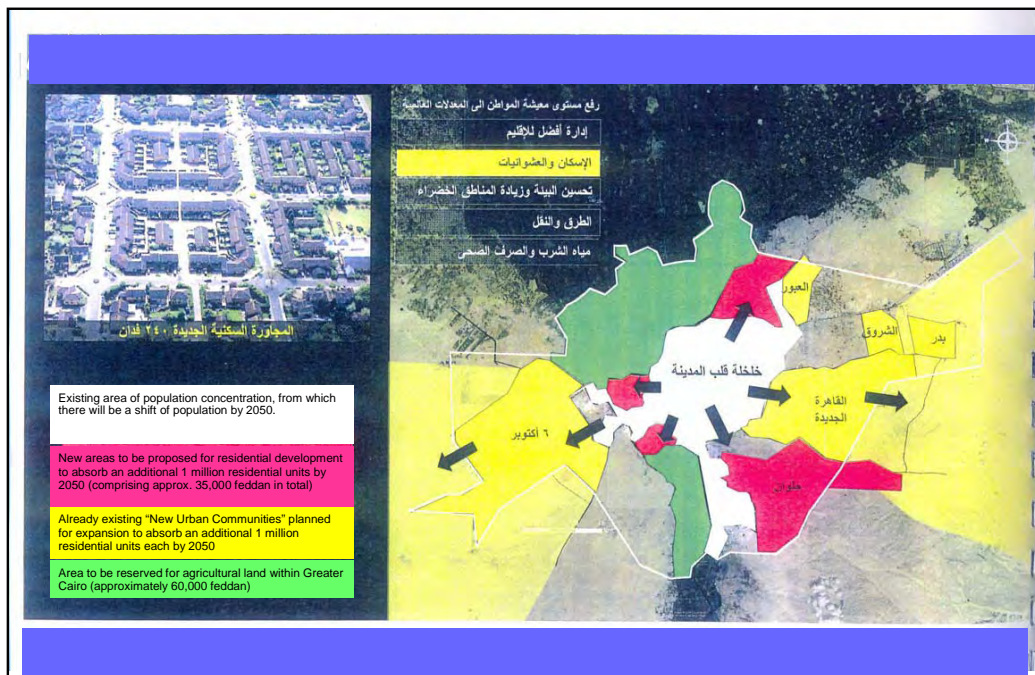
The study area comprises rapidly growing and newly urbanizing communities at its western and eastern extremities, as well as a mature urban core at its centre and in its northern section. The purpose of this section of the report is to assess the likely direction and rate of urban development, as well as the likely socio-economic growth within this area up until the end of the forecast timeframe in 2050.

### 2.2.1 Future Patterns of Urbanization

The pattern of urban growth within Greater Cairo up until 2050 was assumed to follow the shift of residential development and population away from the existing urban concentrations

(agglomerations) to “New Urban Communities” (NUCs), as envisaged in *Cairo Vision 2050*<sup>1</sup>.

The strategy for the urban development of Greater Cairo, as presented in *Cairo Vision 2050*, is given in Figure 2-36 below.



Source: Cairo Vision 2050, General Organization for Physical Planning, Ministry of Housing, Utilities and Urban Development

**Figure 2-36 Urban Development Strategy for Greater Cairo up to 2050**

This strategy will encourage urban development away from the existing saturated centre of Greater Cairo (white section of map) to:

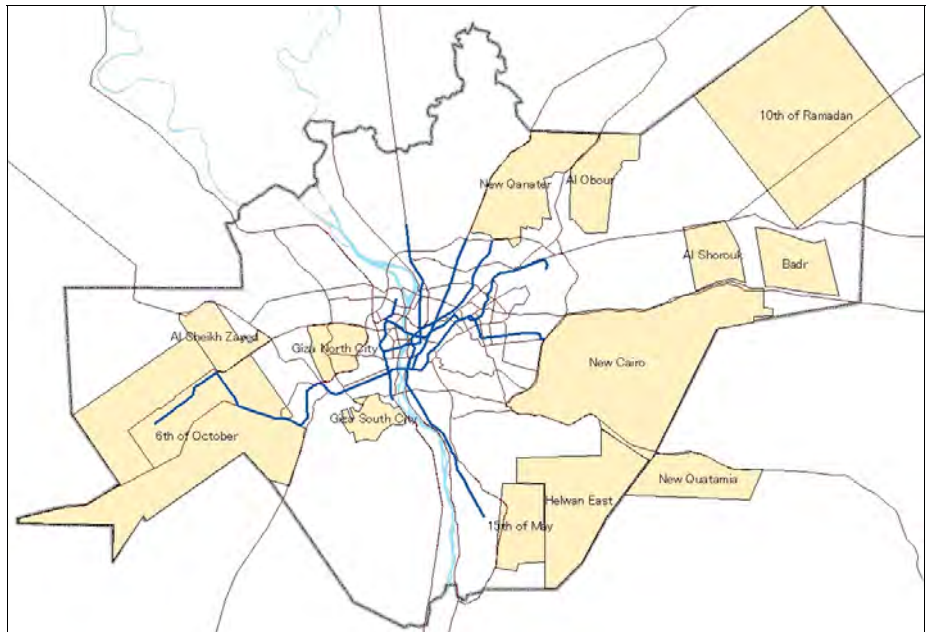
- six existing NUCs on the city’s eastern and western perimeters (shown in yellow on the map); and
- five new areas being proposed for development by 2050 (shown in pink on the map) - to the north, south and west of the city centre – these areas being located at intermediate distances between the city centre and the perimeter of Greater Cairo.

The strategy will be supported by appropriate planning of land use, infrastructure development and associated public investment. Its purpose will be to avoid the uncontrolled random expansion outwards from the main agglomeration, which has characterized past urban development and led to rapid saturation of the city core. Instead, urban growth will be

<sup>1</sup> Cairo Vision 2050: Slide Presentation by General Office for Physical Planning of the Ministry of Housing, Utilities and Urban Development (2009).

concentrated within the compact geographical areas which may be more efficiently served by public infrastructure, including transport.

The map in Figure 2-37 below identifies in greater detail the areas which will be the focus of urban development in Greater Cairo until 2050.



Source: JICA Study Team

**Figure 2-37 New Urban Community (NUC) Development until 2050**

The six existing NUCs, which will be expanded to provide collectively an additional one million residences by 2050, are the: 6th October City in the west, and New Cairo, El Shorouk, Badr, 10th of Ramadan City and El Obour in the east.

The five new areas to be developed as NUCs by 2050 are the: Giza North City and Giza South City in the west, New Qanater in the north, and Helwan East and New Quatamia in the south. These comprise a total land area of 35,000 feddan (approximately 14,700 hectares) and by 2050, are expected to provide collectively an additional one million housing units for the Greater Cairo area.

## 2.2.2 Population Projections

### (1) Population Projection for Metro Line 4 Study Area

Forecasts of the population of the study area for Metro Line 4 were generated by the SDMP study for the period 2007 to 2027. These forecasts are given in Table 2-9 below.

**Table 2-9 Population Growth Forecast for Study Area (SDMP Study)**

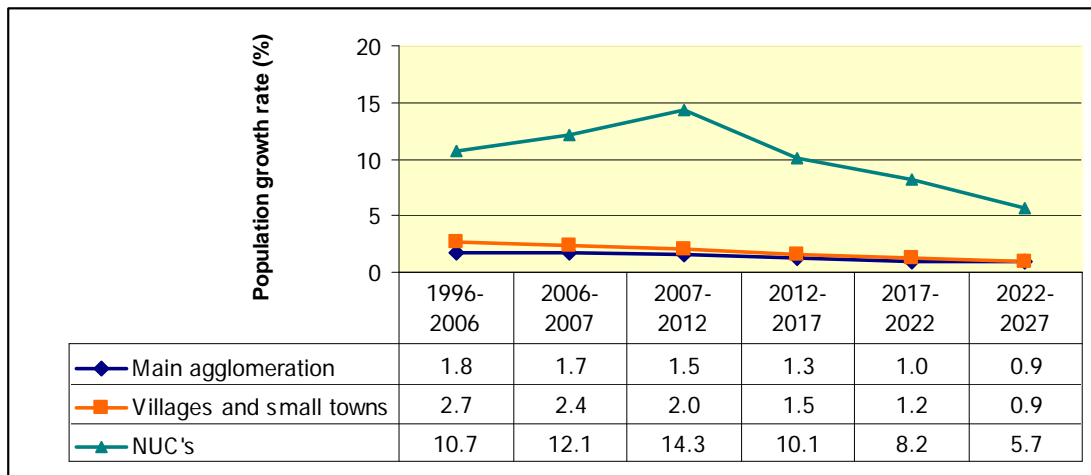
Year	Total Population (thousand persons)	Annual Growth Rate
2006	16,101	2.22%
2007	16,464	2.25%
2012	18,411	2.26%
2017	20,369	2.04%
2027	24,192	1.61%

Source: SDMP study report

Note: The study area on which the SDMP study forecast was based comprises: the Cairo and Qaliobeya governorates; part of the Giza governorate and the 10th of Ramadan NUC.

The SDMP population forecast is based on population data from the 2006 census. The growth rate shown that year (2.22%) represents the average annual growth between the census years of 1996 and 2006. The growth rate of 2.25% assumed to apply in 2007 was based on population projections by the Cairo Demographic Centre in 2001, while growth rates for subsequent years were estimated by SDMP Study Team.

The SDMP forecast assumes a high rate of population shift from the main agglomeration to the six existing NUCs during the forecast period of 2007 to 2027, as reflected in the relative population growth rates assumed for the main agglomeration, villages and small towns, and NUCs comprising the study area (refer Figure 2-38).



Source: SDMP study report

**Figure 2-38 Relative Population Growth between NUCs and Other Urban Areas**

The re-basing of the feasibility study on the period 2010-2050 required that the population forecasts be extended over this period. The resulting population growth forecast for the study area until 2050 is given in Table 2-10.

For the period 2007-2030 the assumed growth rates are identical to those assumed in the SDMP study report. For subsequent years, however, it was assumed that population growth would reduce to a rate of about 1 % per annum by 2050.

**Table 2-10 Feasibility Study Population Forecast for Study Area**

Year	Population	
	1000 persons	Av Annual Rate of Growth
2006	16,101	2.22%
2007	16,464	2.25%
2008	16,836	2.26%
2009	17,217	2.26%
2010	17,606	2.26%
2011	18,004	2.26%
2012	18,411	2.26%
2017	20,369	2.04%
2027	24,192	1.61%
2030	25,387	1.61%
2040	28,802	1.27%
2050	31,815	1.00%

Source: SDMP study report

Notes:

1. Population Figure for 2006 from 2006 Population Census
2. Population growth rates for 2007 – 2030 derived from SDMP study
3. Population growth rates for 2030 – 2050 are SDMP Study Team estimates

The feasibility study forecast assumes that population in the existing NUCs will continue to grow between 2027 and 2050, but at lower rates than those expected for the period 2007-2027, as these areas approach their capacity limits in terms of population density. However, the forecast assumes that development of the new NUCs (as identified in Section 2.2.1 above) will commence at some time after 2027 and that the population of these areas will grow at significantly faster rates than those assumed for the overall study area, until their capacity limits are reached around 2050.

## **(2) Population Projections for Study Sectors**

For the purpose of summarizing the population forecasts used as inputs for the transport demand forecast, the study area was divided into 18 geographical sectors. These sectors collectively account for about 464 traffic zones, which are the bases for the estimation of total traffic flows in the transportation demand model. These geographical sectors are identified and presented in Figure 2-39.





Source: JICA Study Team

Figure 2-39 Delineation of Study Geographical Sectors

The projected population for the study area was distributed among the 18 study sectors in accordance with the following procedure:

- First, the distribution of the SDMP population forecast by study sector was adopted as the basis of the feasibility study forecast for the years 2007-2027.
- Second, the population of four of the five<sup>2</sup> new NUCs in the study area (as identified in Cairo Vision 2050) was the forecast for the years 2030, 2040, and 2050, determined by multiplying their land area by the assumed population density in each of these years.
- Third, the projected population growth of the study area (excluding the new NUCs) for the period 2030-2050 was distributed among the study sectors in proportion to their shares in the SDMP forecast of population for the study area in 2027. Then, the NUC population projections were added back into the population totals for the study sectors to which the NUCs belong.

The population forecasts for the four new NUCs, (determined in accordance with the above procedure) are given in Table 2-11.

**Table 2-11 Population Projection for NUCs to be Developed After 2027**

NUC	Land Area, to be developed,	Population forecast by year		
		2030	2040	2050
Giza North	40	80,000	240,000	480,000
Giza South	29	58,000	174,000	348,000
Helwan East	147	294,000	882,000	1,764,000
New Qanater	110	220,000	660,000	1,320,000
<b>Total</b>	<b>326</b>	<b>652,000</b>	<b>1,956,000</b>	<b>3,912,000</b>
<b>Population density assumed (persons per sq.km)</b>		<b>2,000</b>	<b>6,000</b>	<b>12,000</b>

Source: JICA Study Team

This forecast was validated against the projections of Cairo Vision 2050, which envisage the provision of an additional one million residential units within the four new NUCs by 2050. For Greater Cairo, the average number of persons per household is 4.02 (as determined from the 2006 Census). Thus, on the assumption that this indicator will not change significantly, an additional one million residential units could accommodate an extra four million people in the new NUCs by 2050. This number closely compares with the population of 3.91 million forecast for the four new NUCs in 2050 (see Table 2-11 above).

The population forecast by study sector, derived by the procedure indicated above, is given in Table 2-12, while the growth rates associated with this forecast are summarized in Table 2-13.

<sup>2</sup> One of these, New Quatamia, is understood to be outside of Greater Cairo, and therefore, of no relevance to this study.

**Table 2-12 Population Forecast for Greater Cairo by Study Sector, 2007-2050**

No.	Study Sector	Population forecast (number of persons) for reference years								
		2007	2009	2012	2017	2022	2027	2030	2040	2050
1	6th of October	212,574	322,880	441,470	751,699	1,120,364	1,449,364	1,481,874	1,608,331	1,671,672
2	Imbaba Markaz	1,660,231	1,835,262	2,057,377	2,341,873	2,539,466	2,684,164	2,824,372	3,218,564	3,575,870
3	Dokki	1,345,855	1,343,380	1,375,369	1,392,886	1,409,739	1,429,463	1,461,527	1,586,247	1,648,719
4	Giza	1,532,983	1,567,077	1,641,374	1,733,653	1,844,470	1,974,991	2,077,292	2,365,609	2,625,922
5	South Giza	525,737	530,317	548,502	562,591	574,496	590,495	603,740	655,261	681,067
6	Helwan	806,093	820,100	855,146	896,085	937,043	995,041	1,311,361	1,986,178	2,911,664
7	Maadi	1,038,498	1,113,044	1,216,145	1,394,566	1,524,869	1,655,522	1,692,657	1,837,100	1,909,452
8	Khaleafa	850,018	858,798	889,611	927,466	937,678	951,550	972,894	1,055,916	1,097,502
9	CBD	407,156	399,602	402,299	399,583	389,553	384,529	393,154	426,704	443,509
10	Shobra	1,029,514	1,020,712	1,038,096	1,050,047	1,040,147	1,041,766	1,065,134	1,156,027	1,201,556
11	Masr El Gedeeda	879,293	873,972	891,072	911,527	947,948	976,786	998,696	1,083,920	1,126,609
12	Nasr City	1,019,609	1,118,408	1,245,899	1,517,150	1,944,114	2,355,577	2,408,415	2,613,938	2,716,884
13	Ain Sham	1,017,588	1,067,601	1,145,003	1,266,927	1,338,631	1,401,467	1,432,903	1,555,181	1,616,429
14	Salam City	844,972	815,377	806,700	780,886	746,741	725,064	741,328	804,589	836,277
15	Shobra El Kheima	1,042,303	1,084,038	1,153,583	1,245,672	1,333,275	1,406,107	1,437,647	1,560,329	1,621,781
16	Qalyob	874,049	924,506	998,681	1,104,810	1,199,685	1,270,396	1,298,892	1,409,734	1,465,254
17	Qanater	1,241,229	1,350,293	1,493,999	1,778,883	2,064,134	2,313,704	2,585,602	3,227,472	3,988,588
18	10th of Ramadan	136,538	171,217	210,288	312,719	441,503	586,024	599,169	650,299	675,910
<b>Total</b>		<b>16,464,242</b>	<b>17,216,582</b>	<b>18,410,613</b>	<b>20,369,022</b>	<b>22,333,857</b>	<b>24,192,009</b>	<b>25,386,656</b>	<b>28,801,399</b>	<b>31,814,663</b>
Total less new NUC's								24,734,656	26,845,399	27,902,663
Growth index							100%	102%	111%	115%

Sources: (1) SDMP Study Report 2008 (Population forecasts 2007-2027)  
(2) JICA Study Team 2009 (Population forecasts 2030-2050)

Notes: Individual sector totals include, where relevant, population of existing NUCs from 2007-2027 and population of new NUCs (as envisaged in Cairo Vision 2050) from 2030-2050.

Table 2-13 shows that in most cases of sectors containing existing NUCs (see rows shaded green), the average rate of population increase declines significantly between 2027 and 2050, as these areas approach their capacity. Conversely, it shows that in most cases of sectors containing new NUCs (see rows shaded purple), the average rate of population increase either remains constant or expands between 2027 and 2050.

**Table 2-13 Summary of Forecast Population Growth Rates, by Study Sector**

No.	Sector	Y2009	Y2027	Y2050	Overall Growth		Av. annual rate of growth	
					2009-2027	2009-2050	2009-2027	2009-2050
1	6th of October	322,880	1,449,364	1,671,672	449%	518%	8.7%	4.1%
2	Imbaba Markaz	1,835,262	2,684,164	3,575,870	146%	195%	2.1%	1.6%
3	Dokki	1,343,380	1,429,463	1,648,719	106%	123%	0.3%	0.5%
4	Giza	1,567,077	1,974,991	2,625,922	126%	168%	1.3%	1.3%
5	South Giza	530,317	590,495	681,067	111%	128%	0.6%	0.6%
6	Helwan	820,100	995,041	2,911,664	121%	355%	1.1%	3.1%
7	Maadi	1,113,044	1,655,522	1,909,452	149%	172%	2.2%	1.3%
8	Khaleafa	858,798	951,550	1,097,502	111%	128%	0.6%	0.6%
9	CBD	399,602	384,529	443,509	96%	111%	-0.2%	0.3%
10	Shobra	1,020,712	1,041,766	1,201,556	102%	118%	0.1%	0.4%
11	Masr El Gedeeda	873,972	976,786	1,126,609	112%	129%	0.6%	0.6%
12	Nasr City	1,118,408	2,355,577	2,716,884	211%	243%	4.2%	2.2%
13	Ain Sham	1,067,601	1,401,467	1,616,429	131%	151%	1.5%	1.0%
14	Salam City	815,377	725,064	836,277	89%	103%	-0.7%	0.1%
15	Shobra El Kheima	1,084,038	1,406,107	1,621,781	130%	150%	1.5%	1.0%
16	Qalyob	924,506	1,270,396	1,465,254	137%	158%	1.8%	1.1%
17	Qanater	1,350,293	2,313,704	3,988,588	171%	295%	3.0%	2.7%
18	10th of Ramadan	171,217	586,024	675,910	342%	395%	7.1%	3.4%
<b>Total</b>		<b>17,216,581</b>	<b>24,192,010</b>	<b>31,814,664</b>	<b>141%</b>	<b>185%</b>	<b>1.9%</b>	<b>1.5%</b>

Sources: (1) SDMP Study Report 2008 (Population forecasts 2007-2027)  
(2) JICA Study Team 2009 (Population forecasts 2030-2050)

Key:  Includes existing NUCs  
 Includes new NUCs identified in Vision 2050

The population forecasts to be used as inputs for the forecasts of transport demand assume only a relatively small (15.6%) increase in the area of urban land within Greater Cairo between now and 2050. Most of this increase will be concentrated within the boundaries of the planned NUCs, as may be seen from Table 2-14 below. As a

consequence, the population densities (number of persons per square km of land area) of many of the 18 study sectors will more than double over the 41 years from 2009 to 2050.

**Table 2-14 Land Area and Population Density in the Study Area, 2009-2050**

No.	Study Sector	Urban Land Area (km <sup>2</sup> )		Population density (persons per km <sup>2</sup> )		
		In 2009	In 2050	2009	2027	2050
1	6th of October	158.83	158.83	2,033	9,125	10,525
2	Imbaba Markaz	287.04	327.04	6,394	9,351	10,934
3	Dokki	26.56	26.56	50,579	53,820	62,075
4	Giza	105.43	134.43	14,864	18,733	19,534
5	South Giza	137.11	137.11	3,868	4,307	4,967
6	Helwan	173.24	320.24	4,734	5,744	9,092
7	Maadi	87.39	87.39	12,737	18,944	21,850
8	Khaleafa	58.32	58.32	14,726	16,316	18,819
9	CBD	17.01	17.01	23,492	22,606	26,073
10	Shobra	18.1	18.1	56,393	57,556	66,384
11	Masr El Gedeed	49.64	49.64	17,606	19,677	22,696
12	Nasr City	308.73	308.73	3,623	7,630	8,800
13	Ain Sham	14.56	14.56	73,324	96,255	111,018
14	Salam City	51.53	51.53	15,823	14,071	16,229
15	Shobra El Kheir	27.77	27.77	39,036	50,634	58,400
16	Qalyob	222.74	222.74	4,151	5,703	6,578
17	Qanater	280.74	390.74	4,810	8,241	10,208
18	10th of Ramada	61.57	61.57	2,781	9,518	10,978
	<b>Total</b>	<b>2086.31</b>	<b>2412.31</b>	<b>8,252</b>	<b>11,596</b>	<b>13,188</b>

Source: JICA Study Team

The population densities used for the estimation of future population of the new NUCs (see Table 2-11) were derived from the above table. From this table, it may be seen that the maximum population density for NUCs is in the range of about 10,000-12,000 persons per square km. This contrasts with some of the main urban agglomerations, which are classified as very high density residential areas close to the city centre. These areas currently have an average population density of 50,000-73,000 persons per square km and in one extreme case, will exceed 100,000 persons per km<sup>2</sup> by 2050.

### 2.2.3 Employment Projections

The growth of employment in the study area is one of the factors having a strong influence on the growth in demand for the proposed Metro Line 4. Thus, the collection of data relating to the growth of employment in the study area was one of the priority tasks for the first stage of the feasibility study.

#### (1) Employment Projection for Metro Line 4 Study Area

Employment projections were prepared for the SDMP study and cover the period from 2007 to 2027. These projections, which relate to employment in all sectors of the economy, are given in Table 2-15.

**Table 2-15 SDMP Employment Growth Forecast for the Study Area**

Year	Labour force		Unemployment rate	No. workers	
	(1,000 persons)	Annual growth rate		(1,000 persons)	Annual growth rate
2006	4,613		7%	4,310	
2007	4,777	3.56%	6%	4,475	3.83%
2012	5,506	2.88%	6%	5,196	3.03%
2017	6,316	2.78%	5%	5,982	2.86%
2027	7,761	2.08%	5%	7,378	2.12%

Source: SDMP study report

The base data for the SDMP employment forecast are labour force, employment and unemployment statistics from the 2006 Census, in addition to the Gross Regional Domestic Product (GRDP) estimates made independently by the SDMP Study Team<sup>3</sup>.

The labour force for the study area was assumed to grow at rates which were linked (but not identical) to the composite of population and GRDP growth. Independent estimates of unemployment rates were made, reflecting a decline in unemployment from the present high rate of 7% to a more moderate rate of 5% by 2027. The actual number of workers employed in all sectors of the economy was then calculated by deducting the number of unemployed workers from the labour force estimates. The growth in the number of workers employed is expected to decline from 3.8% per annum in 2007 to just over 2.0% per annum in 2027.

The SDMP forecasts were extended to reflect projected growth over the longer planning timeframe adopted for the feasibility study, viz. 2009-2050, as shown in Table 2-16 below. The extended forecast reflects an expectation that the rate of employment growth in the study area will continue to decline during the period 2030-2050, albeit at a slightly reduced rate as compared with the period 2007-2027.

**Table 2-16 Feasibility Study Employment Forecast for the Study Area**

Year	Population (1,000 persons)	Labour force			Unemployment rate	No. workers	
		(1,000 persons)	LF % of population	Annual growth rate		(1,000 persons)	Annual growth rate
2006	16,101	4,613	28.65%		7%	4,310	
2007	16,464	4,777	29.01%	3.56%	6%	4,475	3.83%
2009	17,217	5,096	29.60%	3.29%	6%	4,791	3.47%
2012	18,411	5,506	29.91%	2.88%	6%	5,196	3.03%
2017	20,369	6,316	31.01%	2.78%	5%	5,982	2.86%
2022	22,334	7,151	32.02%	2.51%	5%	6,793	2.58%
2027	24,192	7,761	32.08%	2.08%	5%	7,378	2.12%
2030	25,387	8,193	32.27%	1.82%	5%	7,783	1.80%
2040	28,802	9,602	33.34%	1.60%	4%	9,218	1.71%
2050	31,815	11,012	34.61%	1.38%	4%	10,572	1.38%

Sources: SDMP study report and JICA Study Team

<sup>3</sup> These GRDP estimates and the associated methodology are presented and explained in detail in Volume 1.

## (2) Employment Projections for Study Sectors

The employment growth forecast was used as an input for the estimation of future transport demand within the study area. However, it was first necessary for the forecast results to be distributed on a zonal basis so that they could be available in a form which could be used for the transport forecasting model to generate trip estimates. In addition, it was necessary to adjust the forecast values to reflect only the growth in employment in the secondary and tertiary industrial sectors, since these, rather than the primary industry, are expected to generate demand for Metro Line 4. This assumption is based on the likelihood that primary industry workers would not be required to travel by public transport between their places of abode and their workplaces, which in most cases would be one and the same.

As was the case for the population forecast, the employment forecast results were summarized for the 18 study sectors comprising the 464 traffic zones which form the basis for the calculation of future traffic flows by the model. In addition, a similar procedure was used for the distribution of the employment forecast to the study sectors as was used for the population forecast.

- First, the distribution of the SDMP forecast of employment in the secondary and tertiary industries, by type of urban area (main agglomerations, villages and small towns, and New Urban Communities), was adopted as the basis of the feasibility study forecast for the years 2007-2027.
- Second, employment of four of the five new NUCs in the study area (as identified in Vision 2050) was forecasted for the years 2030, 2040, and 2050 by multiplying their estimated employment ratios (employment expressed as a percentage of population) by their forecast populations in each of these years.
- Third, the projected employment growth of the study area (excluding the new NUCs) for the period 2030-2050 was distributed among the study sectors in proportion to their shares in the SDMP forecast of population for the study area in 2027. Then, the new NUC employment projections were added back into the employment totals for the study sectors to which these NUCs belong.

The distribution of the employment forecast by type of urban area is given in Table 2-17. The SDMP forecast for the period 2007-2027 was based on population statistics from the 2006 Census conducted by CAPMAS. In addition, the forecast was derived from estimates originally generated by a household survey in the CREATS study, which show that the unit demand was 100 workers per 1,000 population outside of the Ring Road and 150 workers per 1,000 populations for the shiakha inside the Ring Road<sup>4</sup>.

As was the case with the forecast of all employment in the study area, SDMP have forecast the secondary and tertiary industry employment to grow at a gradually declining rate (in line with population) over the period 2007-2027.

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<sup>4</sup> The Strategic Urban Development Master Plan Study for a Sustainable Development of the Greater Cairo Region in the Arab Republic of Egypt, Final Report (Volume 2) 2008, pages 3-16.

The feasibility study forecast for the period 2030-2050 anticipates a continuation of this trend, albeit the share of secondary and tertiary employment in the total population over this period is expected to improve from 25.2% in 2006, to 28.6%, 29.2% and 30.6% in 2030, 2040 and 2050, respectively.

Secondary and tertiary industry employment in the new NUCs is, however, expected to grow at significantly faster rates than that in other types of urban area, reflecting the attraction to these areas of new industries, as well as the relocation of some government administrative staff. For the reference years, 2030, 2040 and 2050, the numbers of workers employed in secondary and tertiary industries in these areas are expected to represent 33%, 34% and 36%, respectively, of their total populations.

**Table 2-17 Total Employment in Secondary and Tertiary Industries by Type of Urban Area, 2006-2050**

Urban Characteristic	Governorate	No. workers employed in secondary and tertiary industry (1,000 persons)								
		2006	2007	2012	2017	2022	2027	2030	2040	2050
Main Agglomerations	Cairo	2,194	2,275	2,616	2,964	3,257	3,458			
	Giza	727	739	781	830	871	894			
	Kalouobia	295	306	339	377	413	432			
	<b>Sub-total (1)</b>	<b>3,216</b>	<b>3,320</b>	<b>3,736</b>	<b>4,171</b>	<b>4,541</b>	<b>4,784</b>	<b>4,929</b>	<b>5,445</b>	<b>6,014</b>
Villages + small towns	Giza	219	226	260	282	304	318			
	Kalouobia	259	269	308	347	385	405			
	<b>Sub-total (2)</b>	<b>478</b>	<b>495</b>	<b>568</b>	<b>629</b>	<b>689</b>	<b>723</b>	<b>745</b>	<b>823</b>	<b>909</b>
	<b>Sub-total (3)= (1)+(2)</b>	<b>3,694</b>	<b>3,815</b>	<b>4,304</b>	<b>4,800</b>	<b>5,230</b>	<b>5,507</b>	<b>5,674</b>	<b>6,267</b>	<b>6,923</b>
NUC's	Cairo	45	49	104	173	294	400			
	Giza	117	122	172	241	335	402			
	Kalouobia	38	42	84	128	176	220			
	10th Ramadan	157	180	226	292	365	421			
	<b>Sub-total</b>	<b>357</b>	<b>393</b>	<b>586</b>	<b>834</b>	<b>1,170</b>	<b>1,443</b>	<b>1,598</b>	<b>2,148</b>	<b>2,803</b>
<b>Total</b>		<b>4,051</b>	<b>4,208</b>	<b>4,890</b>	<b>5,634</b>	<b>6,400</b>	<b>6,950</b>	<b>7,272</b>	<b>8,415</b>	<b>9,726</b>
Population -study area (1,000 persons)		16,101	16,464	18,411	20,369	22,334	24,192	25,387	28,802	31,815
Employed % of population - study area		25.2%	25.6%	26.6%	27.7%	28.7%	28.7%	28.6%	29.2%	30.6%
Employed % of population - NUC's								33.40%	34.1%	35.6%

**Key**

CAPMAS 2006 Census

SDMP 2008

JICA Study Team 2009

Sources; CAPMAS estimates, SDMP estimates, JICA Study Team estimates

Employment ratios (reflecting the share of employee numbers in the total population) were used to estimate future employment in the new NUCs which are expected to be developed after 2027. The resulting estimates are shown in Table 2-18.

**Table 2-18 Population Projection for NUCs to be Developed after 2027**

NUC	Employment forecast by year		
	2030	2040	2050
Giza North	694	806	936
Giza South	202	223	243
Helwan East	438	677	1,038
New Qanater	864	1,100	1,422
<b>Total</b>	<b>2,197</b>	<b>2,805</b>	<b>3,639</b>
Employment % of population	33.40%	34.07%	35.65%

Source: JICA Study Team

Finally, the distribution of the employment forecast by study sector was estimated using the data from Table 2-17 and Table 2-18, in accordance with the procedure described above. The resulting forecast by study sector is given in Table 2-19.

**Table 2-19 Secondary and Tertiary Industry Employment Forecast by Study Sector**

No.	Study Sector	Number of persons employed in secondary and tertiary industry, in reference years (by sector)								
		2007	2009	2012	2017	2022	2027	2030	2040	2050
	<b>NUCs - existing</b>	<b>393</b>	<b>461</b>	<b>586</b>	<b>834</b>	<b>1,170</b>	<b>1,443</b>	<b>1,598</b>	<b>2,148</b>	<b>2,803</b>
1	6th of October	117	119	122	172	241	335	409	550	718
12	Nasr City	45	47	49	104	173	294	402	540	704
18	10th of Ramadan	157	166	180	226	292	365	421	566	739
	Others	74	130	235	332	464	449	775	492	642
	<b>Agglomerations, small towns and new NUC's</b>	<b>3,815</b>	<b>4,004</b>	<b>4,304</b>	<b>4,800</b>	<b>5,230</b>	<b>5,507</b>	<b>6,218</b>	<b>7,250</b>	<b>8,462</b>
2	Imbaba Markaz	420	463	536	632	705	747	545	603	654
3	Dokki	340	347	358	376	392	398	290	321	348
4	Giza	387	403	428	468	512	549	1,095	1,249	1,417
5	South Giza	133	137	143	152	160	164	322	356	387
6	Helwan	204	211	223	242	260	277	640	900	1,280
7	Maadi	262	283	317	376	424	460	336	372	403
8	Khaleafa	215	221	232	250	260	265	193	214	232
9	CBD	103	104	105	108	108	107	78	86	94
10	Shobra	260	264	271	283	289	290	212	234	254
11	Masr El Gedeeda	222	226	232	246	263	272	198	219	238
13	Ain Sham	257	273	298	342	372	390	285	315	341
14	Salam City	214	212	210	211	207	202	147	163	177
15	Shobra El Kheima	263	278	301	336	370	391	286	316	343
16	Qaiyob	221	236	260	298	333	353	258	285	309
17	Qanater	314	342	389	480	573	643	1,333	1,619	1,985
	<b>Total</b>	<b>4,208</b>	<b>4,465</b>	<b>4,890</b>	<b>5,634</b>	<b>6,400</b>	<b>6,950</b>	<b>7,272</b>	<b>8,415</b>	<b>9,726</b>
	Total less new NUC's							5,075	5,610	6,088
	Growth index						100%	73%	77%	72%

Sources: SDMP study report, 2008 and JICA Study Team, 2009

The growth rates associated with the employment forecast above are given in Table 2-20 below. It may be observed that the forecast reflects an expectation of a substantial shift of employment away from the main agglomerations to the existing and proposed NUCs. The former (shaded green) are expected to continue employment growth beyond 2027, but at reduced rates, while the latter (shaded purple), for the most part, are expected to more than double their annual rates of growth between 2009 and 2050, as compared with 2009-2027.



**Table 2-20 Summary of Forecast Employment Growth Rates by Study Sector**

No.	Study Sector	Y2009	Y2027	Y2050	Overall Growth		Av. annual rate of growth	
					2009-2027	2009-2050	2009-2027	2009-2050
	<b>NUC's - existing</b>	<b>461</b>	<b>1,443</b>	<b>2,803</b>	<b>313%</b>	<b>608%</b>	<b>6.5%</b>	<b>4.5%</b>
1	6th of October	119	335	718	282%	603%	5.9%	4.5%
12	Nasr City	47	294	704	631%	1513%	10.8%	6.9%
18	10th of Ramadan	166	365	739	220%	446%	4.5%	3.7%
	Others	130	449	642	346%	495%	7.1%	4.0%
	<b>Agglomerations, small towns and new NUC's</b>	<b>4,004</b>	<b>5,507</b>	<b>8,462</b>	<b>138%</b>	<b>211%</b>	<b>1.8%</b>	<b>1.8%</b>
2	Imbaba Markaz	463	747	654	161%	141%	2.7%	0.8%
3	Dokki	347	398	348	114%	100%	0.8%	0.0%
4	Giza	403	549	1,417	136%	352%	1.7%	3.1%
5	South Giza	137	164	387	120%	283%	1.0%	2.6%
6	Helwan	211	277	1,280	131%	606%	1.5%	4.5%
7	Maadi	283	460	403	163%	142%	2.7%	0.9%
8	Khaleafa	221	265	232	119%	105%	1.0%	0.1%
9	CBD	104	107	94	103%	90%	0.2%	-0.2%
10	Shobra	264	290	254	110%	96%	0.5%	-0.1%
11	Masr El Gedeeda	226	272	238	120%	105%	1.0%	0.1%
13	Ain Sham	273	390	341	143%	125%	2.0%	0.5%
14	Salam City	212	202	177	95%	83%	-0.3%	-0.4%
15	Shobra El Kheima	278	391	343	141%	123%	1.9%	0.5%
16	Qalyob	236	353	309	150%	131%	2.3%	0.7%
17	Qanater	342	643	1,985	188%	581%	3.6%	4.4%
	<b>Total</b>	<b>4,465</b>	<b>6,950</b>	<b>9,726</b>	<b>156%</b>	<b>218%</b>	<b>2.5%</b>	<b>1.9%</b>

Sources: SDMP study report and JICA Study Team

## 2.2.4 Projected Student Enrolments

Student enrolments are yet another important determinant for the level of demand for a metro, or indeed for any other form of public transport system. As such, forecasted student enrolments at the traffic zone level are used as an input for the Transport Demand Forecasting Model for the calculation of trip generation.

The SDMP study produced forecasts for the period 2007-2027 of the numbers of students enrolled at the four levels of education adopted in Egypt. These levels are primary, preparatory, secondary and university.

As expected, these forecasts are closely related to projected population growth. The estimates for the primary, preparatory and secondary student numbers were calculated in terms of rate per thousand head of population. In the case of primary and preparatory students, an initial rate of 140 students per 1,000 head of population was used, while in the case of secondary students, the initial rate used was 40 students per 1,000 head of population. These initial rates were expanded over the forecast period to achieve attendance targets adopted for future years.

Estimates of the numbers of university students were initially established according to the location of existing universities, and for future years, were distributed according to the population size of each traffic zone.

### (1) Student Enrolment Projections for the Study Area

The education forecasts prepared for the study area by SDMP are given in Table 2-21.

**Table 2-21 SDMP student enrolment forecast for the study area**

Year	Primary students enrolled		Preparatory students enrolled		Secondary students enrolled		University students enrolled		Total students enrolled	
	(1,000 students)	Annual growth rate	(1,000 students)	Annual growth rate	(1,000 students)	Annual growth rate	(1,000 students)	Annual growth rate	(1,000 students)	Annual growth rate
2006	1,827		479		593		504		3,403	
2007	1,828	0.05%	501	4.59%	612	3.20%	519	2.98%	3,460	1.67%
2012	1,963	1.44%	675	6.14%	709	2.99%	565	1.71%	3,912	2.49%
2017	2,075	1.12%	847	4.64%	914	5.21%	646	2.72%	4,482	2.76%
2027	2,333	1.18%	1,281	4.22%	1,334	3.85%	877	3.10%	5,825	2.66%

Source: SDMP study report

The overall growth in student enrolments reflects a rising rate of enrolments<sup>5</sup> at all levels above primary education, but a declining population growth rate.

The SDMP forecast was extended to reflect projected growth over a longer planning timeframe adopted for the feasibility study, viz. 2010-2050, as shown in Table 2-22 below. The feasibility study forecast reflects an expectation that the growth in student enrolments will continue to decline after 2027, in line with the expected trend in population growth. At the same time, the forecast reflects a continuous increase in the student population share of the general population. Overall, this share is projected to grow from just over 21% in 2006 to more than 27% in 2050. While the share of primary level students in the general population is projected to increase gradually, that of secondary and university students is projected to increase rapidly. This reflects an expectation of the rising rates of retention of students at higher levels of education.

**Table 2-22 Feasibility Study Student Enrolments Forecast for the Study Area**

Year	Population	Primary and Preparatory students enrolled			Secondary and University students enrolled			Total students enrolled		
	(1,000 persons)	(1,000 students)	Annual growth rate	Student % of population	(1,000 students)	Annual growth rate	Student % of population	(1,000 students)	Annual growth rate	Student % of population
2006	16,101	2,305		14.32%	1,094		6.79%	3,399		21.11%
2007	16,464	2,328	1.00%	14.14%	1,132	3.47%	6.88%	3,460	1.79%	21.02%
2012	18,411	2,638	2.53%	14.33%	1,275	2.41%	6.93%	3,913	2.49%	21.25%
2017	20,369	2,922	2.07%	14.35%	1,560	4.12%	7.66%	4,482	2.75%	22.00%
2027	24,192	3,614	2.15%	14.94%	2,211	3.55%	9.14%	5,825	2.66%	24.08%
2030	25,387	3,854	2.16%	15.18%	2,361	2.21%	9.30%	6,215	2.18%	24.48%
2040	28,802	4,545	1.66%	15.78%	2,932	2.19%	10.18%	7,477	1.87%	25.96%
2050	31,815	5,249	1.45%	16.50%	3,531	1.88%	11.10%	8,781	1.62%	27.60%

Sources: SDMP study report and JICA Study Team estimates

## (2) Student Enrolment Projections for Study Sectors

It was first necessary for the forecast results to be distributed on a zonal basis so that they would be available in a form which could be used for the Transport Forecasting Model for generating trip estimates.

As was the case for the population and employment forecasts, the education forecast results were summarized for the 18 study sectors comprising the 464 traffic zones, which form the basis for the calculation of future traffic flows by the model. In addition, a similar

<sup>5</sup> The enrolment rate is computed as the number of students enrolled as a percentage of all persons within the eligible age group.

procedure was used for the distribution of the education forecast to the study sectors as used for the population forecast.

- First, the distribution of the SDMP forecast of student enrolments at the primary/preparatory and secondary/university levels, by type of urban area (main agglomerations, villages and small towns, and New Urban Communities), was adopted as the basis of the feasibility study forecast for the years 2007-2027.
- Second, student enrolments of four of the five new NUCs in the study area (as identified in Cairo Vision 2050) were forecasted for the years 2030, 2040, and 2050 by multiplying their estimated enrolment ratios (student enrolments expressed as a percentage of population) with their forecasted populations in each of these years.
- Third, the projected student enrolment growth in the study area (excluding the new NUCs) for the period 2030-2050 was distributed among the study sectors in proportion to their shares in the SDMP forecast of population for the study area in 2027. Then, the new NUC enrolment projections were added back into the enrolment totals for the study sectors to which these NUCs belong.

The distribution of the employment forecast by type of urban area is given in Table 2-23.

**Table 2-23 Total Student Enrolments by Type of Urban Area, 2006-2050**

Urban Characteristic	Governorate	No. students enrolled (all levels of education) (1,000 persons)								
		2006	2007	2012	2017	2022	2027	2030	2040	2050
Main Agglomerations	Cairo	1,597	1,629	1,662	1,770	1,794	1,869			
	Giza	777	776	919	1,093	1,222	1,369			
	Kalyoubia	296	307	353	407	439	468			
	<b>Sub-total (1)</b>	<b>2,670</b>	<b>2,712</b>	<b>2,934</b>	<b>3,270</b>	<b>3,455</b>	<b>3,706</b>			
Villages + small towns	Giza	286	281	354	430	472	531			
	Kalyoubia	325	338	375	419	448	475			
	<b>Sub-total (2)</b>	<b>611</b>	<b>619</b>	<b>729</b>	<b>849</b>	<b>920</b>	<b>1,006</b>			
	<b>Sub-total (3)= (1)+(2)</b>	<b>3,281</b>	<b>3,331</b>	<b>3,663</b>	<b>4,119</b>	<b>4,375</b>	<b>4,712</b>	<b>4,879</b>	<b>5,458</b>	<b>5,971</b>
NUC's	All	118	129	250	363	670	1,113	1,336	2,019	2,810
	<b>Sub-total</b>	<b>118</b>	<b>129</b>	<b>250</b>	<b>363</b>	<b>670</b>	<b>1,113</b>	<b>1,336</b>	<b>2,019</b>	<b>2,810</b>
<b>Total</b>		<b>3,399</b>	<b>3,460</b>	<b>3,913</b>	<b>4,482</b>	<b>5,045</b>	<b>5,825</b>	<b>6,215</b>	<b>7,477</b>	<b>8,781</b>
Population -study area (1,000 persons)		16,101	16,464	18,411	20,369	24,192	24,192	25,387	28,802	31,815
Student % of population - study area		21.1%	21.0%	21.3%	22.0%	20.9%	24.1%	24.5%	26.0%	27.6%
Student % of population - NUC's								28.0%	29.7%	31.6%

**Key**

CAPMAS 2006 Census



SDMP 2008



JICA Study Team 2009



Sources: CAPMAS estimates, SDMP estimates and JICA Study Team estimates

The extension of this forecast to 2050 (for the purposes of the feasibility study) was achieved by projecting the student enrolment share of the general population from 24.1% in 2027, to 27.6% in 2050. In the case of the new NUCs (as proposed in Cairo Vision 2050), it was assumed that higher ratios would apply during the period 2030-2050, viz. 28.0% in 2030, 29.7% in 2040 and 31.6% in 2050.

These enrolment ratios were used to estimate future student enrolments for the new NUCs which are expected to be developed after 2027. The resulting estimates are shown in Table 2-24.

**Table 2-24 Student Enrolment Projection for NUCs to be Developed After 2027**

NUC	No. students (all levels) enrolled in:		
	2030	2040	2050
Giza North	582	702	829
Giza South	169	195	215
Helwan East	367	590	919
New Qanater	724	958	1,259
<b>Total</b>	<b>1,842</b>	<b>2,445</b>	<b>3,222</b>
<b>Enrolment ratio</b>	<b>28.0%</b>	<b>29.7%</b>	<b>31.6%</b>

Source: JICA Study Team

The distribution of the student enrolment forecast by study sector was estimated using the data from Table 2-23 and Table 2-24 in accordance with the procedure described above. The resulting forecast by study sector is given in Table 2-25.

**Table 2-25 Student Enrolment Forecast by Study Sector**

No.	Study Sector	Number of students enrolled (all education levels), in reference years							
		2007	2009	2012	2017	2027	2030	2040	2050
	NUC's - existing	129	167	250	363	1,113	1,336	2,019	2,810
1	6th of October	20	31	58	106	367	441	666	927
12	Nasr City	96	119	164	213	597	717	1,083	1,507
18	10th of Ramadan	13	17	28	44	149	178	269	375
	<b>Agglomerations, small towns and new NUC's (after 2027)</b>	<b>3,331</b>	<b>3,460</b>	<b>3,663</b>	<b>4,119</b>	<b>4,712</b>	<b>5,379</b>	<b>6,515</b>	<b>7,719</b>
2	Imbaba Markaz	366	400	456	542	639	480	552	610
3	Dokki	297	300	305	323	340	255	294	325
4	Giza	338	348	364	401	470	934	1,108	1,277
5	South Giza	116	118	122	130	141	275	316	349
6	Helwan	178	183	190	208	237	545	794	1,145
7	Maadi	229	245	270	323	394	296	340	376
8	Khaleafa	188	191	197	215	226	170	196	216
9	CBD	90	90	89	93	92	69	79	87
10	Shobra	227	228	230	243	248	186	214	237
11	Masr El Gedeeda	194	195	198	211	232	174	201	222
13	Ain Sham	225	236	254	293	334	250	288	318
14	Salam City	186	183	179	181	173	130	149	165
15	Shobra El Kheima	230	240	256	288	335	251	289	319
16	Qalyob	193	204	222	256	302	227	261	288
17	Qanater	274	296	331	412	551	1,137	1,434	1,785
	<b>Total</b>	<b>3,460</b>	<b>3,635</b>	<b>3,913</b>	<b>4,482</b>	<b>5,825</b>	<b>6,215</b>	<b>7,477</b>	<b>8,781</b>

Sources: SDMP study report and JICA Study Team

The growth rates associated with the education forecast by study sector are given in Table 2-26 below. It may be observed that the forecast reflects an expectation of a large shift of student numbers away from the main agglomerations to the existing and proposed NUCs. The former (shaded green) are expected to continuously increase in terms of student numbers beyond 2027, but at reduced rates, while the latter (shaded purple), for the most

part, are expected to double their annual rates of growth between 2009 and 2050, as compared with 2009-2027.

**Table 2-26 Summary of Forecasted Student Enrolment Growth Rates by Study Sector**

No.	Study Sector	Y2009	Y2027	Y2050	Overall Growth		Av. annual rate of growth	
					2009-2027	2009-2050	2009-2027	2009-2050
	NUC's - existing	167	1,113	2,810	666%	1680%	11.1%	7.1%
1	6th of October	31	367	927	1197%	3023%	14.8%	8.7%
12	Nasr City	119	597	1,507	502%	1266%	9.4%	6.4%
18	10th of Ramadan	17	149	375	849%	2144%	12.6%	7.8%
	Agglomerations, small towns and new NUC's	3,460	4,712	7,719	136%	223%	1.7%	2.0%
2	Imbaba Markaz	400	639	610	160%	152%	2.6%	1.0%
3	Dokki	300	340	325	113%	108%	0.7%	0.2%
4	Giza	348	470	1,277	135%	367%	1.7%	3.2%
5	South Giza	118	141	349	119%	295%	1.0%	2.7%
6	Helwan	183	237	1,145	130%	627%	1.5%	4.6%
7	Maadi	245	394	376	161%	154%	2.7%	1.1%
8	Khaleafa	191	226	216	118%	113%	0.9%	0.3%
9	CBD	90	92	87	102%	97%	0.1%	-0.1%
10	Shobra	228	248	237	109%	104%	0.5%	0.1%
11	Masr El Gedeeda	195	232	222	119%	113%	1.0%	0.3%
13	Ain Sham	236	334	318	141%	135%	1.9%	0.7%
14	Salam City	183	173	165	94%	90%	-0.3%	-0.3%
15	Shobra El Kheima	240	335	319	139%	133%	1.9%	0.7%
16	Qalyob	204	302	288	148%	142%	2.2%	0.9%
17	Qanater	296	551	1,785	186%	604%	3.5%	4.5%
	<b>Total</b>	<b>3,635</b>	<b>5,825</b>	<b>8,781</b>	<b>160%</b>	<b>242%</b>	<b>2.7%</b>	<b>2.2%</b>

Sources: SDMP study report, 2008 and JICA Study Team, 2009

## 2.2.5 Car Ownership Projections

A projection of the growth in car ownership until 2050 was made as the basis for estimating the growth in the daily number of car trips within the study area in the "without project" case (i.e. the situation which would apply without Metro Line 4 in operation).

Car ownership rates were derived from the number of registered private cars and the population for the three governorates comprising the study area (Cairo, Giza and Qaliobeya) in the period 2002-2008. Details of the car registrations for the years 2006-2008 (obtained from CAPMAS) were supplemented with car registrations pro-rated for the three governorates from national statistics for the years 2002-2004, and data for 2005 as presented in the SDMP study report. Population numbers were based on the national census for 2006 and on intercensal estimates made by CAPMAS in the other years.

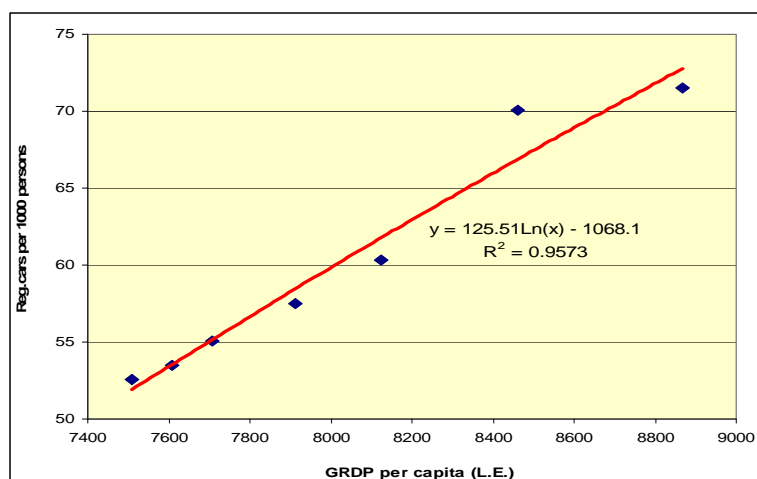
The resulting car ownership rates were regressed against estimates of GRDP per capita in order to forecast car ownership in the study area until 2050. The variables derived for input to the regression analysis (car ownership rates and GRDP per capita) are shown in Table 2-27, while the results of the regression analysis are given in Figure 2-40.

**Table 2-27 Analysis of Car Ownership in Three Governorate Against GDRP growth**

Year	2002	2003	2004	2005	2006	2007	2008	Av. annual rate of growth
GRDP (million L.E.)	125,058	129,060	133,190	139,184	148,648	159,202	170,665	5.3%
Registered car numbers	875,472	907,410	951,375	1,011,293	1,103,843	1,318,712	1,376,043	7.8%
Population	16,656,854	16,963,854	17,278,752	17,593,094	18,297,000	18,817,888	19,243,172	2.4%
GRDP per capita	7,508	7,608	7,708	7,911	8,124	8,460	8,869	2.8%
Cars per 1000 persons	52.56	53.49	55.06	57.48	60.33	70.08	71.51	5.3%

Registered cars for 3 governorates calculated as fixed share of total Egypt

Source: CAPMAS, Statistical Yearbook 2008



Source: JICA Study Team

**Figure 2-40 Regression of Car Ownership Rate Against GRDP per Capita in Three Governorates (Cairo, Giza and Qaliobeya)**

Application of the equation derived from the regression process to per capita GRDP resulted in determining the forecasted car ownership rates for the period 2009-2050, as shown in Table 2-28.

**Table 2-28 Car Ownership Forecast (Three Governorates)**

Year	GRDP per cap (x)	Ln (x)	Cars per 1000 persons	
			Estimate	Actual
2006	8,124.17	9.00	61.82	60.33
2007	8,460.14	9.04	66.90	70.08
2008	8,868.86	9.09	72.82	71.51
2009	8,985.05	9.10	74.46	
2010	9,050.07	9.11	75.36	
2011	9,181.94	9.12	77.18	
2012	9,383.07	9.15	79.90	
2020	14,238.00	9.56	132.24	
2030	23,873.84	10.08	197.11	
2040	37,685.37	10.54	254.40	
2050	55,571.49	10.93	303.15	
Growth factor 2050/2006	6.84		4.90	

Source: JICA Study Team

This forecast was checked for reliability in terms of the relationship between the growth in GRDP and the growth of the car ownership rate over the forecast period. Initially, car ownership may be seen increasing at a faster rate than that of GRDP. This is generally a characteristic of developing economies. Towards the end of the forecast period, however,

car ownership may be seen growing at a slower rate than that of GRDP, which is a characteristic of more developed economies. Overall, over the 40 years of the forecast period, GRDP is projected to grow by a factor of nearly seven, while the car ownership rate is projected to grow by a factor of five. This appears to be reasonable given the likely transformation of the Egyptian economy from “developing” to “developed” status over this period.

The reliability of the estimate was also checked against car ownership rates for 14 advanced economies in Western Europe, with per capita GDP averaging about US\$ 48,000 per annum. This analysis (Table 2-29) shows that the car ownership rate exceeded 500 cars per 1000 persons in the case of only five of these countries, with an average of around 467.

**Table 2-29 Car Ownership Rates vs. GDP Per Capita (USD), Countries in Western Europe**

Country	Cars per 1000 persons in 2004	GDP per capita (nominal) in 2007 (Source: WB)
Italy	581	35,494
Germany	560	40,079
Switzerland	514	55,035
France	503	41,523
Austria	501	45,343
Belgium	467	42,213
UK	463	44,693
Sweden	456	48,584
Spain	454	31,846
Finland	448	46,515
Norway	429	81,111
Netherlands	429	46,041
Eire	385	58,339
Denmark	354	56,427

Source: UK Commission for Integrated Transport: “Are we there yet? - A comparison of transport in Europe, 2007”

## 2.2.6 Summarized Transport Planning Indicators

The socio-economic indicators which have been assessed as bases for transport planning in this feasibility study are summarized in Table 2-30 below.

**Table 2-30 Socio-economic Indicators in the Study Area**

Indicator	Unit	2006	2007	2009	2012	2017	2027	2030	2040	2050
<b>Population</b>	1000 persons	16,101	16,464	17,217	18,411	20,369	24,192	25,387	28,801	31,815
No.of Households	1000	4,007	4,097	4,284	4,582	5,067	5,385	6,318	7,168	7,918
Household Size	Persons/household	4.02	4.02	4.02	4.02	4.02	4.02	4.02	4.02	4.02
<b>Economy</b>										
GRDP	Million L.E.	148,648	159,202	176,808	197,444	283,457	352,138	692,708	1,240,534	2,020,700
GRDP per Capita	L.E. per capita	9,232	9,670	10,270	10,724	13,916	16,273	27,286	43,072	63,515
Labour force	1000	4,613	4,777	5,096	5,506	6,316	7,761	8,193	9,602	11,012
Unemployment	%	7%	6%	6%	6%	5%	5%	5%	4%	4%
No.of Workers (Secondary and Tertiary)	1000 workers	4,051	4,208	4,465	4,890	5,634	6,950	7,272	8,415	9,726
<b>Education</b>										
Primary and Preparatory	1000 students	2,305	2,328	2,447	2,638	2,922	3,614	3,854	4,545	5,249
Secondary and University	1000 students	1,094	1,132	1,187	1,275	1,560	2,211	2,361	2,932	3,531
Total	1000 students	3,399	3,460	3,635	3,913	4,482	5,825	6,215	7,477	8,781

Sources: SDMP study report and JICA Study Team estimates