

## CHAPTER 10: HUMAN RESOURCES DEVELOPMENT IN TRAFFIC SAFETY

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### 10.1 EXISTING ISSUES, CONSTRAINTS AND OPPORTUNITIES

#### 10.1.1 Introduction

Traffic congestion in Greater Cairo is in the first place caused by the gap between traffic demand and traffic capacity and the therewith related traffic management problems. But addressing the hardware and software component of the traffic system is insufficient to achieve sustainable improvements. The third component, the *human factor*, also needs to be addressed in a coordinated and comprehensive manner.

Both users and managers of the traffic system have to become aware of the problems and need to develop a rational attitude that enables the efficient use of the transport infrastructure. In that context, it is necessary that drivers/pedestrians understand the merit of and need for safe traffic behavior. The level of conflict in the system can be minimized only by simultaneously improving the road/traffic facilities and implementing traffic safety measures.

The evaluation of problems and issues of traffic safety allows concluding that among other requirements, traffic (safety) training and education should not be overlooked. The lack of knowledge about traffic safety and the general absence of rational traffic behavior were already pointed out by other studies. For example, the World Bank recently highlighted two priority initiatives<sup>1</sup>:

- Increasing public awareness of efforts to improve the traffic situation and inviting public participation in those efforts;
- Improving poor driver behavior (making improper turns, poor lane discipline, etc...).

Sustainable solutions to improve the traffic situation in Cairo will require *targeted action to increase the awareness of the people and to achieve behavioral change*.

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<sup>1</sup> “Cairo Urban Transport Note : *Keep Cairo Moving*” , World Bank, May 2000

To be successful, a comprehensive *Traffic Safety Program* should be developed. The framework of the Traffic Safety Program (TSP) is proposed in this chapter<sup>2</sup>.

## 10.1.2 Issues

### (1) Traffic Behavior

The government of Egypt demonstrates its concern for the well-being of its citizens in Article 1 of the Traffic Law, which states: “Using the roads, whatever their nature, in traffic shall be in a manner that does not expose lives or properties to danger, or lead to perturbing the safety of the road, delaying or hampering their use by others, or disturbing people’s comfort or in a way prejudicial to the environment”.

However, the will of the government is not reflected in the behavior of participants of Cairo’s transport system as demonstrated in next table.

**Table 10.1.1 Attitude of Transport Users**

Article 72 bis n°	Article description	Attitude in the streets
1	Prohibits passengers to sit or stand on the external parts of the vehicle.	Public transport users (in particular of bus and shared taxi) frequently hang out of the vehicle. Also entering and exiting the bus regularly happens while the vehicle is still in motion. Buses and even more so shared taxis frequently stop in the middle of traffic to embark or disembark passengers.
2	Driving the vehicle at night without using the front lights and the rear red lights or the lights reflector, as prescribed, even if the failure to use the lights is due to their unfitness, or their non-existence.	Many vehicles, even recent models and public vehicles have lights that are not or only partly working. Many drivers also willingly drive without lights or use their lights as decoration (blue or red lights, flickering lights, etc...).
4	Parking the vehicle at night in a road, in places where no lights exist, without using the front small lights and rear red lights, or the prescribed light reflector.	The parking survey clearly demonstrated that parking behavior is a substantial problem and that no consideration whatsoever is given to the condition under which the vehicle is parked. Parking at dark places without any lights is common.
6	Leaving or parking the vehicle in a road in a condition which results in exposing the life and properties of others to danger, or traffic obstruction or impedance.	The parking attitude of Egyptian drivers is completely the opposite. Double and triple parking, abandoning vehicles in the middle of the street (when broken down) or parking at places that hinder and even block traffic is generally accepted.
7	Driver’s failure to observe traffic lights or signs, and traffic agents’ instructions for traffic reorganization	Traffic lights hardly function in Cairo city and if they work, their signals are ignored. The respect for traffic signs is also completely absent. Traffic lane indication, on site street signs, speed limits and other

<sup>2</sup> The details are presented in Technical Report 4 : *Traffic Safety and Environmental Programs*.

		signals are ignored or not understood. The signals given by police officers are generally obeyed but the time between the signal and the obedience is too long, creating dangerous situations on many intersections. Furthermore, police signs are oriented towards vehicles, and not towards pedestrians. But also pedestrians have no consideration at all about even the basics of safe traffic behavior and obeying traffic rules and regulations.
14	Intentional act by the driver to impede or obstruct traffic in a road	The attitude of the average driver in Cairo is egocentric. He does not consider other road users and acts solely according to his egocentric impression of traffic, without consideration for other drivers or basic traffic rules. This creates chaos at almost all intersections and U-turns and in many streets. Common phenomena are the random stopping and even abandoning the car at places where it creates serious traffic problems, constant change of lanes, speeding or backwards driving on crowded streets because an exit was missed or any other irrational reason.
15	Using the hooters in a way violating the instructions prescribed for their use	This element needs no clarification. The hooter is not considered by the Egyptian driver as an emergency signaling tool, but as a means to communicate. The noise levels in Cairo are unacceptably high (see environmental survey results) and one cause is the constant use of the sound signal as a replacement for careful driving or braking (reduction of speed) or just to indicate that one is approaching.

*Source: JICA Study Team*

## **(2) Facts and Figures of Drivers Behavior**

### **1) Current number of traffic accidents**

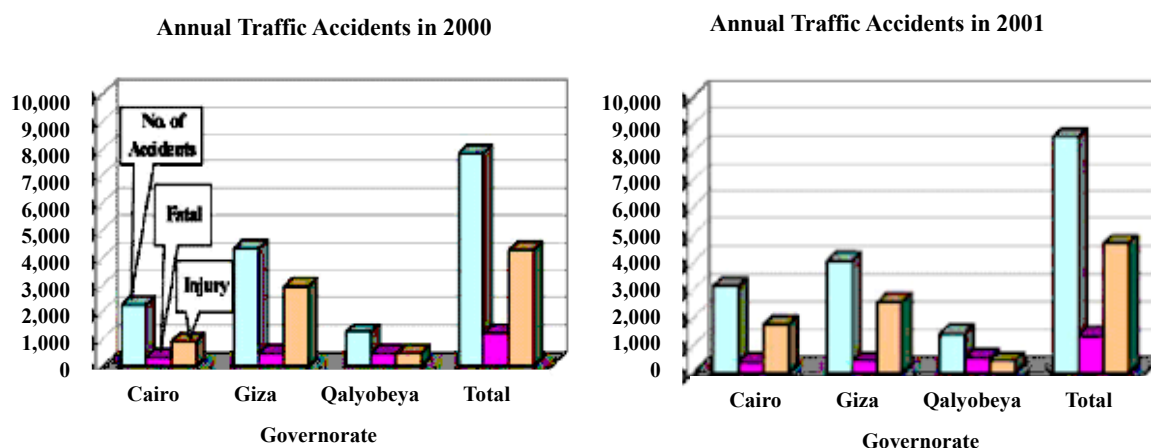
Table 10.1.2 and Figure 10.1.1 present the number of road accidents that occurred in the Governorates of Cairo, Giza and Qalyobeya during the past 2 years (2000-2001). As shown in the table, the number of accidents in total Governorate increased in one year with 8% and especially the number of accidents is high in Giza. The number of accidents in the Cairo Governorate increased sharply, the number of accidents with injury almost doubling.

**Table 10.1.2 Annual Traffic Accidents by Governorate**

Governorate	Year 2000			Year 2001		
	No. of Accidents	No. of Fatal Accidents	No. of Injury	No. of Accidents	No. of Fatal Accidents	No. of Injury Accidents
Cairo	2,236	327	890	3,106	394	1,711
Giza	4,324	468	2,932	4,016	414	2,533
Qalubya	1,265	449	461	1,375	509	429
Total	7,825	1,244	4,283	8,497	1,317	4,673
Total Republic*	24,818	5,420	19,708	23,735	5,161	19,602

Note: 1) \* Without the accidents on the highways supervised by the General Traffic Department  
2) The accidents of the property damage are not registered.

Source: General Traffic Department, Section Planning and Monitoring, Department of Statistics



Source: General Traffic Department, Section Planning and Monitoring, Department of Statistics

**Figure 10.1.1 Annual Traffic Accidents by Governorate**

It is clear that more attention should be devoted to traffic safety in order to reduce the number of traffic accidents. As is demonstrated in next paragraph, one important objective is to change the behavior of drivers and pedestrians.

## 2) Driver and pedestrian behavior

### Driver Behavior

Egyptian drivers, considered collectively, have been described as undisciplined. The most common complaints are: sudden and constant change of lanes without notice or consideration of other drivers; jumping queues in dense traffic; blocking

intersections and roads for no reason; speeding and dangerous driving. Such behavior leads to a reduction of traffic speed and an increase of traffic accidents.

During the Practical Demonstration (see further) a general evaluation of driver behavior was made. This was done by issuing a questionnaire to the participants (drivers) about the traffic safety. The most remarkable driving habits of Egyptian drivers were:

- On a total of 171 drivers, 60% considered speeding as a serious problem although at the same time admitted that they also speeded. Surprisingly, most other dangerous driving behavior was considered very normal. Only 15% to 24% considered irrational changing of lanes, uncontrolled overtaking and cutting in front of cars a problem. About 30% of total drivers confessed to park on places where parking is prohibited, although one can wonder how illegal parking is perceived given the results of the survey that give the impression that whatever way the car can be parked is “permitted”.
- The car is the priority vehicle and other traffic users are subject to it. Over 20% of the drivers admitted that they considered pedestrians as obstacles at pedestrian crossings, 32% answered that they become irritated whenever pedestrians are crossing roads, and at least 51% answered that they feel pedestrians and bicycles as obstacles for their driving.

Despite that behavior, there are a relatively low number of serious traffic accidents in Cairo. This is in the first place a consequence of the slow speed resulting from congestion. A second possible reason is the “*Defensive Driving*” of most drivers in Cairo. It should, however, be noted that defensive driving in Cairo is totally different from what is generally understood under that term. Drivers in Cairo expect other drivers to commit mistakes and are constantly on the alert to avoid the most dangerous consequences of irrational driving behavior. But in trying to avoid an accident, drivers do not slow down, they only blow their horn and react themselves in an irrational manner, mostly an immediate change of lane. This causes following drivers to react the same way and to change lane until one driver is finally blocked, putting in many cases oncoming traffic to a complete standstill. This type of irrational / irresponsible behavior increases with the density of traffic. More or less orderly traffic can be observed at less-busy signalized intersections, but at congested intersections the situation becomes totally chaotic with more aggressive and competitive driving and no consideration for pedestrians or other drivers.

### Pedestrian Behavior

Pedestrian’s behavior is equally bad. Pedestrians cross streets randomly at all sections of the road (jay-walking), even if this is highly dangerous. They also walk on vehicle lanes to shortcut their journey. Pedestrians and passengers also overflow vehicle lanes at bus stops, or when they wish to board a shared taxi.

Pedestrians understandably become irritated at major intersections where they must wait a long time before they can cross the street, this in an environment characterized by heavy traffics exhausts and high noise levels. Furthermore, drivers generally pay little attention to pedestrians even when the latter are using pedestrian's crossings at intersection.

Most drivers consider pedestrians as “*Outsiders in Traffic*” who block traffic, reduce car speed and street capacity and create chaos at intersections and main inner city streets.

### (3) Organization and Responsibility for Traffic Safety

During the Workshops, the members of the Practical Demonstration Team were asked to complete a questionnaire to assess the present situation regarding traffic safety education. The results were as follow:

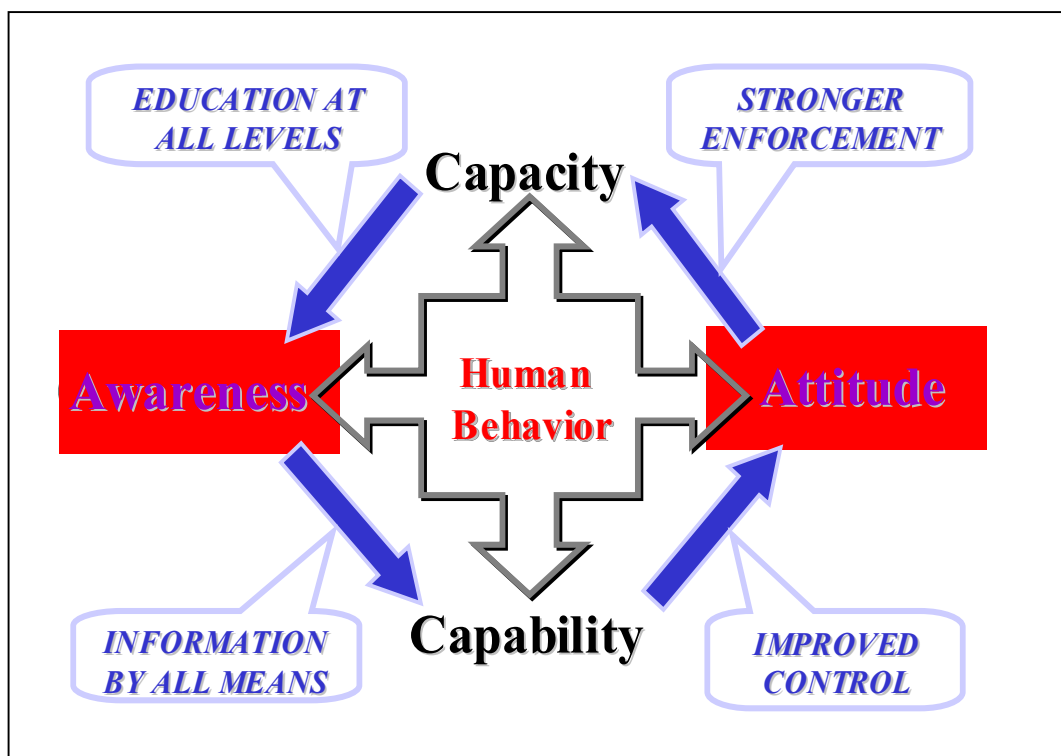
- In order to promote the sustainable activities of safety education in Egypt, the idea of a new organization system such as a “Traffic Safety Education Center” composed of several organizations was appreciated and considered necessary by more than 50%, and 40% considered that the Practical Demonstration of CREATS should be continued in a more sustainable manner.
- The suggestions to improve the organization were; 1) Coordination among concerned authorities, 2) Establishment of “Traffic Safety Education Center” as coordinating and centralizing body for traffic safety, 3) Establishment of “Road Safety Council” having separate budgets, 4) Institutional development of a traffic safety education program.

Partly as a consequence of lacking a structured and integrated agency, efforts to improve driver education and road safety have been lagging. At present, promoting safety and comfort in traffic is relatively backward and is almost absent in the policy approach to traffic. Thus one out of the **three (3) “Es”, i.e., Education, Engineering and Enforcement for safe and efficient traffic** is absent / ignored. The continued improvement of traffic infrastructure (Engineering) can improve traffic only if it is used rationally (Education) and efficiently controlled (Enforcement). The weak coordination between Traffic Engineering, Education and Enforcement at present reduces the effectiveness of all efforts.

### 10.1.3 Constraints: Scale and Scope

Traffic training programs are presently limited to a combination of practical and theoretical tests to obtain a drivers license. Candidates can prepare for these tests either individually or follow courses. However, learning how to drive a car is only a small part of the set of measures / initiatives required to achieve acceptable levels of safety in traffic. Furthermore, safety is not only an issue related to driving a vehicle, but includes a large variety of other attitudinal matters.

A full scale sustainable Traffic Safety Program (TSP) needs to create a direct link between the *awareness* of the traffic problems and stimulate a more rational *attitude* to ultimately change human behavior in traffic. The concept is visualized in next Figure 10.1.2.



Source: JICA Study Team

Figure 10.1.2 the concept of the TSP

Transport users all have the *capacity* to learn how to perform in the transport system. This capacity is part of the general education that is given by the parents and is further shaped by daily experiences.

This “given” knowledge of the transport system will provide transport users basic *awareness*, which assists them to identify the boundaries of their transport behavior. Education at all levels, from kindergarten through school and inside the professional environment, can change the basic awareness and thus adjust behavior.

However, transport systems are complex and ever-changing. Information (refreshing and updating basic knowledge), provided by the proper sources and through all available means will ensure that the general awareness is translated into a concrete *capability* to safely and rationally behave together in traffic.

Because different transport users have different transport needs (priorities), the real impact of the transport user is determined by his *attitude*. Rules and regulations objectively define the boundaries for each transport user in between which he or she can develop a personalized transport behavior. To ensure that transport users’

attitudes do not conflict with the set of rules and regulations, control becomes imperative.

While control of transport behavior can eliminate excesses (the deterrent factor), enforcement is required there were the transport user pertinently “refuses” to obey to the rules and regulations and therefore, is incapable to function appropriately in traffic. Although each human being can learn and adjust his behavior, he or she is sometimes unwilling to change / adapt, requiring public authorities to enforce the rules and regulations upon them.

The TSP initially acts at the level of the awareness, but will have to coordinate and integrate at the level of the attitude to be really successful.

This chapter presents the different components of the TSP. The concept, content and structure are based upon the results of a Practical Demonstration Program, conducted within the context of the CREATS study. Also a structural framework for a sustainable TSP is proposed and discussed. Various issues will be discussed in this section, among which the organization, the methods, the implementation and the financing. The TSP has many components and a wide variety of detailed information on the content of the programs. A more elaborated description is provided in *Technical Report 4*.

#### 10.1.4 Opportunities: Setting the targets

The human factor in the Cairo transport system can be divided in three levels, each with its own priorities and needs (Figure 10.1.3). They are respectively the private users, the commercial users and the organizers.

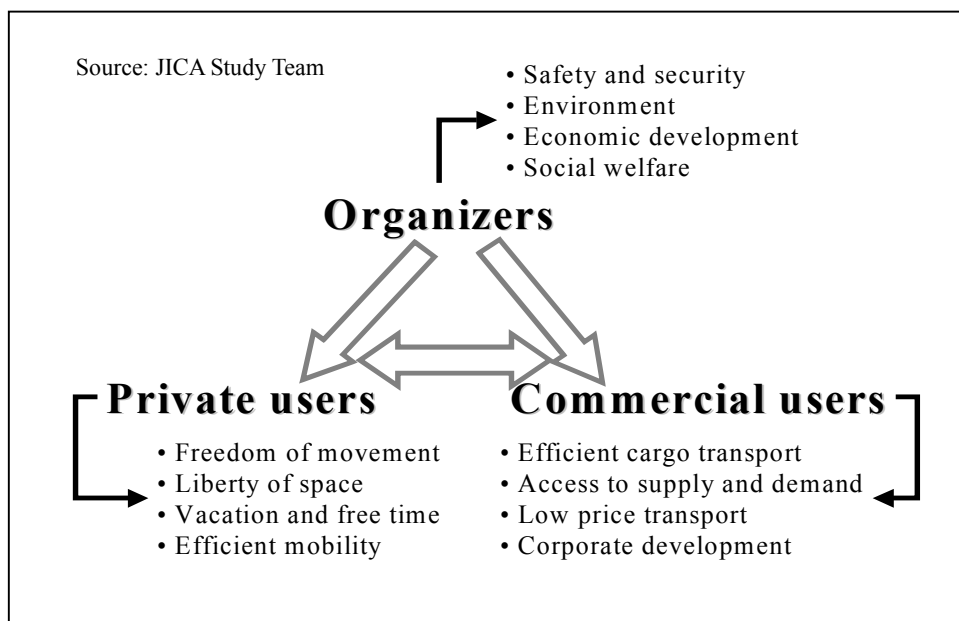


Figure 10.1.3: Transport User Priorities and Needs



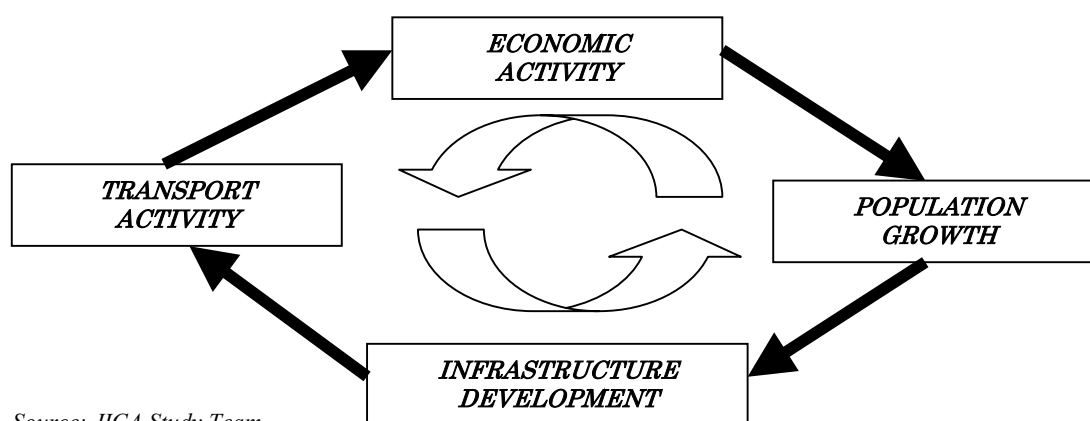
The government's task as transport system organizer is to balance between the needs of the private and commercial users, taking into account a wide variety of conflicting priorities. The realization of this balance needs considering the relationship between transport (infrastructure) priorities and the set of social, demographic (or societal), environmental and economic priorities.

Several conflicting priorities are making that balancing a difficult exercise. A dominant component of the puzzle is the inter-relationship between society and economy and the therewith related transport infrastructure needs. Transport is an essential factor in economic competitiveness, but vice-versa, transport cannot be developed if there is no economic activity. At the same time, economic activity stimulates / generates population growth which in turn requires further infrastructure development. But it is exactly at this level the real problem start.

The needs for transport infrastructure still concentrate on road transport infrastructure. This is because road transport is the best adapted to meet increasingly complex needs of both the industry and the population at large. It is flexible, efficient and considered cost efficient and is by some even seen as an environment friendly transport mode<sup>3</sup>.

The reality is that the constant road infrastructure development increases road traffic to a level where the transport of people and goods becomes a burden to society in terms of congestion and environmental effects (increasingly higher socio-economic costs).

The conflicting relationship between transport and society is visualized in next Figure 10.1.4.



Source: JICA Study Team

Figure 10.1.4: Vicious circle of transport

<sup>3</sup> See for example, the discussion by Joseph L. Bast and Jay Lehr, Ph.D.: “The Increasing Sustainability of Cars, Trucks, and the Internal Combustion Engine”, Heartland Policy Study June, 2000

One way to reduce the negative effects of road traffic is to stimulate a modal shift from the road to alternative transport modes (for cargo transport) and to public transport (for passenger transport).

The searched-for balance is therefore one between the private transport user and the commercial transport user and their preference of transport mode(s). The former considers transport as *private mobility* and sees it as a means to improve the quality of life. Private users appreciate (*demand*) their personal freedom of movement and liberty of space to have vacations and enjoy increasing free time, predominantly by using private cars. The objectives of the commercial transport users are frequently opposing private transport users' priorities because the commercial user strives for efficient and low cost cargo movements from place of production to place of consumption (*commercial mobility*). The ultimate goal of the commercial user is to guarantee continued corporate growth and to generate bottom-line profit. For that purpose, they wish to minimize transportation costs, which can in their opinion only be achieved by rapid road traffic that is not hindered by private vehicles (congestion is both a direct and indirect financial loss).

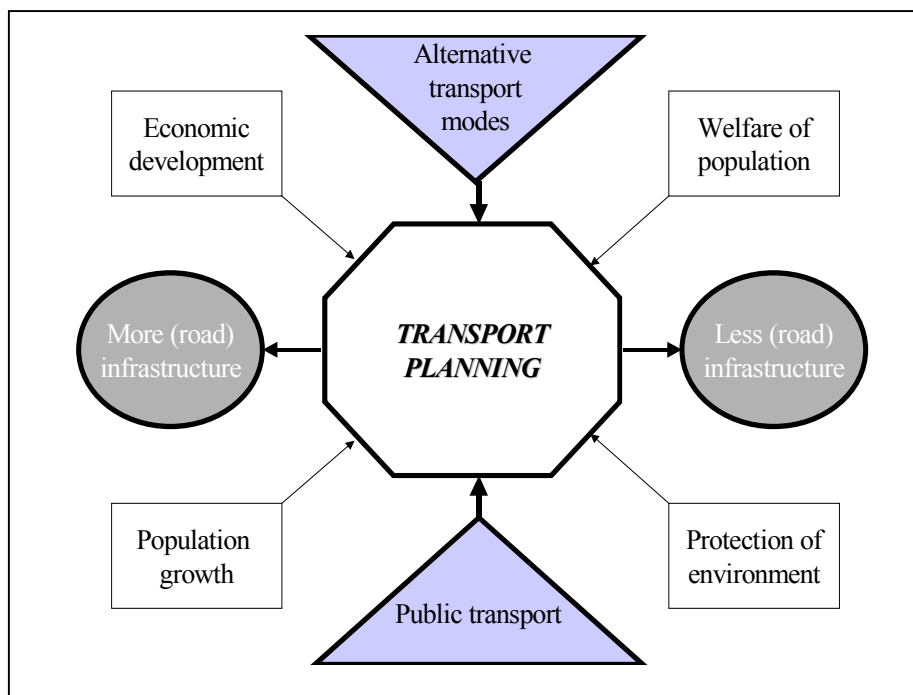
Although the socio-economic situation should be a priority basis for infrastructure planning and development, reality is frequently different. Socio-economic conditions are often forgotten in transport planning and replaced by political priorities. "Similarly some of the country transport projects have little or nothing to do with transport demand. .... Such is the politicization of the transport planning process"<sup>4</sup>. The politicization of transport planning and development is a common factor in developed countries and finds its origins in two other (increasingly important) components of the equation, namely *welfare*. Welfare is defined as the safety and well-being of a constantly growing population and the preservation of nature for the population to enjoy it. Welfare is this in direct conflict with the constant increase of (road) transport. The complex problem of transport planning is summarized in Figure 10.1.5.

Political intervention therefore replaces socio-economic planning and artificially tries to reduce road transport. The industry is encouraged / forced to use alternative (Intermodal) transport modes, while population is incited to leave the private car at home and to use public transport. In other words, governments try to develop policies that find a balance between a flexible and inexpensive road transport system and more rigid and in many cases more expensive alternatives.

To achieve success, governments must work with a mix of on the one hand, stimulating measures helping the industries and population to make the transition from road to alternative transport systems, and on the other hand enforcement measures there where stimulating measures do not reach pre-defined goals.

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<sup>4</sup> Reflections on Transport Planning, Politics, and the Future: 'we can survive without a 4-wheel drive'. Derek Scrafton, Transport Systems Centre, University of South Australia. Speech Royal Australian Planning Institute; The Planning Education Foundation of SA; Adelaide: 8 November 2000.



Source: JICA Study Team

**Figure 10.1.5: The complexity of transport planning**

*One available and highly efficient tool that is frequently forgotten is the training and education as well as the awareness creation. The Traffic Safety Program proposes the framework for developing such tool in Egypt.*

## 10.2 THE TRAFFIC SAFETY PROGRAM DEMONSTRATOR

### 10.2.1 Introduction

A “*Traffic Safety Education Program and Campaign*” (hereinafter refer to as “Campaign”) was organized by the JICA Study Team as demonstrator to set the framework for a future sustainable traffic safety campaign.

The campaign was followed by an Impact Study to assess effects of the demonstrator and to identify the key structures to translate the demonstrator into a sustainable traffic safety program for the future. Analyzing the objectives of the Campaign, the Impact Study explores critical organizational and institutional issues to be solved for the sustainable implementation in the future by the Egyptian Government.

### 10.2.2 Brief review of the Campaign

The campaign consisted of a series of Workshops for targeted audiences and of a street side campaign, using materials designed by the Campaign Team.

#### (1) The Workshops

The first Workshop was aimed at professional drivers inside public administration. Over 170 persons attended the Workshop and completed the various questionnaires. These questionnaires were designed to enable the participants to conduct a self-diagnostic regarding their driver habits.

Workshop 2 aimed at training relevant parties of traffic police. Forty five traffic police officers participated in the Workshop. The 45 officers were distributed among the governorates as follows:

- 25 officers from Cairo traffic department;
- 15 officers from Giza traffic department; and
- 5 officers from Qalubia traffic department.

The second Workshop included five (5) Lectures were carried out during the day. In addition, the participants were asked to fill in a questionnaire before the start of Workshop and another questionnaire after the Lecture and video tapes.

The third Workshop aimed at training trainers of driving schools. The Workshop was prepared in cooperation with the JICA study team in the English language after which the material was translated and modified to suit the Egyptian experience. Workshop 3 included four (4) Lectures and several videos with case studies.

## (2) The street-side campaign

The street side campaign included the distribution of stickers and pamphlets at critical intersections. The public in the street. The stickers and pamphlets were designed by the Consultant and the Safety Campaign Committee (Figures 10.3.1 and 10.3.2).



Figure 10.2.1: Campaign sticker



Figure 10.2.2: Campaign pamphlet

Also a special safety T-shirt was designed and distributed to the participants in the Campaign to attract the attention of the drivers and pedestrians and to make them more visible in traffic.

The T-Shirt was designed by the consultant and the Safety Campaign Committee. The campaign slogan and logo were printed in color on the T-Shirts. Figure 10.2.3 shows the T-Shirts final design.



**Figure 10.2.3: Campaign T-Shirt**

The method of the on street traffic safety campaign was following:

- Senior and high school students together with their teachers/community members (referred to as “the Campaign Team”) were gathered at the corners of the signalized intersections, and distributed “Traffic Safety Campaign” stickers and pamphlets to pedestrians and drivers.
- Five (5) Campaign Teams were organized.
- A Campaign Team was composed of four (4) students, two (2) teachers, two (2) community members and a traffic policeman.
- The campaign was conducted at five (5) intersections for two days as scheduled before.

### **10.2.3 The Impact Study : The Workshops**

The Impact Study was undertaken using the method of “KAP (knowledge, attitude and practice)” evaluation *before* and *after* the Workshop. This technique used different sets of questionnaires that were distributed to the participants to gather their opinion before and after each Workshop. The outcome of the Impact Study is briefly discussed in the following section. The detailed results are provided in *Technical Report 4*.

### (1) The first Workshop

The questionnaire to evaluate the change in driving behavior consisted of 32 questions that enabled to identify different driver types, ranged between A to E:

**Type A:** Driving manners are violent, this driver has several weak safety driving points such as driving with high speed, sudden lane change, cut in front of cars and troublesome parking behavior.

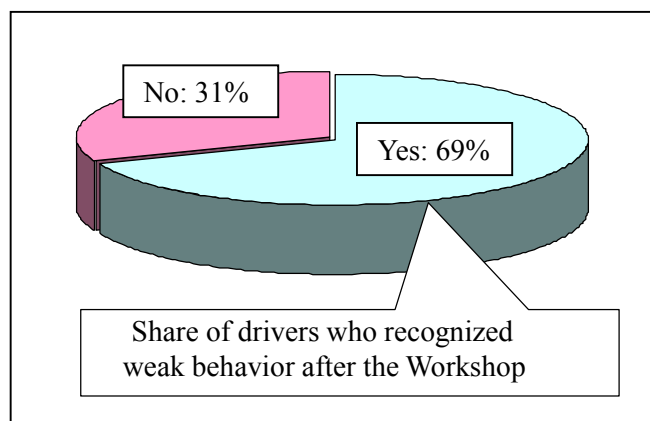
**Type B:** Drivers opt to become irritated, this driver has several weak points such as aggressive driving towards pedestrians/bicycles and sounding the horn to slow driving vehicles and pedestrians.

**Type C:** Driving based upon case-by-case decision-making, this driver has a weak safety driving behavior and lacks conformity and safety perception, frequently combined with a loss of calmness.

**Type D:** Driving manner is overconfident, this driver is overconfident and drives at high speed, accelerates faster than other cars and cuts of other traffic to be first.

**Type E:** Driving manner is calm, this driver is good driver.

Next figure shows the share of drivers who recognized that they have weak points after the Workshop. The figure reveals that 69% of total participants found weak points in their driving after the Lecture of the Workshop, meaning that the driver's consciousness had improved (Figure 10.2.4).



**Figure 10.2.4**  
**Share of Drivers recognizing bad driving behavior after the Workshop**

Out of the results, it could be deduced that after the Workshop, the willingness increased to stop or slow down at intersections, to take extra care to slow driving vehicles and to try to avoid troublesome parking. Especially, the participants had changed their mind and became convinced that safe driving at intersection was highly important as was taking care of illegal parking.

## (2) The second Workshop

As in the previous Workshop, the objective of the Impact Study questionnaires was to identify the possible change of attitude of traffic police officers after having attended the Workshop. The questionnaire was related to safe driving and consisted of ten (10) questions with three (3) possible answers for each question. The participant was asked to answer the ten (10) questions before the Lecture and then asked to answer the same questions after the Lectures.

A comparison of the answers of the participants between “BEFORE” and “AFTER” was performed to estimate the effects on how safe driving was perceived by police officers and to what level the Lectures contributed to improve their perception. Figure 10.2.5 depicts a summary of the correct answers for each question between “BEFORE” and “AFTER”. A substantial improvement could be noticed in the participants’ answers between “BEFORE” and “AFTER”, this result shows that the Workshop related to traffic safety campaign was effective for the participants. The level of improvement is shown in Figure 10.2.6.

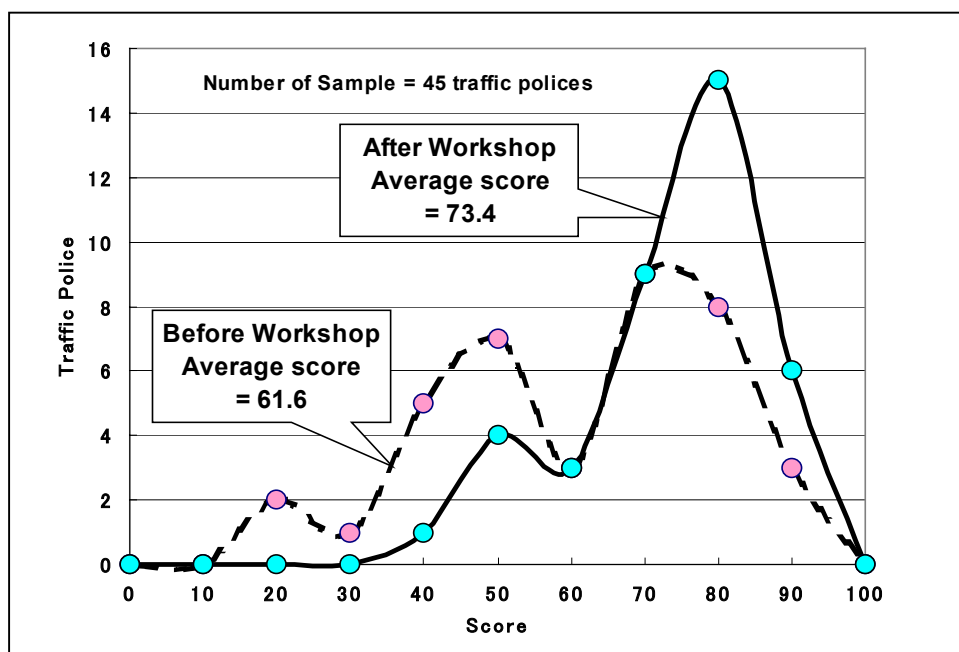


Figure 10.2.5 Average Scores of Correct Answers “BEFORE” and “AFTER”



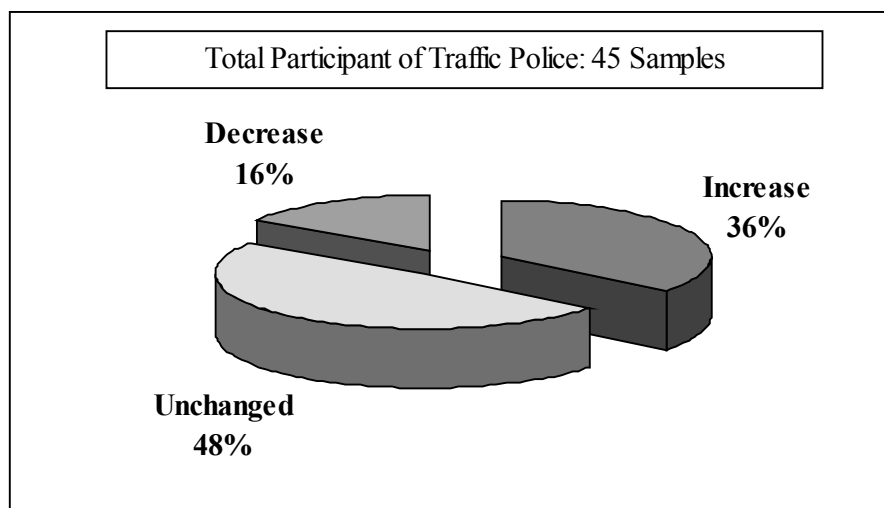


Figure 10.2.6 Improvement “BEFORE” and “AFTER” of Traffic Police

### (3) The third Workshop

Also in the third Workshop, the participants were asked to fill a questionnaire before the start of Workshop and another questionnaire after the Lectures and video tapes. The objective of the questionnaires was to evaluate the expertise of trainers. The text material used in this Workshop was the same text used in previous Workshop 2. Seven teachers of driving school were asked to complete the questionnaire.

Figure 10.2.7 shows the scores “BEFORE” and “AFTER” the Workshop. Of the 7 participating driving teachers, 43% increased their positive score, 43% had unchanged scores while 14% had a decreased score. Thus, about 43% of participants was increased their knowledge about the safe driving thanks to the Lectures during the Workshop. Due to the small number of sample, the concrete effect of the Workshop may be difficult to identify.

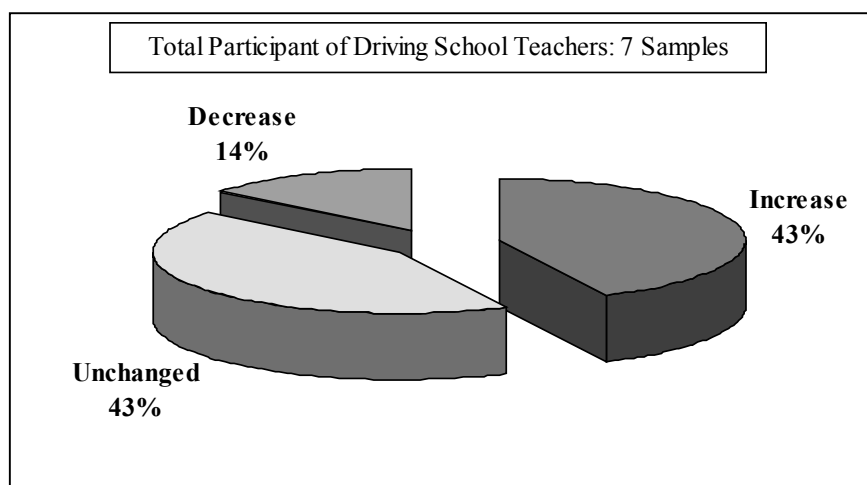


Figure 10.2.7 improvement “BEFORE” and “AFTER” of Driving School Teachers

### 10.2.4 The Impact Study : The Campaigns

The on-street traffic safety campaign was implemented on Wednesday and Thursday, the 26th and the 27th of June, 2002. The campaign at each signalized intersection was carried out for 3 hours from 9:00 to 12:00 hrs. The sites of the campaign are noted in Table 10.2.1.

**Table 10.2.1: Itinerary of road-side campaign**

	Name of intersection	Governorate
No.1	Rabiah al Adawiyyah	Cairo
No.2	Tahrir Sq.	Cairo
No.3	Roxy Sq.	Cairo
No.4	Ataba Sq.	Cairo
No.5	Ahmad Maher Sq.	Cairo
No.6	Fumm Al Khaleeg Sq.	Cairo
No.7	Salah Salem/Salah Al Deen (Saida Isha) Sq.	Cairo
No.8	Sphinx Sq.	Giza
No.9	Galaa Sq.	Giza
No.10	Giza Sq.	Giza

*Source JICA Study Team*

In addition to the questionnaires distributed at the Workshops, a special questionnaire was distributed among the members of the Practical Demonstration Team participating in the traffic safety campaign on the street.

The objective of this questionnaire was to collect ideas and opinions on how to sustain the road-side campaign in the future.

The members of the Practical Demonstration Team were asked to complete an individual interview form to assess implementation and organizational issues. The assessment was focused on three (3) main items:

- Performance,
- Positive and negative issues,
- Critical factors required for sustainable implementation.

The interviews were conducted through a structured questionnaire aiming at obtaining opinions of the Practical Demonstration Team related to the abovementioned items.

The questionnaire contained four (4) main groups of information. The first included personal information of the Practical Demonstration Team members. The second group is concerned with the scope of the traffic safety campaigns and the degree of efficiency of its activities. The third group addressed the assessment of the property of the Practical Demonstration Team. Finally, the fourth group

consisted of questions on future traffic safety education programs. Ten (10) members of the Practical Demonstration Team were asked to fill in the questionnaire.

## 10.3 STRUCTURING FOR SUSTAINABILITY

### 10.3.1 Institutional organization

The weak coordination between the Education, Engineering and Enforcement functions in terms of traffic safety hinders achieving effective traffic safety. Coordination is best when it is well integrated as an independent center for implementation.

It is, therefore, recommended that functions related to traffic education in each Ministry are integrated in a nationwide initiative, and operated in parallel and in coordination with the agencies, responsible for engineering and enforcement.

In conjunction with programs to address the “Engineering” and “Enforcement” issues discussed in other chapters in the Phase I Final Report, the development of following organization with respect to the TSP is proposed<sup>5</sup>:

- Establish an Egyptian Traffic Safety Council (TRASAC);
- Establish the Executive Committee for efficient implementation;
- Establish a Traffic Safety Education Center (TRASEC);
- Establish a Traffic Safety Information Center (TRASIC);
- Support the creation of Non-Governmental Regional Traffic Safety Organizations (TRASOs).

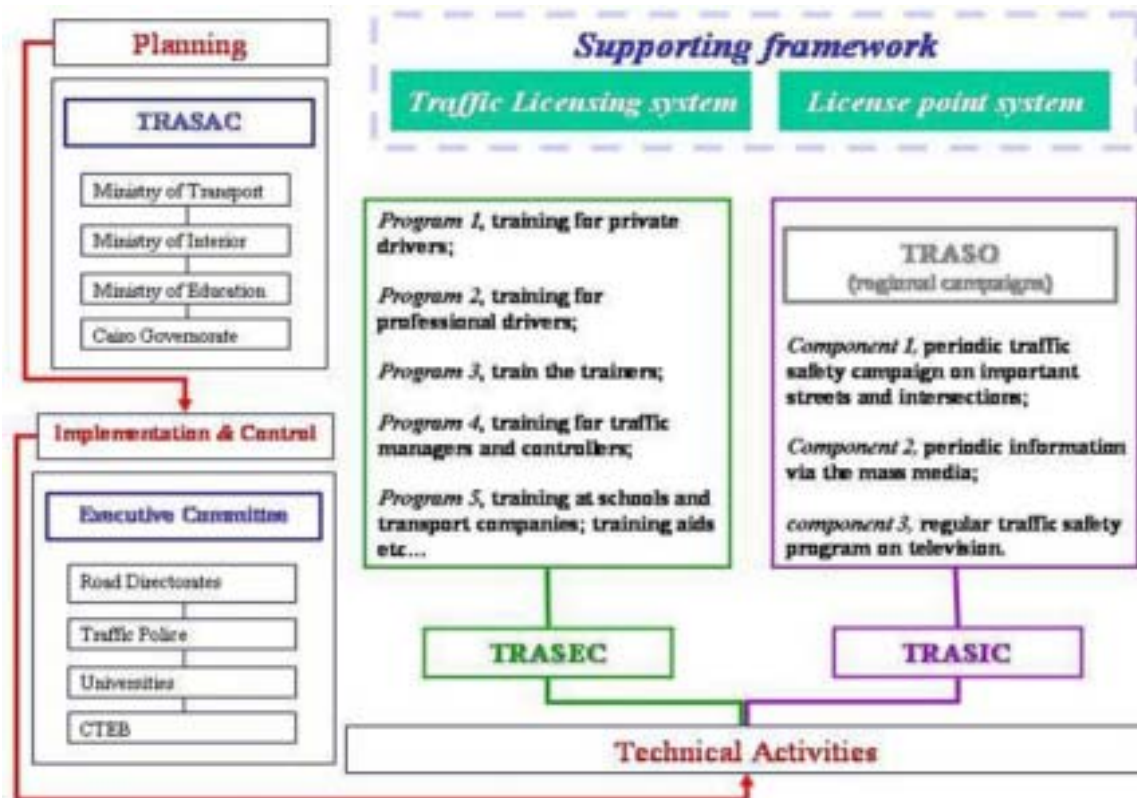
Traffic safety responsibilities in each Ministry or public organization should be integrated in an ***Egyptian Traffic Safety Council (TRASAC)***. This council should have full responsibility for the strategy for and financing of the annual traffic safety initiatives. An *Executive Committee* needs to be installed for implementing the strategy, allocate the annual budget to the different initiatives and manage the daily activities. Finally, the execution of the agreed upon programs is the responsibility of the *Traffic Safety Education Center (TRASEC)* for all components, related to education and training in traffic, and of the *Traffic Safety Information Center (TRASIC)* for the various initiatives to increase public awareness.

The work of TRASAC could be supported at regional level via Traffic Safety Organizations (TRASOs), non-governmental organizations that promote traffic safety and responsible behavior in their region.

Figure 10.3.1 visualizes a proposed organizational structure for the TSP.

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<sup>5</sup> See Technical Report 4 for a more detailed description of the proposed organization.



Source: JICA Study team

**Figure 10.3.1 Proposed Organization System for Road Safety**

### 1) Establish of the Egyptian Traffic Safety Council (TRASAC)

In order to improve weak coordination among various Ministries and structure their activities to improve traffic safety, a nationwide Traffic Safety Council (TRASAC) should be established in Egypt. The council would be responsible for following specific activities:

- Policy development for traffic safety;
- Formulation of a national code of standards for traffic safety education;
- Approval of annual plans and allocation of budgets for traffic safety campaigns;
- Instruct and control to the Executive Committee;
- Coordination with different agencies and Ministries.

The Ministry of transport (MOT), Ministry of Interior (MOI), Ministry of Education (MOE) and the Governorates are each performing a part of this role but none is coordinated or integrated.

Representatives of these Ministries and of other relevant ministries and institutions should be incorporated in TRASAC to coordinate, structure and organize traffic education and annual traffic safety campaigns.

## **2) Establish the Executive Committee of TRASAC (EC)**

In order to efficiently execute the strategies and to coordinate the concrete implementation, an Executive Committee (EC) should be established. The Executive Committee should be responsible for:

- Planning and budgeting traffic safety education programs and campaigns for the year to come;
- Controlling standards of traffic safety training and education;
- Internal coordination and daily management of TRASAC;

The EC would be composed of representatives from road directorates, traffic police and universities among others.

## **3) Establish the Traffic Safety Education Center (TRASEC)**

In order to conduct sustainable traffic safety education, the Traffic Safety Education Center (TRASEC) should be established. The Traffic Safety Education Center would be responsible as follows:

- Execution of traffic safety training programs;
- Execution of traffic safety education programs;
- Countermeasures for traffic accidents - specialized training.

The TSEC would be composed of visiting staff from road directorates, traffic polices, schools and universities and of a selection of professional trainers.

## **4) Establish the Traffic Safety Information Center (TRASIC)**

In order to create awareness among the population, the Traffic Safety Information Center (TRASIC) should be established. The Traffic Safety Information Center would be responsible as follows:

- Design and execution of annual traffic safety campaign;
- Design and execution of dedicated and targeted safety campaigns;
- Coordination with the regional TRASOs;
- Specialized initiatives and campaigns.

### **5) Establish regional Traffic Safety Organizations (TRASO)**

In order to assist traffic safety activities through public participation, Traffic Safety Organizations (TRASO) should be established at the regional level. These regional organizations would be responsible for:

- Traffic safety activities for members of their community;
- Identify traffic safety issues at the level of their region;
- Propose traffic safety improvements in their region;
- Regional assistance for the traffic safety campaigns.

The activities of TRASAC should be supported by a set of measures such as

- Rigorous and improved control and enforcement;
- Improved driver license system;
- Improved car inspection system.

The supporting measures will be discussed briefly and their relevance to traffic safety demonstrated.

## **10.4 THE TRAFFIC SAFETY PROGRAM**

### **10.4.1 The objectives**

The objective of the Traffic Safety Program (TSP) is to attain the following improvements by target groups (general public including infants and students, professional and private drivers, traffic trainers, traffic control/management groups):

- Prevention of traffic accidents and creation of awareness (general public including infants and children);
- Improvement of driver's compliance with traffic rules and regulations (drivers);
- Improvement of education system in driving schools (traffic trainers);
- Effective traffic enforcement and teaching (traffic control/management groups and trainers).

The TSP offers a comprehensive solution to address road user's lack of discipline and knowledge on proper road use, and the citizenry's passiveness towards the transportation and traffic problem through a combination of training and education on the one hand and on the other hand the creation of (more) awareness.

### **10.4.2 Traffic safety training and education**

The Traffic Safety Education Center (TRASEC) is aimed at performing the activities of the traffic safety education and training programs.

The general plan of traffic education programs and training is described below. A more detailed description, including framework courses, can be found in Technical Report 4. TRASEC provides traffic safety education and training in five (5) programs: *Program 1*, training for private drivers; *Program 2*, training for professional drivers; *Program 3*, train the trainers; *Program 4*, training for traffic managers and controllers; *Program 5*, training at schools and transport companies; training aids; specialized training etc...

The different programs are summarized hereafter.

#### **Program 1: Seminars for private drivers**

Program 1 includes seminars with following six (6) different course modules:

- Overview on the transportation and traffic law; traffic rules and regulations;
- Driver ethics (value formation, and road courtesy);
- Responsibility of drivers;
- Driving manners;
- Traffic safety (defensive driving and basic troubleshooting);
- Car mechanics and electronics.

These seminars are not intended to be followed by those that wish to obtain their driver license. They can follow the training and education courses in accredited facilities (see further).

These seminars are intended to re-educate drivers that have committed serious violations to the traffic law and who are forced to follow a re-education training program before they receive back their driver license as a consequence of the penalty points they collected (see further, supporting measures).

### **Program 2: Seminars for professional drivers**

Program 2 is oriented towards the transport professional. Several types of professionals can be identified such as tourist bus drivers, taxi and shared taxi drivers, truck drivers, emergency vehicle drivers, limousine drivers, etc... It should be stressed that candidates for the program must have successfully passed the first program before they can be allowed to follow Program 2.

Program 2 includes three (3) general modules and in addition specialized training specifically tailored for each profession.

The general modules are:

- Ethics, value formation, and road courtesy;
- Responsibility of professional drivers;
- Driving manners;

These three modules are complemented with specific tailor-made modules, specially adapted to the characteristics of the profession. These special modules include Workshops on

- Special rules and regulations for the profession;
- Advanced mechanics and electronics of the commercial vehicle;
- Special driving skills;
- First aid training and safety assistance;
- Basic management and economic courses.



### **Program 3: Training the trainers**

The third program consists of *training the trainers* to establish an adequate base of training staff in the private sector that provides traffic training according to national standards and using standard training programs.

Trainers providing lessons to persons wanting to obtain their driver license need to follow these courses. After successful completion of the course, they are accredited with a license that allows them to provide traffic education and training.

Program 3 includes following seven (7) course modules:

- Overview on the transportation and traffic law; traffic rules and regulations;
- Driver ethics (value formation, and road courtesy);
- Responsibility of drivers and driving manners;
- Traffic safety (defensive driving and basic troubleshooting);
- Teaching techniques and methods;
- Methods of examination;
- Review of recent traffic law changes.

The latter module is independent from the 6 others and foresees that licensed trainers frequently update their knowledge and expertise (e.g., every three years).

All participants in the program need to pass a professional examination on their knowledge in order to ensure that their expertise is adequate to teach others how to behave in traffic. Only after successfully passing the exam, candidate trainers obtain a teaching license which allows them to practice in a driving school.

Important is that the profession is recognized and protected by law. This law should organize and protect access to the profession and ensure that driving schools teach according to fixed standards and approved high-quality programs.

### **Program 4: Training of traffic managers and controllers**

Program 4 is oriented towards the persons, responsible for managing and controlling traffic. In particular the traffic police will be offered the possibility to increase their expertise in traffic control and enforcement, while senior police and decision makers, responsible for managing and organizing traffic, will be able to strengthen their expertise in traffic management and in other related fields.

The program includes 3 general modules, dedicated to traffic management, control and enforcement, and is supplemented by a series of specialized modules.

The following three (3) course modules are general:

- Overview on the transportation and traffic law; traffic rules and regulations;
- Driver ethics and driving manners overview;
- Methods of traffic management, control and enforcement: general overview.

The specialized modules train the professional in various types of management, control and enforcement methods. Several of these modules are complemented with practical training sessions in which the theory is put into practice.

One of these specialized training modules relates to traffic forecasting and network control. It includes lectures focusing on the CREATS forecasting model, what it is, how to use it and what results can be expected. These courses should be given in direct collaboration with the universities, given the high level of complexity of the programs. This issue will be discussed in more detail in Technical Report 4.

### **Program 5: Special training programs, training aids and educational material**

Program 5 includes the development of training aids and educational materials and of specialized programs oriented towards a target public (e.g., emergency vehicle drivers).

A first component of Program 5 is the development of educational materials to be used by the regional TRASO, in schools and by other recognized organizations involved in traffic.

The tools include books on different subjects, slides, traffic videos, computer based traffic games, etc. (Figure 10.4.1).



Source: BIVV

**Figure 10.4.1 Safety education materials in Belgium**

One of the most important elements for sustainable traffic safety is traffic training and education in schools. The School Education Module should therefore include specialized education materials for infants, children, adolescents and students to train each of them in how to behave in traffic and this according to their specific habits.

This fifth Program should also foresee in special training programs for senior citizens, professionals and should have basic education and training packages which can be put at the disposal of the TRASOs.

Finally, this fifth program can develop traffic simulation tools, training parks for children and practical training facilities of various types.

*The different components of Traffic Training and Education are discussed in more detail in Technical Report 4. Also many examples of educational materials and methods are provided in this technical report.*

### **10.4.3 Traffic information and awareness creation**

Creating awareness and providing regular and updated information to the general public will be the responsibility of TRASEC, the Traffic Safety Information Center.

The traffic environment in Cairo is chaotic and people have learned to live with it. In many cases, the population is not aware of the substantial problems of the system and do not consider any attitudinal change because they not know know better.

Before any sustainable solution can be found for the ever increasing problems in the streets of Cairo, people have to be made aware of the problems and have to be convinced that a change of attitude is urgently needed.

Creating awareness requires action at two levels. The first level is providing direct information trough the media, directly linked to strict control and enforcement. This level addresses specially the users of the traffic system and intends to stimulate an immediate change in dangerous traffic behavior. The second level is the long term strategy with the perspective of achieving sustainable safe traffic behavior. This has to be realized through traffic awareness creation from the early years.

#### **(1) The Traffic Safety Campaign**

Creating awareness among the general public on traffic safety should be conducted by utilization of mass media, targeted campaigns and public participation. The basis is the annual safety campaign, designed at setting for the year the general framework for the individual actions for safer traffic.

Via an annual nationwide contest, a yearly slogan and poster design is selected. The initiative organized by TRASEC needs sponsors to support the contest with prizes and other rewards for the best slogans and posters.

This approach is highly successful in Japan where the 1999 Yearly Traffic Safety Slogan was selected out of 258,489 submissions and the Yearly Traffic Safety Poster out of more than 8,912 designs.

Via road-side posters and safety slogans, considered very efficient tools to constantly remind drivers about the dangers of traffic, the winning poster and slogan is used to efficiently and directly incite drivers to observe traffic rules and regulations and to observe a safe driving habit.

The annual slogan and poster campaign is supported by following three (3) safety awareness creation modules:

### **Module 1: Periodic traffic safety campaign on streets**

Module 1 is the periodic street campaign. The campaign could be conducted two times per year with the explicit purpose of spreading the annual slogan and poster and more generally the idea of traffic safety among all the people. The campaign should also aim to develop the habit of observing traffic rules and manners.

At the same time, traffic police should support the campaign via extended proper driving guidance and enforcement on the street. Volunteers of the regional Traffic Safety Organizations (TRASO) could be involved and distribute to pedestrians and drivers pamphlets with information of basic reminders on traffic rules.

### **Module 2: Traffic safety campaigns in the mass media**

Module 2 consists of periodic traffic safety campaigns through advertisement in the mass media. In page-wide posters in the newspapers and a few minutes of television prime time, proper driving behavior can be fostered. The scale of traffic safety campaign in the mass media will be constrained by financial resources. It is therefore recommended that the resources are complemented by donations from private companies such as automobile companies, newspaper owners etc.... Also television should be used more regularly to create awareness and to incite people to observe rational traffic behavior. At prime time (generally before or after the evening news) a dedicated traffic program should discuss specific traffic situations, explain how people generally behave and what the rational and correct behavior is. During that program, citizens should also be informed about special enforcement initiatives as a deterrent for irrational behavior.

### **Module 3: Visiting schools, organizations and the regional TRASOs**

Module 3 includes teach-ins and visits to target audiences in schools, organizations (such as senior citizens and professional organizations) and the regional TRASOs to instruct and inform on traffic signs, rules and regulations and on traffic road safety and disciplined traffic behavior.

*As already argued, the traffic safety campaign will only be successful if its activities are fully supported by a rigorous traffic control and enforcement.*

*With this assistance, supporting measures can be developed that will support the efforts of TRASAC. The measures are briefly introduced in next chapter.*

## 10.5 SUPPORTING MEASURES

### (1) Traffic Licensing System Improvement

The urgent introduction of mandatory lessons and a high quality examination on traffic regulations at a specialized and regulated institute before candidate drivers can apply for a driver license is the most effective way of educating prospective new drivers.

In a later stage, a license renewal scheme will provide the occasion to control the expertise of licensed drivers and create the opportunity for driver re-education.

In addition to the review of the licensing system, the driver education and re-education programs should be institutionalized and the importance of driving schools made explicit.

### (2) The Penalty Point System

Traffic safety will benefit from a more stringent licensing system. Frequent traffic offenders should be penalized by suspension of their license, and/or by making it compulsory for them to attend re-education programs.

A “*penalty-point system*” can be developed in such a way that serious offenders have a higher penalty than less serious offenders. Points are accumulated until the license has to be renewed (see previous measure). But it is recognized that an efficient implementation of such a system requires further progress in the management of traffic citation records.

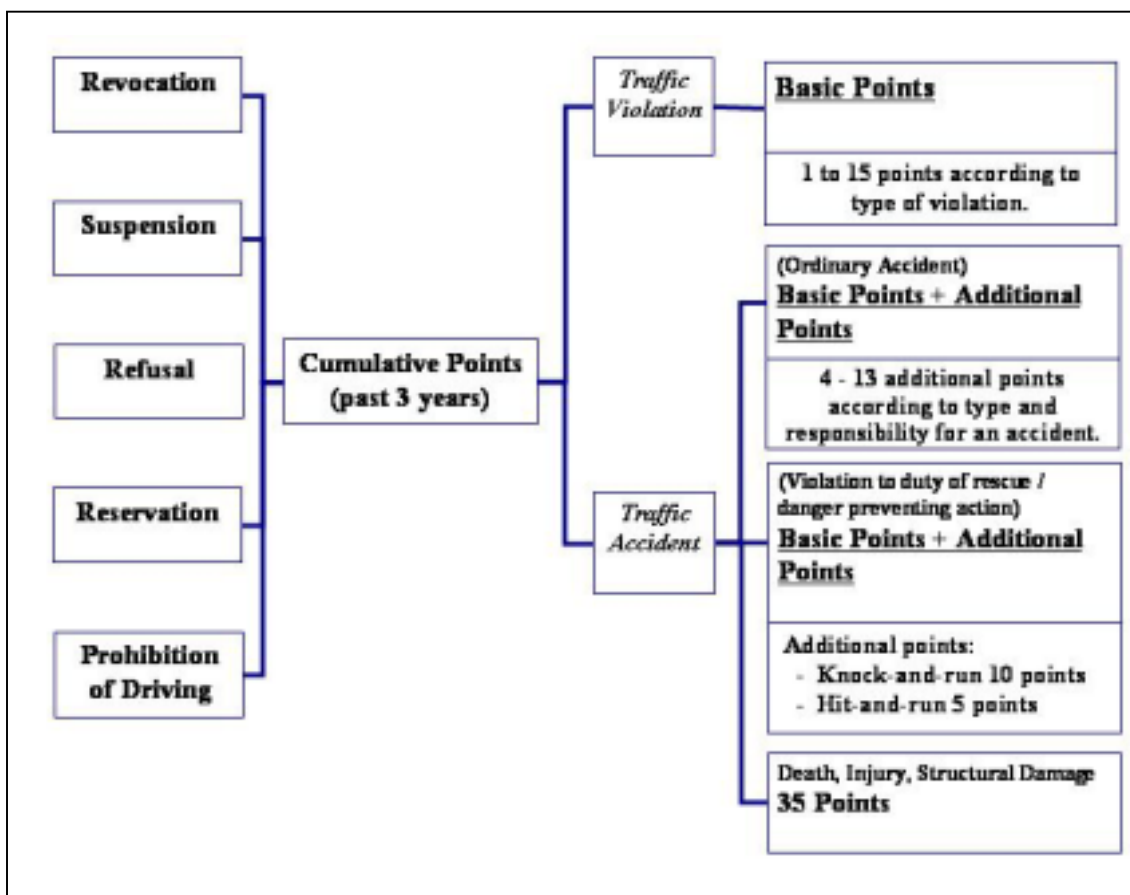
A possible “*penalty-point system*” is described hereafter:

#### a) Administrative Action by Traffic Police

Up to 15 points are assigned to violations to road traffic regulations as well as to traffic accidents. Administrative actions are taken according to the total number of cumulated points over a period of 3 years (period before license renewal). Based on the cumulative points of offenders, administrative actions are taken that include license revocation, suspension, refusal, reservation and prohibition of driving.

#### b) Functioning of the Point System

Figure 10.5.1 visualizes the functioning of the point system. The points of violation are assigned from 1 to 15 points according to the seriousness of the violation. While the points of traffic accidents increase from 4 to 35 points according to the seriousness of the accident. For the latter, further distinction is made between ordinary accidents, refusal to deliver assistance and actions to prevent dangerous situations and finally, causing death, injury or structural damage.



Source: JICA Study Team

**Figure 10.5.1 Functioning of the Penalty-Point System**

c) Criteria for Actions

Table 10.5.1 summarizes the criteria for action. The cumulative points are classified into four (4) histories such as “Non”, “Once”, “Twice” and “Three times or more”.

**Table 10.5.1 Criteria for Action of Points**

History of administrative actions (e.g., license suspension) during past 3 years	License revocation, refusal, driving prohibition			License suspension, reservation, driving prohibition
	(Disqualification period) 3 years	(Disqualification period) 2 years	(Disqualification period) 1 year	
Non	35 points or more	25-34 points	15-24 points	6-14 points
Once	30 points or more	20-29 points	10-19 points	4-9 points
Twice	25 points or more	15-24 points	5-14 points	2-4 points
Three times or more	20 points or more	10-19 points	4-9 points	2 or 3 points

Notes: 1. A disqualification period means the period during which one cannot obtain a license.

2. Additional two years should be added to the period indicated in the above Table when one who had a driver's license revoked during 5 years after the expiration of a disqualification period.

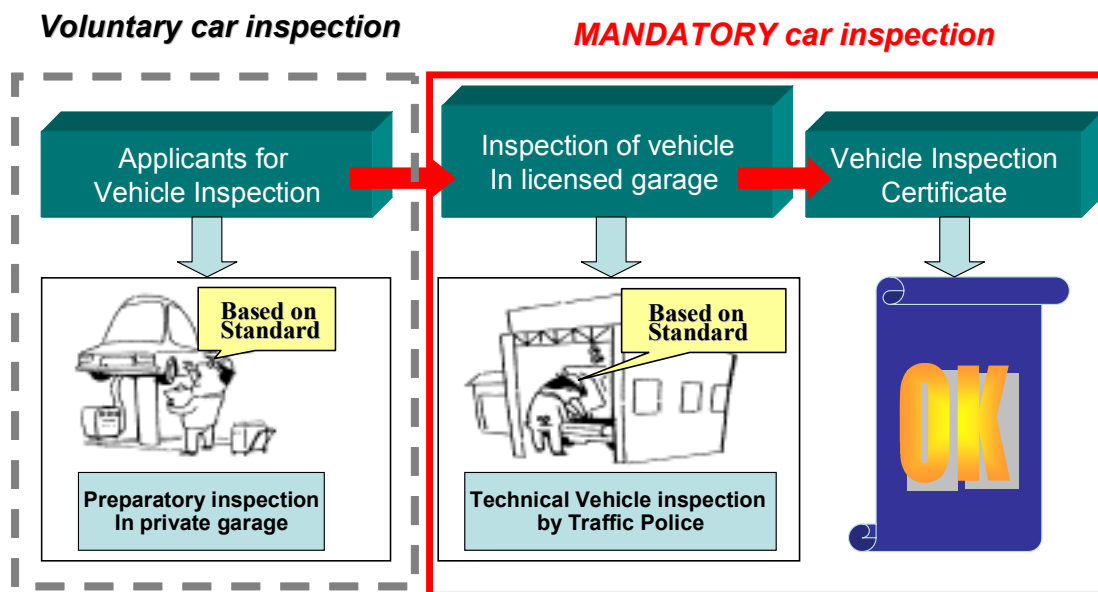
### **(3) Improved Car Inspection System**

Immobilized vehicles are causing traffic congestion and are dangerous. Furthermore, these broken-down cars generate economic losses and environmental pollution. Technical improvement of the existing vehicle inspection system is therefore highly recommended.

In order to implement more stringent vehicle inspection system, all privately-owned regular passenger cars that are for example older than 5 years should be inspected once a year, by vehicle inspection offices, recognized by Traffic Police. The inspection procedure can be licensed to private companies or can remain the full responsibility of the traffic police. The most important element of an efficient vehicle inspection system is the introduction of standards for inspection and a yearly inspection sticker or card indicating that the car has successfully passed inspection. These standards should be classified into three categories: chassis (including engine and brakes), body (general state of the car) and lights (See for details Chapter 8).

Applicants could prepare for that inspection by having their car *updated for inspection* by a private garage. This, however, is not mandatory but will ensure that the car is prepared to maximize the chance of passing the more rigorous inspection system.

It is necessary to regulate the car inspection system by law. Offenders, those failing to provide a regular inspection certificate, should be penalized by suspension of vehicle's license until a regular and updated vehicle inspection certificate can be shown. This system revolution is possible but requires an administrative decision and a will to change.



Source: JICA Study Team

Figure 10.5.2 Vehicle inspection procedure

## 10.6 CONCLUSIONS

Based upon the results of the practical demonstrator and in particular the impact study, critical organizational and institutional issues to be solved by the Egyptian Government for the sustainable implementation of the Traffic Safety Program are:

- Regarding the content of the Workshops the textbooks and presentations need to be improved in order to enrich and be more professional. The general approach of the Practical Demonstrator could be maintained.
- The design of the sticker was “Innovative and efficient” but a more professional design should be considered.
- In order to promote the sustainable activities of safety education in Egypt, the idea of a new organization such as “Traffic Safety Council” composed of several organizations was indicated the highest share at 50%, next high share with 40% was in favor of continuing with the existing Practical Demonstration Team in a more structured setting.
- Following organizations or agencies are considered important for a successful campaign and are provided in order of importance: 1) Traffic police, 2) Road directories, 3) Universities or schools, 4) CTEB, 5) Others (ENIT), and 6) NGO.



Public participation from non-governmental organizations was considered less important for achieving a sustainable traffic safety campaign.

- The approach of the Practical Demonstration Team was “Efficient”. The top three list of important activities were; 1) Annual traffic safety education programs, 2) Development of road safety materials and 3) Organizing and implementing a road safety policy.
- In order to achieve sustainable traffic safety campaigns, the main problems in a ranked order were following; 1) Financial resources, 2) Organization, 3) Experts and 4) Educational equipments.
- Proposals to solve the issue of financial resources were: 1) Donations of the private sector (in particular automobile companies, automobile club and insurance companies), 2) Project funding by donor’s countries or development banks and 3) Allocating penalty money (penalty-point system) from traffic offenders to the program.
- Proposals to solve the organizational issues were in order of appreciation; 1) Coordination among concerned authorities, 2) Establishment of “Traffic Education Center” to coordinate education activities and adoption of a formal traffic safety education system by Presidential Decree, 3) Establishment of a “Road Safety Council” with separate budget, 4) Institutional support is necessary for the traffic safety education program.

The proposed TRASAC and sub-departments TRASEC and TRASIC are structured on the basis of the results of the Practical Demonstrator and subsequent Impact Study. Also the generic content of the training and education programs and of the annual safety awareness campaigns are designed according to the suggestions made during the practical demonstrator and impact assessment.

The Impact Study of the Practical Demonstration program demonstrated important improvements of participant’s consciousness and knowledge in terms of traffic safety. In addition, through interviews of members of the Practical Demonstration Team about the critical organizational and institutional issues, the importance of creating a sustainable and structured Traffic Safety Program was recognized but simultaneously, the many problems and issues related to its concrete realization were highlighted.

All participants and team members agreed that if such a campaign is to be carried out regularly, the effects will accumulate over time and contribute to decreasing traffic accidents while increasing road capacity and smoother traffic flows in addition to a much safer traffic environment.

CREATS proposes an innovative approach to solving the traffic problems in Cairo. Creating awareness and improving expertise in a structured way is one of the new components to create sustainability. For that reason, the CREATS Study Team submits in addition to this chapter a *4<sup>th</sup> Technical Report* that is dedicated to the *humanware conditions* of creating a safe and friendly transport environment in Cairo that will help to *keep Cairo moving*.

The Traffic Safety Campaign is relatively easy to implement because it is cheaper than constructing new or improving existing roads and the results will become apparent shortly after implementation.

## **10.7 RECOMMENDATIONS**

### **10.7.1 What to do?**

The transport system in Cairo is determined by three important components, hardware (infrastructure), software (equipment) and humanware (use and management). They reflect the three needs for sustainability Engineering (hardware), Enforcement (software) and Education (humanware).

The humanware factor and the level of expertise are thus directly influencing the efficiency of the two prior components through a three-way relationship.

The Practical Demonstration of a Traffic Safety Campaign during the CREATS study obtained substantial support from the counterpart authorities and was attended by over 270 participants. A follow-up survey demonstrated that the combined approach of promotion and education was highly appreciated.

It is therefore recommended to build upon the momentum obtained with the practical demonstration and repeat the program on a larger scale next year.

Simultaneously, a *Traffic Safety Campaign Implementation Project* should be initiated as soon as possible to transform the existing momentum into a sustainable program for improved traffic safety on the roads. One of the important elements in the project is to establish a nationwide organization, responsible for safe and environment friendly transport (*TRASAC*).

The implementation project should consider regulatory, institutional, managerial and operational conditions for the establishment of TRASAC and will develop the tools and techniques for the training and education programs as well as for the information campaigns.

It should also assess in detail questions related to its financing and different financial engineering schemes should be developed to minimize the impact of the program on the national budget while at the same time maximize the impact.

## 10.7.2 How to do it?

The proposed implementation study will focus on three important elements:

1. Traffic Safety Campaign for 2003/2004
2. Requirements and conditions for establishing a Traffic Safety Council (TRASAC) in Egypt
3. Identification of the regulatory, operational, managerial and financial requirements for the implementation of a sustainable TSP.

The following elements should be addressed in detail during the proposed project:

### **1 Lectures and training programs**

- 1.1 The theory and practice of traffic Lectures
- 1.2 Lectures for private and professional drivers
- 1.3 Lectures for trainers
- 1.4 Lectures for managers
- 1.5 Development of generic educational material

### **2 Study materials and background information**

- 2.1 Concept and goals of the study materials
- 2.2 Study material and background information for drivers: *“The safe driver manual”*
- 2.3 Study material and background information for trainers: *“Manual for efficiency and effectiveness in traffic training”*
- 2.4 Study material and background information for managers: *“How to manage the transport system: Theory and Practice”*

### **3 Promotion campaign: creating public awareness**

- 3.1 The role of targeted promotion campaigns
- 3.2 Conditions for sustainability of awareness creation
- 3.3 Methods and tools / theory and practice
- 3.4 Traffic Safety Campaign 2003/2004: design and implementation

### **4 Creating sustainability**

- 4.1 Conditions and requirements for establishing TRASAC
- 4.2 Establishing a generic and comprehensive TSP basic structure
- 4.3 Regulatory support and legislation requirements
- 4.4 The role of enforcement and how it will complement the TSP

### **5 The Traffic Safety Council:**

- 5.1 Organizational issues
- 5.2 Operational issues
- 5.3 Regulatory issues
- 5.4 Financing structure and revenue generating methods
- 5.5 Long term development plan

# **CHAPTER 11: THE INTEGRATED TRANSPORT MASTER PLAN**

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## **11.1 INTRODUCTION**

In the previous chapters, issues and problems of urban transport in the GCR were discussed and examined carefully by each urban transport sector. The sectors proposed many options/plans to solve/alleviate issues and problems.

These options should be integrated into one the Master Plan of the CGR. The Study Team formulated the CREATS urban transport Master Plan considering these options and plans. The Team examined discrepancies or duplications of the sector plans, and finally established the Master Plan by integrating the plans systematically.

In this chapter, Goal, Visions and Strategies of the Master Plan were discussed in the first place. What are the issues and problems, which would work efficiently to solve/alleviate the problems, what should be considered in the course of formation of the Master Plan? These issues are carefully examined and discussed again, here.

After confirming the Goal, Visions and Strategies, Mater Plan Formation Procedure is explained. Descriptions on Master Plan Scenarios, selection criteria and scenario evaluation are described after the procedure explanation. Some examinations to improve the draft Master Plan were made, basically applying the TDM means. After a series of improvement trials, the CREATS Integrated Urban Transport Master Plan is summarized in terms of System Development, System Integration and System Sustainability.

Finally, the Study Team proposed a recommended implementation plan based on a theoretical methodology to select priority projects and programs.

## **11.2 VISION, POLICIES AND STRATEGIES**

### **11.2.1 Overall Issues**

Cairo, the premier city of Egypt and one of the cultural as well as historical beacons of the Arab World, has reached a cross-roads; her population has swelled to more than 14 million persons and will reach 20 million in 2022, thus placing growing stress on a variety of infrastructure systems. The increasingly difficult urban

transport situation, characterized by a high degree of traffic congestion, constrained resources for public transport services and deteriorating air quality, lies in the forefront of such concerns. Concurrently, the political, spatial and economic roles of Greater Cairo are changing; the on-going implementation of the satellite cities program, anchored by the potentially massive 6th October and 10th Ramadan cities, require unique solutions which are capable of addressing both the functional integration of the region, as well as the needs of inner city development.

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.

Economic expansion within Egypt is well underway; continuing improvements in productivity and well-being are expected. As economic growth continues, changes in transport activities and behavior will follow suit. Thus, the foci of transport planning must gradually shift from alleviation of present deficiencies to realization of a transport system founded upon sustainable evolution and integrated, mutually supportive transport solutions. This strategy is particularly valid in the 20-year planning horizon.

If history holds any lessons, it is that future growth in income will inevitably catalyze an increase in trip making, as well as changes in the types of modes used to accomplish such trips. It is likely that private modes of transport, such as passenger cars, will continue to become increasingly popular with Cairo people. The key issue is therefore how to manage growth in transport demand by developing transport systems that ultimately enhance economic productivity, increase personal mobility, improve the urban environment and ensure financial viability. A key consideration in this regard is that ultimately the need to move people must take precedence over the need to move vehicles.

A need for capital-intensive improvement projects will likely be confirmed as the investigative efforts proceed. This, in turn, will require careful thought regarding investment decisions. Domestic funds will likely be limited for the foreseeable future, thus, international funding in the form of aid, grants and other monetary mechanisms is expected to evolve as an important source of finance, including the participation of the private sector.

A series of the extensive surveys conducted by CREATS revealed a number of notable findings and planning implications on the current transport situation in the Greater Cairo Metropolis. Based on those, it is clear that new additional infrastructure construction cannot, in isolation, provide a comprehensive solution. Other mutually supportive strategies are required.

## 11.2.2 Goal and Visions

CRETS aims at a social goal to ultimately achieve three (3) visions, of which each is the vital factor to improve the Egyptian people's quality of lives:

### ***Vision 1: To Achieve a Sustainable Social and Economic Growth***

Cairo, the premier city of Egypt, should be a robust engine to drive the Egyptian economy towards keeping its position as the economic and cultural center in the Arab world as well as Egypt in the future.

### ***Vision 2: To Assure Social Equity***

Benefits of the development should not be concentrated on selected groups, but should be equitably prevailed for all the people. Getting one happy must not worsen another.

### ***Vision 3: To Improve Urban Environment***

Being free from any fear of environmental risks is an essential condition for all urban habitants to enjoy sustainable urban life and economic activities. The healthy city must be a pride of all the Cairo citizens.

### ***Missions of Transport***

The transport sector shall play significant roles to materialize the above social visions. The Cairo urban transport should be developed to satisfy the following three:

- Economically Effective Urban Transport Systems
- Equitable People's Mobility
- Safe and Comfortable Transport System

## 11.2.3 Five (5) Key Strategies

In line with the three missions of transport, 5 key strategies are proposed towards a new challenge for making Cairo Transport innovative on the coming two decades time-horizon:

### ***Strategy 1: Improvement of People's Mobility***

Urban economies are supported by smooth and uneventful travel activities of an individual from one place to another with a purpose, which can be achieved by an optimal transport mode, not necessarily with a vehicle. The most important is that people's mobility should be improved in such a way that every travel can be made by the optimal cost, time and mode. Alleviation of road congestions is one of vital issues to be tackled, however, this shall contribute to improve the people's mobility rather than vehicle's mobility. To support the megalopolis with a 20 million population in this sense, development of a well-functioning public transport system is a must.

**Strategy 2: Optimal Infrastructure Development**

Viewing future changes in social and economic activities as well as people’s travel behaviors, economically justifiable investments should be explored in order to fulfill a gap between demands and supplies. Over-investments to provide a supply capacity shall eventually shoulder a negative burden on the society, and under-investments will cause economical losses in the society. The key word must be “optimal” in terms of budgetary and economic affordability of capital investments and costs for operation and maintenance.

**Strategy 3: Safe and Comfortable Transport**

Safe transport is not only a basic requisite for the human right but also a critical factor to alleviate social and economic losses. A social norm that pedestrians shall take advantages in daily traffics should be fostered among all people. The environmentally risky society should be moved to realize sustainable prosperity of people.

**Strategy 4: Accessible Transport for All**

Public transport services should be equally provided for all the poor, handicappers and the weak in the society. The social welfare sector needs to address effective measures even in the transport sector based on a definite policy that any social exclusion shall not be accepted referring to the constitution.

**Strategy 5: Establishment of a Sustainable Institutional and Financial Mechanism**

An Integrated policy implementation, a strong leadership for appropriate and timely decision-making and a sustainable mechanism to meet financial demands need to be established in order to make the Cairo Transport more functional and rational. In this regard, a number of institutional reforms should be taken into action with a firm will by the elected people.

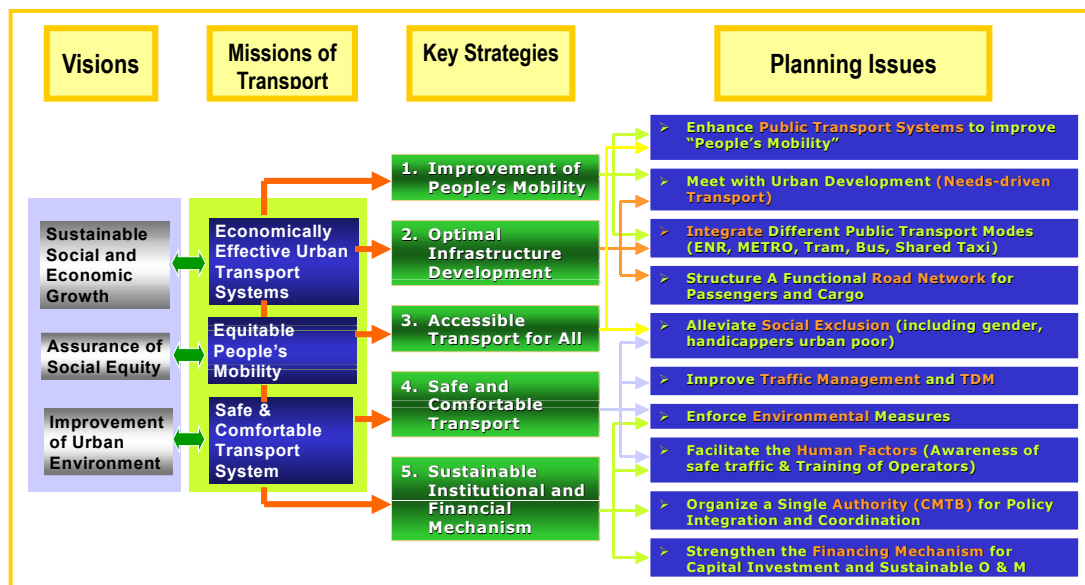


Figure 11.2.1 Planning Structure of CREATS



### **11.3 MASTERPLAN FORMATION PROCEDURE**

A flowchart of overall CREATS Master Plan formation procedure is shown in Figure 11.3.1.

Based on discussions on Item 1: Vision and Item 2: Issues in the previous section, Item 3: Policies and Strategies were derived.

According to the policies and strategies of the Master Plan, the Study Team made Item 4: Master Plan Components, which would solve/alleviate urban transport issues/problems in the GCR. The components cover a wide range of plans from infrastructure development to institutional and organizational matters related to the urban transport issues.

After finishing preparation of the Master Plan Components, the Study Team separated the components into two groups. The components in the first group meet mathematical analysis such as infrastructure improvement components, while effects of the second group cannot be measured by mathematical tools. Generally speaking, mathematical tools are effective for calculating effects of infrastructure development, but organizational and institutional renovation, traffic safety awareness, transport planning capability cannot be calculated easily. The second group components are Item 6: Non-quantitative Components Plans.

The first group components of the master plan were combined into several scenarios, which are draft master plan scenarios (Item 7: Scenario Development). A master plan consists of various sub-plans (components). The Study Team firstly developed a “Do Maximum Scenario” to test its effects to the urban transport problems in Cairo. The “Do Maximum Scenario” includes potential improvement plans at the greatest at the moment.

Component 8: Scenario Evaluation Criteria was prepared at the same time to evaluate the planned Master Plan Scenarios, which consists of three parts of 1) Economically Effective Urban Transport System, 2) Equitable People’s Mobility and 3) Safe and Comfortable Transport System, corresponding to the mission of transport of the CREATS Urban Transport Master Plan.

The scenarios were tested by the CREATS Models shown in Item 9 of the flowchart. The model was developed for the Study, based on a series of surveys conducted in this Study, including a huge scale of Home Interview Survey, which collected information on travel activities and household/person characteristics of more than 57 thousand households. The CREATS Models tested the prepared scenarios by computing evaluation indices stipulated by the Component 8: Scenario Evaluation Criteria.

In Item 10: “Satisfied?”, evaluations of scenarios were made until satisfactory results are obtained referring to the evaluation criteria. The initially prepared scenario, which was the “Do Maximum Scenario”, was improved repeatedly by every computer run.

After a series of modifications of scenarios, computer runs and evaluations, the Study Team obtained final satisfactory results of the Master Plan Scenario in Item 11: Draft Master Plan Scenario.

In the next stage, Item 12: Master Plan Improvement Options were prepared to improve the master plan at the most. These options consisted of basically Transport Demand Management (TDM) measures, which are 1) Introduction of fuel tax, 2) Introduction of Parking Charge System, 3) Common Ticketing System of Public Transport Modes and 4) Multi-polar Urban Sub-center Development Scheme. These options were tested based on the selected Scenario D.

Based on the developed Draft CREATS Urban Transport Master Plan scenario, results of the sensitivity test of the improvement options and the non-quantitative component plans, the Study Team finally formed Item 14: the Integrated CREATS Urban Transport Master Plan. The final integrated master plan includes not only infrastructure plans but also TDM plans and institutional renovations examined in the preceding chapters.

The final master plan was evaluated in terms of economic viability and environmental impacts in the succeeding chapters.

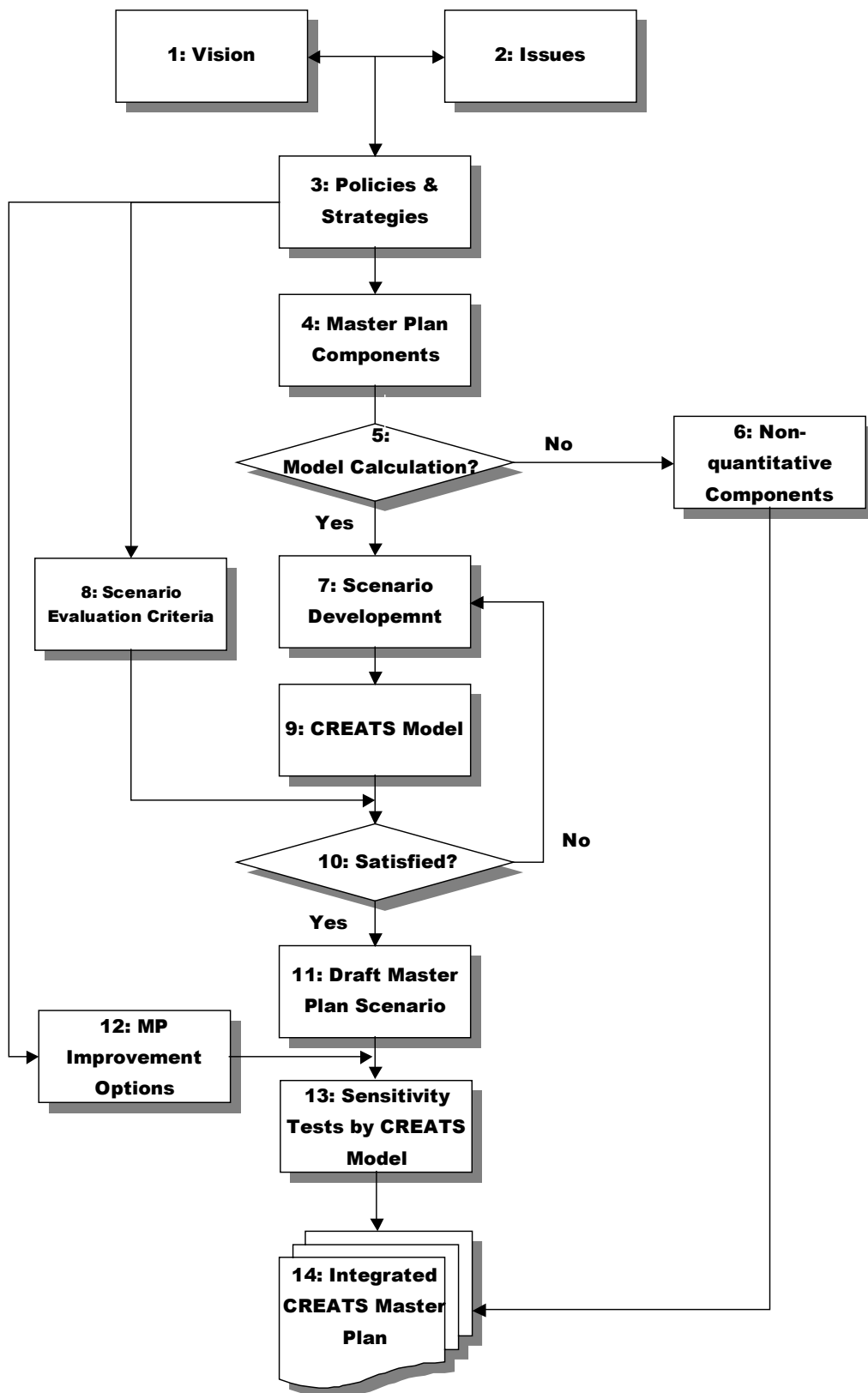


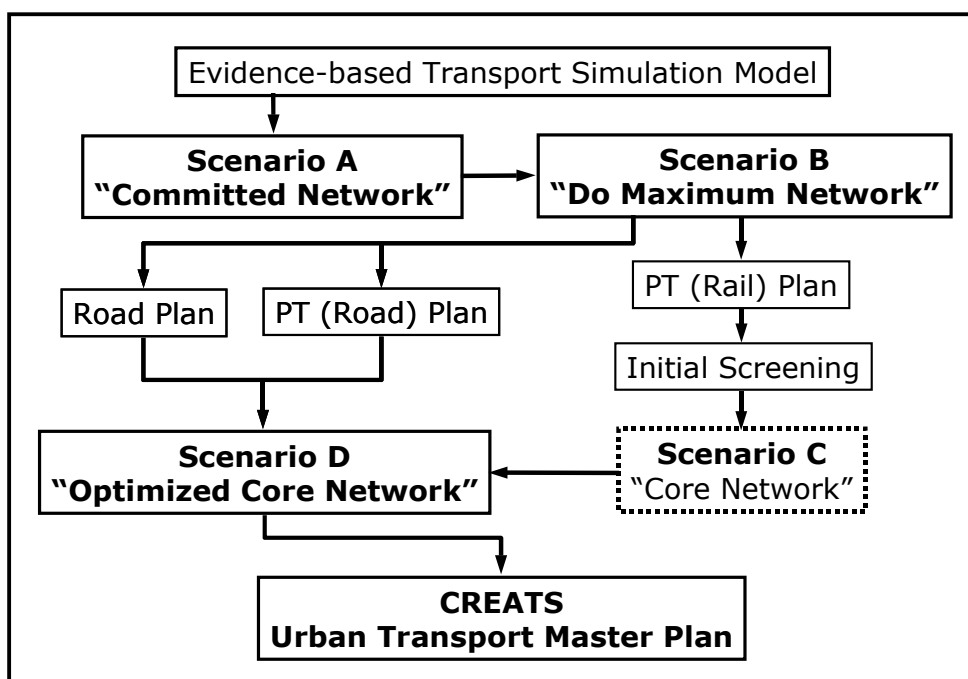
Figure 11.3.1 CREATS Master Plan Formation Procedure

## 11.4 CREATS MASTER PLAN SCENARIOS

### 11.4.1 Scenario Development

CREATS has initially developed alternative infrastructure projects and/or programs by sub-sector which are assessed to be improved and newly developed, based on analysis and examinations about the current and future transport issues. These sub-sector improvement plans are integrated into several scenarios for an Integrated master Plan, and were tested in terms of the efficiency, the complementary effects and the projected future transport demands.

Figure 11.4.1 shows the master plan scenario formulation procedure. Four scenarios, namely Scenario A through D, are composed of different project components. Since Scenario C is a process of the optimal core network (Scenario D), the master plan scenarios are explained mainly for Scenario A, B and D.



Source: JICA Study Team

**Figure 11.4.1 Master Plan Scenario Formulation Procedure**

There are some urban transport related projects in the study area, which are already on going or decided to execute in near future, such as projects included in the Five-Year Plan, Metro Line No.3, extension of Metro Line No. 2 and minor extension plans of tram. The Study Team considered these projects as “Committed Projects”. These committed projects were not analyzed nor evaluated in this scenario development, because the committed projects are considered as the projects, which should be included in the so-called “Do-Nothing” case. However, when it comes to a discussion on budgetary constraints, the study team referred to costs of the “Committed Projects” to make the Master Plan be realistic.

Therefore, as mentioned earlier, the Study Team initially prepared the Scenario B: “Do Maximum” as the most extensive infrastructure development plan for public transport and highway network.

The Scenario B is a maximum infrastructure development of rail-based and road-based public transport with an extensive urban expressway/highway network, by ignoring budgetary constraints of the public sector.

- Highway: In addition to the committed network, 18 arterial road development projects and a 90 km long new urban expressway development project were added.
- Rail-based public transport: In addition to the committed network, the planned Systra Corridor 4, 5 and 6 projects by Systra in 1998 and new busway/passenger railway services form the CBD to the two new communities.
- Road-based public transport: In place of the existing bus and shared taxi service, extensive bus-ways and trunk bus system are introduced on major roads in the area. Shared taxi service will work as feeder service to the trunk bus system.

The scenario is summarized in Table 11.4.1 (refer to Chapter 4: Public Transport System and Chapter 5: Urban Road System).

**Table 11.4.1 Scenario B: “Do Maximum” Public Transport and Road Network**

Road Network	Committed Network + Improvements Urban Expressway Network (92km)
Public Transport	
MRT	Committed Network + Systra Corridor 4,5 & 6 Satelite city corridors
LRT	Improved tramway
Bus	Optimized shared-taxi & bus route structure coordinated with MRT/LRT network

*Note: Systra Corridor 4,5, & 6 were planned by Systra Study in 1998.*

Figure 11.4.2 and 3 show network maps of public transport and urban expressway network in the Scenario B, respectively

The Scenario C was formulated in the process of optimizing the public transport network. After Scenario B was formulated, the effort was made how to minimizing the master plan cost with maintaining the network performance as much as possible.

The optimization began with the initial screening process, which tested various rail-based public transport network alternatives<sup>1</sup>. This resulted in the “Core Network”, Scenario C.

<sup>1</sup> See Chapter 4, Section 4.6 and 4.7 for more detailed discussion.



Source: JICA Study Team

**Figure 11.4.2 Scenario B: Rail-based Public Transport Network**



Source: JICA Study Team

**Figure 11.4.3 Scenario B: Urban Expressway Network**

The Study Team tested a series of network by revising the Scenario B to reach to a satisfactory scenario. Finally, the Study Team obtained Scenario D as an optimal scenario by clearing the evaluation criteria and satisfying budgetary constraints in some extent. This scenario is a basic infrastructure network to finalize the CREATS Urban Transport Master Plan. Table 11.4.2 shows a summary of the Scenario D components and Figures 11.4.4 – 6 show a map of rail-based public transport network, road-based public transport network and the bus-way system in Scenario D.

The Scenario D is an Optimized infrastructure development of rail-based and road-based public transport, by considering development possibility such as physical constraints at planned sites and budgetary constraints in some extent.

- Highway: Length of urban expressway was shortened from 90 km to 78 km.
- Rail-based public transport: In place of Systra Corridor 4, 5 and 6, Metro Line No. 4 was incorporated, which is a combination of the partial sections of Corridor 4 and 6 of the Systra Plan 1n 1998.
- Road-based public transport: Same as the Scenario B.

**Table 11.4.2 Scenario D: “Optimized” Public Transport and Road Network**

Road Network	Committed Network + Improvements Urban Expressway Network (78km)
Public Transport	
MRT	Committed Network + Metro Line No. 4
LRT	Satelite city corridors
Bus	Super tram system
	Same as Scenario B

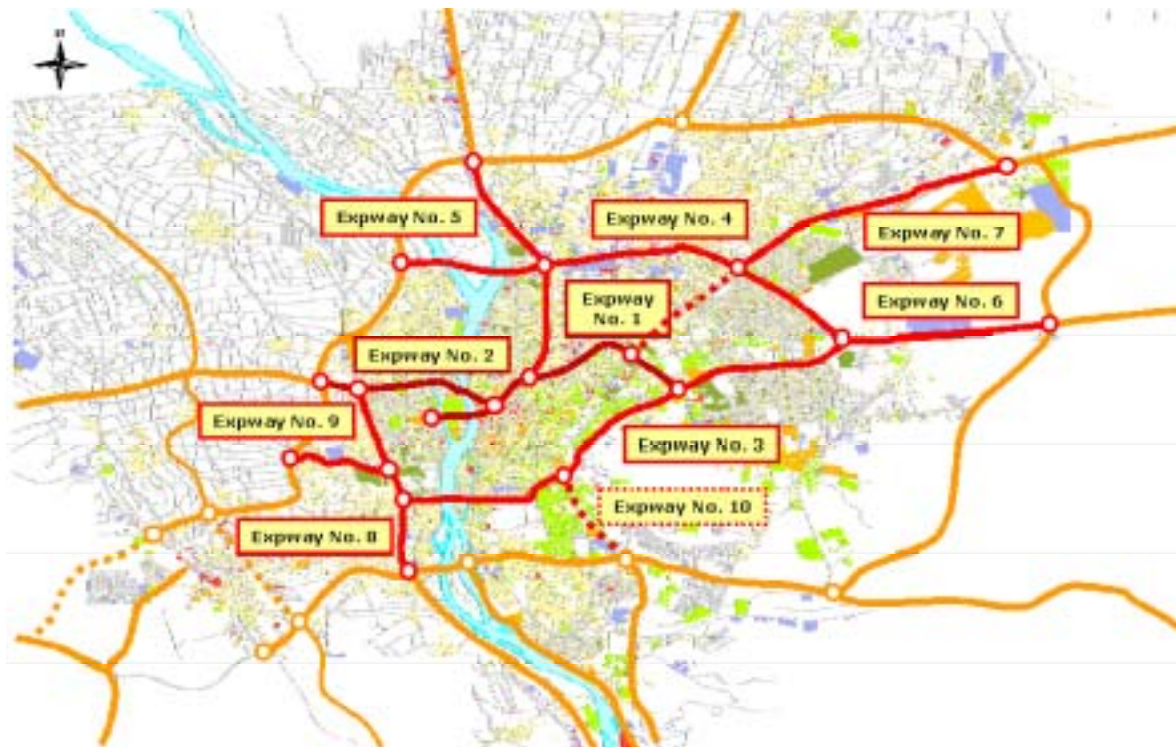
*Note: Metro Line No. 7 is the CREATS proposed line.*





Source: JICA Study Team

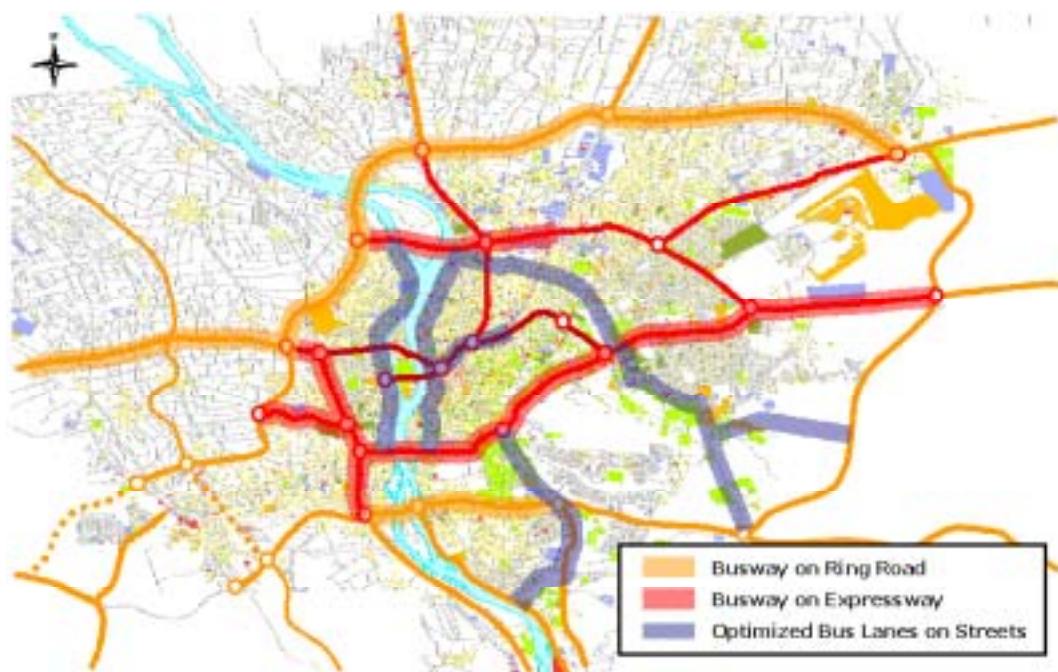
**Figure 11.4.4 Scenario D: Rail-based Public Transport Network**



Source: JICA Study Team

**Figure 11.4.5 Scenario D: Urban Expressway Network**





Source: JICA Study Team

**Figure 11.4.6 Scenario B and D: Bus-way Network**

Table 11.4.3 summarizes a comparison of the Scenarios of A (Committed), B (Do Maximum) and D (Optimized).

**Table 11.4.3 A Comparison of Scenarios**

Plans	Scenario		
	A Committed	B Do Max.	D Optimized
<b>Rail-based Public Transport</b>			
RW-1 Existing Railway Services	○	○	○
RW-2 Line No. 3 (whole planned section)	○	○	○
RW-3 Line No. 2 extension	○	○	○
RW-4 Systra Corridor No. 4, 5 and 6		○	
RW-5 Line No. 4			○
RW-6 LRT in Heliopolis Improvement		○	○
RW-7 LRT in Helwan Improvement		○	○
RW-8 Wing Railways to New Communities		○	○
<b>Road-based Public Transport</b>			
BS-1 Existing Bus System	○		
BS-2 Existing Shared Taxi Operation	○		
BS-3 Busway System		○	○
BS-4 Area-based Shared Taxi Operation		○	○
<b>Water-based Public Transport</b>			
FR-1 Ferry Service Improvement		○	○
<b>Road Network</b>			
RD-1 Existing Road Network	○	○	○
RD-2 Committed Road Improvement	○	○	○
RD-3 New Highways and additional roads		○	△ <sup>1</sup>
<b>TDM Policy Options</b>			
TD-1 Tollway System		○	○
TD-2 Fare/tariff Structure for Public Transport Mode			○
TD-3 Parking Charge System			○
TD-4 Introduction of Fuel Tax			○
TD-5 Multi-polar Urban Structure			○

Note 1: New highway system scale is small then the scenario B.

Investment costs of the scenarios are summarized in Table 11.4.4. Scenario A “Committed” cost was added to Scenario B and D to see budgetary affordability of the scenarios. Therefore, the Scenario B costs LE 71.8 billion, while the Scenario B costs LE 59.8 billion.

**Table 11.4.4 Capital Cost by Scenario in LE Billion**

Scenario	Mode	2003 - 06	2007 - 11	2012 - 16	2017 - 21	Total
Scenario A "Committed"	Road	2.4	0.0	0.0	0.0	2.4
	Bus	0.2	0.2	0.2	0.2	0.8
	Railway	2.4	6.7	5.7	0.3	15.0
	Total	4.9	6.9	5.9	0.5	18.2
Scenario B "Do Maximum"	Road	2.7	2.6	2.6	2.4	10.3
	Bus	1.8	1.6	1.2	1.1	5.6
	Railway	2.3	5.4	8.8	21.2	37.7
	Total	6.7	9.5	12.7	24.7	53.6
Scenario D "Optimum"	Road	2.3	2.3	2.3	2.1	9.0
	Bus	1.8	1.6	1.2	1.1	5.6
	Railway	1.6	3.9	6.3	15.2	27.0
	Total	5.7	7.7	9.8	18.4	41.6

*Note: Scenario B and D do not include the cost of the committed projects.*

## 11.4.2 Scenario Evaluation: Criteria and Results

### (1) Scenario Evaluation Criteria

The Study Team prepared the Scenario Evaluation Criteria based on the mission of transport introduced earlier in this chapter. The criteria are shown below.

- Economically Effective Urban Transport System
  - a) Investment cost: Index to clarify budgetary affordability, which includes not only investment cost of the scenario but also the cost of “Committed Projects”.
  - b) Economy (B/C: benefic cost ratio): Index to identify economic efficiency
  - c) Trip speed (km/h, average trip speed of the people by all modes): Index to represent transport system performance
  - d) Modal share of public transport (%): Index to satisfy public transport usage
  - e) Number of public transport passengers (number of un-linked trips of public transport mode): Index to satisfy public transport usage
  - f) Total vehicle-kilometers: Index to show system efficiency and vehicle usage
  - g) Road congestion (V/C: a ratio of average daily traffic volume against road capacity): Index to show road system capacity
- Equitable People’s Mobility

- a) Population within 800 m along major public transport modes: Index to see overall system coverage
- b) Employment within 800 m along major public transport modes: Index to see system coverage over economic activity
- c) Students within 800 m along major public transport modes: Index to see system coverage in terms of education
- d) Low income population within 800 m along major public transport modes: Index to see system coverage for low income people

The “major public transport modes” denotes rail-based public transport.

- Safe and Comfortable Transport System

- a) CO<sub>2</sub> emission: A representative index to show environmental impact

## **(2) Evaluation Results**

Evaluation results are shown in Table 11.4.5 with comparison to the existing situation, Scenario A (Committed), Scenario B (Do Maximum) and Scenario D (Optimum). It should be noted that this table is the final evaluation table of the Master Plan.

- Base Year

These indices are shown to compare with those in future.

- Scenario A

This is a case in 2022 when no improvement would be done except for the committed projects, as explained before.

As shown in the table, the most striking difference among the indices was low trip speed compared to the Base Year. The speed dropped down to almost a half of the Base Year. The Daily Vehicle-km is also remarkable. It increased more than double. The number of public transport passengers increased around 37 % over the Base Year.

The above was related with the efficiency of urban transport system. In terms of “Equitable People’s Mobility”, all indices show increase. This is because of results by the committed projects execution and by increase of socio-economic growth of the area.

The CO<sub>2</sub> emission, which is only one index of environmental impact, clearly shows an increase of air pollution.

- Scenario B and D

As explained before, the Scenario B is the case that the most intensive urban transport system development was made, while the Scenario D was a resulting

optimum solution derived from the B to maximize investment efficiency by keeping the decrease of effects to minimum.

In both Scenarios, Trip Speeds, Modal Share of public transport and V/C were kept at almost same level as the Base Year. Major differences were investment Cost and B/C. Total investment of the Scenario D is less than the B by around 17%. The B/C of the D was apparently big against the B. As a whole, the D was considered satisfactory in terms of economic efficiency of the Master Plan.

Regarding “Equitable People’s Mobility”, the D covers more area than the B in all the indices except for the number of students. The improved B was considered satisfactory.

The “Alleviation of Environmental Pollution” index was improved by the D compared to the B. Although the emission of CO<sub>2</sub> increased from the Base Year, the D decreased total volume of emission. Therefore, the Study Team considers the D is acceptable in terms of environmental pollution as well.

Concerning the CO<sub>2</sub> calculation, it should be noted that in the Scenario B and D, it was assumed that maximum travel speed of trucks would be regulated at 40 km/h because of a big CO<sub>2</sub> emission rate per one vehicle-kilometer.

As a conclusion, the Study Team proposes that the Scenario D should be a Master Plan of the GCR as an urban transport infrastructure development plan.

**Table 11.4.5 Scenario Evaluation Results**

Scenario	Base Year 2001	Scenario A 2022 Com.	Scenario B 2022 Do Max	Scenario D 2022 Opt. Core
<b>Economically Efficient Urban Transport System</b>				
Cost (LE billion)	--	18.2	71.7	59.8
Economy (B/C)	--	--	1.41	1.77
Trip Speed (km/h)	19.0 km/h	11.6 km/h	18.2 km/h	18.0 km/h
Modal Share of PT (%)	70.9%	61.7%	58.0%	57.9%
No. of Pax of PT (Million)	13.3	18.2	21.1	20.3
Daily Vehicle-km (10 <sup>6</sup> pcu-km)	62.8	127.3	144.0	139.7
Average Congestion (V/C)	0.67	1.11	0.96	1.00
<b>Equitable People's Mobility</b>				
Population (share to total) within 800m along Major PT (Million, %)	2.04 (14.2%)	3.09 (14.9%)	8.8 (42.5%)	8.2 (39.5%)
Employment within 800m along Major PT (Million)	1.11	1.70	3.60	4.20
Students within 800m along Major PT (Million)	0.74	1.08	2.60	2.70
Low Income Population within 800m along Major PT (No. of HH)	46,300	68,400	174,400	188,300
<b>Alleviation of Environmental Pollution</b>				
CO <sub>2</sub> Emission (10 <sup>6</sup> ton)	12.2	15.9	13.8	13.6

Source: JICA Study Team

### **(3) Budgetary Affordability**

As seen in Table 11.4.4, necessary investment cost to execute the scenario D amounts to nearly LE 60 billion. This huge amount of investment should be prepared to realize the Master Plan.

The Study Team examined past transport related budget as well as potential financial sources for the investment as discussed in chapter 9. Based on the discussion in the chapter, the Study Team examined budgetary affordability of the public sector of Egypt to the Scenario D as below.

- A total government investment to the transport sector in the GCR during the last Five-Year Plan (1997 – 2002) was estimated as around LE 10.25 billion. It means that the investment was LE 2.05 billion per year on average. This amount corresponds to 0.6 % of GDP in 2000/2001 of Egypt.
- The Master Plan period covers four Five-Year Plan periods. Therefore, available government budget for the Cairo Planning Region would amount to LE 41 billion, if past investments continues in the future as well.
- According to the CREATS forecast on future economic growth of Egypt (refer to chapter 2), the economy will grow at an average rate of 4.6 % in real term. If the government budget increases along with the economic growth, total budget for the transport investment to the GCR would amount to about LE 73 billion for future 20-year period.
- Based on the above discussion, the budget scale of Scenario D is considered affordable, while the investment cost of the Scenario B seems critical.

Discussion might occur that government budget to the transport sector of the Cairo Planning Region during the previous period was exceptionally big because of expense for Metro Line No.2 construction. However, the GCR is an engine to propel national economy of Egypt and it is considered necessary to invest to urban transport improvement to maintain the engine.

Government budget, however, usually fluctuates year by year. The Study Team discusses other stable and robust funding sources to cope with this issue in the later section.

## **11.5 MASTER PLAN IMPROVEMENT OPTIONS**

### **11.5.1 Transport Demand Management (TDM)**

One of major characteristics of transport demand is that it is basically “derived” demand. It is rare that people travel only for transport purpose. People travel, for instance to go to work, to go to school and/or to go to somewhere for recreation. Transport demand is demand of movements to attain some original demand.

Therefore, transport demand is generated by those “original” demands, namely working, education, recreation and so on.

If those demands have a peak, transport demand has a peak in consequence.

In urban life, work starts in the morning, schools begin in the morning. In the evening, work, school and major activities finish. Transport demand for these activities, therefore, has peaks in the morning and evening as a result.

Transport Demand Management (TDM) is an idea to control concentration of transport demand, because the concentration of the demand causes serious traffic congestion in urban areas.

Traffic congestion is usually generated in specific time of day and in specific urban areas. The TDM aims at solving the traffic congestion, by leveling the peaks in time and space and by shifting use of transport mode from car to public transport for efficient use of transport infrastructure.

Major tools of the TDM are summarized as below:

- Pricing, such as road pricing in CBD, common ticketing system among urban public transport modes, taxation to car ownership and car usage and so on;
- Enforcement, such as traffic restriction to city centers by number plates of cars, priority traffic treatments for public transport, three in one policy in Jakarta and so on; and
- Public cooperation, such as transport management association, staggered working hours/weekends, car-pool/van pool and so on.

As a long-term TDM policy, one of measures is to guide urban development direction to public transport oriented cities. Transit Oriented Development, which aims at developing urban centers with railways, is one of examples.

The CREATS tested following TDM measures by using the CREATS model.

- Public Transport Fare/tariff Change and Common Ticketing System;
- Introduction of Fuel Tax and Parking Charge System; and
- Multi-polar Urban Structure Development.

### **11.5.2 Public Transport Fare Change and Common Ticketing System**

To promote public transport system, the Study Team tested performances of alternative scenarios as mentioned before, mainly for infrastructure development. Common ticketing system is one of soft measures without huge investment to promote public transport system, because the system reduces transfer resistance for public mode passengers. Passengers can transfer modes without buying a new ticket of next mode, because the ticket is valid for all public transport. Fare/tariff system is also considered in the system that an integrated system will be introduced.

Passengers do not have to pay first ride fare twice even though he makes transfers. Therefore, travel resistance of passenger is expected to reduce significantly.

Of course, to introduce the system, public transport operators have to make an agreement. Fare adjustment organization is definitely necessary to allocate the collected fare/tariff revenue.

The Study Team conducted a test run by using the CREATS transport model to identify the effects of the common ticketing system based on the scenario D. The results are shown below:

- Number of public mode passengers:

Total number of public mode passengers increased from 20.3 billion to 22.1 billion per day.

- Revenue change of public transport operators:

Total revenue of public transport operators increased from LE11.6 billion to LE12.2 billion.

In this run, existing fare system was changed to a simple distance based fare system for all public transport modes. The new fare level is 10 Piaster/km. No first ride charge was assumed as mentioned earlier.

Because the existing fare system is pretty different from mode to mode, the new fare is expensive to some modes, and on the other hand it is cheaper than the current for some other modes. Therefore, the Study Team could not get a clear idea on the effects. However, the simple test implies that public modes would be utilized more if the common ticket system is adopted, and that increasing current fare level would be one of the options to be tested further. A further study will be necessary to identify the effects by testing a series of possible options. In the further study, season ticket system, which offers cheaper price of ticket to patronage by providing free rides during designated period, should be examined. In place of the discount of fare by the system, public transport operators would receive advance payment and the operators would obtain pretty stable and robust patronage.

### **11.5.3 Introduction of Fuel Tax and Parking Charge System**

Fuel price of one litter of gasoline is LE 1.00 in average in Egypt. It is considered substantially cheap compared to other countries. This low fuel price usually generates over usage of car transport. It will also affect car ownership increase in longer term, because of low operating cost of cars.

Government subsidy usually deteriorates optimal resource allocation in the market economy system. In this sense, low fuel price associated with subsidy causes over consumption of fuel. In addition to this, social cost should be considered if one talks about car usage.

Car usage, as discussed everywhere, generates air pollution by its emission gas. It can be said that the cost is not compensated by car users at the moment in Egypt. Car occupies public space not only roads by illegal on-road parking but also sidewalks for pedestrians as seen everywhere in the city.

Therefore, the Study Team considers that the introduction of fuel tax is one of important and strong means to reduce car usage and to promote public transport mode. The tax would work to control over usage of cars and it will adjust scarce resource allocation in the economy.

The introduction of the tax would contribute not only reducing car usage and delaying the motorization, as mentioned above, but also increasing financial resources of the public sector.

Introduction of parking charge system is aiming at reducing car traffic to the CBD as well as increasing financial resources of the public sector. This is a means to reduce car traffic concentration to specific areas of the city.

In this sensitivity test, fuel price was doubled, which means that the public sector receives LE 1.00 per litter as the fuel tax. Regarding the parking charge, assumption was made that cars entering to the CBD area and Giza area, which was mentioned in Chapter 8, are levied LE 10.00 as parking charge.

These assumptions were made simple, for the purpose of the test by the models, though analyses in the previous chapter were in detail.

The test results are shown as below.

- Traffic congestion

The volume capacity ratio (V/C) decreased from 1.2 to 1.1. This seems not so big, but it considered big because the difference between B and D was almost nothing.

- Average daily trip speed

The trip speed increased remarkably from 18 km/h to 20.7 km/h in comparison with D. In 2001, which is the current network, the speed was 19.0 km/h. Therefore, this index showed a striking improvement in terms of people's mobility. By introducing the fuel tax and parking charge system together with the Scenario D, people can move quickly than now in 2022.

- Public transport usage

Corresponding to the introduction of the fuel tax and the parking charge system, modal share of public transport modes increased from 57.9 % to 61.0 %. Number of public mode passengers also increased from 20.3 million to 22.0 million, which is equivalent to 8 % increase, compared to the D.

- Vehicle-km



Comparison of vehicle-km in terms of pcu (passenger car unit) showed 10 % decrease compared to D, from 139.7 million-kilometer to 126.4 million per day.

- Number of cars entering to the parking charge system areas

As mentioned earlier, the Study Team assumed two areas as the parking charge system area in the central city. Effect of this measure was calculated at the same time of the fuel tax introduction. The effect was outstanding. Total number of cars entering the parking charge system area reduced by 44 % daily, from 518,500 vehicles to 289,300 vehicles.

The Study Team considers that the introduction of fuel tax and parking charge is strongly effective to promote public transport.

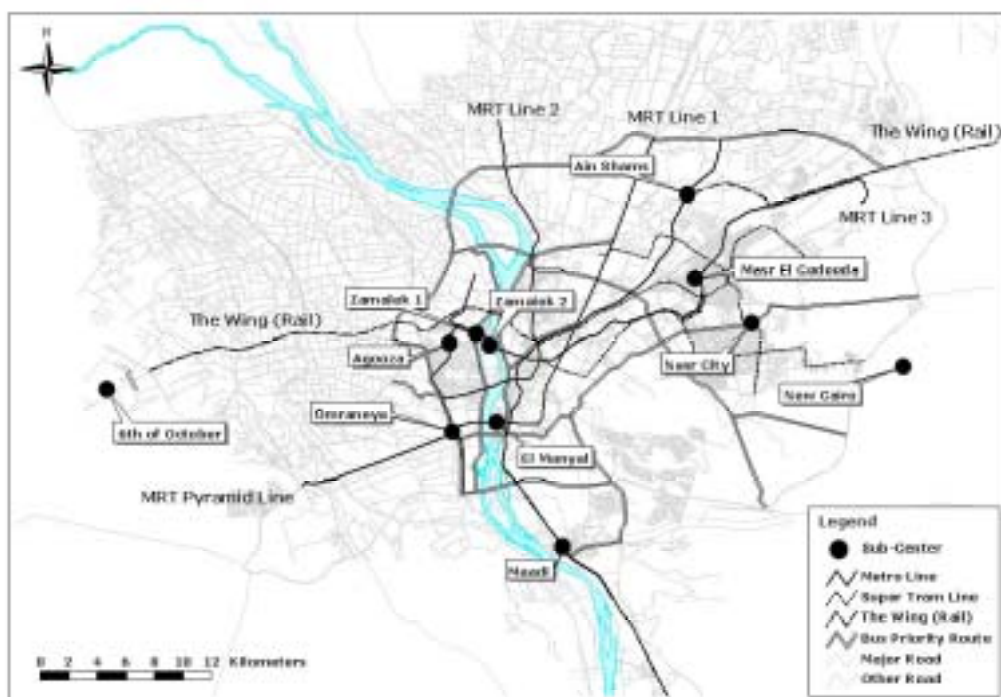
#### **11.5.4 Multi-polar Urban Structure Development**

It is clear without saying that urban transport should be planned in good coordination with urban development, because that location and magnitude of urban activities determine travel demand in the area. However, it is not necessary true in GCR. As shown in Figure 2.4.1 in Chapter 2, employment in 2001 is concentrated in CBD, Giza, Heliopolis and Nasr City area. In 2022, the Study Team estimated future employment by zone as shown in Figure 2.4.11. The future employment distribution is almost same as that in 2001, because no clear development policy was found in the area.

This causes a serious congestion in the central area of the city, by concentrated employment chances in the center. To attain an efficient utilization of urban transport infrastructure, intentional growth of urban sub-centers around the fringe area of the city is necessary. An urban development plan should consider the sub-center development to cope with traffic problems, particularly traffic congestion. In this sense, urban sub-center development is considered as one of the TDM in longer term to avoid special concentration of transport demand.

The Study Team has conducted a sensitivity test on this sub-center development using the CREATS travel demand forecast models. The team selected 11 centers as the sub-centers in the future as shown in Figure 11.5.1. These sub-centers were selected based on current concentration of the tertiary industry employment and future development potential in line with future public transport development. Simple assumptions were made to determine future tertiary industry employment as below.

- A half of tertiary industry employment increases during 2001 and 2022 will move to the eleven sub-centers from remaining area;
- The diverted employment will be allocated to the sub-centers in proportion to the current number of tertiary employment by sub-center; and
- The other area than the sub-centers will lose tertiary employment in proportion to the current tertiary employment.



Source: JICA Study Team

**Figure 11.5.1 Multi-polar Urban Structure Plan**

The increase rate of the tertiary industry employment of the sub-centers was 38 %, while decrease rate of the remaining area was 14 % as comparison to the original employment in 2022.

The effects of the multi-polar sub-centers were calculated as shown below.

- Vehicle-km

Comparison of vehicle-km in terms of pcu showed 8 % decrease compared to D, from 139.7 million-kilometer to 128.8 million per day.

- Average daily trip speed

The speed increased remarkably from 18 km/h to 23.6 km/h in comparison with D. In 2001, which is the current network, the speed was 19.0 km/h. Therefore, this index showed the best improvement in terms of people's mobility. The sub-center development is considered pretty effective.

- Public transport usage

Corresponding to the sub-center development, modal share of public transport modes increased from 57.9 % to 59.3 %. Number of public mode passengers also increased from 20.3 million to 20.8 million, which is equivalent to 2.5 % increase, compared to the D.

The Study Team considers that the effects of the sub-center development were considerable. This implies that urban development pattern affects urban transport pretty much. Therefore, systematic and synthesized planning between urban and transport development should be emphasized to approach to an efficient use of transport infrastructure in GCR.

Proper urban development plan of the area would be necessary, as well, not only to alleviate urban transport problems but also to upgrade urban life of the residents.

## **11.6 CREATS INTEGRATED URBAN TRANSPORT MASTER PLAN**

### **(1) System Development**

This topic corresponds to the Strategy 1: Improvement of People's Mobility and Strategy 2: Optimal Infrastructure Development for Integrated Transport System. This also corresponds major parts of development plans of each sector, which were described in previous chapters.

The Study Team selected the Scenario D as the most efficient and budgetary affordable urban transport system development plan in the GCR. The scenario is basically a public transport oriented infrastructure development by avoiding private transport dependent urban transport system.

The team has studied many system development plans, which were not necessarily included in the Scenario D because of quantifiable level, as mentioned earlier. A summary of development plans in 1) Cargo Transport and 2) Target Area Transport Management, which were not explicitly included in the scenarios, are described below.

- Cargo Transport (refer to chapter 6)

Cargo transport system development should not be forgotten in urban transport planning, although major focus is concentrated to people's mobility.

In urban cargo transport sector, three major system development plans were proposed, which are 1) Truck Terminal Development at three location in the North, South and East fringe of urban area, 2) Expansion of Existing Rail and River Terminals and 3) Sector Restructuring for Containerization. The truck ban regulation should be maintained in the future as well to secure people's mobility.

- Target Area Transport Management (refer to chapter 8)

Traffic management mainly copes with urgent and short-term traffic problems. In this Master Plan study, this sector focused on 1) Installation of Traffic Signals, 2) Traffic Safety Facility Development focusing on pedestrian friendly facility, 3) Parking Charge System, 4) Strengthening of Vehicle Inspection and

5) Bus Priority Lane Development as a short-term program, while as medium and long-term projects Traffic Information System was proposed.

The pedestrian safety facility development, which was proposed in chapter 8, is of particular importance to promote public transport usage. Because public transport system basically needs walking of passengers, this project is indispensable to promote public transport and should be implemented prior to the public transport improvement.

The proposed strengthening of vehicle inspection is aiming at reducing traffic accidents as well as break down of cars on the road, which causes a serious traffic congestion in everywhere and everyday in the GCR. In this sense, this proposal is considered urgent and important in the area.

## **(2) System Integration**

This topic corresponds to Strategy 1: Improvement of People's Mobility, the Strategy 2: Optimal Infrastructure Development for Integrated Transport System and Strategy 5: Sustainable Institutional and Financial Mechanism.

The above System Development plans were developed basically independent to the other sectors, though some considerations were taken in some plans. System Integration should be properly planned to make the developed system efficient, to make the system as if one systematically integrated urban transport system and to make maximum use of the system performance.

As the System Integration, the Study Team firstly planned intermodality in chapter 7, which combines different transport modes systematically. Plans of intermodality covers 1) Typical Intermodal Terminal Development Plans at Ramses, Moneeb, Ain shams and the planned Stadium station, 2) Common (Single) Ticketing System for all public transport modes and 3) Park and Ride System.

The System Integration was also proposed in chapter 4, as a combined trunk bus and shared-taxi area license scheme. The combined system also planned to be integrated with urban railway system such as Metro and tram at terminals. The trunk bus system shall be operated with the state of the art equipment such as bus location system, which reduces irritation and frustration of patronage to wait for the next bus.

However, area division for the shared taxi area franchising should be made carefully by considering existing demand pattern. If the division is made inadequately, users are forced to increase number of transfer to travel from origin to destination. It also might stimulate illegal operation of shared taxis, if demand is dense.

The common ticketing system, which was tested in this chapter as mentioned earlier, would affects modal shift from private mode to public mode, if the system works properly. The park and ride system integrates private and public transport modes, though it needs incentives and/or discouragement to car users.

As a conclusion in terms of System Integration, the Study Team intended an integration of not only public transport modes but also of private mode into the Integrated Urban Transport System in this context.

### **(3) System Sustainability**

After establishing the System Development and the System Integration, main focus should be placed on how to sustain the System. The last topic of the Integrated Master Plan comes to the System Sustainability Discussion. This topic corresponds mainly to the Strategy 4: Safe and Comfortable Transport and Strategy 5: Sustainable Infrastructure and Financial Mechanism.

The Study Team examined the sustainability from three aspects, which are 1) investment sustainability, 2) operational sustainability and 3) administrative sustainability.

- **Investment Sustainability**

As discussed in the previous section, necessary investment cost for the Master Plan is around LE 60 billion. The Study Team considered that the Master Plan is affordable by examining the past budget expenses to transport investment in the Cairo Planning Region.

However, the Study Team suggested that some stable fund is necessary to execute the Master Plan for certain and without delay. In line with this suggestion, the Team made a sensitivity test on the introduction of fuel tax and parking charge system as the TDM to make private mode users shift to public modes.

According to the calculation of the fuel tax introduction test by the CREATS model, tax revenue was estimated as much as LE 4.6 billion in 2022 and it would be LE 72 billion in 20-year planning period, if the tax rate is one pound per one litter. The calculation took not only the decrease of car traffic by the tax and by the parking charge system but also traffic growth trend during the planning period into consideration. The Study Team considers that the fuel tax would provide stable financial resource to the public sector. If the tax revenue comes to a local public sector and spent for local area urban transport development, this would meet the benefit principle. The fuel tax would be effective not only to restrain car usage but also to reduce air pollution. In addition to these, the tax would contribute to go forward to the optimum scarce resource allocation in the economy.

There is an argument that fuel tax should be spent only for roads in accordance with the benefit principle because the tax was levied to car users. However, if car users shift to public transport corresponding to public transport improvement by the tax revenue, road congestion would be alleviated and car users would receive travel time saving benefit. This argument has been made in developed countries and a consensus is almost established in the country to use fuel tax to public transport improvement. The fuel tax should be considered as a

mechanism to control over usage of cars and to attain an optimum and efficient allocation of scarce resources of the society.

Back to the fuel tax rate, it might be unrealistic to levy one-pound fuel tax per litter to petroleum. The Study Team also calculated a more realistic case that the tax would be 5-piaster per litter in the first year and that the tax would increase by 5-piaster every year. As a result, tax revenue was calculated as LE 0.8 billion in 2007, LE 1.7 billion in 2012 and LE 4.6 in 2022. Total revenue during the 20 years amounts LE 41 billion.

A toll road system was examined in chapter 5. The Study Team examined cost recovery of the toll road by the collected toll. This is one of ways for the System Sustainability of the urban expressway system.

Introduction of parking charge system in CBD was also proposed in chapter 8 and the system was tested by the CREATS model as one of TDM means as discussed earlier. In chapter 8, one proposal was made to spend the collected charge to construct parking lots in the CBD area. Annual revenue from the system was estimated as LE 0.8 billion in 2022.

As a conclusion, the Study Team strongly proposes the introduction of fuel tax as local earmarked tax for urban transport improvement of the area to secure investment sustainability.

- Operational Sustainability

The Study Team considers operational sustainability as crucial to secure future public transport operation. In this sense, financial revenue of the operators should be increased to an appropriate level to continue the service supply. If the financial revenue is not sufficient, the operators would reduce service frequency, use old vehicles for a long time, drop maintenance quality and so on. In the end of the day, the service might be halt.

In chapter 4, it was analyzed that public transport operators, such as Cairo Metro Organization (CMO) and Cairo Transport Authority (CTA), have been suffering deficit. The operators usually cut operating expenses such as maintenance of the system. This might cause deterioration of level of service because of insufficient maintenance of the system. This is the issue of operational sustainability.

The Study Team understands that fare level of public transport is highly political because it closely relates to the living standard of people. However, self-sustainable operation by appropriate fare level should be secured to make public transport operators sustainable. The self-sustainable operators would need minimum subsidy from the public sector. Therefore, the Study Team proposes to review public transport fare levels by operators. Management efficiency should be investigated at the same time of the fare level review.

In section 11.5 Master Plan Improvement Options, the CREATS model calculated effects by Public Transport Fare/tariff Change and Common Ticketing System as one of sensitivity tests. The result showed significant increase of public transport passengers.

The common ticketing system intends to promote public transport modes by providing convenience to passengers, originally. The test results indicated that the system would work in Egypt as well. However, a fare adjustment organization is necessary to realize the system. The organization collects fare revenue from all the public transport operators. The organization allocates the fare revenue to the public transport operators based on an allocation agreement among the public transport operators, which would reflect transport cost by operator. Therefore, the Study Team proposes to begin discussion urgently on the common ticketing system among operators, because it could take a lot of time.

As mentioned above, the common ticket system is effective to promote public transport usage, the Team suggests an establishment of a body to start the discussion.

- Administrative Sustainability

After the system is developed and the coordinated system integration is completed, it is indispensable to secure the sustainability of the system as mentioned above. Administrative sustainability should be stressed at this stage, because regulation, enforcement and coordination of the system would be done only by the public sector: administrative sector.

An integrated administrative body, which is responsible for all urban transport issues covering the whole metropolitan area, with robust financial base would be the first priority to be established as mentioned in chapter 10: Cairo Metropolitan Transport Bureau (CMTB). As potential financial sources, the fuel tax, toll revenue, parking charge revenue should be considered.

Regarding the fuel tax, it should be a local tax, to spend the revenue for the residents of the area. Expense should not be limited to road as discussed earlier. It should be spent for all urban transport related improvements, because all urban transport modes are closely related and affecting each other.

Planning sustainability is also stressed. It is essential to maintain efficient urban transport system to the future. However, there is no vital entity in Egypt at the moment, which is responsible for overall urban transport system of the metropolitan area. Self-sustainable urban transport planning/monitoring body should be established. The Study Team proposed to enhance functions of Egyptian National Institute of Transport (ENIT) as the responsible planning body of the GCR in chapter 10.

It should be noted that a systematic urban transport planning is crucial by securing close coordination with urban development plan, as mentioned earlier in the sensitivity test.

#### **(4) Necessary Considerations**

Equity, traffic safety and environmental issues, which are defined as the second and the third transport mission in the CREATS, are not sufficiently incorporated into the market economy system at the moment. Therefore, it is very important to promote traffic safety, environmental preservation and equitable people's mobility properly and intensively in the course of Master Plan implementation.

- **Environmental Preservation**

Environmental preservation is indispensable for long-term development of the society. Although only CO<sub>2</sub> emission was estimated in this Study, impacts of urban transport should be taken into consideration for the future. The modal shift to public transport modes was discussed mainly, which enable to reduce harmful emission by cars. However, car is a part of urban transport system and its role is important, without saying. Important point is how to reduce and minimize the emission in addition to the modal shift.

Enhancement of car inspection system was proposed in chapter 8. This would not reduce break down cars on busy streets in Cairo, but also reduce air pollution by cars. The compressed natural gas (CNG) vehicles would also effective to improve air quality of the area.

Regarding noise issues by urban transport, of which a major source is considered horn sounds by car in Cairo, education of drivers is proposed as mentioned in the same chapter. Soundproofing barrier will be also effective means to protect people from noise along busy roads.

It should be also mentioned that periodical environmental monitoring on urban traffic is necessary and effective to understand magnitude of environmental situation and to project environmental danger in advance.

- **Equitable people's mobility**

In chapter 4, necessary considerations were done particularly on urban poor. Service coverage by public transport network was taken into the scenario development, particularly for urban poor. However, equitability would closely relate to welfare policy. Therefore, coordinated policy persuasion with welfare policy would be necessary.

In longer-term, barrier free facilities should be equipped to assist handicapped and aged people for convenience at stations and terminals such as slope, lift, toilet and so on. Vehicles, which are friendly to those people, would be one of additional options.



- Safety facilities for pedestrian

For public transport users, walking is indispensable. A person has to walk from his residence to bus stop or Metro station and he has to walk from terminal station or stop to his destination. Pedestrian's safety is critical to promote public transport in any urban areas. It was mentioned before, but it should be stressed again and again.

However, pedestrian safety condition in Cairo is terrible. Even a young and healthy man cannot walk safely in Cairo. Cars don't stop for pedestrians. Limited pedestrian safety facilities, such as pedestrian zebra crossings and pedestrian traffic signals, are installed in the city. Condition of the city is even dangerous for ladies, children, aged and handicapped people. Operation of buses is also dangerous. Buses operate keeping doors open usually. Passengers jump onto a moving bus so often.

The establishment of TRASAC, which was proposed in this Study, will be effective to inspire people's awareness to traffic safety. Drivers should be educated to keep driving safely. "Pedestrians first" should become to be a commonsense.

## **11.7 IMPLEMENTATION**

CREATS proposes a number of projects and programs to realize the five (5) key strategies embedded in the Master Plan for the integrated transport systems as tabulated below. These include not only infrastructure development projects but also to "software" components such as institutional, organizational and human-based programs. The necessary investments or initiatives for the implementation are conceptually allocated over the twenty years time horizon which is divided into three phases. The priority is given to those that satisfy the following conditions:

- Needs/Demands to strengthen the integrated public transport system with Metro Line, ENR and bus services;
- Economic rationality of the investment;
- Rehabilitation and revitalization of existing infrastructures;
- Low-cost solutions ready for the implementation;
- Essential initiatives to catalyze improvement of efficient, safe and comfortable transport; and
- Institutional programs as a prerequisite for the implementation of the CREATS Master Plan.

**Strategy 1: Improvement of People’s Mobility**

Proposed Measure and Project/Program		Short-tem ~2007	Mid.-tem ~2012	Long-term ~2022
Integrated Public Transport	• Committed Project (Capacity Enlargement of Metro Line 1 and 2)			
	• Improvement of Bus Services			
	• Improvement of Strategic Intermodal Points/Facilities			
	• Development of “Park and Ride System”			
	• <u>Rerouting of Bus and Shared Taxi Services</u>			
• <u>Improvement of an Integrated Ticketing System</u>				
Policy Enforcement	• Introduction of TDM (Traffic Demand Management) Policies (Taxation on petroleum and parking charge system)			
	• <u>Truck Traffic Control (Generalized Truck Ban)</u>			

**Strategy 2: Optimal Infrastructure Development**

Proposed Measure and Project/Program		Short-tem ~2007	Mid.-tem ~2012	Long-term ~2022
Rail-based Public Transport	• Committed Projects (incl. Metro 3)			
	• New Metro Line 4 Development			
	• Tram Improvement			
	• Super Tram Development			
	• ENR Suburban Line Improvement			
	• ENR E-W Wing Lines to New Communities			
	• Intermodal Facilities Development			
Road-based Public Transport	• Improvement of Bus Service Facilities			
	• Bus Fleet Improvement			
	• Priority Bus Facility Development			
Roads and Highways	• Committed Projects			
	• Primary/ Secondary Roads Development			
	• Grade Separation Works			
	• Expressway Network			
Cargo Transport	• Truck Terminal Development (3 Locations)			
	• Expansion of Existing Rail and River Terminals			
	• Sector Restructuring for Containerization			

Notes: 1) *Underlined measures represents “institutional, organizational and/or human-based program”; while non-underlined ones, physical and/or infrastructure projects. The width of the bar drawn in phasing blocks stands for a relative magnitude of investment and activities to be placed on the corresponding project/program; and the dotted line stands for research or monitoring.*

**Strategy 3: Accessible Transport for All**

Proposed Measure and Project/Program		Short-tem ~2007	Mid.-tem ~2012	Long-term ~2022
For All Citizens	<ul style="list-style-type: none"> <li>• <a href="#">Rerouting Program of Public Transport Services</a> (All people are covered within 800m from/to any public transport mode)</li> </ul>			
For the Poor	<ul style="list-style-type: none"> <li>• <a href="#">Social Welfare Policy for Public Transport Usage</a></li> <li>• <a href="#">Free-pass System for the Poorest Poor</a></li> <li>• Provision of Micro-bus Services in Inaccessible Areas</li> </ul>			
For Gender Issues	<ul style="list-style-type: none"> <li>• Provision of Clean and Safe Bus Service</li> <li>• <a href="#">Establishment of a "Gender Auditing System"</a></li> </ul>			
For Handicappers	<ul style="list-style-type: none"> <li>• Improvement of Barrier-Free Facilities at Stations</li> </ul>			

**Strategy 4: Safe and Comfortable Transport**

Proposed Measure and Project/Program		Short-tem ~2007	Mid.-tem ~2012	Long-term ~2022
Traffic Management	<ul style="list-style-type: none"> <li>• Improvement of Intersections/ Signal System in Cairo CBD and Central Giza</li> <li>• <a href="#">Policy Zoning System for Parking Management</a></li> <li>• Development of Parking Lots</li> <li>• Improvement of Bus Safety Facilities</li> <li>• Bus Location Information System</li> <li>• Introduction of Traffic Information System</li> </ul>			
Human Resource Management	<ul style="list-style-type: none"> <li>• <a href="#">Establishment of Egyptian Traffic Safety Council (TRASAC)</a></li> <li>• <a href="#">Traffic Safety Education &amp; Information Program</a></li> <li>• <a href="#">Coordinated Enforcement for Drivers' Licenses</a></li> </ul>			
Environmental Measures	<ul style="list-style-type: none"> <li>• <a href="#">Enhanced Environmental Monitoring System</a></li> <li>• <a href="#">Increased Use of Compressed Natural Gas (CNG) and Unleaded Gasoline</a></li> <li>• <a href="#">Enforced Transport Regulations &amp; Operations</a></li> <li>• <a href="#">Enhanced Vehicle Inspection System</a></li> <li>• <a href="#">Introduction of Alternative Fuels/ Hybrid Cars</a></li> <li>• <a href="#">Environmental Awareness Campaigns</a></li> </ul>			

### Strategy 5: Institutional and Financial Mechanism

Proposed Measure and Project/Program		Short-tem ~2007	Mid.-tem ~2012	Long-term ~2022
Institutional Arrangement	• <u>Establishment of Cairo Metropolitan Transport Bureau (CMTB)</u>			
Sustainable Financial Mechanism	• <u>Rationalization of Subsidy Policy and Revision of Public Transport Traffic Structure</u>			
	• <u>Introduction of "User Charge System"</u>			
	• <u>Introduction of "Earmarked Taxation" for Transport Improvement</u>			
Justifiable Investment	• <u>Legalization of Public Private Partnership Scheme for Transport Investment</u>			
Human Resource	• <u>Facilitation of Public Awareness of "Safety and Environment"</u>			
	• <u>Capacity Building of Operators for "Good Practice"</u>			
Improvement/ Restructuring of Operators	• <u>Restructuring of CTA</u>			
	• <u>Introduction of "Area Franchising System" for Shared Taxi Service</u>			
	• <u>Establishment of "Suburban Rail Service Corporation" and "Expressway Development Corporation"</u>			

Notes: 1) Underlined measures represents "institutional, organizational and/or human-based program"; while non-underlined ones, physical and/or infrastructure projects.

2) The width of the bar drawn in phasing blocks stands for a relative magnitude of investment and activities to be placed on the corresponding project/program; and the dotted line stands for research or monitoring.

## 11.8 PROJECT PRIORITY SELECTION PROCESS

### 11.8.1 General Description of the Methodology

The prioritization of the recommended projects was done in two phases. In a first phase, the first phase ranked the projects using the Goal Achievement Matrix. Next, the projects were integrated into a Relational Matrix. The results of the former evaluation reflect the theoretical priority level of each of the recommended projects on the basis of a set of evaluation criteria. The latter analysis determined the interdependency of the projects. Based upon their priority level and typology, this final stage identified the implementation logic that will maximize the expected benefits of each individual project.

In addition, the various projects were divided into three different project types, namely hardware, software and humanware projects. This definition is important to assess on a more qualitative level the context and complexity of realizing the projects.

The overall objective of CREATS, move people not vehicles, was translated into five generic strategies:

Strategy 1	Improvement of people's mobility
Strategy 2	Optimal infrastructure development
Strategy 3	Accessible transport for all
Strategy 4	Safe and comfortable transport
Strategy 5	Sustainable institutional and financial mechanisms

Each of the recommended projects contributes to the achievement of one of these five strategies according to the nature and structure of the project.

### **11.8.2 The Goal Achievement Matrix**

The Goal Achievement Matrix (GAM) is an analysis process developed in the 1960's. The method is generally accepted as a suitable process for evaluating the benefits and costs of large-scale investments<sup>2</sup>. The GAM process relies upon the identification of a set of objectives (goals) that the recommended projects should achieve. The objectives of CREATS (5 *strategies*) are further refined using quantifiable criteria against which the objectives can be assessed. The process allows for the weighting of the criteria to ensure that those considered most "important" are given a suitable and equitable evaluation. It also allows sensitivity testing of the individual projects against one or more specific criteria. The process thus allows assessing the level to which any particular project is able to achieve the goal(s).

GAM is a useful tool for the consideration of projects whose benefits and costs are not able to be totally quantified in dollar values and are therefore unable to be included in a conventional benefit-cost analysis. The assessment of some criteria is necessarily subjective but introduced in GAM allows for a comparison against nominated key criteria that were developed by the Study Team. As far as possible, the scores allocated to each of the projects are based on quantitative data. Qualitative assessments were made and the attributing scores reflect the relative merits of the projects, considering the scope and scale of the work and the expected results.

The GAM approach is widely recognized and is implemented in several countries. Some examples are:

*"Queensland Transport Strategic Plan 1999-2003"; Corporate Strategy and Performance Branch, Corporate Governance Division, Queensland Transport.*

*"Creating a Beautiful National Land with Safety and Vitality"; National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure and Transport, Japan.*

*"Tasman Highway Transport Planning Study - Hobart Airport to Esk Main Road"; Department of Infrastructure, Energy and Resources, Transport, State Government of Tasmania.*

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<sup>2</sup> *It should be noted that a simplified GAM has been used. A more complex and mathematical approach is the GAM (Goal Agenda Manager) subprogram in IPP which aims at solving complex planning tasks through the extraction of sub-problems.*

*“City Development Strategy and City Assistance Program” Katmandu Metropolitan City, Nepal (with financial support of the World Bank).*

*“Transport Plan 2001-2002” Westminster City Council - Department of Planning and Transportation; prepared by the London Bridges Engineering Group.*

The GAM methodology is also part of the teaching program in “Water Resources Management” (reference 1418/1997) at the Islamic Educational, Scientific and Cultural Organization (ISESCO).

The individual projects that make up the five generic strategies were measured against 20 different criteria, listed in next table.

**Table 11.8.1 GAM - Weighted evaluation indicators**

<b>Operational indicators</b>	
1	Person demand
2	Supply utilization
3	Cargo transport facilitation
<b>Performance indicators</b>	
4	Improved governance
5	Enhanced market mechanisms
6	Public private partnership potential
7	Knowledge based management
<b>Implementation indicators</b>	
8	Right of Way
9	Financing potential
10	Project approval procedures
11	Legal framework
12	Stakeholder involvement
13	Development cost
14	Cost recovery potential
<b>Socio-economic indicators</b>	
15	Regional economic development
16	Transport access
17	Social integration
<b>Environment and safety indicators</b>	
18	Quality of life
19	Aesthetics
20	Transport safety

*Source: JICA Study Team*

Each of these criteria reflects to a specific issue that is important to determine the overall quality and urgency of the recommended project. During the sensitivity analysis, the criteria are attributed a weight indicating its level of importance in the overall assessment of the project value and urgency. The settings of the model were first tested on their relevance, quality and consistency. Several sensitivity tests were conducted with different weight variations to asses their individual impacts on the priority of the project.

The indicators and their weights are briefly discussed hereafter.

### Operational Indicators

The operational indicators include (1) person demand, (2) supply utilization and (3) the cargo facilitation. The numeric values generated by the CREATS traffic model are translated into an appreciative value according to following approach:

- (1) Demand is related to the hierarchy of services with the perspective of year 2022 demand. The PCU and passenger values of the model are translated into person movements using (1) average occupancy of vehicles and (2) passenger volume while trucks are eliminated (their demand is evaluated with the third indicator).
- (2) Supply utilization evaluates the ability of supply to match demand. Following ranking is applied:
- (3) The third indicator assesses whether the recommended project contributes to efficiently move cargo from origin to destination. The evaluation is based upon the percentage of trucks in total traffic. A moderate positive contribution (+) is given to PT/Metro and trunk busway projects while ENR and bus related projects are considered neutral (2).

### Performance indicators

Performance indicators are strategic qualitative assessments of the effects of the projects. They particularly refer to increased expertise, knowledge and management.

Improved corporate governance relates to the contribution the project has in increasing overall operational and managerial capacity of operators, public and private companies, institutes etc... in running their individual organizations. Improved corporate governance includes among others: financial and organizational transparency; improved organizational structure; better level of control; shorter lead times between decision and implementation, etc...

Enhanced market mechanisms refer to the level of commercialization and competitiveness that is achieved by the recommended project. Market mechanisms include among others: the increased use of publicity and information tools towards customers, cost-based analyses and decisions, reductions in required subsidies (increased profitability) etc...

The Public Private Partnership potential assesses the level of private involvement that becomes possible when the recommended project is implemented. The levels of private involvement can vary from total privatization to outsourcing divisions or operations to the private sector to performance-based public operations. The latter, contrary to the others, does not involve private partners but is based upon an agreement between the public company and government on the way operations should perform in the field of operational targets and budgets. Of course, there are projects which have no potential at all for private involvement.

Knowledge based management is the final performance indicator and relates to the increased awareness of existing problems and potential solutions and the level of managerial and operational accountability towards that knowledge. In particular, it refers to the way the recommended project can contribute to the introduction/implementation of methods and techniques that improve the evaluation of results.

#### Implementation indicators

Implementation indicators assist to evaluate the overall potential that a recommended project can be realized on the basis of its cost, complexity, maturity and financial impacts. Several sub-indicators are used to determine the implementation potential of the recommended projects. Projects that have a high score can be implemented much earlier than projects with a lower score.

Right of way is a first indicator and of strategic importance for transport infrastructure projects. Without the right of way, infrastructure cannot be build. Absence of the Right of Way implies immediately that additional studies to define feasible route or the purchase of land is still necessary before implementation becomes possible. The project is at that time not yet mature for implementation in the short term.

Financing potential is a critical implementation indicator. The availability of financing is a critical condition for a successful project. If budgets have been allocated or investors contracted, the project has the highest financial potential, but if it is a very complex, highly expensive project without any clear knowledge of the necessary budget, its financing potential.

Project approval procedures is the next indicator and assess the complexity of the public decision making process. Projects that have been approved and incorporated into the 5 year development plan have a high score because the project is formally approved while the projects which are still pending can require difficult or easy procedures for approval. This indicator is closely related to the previous one. If a project is approved and has sufficient financing, it can be implemented immediately.

The legal framework assesses the level of maturity of a project. While some projects require no specific decisions at the regulatory level, others can only be implemented if laws or regulations are changed. These legal requirements could hinder the short-term implementation potential of projects or could contribute to making its realization more complex.

Stakeholder involvement refers to the level of participation in the decision making and implementation process of recommended projects. Some projects only need the participation of one public authority while others can only be implemented after approval by and participation of a range of governmental bodies. The more stakeholders involved, the more the implementation potential reduces;

Development cost is an important indicator for the (short-term) implementation possibility of projects. The development cost for infrastructure projects is higher



than the cost of “soft” projects, the former relating to the cost per kilometer of new infrastructure and the numbers of people moved and the latter relates to the total project investment and expected direct impacts (e.g., reductions in operating cost or critical need of the project before another can be started). The development cost of course is closely related to the other criteria in the implementation potential indicator. The volume of the investment can facilitate a decision, but it is not a deciding factor. If political will and stakeholder involvement is high, an expensive project could be more easily decided than a “cheap soft” project which has a high level of opposition.

The final implementation criterion evaluates the recovery potential of a recommended project. If the outcome of a project is expected to generate revenues, a part (or the total) of the investment can be recovered over time. For example, toll-roads and commercial space in terminals are good examples of projects that have a high recovery potential while “soft” projects have a low score because cost recovery effects are not direct but have indirect effects (e.g. improved industrial competitiveness, safer traffic, etc...).

#### Socio-economic indicators

The next set of indicators is the socio-economic indicators that assess the value / importance of the project from a social and economic perspective. The three parameters highly contribute to determine the level of priority of a recommended project. They are predominantly evaluated on a quantitative basis using the GIS numeric database. Indicators include population density, average household income; students and employment.

The first parameter is the Regional Economic Development of the recommended project. This indicator includes elements such as employment generation, improved mobility and reduction of congestion costs, etc... This parameter is partly quantified and partly a qualitative expert assessment.

Public Transport Access is a very important social evaluation criterion related to the improvements in accessibility of people to transport services. The evaluation is based upon the GIS database information in respect of the location of the individual projects. “Soft” projects are assessed on its contribution to reduce congestion (TDM applications), improve accessibility (e.g., Intermodal public terminal) and others.

The final socio-economic indicator is the social integration. This indicator specifically relates to the poor and the accessibility to transport services of weaker transport infrastructure users such as the handicapped and women. The assessment is based on the average Household Income information in the GIS database.

#### Environment and safety indicators

The last set of indicators relate to environmental impact and safety of traffic. Most assessments of projects are based upon the preliminary environmental assessment conducted on the recommended projects in the context of the CREATS study. It should be noted here that the environmental parameters are only preliminary values

and that in several cases a full scale Environmental Impact Assessment will be necessary which is reflected in the assessment scale.

The first criterion in this group is the quality of life. This criterion is the combination of several environmental factors which make up the general quality of the city / area in which people live. They include CO2 levels, noise and vibration.

The second criterion is also an environmental criterion but has also broader socio-economic implications. It is the aesthetics which relate to the visual intrusion or the endangerment of the historic, cultural and / or religious heritage.

The final criterion is the safety of people's movement. This is the general description of all elements that relate to safer traffic conditions and include components such as reduction of accidents, speed and congestion control, protection of pedestrians and weaker traffic infrastructure users, etc...

The weighting method for each of the criteria is visualized in next table.

Indicators	++	+	N	-	--
<b>Operational Indicators</b>					
Person Demand	> 40,000 pers/hr/dir HIGH	30,000 - 40,000 pers/hr/dir MEDIUM	20,000 - 30,000 pers/hr/dir NEUTRAL (or irrelevant)	10,000 - 20,000 pers/hr/dir LOW	<10,000 pers/hr/dir VERY LOW
Supply Utilization	V/C > 1.5 HIGH	V/C = 1.2 - 1.5 MEDIUM	V/C = 1 - 1.2 NEUTRAL (or irrelevant)	V/C = 0.8 - 1.0 LOW	V/C < 0.8 VERY LOW
Cargo Transport Facilitation	Share of trucks > 40% HIGH	Share of trucks > 30% MEDIUM	Share of trucks > 15% NEUTRAL (irrelevant)	Share of trucks > 10% LOW	Share of trucks < 10% VERY LOW
<b>Performance Indicators</b>					
Improved Governance	Certain / High improvement	Possible / some improvement	No contribution (or irrelevant)	XX	XX
Enhanced Market Mechanisms	Certain / High improvement	Possible / some improvement	No contribution (or irrelevant)	XX	XX
Public Private Partnership Potential	Full PPP	Partial PPP	No potential for PPP	XX	XX
Knowledge Based Management	High improvement	Some improvement	No contribution (or irrelevant)	XX	XX
<b>Implementation Indicators</b>					
Right Of Way	100% available	RoW needed but likely available from other infrastructure	More purchases for peripheral facilities	Some purchases for above ground projects (peripheral area)	Expensive purchases for above ground projects (Urban area)
Financing Potential	Funding available	Funding partially available	Possible, but not yet available (or irrelevant)	Not available, small investment	Not available, large investment
Project Approval Procedures	Committed project	Process initiated	Favorable potential (or irrelevant)	Difficulties in approval	Low probability of approval
Legal Framework	Legal framework changed or in place	Changes initiated	Irrelevant	Not yet initiated (small changes needed)	Not yet initiated (major changes in Law required)
Stakeholder Involvement	Single stakeholder	Single stakeholder, complex project	XX	Multiple stakeholders	Multiple stakeholders, complex
Development Cost	< 50000 / KM LOW	50000 - 75000 / KM MEDIUM LOW	75000 - 100000 / KM NEUTRAL (irrelevant)	100000 - 125000 / KM HIGH	> 125000 / KM VERY HIGH
Cost Recovery Potential	Profitable	Break even	< 70%	< 50%	No revenues
<b>Socio-Economic Indicators</b>					
Regional Economic Development	HIGH	MEDIUM / PARTIAL	MINIMAL (irrelevant)	XX	XX
Transport Access*	Pop dens > 100000 Students > 20000 Employment > 150000 HIGH INCREASE	Pop dens 50000 - 10000 Students 10000 - 20000 Employment 50000 - 150000 INCREASE	Pop dens < 50000 Students < 10000 Employment < 50000 MINIMAL (irrelevant)	XX	XX
Social Integration (HH Income Below 300 LE)	HH>30000 HIGH INCREASE	10000 - 30000 HH INCREASE	< 10000 HH MINIMAL	XX	XX
<b>Environment And Safety Indicators</b>					
Quality Of Life	NONE (No EIS required)	LOW (limited EIS needed)	NO IMPACT (irrelevant)	MEDIUM (type of EIS undecided)	HIGH (Full EIS needed)
Aesthetics	NONE (No EIS required)	LOW (limited EIS needed)	NO IMPACT (irrelevant)	MEDIUM (type of EIS undecided)	HIGH (Full EIS needed)
Transport Safety	HIGH SAFETY	LOW SAFETY	NEUTRAL (irrelevant)	REDUCE SAFETY	DANGEROUS

### 11.8.3 The Relational Matrix: Implementation logic

Once the recommended projects are evaluated according to their expected impact on the criteria, a second analysis assesses the implementation logic. This analysis relates the urgency of the implementation to the implementation logic and adjusts project priorities according to this logical relation. Two concrete examples will demonstrate the approach.

The first example makes the comparative evaluation of the commercialization of CTA and the rehabilitation of the existing bus fleet. From a relational perspective, the effects of rehabilitating the fleet will only be maximized if fleet operations are improved (new integrated bus services; improved information to the public, better accounting methods, new ticketing and adjusted fare level etc...). The improvement of the bus fleet can only be effective after a program that improves the commercial qualities of CTA via which a new approach to operating bus services will make the service more attractive to the public.

The second example compares building new Intermodal public terminals with the development of the supertram. Upgrading for example Stadium Station according to the recommendations is less effective until the supertram is operational. For an efficient supertram on that service line, the best option will probably be underground which means that to optimize the investment costs, the construction of the supertram should be done simultaneously with the construction of the new metro line. So from a relational perspective, the implementation logic is that the new metro line, the supertram line and the Intermodal terminal of Stadium Station should be realized simultaneously and not that the terminal is build before the services are available.

### 11.8.4 List of Recommended Projects

**Table 11.8.2 List of Recommended Projects**

<i>n°</i>	<i>Recommended project</i>	<i>Code</i>
<b><u>Strategy 1: Improvement of Peoples Mobility</u></b>		
1	Integrated Organization of Public Transport Operators	IPT
2	Traffic Demand Management	TDM
<b><u>Strategy 2 Optimal Infrastructure Development</u></b>		
<b>Road transport</b>		
<u>Regional Primary Highway Improvements</u>		
3	Ring Road (on Maryooteya Road)	HR-9
4	Ismailya Desert Rd.	HR-10
5	Suez Desert Rd.	HR-11
<u>Primary Arterial Street Improvements</u>		
6	Saft El Laban Axis	HP-2
7	Rod El Farag Axis	HP-3
8	15th May St. Extension	HP-4
9	Ahmed Oraby St.	HP-5
10	Moasaset El Zakah St.	HP-6
11	Ain Sukhna-Nasr City Rd. Extension	HP-7

<u>Secondary Arterial Street Improvements</u>		
12	Matareya Secondary Arterial Improvement Package	HS-1
		HS-2
		HS-3
13	Giza Secondary Arterial Improvement Package	HS-4
		HS-5
		HS-6
		HS-7
<u>Intersection Grade Separation Projects</u>		
14	Shobra El Kheima GS Plan Package	HG-15
		HG-16
		HG-17
15	North Cairo GS Plan Package	HG-18
		HG-19
		HG-20
16	Heliopolis/Nasr City GS Plan Package	HG-21
		HG-22
		HG-23
		HG-24
		HG-25
17	Central Cairo GS Plan Package	HG-26
		HG-27
18	Giza GS Plan Package	HG-28
		HG-29
<u>Urban Expressway Projects</u>		
19	Expway No. 3 (Autostrad-Salah Salem Route)	HE-3
20	Expway No. 4 (Abu Bakr El Sadeeq Route)	HE-4
21	Expway No. 5 (Alex. Agriculture Rd. Route)	HE-5
22	Expway No. 6 (Suez Rd. Route)	HE-6
23	Expway No. 7 (Gesr El Suez Route)	HE-7
24	Expway No. 8 (Tereat El Zumur South Route)	HE-8
25	Expway No. 9 (Tereat El Zumur North Route)	HE-9
<b>Public Transport</b>		
26	MRT Line 1 improvements	PTM-1
27	MRT Line 2 Extensions	PTM-2/3
28	Mrt Line 3	PTM-4
29	Mrt Line 4	PTM-5
30	Supertram 1	PTST-1
31	Supertram 2	PTST-2
32	Supertram 3	PTST-3
33	Tram / Heliopolis Metro Rehabilitation	PTT-1/2
34	Rail Wing East (Phase 1)	PTXR-1
35	Rail Wing East (Phase 2)	PTXR-2
36	Rail Wing West (Phase 2)	PTXR-3
37	Suburban Rail Rehabilitation	PTSR-1-4
38	Public Bus Fleet Expansion / Modernization	PTB-1
39	6th of October Trunk Busway	PTB-2
40	Bus Priority Treatments	PTB-3-5
41	Public Transport Intermodal Terminals	I-1
<b>Cargo Transport</b>		
42	Road Cargo Terminals	CT-1

43	River And Rail Container Terminal Development	CT-2
<b>Strategy 3: Safe and Comfortable Transport</b>		
44	Accessibility for All to Public Transport	AC-1
45	Targeted Support for The Poor	AC-2
46	Gender Based Sensitivity	AC-3
47	Handicapped Accessibility	AC-4
<b>Strategy 4: Accessible Transport for All</b>		
48	Traffic Management And Control	SAF-1
49	Traffic Safety Strategies	SAF-2
50	Environmental Management	SAF-3
<b>Strategy 5: Sustainable Institutional and Financial Mechanisms</b>		
51	Institutional Strengthening	IN-1
52	Sustainable Financial Mechanisms	IN-2
53	Investment Decision Procedures	IN-3
54	Human Resources Development	IN-4
55	Improvement / Restructuring of Operators	IN-5
56	Cargo Transport Sector Restructuring	IN-6

The list of recommended projects was introduced in the GAM matrix and a quantitative and qualitative appreciation made, attributing a score of each project on the criteria. The scoring was quantitative and translated into a result where each project obtains a score between “++” and “--” per criterion. The results are visualized in next table.

Table 11.8.3 Appreciation of Recommended Projects – Results

	Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
<b>Strategy 1: Improvement Of Peoples Mobility</b>																						
Integrated Organization Of Public Transport Operators	IPT	+	++	N	--	+	+	N	--	+	--	-	--	-	N	N	++	+	++	+	+	
Traffic Demand Management	TDM	+	++	N	+	N	N	+	N	-	--	--	--	+	-	N	N	N	++	++	N	++
<b>Strategy 2 Optimal Infrastructure Development</b>																						
<b>Road Transport</b>																						
<u>Regional Primary Highway Improvements</u>																						
Ring Road (On Maryoteya Road)	HR-9	--	--	-	N	N	N	N	+	-	+	N	++	++	--	++	++	++	--	N	++	
Ismailiya Desert Rd.	HR-10	-	+	+	N	N	N	-	-	-	N	N	++	++	--	++	++	+	--	N	N	
Suez Desert Rd.	HR-11	-	++	N	N	N	N	-	-	-	N	N	++	++	--	++	++	+	--	N	N	
<u>Primary Arterial Street Improvements</u>																						
Saft El Laban Axis	HP-2	--	+	-	N	N	N	N	--	-	-	++	++	-	+	+	+	--	--	+	+	
Rod El Farag Axis	HP-3	--	++	--	N	N	N	N	--	-	-	N	++	++	--	+	+	+	--	+	+	
15th May St. Extension	HP-4	-	+	N	N	N	N	-	-	-	N	N	++	++	--	+	+	+	--	+	+	
Ahmed Oraby St.	HP-5	-	N	-	N	N	N	-	-	-	N	N	++	++	--	+	+	+	--	+	+	
Moasaset El Zakah St.	HP-6	--	-	-	N	N	N	+	-	-	-	N	++	++	--	+	+	+	--	+	+	
Ain Sukhna-Nasr City Rd. Extension	HP-7	--	--	--	N	N	N	-	-	-	-	N	++	++	--	+	+	+	--	+	+	
<u>Secondary Arterial Street Improvements</u>																						
Matareya Secondary Arterial Improvement Package	HS-1	-	+	-	N	N	N	N	--	N	-	N	++	++	--	+	+	+	-	+	+	
	HS-2																					
	HS-3																					
Giza Secondary Arterial Improvement Package	HS-4	-	N	N	N	N	N	N	+	N	-	N	++	-	--	+	+	+	-	+	+	
	HS-5																					
	HS-6																					
	HS-7																					
<u>Intersection Grade Separation Projects</u>																						
Shobra El Kheima GS Plan Package	HG-15	++	N	N	N	N	N	N	++	+	+	N	++	++	--	N	N	N	-	+	+	







### 11.8.5 Goal Achievement Matrix: Testing and Results

In a next phase, the project evaluation and the criteria were tested in three test runs. The test run settings were:

- *Test 1:* All criteria receive An equal weight of “1” (neutral). This test assesses the impact of attributing a qualitative and / or quantitative appreciation as listed in the table above. The setting is given in next table.

**Table 11.8.4 Setting of the Criteria - Test 1**

	Weights	Generic Weight	Weighted Value
<b>Operational indicators</b>	<b>100%</b>	<b>20</b>	
Person demand	40%		1
Supply utilization	30%		1
Cargo transport facilitation	30%		1
<b>Performance indicators</b>	<b>100%</b>	<b>20</b>	
Improved governance	40%		1
Enhanced market mechanisms	30%		1
Public private partnership potential	20%		1
Knowledge based management	10%		1
<b>Implementation indicators</b>	<b>100%</b>	<b>20</b>	
Right of Way	20%		1
Financing potential	20%		1
Project approval procedures	10%		1
Legal framework	10%		1
Stakeholder involvement	20%		1
Development cost	15%		1
Cost recovery potential	5%		1
<b>Socio-economic indicators</b>	<b>100%</b>	<b>20</b>	
Regional economic development	30%		1
Transport access	30%		1
Social integration	40%		1
<b>Environment and safety indicators</b>	<b>100%</b>	<b>20</b>	
Quality of life	25%		1
Aesthetics	25%		1
Transport safety	50%		1
		100	20

Source: JICA Study Team

- *Test 2:* All criteria receive a percentage value that is equal within their generic criterion and the weights of the five generic criteria are equal. This test evaluates the impact of the individual criteria on the projects, given that the percentage weight differs between criteria. The setting is given in next table.

**Table 11.8.5 Setting of the Criteria - Test 2**

	Weights	Generic Weight	Weighted Value
<b>Operational indicators</b>	<b>99%</b>	<b>20</b>	
1 Person demand	33%		6,6
2 Supply utilization	33%		6,6
3 Cargo transport facilitation	33%		6,6
<b>Performance indicators</b>	<b>100%</b>	<b>20</b>	
4 Improved governance	25%		5
5 Enhanced market mechanisms	25%		5
6 Public private partnership potential	25%		5
7 Knowledge based management	25%		5
<b>Implementation indicators</b>	<b>98%</b>	<b>20</b>	
8 Right of Way	14%		2,8
9 Financing potential	14%		2,8
10 Project approval procedures	14%		2,8
11 Legal framework	14%		2,8
12 Stakeholder involvement	14%		2,8
13 Development cost	14%		2,8
14 Cost recovery potential	14%		2,8
<b>Socio-economic indicators</b>	<b>99%</b>	<b>20</b>	
15 Regional economic development	33%		6,6
16 Transport access	33%		6,6
17 Social integration	33%		6,6
<b>Environment and safety indicators</b>	<b>99%</b>	<b>20</b>	
18 Quality of life	33%		6,6
19 Aesthetics	33%		6,6
20 Transport safety	33%		6,6
		100	99

Source: JICA Study Team

- *Test 3:* All criteria receive a final percentage value which indicates their importance in the specific criterion at the generic level and all criteria have an equal weight at the generic level. This final test assesses the impact of attributing different levels of importance to each of the criteria. The setting is given in next table.

**Table 11.8.6 Setting of the Criteria - Test 3**

	Weights	Generic Weight	Weighted Value
<b>Operational indicators</b>	<b>100%</b>	<b>20</b>	
1 Person demand	40%		<b>8</b>
2 Supply utilization	30%		<b>6</b>
3 Cargo transport facilitation	30%		<b>6</b>
<b>Performance indicators</b>	<b>100%</b>	<b>20</b>	
4 Improved governance	40%		<b>8</b>
5 Enhanced market mechanisms	30%		<b>6</b>
6 Public private partnership potential	20%		<b>4</b>
7 Knowledge based management	10%		<b>2</b>
<b>Implementation indicators</b>	<b>100%</b>	<b>20</b>	
8 Right of Way	20%		<b>4</b>
9 Financing potential	20%		<b>4</b>
10 Project approval procedures	10%		<b>2</b>
11 Legal framework	10%		<b>2</b>
12 Stakeholder involvement	20%		<b>4</b>
13 Development cost	15%		<b>3</b>
14 Cost recovery potential	5%		<b>1</b>
<b>socio-economic indicators</b>	<b>100%</b>	<b>20</b>	
15 Regional economic development	30%		<b>6</b>
16 Transport access	30%		<b>6</b>
17 Social integration	40%		<b>8</b>
<b>Environment and safety indicators</b>	<b>100%</b>	<b>20</b>	
18 Quality of life	25%		<b>5</b>
19 Aesthetics	25%		<b>5</b>
20 Transport safety	50%		<b>10</b>
		<b>100</b>	<b>100</b>

Source: JICA Study Team

Each of the individual tests provided a ranking of the recommended projects according to the weights attributed. The rankings of each individual test were added and a final ranking made by which the project with the lowest total score is the best because on average, that project was ranked the highest during the three tests.

The results are presented in next table.

**Table 11.8.7 Setting of the Criteria - Results**

Recommended Project	Test 1	Test 2	Test 3	Total Score
<b>MRT Line 1 improvements</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>6</b>
<b>Mrt Line 3</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>8</b>
<b>Mrt Line 4</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>8</b>
<b>Supertram 1</b>	<b>4</b>	<b>5</b>	<b>8</b>	<b>17</b>
<b>Public Bus Fleet Expansion / Modernization</b>	<b>2</b>	<b>9</b>	<b>6</b>	<b>17</b>
<b>Improvement / Restructuring Of Operators</b>	<b>9</b>	<b>4</b>	<b>4</b>	<b>17</b>
<b>6th of October Trunk Busway</b>	<b>2</b>	<b>6</b>	<b>12</b>	<b>20</b>
<b>Supertram 3</b>	<b>6</b>	<b>7</b>	<b>9</b>	<b>22</b>
<b>MRT Line 2 Extensions</b>	<b>12</b>	<b>8</b>	<b>7</b>	<b>27</b>
<b>Institutional Strengthening</b>	<b>18</b>	<b>10</b>	<b>5</b>	<b>33</b>
<b>Tram / Heliopolis Metro Rehabilitation</b>	<b>6</b>	<b>13</b>	<b>15</b>	<b>34</b>
<b>Cargo Transport Sector Restructuring</b>	<b>12</b>	<b>12</b>	<b>11</b>	<b>35</b>
<b>Rail Wing East (Phase 1)</b>	<b>12</b>	<b>11</b>	<b>16</b>	<b>39</b>
<b>Central Cairo GS Plan Package</b>	<b>9</b>	<b>22</b>	<b>9</b>	<b>40</b>
<b>Supertram 2</b>	<b>9</b>	<b>15</b>	<b>21</b>	<b>45</b>
<b>River and Rail Container Terminal Development</b>	<b>12</b>	<b>15</b>	<b>20</b>	<b>47</b>
<b>Human Resources Development</b>	<b>18</b>	<b>19</b>	<b>13</b>	<b>50</b>
<b>Shobra El Kheima GS Plan Package</b>	<b>12</b>	<b>24</b>	<b>16</b>	<b>52</b>
<b>Rail Wing East (Phase 2)</b>	<b>22</b>	<b>14</b>	<b>19</b>	<b>55</b>
<b>Accessibility for All to Public Transport</b>	<b>25</b>	<b>18</b>	<b>13</b>	<b>56</b>
Investment Decision Procedures	22	20	18	60
North Cairo GS Plan Package	18	26	23	67
Giza GS Plan Package	18	26	25	69
Rail Wing West (Phase 2)	26	21	23	70
Targeted Support for the Poor	28	23	22	73
Suburban Rail Rehabilitation	12	31	31	74
Integrated Organization of Public Transport Operators	34	17	29	80
Heliopolis/Nasr City GS Plan Package	22	35	28	85
Traffic Demand Management	38	24	25	87
Sustainable Financial Mechanisms	28	29	32	89
Expway No. 3 (Autostrad-Salah Salem Route)	28	29	33	90
Ismailya Desert Rd.	28	33	33	94
Suez Desert Rd.	28	33	33	94
Traffic Management and Control	42	26	27	95
Traffic Safety Strategies	38	31	30	99
Ring Road (on Maryooteya Road)	28	43	33	104
15th May St. Extension	34	37	37	108
Giza Secondary Arterial Improvement Package	38	38	37	113
Road Cargo Terminals	26	39	48	113
Gender Based Sensitivity	34	40	39	113
Bus Priority Treatments	34	40	44	118
Public Transport Intermodal Terminals	42	36	40	118
Expway No. 9 (Tereat El Zumur North Route)	38	40	43	121

Matareya Secondary Arterial Improvement Package	42	45	42	129
Ahmed Oraby St.	42	47	44	133
Expway No. 4 (Abu Bakr El Sadeeq Route)	42	46	46	134
Environmental Management	54	44	41	139
Saft El Laban Axis	48	48	48	144
Rod El Farag Axis	48	48	48	144
Moasaset El Zakah St.	47	51	48	146
Expway No. 5 (Alex. Agriculture Rd. Route)	48	51	52	151
Expway No. 6 (Suez Rd. Route)	48	51	52	151
Expway No. 7 (Gesr El Suez Route)	48	51	52	151
Expway No. 8 (Tereat El Zumur South Route)	48	51	52	151
Handicapped Accessibility	54	50	47	151
Ain Sukhna-Nasr City Rd. Extension	56	56	56	168

Source: JICA Study Team

The results were satisfactory because the CREATS project logic was clearly reflected in the ranking. The objective of CREATS is to *move people and offer affordable transport for all in an efficient way*. MRT projects which have a high capacity of moving people score high, as do the Supertram projects which move less people but are still high contributors to efficient public transport. Finally, social mobility and linking the satellite cities ranked high, indicating that projects that efficiently link the satellite cities highly contribute to the needs of Cairo. But offering affordable transport in an efficient manner requires expertise and structured organizations. “Soft projects” that improve management systems and decision procedures or increase knowledge and expertise can also be found in the top 20 list of projects. Finally, the ranking clearly demonstrated that measures are necessary to control the movement of cargo. Given these satisfactory results, sensitivity tests were conducted to assess the impact of changed weights on the ranking. The overall results of the sensitivity tests are visualized in next table.

**Table 11.8.8 Sensitivity tests - Results**

Proposed project	Rank ST1	Rank ST2	Rank ST3	Rank ST4	Rank ST5	Total ranking
MRT Line 1 improvements	2	6	1	5	4	18
MRT Line 4	1	5	12	1	1	20
MRT Line 3	2	6	9	2	2	21
improvement / restructuring of operators	4	1	18	3	13	39
Public bus fleet expansion / modernization	26	11	2	4	5	48
MRT Line 2 extensions	6	15	15	9	6	51
institutional strengthening	8	4	17	20	3	52
Supertram 1	16	16	4	14	7	57
Supertram 3	19	19	10	16	10	74
6th of October trunk busway	28	10	7	5	25	75
Accessibility for all to public transport	9	13	25	9	22	78
Central Cairo GS Plan package	5	19	3	34	21	82
Rail Wing East (phase 1)	36	17	18	7	8	86

cargo transport sector restructuring	11	3	22	22	32	90
Tram / Heliopolis metro rehabilitation	24	24	4	30	11	93
Rail Wing East (phase 2)	29	21	26	8	9	93
Human resources development	20	2	23	35	17	97
river and rail container terminal development	7	9	18	25	39	98
Investment decision procedures	15	8	24	31	20	98
Shobra El Kheima GS Plan package	10	25	6	36	23	100
Supertram 2	33	26	16	22	16	113
Targeted support for the poor	13	27	32	15	26	113
Rail Wing West (Phase 2)	32	28	33	9	12	114
North Cairo GS Plan package	18	28	8	41	27	122
Traffic Demand Management	12	17	43	42	14	128
traffic management and control	17	12	42	45	15	131
Giza GS Plan package	21	30	11	42	29	133
Integrated public transport system	14	39	47	24	18	142
Traffic safety strategies	25	22	41	39	19	146
Heliopolis/Nasr City GS Plan package	23	31	13	50	31	148
Ring Road (on Maryooteya Road)	49	36	21	12	33	151
Ismailya Desert Rd.	29	36	26	17	46	154
Suez Desert Rd.	29	36	26	17	46	154
Suburban rail rehabilitation	43	35	14	42	24	158
Expway No. 3 (Autostrad-Salah Salem Route)	39	23	39	12	46	159
sustainable financial mechanisms	22	14	40	45	38	159
Giza Secondary Arterial Improvement package	40	40	29	32	34	175
15th May St. Extension	38	40	30	32	36	176
Expway No. 9 (Tereat El Zumur North Route)	48	32	44	19	49	192
Gender based sensitivity	37	42	31	52	30	192
Public transport Intermodal terminals	27	47	48	40	40	202
Matareya Secondary Arterial Improvement package	44	48	38	37	37	204
Expway No. 4 (Abu Bakr El Sadeeq Route)	50	33	49	21	51	204
environmental management	34	34	56	54	27	205
Ahmed Oraby St.	45	49	36	38	41	209
Bus priority treatments	42	49	36	51	41	219
Expway No. 5 (Alex. Agriculture Rd. Route)	52	43	51	26	52	224
Expway No. 6 (Suez Rd. Route)	52	43	51	26	52	224
Expway No. 7 (Gesr El Suez Route)	52	43	51	26	52	224
Expway No. 8 (Tereat El Zumur South Route)	52	43	51	26	52	224
Moasaset El Zakah St.	51	53	34	47	43	228
road cargo terminals	35	51	34	55	56	231
Saft El Laban Axis	46	53	45	47	43	234
Rod El Farag Axis	46	53	45	47	43	234
handicapped accessibility	41	52	51	56	35	235
Ain Sukhna-Nasr City Rd. Extension	56	56	50	53	50	265

Source: JICA Study Team

The ranking of above results allows distinguishing between projects that need to be implemented in the short-term, medium-term and long-term. From that perspective the first set of projects can be considered as *priority projects*.

As can be seen, the overall logic of the CREATS objectives is clearly reflected. In the list of priority projects, Infrastructure projects that contribute of moving many people are high in the priority list (metro); projects with less capacity but also moving more people than private cars rank second (Supertram), while linking the satellite cities via efficient transport connections is also important (WINGS). But also after sensitivity testing, efficiency improvement measures (soft projects) score high. These soft projects are in particular:

- improvement / restructuring of operators
- institutional strengthening
- cargo transport sector restructuring
- human resources development

### **11.8.6 Implementation Logic**

Considering the obtained priority list, recommendations can now be formulated regarding the urgency of projects and the relation with the feasibility study that is part of the CREATS study.

Therefore, a relational matrix was build up for the priority projects to link projects together and to introduce logic both in terms of implementation potential and in terms of relational strength.

For the above set of projects for metro, tram, WINGS and expertise/efficiency building, the results of the implementation logic are provided. From these results, candidates for the feasibility study (within the context of CREATS) and for additional Technical Assistance can be deduced.

Four metro projects received top rankings in the priority list. These are :

- MRT Line 1 improvements
- MRT Line 4
- MRT Line 3
- MRT Line 2 extensions

Furthermore, 3 tramway projects were ranked high in the list:

- Supertram 1
- Supertram 3
- Tram / Heliopolis metro rehabilitation



Connecting the satellite cities was also considered as a high priority and included following projects:

- 6th of October trunk busway
- Rail Wing East (phase 1)
- Rail Wing East (phase 2)

Finally, a number of efficiency improvement programs are highly important to achieve / increase traffic efficiency and to maximize future investments in traffic. These “soft projects” are:

- Improvement / restructuring of operators
- Institutional strengthening
- Cargo transport sector restructuring
- Human resources development
- Investment decision procedures

Each one of the above group of projects have equal importance. Distinguishing between the different projects can be done on the basis of the priority list (table 11.7.8). From an implementation logic perspective, the individual projects in each of the above group can be ranked as follows:

#### Metro projects

- MRT Line 1 improvements
- MRT Line 3
- MRT Line 2 extension
- MRT Line 4

Although Line 4 (the CREATS proposal) is highly important from a traffic effectiveness perspective, the priority of the project is lower in terms of implementation. This of course does not mean that no consideration should be given to the project. On the contrary, many issues need to be solved and require substantial study. This preparation process (study, engineering design etc...) should be initiated in parallel with the implementation of the three other metro projects. These other three projects are *committed projects* which can start as soon as the financing is available. This is not the case for Line 4, which is a project that still needs substantial studies and budgeting prior to any decision of implementing. The ranking of the three committed projects is based upon a number of criteria, including project cost, implementation time and traffic demand relevance.

#### Tramway projects

- Supertram 1
- Tram / Heliopolis metro rehabilitation
- Supertram 3

Supertram 1 is the best ranked project because it offers a high potential to improve public transport, it is located on one of the most dense traffic demand corridors and it links via Ramses Station to the inter-city railway network and to the city metro. Undoubtedly, the benefits in terms of improved public transport are high and implementation is not too difficult given that the right of way is there and most stakeholders and decision makers consider developing such system as a needed project. Closely related thereto is the upgrading of the existing Heliopolis metro network, including replacing the rolling stock and adjusting time tables. This project complements the Supertram 1 network. Finally Supertram 3 line can be developed. Supertram 2 scores relatively low because of several reasons, among which the low level of present demand and the need for “Right of Way”. The urgency of both lines is thus lower given the demand and implementation problems.

### WINGS

- 6th of October trunk busway
- Rail Wing East (phase 1)

The objective of the WINGS is to connect the satellite cities of 6<sup>th</sup> of October and 10<sup>th</sup> of Ramadan to Cairo. In total four projects have been evaluated. The 6<sup>th</sup> of October trunk busway has the highest priority because all conditions for implementation are in place (right of way, technology, etc...) and the overall costs are low as compared to the three other projects. Furthermore, the 6<sup>th</sup> of October trunk busway is matching specific traffic demand. Traffic demand is the reason why Rail Wing West Phase 2 (upgrading trunk busway to rail) scores relatively low given the demand forecasts which do at the present time does not warrant such investment. Rail Wing East Phase 1 scores equally high because the plan foresees in upgrading and extending existing rail infrastructure. From an implementation logic, this project is strong on all fronts. The second phase of both projects (Rail Wing East and West) is of less urgency because the upgrade of the link to a two way electrified rail track will depend upon concrete future demand.

### Soft projects

- Improvement / restructuring of operators
- Institutional strengthening / Investment decision procedures
- Cargo transport sector restructuring
- Human resources development

Given that buses and shared taxis have an important role in feeding the main supertram and metro lines, their managerial efficiency and operational effectiveness becomes an important success factor. Therefore, the improvement and restructuring of public transport operators becomes a highly critical project.

At the same time, the final objective is to develop over time an integrated public transport system (CREATS strategy 1). This means that the coordination and operations of many presently fragmented operators needs to be streamlined and

structured in an integrated manner. Via an institutional strengthening program, the creation of an integrated organization of public transport operators could be established over time, therewith validating the infrastructure efforts. At the same time, investment decision procedures can be adjusted and based upon methodologies that evaluate investments from that integrated perspective.

Given that cargo transport has at present and will continue to have in the future a direct impact on traffic flows in the Greater Cairo Area, initiatives should be taken to divert as much as possible traffic from the roads to rail and river transport. As was argued in the CREATS study, the infrastructure therefore is available, but the sector and the operators are lacking the expertise and equipment. A comprehensive sector restructuring study will establish the framework conditions for increased competitiveness and efficiency of transport operations and indicate the needs in terms of infrastructure, equipment and operational conditions. Only after this study, investments in the proposed road terminals and the upgrading of the river and rail terminals will be successful and maximize the return on the necessary investments.

The above proposed soft measures all come down to an important final element, namely the development of expertise and awareness. A comprehensive human resources development plan is the final urgent measure. This program relates to structures, methods and organizations that are responsible for training and education in all fields of transport and for the creating of awareness among the professionals and the public at large on traffic safety and traffic behavior. This project has many phases and components and its implementation should therefore be considered in full parallel with the other soft projects and start as soon as possible.

### **11.8.7 Combining the results**

In a final step, the above ranking and logical structuring resulted in a priority list and a set of candidates for feasibility study and technical assistance.

The project priority list is given in next table. The table uses the priority projects identified during the sensitivity testing (table 11.8.8) and incorporates an implementation time frame for the projects. The candidates for feasibility study (within the context of the CREATS program) and for future technical assistance are made available in the figure thereafter.

**Table 11.8.9 Priority Projects Implementation Time Chart**

Proposed Priority Measure and Project		Short-tem ~2007	Mid.-tem ~2012	Long-term ~2022
<b>Metro</b>	• Metro Line 1 Improvements	██████████		
	• Metro Line 3 Construction	██████████	██████████	██████████
	• Metro Line 2 Extension		██████████	
	• Metro Line 4 Construction	■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■ ■ ■	██████████
<b>Tramway</b>	• Supertram 1	██████████		
	• Tram/ Heliopolis Metro Rehabilitation	██████████		
	• Supertram 3		██████████	
<b>Satellite Cities</b>	• 6 <sup>th</sup> Of October Bus Trunk Busway	■ ■ ■ ■ ■ ■ ■ ■	██████████	
	• Rail Wing East (Phase 1)	■ ■ ■ ■ ■ ■ ■ ■	██████████	
	• Rail Wing East (Phase 2)			██████████
<b>Cargo Transport</b>	• Cargo Transport Sector Restructuring	■ ■ ■ ■ ■ ■ ■ ■	██████████	
	• Rail and River Terminals	██████████		
<b>Road Projects</b>	• Central Cairo GS Plan Package	■ ■ ■ ■ ■ ■ ■ ■	██████████	
<b>Soft Measures</b>	• Restructuring of Operators	■ ■ ■ ■ ■ ■ ■ ■	██████████	
	• Public Bus Fleet Expansion/ Modernization	██████████		
	• Institutional Strengthening	██████████	██████████	██████████
	• Accessibility for All to Public Transport	■ ■ ■ ■ ■ ■ ■ ■	██████████	
	• Human Resources Development	■ ■ ■ ■ ■ ■ ■ ■	██████████	
	• Investment Decision Procedures	██████████		

The priority projects can be combined in 6 groups of projects:

- Metro development
- Tramway development
- Connecting the satellite cities
- Improvements of cargo transport
- Road projects
- Soft measures

Each of these groups contains a number of project components which have their individual implementation logic and phasing.

As can be seen in above table 11.8.9, all identified priority projects (see table 11.8.8) need to start within the next five years. However, some of the projects require further in-depth study and / or preparation, while for others, implementation can start immediately (sometimes depending upon available funding).

### Metro development

Metro Line 1 improvements and the construction of Metro Line 3 are of the highest priority. Both projects need to start as soon as the necessary funding is available. Extending Metro Line 2 and construction of Metro Line 4 (the CREATS proposal) are also priority projects, but require more preparation and in particular for Metro Line 4, substantial preparatory studies, which should commence within the next few years.

### Tramway development

The tram is one of the existing public transport modes and has substantial potential for the future. Rehabilitation of Heliopolis Metro and Tram as well as the proposed Supertram Line 1 are of high priority and the related works should commence as soon as possible by means of a rehabilitation study and a detailed feasibility and engineering study for Supertram Line 1. Given their close relation, both projects could be combined to facilitate the implementation. Supertram Line 3 remains a priority but is not as urgent as the two other projects while Supertram Line 2 remains of low priority, given the lower number of expected passengers (see ranking in table 11.8.8).

### Connecting the satellite cities

Improving the connections is an urgent requirement, given the high traffic density between Cairo and the two most important satellite cities 6<sup>th</sup> of October City and 10<sup>th</sup> of Ramadan City. The CREATS study identified the optimal public transport mode between Cairo and the two satellite cities, based upon expected demand and implementation potential. Implementation of both projects will require further detailed studies which should be initiated as soon as possible. Furthermore, urgent measures are necessary to guarantee the needed right of way or to initiate procedures to acquire this right of way.

The West wing connection to 6<sup>th</sup> of October City will be via Trunk Bus Way because of the low volume of expected passengers. A detailed engineering and feasibility study should start immediately to fix the optimal route and to identify the bottlenecks for a future implementation, taking into consideration a possible upgrading to rail. The development of a trunk bus way could start soon after the study work is completed. The East Wing connection to 10<sup>th</sup> of Ramadan City can start immediately with Phase 1 that consists of upgrading the existing railway line. Phase 2 (the electrification of the line) can follow based upon future demand.

### Improvement of cargo transport

Although cargo transport generates only minor problems and will in the future not grow as fast as road transport, measures are necessary to improve their integration in the GCR transport system. The proposed Cargo Transport Sector Restructuring Study will not only address the physical movement of cargo, but will also consider how technological and technical innovation, soft measures and expertise building can contribute to improve sector performance. The ultimate goal of this sector rehabilitation effort is to develop over time Intermodal transport.

However, achieving Intermodal transport depends predominantly of private sector initiative. This does not mean that public authorities cannot contribute in its development via various stimulating measures. In that respect, the transformation of some of the existing rail and river terminals into Intermodal terminals is a first and significant step forwards in the introduction of Intermodal transport in the GCR.

Both the study and the transformation of the rail and river terminals are therefore urgent projects which should be initiated as soon as possible.

#### Road Projects

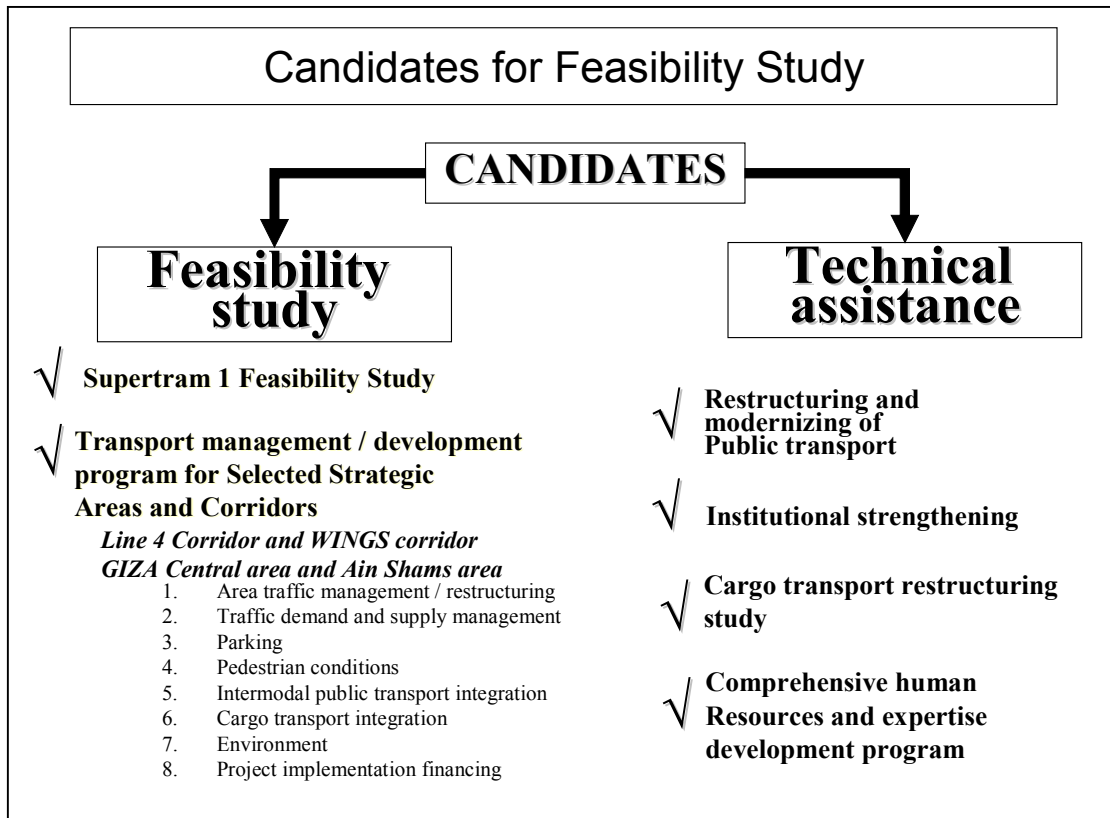
CREATS proposes a large list of detailed road development and rehabilitation projects. The most urgent of all is the Central Cairo GS Plan Package which should start urgently. The traffic situation in Central Cairo is at present already problematic and the problems will continue to increase in time, making traffic in the near future almost impossible in the center of Cairo. The proposed Package for Central Cairo should therefore be implemented without delay.

#### Soft Measures

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.

Within the context of the CREATS project and in direct coordination with the Steering Committee, some priority projects were identified as candidates for either a feasibility study (as second part of the CREATS project) or as candidates for Technical Assistance (outside the context of the CREATS project).

The candidates are presented in next Figure 11.8.1.



*Source: JICA Study Team*

**Figure 11.8.1 Candidates for Feasibility Study and Future Technical Assistance**

## 11.9 RECOMMENDATIONS

The Study Team concludes and recommends that the Scenario D should be the Master Plan of the Greater Cairo Region for the year 2022, based on the above discussions and examinations. The Master Plan is shown at the top of this volume.

Towards forming the integrated urban transport system, infrastructure projects should be implemented in association with institutional and human-related programs. Yet, viewing the infrastructure projects, MRT-related projects such as the improvement of MRT Line 1, the extension of Line 2 and the new construction of Line 3, are ranked at the highest places. These have been all committed, therefore, are expected to be executed out as scheduled. Metro Line 4, proposed by CREATS,

is also at the highest rank, however, it is recommended that this project is initiated soon after the committed MRT projects are accomplished.

Other than the MRT projects, three projects are evaluated to be of the highest priority, namely,

- 1) Supertram projects;
- 2) Public bus fleet expansion/modernization project; and
- 3) The 6<sup>th</sup> October trunk busway project.

These are vital to structure an integrated mass-transit system, therefore, should be initiated at the early phase.

Regarding the institutional and human-based programs, all the programs ranked at the top 10 are equally crucial. Among them, the highest priority is given to the programs for:

- 1) Improvement and restructuring public transport operators;
- 2) Institutional component for “public fleet expansion and modernization”, and
- 3) Institutional strengthening for integrated policy.

Although all the programs listed in the top 10 are related to each other, these may be pursued individually. However, in order to make them successful, definite political decision-making for a comprehensive sector reform is needed. This should start with establishment of an organizational structure for integrated policy formulation as soon as practical.

In the following Chapter 12 and 13, environmental assessment and economic and financial analyses results of the Master Plan are described, respectively.



## **CHAPTER 12: INITIAL ENVIRONMENTAL EXAMINATION (IEE)**

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### **12.1 EXISTING ISSUES, OPPORTUNITIES AND CONSTRAINTS**

#### **12.1.1 Introduction**

Transport improvement projects are implemented to improve the mobility of goods and persons, which should result in improved economic development. Consequently, it will improve the social environment of the people involved. However, almost every project has also negative impacts on the environment, being slight or severe.

Environmental Impact Assessment (EIA) is an integral part of the process of project selection, design and implementation. It should be a tool for decision makers to consider the impacts of proposed activities on the (physical and social) environment, in order to seek for alternatives, to prepare steps to mitigate the negative impacts and to enhance the positive impacts. If necessary a proposed activity should be rejected.

To ensure sustainability for the proposed transport improvement projects for Greater Cairo, an Initial Environmental Examination (IEE) of these projects has been carried out as part of the pre-feasibility studies. The IEE indicates the potential negative as well as the positive environmental impacts to be expected from the planned transport development projects, in order to determine whether follow up detailed environmental studies are needed. Also an indication of mitigation measures, required to alleviate the identified adverse environmental impacts, are provided.

Local consultants have been contracted to carry out Environmental Surveys, which results helped to reveal the present environmental condition of the Project Areas and the potential environmental impacts expected from the proposed transport projects. Air Quality, Noise and Environmental Awareness Surveys were carried out. The Air Quality and Noise Surveys were presented in Progress Report No.2; the results from the Environmental Awareness Survey are presented in Part 1 of Technical Report No 4. Summaries on these subjects are provided in current Chapter 12.

The screening and scoping process, whereby Egyptian<sup>1</sup> and other international guidelines have been applied (JICA<sup>2</sup>, EU<sup>3</sup>, World Bank<sup>4</sup>, other<sup>5</sup>), has resulted in

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<sup>1</sup> *Guidelines for Egyptian Environment Impact Assessment, EEAA, EEAA 1996.  
Environmental Law No. 4, EEAA, 1994.*

identification of one of the following analysis requirements for each proposed transport improvement project:

- a full Environmental Impact Assessment plus Environmental Management and Monitoring Plans are required, because **significant** adverse environmental impacts are to be expected;
- only Environmental Management and Environmental Monitoring Plans are required, because **limited** environmental impacts are to be expected;
- no further environmental analysis is required, as only **minor** (no significant) adverse environmental impacts are to be expected.

Besides possibly recommended environmental studies, it is assumed that for all projects proper Operation & Maintenance Plans will be prepared and executed.

The following definitions have been applied in current report:

- **Initial Environmental Examination (IEE):** the examination/assessment to determine the environmental impacts that may be created by a proposed transport development project, based on existing information and data, easily accessible information, and professional judgement.
- **Screening:** the evaluation/judgement on the necessity of an Environmental Impact Assessment.
- **Scoping:** the identification of important/significant environmental impacts, resulting from a proposed transport development project, and the formulation of items to be studied in an EIA.
- **Significant environmental impact:** a fundamental change to the physical, biological, or social environment, resulting from a proposed transport development project.
- **Environmental Impact Assessment (EIA):** a detailed and in-depth research study on significant environmental impacts to be expected from a proposed transport development project.
- **Environmental Management Plan:** a document presenting those efforts that will

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<sup>2</sup> *Environmental Guidelines for Infrastructure Projects, XII Transport Development, JICA Environmental Guidelines, Japan International Co-operation Agency, September 1992.*

<sup>3</sup> *Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (85/337/EEC - OJ L 175/40, 5 July 1985). Council Directive 97/11/EEC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (97/11/EEC - OJ L 73/5, 14 March 1997). Manual on Strategic Environmental Assessment of Transport Infrastructure Plans, European Commission, DG Energy and Transport, 1998.*

<sup>4</sup> *Environmental Assessment Sourcebook, World Bank Technical Paper, no. 139, 140; Environment Department, The World Bank, Washington D.C., USA, 1991, 1994: Volume I: Policies, Procedures, and Cross-Sectoral Issues; Volume II: Sectoral Guidelines.*

<sup>5</sup> *Environmental Impact Assessment, Guidelines for Transport Development, ESCAP - Environment and Development Series, United Nations, New York, 1990. Environmental Analysis of Transportation Systems; Louis F. Cohn, Vanderbilt University; Gary R. McVoy, New York State Department of Transportation; John Wiley & Sons.*

be made to manage adverse environmental impacts resulting from a proposed transport development project.

- ***Environmental Monitoring Plan:*** a document presenting those efforts that will be made to monitor the environmental components, which may be affected by a proposed transport development project.
- ***Operation and Maintenance Plan:*** a plan that describes in detail which measures are required for a proper operation/functioning and maintenance of a proposed transport development project.

### **12.1.2 Major Conclusions from the Air Quality and Noise Level Surveys**

The Cairo Regional Area Transportation Study (CREATS) addresses, amongst other issues, the major environmental problems in the Study Area in relation to traffic development. To obtain an actual picture of these environmental constraints, two Environmental Surveys at 15 locations were carried out for CREATS: an Air Quality Survey and a Noise Level Survey (presented in full in Progress Report No.2). Because public involvement is considered an important planning tool of the Study, additionally an Environmental Awareness Survey (among 1000 households) was proposed and carried out, to identify the awareness of residents in Cairo of environmental issues related to traffic (presented in Technical Report IV); a summary has been included in Section 12.2.5 of current report.

The Air Quality and Noise Level Surveys were carried out at 15 Survey Locations, in such a way that the streets, districts and suburbs – inside the Ring Road of Cairo – would be well represented. Each Survey Location consisted of a Location “A” along the main road and a Location “B”; the latter at a distance of 100 to 1000 meters from Location “A”, off the main road and in more residential areas.

The following major conclusions can be drawn from the Air Quality and Noise Level Surveys carried out for CREATS<sup>6</sup> and from visual inspection of the traffic situation in Cairo:

- Air pollution originating from traffic in Cairo - for the major components NO<sub>2</sub>, SO<sub>2</sub>, CO and PM<sub>10</sub> - has reached high levels.
- Measured levels for PM<sub>10</sub> were very high and exceeded the standard at all measured locations, during all measuring periods.
- Measured daily/8-hours average levels for SO<sub>2</sub> and CO were rather high and exceeded their standards at several locations in various measuring periods.
- Measured NO<sub>2</sub> levels were medium high.
- Of major air pollutants in Cairo, originating for a large part by traffic, very fine particles (PM<sub>10</sub> and smaller) are a major contributor to the air pollution.
- Air pollution in Cairo will have a significant negative impact on the health and welfare of its residents, as well as on existing ecology.

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<sup>6</sup> *Air Quality and Noise Level Survey for the Cairo Regional Area Transport Study (CREATS), Ain Shams University Environmental Laboratory, in cooperation with the Cairo University Centre for Environmental Hazard Mitigation, Cairo, January 2002.*

- With the limited data available no evident correlation (except for one remarkable situation) could be found between levels of air pollutants at certain locations and traffic counts. It is realised that the meteorological situation, especially wind speed and direction plays a major role.
- Noise levels in Cairo are very high, exceeding the standards for day, evening and night, continuously along the main roads as well as in residential areas off the main roads.
- The high noise levels in Cairo will have a significant negative impact on the health and welfare of its residents (especially young children and elder people).
- With the limited data available a correlation could be found between noise levels at certain locations and traffic counts.
- There is a high risk for traffic accidents in Cairo; especially there is a high risk for pedestrians.
- There is a significant impact of traffic and traffic related structures on aesthetics, having a negative impact on the welfare of the residents of Cairo.

Tables 12.1.1 and 12.1.2 present the outcome of the measurements of the major air pollutants originating from traffic, as well as the measured noise levels. It must be realised that the levels presented for NO<sub>2</sub>, SO<sub>2</sub>, CO and PM<sub>10</sub>, are weekly averages. Daily averages (Volume II of Progress Report 2) give a more periodic, but also a more negative picture of the situation regarding air quality.

**Table 12.1.1 Average concentrations of NO<sub>2</sub>, SO<sub>2</sub>, CO and PM<sub>10</sub> over 7 days measuring period, Survey Locations A<sup>7</sup>**

Measured Parameter	NO <sub>2</sub> µg/m <sup>3</sup>		SO <sub>2</sub> µg/m <sup>3</sup>		CO mg/m <sup>3</sup>		PM <sub>10</sub> µg/m <sup>3</sup>	
	Egypt <sup>8</sup> 24 hrs. 150 µg/m <sup>3</sup>	WHO <sup>9</sup> -	Egypt 24 hrs. 150 µg/m <sup>3</sup>	WHO 24 hrs 125 µg/m <sup>3</sup>	Egypt 8 hrs 10 mg/m <sup>3</sup>	WHO 8 hrs 10 mg/m <sup>3</sup>	Egypt 24 hrs. 70 µ/m <sup>3</sup>	WHO 24 hrs. Estim.
Survey Location								
1A	99		78		3.8		120	
2A	96		118		7.0		120	
3A	124		55		13.7		170	
4A	99		43		6.6		163	
5A	51		15		6.1		214	
6A	42		24		10.8		182	
7A	53		43		12.6		142	
8A	86		57		11.8		244	
9A	51		44		8.3		262	
10A	50		37		9.4		202	
11A	67		36		14.2		115	
12A	71		38		11.1		216	
13A	72		59		9.7		111	
14A	65		43		5.5		224	
15A	93		61		12.0		186	

Note 1 – concentrations of NO<sub>2</sub>, SO<sub>2</sub>, and PM<sub>10</sub>: weekly average concentrations

Note 2 – concentration of CO: 8-hours average concentration

Note 3 – Estim.: Estimation

Note 4 – shaded figures are figures exceeding standards

Source: JICA Study Team

<sup>7</sup> Air Quality and Noise Level Survey for the Cairo Regional Area Transport Study (CREATS), Ain Shams University Environmental Laboratory, in cooperation with the Cairo University Centre for Environmental Hazard Mitigation, Cairo, January 2002.

<sup>8</sup> Max. Permissible Noise Level Limits; Environment Law 4, 1994

<sup>9</sup> World Health Organization standards for Noise and Air Quality, WHO, 1999.

**Table 12.1.2 Noise Levels at Survey Locations A for Day, Night and Evening in dB(A)<sup>10</sup>**

Max. Permissible Noise Level Limits; Environment Law 4, 1994	Day	Evening	Night
Residential Areas including some workshops or commercial businesses or on public roads	7 am - 6 pm	6 pm - 10 pm	10 pm - 7 am
	50-60 dB(A)	45-55 dB(A)	40-50 dB(A)
Location 1A	77,5	76,2	74,2
Location 2A	75,8	75,3	70,3
Location 3A	74,0	73,8	68,1
Location 4A	75,9	76,7	74,1
Location 5A	73,1	72,6	70,3
Location 6A	77,3	76,9	72,6
Location 7A	76,4	75,5	70,7
Location 8A	73,1	75,2	67,3
Location 9A	82,0	79,9	73,1
Location 10A	76,6	74,2	72,8
Location 11A	77,5	77,2	74,5
Location 12A	81,9	82,5	74,1
Location 13A	67,7	66,5	61,4
Location 14A	76,3	75,0	73,4
Location 15A	74,4	73,9	73,0

Note 1: Noise Levels in dB(A)

Note 2: LA<sub>F</sub>eq: average over time periods "day", "evening" and "night".

Note 2: shaded figures: levels exceeding standards.

Source: JICA Study Team

The major conclusions of the Environmental Survey, concerning air quality and noise levels, are also pointing out the key factors for the Environmental Situation in Cairo in relation to traffic. It is highly recommended to implement mitigation measures to improve the degraded socio-economic and physical/biological environment in Cairo, as a result of severe air pollution and high noise levels caused by traffic and traffic related activities.

<sup>10</sup> Air Quality and Noise Level Survey for the Cairo Regional Area Transport Study (CREATS), Ain Shams University Environmental Laboratory, in cooperation with the Cairo University Centre for Environmental Hazard Mitigation, Cairo, January 2002.

## **12.2 ENVIRONMENTAL ISSUES**

### **12.2.1 Introduction**

Chapter 12.2 describes the environmental issues, which are regarded important for the traffic situation in Greater Cairo. These issues have been revealed during the earlier phases of the Project and have been described in Progress Report No.1, Progress Report No.2, and two Environmental Technical Reports. Earlier several Environmental Surveys were carried out, which were found essential to characterise the present environmental situation in Greater Cairo in relation to transport activities. The surveys carried out were:

- Air Quality Survey;
- Noise Survey;
- Environmental Awareness Survey.

The Air Quality and Noise Surveys were reported in Progress Report No.2, Chapters “Environmental Situation” and “Environmental Surveys”; a summary is provided in Section 12.1.2. The results of the Environmental Awareness Survey were presented in Part 1 of Technical Report No.4 and a summary is presented in Section 12.2.5. The major conclusions of the Environmental Surveys are presented in Chapter 12 of the Interim Report, because the results are regarded as important issues related to the environmental situation in Greater Cairo.

The major environmental issues related to the Transport Master Plan for Greater Cairo are:

- Positive Impacts of Transportation;
- Negative Environmental Impacts of Air Pollution;
- Negative Environmental Impacts of Noise;
- Environmental Awareness.

In the following sections the major identified environmental issues are presented and discussed.

### **12.2.2 Positive Impacts of Transportation**

Traffic in general causes impacts on both the socio-economic and physical/biological environments. These impacts are differentiated in positive and negative environmental impacts. Positive impacts of traffic relate mainly to the socio-economic environment; negative impacts relate to the socio-economic as well as to the physical and biological environment.

Generally, potential positive impacts of traffic (and transport projects) on the socio-economic environment are:

- Improved access; reduced travel time and costs;
- Improved conditions for economic development;
- Improved conditions for development of tourism; Reduced number of accidents (with proper design).

It may be concluded that the major potential positive impact of transportation (and transportation projects) is increased welfare of people.

### **12.2.3 Negative Environmental Impacts of Transportation**

Negative impacts of traffic on the environment can be divided in large scale negative effects and adverse impacts that are felt more locally.

#### **(1) Large Scale Adverse Impacts of Transport Activities**

Large-scale adverse impacts of transport<sup>11</sup> are: natural resource depletion, climate change, acidification and photochemical smog.

##### ***Natural Resource Depletion***

Natural resource depletion is recognized as a major aspect relating to sustainability of transportation. There have been improvements in fuel efficiency of vehicles over the years; however their effect has been out-weighed by the increasing demand for transport. Modern transportation systems require nowadays large inputs of concrete, sand and steel for infrastructure, and plastics and ferrous and non-ferrous metals for the construction of vehicles. Partly, these materials are scarce, and their extraction and production causes environmental impacts. In addition, considerable waste streams are generated, including non-renewable, non-recyclable and environmentally harmful materials.

##### ***Climate Change***

The global climate is strongly influenced by changes in the atmospheric concentrations of a number of gases that trap heat radiated from the earth's surface (the "greenhouse effect"). Water vapour and Carbon Dioxide (CO<sub>2</sub>) in the atmosphere cause a natural "greenhouse effect", which is worsened by emissions caused by human activities. Other important "greenhouse gases" are Methane (CH<sub>4</sub>), Nitrous Oxide (N<sub>2</sub>O), and halogenated compounds, such as the Chloro-Fluoro-Carbons (CFC's). Over the past hundred years, human activities caused increased concentrations of the so called "greenhouse gases" and other

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<sup>11</sup> *Manual on Strategic Environmental Assessment of Transport Infrastructure Plans, European Commission, DG Energy and Transport, 1998.*



pollutants in the atmosphere, resulting in “global warming”. Climate change is now widely recognised as a threat to the world's environment.

The most important “greenhouse gas” produced by transport activities is Carbon Dioxide, which has a direct impact on global warming. Since 1980, the contribution of road transport to the total emission of “greenhouse gases” in the EU, due to combustion of fossil fuels has increased from about 10% to nearly 20%.

### ***Acidification***

Acid deposition originates largely from emissions of gaseous pollutants, of which Sulphur Dioxide (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>x</sub>) are the most important. The adverse effects of acidification include damage to agricultural crops, defoliation, eutrophication, and damage to limestone and marble buildings and monuments. Some of the SO<sub>2</sub> and NO<sub>x</sub> emissions originate from diesel and petrol driven vehicles, ships and aircraft.

### ***Photochemical Smog***

Photochemical smog is chemically formed from a number of gases that are present in the troposphere. Mainly, it originates from Nitrogen Oxides (NO<sub>x</sub>), Non-Methane Volatile Organic Compounds (NMVOC's), Methane (CH<sub>4</sub>) and Carbon Monoxide (CO). Many human activities produce these pollutants, including fossil-fuel combustion from transport activities. Sunlight acting on these pollutants causes the formation of a range of compounds, known as photochemical oxidants, the most important of which is Ozone (O<sub>3</sub>). Major consequences of exposure to Ozone are respiratory difficulties and damage to vegetation and ecosystems.

Above mentioned large-scale effects of traffic have its adverse impacts on the socio-economic environment (people) as well as the physical/biological environment (ecology, flora and fauna).

## **(2) Regional and Local Adverse Environmental Impacts of Transport Activities**

*Regional and local negative impacts of traffic (and traffic projects) on the socio-economic environment are in general:*

- Increased air pollution, noise and vibrations;
- Risk of accidents;
- Risks of contaminating drinking water sources and soil, caused by accidents and spills;
- Split up of land (agricultural and urban);
- Encroachment (unplanned settlements), affecting land use and aesthetics;(Visual) impact on aesthetics / modification of landscape;

- Land take (agricultural land, historical and cultural sites);
- Increase of land prices, pushing lower income residents out.

*Regional and local negative impacts of traffic (and traffic projects) on the physical/biological environment are in general:*

- Long term impact of air pollution on ecology and ecologically fragile areas;
- Encroachment (unplanned settlements), affecting ecology and ecologically fragile areas; Risks of contaminating water sources and soil, caused by accidents and spills. Runoff pollution. *The negative impacts of traffic on aesthetics can be specified as:*
  - Blocking views of residents by roads or road structures (bridges, viaducts, flyovers);
  - Demolition of characteristic city buildings / areas / parks etc.

The overall conclusion is that the major adverse impacts of traffic (and traffic projects) are negative effects on public health – causing reduction of the welfare of residents – and adverse impacts on ecology (flora and fauna).

#### **12.2.4 Air Quality and Noise**

The major conclusions of the Environmental Surveys (see Section 12.1.2), concerning air quality and noise levels, are pointing out the key factors for the Environmental Situation in Cairo in relation to traffic. It can be concluded that the socio-economic and physical/biological environment in Cairo has been degraded as a result of severe air pollution and high noise levels caused by traffic and traffic related activities.

#### **12.2.5 Environmental Awareness related to Transportation**

The objective of the Environmental Awareness Survey (carried out by Cairo University<sup>12</sup> and analysed and reported in CREATS Part 1, Technical Report No.4) was to address the major environmental problems encountered in the Study Area in relation to the existing traffic situation. It was found important to assess the awareness of residents of nuisance and other problems originating from traffic in the Study Area. It was concluded that air pollution and noise were the major constraints caused by traffic in Cairo.

Major conclusions from the Environmental Awareness Survey are listed below:

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<sup>12</sup> *Environmental Awareness Survey (EAS), Final Report Part II, Development Research & Technological Planning Centre (DRTPC), Cairo University, in cooperation with The Transport and Traffic Consultations Unit, Ain Shams University, December 31, 2001.*

The majority of the interviewed persons are:

- aware of air pollution and the increase of air pollution in Cairo;
- aware of the problems resulting from traffic;
- suffering, or at least experience nuisance, from air pollution;
- suffering from traffic congestion;
- aware of the fact that Cairo has a high accident rate;
- familiar with cars driving on Compressed Natural Gas (CNG);
- are in favour of introducing stricter vehicle checks and obliging car owners to install improved combustion technology in their cars;
- willing to pay for this, especially if the government subsidizes these measures.

Furthermore, the majority of the interviewed persons have the opinion that:

- air quality in Cairo is poor;
- air pollution is increasing every year in Cairo;
- their health, and the health of their family, is negatively affected by daily exposure to traffic;
- vehicle smoke and noise are major impacts of traffic;
- at crossing roads there is a high risk for accidents, because there is no safe passage for pedestrians;
- increased air pollution is mainly the result of an increased number of private cars, taxis and busses, as well as open burning of rice hay, and to a lesser extent caused by increased industrial development or insufficient control on industries;
- reducing the use of private cars for short trips would improve the air quality in Cairo;
- also poor maintenance and combustion of old vehicles, as well as insufficient technical checkups of vehicles and insufficient enforcement of traffic regulations, are major causes for increased air pollution;
- bad driving habits, insufficient training of drivers, insufficient laws to control traffic and pollution, also contribute to an increase of air pollution;
- each year the number of accidents are increasing;

- the number of accidents could be reduced if traffic police controls would intensify, penalties for driving at too high speed would be higher, and pedestrian passages would be safer.

*A careful conclusion can be drawn that if public transport would be more convenient, cheaper, more attractive, and faster, then part of the Cairo residents would be willing to use their car less and public transport more.*

### 12.2.6 Negative Environmental Impacts of Air Pollution

Because air pollution is a major environmental problem in Cairo, the following data are presented concerning air quality:

The major components of air pollution caused by traffic (fuel combustion of vehicles) are:

- CO: Carbon Monoxide;
- NO<sub>x</sub>: Nitrogen Oxides;
- NO<sub>2</sub>: Nitrogen Dioxide;
- N<sub>2</sub>O: Nitrous Oxide;
- SO<sub>x</sub>: Sulphur Oxides;
- SO<sub>2</sub>: Sulphur Dioxide;
- NMVOC's: Non Methane Volatile Organic Compounds;
- NH<sub>4</sub>: Methane;
- PM<sub>10</sub>: Suspended Particulate Matter (PM<sub>10</sub>: particles of 2.5-10 µm);
- PM<sub>2.5</sub>: Suspended Particulate Matter (PM<sub>2.5</sub>: part. of 2.5 µm or less);
- HM: Heavy Metals;
- O<sub>3</sub>: Ozone.

Emissions of above listed air pollutants originating from traffic may have large negative impacts on health and biodiversity. However, it must be kept in mind that activities in other sectors, like industries, power plants, and partly also the agricultural sector, also cause similar adverse effects.

During the Air Quality Survey for CREATS (Progress Report No.2), the measured concentrations of PM<sub>10</sub> (Particulate Matter, less than 10 µm) appeared to be high. Generally, the composition of this type of very fine suspended particles is as follows<sup>13</sup>:

- Coal and oil fly ash;
- Metals and metal oxides;
- Tire wear debris;
- Street dust;
- Carbon, Sulphate, and Nitrate particles.

*The sources of particles of 10 µm (micrometer) or less (PM 10) are generally:*

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<sup>13</sup> WHO Guideline Values for the "Classical" Air Pollutants, WHO, 1999.

- Natural background (desert dust\*)
- Combustion of oil, diesel, gasoline, coal, and wood;
- Traffic, and industrial and agricultural operations;
- Construction and demolition operations;
- Transformations from NO<sub>x</sub> and SO<sub>2</sub>.

\*Generally, desert dust makes up about 40% of the PM<sub>10</sub> levels (source EEAA).

*The negative impacts on health of the major air pollutants attributed to traffic are:*

- CO: fatigue, lung and heart diseases, retarded brain function;
- NO<sub>2</sub>: coughing, headache, bronchitis;
- SO<sub>2</sub>: coughing, asthma;
- VOC's: odour nuisance, headache, cancer;
- PM(10): lung diseases, cardiovascular diseases;
- O<sub>3</sub>: headache, eye irritation, aggressiveness, asthma, bronchitis.

### **12.2.7 Negative Environmental Impacts of Noise**

Traffic produced noise can cause considerable annoyance. It can interfere with daily life, like: work, sleep, study, communication and recreation. Long term exposure to noise can generate undesirable physical and psychological effects. In calm environments, generally sound levels of 30 - 50 dB (A) are measured. Disruptive sounds have noise levels higher than about 70 dB (A).

Generally, the following negative impacts on health are attributed to high noise levels:

- Fatigue;
- Headache;
- Lack of concentration;
- Sleep disturbance;
- Delayed reaction;
- Mood and behavioural changes;
- High blood pressure;
- Hearing impairment;
- Neurological ailments.

## **12.3 ENVIRONMENTAL REGULATIONS AND POLICY IN EGYPT**

### **12.3.1 Introduction**

Environmental guidelines to be followed in the Study are in principle the guidelines and regulations of Egypt, as well JICA and environmental guidelines. In general, it can be stated that Egyptian environmental regulations, as well as other international

guidelines (like World Bank and EC guidelines), prescribe that transport development projects should be designed and constructed along environmentally sound principles to ensure sustainability.

### **12.3.2 Governmental Agencies**

The State Ministry of Environmental Affairs, established in 1982, is the final body in Egypt for all matters relating to national environmental policy and regulatory actions. Apart from overseeing the activities of the implementing agency, the Egyptian Environmental Affairs Agency (EEAA), the ministry has major inputs on the setting of the environmental policy and public investment projects. The EEAA has a broad mandate and regulatory power for enforcing Law No 4 for Environment (1994) and various environmental regulations. The EEAA is also responsible for environmental guidelines and setting of standards for industries, surveillance of environmental quality and sampling, and stipulation of corrective measures for polluters. It reviews EIA's for development projects and provides environmental clearance. The Agency has the mandate to develop public awareness, environmental training and undertake research on environmental resource management.

Through its regional branch offices the EEAA oversees all activities in the field of environment in Egypt. In undertaking its duties, the EEAA cooperates with several multilateral and bilateral donors, as well as a large number of Egyptian bodies. The latter include research institutes, universities, central and local government agencies. As far back as 1992, Egypt developed a National Environmental Action Plan<sup>14</sup>, which sought to address all major issues related to Egypt's environment. The Plan provided the basis for environmental action and the framework for foreign funding of environmental projects in Egypt. In 2002 the EEAA updated its 1992 version of the National Environmental Action Plan.

### **12.3.3 Non-Governmental Agencies**

A number of well-established NGO's operate in Egypt. Some of the prominent like CEDARE and EQI have been contacted during the Study. It is commendable to include the experience of these agencies into the second phase of the CREATS Study once specific tasks are identified in line with the results obtained from the Environmental Awareness Survey.

Initiatives of NGO's, especially those with experience in environmental activities, are sponsored by a CIDA-program called "Community Environmental Initiatives Fund". The fund primarily supports pilot projects aiming at environmental education, solid waste management, drinking water access, advocacy and landscape aesthetics.

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<sup>14</sup> *National Environmental Action Plan, EEAA, 1992.*

### **12.3.4 Environmental Laws and Regulations in Egypt**

Major enacted presidential decrees on the protection of environment in Egypt include:

- The Presidential Decree No. 631 of 1982 for setting up an Environment Affairs Agency affiliated to the Cabinet.
- The Presidential Decree No. 54 of 1983 on the protocol for the protection of the Mediterranean Sea from pollution.
- The Presidential Decree No. 478 of 1988 on the Civil Obligation Agreement Against Oil Spills signed in Brussels in 1969.

Enacted laws regulating the protection of natural resources and environmental quality are:

- Law No. 27 of 1981 for employing mine and quarry workers.
- Law No. 48 of 1982 for protecting the River Nile and waterways against pollution.
- Law No. 102 of 1983 for nature reserves.
- Law No. 3 of 1982 for urban planning.
- Law No. 116 of 1983 amended by Law No. 2 of 1985 for agricultural land scooping.
- Law No. 117 of 1983 for archaeological protection.

The most important legal framework with reference to environmental protection is the “Law No. 4 of 1994”. This law explains the objectives and policies advocated by the EEAA, and their means of their realization. The Law called upon the formation of an Environmental Protection Fund to support environmental protection projects and studies. The law also outlines the legal requirements and procedures for Environmental Impact Assessment for different categories of development projects, including the construction of infrastructure for the transport sector.

The EEAA published in 1996 the “Guidelines for Environmental Impact Assessment”. These guidelines complement the above mentioned rules and protective measures stipulated in the Environmental Law 4/1994. For the CREATS Study, the sections dealing with the categories of projects and the sector guidelines are of special relevance.

Similar EIA guidelines have been developed in the Ministry of Housing and Ministry of Transport, reflected in the “Egyptian Code for Urban and Rural Highway Works”. A special circulation letter has been circulated by the EEAA which regulates the Implementation of Infrastructure Development Projects in the Transport Sector.

### **12.3.5 Environmental Policy in Egypt**

The Environmental Policy of Egypt has been presented in the “Environmental Action Plan of Egypt (1992)”. This Plan is outdated now as a result of changes in

environmental degradation, changed economic conditions and a changed legal situation (Environmental Law No. 4 was amended two years after the publication of the Environmental Action Plan). Accordingly, a new national Environmental Action Plan is currently under preparation.

The present national environmental policy is described in the latest annual report of the EEAA, stipulating that:

- the government of Egypt seeks to implement laws for protection of the environment through developing institutional and legislative frameworks at national, regional and local level;
- it seeks to strengthen bilateral and international partnerships;
- it enforces laws relating to the protection of nature and natural resources;
- it elaborates guidelines for environmental impact assessment;
- it supports institutional strengthening and capacity building at the EEAA and its regional branch offices;
- it promotes Integrated Environmental Management Systems;
- it integrates the use of market-based instruments in the field of environmental protection;
- it promotes the transfer and adaptation of environmentally friendly technologies.

Furthermore, a USAID-sponsored program has been launched in 1999 which aims at supporting the Ministry in developing and implementing more detailed policy measures to ensure effective and sustainable environmental management. This program will also address cross-cutting institutional and legal issues and economic and other constraints in policy planning and development. Major focuses of the newly refined policy will be in the field of using cleaner and more efficient energy, reduction of air pollution, solid waste management and environmentally sound tourism.

### **12.3.6 Comparison of Egyptian and International Environmental Regulations**

It can be concluded that the Egyptian Environmental laws and regulations are well developed and do not lack behind - for the major environmental problems - compared to international environmental laws, regulations and guidelines.

Although the legal and environmental framework can be considered sufficient, enforcement of environmental laws and regulations should be drastically improved.



## **12.4 CRITERIA FOR ENVIRONMENTAL IMPACT ASSESSMENT**

### **12.4.1 Introduction**

It is essential, as part of a pre-feasibility study, to carry out an Initial Environmental Examination/Environmental Screening of proposed projects, to obtain insight in possible adverse environmental impacts arising from proposed transport development projects, and to ensure sustainability. Environmental Screening will show the negative as well as the positive environmental impacts to be expected from proposed projects.

In general, Environmental Impact Assessment should be an integral part of the process of selection, design and implementation of proposed transport development projects, and should be a tool for decision makers to consider the impacts of proposed activities on the socio-economic and physical/biological environment. In this way alternatives can be determined and steps prepared to mitigate the negative impacts and to enhance the positive impacts. If necessary a proposed activity should be rejected.

### **12.4.2 Environmental Criteria**

Environmental impacts may be permanent or temporary; may occur during the Pre-Construction/Design Phase, the Construction Phase and the Operation & Maintenance Phase of a project, and may be a direct result of construction activities, or an indirect result (like unplanned developments along roads).

Criteria which should be applied to judge the significance of environmental impacts are related to the characteristics of projects (project size), the location/environmental sensitivity of project areas, and the characteristics of potential impacts. Additionally, the following aspects should be taken into account in the process of Environmental Impact Assessment: number of other environmental components affected and the cumulative nature of the impact.

Environmental criteria for the proposed transport improvement projects relate to processes and activities, which may affect the social and cultural environment and/or the physical/biological environment. The criteria to judge the significance of environmental impacts are well described in Egyptian and international laws, regulations and guidelines. Relevant for the current Initial Environmental Examination are:

- Guidelines for Egyptian Environment Impact Assessment, EEAA, 1996.
- Environmental Law No. 4, EEAA, 1994.
- Environmental Guidelines for Infrastructure Projects, XII Transport Development, JICA Environmental Guidelines, Japan International Co-operation Agency, September 1992.
- Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (85/337/EEC - OJ L 175/40, 5 July 1985).

- Council Directive 97/11/EEC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (97/11/EEC - OJ L 73/5, 14 March 1997).
- Environmental Impact Assessment, Guidelines for Transport Development, ESCAP Environment and Development Series, United Nations, New York, 1990.
- Environmental Assessment Sourcebook, World Bank Technical Paper, no. 139, 140; Environment Department, The World Bank, Washington D.C., USA, 1991, 1994: Volume I: Policies, Procedures, and Cross-Sectoral Issues; Volume II: Sectoral Guidelines.

The overall environmental appropriateness of the proposed transport development projects could be indicated by answering the following questions:

- Will the project make unwarranted accelerated use of scarce resources in favour of short-term over long-term economic gains?
- Will the project create unwarranted losses in precious/irreplaceable natural or other sources?
- Will the project significantly affect people's health negatively?
- Will the project result in unwarranted hazards to endangered species?
- Will the project have an unreasonable impact on the livelihoods and subsistence of the people concerned?
- Will the project tend to intensify urban migration from rural areas to an undesirable degree?

### **12.4.3 Impacts on the Socio-Cultural Environment**

When discussing the impact on the environment, not only the physical and biological environment is meant, but also the social environment. Impact on the social environment, which is an important issue in any development project, implies adverse effects on social structures and persons.

Examples of impacts on the social environment, related to transport development projects, are:

#### ***Necessity of Resettlement:***

When persons have to leave their homes for the realisation of a project, they should be compensated for the loss of their land, house and other properties. Also they should be assisted (socially and financially) to find other accommodation (and work, if applicable), to be able to live at least at the same standard as before.

#### ***Health Hazards:***

Health hazards have social implications. Health risks can result for example from air pollution, collisions, uncontrolled storage of spoils, leakage of hazardous spills, and noise.

***Impairment of Historical/Cultural Sites, Monuments, and Aesthetics:***

Examples of impacts on the social environment are: damage to areas worthwhile for their natural beauty and damage to specific historical areas, beloved monuments or graveyards. If such areas/monuments will be affected by a project, careful weighing of interests should be executed, and alternative solutions should be investigated. If it is decided to sacrifice an area (or monument) totally or partly, one should try to offer compensation for what is lost, or take as many mitigation measures as possible.

***Nuisance:***

Nuisance, for example caused by noise, air pollution, bad smells of spoils, dust, etc., also has an adverse impact on the social environment.

## **12.5 PROPOSED TRANSPORT IMPROVEMENT PROJECTS FOR GRATER CAIRO**

### **12.5.1 Introduction**

For improvement of Roads, Rail Based Public Transport (metro, super tram, tram, train), and Road Based Public Transport (bus, shared taxi) basically four scenarios - Scenarios A, B, C, and D - have been formulated:

Scenario A: Committed Projects Scenario;

Scenario B: Do Maximum Scenario;

Scenario C: Core Scenario;

Scenario D: Master Plan Scenario.

The finally proposed Scenario D for the different sectors is a refinement of Scenario C. In the following sections an overview is provided of all the identified and proposed Road Projects, Railway Based Public Transport Projects, Road Based Public Transport Projects, Water Based Public Transport Projects and Inter-Modal Projects.

Scenario D - the selected projects for the Transport Master Plan - has been evaluated for its environmental implications (see Chapters 8.6, 8.7, and 8.8). The differences between Scenario B (Do Maximum Scenario) and Scenario D (Master Plan Scenario) appeared to be not substantial from an environmental point of view. In order to carry out the Initial Environmental Examination for Scenario D for the different sectors, all the identified proposed projects were screened for their potential environmental impacts.

Abbreviations used in the tables are as follows:

LRT:	Light Rail Transit;
PTB:	Public Transport Bus;
PTF:	Public Transport Ferry;
PTM:	Public Transport Metro;
PTSR:	Public Transport Suburban Rail;
PTST:	Public Transport Super Tram;
PTT:	Public Transport Tram;
PTXR:	Public Transport Express Rail;
PTF:	Public Transport Ferry;
IM:	Inter-Modal.

## 12.5.2 Proposed Road Projects

All proposed road improvement projects for Greater Cairo, identified for Scenario D, have been screened for their environmental consequences. The projects are presented in Table 12.5.2. For completeness, Table 12.5.1 presents the projects, which are already committed to be implemented (Scenario A).

**Table 12.5.1 Scenario A: Major Committed Road Projects  
 (“Do Nothing Scenario”)**

Project No.	Proposed Project	Length (km) New Roads (subtotal)	Length (km) Improvement (subtotal)
<b>Regional Primary Highway Projects</b>			
HR-1	<i>New Road:</i> Ring road connection-Wahat (Oases)	4.5	-
HR-2	<i>New Road:</i> Regional Ring Road South Tebeen Bridge	1.0	-
HR-3	<i>New Road:</i> Regional Ring Road Suez Rd. to Fayoum Rd.	103.0	-
HR-4	<i>New Road:</i> Regional Ring Road Fayoum Rd. to Khatatba	97.0	-
HR-5	<i>New Road:</i> Regional Ring Road Axis to New Cairo	35.0	-
HR-6	<i>New Road:</i> Regional Ring Road Axis to Autostrad	10.0	-
HR-7	<i>Improvement:</i> Regional Ring Road Khatatba to Suez Rd.	-	160.0
HR-8	<i>Improvement:</i> Regional Ring Road Axis Khatatba to Waraq	-	50.0
<b>Primary Arterial Street Improvements</b>			
HP-1	<i>Improvement:</i> Kamel Sedqy-Banhawy St.	-	2.1
<b>Intersection Grade Separation Projects</b>			
HG-1 to HG-14	<i>Grade Separations</i>	-	-
<b>Totals</b>		<b>250.5</b>	<b>212.1</b>

Source: JICA Study Team

The difference between Scenario B (“Do Maximum”) and Scenario D (“Realistic Scenario D”) - D presenting the proposed projects for the Transport Master Plan for Greater Cairo - consists of (only) two projects.

**Table 12.5.2 Scenario D: Proposed Road Projects for Transport Master Plan  
("Realistic Scenario")**

Project No.	Proposed Project	Length (km) New Roads and NwRds+ Widening (subtotal)	Length (km) Widening/ Improvement (subtotal)
<b>Regional Primary Highway Improvements</b>			
HR-9	<i>New Ring Road:</i> Maryooteya Rd.	3.8	-
HR-10, HR-11	<i>Widening:</i> Ismailya Desert Rd., Suez Desert Rd.	-	63.0
<b>Primary Arterial Street Improvements</b>			
HP-3, HP-4, HP-7	<i>New Roads+Widening:</i> Rod El Farag Axis, 15 <sup>th</sup> May Str. Extension, Ain Sukhna-Nasr City Rd. Extension	11.0	-
HP-2, HP-5, HP-6	<i>Widening:</i> Saft El Laban Axis, Ahmed Oraby Str., Moasaset El Zakah Str.	-	17.3
<b>Secondary Arterial Street Improvements</b>			
HS-1, HS-4, HS-5	<i>New Roads:</i> New Masala Str., Tereat Tirsa Str., Khafra Str.	11.7	-
HS-2, HS-3, HS-6	<i>Improvement:</i> Talaat El Gabal St., Emtedad 6 <sup>th</sup> October St., Tereat El Zumur St.	-	6.0
HS-7	<i>New Bridge:</i> Imbaba Nile Bridge	0.5	-
<b>Intersection Grade Separation Projects</b>			
HG-15, 16, 18-27	<i>Fly overs</i>	-	-
HG-17	<i>Connection</i>	-	-
HG-28, HG-29	<i>Underpasses</i>	-	-
<b>New Urban Expressway Projects</b>			
HE-3	<i>Expway N0.3: Autostrad-Salah Salem Route</i>	24.3	-
HE-4	<i>Expway N0.4: Abu Bakr El Sadeeq Route</i>	17.5	-
HE-5	<i>Expway N0.5: Alex. Agriculture Rd. Route</i>	11.0	-
HE-6	<i>Expway N0.6: Suez Rd. Route</i>	7.5	-
HE-7	<i>Expway No.7: Gesr El Suez Route</i>	11.0	-
HE-8	<i>Expway N0.8: Tereat El Zumur South Route</i>	3.0	-
HE-9	<i>Expway No.9: Tereat El Zumur North Route</i>	4.0	-
<b>Totals</b>		<b>105.3</b>	<b>86.3</b>

Source: JICA Study Team

### 12.5.3 Proposed Rail Based Public Transport Projects

In the rail sector an extensive new and rehabilitation program has been formulated for Greater Cairo. Presented are the Committed Projects (Do Nothing Scenario, Table 12.5.3) and the Projects selected for the Master Plan (Scenario D, Table 12.5.4).

Like for the Road Projects, only two projects form the difference between Scenario B and Scenario D for the proposed Rail Based Public Transport Projects.

**Table 12.5.3 Scenario A: Major Committed Rail Projects  
 (“Do Nothing Scenario”)**

Project No. and Type	Proposed Project	Length (km) New Rail (subtotal)	Length (km) Rehabilitation (subtotal)
PTM 1 Metro	<i>Existing Railway Improvements</i> Line 1: Helwan - New El Marg	-	43.7
PTM 2 Metro	<i>Extension Line 2</i> Line 2: Giza Suburban - Monib	2.1	-
PTM 3 Metro	<i>Extension Line 2</i> Line 2: to Kaliub	7.0	-
PTM 4 Metro	<i>New Section Line 3</i> Line 3: Imbaba / Mohandeseen – Heliopolis / Cairo Airport	34.0	-
PTM5 Metro	<i>New Section Line 4</i> Line 4: Pyramid – Port Said Street	27.0	-
<b>Totals</b>		<b>70.1</b>	<b>43.7</b>

Source: JICA Study Team

**Table 12.5.4 Scenario D: Proposed Rail Based Public Transport Projects for Transport Master Plan (“Realistic Scenario”)**

<b>Project No. and Type</b>	<b>Proposed Project</b>	<b>Length (km) New Rail (subtotal)</b>	<b>Length (km) Rehabilitation of existing tracks (subtotal)</b>
PTM Metro	<i>Existing Railway Services, Line 1-4</i> Committed Projects	-	-
PTST 1 (LRT) Super Tram	<i>New Section</i> Super Tram 1: New Cairo - Ramses	22.0	-
PTST 2 (LRT) Super Tram	<i>New Section</i> Super Tram 2: Sheraton – Attaba	15.0	-
PTST 3 (LRT) Super Tram	<i>New Section</i> Super Tram 3: Nasr City – Matarya	16.0	-
PTXR 1 Express Train	<i>New Section</i> Ains Shams – 10 <sup>th</sup> of Ramadan (East Wing)	46.0	-
PTXR 2 Express Train	<i>New Section</i> Cairo - 6 <sup>th</sup> of October (West Wing)	40.0	-
PTXR 1 Express Train	<i>Rehabilitation</i> Cairo - Kaliub		69.0
PTXR 2 Express Train	<i>Rehabilitation</i> El Marg – Shebeen El Kanater		20.0
PTXR 3 Express Train	<i>Rehabilitation</i> Cairo – El Manashi		20.0
PTXR 4 Express Train	<i>Rehabilitation</i> Cairo – El Maraziek, 6 <sup>th</sup> of October		104.0
PTT 1 Tram	<i>Rehabilitation, Helwan</i>		28.0
PTT 2 Tram	<i>Rehabilitation, Heliopolis</i>		7.5
<b>Totals</b>		<b>185.0</b>	<b>248.5</b>

Source: JICA Study Team



### 12.5.4 Proposed Road Based Public Transport Projects

Six Road Based Public Transport Projects have been formulated and proposed, which are presented in Table 12.5.5.

**Table 12.5.5 Scenario D: Proposed Road Based Public Transport Projects for Transport Master Plan (“Realistic Scenario”)**

<b>Project No. and Type</b>	<b>Proposed Project</b>
BTB-1 Bus	<b><i>Fleet Expansion, Modernization; Support Facilities:</i></b> Purchase and replacement of 1100 buses (average age of bus will drop from 12.7 yrs. to 5.6 yrs.). New depots. Improved bus stops and shelters. New headquarter; facility improvements.
PTB-2 Bus	<b><i>6th October Trunk Bus way; Support Facilities, 34 km</i></b>
BTB-3 Bus	<b><i>Urban Expressway Priority Treatment, 48.5 km:</i></b> Segregated Bus Lanes (2 bus lanes on new Express Ways; reserved bus lanes on existing roads; 2 reserved bus lanes on Alexandria Desert Road). Trunk Bus Ways, related to services for satellite cities.
PTB-4 Bus	<b><i>Regional Primary Highway Priority Treatments, 50 km</i></b>
PTB-5 Bus	<b><i>Urban Primary Street Priority Treatments, 51.5 km</i></b>
PTST-1 Shared Taxi	<b><i>Area Franchise</i></b>

*Source: JICA Study Team*

### 12.5.5 Proposed Water Based Public Transport Project

Only minor activities have been proposed related to Water Based Public Transport. The proposed Project activities are presented in Table 12.5.6.

**Table 12.5.6 Scenario D: Proposed Water Based Public Transport Project for Transport Master Plan (“Realistic Scenario”)**

<b>Project No. and Type</b>	<b>Proposed Project</b>
PTF 1	<b><i>Fleet Expansion, Modernization; Station (20 km)</i></b>

*Source: JICA Study Team*

### 12.5.6 Proposed Inter-Modal Projects

Activities for four Inter-Modal Points have been proposed for the “Realistic Scenario D”: the rehabilitation/reconstruction of two existing terminals and two terminals

needing expansion and reconstruction. The proposed project activities are presented in Table 12.5.7

**Table 12.5.7 Scenario D: Proposed Inter-Modal Projects for Transport Master Plan (“Realistic Scenario”)**

<b>Project No. and Type</b>	<b>Proposed Project</b>
IM1	<i>Ramses Inter-Modal Point</i> Rehabilitation
IM2	<i>Stadium Inter-Modal Point</i> Expansion and reconstruction
IM3	<i>Moneeb Inter-Modal Point</i> Expansion and reconstruction
IM4	<i>Ain Shams Inter-Modal Point</i> Reconstruction

Source: JICA Study Team

## 12.6 EXISTING SITUATION AND POTENTIAL POSITIVE IMPACTS OF PROPOSED TRANSPORT IMPROVEMENT PROJECTS

### 12.6.1 Introduction

Potential adverse and positive environmental impacts have been identified, which might originate from the proposed projects in the Transport Master Plan for Greater Cairo. Also, the existing situation (which requires major improvements) has been evaluated for its environmental impacts.

Often the existing transport situation is unsatisfactory in several aspects; reason why transportation improvement projects are initiated and developed. Tables 12.6.1-5 present the *Adverse impacts on the socio-economic environment in the existing situation* and the *Expected positive impacts after project implementation* for the proposed transport improvement projects (Scenario D) in the sectors Roads, Rail Based Public Transport, Road Based Public Transport, Water Based Public Transport and Inter-Modality.

For characterisation of the existing situation the results have been used from the Environmental Surveys carried out in the Project Area (see Chapter 8.2).

### 12.6.2 Proposed Road Projects

Related to the Roads Sector, the negative environmental impacts in the existing situation and the expected positive impacts on the environment from the proposed Road Projects (Scenario D) are presented in Table 12.6.1.

**Table 12.6.1 Roads: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects**

<b>Proposed Projects, Scenario D (“Realistic Scenario”)</b>	<b>Adverse socio-economic environmental impacts in existing situation</b>	<b>Expected positive socio-economic environmental impacts after project implementation</b>
<b>New roads, ring road, expressways, road extensions, bridges, flyovers, connection, underpasses</b>	Poor condition of existing roads, causing traffic congestion and high vehicle operation costs. Unsafe traffic conditions. Nuisance. Poor accessibility.	Reduction of travel time and vehicle operation costs, increased economic development, improved mobility, facilitating the urban function of the city, increased safety.
<b>Road Improvements: widening/additional lanes, bridges, flyovers, connection, underpasses</b>	Poor condition of existing roads. Bottlenecks, causing unsafe traffic conditions, nuisance, and high vehicle operation costs. Traffic congestion, caused by through traffic. Poor accessibility.	Reduction of travel time and vehicle operation costs, increased economic development, improved mobility, facilitating the urban function of the city, increased safety.

*Source: JICA Study Team*

### 12.6.3 Proposed Rail Based Public Transport Projects

Related to Rail Based Public Transport, the negative environmental impacts in the existing situation and the expected positive impacts on the environment from the proposed Projects (Scenario D) are presented in Table 12.6.2.

**Table 12.6.2 Rail Based Public Transport: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects**

<b>Proposed Projects, Scenario D (“Realistic Scenario”)</b>	<b>Adverse socio-economic environmental impacts in existing situation</b>	<b>Expected positive socio-economic environmental impacts after project implementation</b>
<b>New lines, new sections, extensions:  Metro Super Tram Express Train</b>	-	Reduction of travel time for passengers, reduction of operation costs, increased economic development, improved mobility, facilitating the urban function of the city, increased safety. Considerable less emissions compared to use of cars.
<b>Rehabilitation of existing tram lines</b>	Bad condition of existing lines, long travel time for passengers, nuisance, high operation costs, poor accessibility.	Reduction of travel time for passengers, reduction of operation costs, increased economic development, improved mobility, facilitating the urban function of the city, increased safety.

*Source: JICA Study Team*

## 12.6.4 Proposed Road Based Public Transport Projects

Related to Road Based Public Transport, the negative environmental impacts in the existing situation and the expected positive impacts on the environment from the proposed Projects (Scenario D) are presented in Table 12.6.3.

**Table 12.6.3 Road Based Public Transport: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects**

Proposed Projects, Scenario D (“Realistic Scenario”)	Adverse socio-economic environmental impacts in existing situation	Expected positive socio-economic environmental impacts after project implementation
<b>Fleet Expansion and Modernisation, Support Facilities:</b>  <b>Purchase and replacement of buses New depots.</b> <b>Improved bus stops and shelters.</b> <b>New headquarter.</b> <b>Facility improvements.</b>	Bad condition of existing busses and bus stops, long travel time for passengers, nuisance, high operation costs, poor accessibility, unsafe traffic conditions.	Reduction of travel time for passengers, reduction of operation costs, increased economic development, improved mobility, facilitating the urban function of the city, increased safety. Decrease of emissions per bus, because of replacement of old fleet.
<b>Bus Priority Treatment Projects:</b>  <b>Segregated Bus Lanes.</b> <b>Trunk Bus Way, related to services for satellite cities.</b>	Bad performance of existing lines, bus long travel time for passengers, nuisance, high operation costs, poor accessibility, unsafe traffic conditions.	Reduction of travel time for passengers, reduction of operation costs, increased economic development, improved mobility, facilitating the urban function of the city, increased safety.
<b>Shared Taxi Project:</b>  <b>Area Franchise</b>	Poor performance of existing taxi system.	Reduction of travel time for passengers, reduction of operation costs, increased economic development, improved mobility, facilitating the urban function of the city.

Source: JICA Study Team

## 12.6.5 Proposed Water Based Public Transport Projects

Related to Water Based Public Transport, the negative environmental impacts in the existing situation and the expected positive impacts on the environment from the proposed Projects (Scenario D) are presented in Table 12.6.4.

**Table 12.6.4 Water Based Public Transport: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects**

Proposed Projects, Scenario D (“Realistic Scenario”)	Adverse socio-economic environmental impacts in existing situation	Expected positive socio-economic environmental impacts after project implementation
<b>Fleet Expansion.</b> <b>Modernization.</b> <b>Station.</b>	Poor condition of existing ferries, long travel time for passengers, high operation costs, unsafe traffic conditions.	Reduction of travel time for passengers, reduction of operation costs, improved mobility.

Source: JICA Study Team

## 12.6.6 Proposed Inter-Modal Transport Projects

Related to Inter-Modal Transport, the negative environmental impacts in the existing situation and the expected positive impacts on the environment from the proposed Projects (Scenario D) are presented in Table 12.6.5.

**Table 12.6.5 Inter-Modality: Adverse Environmental Impacts in Existing Situation and Expected Positive Impacts from Proposed Projects**

Proposed Projects, Scenario D (“Realistic Scenario”)	Adverse socio-economic environmental impacts in existing situation	Expected positive socio-economic environmental impacts after project implementation
<b>Ramses Inter-Modal Point, rehabilitation. Stadium Inter-Modal Point, expansion and reconstruction. Moneeb Inter-Modal Point, expansion and reconstruction. Ain Shams Inter-Modal Point, Reconstruction.</b>	Poor condition of existing terminals, long travel time for passengers, nuisance, high operation costs, poor accessibility, unsafe traffic conditions.	Reduction of travel time for passengers, reduction of operation costs, increased economic development, improved mobility, facilitating the urban function of the city, increased safety.

*Source: JICA Study Team*

## 12.7 POTENTIAL ADVERSE IMPACTS OF PROPOSED TRANSPORT IMPROVEMENT PROJECTS ON THE ENVIRONMENT

### 12.7.1 Introduction

Activities and processes, related to transport development projects, may result in significant negative impacts to the environment. Potential adverse environmental impacts have been identified, which might originate from the proposed projects for the Transport Master Plan for Greater Cairo. The potential significant adverse environmental impacts from the proposed transport development projects are presented in Tables 12.7.1-6. In these tables the impacts have been differentiated in two main categories: impacts on the *socio-economic environment* and impacts on the *physical-biological environment*. Only potential realistic impacts are presented for the proposed transport development projects. Estimated CO<sub>2</sub> emissions are presented in Table 12.7.2.

The presented environmental impacts in the tables do not suggest that all listed impacts will actually occur; merely they show which environmental impacts *may* be expected from the proposed activities.

The presented results are also based on visual inspection of the Project Area by the environmental specialist of the JICA/PCI Study Team.

## 12.7.2 Potential Impacts from Proposed Road Projects

Related to the Roads Sector, the potential negative environmental impacts on the socio-economic and the physical/biological environment from the proposed Road Projects (Scenario D) are presented in Table 12.7.1.

**Table 12.7.1 Potential Significant Adverse Environmental Impacts from Proposed Road Projects; Scenario D (Master Plan)**

Proposed Road Projects (Scenario D)	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
<p><b><u>NEW ROADS+WIDENING, REQUIRING LAND ACQUISITION</u></b></p> <p><b>HS-1: New Road</b>, New Masala Str., <b>HP-2: Widening</b>, Saft El Laban Axis <b>HP-3: New Road</b>, Rod El Farag Axis <b>HP-7: New Road</b>, Ain Sukhna-Nasr City Rd Extension</p>	<p>Loss of land, houses, property, public facilities, historical and cultural sites. Fragmentation/split up of areas. Impact on land use. Impact on affected persons. Resettlement. Effects of increased air pollution and noise/vibrations on health of affected persons (public health). Risk of accidents (public health). Impact on aesthetics/ modification of landscape. Temporary impact on health of workers during construction.</p>	<p>Fragmentation/split up of areas. Impact on land use. Increased air pollution. Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents. Runoff.</p>
<p><b><u>NEW ROADS NOT REQUIRING LAND ACQUISITION</u></b></p> <p><b>New Ring Road:</b> <b>HR-9:</b> Maryooteya Rd. <b>New Roads:</b> <b>HP-3:</b> 15<sup>th</sup> May Str. Extension <b>HS-4:</b> Tereat Tirsia Str., <b>HS-5:</b> Khafra Str. <b>New Expressways*:</b> <b>HE-3, Expway No.3:</b> autostrad - Salah Salem Route <b>HE-4, Expway No.4:</b> Abu Bakr El Sadeeq Route <b>HE-5, Expway No.5:</b> Alex. Agriculture Rd. Route <b>HE-6, Expway No.6:</b> Suez Rd. Route <b>HE-7, Expway No.7:</b> Gesr El Suez Route <b>HE-8, Expway No.8:</b> Tereat El Zumur South Route <b>HE-9, Expway No.9:</b> : Tereat El Zumur North Route * Expressways to be elevated on existing roads.</p>	<p>Impact on historical and cultural sites. Increased fragmentation/split up of areas. Impact on land use. Effects of increased air pollution and noise/vibrations on health of affected persons (public health). Risk of accidents (public health). Impact on aesthetics/ modification of scenery. Temporary impact on health of workers during construction.</p>	<p>Increased fragmentation/split up of areas. Impact on land use. Increased air pollution. Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents. Runoff.</p>

Source: JICA Study Team

**Table 12.7.1 (continued) Potential Significant Adverse Environmental Impacts from Proposed Road Projects; Scenario D (Master Plan)**

Proposed Road Projects (Scenario D)	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
<p><b><u>ROAD IMPROVEMENTS, NOT REQUIRING LAND ACQUISITION</u></b></p> <p><b>HS-2, HS-3, HS-6: Road Improvement</b>  <b>HS-7: New Bridge, Imbaba Nile Bridge</b>  <b>HG-15, 16, 18-27: Fly Overs</b>  <b>HG-17: Connection</b>  <b>HG-28, HG-29: Underpasses</b>  <b>HR-10: Widening, Ismailya Desert Rd.</b>  <b>HR-11: Widening, Suez Desert Rd.</b>  <b>HP-5: Widening, Ahmed Oraby St.</b>  <b>HP-6: Widening, Moasaset El Zakah St.</b></p>	<p>Impact on cultural and historical sites.                      Increased fragmentation/split up of areas.                      Effects of increased air pollution and noise/ vibrations on health of affected persons (public health).                      Impact on aesthetics/modification of scenery.                      Temporary impact on health of workers.</p>	<p>Increased fragmentation/split up of areas.                      Impact on land use.                      Increased air pollution.                      Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents.</p>

*Source: JICA Study Team*

CO<sub>2</sub> emissions were estimated for the different Scenarios of the proposed Transport Improvement Projects for Greater Cairo. Japanese standards were used for the estimation, because Egyptian standards are not available. Consequently, the absolute values are not very relevant. However when the figures are used relatively - to compare the Scenarios – then some indication is provided on the expected CO<sub>2</sub> emissions. Table 12.7.2 presents the estimated CO<sub>2</sub> figures for the different Scenarios.

It is evident that CO<sub>2</sub> emissions are increasing, because of the enormous growth of the use of private cars in the coming years in Egypt. This a phenomenon happening worldwide in developing countries. For the selected Scenario D there is an increase of CO<sub>2</sub>, compared with the year 2001, with approximately 11 percent. With the “Do Maximum” Scenario the situation will be better, even compared with the emissions in 2001. The cause of this effect must be the relatively high weight of the component for public transport in Scenario B; the “Do Maximum” Scenario, which is unfortunately not affordable financially.

**Table 12.7.2 Estimated CO<sub>2</sub> Emissions for Different Scenarios**

	Base Year 2001	Scenario A Committed Projects 2022	Scenario B Do maximum 2022	Scenario C Core Projects 2022	Scenario D Proposed 2022
CO <sub>2</sub> Emissions (10 <sup>6</sup> ton)	12.2	15.9	10.6	13.7	13.6

*Source: JICA Study Team*

### 12.7.3 Potential Impacts from Proposed Rail Based Public Transport Projects

For Rail Based Public Transport, the potential negative environmental impacts on the socio-economic and the physical/biological environment from the proposed Projects (Scenario D) are presented in Table 12.7.3.

**Table 12.7.3 Potential Significant Adverse Environmental Impacts from Proposed Rail Based Public Transport Projects; Scenario D (Master Plan)**

Proposed Rail Based Public Transport Projects (Scenario D)	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
<p><b><u>NEW RAILWAYS, NOT REQUIRING LAND ACQUISITION</u></b></p> <p><b>PTM 2 Metro New Section, Line 2:</b> Line extension to Monib.</p> <p><b>PTM 3 Metro New Section, Line 2:</b> Line extension to Kaliub.</p> <p><b>PTM 4 Metro New Section, Line 3:</b> Giza - Airport.</p> <p><b>PTM 5 Metro New Section, Line 4:</b> Line Pyramid – Port Said Street.</p> <p><b>PTST 1 (LRT) Super Tram New Section, Line 1:</b> New Cairo - Ramses.</p> <p><b>PTST 2 (LRT) Super Tram New Section, Line 2:</b> Sheraton - Attaba.</p> <p><b>PTST 3 (LRT) Super Tram New Section, Line 3:</b> Nasr City - Matarya.</p> <p><b>PTXR 1 Express Train New Section:</b> Ains Shams – 10<sup>th</sup> of Ramadan.</p> <p><b>PTXR 2 Express Train New Section:</b> Ains Shams – 10<sup>th</sup> of Ramadan.</p> <p><b>PTXR 3 Express Train New Section:</b> Cairo- 6<sup>th</sup> of October</p>	<p>Impact on historical and cultural sites.</p> <p>Increased fragmentation/split up of areas.</p> <p>Impact on land use.</p> <p>Impact on aesthetics/ modification of scenery.</p> <p>Temporary impact on health of workers during construction.</p>	<p>Increased fragmentation/split up of areas.</p> <p>Impact on land use.</p>
<p><b><u>RAIL BASED PUBLIC TRANSPORT IMPROVEMENTS, NOT REQUIRING LAND ACQUISITION</u></b></p> <p><b>PTSR 1 Express Train Rehabilitation,</b> Cairo - Kaliub.</p> <p><b>PTSR 2 Express Train Rehabilitation,</b> El Marg - Shebeen El Kanater.</p> <p><b>PTSR 3 Express Train Rehabilitation,</b> Cairo - El Manashi.</p> <p><b>PTSR 4 Express Train Rehabilitation,</b> Cairo - El Maraziek, 6<sup>th</sup> of October.</p> <p><b>PTT 1 Tram Rehabilitation,</b> Helwan.</p> <p><b>PTT 2 Tram Rehabilitation,</b> Heliopolis.</p>	<p>Temporary impact on health of workers.</p>	<p>-</p>

Source: JICA Study Team



### 12.7.4 Potential Impacts from Proposed Road Based Public Transport Projects

For Road Based Public Transport, the potential negative environmental impacts on the socio-economic and the physical/biological environment from the proposed Projects (Scenario D) are presented in Table 12.7.4.

**Table 12.7.4 Potential significant Adverse Environmental Impacts from Proposed Road Based Public Transport Projects; Scenario D (Master Plan)**

Proposed Road Based Public Transport Projects (Scenario D)	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
<p><b><u>ROAD BASED PUBLIC TRANSPORT IMPROVEMENTS, NOT REQUIRING LAND ACQUISITION</u></b>  <b>BTB-1 Fleet Expansion, Modernization; Support Facilities:</b>                      Purchase and replacement of 1100 buses (average age of bus will drop from 12.7 yrs. to 5.6 yrs.).                      New depots.                      Improved bus stops and shelters.                      New headquarter; facility improvements.  <b>PTB-2 6th October Trunk Bus way; Support Facilities, 34 km</b>  <b>BTB-3 Urban Expressway Priority Treatment, 48.5:</b>                      Segregated Bus Lanes (2 bus lanes on new Express Ways; reserved bus lanes on existing roads; 2 reserved bus lanes on Alexandria Desert Road).                      Trunk Bus Ways, related to services for satellite cities.  <b>PTB-4 Regional Primary Highway Priority Treatments, 50 km</b>  <b>PTB-5 Urban Primary Street Priority Treatments, 51.5 km</b></p>	<p>Temporary impact on health of workers.</p>	<p>-</p>
<p><b>PTST-1: Area Franchise</b></p>	<p>-</p>	<p>-</p>

*Source: JICA Study Team*

### 12.7.5 Potential Impacts from Proposed Water Based Public Transport Projects

The potential negative environmental impacts on the socio-economic and the physical/biological environment from the proposed Projects for Water Based Public Transport, (Scenario D) are presented in Table 12.7.5.

**Table 12.7.5 Potential Significant Adverse Environmental Impacts from Proposed Water Based Public Transport Projects; Scenario D (Master Plan)**

Proposed Water Based Public Transport Projects (Scenario D)	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
<b>PTF1: Fleet Expansion. Modernization. Station.</b>	-	-

Source: JICA Study Team

### 12.7.6 Potential Impacts from Proposed Inter-Modal Transport Projects

For the proposed Inter-Modal Transport Projects, the potential negative environmental impacts on the socio-economic and the physical/biological environment (Scenario D) are presented in Table 12.7.6.

**Table 12.7.6 Potential Significant Adverse Environmental Impacts from Proposed Inter-Modal Projects; Scenario D (Master Plan)**

Proposed Inter-Modal Projects (Scenario D)	Potential significant impacts on socio-economic environment	Potential significant impacts on physical/biological environment
<b>IM 2 Stadium Inter-Modal Point</b> Expansion and reconstruction  <b>IM 3 Moneeb Inter-Modal Point</b> Expansion and reconstruction	Loss of land, houses, property, public facilities, historical and cultural sites. Fragmentation/split up of areas. Impact on land use. Impact on affected persons, households. Resettlement. Effects of increased air pollution and noise/vibrations on the health of affected persons (public health). Risk of accidents (public health). Impact on aesthetics/ modification of landscape. Temporary impact on health of workers.	Fragmentation/split up of areas. Impact on land use. Increased air pollution. Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents. Runoff.
<b>IM1 Ramses Inter-Modal Point</b> Rehabilitation <b>IM 4 Ain Shams Inter-Modal Point</b> Reconstruction	Temporary impact on health of workers.	-

Source: JICA Study Team

## 12.8 ENVIRONMENTAL SCREENING; RECOMMENDATIONS FOR FURTHER ENVIRONMENTAL STUDIES

### 12.8.1 Introduction

All the proposed projects in the roads, railways, waterways and inter-modal sectors have been screened on the necessity for further environmental studies. Tables 12.8.1-5 present the outcome of the *Environmental Screening* of the identified and proposed transport improvement projects for the Transport Master Plan for Greater Cairo.

It is indicated in the tables from which projects slight (mostly temporary) impacts are expected and from which projects significant (mostly long term) impacts are expected. Based on professional judgement scoring has been used to weight the significance of the impacts.

In the Egyptian “Guidelines for Environmental Impact Assessment<sup>15</sup>” three categories of projects are presented, based on different levels of severity of possible environmental impacts: “White Projects”, “Grey Projects”, and “Black Projects”.

The three categories have the following characteristics:

- “White Projects”: projects with potential minor environmental impacts, which do not require further environmental assessment.
- “Grey Projects”: projects which may result in substantial environmental impact, that may or may not need a full Environmental Impact Assessment, but in most cases need an Environmental Management and Environmental Monitoring Plan.
- “Black Projects”: projects with potential *significant* environmental impacts, which require a full Environmental Impact Assessment (EIA).

The following notes are provided for a good understanding of the tables:

XXXXX	:negative impacts expected to be significant/severe (long term impact)
XXX	:negative impacts expected to be significant (long term impact)
XX	:negative impacts expected to be moderate
X	:negative impacts expected to be slight (temporary impact)
-	:no significant impact expected
EIA	:Environmental Impact Assessment
Env.Man.Plan	:Environmental Management Plan*
Env.Mon.Plan:	:Environmental Monitoring Plan

\* :*Environmental Management Plans should include Resettlement Plans if people have to be moved from their homes.*

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<sup>15</sup> Egyptian Environmental Affairs Agency / EEAA, 1996

## 12.8.2 Environmental Screening of proposed Road Projects

Environmental Screening of the proposed Road Projects resulted in the environmental assessment requirements, as presented in Table 12.8.1.

**Table 12.8.1 Environmental Screening of Proposed Road Improvement Projects (Scenario D/Realistic Scenario)**

<b>PROPOSED TRANSPORT PROJECTS</b>	<b>Potential Negative Environmental Impact</b>	<b>Recommended Environmental Study</b>
<b>ROAD IMPROVEMENT PROJECTS</b>		
<b><u>NEW ROADS+WIDENING, REQUIRING LAND ACQUISITION</u></b> HS-1: New Road, New Masala Str., HP-2: Widening, Saft El Laban Axis HP-3: New Road, Rod El Farag Axis HP-7: New Road, Ain Sukhna-Nasr City Rd Extension	<b>XXXXX</b>	<b>EIA + Env.Man.Plan + Env.Mon.Plan</b> (EEAA: 'Black Projects')
<b><u>NEW ROADS NOT REQUIRING LAND ACQUISITION</u></b> New Ring Road: HR-9: Maryooteya Rd. New Roads: HP-3: 15 <sup>th</sup> May Str. Extension HS-4: Tereat Tirsas Str., HS-5: Khafra Str. New Expressways*: HE-3, Expway No.3: autostrad - Salah Salem Route HE-4, Expway No.4: Abu Bakr El Sadeeq Route HE-5, Expway No.5: Alex. Agriculture Rd. Route HE-6, Expway No.6: Suez Rd. Route HE-7, Expway No.7: Gesr El Suez Route HE-8, Expway No.8: Tereat El Zumur South Route HE-9, Expway No.9: : Tereat El Zumur North Route	<b>XXX</b>	<b>EIA + Env.Man.Plan + Env.Mon.Plan</b> (EEAA: 'Black Projects')
<b><u>ROAD IMPROVEMENTS, NOT REQUIRING LAND ACQUISITION</u></b> HS-2, HS-3, HS-6: Road Improvement HS-7: New Bridge, Imbaba Nile Bridge HG-15, 16, 18-27: Fly Overs HG-17: Connection HG-28, HG-29: Underpasses HR-10: Widening, Ismailya Desert Rd. HR-11: Widening, Suez Desert Rd. HP-5: Widening, Ahmed Oraby St. HP-6: Widening, Moasaset El Zakah St.	<b>XX</b>	<b>Env.Man.Plan+ Env.Mon.Plan</b> (EEAA : 'Grey Projects')

Source: JICA Study Team

### 12.8.3 Environmental Screening of proposed Rail Based Public Transport Projects

Environmental Screening of the proposed Rail Based Public Transport Projects resulted in a recommendation for environmental assessment studies, as presented in Table 12.8.2.

**Table 12.8.2 Environmental Screening of Proposed Rail Based Public Transport Projects (Scenario D/Realistic Scenario)**

PROPOSED TRANSPORT PROJECTS	Potential Negative Environmental Impact	Recommended Environmental Study
<b>RAIL BASED PUBIC TRANSPORT IMPROVEMENT PROJECTS</b>		
<u><b>RAIL PROJECTS (NOT REQUIRING LAND ACQUISITION), NEW SECTIONS</b></u> <b>PTM 2 Metro New Section, Line 2:</b> Line extension to Monib. <b>PTM 3 Metro New Section, Line 2:</b> Line extension to Kaliub. <b>PTM 4 Metro New Section, Line 3:</b> Giza - Airport. <b>PTM 5 Metro New Section, Line 4:</b> Line Pyramid – Port Said Street. <b>PTST 1 (LRT) Super Tram New Section, Line 1:</b> New Cairo - Ramses. <b>PTST 2 (LRT) Super Tram New Section, Line 2:</b> Sheraton - Attaba. <b>PTST 3 (LRT) Super Tram New Section, Line 3:</b> Nasr City - Matarya. <b>PTXR 1 Express Train New Section:</b> Ains Shams – 10 <sup>th</sup> of Ramadan. <b>PTXR 2 Express Train New Section:</b> Ains Shams – 10 <sup>th</sup> of Ramadan. <b>PTXR 3 Express Train New Section:</b> Cairo- 6 <sup>th</sup> of October	<b>XXX</b>	<b>EIA + Env.Man.Plan + Env.Mon.Plan</b>  (EEAA: ‘Black Projects’)
<u><b>RAIL IMPROVEMENTS (NOT REQUIRING LAND ACQUISITION)</b></u> <b>PTSR 1 Express Train Rehabilitation</b> Cairo – Kaliub. <b>PTSR 2 Express Train Rehabilitation</b> El Marg - Shebeen El Kanater. <b>PTSR 3 Express Train Rehabilitation</b> Cairo - El Manashi. <b>PTSR 4 Express Train Rehabilitation</b> Cairo - El Maraziek, 6 <sup>th</sup> of October. <b>PTT 1 Tram Rehabilitation,</b> Helwan. <b>PTT 2 Tram Rehabilitation,</b> Heliopolis.	<b>X</b>	<b>None, normal safety precautions and environmental regulations to be followed</b>  (EEAA: ‘White Projects’)

Source: JICA Study Team

## 12.8.4 Environmental Screening of proposed Road Based Public Transport Projects

Environmental Screening of the proposed Road Based Public Transport Projects resulted in the environmental assessment requirements, as presented in Table 12.8.3.

**Table 12.8.3 Environmental Screening of proposed Road Based Public Transport Projects (Scenario D/Realistic Scenario)**

<b>PROPOSED TRANSPORT PROJECTS</b>	<b>Potential Negative Environmental Impact</b>	<b>Recommended Environmental Study</b>
<b>ROAD BASED PUBIC TRANSPORT IMPROVEMENT PROJECTS</b>		
<b>BTB-1: Fleet Expansion, Modernization; Support Facilities:</b> Purchase and replacement of 1100 buses. New depots. Improved bus stops and shelters. New headquarter; facility improvements.	<b>X</b>	<b>None, normal safety precautions and environmental regulations to be followed</b>  (EEAA: 'White Projects')
<b>PTB-2: 6th October Trunk Bus way; Support Facilities, 34 km</b>	<b>XX</b>	<b>Env.Man.Plan+ Env.Mon.Plan</b>  (EEAA : 'Grey Projects')
<b>BTB-3: Urban Expressway Priority Treatment, 48.5:</b> Segregated Bus Lanes (2 bus lanes on new Express Ways; reserved bus lanes on existing roads; 2 reserved bus lanes on Alexandria Desert Road). Trunk Bus Ways, related to services for satellite cities.	<b>XX</b>	<b>Env.Man.Plan+ Env.Mon.Plan</b>  (EEAA : 'Grey Projects')
<b>PTB-4: Regional Primary Highway Priority Treatments, 50 km</b>	<b>XX</b>	<b>Env.Man.Plan+ Env.Mon.Plan</b>  (EEAA : 'Grey Projects')
<b>PTB-5: Urban Primary Street Priority Treatments, 51.5 km</b>	<b>XX</b>	<b>Env.Man.Plan+ Env.Mon.Plan</b>  (EEAA : 'Grey Projects')
<b>PTST-1: Shared Taxi, Area Franchise</b>	<b>X</b>	<b>None, normal safety precautions and environmental regulations to be followed</b>  (EEAA: 'White Project')

Source: JICA Study Team

### 12.8.5 Environmental Screening of proposed Water Based Transport Projects

The proposed Water Based Public Transport Projects were screened for their environmental implications. The outcome is presented in Table 12.8.4.

**Table 12.8.4 Environmental Screening of Proposed Water Based Improvement Projects (Scenario D/Realistic Scenario)**

PROPOSED TRANSPORT PROJECTS	Potential Negative Environmental Impact	Recommended Environmental Study
<b>WATER BASED PUBLIC TRANSPORT IMPROVEMENT PROJECTS</b>		
<b>PTF1: Fleet Expansion, Modernization; Station</b>	<b>X</b>	<b>None, normal safety precautions and environmental regulations to be followed (EEAA: 'White' Projects')</b>

*Source: JICA Study Team*

### 12.8.6 Environmental Screening of proposed Inter-Modal Projects

Environmental Screening of the proposed Intermodal Projects resulted in the environmental assessment requirements, as presented in Table 12.8.5.

**Table 12.8.5 Environmental Screening of Proposed Intermodal Projects (Scenario D/Realistic Scenario)**

PROPOSED INTERMODAL PROJECTS	Potential Negative Environmental Impact	Recommended Environmental Study
<b>INTERMODAL IMPROVEMENT PROJECTS</b>		
<b>IM 2 Stadium Intermodal Point</b> Expansion and reconstruction	<b>XXXX</b>	<b>EIA + Env.Man.Plan + Env.Mon.Plan (EEAA: 'Black Projects')</b>
<b>IM 3 Moneeb Intermodal Point</b> Expansion and reconstruction	<b>XXXX</b>	<b>EIA + Env.Man.Plan + Env.Mon.Plan (EEAA: 'Black Projects')</b>
<b>IM1 Ramses Intermodal Point</b> Rehabilitation	<b>X</b>	<b>None, normal safety precautions and env. regulations to be followed (EEAA: 'White Projects')</b>
<b>IM 4 Ain Shams Intermodal Point</b> Reconstruction	<b>X</b>	<b>None, normal safety precautions and env. regulations to be followed (EEAA: 'White Projects')</b>

*Source: JICA Study Team*

## **12.9 SCOPING**

Using the identified potential adverse environmental impacts (Section 8.5) and the results from the Environmental Surveys, the significant environmental impacts ***expected to result*** from the major proposed Transport Improvement Projects (which require an EIA) could be formulated. The results of this scoping process are presented in Table 12.9.1. The expected adverse environmental impacts are the identified items to be studied in the Environmental Impact Assessments (especially projects requiring land acquisition). In Table 12.9.1 a differentiation was made of the expected adverse environmental impacts in the various implementation phases of the transport improvement projects.



**Table 12.9.1 Expected Adverse Environmental Impacts from Major Proposed Transport Improvement Projects in Pre-Construction, Construction and O & M Phases**

PROJECT ACTIVITIES	EXPECTED ADVERSE IMPACTS <i>Socio-economic and physical/biological aspects</i>
<p><b><u>Pre-construction Phase</u></b>                      Survey and site investigations                      Land acquisition: area to be acquired for the "right of way", and for borrow pits and quarries                      Resettlement                      Compensation                      Re-employment.</p>	<p><b><u>Pre-construction Phase</u></b>                      Loss of land, houses, property, public facilities, historical and cultural sites                      Fragmentation/split up of areas                      Impact on: affected persons, households, land use, aesthetics</p>
<p><b><u>Construction Phase</u></b>                      1. Base camp establishment and operation                      2. Quarry establishment and operation                      3. Land clearance                      4. Earthworks/embankment fill:                      - excavation, borrow pit establishment &amp; operation                      - haulage of embankment fill (and construction) material                      - embankment spreading, levelling                      - compaction of embankment                      - shaping, finishing of embankment                      5. Grade separation:                      - interchange construction                      - construction of over and underpasses                      6. Bridge/tunnel construction:                      - excavation works                      - foundation works                      - construction of piers                      - construction of beams                      - erection of beams and casting deck slabs                      7. Drainage structures and related construction                      8. Pavement                      9. Sign posting, road lighting, road marking, km posting, traffic control, noise reduction barriers etc.</p>	<p><b><u>Construction Phase</u></b>                      1. Disposal of waste, waste spills (oil)                      2. Air pollution, spills of waste, vibrations, noise, traffic congestion, impairment of aesthetics, damage to existing roads, safety risks for workers                      3. disturbance on public utilities, effect on graveyards and cultural/historical sites, loss/disturbance of flora and fauna                      4, 5, 6, 7. Interruption of water flows, erosion/sedimentation, change in groundwater level, air pollution, spills of waste, vibrations, noise, safety risks for workers, damage to existing roads, traffic congestion, disposal of earth material/spoils, impact on aesthetics                      8. Impact of asphalt plants: air pollution, risk of spills                      9. Minor impact</p>
<p><b><u>Operation &amp; Maintenance Phase</u></b>                      Maintenance and repairs of pavement/rail tracks                      Maintenance and repairs of rest areas                      Maintenance and repairs of signposts, road lights etc.                      Cleaning up of road debris                      Maintenance of planted trees, grass and berms</p>	<p><b><u>Operation &amp; Maintenance Phase</u></b>                      Long term effects of increased air pollution and noise/vibrations on the health of affected persons (public health, for road projects only).                      Risk of accidents (public health).                      Long term effect on communities, split up by the roads.                      Long term effect of split up of agricultural land.                      Long term impact on aesthetics/modification of landscape.                      Encroachment (non-planned activities: unplanned settlements, unplanned development of industries), affecting land use and aesthetics.                      Increase of land prices, pushing lower income residents out.                      Obstruction of migrating animals.                      Runoff pollution                      Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents.                      Long term interruption of water flows and drainage.</p>

Source: JICA Study Team

## **12.10 MITIGATION MEASURES**

The overall effect of the proposed Transport Improvement Projects on the region of Greater Cairo is expected to be positive and should result in progressing economic development.

Several negative impacts can be avoided or minimized when appropriate mitigation measures are incorporated in the Design, the Construction, and the Operation & Maintenance Phases of a project.

It is emphasised that especially during the Pre-Construction/Design Phase as many mitigation measures as possible should be incorporated to minimise adverse environmental impacts in the next project phases.

Table 12.10.1 presents the expected adverse environmental impacts (which are expected during the Pre-Construction, the Construction and the Operation & Maintenance Phases) of the proposed transport improvement projects, with an indication of possible mitigation measures to minimise the negative impacts.

**Table 12.10.1 Indication of Mitigation Measures for Major Proposed Transport Improvement Projects in the Pre-Construction, Construction and O & M Phases**

<b>EXPECTED ADVERSE IMPACTS</b> <i>Socio-economic and physical/biological aspects</i>	<b>MITIGATION MEASURES</b>
<p><b><u>Pre-construction Phase</u></b> Loss of land, houses, property, public facilities, historical and cultural sites. Fragmentation/split up of areas. Impact on: affected persons, households, land use, aesthetics.</p>	<p><b><u>Pre-construction Phase</u></b> Proper selection of alignment and sites, including quarries and borrow pits. Proper design of roads, underpasses, bridges, sound barriers; landscaping, planting trees and shrubs. Preparation and execution of Environmental Management and Monitoring Plans, Transport Management Plan. Resettlement, compensation for lost land, accommodation, public facilities, property, and jobs (re-employment).</p>
<p><b><u>Construction Phase</u></b> Disposal of waste. Air pollution, spills of waste, vibrations, noise, traffic congestion, impairment of aesthetics, damage to existing roads, safety risks for workers. Disturbance on public utilities, effect on graveyards and cultural/ historical sites, loss/disturbance of flora and fauna. Interruption of water flows, erosion/sedimentation, change in groundwater level, air pollution, spills of waste, vibrations, noise, safety risks for workers, damage to existing roads, traffic congestion, disposal of earth material/spoils, impact on aesthetics. Impact of asphalt plants: air pollution, risk of spills.</p>	<p><b><u>Construction Phase</u></b> Proper Environmental Management and Monitoring during all works. Execution of Transport Management Plan. Construction of bridges/ underpasses/, sound barriers Carry out safety precautions. Planting of trees, landscaping, re-establishing situation. Enforcement of laws and regulations.</p>
<p><b><u>Operation &amp; Maintenance Phase</u></b> Long term effects of increased air pollution and noise/vibrations on the health of affected persons (fore road projects). Risk of accidents. Long term effect on communities, split up of land. Long term effect of split up of agricultural land. Long term impact on aesthetics/modification of landscape. Encroachment (non-planned activities: unplanned settlements, unplanned development of industries, affecting land use and aesthetics. Increase of land prices, pushing lower income residents out. Runoff pollution. Risks of contaminating drinking water sources and soil by spills of hazardous materials, caused by accidents. Long term interruption of water flows and drainage.</p>	<p><b><u>Operation &amp; Maintenance Phase</u></b> Bridges and underpasses. Sound barriers. Settling ponds for runoff. Landscaping, trees, plantations. Proper Operation &amp; Maintenance and repairs. Proper Environmental Management and Monitoring. Safety precautions. Zoning. Use of unleaded fuel. Use of Compressed Natural Gas (CNG). Noise and engine control. Strict enforcement of (environmental) laws and regulations. Development of social housing schemes.</p>

Source: JICA Study Team

## **12.11 ENVIRONMENTAL POLICY FOR AN IMPROVED TRANSPORT SECTOR**

### **12.11.1 Introduction**

Generally, transport brings benefits (positive impacts) in terms of improved economic opportunities and social welfare. However, also negative impacts on the physical/biological as well as the socio-cultural environmental may arise. Therefore, measures must be taken to reduce the short-term negative impacts and to mitigate and manage the long-term adverse environmental impacts.

### **12.11.2 Global, Regional and Local Environmental Impacts**

In the assessment and forecasting of environmental impacts, a distinction should be drawn between impacts at global, regional and local scales. Global and regional environmental impacts of traffic are large-scale impacts, like the depletion of sources of energy and natural resources, climate change, and increased global air pollution. The most useful indicators for global impacts are energy use and atmospheric emissions (greenhouse gases, like CO<sub>2</sub>; NO<sub>x</sub>, SO<sub>2</sub> and VOC). While environmental progress has been made in many sectors, unfortunately many transport activities result in a continued increase in CO<sub>2</sub> emission levels. Local environmental impacts mainly depend on the location and the design of transport infrastructure, and include (local) air pollution, noise, land take, water pollution, impacts on biodiversity and negative visual effects on landscape.

### **12.11.3 Use of Computer Models**

Environmental Impact Assessment of transport projects should focus on route optimization and deciding between alternative infrastructure plans with different environmental implications. Preferably, computer models should be used to forecast impacts from traffic flows, emissions and the dispersion of pollution into the environment. For impacts of noise simplified dispersion models may be used. For Environmental Impact Assessment it is generally appropriate to use simple models, which can compare the impacts of different strategic transport options (taking into account energy use, emissions per vehicle-kilometre for different types of transport, and sensitivity to average speed).

### **12.11.4 Measures to Mitigate Emissions and Energy Consumption**

Measures that can mitigate the major environmental impacts in the Transport Sector, like actions to reduce emissions and energy consumption, are:

- Increased use of public transport, with emphasis on rail transport.
- Increased public transport efficiency.

- Measures for better integration of inter-modal systems for passengers and freight.
- Fair and efficient pricing in transport.
- Increased use of Compressed Natural Gas (CNG).
- Conversion of diesel busses/trucks, taxis to CNG.
- Institutional strengthening of transport agencies.
- Improving transport regulations & operations.
- Improved enforcement of transport laws and regulations.
- Inspection of cars/better maintenance of cars.
- Measures for fuel savings.
- Introduction of alternative fuels/hybrid cars.
- Use of unleaded gasoline.
- Environmental Awareness Campaigns.

## **12.12 RECOMMENDATIONS**

Road, Railway Based Public Transport, Road Based Public Transport, Water Based Public Transport and Inter-Modal improvement projects have been proposed for the Transport Master Plan for Greater Cairo. In the process of the Initial Environmental Examination (IEE), the proposed projects have been screened for their potential adverse and positive environmental impacts and recommendations have been provided for further environmental studies. A scoping exercise has been carried out and possible mitigation measures have been provided.

The result of the **Initial Environmental Examination (IEE)** is as follows:

**Environmental Impacts Assessments (EIA) and Environmental Management and Monitoring Plans** (limited to full) are required for the following projects:

**New Roads+Widening (land acquisition required):**

- HS-1: New Road, New Masala Str.;
- HP-2: Widening, Saft El Laban Axis;
- HP-3: New Road, Rod El Farag Axis;
- HP-7: New Road, Ain Sukhna-Nasr City Rd Extension.

**New Roads, Ring Road, Express Ways (no or limited land acquisition):**

- New Ring Road: HR-9, Maryooteya Rd.
- New Roads: HP-3, 15<sup>th</sup> May Str. Extension; HS-4, Tereat Tirsa Str.; HS-5, Khafra Str.
- New Expressways:
- HE-3: Expway No.3: autostrad - Salah Salem Route;
- HE-4: Expway No.4: Abu Bakr El Sadeeq Route;
- HE-5: Expway No.5: Alex. Agriculture Rd. Route;

HE-6: Expway No.6: Suez Rd. Route;  
HE-7: Expway No.7: Gesr El Suez Route;  
HE-8: Expway No.8: Tereat El Zumur South Route;  
HE-9: Expway No.9: Tereat El Zumur North Route.

**New Rail Sections (no or limited land acquisition):**

PTST 1, (LRT), Super Tram 1: New Section New Cairo – Ramses;  
PTST 2, (LRT), Super Tram 2: New Section Sheraton – Attaba;  
PTST 3, (LRT), Super Tram 3: New Section Nasr City – Matarya;  
PTXR 1, Express Train: New Section Ains Shams - 10<sup>th</sup> of Ramadan (East Wing);  
PTXR 2, Express Train: New Section Ains Shams - 10<sup>th</sup> of Ramadan (East Wing);  
PTXR 3, Express Train: New Section Cairo - 6<sup>th</sup> of October (West Wing).

**Inter-Modal Projects (limited land acquisition):**

IM 2: Stadium Inter-Modal Point, Expansion and reconstruction;  
IM 3: Moneeb Inter-Modal Point, Expansion and reconstruction.

*Not all the recommended Environmental Impact Assessments need the same scope. Depending on the definite alignment, size and location of a project, a limited to full Environmental Impact Assessment should be carried out.*

The projects which require only **Environmental Management and Environmental Monitoring Plans** are listed below.

**Road Improvements (no or limited land acquisition):**

HS-2, HS-3, HS-6: Road Improvement;  
HS-7: New Bridge, Imbaba Nile Bridge;  
HG-15, 16, 18-27: Fly Overs;  
HG-17: Connection;  
HG-28, HG-29: Underpasses;  
HR-10: Widening, Ismailya Desert Rd.;  
HR-11: Widening, Suez Desert Rd.;  
HP-5: Widening, Ahmed Oraby St.;  
HP-6: Widening, Moasaset El Zakah St.

**Road Based Public Transport Projects (no land acquisition):**

PTB-2: 6th October Trunk Bus way; Support Facilities;  
BTB-3: Urban Expressway Priority Treatments:  
Segregated Bus Lanes (2 bus lanes on new Express Ways; reserved bus lanes on existing roads; 2 reserved bus lanes on Alexandria Desert Road).  
Trunk Bus Ways, related to services for satellite cities.  
PTB-4: Regional Primary Highway Priority Treatments.

*Not all recommended Environmental Management and Monitoring Plans need to have the same scope. Depending on the final design of a project, such a study need to be more or less extensive.*

All other proposed transport improvement projects do not need further environmental studies; only the regular environmental regulations and safety procedures should be followed.

## CHAPTER 13: ECONOMIC AND FINANCIAL ANALYSES AND INVESTMENT

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### 13.1 INTRODUCTION

In this chapter, the following two topics are mentioned:

- Economic analysis regarding the implementation of master plan (Scenario B and D)
- Preliminary financial examination regarding public transport mode (bus, ferry, tramway, metro, ENR suburban railway and ENR express railway) for the case of Scenario D (year 2022).

#### **Economic analysis regarding master plan**

Economic analysis follows a conventional cost benefit analysis. Costs stand for the capital cost and operation and maintenance costs for the sector of road, busway and railway. Quantitative benefits include 1) benefit of saving in time cost regarding transport mode users and 2) benefit in saving in operating cost regarding transport mode users.

For the estimation of the above benefits the following basic calculation units are estimated:

- Unit vehicle operating cost
- Unit operating cost per passenger-km
- Unit time cost per passenger and per vehicle

Utilizing the above estimated economic costs and benefits, the cost benefit analysis was made, indicating Economic Internal Rate of Return (EIRR), Benefit-Cost Ratio (B/C) and Net Present Value (NPV).

#### **Preliminary financial examination**

The operating revenues and operating costs are estimated, and by comparing the both, the cost recovery conditions are examined. Utilizing the fare system and the estimated number of passengers and/or passenger-kilometer in 2022, the operating revenues in 2022 are estimated. Then, based on the unit operating cost per passenger-kilometer and the estimated passenger-kilometer in 2022, the operating cost in 2022 are estimated.



## 13.2 ECONOMIC ANALYSIS

### 13.2.1 General

#### (1) Methodology

The main purpose of the economic analysis is to show the effects of the implementation of master plan (Scenario B and D), from the point of view of the nation's economic well-being and to estimate a return on the resources invested. For the purposes of economic evaluation, the economic internal rate of return (EIRR), net present value (NPV) and benefit – cost ratio (BC ratio) are demonstrated.

Economic analysis follows a conventional cost benefit analysis of discounted cash flow methodology. The cost benefit analysis is made by comparison between economic benefits and costs.

The formula of EIRR is shown below:

$$\sum_{t=1}^n \frac{\text{Benefits}_t}{(1+R)^t} = \sum_{t=1}^n \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+R)^t} \quad \text{--- Equation 13.1}$$

where:

Benefits <sub>t</sub>	:	Benefits in year t
Inv. cost <sub>t</sub>	:	Investment cost in year t
O/M cost <sub>t</sub>	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
R	:	Value of EIRR

EIRR means the value, which will satisfy the above formula.

The formula of NPV is shown below:

$$\sum_{t=1}^n \frac{\text{Benefits}_t}{(1+D)^t} - \sum_{t=1}^n \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t} \quad \text{--- Equation 13.2}$$

The formula of BC Ratio is shown below:

$$\sum_{t=1}^n \frac{\text{Benefits}_t}{(1+D)^t} / \sum_{t=1}^n \frac{\text{Inv. cost}_t + \text{O/M cost}_t}{(1+D)^t} \quad \text{--- Equation 13.3}$$

where:

Benefits <sub>t</sub>	:	Benefits in year t
Inv. cost <sub>t</sub>	:	Investment cost in year t
O/M cost <sub>t</sub>	:	Operation and Maintenance costs in year t
n	:	Calculation period
t	:	Year t (from 1 to n)
D	:	Discounted rate

## (2) Basic Assumption

The following basic assumptions are made:

### a. Cost benefit analysis

Cost benefit analysis is made in comparison between the incremental costs and the incremental benefits, in which “incremental” means the difference between “Scenario B or D” condition and “Scenario A (Committed Projects)” condition.

### b. Precondition on benefit estimation

The benefits are calculated for the years of 2007, 2012 and 2022. For other years than these years, estimation by interpolation is made.

### c. Distribution of capital cost

In this economic analysis, the capital costs are distributed from 2003 to 2021, in accordance with the capital cost phasing.

### d. Calculation period

The project life is assumed to be 30 years after 2022. Thus, the total calculation period is from 2003 to 2051.

## 13.2.2 Estimated Costs

### (1) Estimated Capital Costs in terms of Financial Prices

The estimated capital costs by scenario and by phasing in terms of financial prices excluding the amount related to committed projects are shown in Table 13.2.1. In this economic analysis, cost phasing of Scenario B is in accordance with that in Scenario D.

**Table 13.2.1 Capital Costs in Terms of Financial Prices**

(Unit: Billion LE)

Scenario	Mode	Total	2003 – ‘06	’07 – ‘11	’12 – ‘16	’17- ‘21
Scenario B	Road	10.29	2.68	2.56	2.63	2.42
	Busway	5.64	1.75	1.58	1.22	1.09
	Railway	37.65	2.25	5.37	8.82	21.21
	Total	53.58	6.67	9.52	12.67	24.72
Scenario D	Road	9.02	2.34	2.25	2.31	2.12
	Busway	5.64	1.75	1.58	1.22	1.09
	Railway	26.97	1.61	3.85	6.31	15.20
	Total	41.63	5.70	7.68	9.84	18.41

Source: JICA Study Team

Note: \*1: Excluding the amount of committed projects.

\*2: Capital cost related to Ferry (50 million LE in total) is included in the component of Busway.

## **(2) Estimation of Economic Capital Costs**

For the economic analysis, costs in terms of financial prices are converted in terms of economic prices. The details of the conversion process are mentioned below:

### 1) Application of conversion factor

#### a. Conversion factor

In this economic analysis, all the costs are classified into the items of 1) trade goods, 2) non-trade goods (inclusive of the component of skilled labor and unskilled labor), and 3) transfer item. It is assumed that trade goods are equivalent to foreign currency portion, and aggregation of non-trade goods stand for the local currency portion. Transfer item means the portion of taxes.

It is noted that in the cost estimates of this master plan study stage, breakdown of cost component of non-trade goods into the sub-component of skilled labor and un-skilled labor is not made. The economic prices of the whole portion of non-trade goods are assumed to be obtained by applying the standard conversion factor (SCF).

#### b. Standard conversion factor (SCF)

Items such as import duties cause a price differential between the domestic market and international market. The standard conversion factor is an index which converts domestic prices to the border prices by adjustment of the distortion of domestic prices. The standard conversion factor is estimated based on the following equation:

$$SCF = \frac{I + E}{(I + Di) + (E - De)} \quad \text{----- Equation 13.4}$$

where;

I	:	Total value of import
E	:	Total value of export
Di	:	Total value of import duty
De	:	Total value of export duty

According to the statistical data regarding foreign trade and governmental revenues in Egypt, SCF is estimated as shown Table 13.2.2. The standard conversion factor is estimated to be 0.89.

**Table 13.2.2 Estimation of Standard Conversion Factor (SCF)**

(Million US\$)

	1996-97	1997-98	1998-99	1999-2000	2000-01	Total
Import	15,565	16,899	17,008	17,861	16,432	83,765
Export	5,345	5,128	4,445	6,388	7,078	28,384
Import duties	2,392	2,603	3,232	2,545	2,704	13,477
Export duties						
SCF	0.90	0.89	0.87	0.91	0.90	0.89
Custom Duties (Million LE)	8,125	8,886	11,048	9,295	11,000	
Exchange Rate (LE/US\$)	3.3970	3.4132	3.4184	3.6522	4.0673	
Custom Duties (Million US\$)	2,392	2,603	3,232	2,545	2,704	

Source: JICA Study Team.

Note: \*1: Estimated based on the "Quarterly Economic Digest, January-March 2002, Ministry of Economic and Foreign Trade.

\*2: Since information of breakdown of custom duties is not available, values of custom duties are assumed as import duties.

\*3: Original data of custom duties in terms of Egyptian Pound are converted into US\$ basis by using exchange rate of LE per US\$. (Monthly Economic Digest, July 2002.).

## 2) Taxes

In this economic analysis, related taxes to the estimated costs are assumed as the general sales tax and the custom duties.

Regarding the general sales tax, general tax rate is 10%, varying from 5%, 25% and more, dependent on the type of commodities and services.

According to the law on the custom duties, the custom tariff rates which is considered to be related to master plan, ranges, roughly speaking, almost 5% and 10%; for example, construction machinery/equipment such as bulldozer, road roller, etc.: 5%, railway track construction material such as rail, sleeper, etc.: 5%, railway locomotive: 5%, rail passenger coaches: 10%, parts of railway locomotive/rolling stocks: 5%, electric signaling, safety or traffic control equipment for railway, tramway, and roads: 5%, automatic data processing machines: 5%, electrical machines/apparatus: 10%. It should be noted that the above rates are still only shown as a general sample. The actual rates are determined based on the detailed specification of equipment.

For the elimination about tax portion, the following are to be taken into consideration: In the cost estimation in this master plan study stage, specification and procurement source of equipment are not fixedly estimated. And the breakdown of cost component for foreign / local currency portion is still in a preliminary estimation, and also that for labor / material / depreciation of equipment portion in the total cost is still uncertain. Therefore, it is difficult to estimate an accurate tax portion.

Regarding the estimation of economic cost, the following assumptions are made:

While the custom duty rate is assumed to be generally 5%, that for railway rolling stock is assumed to be 9% supposing the composite of locomotives and passenger coaches. The tax rate for general sales tax is assumed to be 10%.

3) Estimated conversion factor

As a result, conversion factors for foreign currency portion are obtained as 0.87 and 0.84 for the cases of 5% and 9% of custom duty rates, respectively. (For example,  $1/1.15$  (sales tax of 10% and import duty of 5%) = 0.87.) And, a conversion factor for local currency portion is obtained as 0.81. ( $1/1.1$  (sales tax of 10%) = 0.91 x 0.89 (estimated standard conversion factor) = 0.81.)

**(3) Economic Capital Costs**

As a result, the economic capital costs by scenario and by phasing in terms of economic prices excluding the amount related to committed projects are obtained as shown in Table 13.2.3. These economic costs are distributed annually as even within each phasing.

**Table 13.2.3 Economic Capital Costs**

(Unit: Billion LE)

		2003 – ‘06	’07 – ‘11	’12 – ‘16	’17- ‘21	Total
Scenario B	Road	2.17	2.09	2.14	1.96	8.36
	Busway	1.36	1.25	0.96	0.86	4.43
	Railway	1.89	4.50	7.39	17.80	31.58
	Total	5.42	7.84	10.50	20.62	44.38
Scenario D	Road	1.91	1.83	1.87	1.72	7.33
	Busway	1.36	1.25	0.96	0.86	4.43
	Railway	1.35	3.22	5.29	12.74	22.61
	Total	4.61	6.30	8.13	15.32	34.37

Source: JICA Study Team

Note: \*1Excluding the amount of committed projects

\*2: Capital cost related to Ferry is included in the component of Busway.

**(4) Operation and Maintenance Costs**

The maintenance cost for the road infrastructure including busway facilities is included into calculation. Regarding the operation and maintenance costs for such public transport modes as tram, metro, ENR suburban railway, bus, shared taxi, ferry, these elements are incorporated in the process of benefit estimation, in which benefits of saving in operating costs for these modes are estimated as a difference between the estimated operation and maintenance costs in “Scenario A” and those in “Scenario B (or D)”. The operation and maintenance costs in terms of economic prices are obtained by using a similar process in the case of capital costs.

**13.2.3 Economic Benefits**

**(1) Expected Benefits**

Benefits which can be expected by implementation of master plan are as follows:

As a direct benefit:

- Saving in time cost regarding transport mode users,
- Saving in operating cost regarding transport mode operators,
- Decrease of traffic accidents, and
- Environmental improvement due to decrease of pollution and noise on road.

As an indirect benefits:

- Contribution to increase in peoples' welfare thanks to higher mobility through diversity of alternative transport modes,
- Contribution to increase in peoples' amenity thanks to higher service level of transport modes,
- Contribution to orderly urban development, and
- Contribution to increase in regional economic activities.

## **(2) Quantitative Benefits**

In this economic analysis, out of the above, 1) benefit of saving in time cost regarding transport mode users and 2) benefit in saving in operating cost regarding transport mode users are treated as quantitative benefits.

### **13.2.4 Estimation of Basic Calculation Units**

Prior to the estimation of benefits, the following basic calculation units are estimated:

- Unit vehicle operating cost
- Unit operating cost per passenger-km
- Unit time cost per passenger and per vehicle

#### **(1) Estimation of Unit Vehicle Operating Cost (VOC)**

##### **1) Estimation of Unit Vehicle Operating Cost (VOC)**

###### **a. Representative vehicle**

The following types of vehicle and corresponding representative vehicles for each type are set up for estimation of unit vehicle operating cost as shown in Table 13.2.4. Regarding the information of vehicle sales market in Cairo, no paper documents showing clearly the sales data by vehicle type, maker, and model are available. Therefore, for selection of representative vehicles, information obtained through interviews to several car dealers in Cairo, trucking companies and CTA (Cairo Transport Authority) Operational Department, as well as the observation on road by the study team members are much utilized.

###### **- Private car (Sedan type passenger car)**

In Cairo, there can be observed many kind (maker, model) of private car (Sedan type passenger car). For previous several decades, Peugeot and Fiat have been

occupied as bestseller private cars. According to the interview to car dealer, however, the recent popular car has been changed to Japanese models, and among them, Mitsubishi 1300 is rather popular. Thus, although the market share of this model is considered still not so in majority, Mitsubishi 1300 is selected. Mitsubishi 1300 is imported.

- Shared taxi

Observation in the several shared taxi terminals in Cairo reveals that Toyota minibus (14 seats) is in majority. Toyota minibus is imported.

- Pick-up

For pick-up, surveys are made to identify a representative model, and it was found that there are many models such as Nissan, Toyota, Mitsubishi, and Hyundai. Based on the observation on road, an assumption of taking Nissan as a representative model is considered appropriate. Nissan pick-up is imported.

- Motorcycle

Based on the observation on road, JAWA was selected as a representative motorcycle. JAWA is imported.

- Large bus and minibus

The major user of bus and minibus in Cairo is CTA, thus, information from CTA is incorporated. According to the interview to CTA Operational Department, the majority of bus and minibus utilized are Nasr model. In this case, for buses, while such portion as engine and chassis are imported, portion of bodies are domestically assembled. In the terms of cost amount, the share percentage of imported portion and domestic portion are assumed as 60% and 40%, respectively.

- Light truck, medium truck and heavy truck

According to the interview to trucking companies, the majority of light truck, medium truck and heavy truck utilized are Mercedes. In this case, trucks are imported.

**Table 13.2.4 Vehicle Type and Representative Vehicle**

Vehicle Type	Representative Vehicle
Private car (Sedan type)	Mitsubishi, 1300cc
Shared Taxi	Toyota, minibus (14 seats)
Pick-up	Nissan
Motorcycle	Jawa
Large Bus	Nasr
Minibus	Nasr
Light Truck	Mercedes (with loading capacity of 8 tons)
Medium Truck	Mercedes (with loading capacity of 15 tons)
Heavy Truck	Mercedes (with loading capacity of 20-22 tons)

Source: JICA Study Team

b. Vehicle prices

The market prices of vehicle are obtained by interview to car dealers, trucking companies and CTA Operational Department. For converting from financial (market) prices to economic prices, information about the import duties and the sales tax are incorporated, and the portion of taxes are deducted. While the rates of import duties for imported vehicles are; private car: 55%, motorcycle: 20%, and others: 40%, those for imported chassis fitted with engines (for buses) are 30%. The rates of sales tax are 15% and 10% for private car and others, respectively.

c. Vehicle life (years), vehicle annual kilometers, and vehicle annual operating hours

The vehicle life (years), vehicle annual kilometers, and vehicle annual operating hours are based on the obtained information by interview to car dealers, trucking companies and CTA.

d. Tire prices

The information of the market prices of tire, the tire life and the number of tire per vehicle is obtained by interview to car dealers, trucking companies and CTA. For converting from financial (market) prices to economic prices, information about the import duties and the sales tax is incorporated, and the portion of taxes are deducted. While the rates of import duties and the rates of sales tax are commonly 20% and 10%, respectively, for each type of tire.

e. Fuel and lubricants

The information of the market prices of fuel/lubricants oil and fuel/lubricants oil consumption conditions is obtained by interview to car dealers, trucking companies and CTA. Regarding the market price of fuel, CTA has some advantage. For converting from financial (market) prices to economic prices, the following is incorporated, based on the interview to petroleum company in Cairo: Regarding gasoline, there is neither sales tax, nor subsidy. Regarding diesel, there is some subsidy.

As for lubricants oil, there are two types, i.e., local made and imported. While no sales tax is charged for the local made one, sales tax is charged for the imported one. According to the interview to vehicle users, almost are local made one, so that, economic prices is assumed to be the same as financial prices.

f. Maintenance spare (percentage to vehicle price)

The percentages to vehicle price for maintenance spare per 1,000 km are set up based on the data which have been applied in the road transport study regarding other developing countries.



g. Maintenance labor hours and maintenance labor cost

The information of the maintenance labor hours and the maintenance unit labor cost is obtained by interview to car dealers, trucking companies and CTA. Basically, the economic maintenance labor cost is assumed to be the same to financial cost. The maintenance work of private cars and shared taxi in Egypt is mostly carried out in private workshops which are available all around. People working in these workshops are almost unskilled labor compared with those working in workshops and garages of specialized transport and bus companies. For this reason, the economic maintenance cost of private cars and shared taxi are taken to be lower than the financial cost, and this is explained by the lower economic cost of unskilled labor compared with their financial cost.

h. Crew cost

The information of the crew cost and crew size is obtained by interview to car dealers, trucking companies and CTA. The economic crew cost is assumed to be the same to financial cost.

i. Depreciation (share percentage of distance related / time related)

The share percentages of depreciation of distance related / time related are set up based on the data which have been applied in the road transport study regarding other developing countries.

Applying the above input information/data, the unit operating cost for each vehicle type is estimated. The summary of input information/data for unit VOC estimation is shown in Table 13.2.5. The estimated results of unit vehicle operating cost per vehicle-km are shown in Table 13.2.6.

Taking the vehicle types in the traffic assignment process into consideration, the three vehicles of pick-up, light truck and medium truck are combined into the category of “truck” as a weighted average, using the percentage share of 62%, 36% and 2% for pick-up, light truck and medium truck, respectively, based on the results of traffic count survey conducted by the JICA study team.

**Table 13.2.6 Estimated Unit Vehicle Operating Cost**

Vehicle Type	Estimated Unit Vehicle Operating Cost (LE per vehicle-km)			
	Financial Prices		Economic Prices	
	Original	Combined	Original	Combined
Passenger Car	0.57	0.57	0.40	0.40
Shared Taxi	0.74	0.74	0.66	0.66
Pick-up	0.50	-	0.44	-
Motorcycle	0.19	0.19	0.16	0.16
Large Bus	2.10	2.10	2.11	2.11
Minibus	1.39	1.39	1.27	1.27
Light Truck	1.22	-	1.16	-
Medium Truck	1.57	-	1.51	-
Heavy Truck	1.75	1.75	1.73	1.73
Truck	-	0.79	-	0.72

Source: JICA Study Team

**Table 13.2.5 Summary of Input Data for Unit VOC Estimation**

CALCULATION OF VOC		Private Cars	Shared Taxi (Cairo operations) Tovota	PICK-UPS- 1.5 tone urban conditions	Motorcycle	CTA BUS	CTA Minibus	Trucks (transport company) Mercedes		
		Mitsubishi 1300cc	Microbus 14 seats (1)	PICK-UPS	Jawa	Nasr	Nasr	(LIGHT)	(MEDIUM)	(HEAVY)
		BY VEHICLE TYPES								
Vehicle types per vehicle classification (%)										
Vehicle Price (Excl.Tires)Financial	1	53,000	96,000	60,000	7,000	275,000	181,500	110,000	156,000	201,600
Vehicle Price (Excl.Tires) Economic	2	31,176	64,000	40,000	5,385	214,844	141,797	73,333	104,000	134,400
Vehicle Life - Years	3	13	10	10	12	10	10	10	12	13
Vehicle Life - Kilometres	4	520,000	1,050,000	600,000	144,000	760,000	675,000	500,000	900,000	1,625,000
Vehicle Annual Kilometrage	5	40,000	105,000	60,000	12,000	76,000	67,500	50,000	75,000	125,000
Vehicle Life Operating Hours	6	10,400	45,000	12,000	5,400	48,000	48,000	13,000	18,000	29,250
Vehicle Annual Operating Hours	7	800	4,500	1,200	450	4,800	4,800	1,300	1,500	2,250
Fuel Price Financial - Cost/Litre	8	1.00	0.40	0.40	1.00	0.38	0.38	0.40	0.40	0.40
Fuel Price Economic - Cost/Litre	9	1.00	0.80	0.80	1.00	0.80	0.80	0.80	0.80	0.80
Fuel Consumption - Litres/km	10	0.125	0.167	0.143	0.050	0.604	0.220	0.400	0.500	0.600
Tire Unit Price Fin - Cost/Pcs.	11	195	400	195	100	1,030	200	864	1,600	1,600
Tire Unit Price Econ - Cost/Pcs.	12	150	308	150	77	792	154	665	1,231	1,231
Tire Percent Recapped	13	0	0	0	0	0	0	0	0	0
Recapping Costs Financial	14	0	0	0	0	0	0	0	0	0
Recapping Costs Economic	15	0	0	0	0	0	0	0	0	0
Number of Tires	16	4	4	4	2	6	6	6	10	14
Tire Life - Kilometres	17	50,000	60,000	70,000	30,000	110,000	52,000	65,000	65,000	65,000
Lubricants Price Fin - Cost/Litre	18	5.00	5.60	3.20	4.00	3.20	3.20	5.00	5.00	5.00
Lubricants Price Econ - Cost/Litre	19	5.00	5.60	3.20	4.00	3.20	3.20	5.00	5.00	5.00
Lubr. Oil Cons. - Litres/1000 km	20	2.00	5.00	4.00	0.60	5.00	4.00	8.00	10.00	10.00
Maintenance Spares/1000 km - % of I(2)	21	0.25	0.20	0.20	0.20	0.10	0.15	0.10	0.10	0.10
Maintenance Labour - Hours/1000 km	22	5.00	10.00	5.00	1.00	20.00	12.00	12.00	15.00	15.00
Maint. Unit Labour Costs F-Cost/Hour	23	5.00	4.00	1.50	3.00	1.88	1.88	4.00	4.00	4.00
Maint. Unit Labour Costs E-Cost/Hour	24	4.00	3.20	1.50	3.00	1.88	1.88	4.00	4.00	4.00
Depreciation, Distance Related - %	25	50	65	65	60	85	85	65	65	65
Depreciation, Time Related - %	26	50	35	35	40	15	15	35	35	35
Opportunity Cost of Capital(Half)-%	27	12	12	12	12	12	12	12	12	12
Overhead, % of total VOC	28	0	0	8	0	15	12	15	15	15
Overhead allotted to Econ cost (1=Yes)	29	1	1	1	1	1	1	1	1	1
Crew Costs Fin - Cost/Hour	30		4.3	1.8		3.0	3.0	4.5	5.0	5.0
Crew Costs Econ - Cost/Hour	31		4.3	1.8		3.0	3.0	4.5	5.0	5.0
Passengers - Number	32	1.9	10.0	0.30	1.10	45.0	20.0			
Percent of Pass Trips Work or Business	33									
Passenger Unit Costs - Cost/Hour	34									
Passengers Carried (% of Trips)	35	100	100	70.00	100.00	100	100	20	20	20
Average Crew Size	36	0.0	1.0	1.00	0.00	2.0	1.0	1.0	2.0	3.0
Total Vehicle Occupancy	37	1.9	11.0	1.3	1.1	47.0	21.0	1.0	2.0	3.0

Source: JICA Study Team

## 2) Unit VOC by Speed Range

The estimated results of unit VOC shown in Table 13.2.6 are not in accordance with the speed range. There is a study result of HDM-VOC (version 4) regarding the unit VOC index by speed range; however, this is related to the inter-city highway condition. In this economic analysis, regarding the unit VOC with speed range pattern, the study results of urban transport study in Bangkok, Thailand is utilized. According to this study, the index by speed range of unit VOC are shown in Table 13.2.7.

**Table 13.2.7 Unit VOC Index by Speed Range**

Speed Range (km/hour)	10.0	15.0	20.0	25.0	35.0	≥ 45.0
Motorcycle	1.50	1.25	1.00	1.00	1.00	1.00
Passenger Car	1.52	1.43	1.29	1.19	1.05	1.00
Bus	1.64	1.44	1.28	1.18	1.08	1.00
Medium Bus	1.48	1.29	1.19	1.10	1.03	1.00
Medium Truck	2.00	1.60	1.40	1.30	1.10	1.00
Heavy Truck	1.33	1.24	1.14	1.10	1.02	1.00

Source: JICA Study Team based on the study results of "Mass Transit: Urban Rail Transportation Masterplan, Bangkok, Thailand, 2001, PCI".

Applying the above index, the unit VOC by speed range in terms of economic prices is estimated assuming the base speed for each vehicle type. The estimated results are shown in Table 13.2.8.

**Table 13.2.8 Estimated Unit VOC by Speed Range (Economic Prices)**  
(Unit: LE/vehicle-km)

Speed Range	Private Cars	Shared Taxi	Motorcycle	Bus	Minibus	Truck	Heavy Truck
S<5	0.61	0.92	0.24	2.71	1.58	1.45	2.30
5<S<10	0.61	0.92	0.24	2.71	1.58	1.45	2.30
10<S<15	0.59	0.86	0.22	2.54	1.48	1.30	2.22
15<S<20	0.54	0.77	0.18	2.24	1.32	1.08	2.06
20<S<25	0.49	0.71	0.16	2.03	1.22	0.98	1.94
25<S<30	0.46	0.67	0.16	1.91	1.15	0.90	1.87
30<S<35	0.43	0.65	0.16	1.82	1.12	0.83	1.80
35<S<40	0.41	0.63	0.16	1.75	1.09	0.78	1.76
40<S<45	0.40	0.62	0.16	1.68	1.07	0.74	1.74
45<S	0.40	0.62	0.16	1.65	1.07	0.72	1.73

Source: JICA Study Team

### (3) Estimation of Unit Operating Cost per Passenger-kilometer

In this sub-section, the unit operating costs per passenger-kilometer of transport mode are estimated. Those for such rail-based public transport mode as metro, tramway and ENR suburban railway, and for such water-based public transport mode as Nile ferry are estimated based on the current financial performance of such operating entities as CTA, CMO and ENR. Regarding shared taxi, due to the data availability limitation, operating cost per passenger-km is estimated based on the estimated unit vehicle operating cost and the assumed occupancy rate. Regarding public bus, the both approaches of 1) CTA data basis and 2) unit vehicle operating cost basis are examined and compared. Finally, the CTA data basis is adopted, considering the consistency with the other public transport modes such as metro, tram, ENR suburban railway and ferry. The summarized performance data for each public transport mode, which are referred hereinafter, are based on the detailed information shown in Chapter 7, Progress Report (2).

#### 1) Metro

The summarized latest performance data (as of year 2000/2001) regarding metro is shown in Table 13.2.9.

**Table 13.2.9 Summary of Performance of Metro (as of Year 2000/2001)**

Category	Item	Amount (thousand)
Income	Annual Passengers	676,832
	Annual Revenue Vehicle Kilometers	80,000
	Annual Revenues (LE)	200,305
Outlay (LE)	Cost Without Depreciation / Without Interest	125,373
	Cost With Depreciation / Without Interest	508,212
	Cost With Depreciation / With Interest	660,500

Source: CMO and Steering Committee

However, regarding the data as of year 2000/2001, no information of annual passenger-km is available. Therefore, using the previous years' data, the annual passenger-km is estimated. Table 13.2.10 shows the trend data of performance of metro in terms of aggregation of Lines No.1 and No.2. Based on the data of annual number of passengers and annual passenger-kilometer, the average trip length per passenger (kilometer) is estimated for each year.

**Table 13.2.10 Summary of Performance of Metro in terms of Aggregated Lines of No.1 and No.2 (During 1996/1997 – 1999/2000)**

	1996/97	1997/98	1998/99	1999/2000
Annual No. of Passengers (million)	448.6	512.0	562.9	655.5
Annual Passenger-km (million)	6,821.1	7,410.4	7,941.2	9,067.9
Annual Vehicle-km (million)	52.2	59.1	63.2	69.6
Estimated Average Trip Length per Passenger (km) (*)	15.2	14.5	14.1	13.8
Estimated Average No. of Passengers per Vehicle (*)	130.7	125.4	125.7	130.3

Source: CMO. (\*) Estimated by JICA Study Team.

Assuming the average trip length per passenger as 13.5 kilometer for year 2000/2001, the annual passenger-kilometer is estimated to be 9,137 million in year 2000/2001 (annual number of passenger of 676.83 million x 13.5 kilometers). As a result, the unit costs per passenger-kilometer are estimated as shown in Table 13.2.11. The unit costs per passenger-kilometer in terms of economic prices are obtained by applying the standard conversion factor (0.89) previously estimated.

**Table 13.2.11 Estimated Unit Cost per Passenger-kilometer of Metro**

Category	Item	Amount	
Income	Per Passenger-kilometer	(LE) 0.0219	
Cost	Per Passenger-kilometer	Financial Prices	Economic Prices
	Without Depreciation / Without Interest	(LE) 0.0137	(LE) 0.0122
	With Depreciation / Without Interest	(LE) 0.0556	(LE) 0.00495
	With Depreciation / With Interest	(LE) 0.0723	(LE) 0.0643

Source: JICA Study Team

## 2) Tramway

The summarized latest performance data (as of year 2000/2001) regarding tramway is shown in Table 13.2.12.

**Table 13.2.12 Summary of Performance of Tramway (as of Year 2000/2001)**

Category	Item	Amount (thousand)		
		Hel. Metro	CTA Tram	Total
Income	Annual Passengers	31,101	18,225	49,326
	Annual Revenue Vehicle Kilometers	2,776	3,755	6,521
	Annual Revenues (LE)	9,202	5,091	14,293
Outlay (LE)	Cost Wo. Depreciation / Wo. Interest	37,026	35,094	72,120
	Cost W. Depreciation / Wo Interest	47,033	41,683	88,716
	Cost W. Depreciation / W. Interest	48,537	41,683	90,220

Source: CTA

However, regarding the data as of year 2000/2001, no information of annual passenger-km is available. Therefore, using the previous years' data, the annual passenger-kms are estimated. Table 13.2.13 shows the trend data of performance of tramway. Based on the aggregation of three years' data of annual number of passengers and annual passenger-kilometer, the average trip length per passenger (kilometer) is estimated to be 5.0 km and 5.5 km for Heliopolis Metro and CTA Tram, respectively.

**Table 13.2.13 Summary of Performance of Tramway (During 1998 – 2000)**

	1998	1999	2000	Total
(1) Heliopolis Metro				
Annual No. of Passengers (million)	43.017	31.877	30.742	105.742
Annual Passenger-km (million)	189.274	180.213	157.808	527.295
Average Trip Length per Passenger (km)	4.4	5.7	5.1	(*) 5.0
(2) CTA Tram				
Annual No. of Passengers (million)	22.206	19.639	18.994	60.839
Annual Passenger-km (million)	113.851	100.690	118.251	332.792
Average Trip Length per Passenger (km)	5.1	5.1	6.2	(*) 5.5

Source: CTA. (\*) Estimated by JICA Study Team.

Assuming the average trip length per passenger as 5.0 km and 5.5 km for Heliopolis Metro and CTA Tram, respectively for year 2000/2001, the annual passenger-kilometer in year 2000/2002 is estimated as shown in Table 13.2.14.

**Table 13.2.14 Estimated Passenger-kilometer of Tramway**

	Hel. Metro	CTA Tram	Total
Annual Passengers (million)	31.101	18.225	49.326
Assumed Trip Length per Passenger	5.0	5.5	
Estimated Annual Passenger-km (million)	155.24	99.69	254.94

Source: JICA Study Team

As a result, the unit cost per passenger-kilometer of tramway is estimated as shown in Table 13.2.15. The unit costs per passenger-kilometer in terms of economic prices are obtained by applying the standard conversion factor (0.89) previously estimated.

**Table 13.2.15 Estimated Unit Cost per Passenger-kilometer of Tramway**

Category	Item	Amount (LE)	
		Hel. Metro & CTA Tram	
Income	Per Passenger-kilometer	0.06	
Cost	Per Passenger-kilometer	Financial Prices      Economic Prices	
	Wo. Depreciation / Wo. Interest	0.28	0.25
	W. Depreciation / Wo. Interest	0.35	0.31
	W. Depreciation / W. Interest	0.35	0.31

Source: JICA Study Team

3) ENR suburban railway

The summarized latest performance data (as of year 2000/2001) regarding ENR suburban railway is shown in Table 13.2.16

**Table 13.2.16 Summary of Performance of ENR Suburban (as of Year 2000/2001)**

Category	Item	Amount (thousand)
Income	Annual Passengers	52,500
	Annual Revenue Vehicle Kilometers	15,000
	Annual Revenues (LE)	8,416
Outlay (LE)	Cost Without Depreciation / Without Interest	30,083
	Cost With Depreciation / Without Interest	n.a.
	Cost With Depreciation / With Interest	39,935

Source: ENR

However, regarding the data as of year 2000/2001, no information of annual passenger-km is available. Therefore, by using the study results of transport demand forecast modeling, the annual passenger-km is estimated. According to the study results of transport demand forecast modeling, the average trip length per passenger is estimated to be 15.3 kilometer, then applying this data, the annual passenger-km is estimated to be approximately 803.25 million. As a result, the unit cost per passenger-kilometer is estimated as shown in Table 13.2.7. The unit costs per passenger-kilometer in terms of economic prices are obtained by applying the standard conversion factor (0.89) previously estimated.

**Table 13.2.17 Estimated Unit Cost per Passenger-kilometer of ENR Suburban**

Category	Item	Amount	
Income	Per Passenger-kilometer	(LE) 0.0105	
Cost	Per Passenger-kilometer	Financial Prices	Economic Prices
	Without Depreciation / Without Interest	(LE) 0.0375	(LE) 0.0334
	With Depreciation / Without Interest	n.a.	n.a.
	With Depreciation / With Interest	(LE) 0.0497	(LE) 0.0442

Source: JICA Study Team

4) Nile Ferry

The summarized latest performance data (as of year 2000/2001) regarding Nile ferry is shown in Table 13.2.18.

**Table 13.1.18 Summary of Performance of Nile Ferry (as of Year 2000/2001)**

Category	Item	Amount (thousand)
Income	Annual Passengers	3,219
	Annual Revenue Vehicle Kilometers	659
	Annual Revenues (LE)	1,403
Outlay (LE)	Cost Without Depreciation / Without Interest	2,810
	Cost With Depreciation / Without Interest	2,905
	Cost With Depreciation / With Interest	2,905

Source: CTA

However, regarding the data as of year 2000/2001, no information of annual passenger-km is available. Therefore, by using the previous years' data, the annual passenger-km is estimated. Table 13.2.19 shows the performance data of Nile ferry in 1999 and 2000. The annual numbers of passengers are estimated by using annual number of days of 300. Based on the aggregation of two years' data of annual passenger-kilometer and the annual number of passengers, the average trip length per passenger is estimated to be 3.87 kilometers.

**Table 13.2.19 Summary of Performance of Nile Ferry (1999 and 2000)**

	1999	2000	Total
Annual Passenger-km (million)	5.9	8.0	13.9
Daily No. of Passengers (thousand)	5.06	6.90	11.96
Conversion to Annual Number	300	300	300
Estimated Annual No. of Passengers (million) (*)	1.52	2.07	3.59
Estimated Average Trip Length per Passenger (km) (*)	3.89	3.86	3.87

Source: CTA. (\*) Estimated by JICA Study Team.

Assuming the average trip length per passenger as 3.87 kilometer for year 2000/2001, the annual passenger-kilometer is estimated to be 12.47 million in year 2000/2001 (annual number of passenger of 3.22 million x 3.87 kilometers). As a result, the unit cost per passenger-kilometer is estimated as shown in Table 13.2.20. The unit costs per passenger-kilometer in terms of economic prices are obtained by applying the standard conversion factor (0.89) previously estimated.

**Table 13.2.20 Estimated Unit Cost per Passenger-kilometer of Nile Ferry**

Category	Item	Amount	
Income	Per Passenger-kilometer	(LE) 0.11	
Cost	Per Passenger-kilometer	Financial Prices	Economic Prices
	Without Depreciation / Without Interest	(LE) 0.23	(LE) 0.2047
	With Depreciation / Without Interest	(LE) 0.23	(LE) 0.2047
	With Depreciation / With Interest	(LE) 0.23	(LE) 0.2047

Source: JICA Study Team

#### 5) Public bus

Regarding public bus, for the estimation of operating cost per passenger-km, the following two approaches are examined:

- CTA data basis
- Estimated unit vehicle operating cost basis

##### a. CTA data basis

The summarized latest performance data (as of year 2000/2001) regarding public bus and public minibus is shown in Table 13.2.21.

**Table 13.2.21 Summary of Performance of Public Bus / Minibus  
(as of Year 2000/2001)**

Category	Item	Amount (thousand)		
		Bus	Minibus	Bus & Minibus
Income	Annual Passengers	660,445	151,037	811,482
	Annual Revenue Vehicle Kilometers	179,360	54,232	233,592
	Annual Revenues (LE)	225,870	62,036	287,906
Outlay (LE)	Cost Wo. Depreciation / W. Interest	334,151	48,324	382,475
	Cost W. Depreciation / Wo. Interest	423,707	63,777	487,484
	Cost W. Depreciation / W. Interest	521,831	63,777	585,608

Source: CTA

As a result, the unit cost per vehicle-kilometer is estimated as shown in Table 13.2.22. The unit costs per vehicle-kilometer in terms of economic prices are obtained by applying the standard conversion factor (0.89) previously estimated.

**Table 13.2.22 Estimated Unit Operating Cost per Vehicle-kilometer of Public Bus and Minibus**

Category	Item	Amount (LE)	
		Bus & Minibus	
Income	Per Vehicle-kilometer	1.23	
Cost	Per Vehicle-kilometer	Financial Prices	Economic Prices
	Wo. Depreciation / Wo. Interest	1.64	1.46
	W. Depreciation / Wo. Interest	2.09	1.86
	W. Depreciation / W. Interest	2.51	2.23

Source: JICA Study Team

The traffic assignment in the transport demand forecast process is on the basis of combination of “public bus” and “public minibus”. Therefore, the operating cost per passenger-km in terms of the combined public bus is to be estimated. The assumed average occupancy of public bus and minibus are 45 and 20, respectively. According to the traffic assignment results for the calculation case of “Scenario A, 2022” in the transport demand forecast, the passenger-km for public bus and minibus are obtained as 14,528 million and 5,058 million, respectively, which is equivalent to the share percentage of 74.2% and 25.8%, respectively. As a result, the weighted average occupancy is estimated as shown in Table 13.2.23.

**Table 13.2.23 Estimated Weighted Average Occupancy of Bus/Minibus**

	Average Occupancy	Share	Weighted Average Occupancy
Bus	45	74.2%	33.38
Minibus	20	25.8%	5.16
Bus & Minibus		100.0%	38.54

Source: JICA Study Team

Table 13.2.24 shows the estimation process of the operating cost per passenger-km in terms of the combine public bus on the basis of CTA data.



**Table 13.2.24 Estimated Unit Operating Cost per Passenger-km of Combined Public Bus (CTA Data Basis)**

	Operating Cost / Vehicle-km (LE)	Weighted Average Occupancy	Bus Minibus Combined Weighted Average Operating Cost / Passenger-km (LE)
Financial Prices			
Wo. Dpr. / Wo. Int.	1.64	38.54	0.0425
W. Dpr. / Wo. Int.	2.09	38.54	0.0542
W. Dpr. / W. Int.	2.51	38.54	0.0651
Economic Prices			
Wo. Dpr. / Wo. Int.	1.46	38.54	0.0379
W. Dpr. / Wo. Int.	1.86	38.54	0.0483
W. Dpr. / W. Int.	2.23	38.54	0.0580

Source: JICA Study Team

b. Estimated unit vehicle operating cost basis

The unit vehicle operating costs of bus and minibus were previously estimated as shown in Table 13.2.25.

**Table 13.2.25 Estimated Unit Vehicle Operating Cost**

	Bus	Minibus
Financial Prices	2.10	1.39
Economic Prices	2.11	1.27

Source: JICA Study Team

Following the similar procedure to the above estimation on CTA data basis, operating costs per passenger-km in terms of the combine public bus on the basis of the unit vehicle operating cost are estimated as shown in Table 13.2.26.

**Table 13.2.26 Estimated Unit Operating Cost per Passenger-km of Combined Public Bus (Estimated Unit VOC Basis)**

		Opr. Cost / Vehicle-km (LE)	Occupancy Rate	Opr. Cost / Psg.-km (LE)	Share Percentage	Weighted Average (LE)
Financial Prices	Bus	2.10	45	0.0468	74.2%	0.0347
	Minibus	1.39	20	0.0693	25.8%	0.0179
	Combined				100.0%	0.0528
Economic Prices	Bus	2.11	45	0.0469	74.2%	0.0348
	Minibus	1.27	20	0.0635	25.8%	0.0164
	Combined				100.0%	0.0512

Source: JICA Study Team

c. Comparison of CTA data basis and unit VOC basis

When comparing the estimated results in the above both approaches, the values range almost similarly. Finally, for the operating cost per passenger-km of combined public bus, the CTA data basis is adopted, taking the consistency with the other public transport modes such as metro, tram, ENR and ferry into consideration.

6) Shared taxi

Regarding shared taxi, due to the data availability limitation, operating cost per passenger-km is estimated based on the estimated unit vehicle operating cost and the assumed occupancy rate. The estimated results are shown in Table 13.2.27.

**Table 13.2.27 Estimated Unit Operating Cost per Passenger-km of Shared Taxi (Estimated Unit VOC Basis)**

	Estimated Unit VOC (LE)	Occupancy Rate	Operating cost per Psg.-km (LE)
Financial Prices	0.74	10	0.074
Economic Prices	0.67	10	0.067

*Source: JICA Study Team*

**(4) Estimation of Time Value**

According to the study results of socio-economic framework, the average household income per month in the study area at constant 2001 prices is shown in Table 13.2.28.

**Table 13.2.28 Average Household Income per Month at Constant 2001 Prices**

Year	2001	2007	2012	2017	2022
Income (LE)	672	754	879	1,006	1,176

*Source: JICA Study Team (Medium economic growth scenario)*

The number of worker per household in the study area is calculated also based on the study results of socio-economic framework as below:

Number of worker	:	3.987	(million)
Number of household	:	3.518	(million)
Number of worker per household	:	1.13	(person)

The average monthly income per worker is estimated as shown in Table 13.2.29.

**Table 13.2.29 Average Monthly Income per Worker**

Year	2001	2007	2012	2017	2022
Income (LE)	593	665	776	888	1,038

*Source: JICA Study Team*

The assumption of the monthly number of working days of 22 days and daily number of working time of 8 hours has resulted in the estimated monthly number of working hours of 176 hours. As a result, the hourly average income per worker is estimated as shown in Table 13.2.30.

**Table 13.2.30 Average Hourly Income per Worker**

Year	2001	2007	2012	2017	2022
Income (LE)	3.37	3.78	4.41	5.04	5.90

Source: JICA Study Team

The above values are adjusted by using an estimated factor related to trip purpose. According to the traffic survey results, the distributions of trip purpose are shown in Table 13.2.31, and assuming factor for each trip purpose, the percentage after factor is estimated to be 74.5%.

**Table 13.2.31 Estimation of Factor Related to Trip Purpose**

Trip Purpose	Percentage	Assumed Factor	After Factor
Work	49.0%	1.0	49.0%
Education	41.6%	0.5	20.8%
Others	7.0%	0.5	3.5%
Non Home Based Trip	2.4%	0.5	1.2%
Total	100.0%		74.5%

Source: JICA Study Team

Applying this factor, the hourly time values in terms of financial prices are estimated as shown in Table 13.2.32. According to the regulation in the income tax law, the limits of a tax exemption of annual income ranges LE 2,000 to 3,000, dependent on family burdens condition. In line with this stipulation, the monthly income level of LE 672 is possibly considered to be equivalent to the tax chargeable level. Then, assuming the income tax rates of 20%, the hourly time values in terms of economic prices are estimated.

**Table 13.2.32 Estimated Hourly Time Value (Public Transport Mode Category)**

Year	2001	2007	2012	2017	2022
Financial Prices (LE)	2.51	2.82	3.28	3.76	4.39
Economic Prices (LE)	2.09	2.35	2.73	3.13	3.66

Source: JICA Study Team

These hourly time values are assumed to be equivalent to those of category of public transport mode users such as bus, minibus, share taxi, metro, tram, ENR railway and ferry.

The hourly time value for category of private transport mode users such as motorcycle, car and taxi are estimated as follows:

Based on the traffic survey results, the average monthly incomes by transport usage are estimated as below:

Category	Estimated Average Income	
Total excluding “Walk”	894 (LE/month)	(a)
Aggregation of “Motorcycle”, “Car” and “Taxi”	1,472 (LE/month)	(b)
Ratio of (b) / (a)	1.65	

Applying the above estimated ratio, the hourly time value for private mode category was estimated as shown in Table 13.2.33.

**Table 13.2.33 Estimated Hourly Time Value (Private Transport Mode Category)**

Year	2001	2007	2012	2017	2022
Financial Prices (LE)	4.13	4.64	5.40	6.19	7.23
Economic Prices (LE)	3.44	3.87	4.50	5.16	6.03

*Source: JICA Study Team*

These unit time values per passenger are converted to unit time value in terms of vehicle mode by using occupancy by vehicle type which were obtained from the traffic survey results. The estimated hourly time values by vehicle mode in terms of economic prices are shown in Table 13.2.34.

**Table 13.2.34 Estimated Hourly Time Value by Vehicle Mode  
(in Terms of Economic Prices, at 2001 Prices)**

Year	Average Occupancy	(LE per hour)				
		2001	2007	2012	2017	2022
Motorcycle	1.1	3.8	4.3	5.0	5.7	6.6
Car	1.9	6.5	7.4	8.6	9.8	11.5
Taxi	2.5	8.6	9.7	11.3	12.9	15.1
Bus	45.0	94.1	105.8	122.9	140.9	164.7
Minibus	20.0	41.8	47.0	54.6	62.6	73.2
Shared Taxi	10.0	20.9	23.5	27.3	31.3	36.6

*Source: JICA Study Team*

## 13.2.5 Estimation of Benefits

### (1) General

As previously mentioned in the section 13.2.3, in this economic analysis, the quantitative benefits comprise the saving in the operating costs and the saving in the time costs related to the urban transport modes in the study area.

Benefits are estimated by comparing the operating costs / time costs in the case of “With” condition and those in the case of “Without” condition, in which “Without” condition means the scenario A, and “With” condition stands for scenario B, and D.

The estimation of operating costs and time costs are made for each scenario as follows:

1) Operating costs

For public transport mode and for private transport mode

2) Time costs

For public transport mode and for private transport mode

**(2) Estimation of Operating Costs**

1) Public transport mode

Regarding the public transport mode such as tram, metro, ENR suburban railway, public buses, shared taxi and ferry, the operating costs are calculated on passenger-km basis. The operating cost for the public transport modes are estimated by multiplying the estimated unit operating cost per passenger-km (which are mentioned in the previous section of (2), 13.2.4) by the passenger-km obtained as the traffic assignment results in the process of transport demand forecast. In this case, for ENR express railway, the data of metro is applied as a substitute, taking the service level of ENR express railway into consideration.

2) Private transport mode

Regarding the private transport mode such as private car, taxi, motorcycle, truck and heavy truck, the operating costs are calculated on vehicle-km basis. The operating cost for the private transport modes are estimated by multiplying the estimated unit vehicle operating cost per vehicle-km km by speed range (which are mentioned in the previous section of (1), 13.2.4) by the vehicle-km by speed range obtained as the traffic assignment results.

**(3) Estimation of Time Costs**

1) Public transport mode

Regarding the public transport mode, the time costs are calculated on passenger-hour basis. The time costs for the public transport modes are estimated by multiplying the estimated unit time cost per passenger-hour for the public transport users (which are mentioned in the previous section of (3), 13.2.4) by the passenger-hour obtained as the traffic assignment results.

2) Private transport mode

Regarding the private transport mode, private car, taxi and motorcycle are objectives of the time cost calculation. The time costs of private car and taxi are calculated as a combined category, which are calculated by multiplying the estimated unit time cost per passenger-hour for the private mode user (which are mentioned in the previous section of (1), 13.2.4) by the passenger-hour as a combined category of private car and taxi obtained as the traffic assignment results.

As for motorcycle, the vehicle-hours by speed range are estimated by dividing the assignment results of vehicle-km per speed range by the speed for each speed range. Then, by applying the above estimated vehicle-hours for the estimated unit time cost per vehicle, the vehicle time cost of motorcycle is obtained.

#### (4) Estimated Benefits

As a result, the 2022 benefits of Scenario B and D are estimated based on the traffic assignment results as shown in Table 13.2.35. The negative benefits in the component of saving in operating cost both for Scenario B and D are explained that the increased volumes of vehicle-km itself of car and taxi, which reduce the effect of some changes to rather higher speed ranges, in the case of Scenario B and D compared with Scenario A, are main factor of negative benefits. The benefits for the year 2007 and 2012 are estimated proportionally to the obtained share percentages of accumulated capital cost in 2007 and 2012 to the total capital cost in accordance with the phased cost in the case of Scenario D (Refer to Table 13.2.36).

**Table 13.2.35 Estimated Benefits in 2022**

	(Million LE/Year)		
	Saving in Operating Cost	Saving in Time Cost	Total Benefits
Scenario B	-1,316	8,848	7,532
Scenario D	-1,222	8,740	7,519

*Source: JICA Study Team*

**Table 13.2.36 Estimated Benefits in 2007, 2012 and 2022**

	(Million LE/Year)		
	Total Benefits		
	2007	2012	2022
Scenario B	1,011	2,392	7,532
Scenario D	1,009	2,388	7,519

*Source: JICA Study Team*

### 13.2.6 Cost Benefit Analysis

Based on the above estimated economic costs and benefits, the cost benefit analysis is made. The calculation results are summarized in Table 13.2.37. As a sample of details of cash flow of the cost benefit analysis, the case of Scenario D is shown in Table 13.2.38.

**Table 13.2.37 Summary of Cost Benefit Analysis**

	Scenario B	Scenario D
EIRR	16.8%	20.1%
B/C (at discounted rate of 12%)	1.41	1.77
NPV (Million LE at discounted rate of 12%)	5,004	7,395
Benefits at Present Value (Million LE at discounted rate of 12%)	17,063	17,033

*Source: JICA Study Team*

**Table 13.2.38 Cash Flow of Cost Benefit Analysis (Scenario D)**

Scenario		D		EIRR		20.1%		B/C		1.77 (at discounted rate of 12%)		NPV		(Million LE)		7,395 (at discounted rate of 12.0%)	
	Cost											Benefits		Net Cash Flow			
	Investment Cost				Maintenance Cost				Cost Total								
	Road	Busway	Rail	(Total)	Road & Busway	(Total)											
2001																	0.0
2002																	0.0
2003		476.3	339.4	337.3	1,153.1			0.0	1,153.1								-1,153.1
2004		476.3	339.4	337.3	1,153.1			0.0	1,153.1								-1,153.1
2005		476.3	339.4	337.3	1,153.1			0.0	1,153.1								-1,153.1
2006		476.3	339.4	337.3	1,153.1			0.0	1,153.1								-1,153.1
2007		365.4	250.8	644.7	1,260.9	3.8		3.8	1,264.7	1,008.8							-255.9
2008		365.4	250.8	644.7	1,260.9	3.8		3.8	1,264.7	1,284.6							19.9
2009		365.4	250.8	644.7	1,260.9	3.8		3.8	1,264.7	1,560.4							295.7
2010		365.4	250.8	644.7	1,260.9	3.8		3.8	1,264.7	1,836.2							571.5
2011		365.4	250.8	644.7	1,260.9	3.8		3.8	1,264.7	2,112.0							847.3
2012		375.0	192.9	1,058.8	1,626.7	5.7		5.7	1,632.4	2,387.8							755.4
2013		375.0	192.9	1,058.8	1,626.7	5.7		5.7	1,632.4	2,900.9							1,268.5
2014		375.0	192.9	1,058.8	1,626.7	5.7		5.7	1,632.4	3,413.9							1,781.6
2015		375.0	192.9	1,058.8	1,626.7	5.7		5.7	1,632.4	3,927.0							2,294.7
2016		375.0	192.9	1,058.8	1,626.7	5.7		5.7	1,632.4	4,440.1							2,807.7
2017		344.1	172.0	2,548.7	3,064.8	7.5		7.5	3,072.3	4,953.2							1,880.9
2018		344.1	172.0	2,548.7	3,064.8	7.5		7.5	3,072.3	5,466.2							2,394.0
2019		344.1	172.0	2,548.7	3,064.8	7.5		7.5	3,072.3	5,979.3							2,907.1
2020		344.1	172.0	2,548.7	3,064.8	7.5		7.5	3,072.3	6,492.4							3,420.1
2021		344.1	172.0	2,548.7	3,064.8	7.5		7.5	3,072.3	7,005.5							3,933.2
1 2022						7.5		7.5	7.5	7,518.6							7,511.1
2 2023						7.5		7.5	7.5	7,518.6							7,511.1
3 2024						7.5		7.5	7.5	7,518.6							7,511.1
4 2025						7.5		7.5	7.5	7,518.6							7,511.1
5 2026						7.5		7.5	7.5	7,518.6							7,511.1
6 2027						7.5		7.5	7.5	7,518.6							7,511.1
7 2028						7.5		7.5	7.5	7,518.6							7,511.1
8 2029						7.5		7.5	7.5	7,518.6							7,511.1
9 2030						7.5		7.5	7.5	7,518.6							7,511.1
10 2031						7.5		7.5	7.5	7,518.6							7,511.1
11 2032						7.5		7.5	7.5	7,518.6							7,511.1
12 2033						7.5		7.5	7.5	7,518.6							7,511.1
13 2034						7.5		7.5	7.5	7,518.6							7,511.1
14 2035						7.5		7.5	7.5	7,518.6							7,511.1
15 2036						7.5		7.5	7.5	7,518.6							7,511.1
16 2037						7.5		7.5	7.5	7,518.6							7,511.1
17 2038						7.5		7.5	7.5	7,518.6							7,511.1
18 2039						7.5		7.5	7.5	7,518.6							7,511.1
19 2040						7.5		7.5	7.5	7,518.6							7,511.1
20 2041						7.5		7.5	7.5	7,518.6							7,511.1
21 2042						7.5		7.5	7.5	7,518.6							7,511.1
22 2043						7.5		7.5	7.5	7,518.6							7,511.1
23 2044						7.5		7.5	7.5	7,518.6							7,511.1
24 2045						7.5		7.5	7.5	7,518.6							7,511.1
25 2046						7.5		7.5	7.5	7,518.6							7,511.1
26 2047						7.5		7.5	7.5	7,518.6							7,511.1
27 2048						7.5		7.5	7.5	7,518.6							7,511.1
28 2049						7.5		7.5	7.5	7,518.6							7,511.1
29 2050						7.5		7.5	7.5	7,518.6							7,511.1
30 2051						7.5		7.5	7.5	7,518.6							7,511.1
Total		7,327.8	4,436.0	22,610.1	34,374.0												

Source: JICA Study Team

## 13.3 FINANCIAL ANALYSIS

### 13.3.1 General

In this section, the preliminary financial examination regarding public transport mode (bus, ferry, tramway, metro, ENR suburban railway and ENR express railway) are made for the case of Scenario D (year 2022). The operating revenues and operating costs are estimated, and by comparing the both, the cost recovery conditions are examined.

Utilizing the fare system and the estimated number of passengers and/or passenger-kilometer in 2022, the operating revenues in 2022 are estimated. Then, based on the unit operating cost per passenger-kilometer and the estimated passenger-kilometer in 2022, the operating cost in 2022 are estimated.

For this financial examination, the fare system, which is applied in the transport demand modeling, is utilized.

The numbers of passengers and/or passenger-kilometers for each mode in 2022 are based on the results of the traffic assignment in the transport demand forecast.

The unit operating cost per passenger-kilometer is based on the estimated results which are previously described in the section of (2), 13.2.4.

### 13.3.2 Fare system

Table 13.3.1 shows the fare system which is applied in the transport demand modeling for Scenario D in 2022. These fare are set up based on the current tariff level and the growth rate of per capita GDP.

**Table 13.3.1 Fare System of Public Transport Mode**

	Unit Boarding Fare (LE)	Unit Fare per Km (LE)
Bus	0.05	0.05
Ferry	0.71	-
Tramway	0.50	-
Metro	0.40	0.01
ENR Suburban	0.90	-
ENR Express	1.00	0.05

*Source: JICA Study Team*

### 13.3.3 Estimation of Operating Revenues

Using the above fare system and the number of passenger and passenger-kilometer derived from the traffic assignment results for the case of Scenario D in 2022, the daily operating revenues are estimated as shown in Table 13.3.2.



**Table 13.3.2 Estimated Daily Operating Revenues (Scenario D, 2022)**

	Number of Passenger (Million / day)	Unit Boarding Fare (LE)	Estimated Revenue (1) (Million LE / day)	Psg.-km (Million / day)	Unit Fare per Km (LE)	Estimated Revenue (2) (Million LE / day)	Total Revenues (1)+(2) (Million LE / day)
Bus	3.910	0.05	0.1955	21.841	0.05	1.0921	1.288
Ferry	0.002	0.71	0.0016	0.004	-	-	0.002
Tramway	1.129	0.50	0.5645	9.097	-	-	0.565
Metro	8.702	0.40	3.4808	69.176	0.01	0.6918	4.173
ENR Suburban	0.518	0.90	0.4662	7.830	-	-	0.466
ENR Express	0.920	1.00	0.9200	17.120	0.05	0.8560	1.776

Source: JICA Study Team

### 13.3.4 Estimation of Operating Cost

Table 13.3.3 shows the unit operating cost per passenger-km (financial prices) which is already estimated in the previous section of (2), 13.2.4.

**Table 13.3.3 Estimated Unit Operating Cost per Passenger-km (Financial Prices)**  
(LE per Passenger-km)

	Without Depreciation / Without Interest	With Depreciation / Without Interest	With Depreciation / With Interest
Bus	0.0425	0.0542	0.0651
Ferry	0.23	0.23	0.23
Tramway	0.28	0.35	0.35
Metro	0.0137	0.0556	0.0723
ENR Suburban	0.0375	n.a.	0.0497
ENR Express	-	-	-

Source: JICA Study Team

Using the above the estimated unit operating cost per passenger-km (financial prices) and the obtained passenger-kilometer derived from the traffic assignment results for the case of Scenario D in 2022, the daily operating costs are estimated as shown in Table 13.3.4. In this case, for ENR express railway, the data of metro is applied as a substitute, taking the service level of ENR express railway into consideration.

**Table 13.3.4 Estimated Daily Operating Cost (Financial Prices) (Scenario D, 2022)**  
(Million LE / day)

	Estimation in Case Applying Unit Cost of "Without Depreciation / Without Interest"	Estimation in Case Applying Unit Cost of "With Depreciation / Without Interest"	Estimation in Case Applying Unit Cost of "With Depreciation / With Interest"
Bus	0.929	1.184	1.422
Ferry	0.001	0.001	0.001
Tramway	2.547	3.184	3.184
Metro	0.948	3.846	5.001
ENR Suburban	0.294	n.a.	0.389
ENR Express	0.235	0.952	1.238

Source: JICA Study Team

### 13.3.5 Operating Revenues Versus Operating Costs

Table 13.3.5 show the daily operating revenues versus operating costs.

**Table 13.3.5 Daily Operating Revenues Versus Operating Costs (Scenario D, 2022)**

(Million LE / day)

	Revenues (Mil. LE)	Operating Costs (Mil. LE)			Rev. – Cost. (Mil. LE)		
		Applying Estimated Unit Operating Cost per Psg-km in Case of:			Applying Estimated Unit Operating Cost per Psg-km in Case of:		
		“Wo. Dep./ Wo. Int.”	“W. Dep. / Wo. Int.”	“W. Dep. / W. Int.”	“Wo. Dep./ Wo. Int.”	“W. Dep. / Wo. Int.”	“W. Dep. / W. Int.”
Bus	1.288	0.929	1.184	1.422	0.358	0.103	-0.135
Ferry	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Tramway	0.565	2.547	3.184	3.184	-1.983	-2.619	-2.619
Metro	4.173	0.948	3.846	5.001	3.225	0.326	-0.829
ENR Suburban	0.466	0.294	n.a.	0.389	0.173	n.a.	0.077
ENR Express	1.776	0.235	0.952	1.238	1.541	0.824	0.538

Source: JICA Study Team

The above daily tabulation are converted to the annual tabulation by using 300 days per annum as shown in Table 13.3.6.

**Table 13.3.6 Annual Operating Revenues Versus Operating Costs (Scenario D, 2022)**

(Million LE / year)

	Revenues (Mil. LE)	Operating Costs (Mil. LE)			Rev. – Cost. (Mil. LE)		
		Applying Estimated Unit Operating Cost per Psg-km in Case of:			Applying Estimated Unit Operating Cost per Psg-km in Case of:		
		“Wo. Dep./ Wo. Int.”	“W. Dep. / Wo. Int.”	“W. Dep. / W. Int.”	“Wo. Dep./ Wo. Int.”	“W. Dep. / Wo. Int.”	“W. Dep. / W. Int.”
Bus	386.27	278.79	355.29	426.69	107.47	30.97	-40.42
Ferry	0.47	0.28	0.28	0.28	0.19	0.19	0.19
Tramway	169.35	764.15	955.19	955.19	-594.80	-785.84	-785.84
Metro	1,251.77	284.31	1,153.86	1,500.43	967.45	97.91	-248.66
ENR Suburban	139.86	88.09	n.a.	116.75	51.77	n.a.	23.11
ENR Express	532.80	70.36	285.56	371.33	462.44	247.24	161.47

Source: JICA Study Team

The financial features by public transport mode are as follows:

1) Public bus

When applying the unit operating cost per passenger-km in terms of “with depreciation and with interest”, the profit/loss of “public bus” represents a negative value. However, in other cases, the profit shows a positive value.

2) Ferry

The profit/loss of “ferry” shows a positive value, although slightly, for each case of applied unit operating cost per passenger-km.

3) Tramway

The profit/loss of “tramway” shows always a negative value for any case of applied unit operating cost per passenger-km. Regarding tramway, therefore, there should be a countermeasure in order to improve a financial condition, either the increase in fare level or decrease in operating cost; or both actions.

4) Metro

The profit/loss of “metro” shows a positive value except for the case of applied unit operating cost per passenger-km with depreciation and with interest.

5) ENR Suburban Railway

The profit/loss of “ENR suburban railway” shows a slight positive value for each case of applied unit operating cost per passenger-km.

6) ENR Express Railway

The profit/loss of “ENR expressway railway” shows a positive value for each case of applied unit operating cost per passenger-km. Reflecting the higher level of fare system, the financial feature of “ENR expressway railway” is better than “ENR suburban railway”.

It should be noted that the above financial examination are merely preliminary analysis based on the fare system applied in the transport demand modeling and the estimated unit operating cost per passenger-km on a basis of existing financial conditions in the management entities of each public transport mode.

## **13.4 AFFORDABILITY**

### **13.4.1 Anticipated Investment**

The following discussion is about the level of anticipated investment for transport projects in the GCR. The discussion is based on the information stipulated in the *National Project for the Development of Cairo Region* (NPDCR), 1997 prepared by the Ministry of Planning in addition to a follow-up memorandum from the same Ministry. In the NPDCR, the Cairo Planning Region is one of seven designated Egyptian planning regions; it includes the whole area of three core governorates (Cairo, Giza and Qalyobeya) plus 10th Ramadan city, which is part of Sharqia Governorate. This means that the Cairo Planning Region is larger than the Study Area by those parts of Qalyobeya Governorate and Giza Governorate not included within the Study Area. However, economic activity within these parts is, vis-à-vis total regional activity, minor. For purposes of the current discussion it may therefore be assumed that, in economic terms, the Cairo Planning Region and the Study Area are essentially identical. The planning horizon of the NPDCR extends to Year 2017 and is divided into 4 Five Year Plans.

The initial point of interest relates to Cairo Planning Region investment during the third Five Year Plan (1992 ~ 1997). Table 13.4.1 shows the governmental investment during the Third Plan for the whole country and for the three Governorates of Cairo Planning Region. Although the population of the Cairo Planning Region represents 25.1% of the total Egyptian population and its GDP represents 30% of total national GDP, the share of Cairo Planning Region in terms of total investment was 36%, and in terms of transport and communication sector investment was 62%. The sector of transport and communication also includes gas pipelines.

**Table 13.4.1 Governmental Investment in the GCR**  
**Third Five-year Plan: 1992-1997**

Million L.E.

Sector	Cairo	Giza	Qalyobeya	Total Region	Egypt	% to total
Agriculture	453	900	168	1,521	8,582	18
Industry	72	120	1	192	1,192	16
Petroleum	697	253	164	1,114	4,587	24
Electricity	2,331	1,379	-	3,710	12,982	29
Construction	2,049	583	147	2,779	7,900	35
<b>Total Commodity Sectors</b>	<b>5,602</b>	<b>3,235</b>	<b>480</b>	<b>9,316</b>	<b>35,243</b>	<b>26</b>
Transport & Communications	1,968	131	79	2,177	3,497	62
Suez Canal	-	-	-	-	48	-
Commerce, Finance & Insurance	113	3	-	115	171	67
Tourism	754	37	-	791	974	81
<b>Total of Productive Services</b>	<b>2,835</b>	<b>171</b>	<b>79</b>	<b>3,083</b>	<b>4,690</b>	<b>66</b>
<b>Total of Social Services</b>	<b>4,601</b>	<b>1,045</b>	<b>1,628</b>	<b>7,274</b>	<b>14,813</b>	<b>49</b>
<b>Total</b>	<b>13,038</b>	<b>4,451</b>	<b>2,187</b>	<b>19,673</b>	<b>54,746</b>	<b>36</b>

*Source: NPDCR, Ministry of Planning*

The total implemented public and private investment in the sector of transport (land, marine and air) at the national level and the share of Cairo Planning region in the first four years of the 5 year national plan 1997 ~ 2002 are shown in table 13.4.2.

**Table 13.4.2 Public & Private Investment in Transportation**

Unit: Billion L.E

Year	Country-wide Investment	Cairo Planning Region	Share of Cairo Planning Region
1997/98	10.2	2.4	24
1998/99	7.9	2.2	28
1999/2000	8.7	2.0	23
2000/2001	7.8	1.6	21
Total and Avg	34.6	8.2	24

*Source: Memorandum, Ministry of Planning*

The values shown in Table 13.4.2 include not only the investment allocated to the Ministry of Transport, but also the investments of the Ministry of Housing, Utilities and New Communities, the investment of the Governorates and private sector in the transportation field. Considering the same mean level of investment for the fifth year of the Five Year Plan 1997 ~ 2002, the country wide and regional investment in the transport field could be estimated to be 43.25 and 10.25 Million L.E., respectively. It is to be noticed that the investment in air transport for this five year consists only of expansions and development of runway and terminal of Cairo International Airport which was not a major investment. The private sector investment is limited mainly to cargo transport fleet which again does not amount to major portion of the total investment.

Table 13.4.3 shows the sectorial distribution of the programmed investment in Cairo Planning Region for the Five Year Plan 1997 ~ 2002 and the subsequent 3 Five Year Plans.

**Table 13.4.3 Sectorial Distribution of Investment in Cairo Planning Region**  
 Unit: Billion L.E

Sector	97 ~ 02	02 ~ 17	Total	% of the Plan
Agriculture	2.1	9.0	11.1	18.9
Industry, Mining & Petroleum	18.6	64.9	83.5	22.3
Tourism	1.6	2.2	3.8	42.1
Electricity & Energy	5.5	8.2	13.7	40.4
Transport & Communication	7.3	5.6	12.9	56.6
Water Supply & Sewerage	4.9	3.3	8.2	59.8
Commercial & Banking	1.3	4.6	5.9	22.0
Social Services	5.2	18.5	23.7	22.0
Environmental Development	0.9	2.4	3.3	27.2
Housing & New Communities	29.3	80.1	109.4	26.8
<b>Total</b>	<b>76.7</b>	<b>196.8</b>	<b>275.5</b>	<b>28.5</b>

Source: Memorandum, Ministry of Planning

From the above table, the share of the allocated investment for the transport and communication sector in the Five Year Plan 1997~2002 is 56.6% of the allocated investment for the same sector in the four Five Year Plans 1997~2017. The NPDCR attributes this higher investment in the Five Year Plan 1997~2002 to the construction of large scale transport projects such as Metro Line 2. Again, the 7.3 billion L.E. allocated for the transport and communication sector in the Five Year Plan 1997~2002 does not include the investment of the Ministry of Housing, Utilities and New Communities or the Governorates in the transportation field.

From the above discussion, and considering the relatively high investment in the field of transport and communication in the Five Year Plan 1997 ~ 2002, it may be considered that the level of the investment attained for the transportation sector alone (without communication) in the Cairo Planning Region of 10.25 billion L.E. could be used as a guide for investment in that field during the subsequent five year plans 2002 ~ 2017.

### 13.4.2 Investment Required for the Master Plan

The estimated cost of the recommended transport scenario mentioned in Chapter 11, *The Integrated Transport Master Plan*, is LE 59.8 billion. This amount constitutes about 1.7 % of the forecast year 2022 GCR GRDP of LE 3,570 billion. To assess the affordability of the estimated investment, required outlay is compared to past performance in public investment both at the national level and at the regional level. At the national level, data published in the *National Conference for Transport in Egypt* (2001) indicate that the total transport investment for the period 1982-2001 has been LE 150 billion. This amount, which included pipelines and Suez Canal outlays, represented about 3.0~3.3% of the Egyptian GDP. It is to be noticed that most of the investment in the mentioned period has been government investment. On the regional level, the GCR transport investment in the Five Year Plan 1997-2002, as mentioned in the previous section, was LE 10.25 billion. Assuming that each of the coming four Five Years Plans will only increase this investment amount by the estimated economic growth rate over the next two decades, the total expected available investment could be on the order of LE 73 billion (Table 13.4.4).

**Table 13.4.4 Transport Investment in GCR**

Item	Description	Unit	Value
1	Estimated GRDP for GCR	LE Billion	3,570
2	Estimated Cost of the Master Plan	LE Billion	59.8
3	Ratio of item 2 to item 1	%	1.7
4	Transport investment level in the Five Year Plan 1997-2002	LE Billion	10.25
5	Increase the Transport investment level by the economic growth rate for the next 4 Five year plans	LE Billion	73.0

*Source: JICA Study Team*

- The above discussion indicates that **the investment required for the implementation of the Master Plan is within affordable ranges of governmental investment.**

It has been mentioned in Section 13.4.1 that the transport investment in the Five Year Plan 1997-2002 has been exceptionally high (56.6% of the total investment planned for the four Five Year Plans 1997-2017) due to the implementation of several high cost projects such as Cairo Metro Line 2 and Azhar Tunnel. However, the Study Team believes that such investment level should be kept for the coming 20 years to alleviate the probable economic loss if the recommended plan is not implemented. It is to be noticed that transport improvement is linked with forecast economic growth. Without implementing the recommended Master Plan, not only the targeted economic growth rate is unlikely be attained but also much higher economic loss can be expected in the form of congestion cost and environmental deterioration.

### 13.4.3 Supplementary Financing Alternatives

The available finance from each measure depends primarily on political, rather than technical, decisions. As an example, a quite detailed *Fare Policy Study for Public Transport in Greater Cairo* has been completed in 1995, but its recommendations were not implemented due to the lack of political resolve. A meaningful quantitative analysis should only be made after having an agreement in principle about applying one or more of the following potential measures.

#### (1) Rationalizing the Public Transport Fare Structure

As discussed in Chapter 4, *Public Transport System*, fare policy must be re-assessed region-wide across all modes from an operational, as opposed to political, perspective. The fare structure of public transport is linked to the subsidy level granted to each type of public transport mode. Sustainability of reasonable service level in public transport calls for adjustment of the fare structure so as to increase revenue. The increased revenue or alternatively the decreased subsidy could be channeled to transport investment.

#### (2) Fuel Taxation

As discussed in Chapter 9, the present long freeze in fuel prices has adverse effects on congestion and on the decrease of badly needed foreign currency earnings. A gradual increase in fuel price in the form of earmarked tax can be one of the sources of finance for the implementation of transport improvements in the Master Plan. As one form of taxes it should be implemented by law and its revenues should be exclusively channeled to urban transport improvement projects including rail-based public transport by satisfying the principle of “beneficiaries pay”. Many countries have been applying fuel taxation as a mean for financing only road improvement schemes. However, urban transport consists of road transport and public transport jointly. The countries have begun to allocate fuel tax to public transport development including rail-based mode. Therefore, it is recommended to earmark the fuel tax to be spent for whole urban transport development. The tax, in addition should be a local tax to be spent for the local urban transport development, which satisfy the benefit principle.

#### (3) Parking Fees

Parking fees collected from motorists who do not have permanent parking facilities at home and from on street parking at business and commercial areas can provide revenues for transport projects. One main function of the recommended organizations on both the regional and local levels should be formulating and implementing parking policies.

#### **(4) Tolls from Express Highways**

The Master Plan includes the establishment of an expressway network to help decrease the expected congestion on at grade roads. Tolls should be charged for the use of these express highways. The revenue from the tolls should be channeled to finance at least part of the construction cost, and all maintenance cost, of the network.

#### **(5) Sharing Windfall Earnings from Transport Projects**

Windfall earnings imply an increase in real state prices due to the construction of infrastructure facilities. An example is the increase of real estate prices in Shoubra Street as a result of the construction of Metro Line 2. The owners of land and buildings along that street enjoy considerable increases in the value of their properties due to expenditures paid by another party (in our example, NAT representing the Government in the construction of the metro line). At present, those owners are charged with extra dues (called improvement dues) added to the real state tax. The amount of these extra dues is very small and does not correlate to the huge amount of the owner's windfall earnings. A more rational approach could be implemented to share such windfall earnings. The revenue from this sharing should be channeled to finance infrastructure projects including transport projects.

### **13.5 RECOMMENDATIONS**

#### **13.5.1 Economic Evaluation**

The proposed CREATS Master Plan (represented by Scenario D, in Chapter 3) requires a total of **LE 59.8 billion** (at 2001 prices) over the next twenty years up to the year 2022, out of which **LE 18.2 billion** are allocated for the committed projects, which have been budgeted in the Five Year Plan (2002-2007) or are about to be constructed in a few years, and **LE 41.6 billion** are necessary for newly proposed infrastructure development in addition to the committed projects. It is noted that Metro Line 3 is included in the committed project package. The economic justification of the LE 41.6 billion investment was examined in terms of the economic benefit against the cost through a conventional cost-benefit analysis. The results are summarized in Table 11.1.

As seen in the table, the investment of LE 41.6 billion (which is converted to the economic cost of LE 34.4 billion) will produce annual economic benefits equivalent to LE 7.52 billion, thus, the **B/C ratio** (at 12% discount rate) is computed to be **1.77**. Another evaluation indicator, the **EIRR** (Economic Internal Rate of Return), is computed at **20.1%**.

These indicators are considerably favorable, and it can be concluded that the proposed Master Plan is economically feasible, therefore, is worth being implemented.



**Table 13.5.1 Economic Evaluation of the Proposed CREATS Master Plan**

		(Billion LE)
Cost for Committed Projects		18.2
Newly Required Capital Costs (CREATS proposed Projects)	Total in Financial Prices	<b>41.6</b>
	Total in Economic Prices	34.4
	(2003 to 2006)	(4.6)
	(2007 to 2011)	(6.3)
	(2012 to 2016)	(8.1)
	(2017 to 2022)	(15.3)
Benefits (in 2022)	Total (Economic Prices)	7.52
	(Saving in Operating Cost)	(-1.22)
	(Saving in Time Cost)	(8.74)
<b>Evaluation Indicator</b>	<b>B/C Ratio (at 12% discounted rate)</b>	<b>1.77</b>
	<b>EIRR</b>	<b>20.1 %</b>

Source: JICA Study Team

### 13.5.2 Financial Resource Mobilization

The huge amount of funds, approximately LE 60 billion, are necessary to develop the urban transport sector for GCR. This amount is equivalent to **1.7%** of the accumulated GRDP (Gross Regional Domestic Product) during the period between 2003 and 2022. This ratio, in comparison with the magnitude of economic activities, seems to be rational and affordable in view of the macro economy.

However, the government should strive to deliberately procure and allocate the funds for the transport infrastructure projects. In order to make it sure and stable, as discussed in Chapter 8, some innovative approaches are necessary to strengthen the financial base and expand the financial framework. The recommended urgent measures are:

- 1) Introduction of “User Pay Systems” such as a toll system for development of the proposed expressway network and a parking charge system;
- 2) Restructuring of the current public transport fare system so as to be flexibly;
- 3) Preparation of proper guidelines and regulations for the Public-Private Partnership scheme for development of public transport facility and service operation; and
- 4) Pursuance of external resources from international aid community to support the implementation.

### **13.5.3 Necessary Urgent Actions**

Out of the proposed projects/programs, the following three are recommended to be urgently taken into action with collective efforts by relevant authorities.

- 1) All committed projects are expected to be uneventfully implemented in the short-term. In particular, the construction of Metro Line 3 should be urgently initiated to structure one of the significant stems of the public transport corridors. The CREATS model shows that the highest sectional volume of demand will be 472,000 passengers/day/direction in 2022 under the CREATS public transport network, which implies that this project will be undoubtedly feasible and justifiable.
- 2) The CREATS Master Plan shall be verified and shared among the stakeholders, and expected to be authorized as the policy guidelines for the medium-term transport sector investment program in GCR.
- 3) For the above reason and the inter-ministerial coordination, the proposed Cairo Metropolitan Transport Bureau (CMTB) needs to be urgently established.

### **13.5.4 Monitoring of the CREATS Master Plan**

The CREATS Master Plan is a blueprint based on the long-term perspectives and visions, therefore, should be periodically (every five years) monitored so as to meet with the reality along with socioeconomic changes. To this end, the CREATS database needs to be periodically updated to support rational decision-making for transport investments. *ENIT* shall be responsible for such technical and professional tasks.