CHAPTER 9

TOLL EXPRESSWAY OPERATION SYSTEM

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9.1 BASIC CONCEPT OF OPERATION, MANAGEMENT AND MAINTENANCE SYSTEM

The basic concept among Operation, Management and Maintenance considered in the previous "Public-Private Partnership (PPP) Program for Cairo Urban Toll Expressway Network Development" is presented in Figure 9.1-1 to overcome any misunderstanding due to the difference of terminology adopted by different countries.

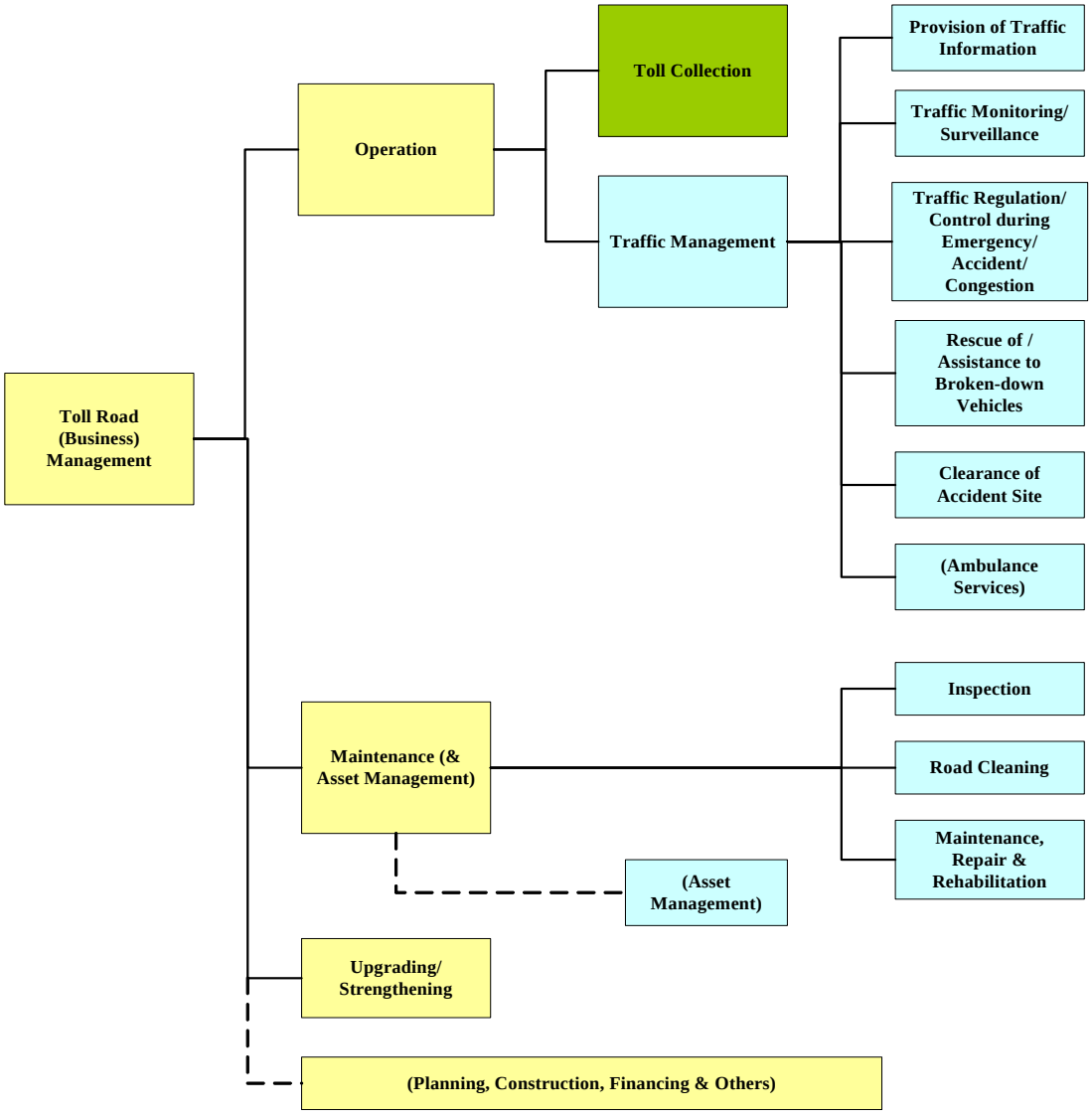


Figure 9.1-1 Terminologies of Operation, Management and Maintenance

Toll Road (Business) Management is the management of whole business of toll roads. May or may not include the works other than maintenance, operation/management and upgrading/strengthening, such as construction, planning and financing. This word is not used frequently. Therefore, when it is used, clear definition shall be given.

Operation is sometimes used to include maintenance, or used in combination with maintenance such as "operation and maintenance". In this Study, this word is used to mean toll collection and traffic management.

Toll Collection is collection of toll, literally.

Traffic Management is distinguished from the word "traffic control". "Traffic Control" in this Study is used to mean regulation or control of traffic by police officers (or law enforcer), while the word "traffic management" is used to mean the works as listed below implemented by the road administrator:

1. Provision of traffic information
2. Traffic monitoring/surveillance
3. Traffic regulation/control during emergency/accident/ congestion
4. Rescue of / assistance to broken-down vehicles
5. Clearance of accident site

Maintenance refers to the works as inspection of the conditions, maintenance, repair and rehabilitation of the road and relevant facilities. Maintenance usually include road surface cleaning also. Asset management is being focused in the recent years. Maintenance is planned from the viewpoint of asset management.

Upgrading or Strengthening includes upgrading of the function of roads, including widening, improvement of functions of road (such as strengthening of bridges/viaducts to cope with the increase in vehicle weight, changing from ordinary AC surface to permeable AC surface) and installation of noise fence.

9.2 OPERATION SYSTEM

9.2.1 Toll Operation

When the system of toll collection is considered or planned, the system or policy for toll setting has to be determined first. There are two types of toll system which is usually adopted; "flat toll system" (or "open toll system") and "distance-dependent toll system" (or "closed toll system").

If the "flat toll system" is adopted, manual collection can be used since there is no need for calculation of toll amount. On the other hand, if "distance-dependent system" is adopted, Electronic Toll Collection (ETC) needs to be introduced because of the complexity of the calculation of tolls.

Flat Toll System for E1, E2, and E3 is recommended in PPP Study. In case of light traffic volumes and with flat toll system, manual collection can be adopted. However, under the high traffic volumes (high arrival rate) on expressways E1, E2 and E3 as shown in Table 9.2-1 based on the finding of PPP Study and due to restricted available land area for Toll Plaza, Electronic Toll Collection (ETC) should be considered even ETC is not adopted on the intercity Egyptian Expressways yet.

Table 9.2-1 Estimated ADT on Expressways under Study in Year 2005

Expressway	ADT (veh)	Max. Peak Hour Volume (veh/Dir)	No. of Expressway Way Traffic Lanes/Dir	Average Headway in Sec.
E1 (6th of October)	329,331	13,400	2	0.537
E2 (26th of July)	93,843	4,204	2	1.713
E3 (Autostrade)	76,486	5,011	3	2.155

Source: JICA Study Team based on PPP Study Table 3.5-1 page 3-26

(1) Manual Toll Collection

"Manual toll collection" is a system whereby the toll is calculated by the toll collector and the toll is paid to him. This system is often used for flat toll where there is no necessity of calculation of toll fee. There are three stages of manual collection depending on the length of toll road network and, thus, the number of entrances and exits.

a. Simple Manual Toll Collection

Where flat toll system is adopted, toll is collected (usually at the entrance) based on the visual vehicle classification by the toll collectors. Toll can be paid in forms of cash or coupon (with discounted rate for frequent users).

The major advantages of this system are as follows:

(i) Little construction cost: This system needs little equipment, and initial construction cost on the side of the toll operator is minimal. Also, it requires no special device on the side of the road users.
(ii) Relatively small area needed for tollgate: Since no complicated facility is required.

On the other hand, this system has the following disadvantages:

(i) Long time required for toll collection: Since this system fully relies on the manual works. The toll collection time becomes longer when the driver pays in a bill with a large amount and toll collector has to calculate and pay change.
(ii) Relatively large chances for toll collectors to commit misconduct: Although the vehicle and number of vehicles can be judged and recorded by various types of vehicle sensors and recording system and toll revenue can be estimated based on the recorded data, still it is possible for the toll collectors to illegally take some portion of the toll revenue before he/she submit it to the supervisor. In an extreme case, misconduct involving the supervisors can occur.

Where flat toll system is adopted, efforts to reduce or eliminate workload of toll collectors have been made in the past. These efforts resulted in the semi-automated or automated systems. One of these systems is described below:

Basket-type toll receiver: When the toll can be paid in a coin or combination of coins with fixed amount(s), the driver throws the coin(s) into a bucket-shaped container attached to the toll receiving machine. Within the toll receiving machine, there is a device to identify the coin (like those used in the various vending machines on the street) and the bar at the tollgate is lifted if the right amount is received.

b. Manual Toll Collection with Ticket

Manual toll collection can be used for distance-dependent system where the number of entrances and exits are not so many. In this case, some type of ticket is handed to the driver (or the driver take a ticket from a machine) at the entrance. The toll is calculated at the exit based on the distance from the entrance which is identified by the ticket that the driver got at the entrance.

c. Manual Toll Collection with Computerized Toll Calculation System

As the total length of the toll road network becomes long and number of entrances and exits becomes large, manual calculation of toll amount by the toll collector becomes practically impossible. Then computerized toll calculation system needs to be introduced. Ticket issuing machines at the entrances and ticket reading machines at the exits are often connected to the central computer which not only calculates the toll amount of each vehicle but also records such data as:

(i) Traffic volume by vehicle type,
(ii) The time from entrance to exit (can be used to check illegal/abnormal travel of vehicles), and
(iii) Toll revenue.

This system is transitional form to ETC which is explained in the next subsection.

Advantages and disadvantages of the manual toll collection with ticket and computerized toll calculation system as described in (b) and (c) above are same to those of simple manual toll collection as described in (a), but are so to less extent than in simple manual collection.

(2) Electronic Toll Collection

"Electronic Toll Collection" system or "ETC" system usually refers to the system whereby the toll is calculated by the computer and paid in forms of prepaid card (contact or non-contact type) or deducted from the driver's bank account based on the agreement between the driver (user of the toll road) and the toll road operator.

"Glossary" of International Bridge, Tunnel and Turnpike Association (IBTTA) defines ETC as follows:

Electronic Toll Collection: The collection of tolls based on the automatic identification and classification of vehicles using electronic systems.

Owing to the remarkable development in computer and peripherals, ETC has been, and is being, rapidly introduced in many countries in the last decade. There are basically two types of system; "On-Board Unit" type and "Prepaid Card" type. They are described below:

a. "On-Board Unit" Type

"On-Board Unit" (OBU) is installed on each vehicle which communicates with the roadside station through very weak radio wave and inform the entrance of the vehicle.
The signal of entrance is sent to the central computer and the vehicle's entrance is registered. At the same time, the gate of tollbooth is opened and the vehicle enters the toll road. At the exit, the OBU again communicates with the roadside station and the signal of exit is sent to the central computer. The computer calculates the amount of toll and transfers the corresponding amount from the driver's account to the toll road operator's account.

This system has the following major advantages:

(i) Reduction of the time to pass the entrance and exit gate, and increase of traffic capacity of the entrance and exit: In this system, vehicles do not need to stop at the entrances and exits although they have to slow down to allow the communication between OBU and the roadside station. This results in the large reduction of the time passing the entrance and exit gates and increase in the traffic capacities of entrance and exit.

(ii) The work of handling cash is eliminated: Since the toll is transferred from the bank account of the driver to that of the toll operator through computer, cash is not used. This results in reduction of chances of crime as well as works of calculating the toll revenue of each toll collector/toll office etc., and transporting the cash.

(iii) The number of personnel at toll office is greatly reduced: Since the system is fully automated, toll collector is not required. However, toll collectors cannot be completely eliminated because some vehicles are not equipped with OBU for ETC and have to be manually handled. Even though the toll collectors cannot be completely eliminated, the number of toll collectors can be reduced resulting in the reduction in operating cost.

On the other hand, this system has the following disadvantages:

(i) High cost of OBU: The market price of OBU in Japan, for example, is in the order of US$ 150. Although the price is expected to become lower in future as they will be manufactured in the larger number, it is a substantial expense for drivers at present. Due to this relatively high price, the increase of the number of vehicles equipped with OBU has been rather slow in Japan. However, the cost of OBU is not felt as a burden when a new car is purchased. Therefore, more than 80 % of the newly sold private cars are equipped with OBU these days (according to the explanation of a major car dealer in Tokyo).

(ii) Need for good banking system: Since the toll is paid using on-line banking system, existence of such banking system is essential

(iii) Special device of OBU for motorcycles: Ordinary OBU is designed to be installed in the “covered” place. Accordingly, it cannot be used for motorcycles. Therefore, special device is necessary for a motorcycle.

b. Prepaid Card Type

In this system, the drivers (users of toll road) buy a prepaid card before entering the toll road. The prepaid card is inserted in the reading machine at the entrance and the exit.

The toll amount is calculated at the exit and deducted from the prepaid card. Currently, most of prepaid card types, are “contact” type that is inserted into the reading machine. In this card type, the data are recorded on the magnetic elements coated on the card. Recently, “non-contact” type of prepaid card has been developed and being used in, for example,

railroad network in Japan. In this case, an IC chip is embedded in the card. The card is placed on, or near, the surface of the reading machine for very short time duration, such as a few seconds to be read by the reading machine.

Thus, the time required for reading the data is very short. This type of card is expected be widely used in the future.

The advantages of prepaid card type are:

(i) High-cost device on the side of the driver (road user) is not necessary: In prepaid card system, special device is not needed on the vehicle. The cost of conventional (contact type) prepaid card in Japan, for example, is in the order of one US$.
(ii) Can be used where on-line banking system is not available: Since this system does not involve on-line banking system, it can be used even if such banking system is not available.
(iii) Prepaid card can be used in parallel to the manual toll collection: Especially in distance-dependent toll system where some type of card is used. The toll calculation facility used in distance-dependent toll system can be modified relatively easily so that prepaid card can be used. Thus, prepaid card system can be used in the transitional stage between the manual collection and full ETC. The time to pass the tollgate is reduced by adopting prepaid card compared to the full manual collection.

Prepaid card system has the following disadvantages:

(i) Vehicles have to stop at tollgate: To let the reading machine read the card and deduct the toll amount from the card, the vehicles necessarily have to stop at tollgates (entrance and exit). This results in less traffic capacity of tollgate than that of full ETC tollgate.
(ii) Danger of fraud prepaid card: Just like any prepaid card for other purposes, fraud prepaid can be produced and sold in the black market. This causes substantial loss of income for the toll road operator.

The advantages and disadvantages described above are summarized and compared in Table 9.2-2.

Table 9.2-2 Comparison between Manual and ETC Systems

Type		Advantage	Disadvantage
Manual	Simple Manual	- No cost to the road users - Small construction cost - Small area needed for tollgate	- Long toll collection time and small traffic capacity at tollgate - Chance of misconduct by toll collectors - Vehicles have to stop at tollgate
	With Ticket	Same as above (to less extent)	Same as above (to less extent)
	Computerized	Same as above (to less extent)	Same as above (to less extent)
ETC	With OBU	- Non-stop operation at tollgate - Large traffic capacity of tollgate - No handling of cash - Low operation cost	- High cost of OBU to be imposed on road users - Cannot be used if on-line banking system is not available
	Prepaid Card (Non-Contact)	- No device is required on the side of road users - Can be used when on-line banking system is not available	- Vehicles have to stop at toll gates - Smaller traffic capacity of toll gates than full ETC
	Prepaid Card (Contact)	Same as above	Longer service time than non-contact type is required

c. Radio Wave Communication System

A micro wave technology using 5.8 GHz-band DSRC (Dedicated Short Range Communications) is certifies as an international standard by ITU (International Telecommunication Union). Two types of DSRC method for radio wave system are developed. One is passive type and the other is active type.

In case of the passive type system, the RSU emits radio wave to the OBU, and receives the reflected waves from OBU with required information.

In case of active type system OBU has an independent power supply from the vehicle, and transmits the required information to the RSU on receiving signal from RSU when the vehicle pass through ETC toll gate.

While passive type has been developed in European countries, active type has been developed in USA and in Japan.

9.2.2 Traffic Management

Traffic management is defined as the actions done by the “road administrator” (such as MEA) to secure safe, smooth and comfortable traffic condition. There are two main reasons that the road administrator takes such actions:

(i) To satisfy the demand of the users of toll roads who naturally expect higher quality of "services" than on the ordinary (non-toll) roads.
(ii) To reduce the chances of accidents which result in decrease in the traffic volume and consequently, decrease in the toll revenue.

Traffic management usually consists of the following works:

(i) Provision of traffic information to the road users,
(ii) Monitoring/surveillance of the traffic conditions,
(iii) Regulation or control of traffic in case of emergency, accident and traffic congestion,
(iv) Rescue of, or assistance to, broken-down vehicles, and
(v) Clearance of the accident site

In addition to the above, ambulance service is needed, but this usually belong to the responsibility of other institutions.

Traffic control is defined as the deeds of the police officers done mainly to enforce the legislations relevant to the road traffic. The deeds of traffic control usually include the followings:

(i) Regulation of speeds
(ii) Regulation of overtaking
(iii) Regulation of stopping/parking
(iv) Regulation for vehicles of certain categories (such as bicycles and animal-drawn carts) not to enter expressways

Among the actions of traffic control as listed above, speed regulation is most important in case of expressway. In any emergency, such as a traffic accident, regulated speed needs to be lowered to secure the safety and avoid the additional accident. Therefore, the police officers have to be always monitoring the hazards on the expressways and take necessary actions.

As can be seen in the above, there is no clear boundary between the traffic control implemented by the traffic police and the traffic management implemented by the road administrator. Actually there are many overlapping between the two. Accordingly, it is very natural that the traffic police and road administrator coordinate with each other.

In Japan for instance, traffic officers are working together with the staff of traffic control centers of the expressways.

9.2.3 Traffic Information System (TIS)

The word "Traffic Information System" usually refers to "Traffic Information Provision System". "Collection of Traffic Information" is done through "Traffic Monitoring and/or Surveillance" which is explained later and is the system where the necessary/desired information is provided to the toll road users via various methods.

(1) Objective

The main objectives of providing the traffic information to the toll road users are as listed below:

(i) Let the driver know the hazardous condition (accident, obstacle on the road, hazardous climate condition, etc.) on the toll road ahead and let the driver take necessary caution.
(ii) Let the user of the toll road know the traffic congestion occurring on the road section ahead and let him/her decide to exit the toll road as he/she opts.
(iii) Let the road user know the congestion on the toll road before entering and let him/her choose to use or not to use the toll road.

(2) Kinds of Information Provided to Road Users

The following kinds of information are usually provided to the road users:

(i) Accident which has not been cleared.
(ii) Vehicle(s) stopping on the carriageway including shoulder.
(iii) Any hazardous obstacle on the carriageway.
(iv) Closure of the toll road.
(v) Maintenance works and other events occurring on the carriageway, shoulder or adjacent area of the toll road with or without traffic regulation.
(vi) Hazardous weather condition, such as heavy rain.

Most of the above items may not need explanation. In Item (ii), "vehicle(s) stopping on shoulder" (not only vehicles stopping on travel lane) is listed as one of the incidents for which the information used to be provided to the drivers.

This may need some explanation: Vehicles passing by the vehicle stopping on the shoulder tend to keep some distance from the vehicle(s) stopping on the shoulder. As a result, vehicles often change their lines of travel as they approach the vehicle(s) stopping on the shoulder or emergency parking bay. Thus, information on the vehicle(s) stopping on the shoulder/emergency parking bay is needed to give precaution to the drivers and minimize the chance of accident. Some information can be said on the maintenance works and other events

occurring on the shoulder or adjacent area of the toll road.

In many countries, information of hazardous weather conditions such as heavy rain, strong wind, thick fog, snow and ice is very important for safe driving. In Egypt, the climate is generally mild and chances of hazardous weather seem to be relatively rare. On the other hand, there may be other climate/weather condition(s) unique to Egypt, such as severe sand storm, which is hazardous to traveling vehicles. Therefore, diligent consideration should be given as to what kind of information is provided to drivers on weather.

(3) Methods/Devices for Traffic Information

Kinds and details of information desired by drivers may vary from one country to aother. Therefore, diligent consideration should be given on the details of traffic information at design stage and necessary modification should be made based on the observation of effectiveness of each method/device after being practically used. Table 9.2-3 shows methods and devices for traffic information and Figure 9.2-1 shows different photos of some devices of traffic information.

Table 9.2-3 Methods/Devices for Traffic Information

Method/Device	Main Feature
Variable Sign Board (Word type)	Message/information is expressed in words or numbers. Various types of mechanism (scroll-film, flip-flop board, LED etc.) can be used. Compact in size compared with “graphic” type. Thus, less costly than “graphic” type.
Variable Sign Board (Graphic type)	Message/information is expressed by combination of simplified picture and words. Usually LED is used. Easier and quicker for drivers to understand the message. Important for providing information to vehicles traveling at high speed. Larger in size compared with “word” type. Thus, more costly than “word” type.
Highway Radio (Exclusive)	Message/information is disseminated through shorter-range (weak) radio wave which is broadcasted via antenna installed along the road and received by car radio. Some type of sign board advising the drivers to turn on their car radios and tune to the frequency of the highway radio broadcast is necessary.
Information Board at Entrance	Various types of message board (simple blackboard, scroll-film type etc.) can be used. If placed at adequate position, easy for the drivers to read because the vehicles stop or slow down to pay the toll or get a ticket. Drivers can get additional information, if necessary, from the personnel at the toll gate. Effective for informing drivers of congestion on the toll road or other informatics and allows them to opt for not using the toll road.

Method/Device	Main Feature
General Radio/ TV Broadcast	Traffic information is broadcasted via general radio or TV at fixed times every day. The times of broad casting of traffic information are preferably fixed at easy-to-remember times, such as "every hour on the hour" or every 30 minutes. Traffic information broadcasted is not limited to that of toll expressway but also includes that of ordinary streets. Can be implemented with relatively small investment.

(4) Main Points of Consideration in Planning/Designing Traffic Information

The following matters should be considered in planning/designing traffic information system:

(i) Traffic information needs to be exhibited overhead of vehicles so that it can be seen from all the drivers passing beneath even if large-size vehicles are blocking the side views. "Gantry-type" of structure is most suitable for this purpose although it is relatively costly.

(ii) Provision of information about traffic/road condition and congestion on the toll road needs to be given to the drivers on the streets accessing the entrance of the toll road to let them decide not to enter the toll road in case of severe traffic jam. For this reason, information board for traffic condition of toll road should be installed not only at the entrance but also some distances, such as 200m and 500m, before the entrance.

VMS installed above Urban Expressways

This VMS displays the traffic and weather information of urban expressways and also the connected inter-urban expressways.

Figure 9.2-1 Examples of Traffic Information Devices in Japan

Source: http://www.nagoya-denki.co.jp

9.2.4 Traffic Monitoring/Surveillance System

(1) Objectives

The main objectives of traffic monitoring/surveillance are:

(i) To know abnormal or hazardous situation and take necessary actions
(ii) To obtain the sources of data/information to be provided to the road users

(2) Methods/Devices Commonly Employed and Kinds of Data/Information Collected

Table 9.2-4 Methods/Devices Commonly Employed and Usage of Collected Data/Information

Method/Devices	Data/Information	Usage of Data/Information
CCTV (Closed-Circuit TV)	• General condition of traffic flow • Accident • Broken-down vehicles • Traffic congestion	• Actions for accident • Rescue for broken-down vehicles • Provision of traffic information to drivers
Traffic Counter (Loop-Coil Type, Ultra-Sonic type)	• Traffic volume • Vehicle speed • Vehicle type (see explanation below the table)	• Judgment of traffic congestion • Record of traffic volume
Axle Load-Meter	• Axle loads of vehicles	• Enforcement of over-loading • Judgment of vehicle type
Patrol Car (Traffic Police and Toll Road Operator)	• Road surface condition • Obstacles on carriageway • Broken-down vehicles • Accident	• Rescue operation for accident/ broken-down vehicle • Warning to drivers on hazardous road condition • Actions to remove obstacles • Repair works of defects of road facilities
Emergency Telephone (Mobile Phones of Drivers)	• Accident • Broken-down vehicles • Obstacles on carriageway • Abnormal incidents on road	• Rescue actions for accident/ broken-down vehicle • Removal of obstacles • Warning to drivers
Devices for Observing Weather/Climate Condition	• Hazardous weather condition	• Warning to drivers • Regulation of travel speed

(1) CCTV

CCTV provides on-time information on the traffic condition. Images taken by the TV cameras are sent to the traffic control center via cable or radio wave. Often, image of CCTV is the first information on accident and other incidents which require emergent actions. TV cameras are often installed on the tops of the building located along the expressway to watch certain length of section. TV cameras usually have zoom lens to take close-up image and rotary base to turn the camera into desired direction.

(2) Traffic Counter

There are some types of traffic counter but most commonly used are: loop-coil type, ultrasonic wave type and light beam-photo-electronic diode type.

i. Loop-Coil Type

A loop of electric wire is embedded in the surface course of the pavement. Weak electric currency is provided to the loop-coil creating magnetic field. When a vehicle passes over the loops coil, the magnetic field is affected and change occurs in the electric currency flowing in the loop-coil. The recorder connected to the loop-coil detects this change of electric currency and interprets as the passage of the vehicle. Vehicle speeds can be measured by installing two loop-coils at certain distance, such as 10m, and measure the time interval that a vehicle passes these two loop-coils.

ii. Ultrasonic Wave Type

The device is hung over the lane and continuously radiate ultrasonic wave towards the pavement surface directly below. The wave is reflected at the pavement surface and comeback to the device. The device measures the time between the radiation of wave and arrival of the reflected wave. When a vehicle passes below the device, the wave is reflected at the roof of the vehicle, and the time between the radiation of wave and arrival of the reflected wave becomes shorter. The magnitude of this shortening of time between radiation and reception of waves becomes larger as the roof of Vehicle is higher. Thus, the type of vehicle can be judged.

iii. Light Beam-Photo-Electronic Diode Type

Light beam is radiated across the road from one side of the road and received by the sensor located the other side. The sensor is basically composed of photo-electronic diode which detects the light beam.

When a vehicle passes between the light radiator and the sensor, the light is interrupted and the sensor detects it. By installing the combination of radiators and sensors at different heights from the road surface, height of the vehicle can be detected and the type of vehicle can be judged.

(3) Patrol Car

Two different organizations dispatch highway patrol; traffic police department and road administrator/operator. The patrol cars of traffic police are given two difference types of duties, one to observe traffic/road condition and report to the traffic control center and the other to enforce traffic regulations. The patrol cars of road administrator/operator, on the other hand, concentrate observation/report on traffic/road condition and rescue of vehicles/road users in

need for assistance.

Patrol crew of road administrator/operator is in charge of first-hand actions to prevent accident, such as placing warning signs, removing obstacles and signaling to coming vehicles.

(4) Emergency Telephone

Emergency telephone sets are installed on roadside. These telephones are directly connected to the traffic control center. Road users involved in, or witnessing, accident are to report to the traffic center. Emergency telephones are also used by road users who need any assistance. Each telephone set is numbered so that location of the accident or other trouble can be easily identified by the personnel in the traffic center.

Owing to the common possession of mobile phones by road users, emergency telephone sets on roadside are becoming less important. If emergency telephones are not to be installed, signs indicating the location (such as "kilometer posts") need to be installed on or along the edge of shoulder so that the road users in need for assistance can easily identify and report their location.

Also, charge-free telephone number to be called for communication with the traffic control center should be shown along the road.

(5) Devices to Observe Weather/Climate Condition

Various types of devices/equipment are used in practice in many countries. These devices are readily available commercially.

9.2.5 Traffic Control/Regulation System

In this subsection, the terminology "Traffic Control" and "Traffic Regulation" is used to mean also like traffic management the actions by the road administrator, such as MEA. The traffic control/regulation by the road administrator includes the following:

(i) Regulation of traffic or closure of road needed for the reasons such as defects of the road,
(ii) Regulation of traffic to prevent an additional accident after an accident occur,
(iii) Regulation of traffic to execute the maintenance works,
(iv) Provision of traffic information as described in Subsection above,
(v) Rescue of, or assistance to, the broken-down vehicles as described in Subsection below,
(vi) Clearance of the accident site as described in Subsection below, and

(vii) Actions are closely related to the traffic control implemented by the traffic control center.

Therefore, close coordination and consultation between the traffic police and road administrator should be maintained. Actually, it is preferable that traffic police officers are stationed in the traffic control center of the toll road administrator and work together. Figure 9.2-2 shows an example of a traffic control center in Japan.

A modern traffic control center exists in Cairo at the Al-Azhar Tunnel, which is shown in Figure 9.2-3. This is a good example for utilizing advanced systems for the traffic control center to be constructed for the proposed urban expressway network.

Figure 9.2-2 Example of Traffic Control Center in Japan

Figure 9.2-3 Traffic Control Center of Al-Azhar Tunnel

9.2.6 Other Activities

(1) Clearance of the Accident Site

When a severe accident occurs, the road often becomes impassable and blocked by the vehicles involved in the accident or debris of the broken vehicles. Sometimes the cargo being transported by the vehicles involved in the accident are spread on the road surface. These obstacles need to be cleaned as soon as possible (It has to be always borne in mind that the longer the time of road closure is, the more the loss of toll revenue.) This work is usually done in cooperation with the traffic police.

The works required for this job often need large number of manpower and experience. Therefore, specially trained crew should be prepared. Also, once a severe accident occurs and the traffic is stopped, the road section leading to the accident site is blocked by the stopped vehicles and it is often difficult for the vehicles and equipment required at the accident site to arrive. Some types of the cargo as listed below need special attention.

(i) Flammable objects such as gasoline and other oils
(ii) Poisonous material including various chemical agents and gases

It should be noted that gasoline, kerosene, motor oil and many other kinds of oil are harmful to asphalt pavement and have to be absorbed as soon as they are spread on the pavement surface. The material to absorb such oil can be commercially obtained, but if not available, powder of lime or even sawdust can be used.

(2) Rescue for Injured Persons in the Accident

When an accident occurs and someone is injured, rescue for the injured is necessary. Usually, such rescue activities are the responsibility of the agency in charge of general rescue activities such as fire brigade or ministry of health. An agreement should be made between the rescue agency and the toll road operator so that ambulance vehicles can quickly enter the toll road when the toll road operator/traffic police informed about the injury.

(3) Rescue of Broken-Down Vehicles

When a vehicle stops on the carriageway, it hampers smooth flow of the traffic and often causes traffic jam. It is also hazardous to other vehicles. Thus, a broken-down vehicle stopping on a toll road needs to be towed away as soon as possible. Even if the broken-down vehicles are parked at the emergency parking bay provided along the expressway at certain intervals, it needs to be repaired at the spot or towed to a repair shop. Accordingly, towing service for such vehicles is needed.

A good example of this service already exists in the Al-Azhar Tunnel in Cairo. In this case, this service is provided by the authority in charge of the management of the tunnel. One towing truck with crew is stationed at the entrance of the tunnel (one for each direction). When a vehicle stops in the tunnel, it is detected at the traffic control center of the tunnel through CCTV and the towing truck is mobilized.

In case of the Al-Azhar Tunnel, this service is currently provided without charge to the driver of the broken-down vehicle. However, as the total length of the urban expressway network becomes longer, the cost of this service may become substantial and this service may need to be charged. There are three possible alternatives for the provider of this service; (i) operator of the expressway (MEA), (ii) a non-profitable organization, such as "automobile associations", and (iii) private garages. To minimize the size of the expressway authority (MEA), it is recommended that either alternative (ii) or (iii) above is adopted.

Since the proposed urban expressway network is to be toll roads, some arrangements for letting the towing truck enter the expressway will be necessary. Therefore, the arrangement of such services needs to be started with the initiatives of the toll road operator (MEA).

9.2.7 Relation of Parties Relevant to Traffic Management

Figure 9.2-4 shows relation of the following parties involved in the traffic management of the toll road:

- Toll Road Operator
- Traffic Police
- Rescue Agency, which is basically under the Ministry of Health
- Automobile Association for rescue services for break-down vehicle

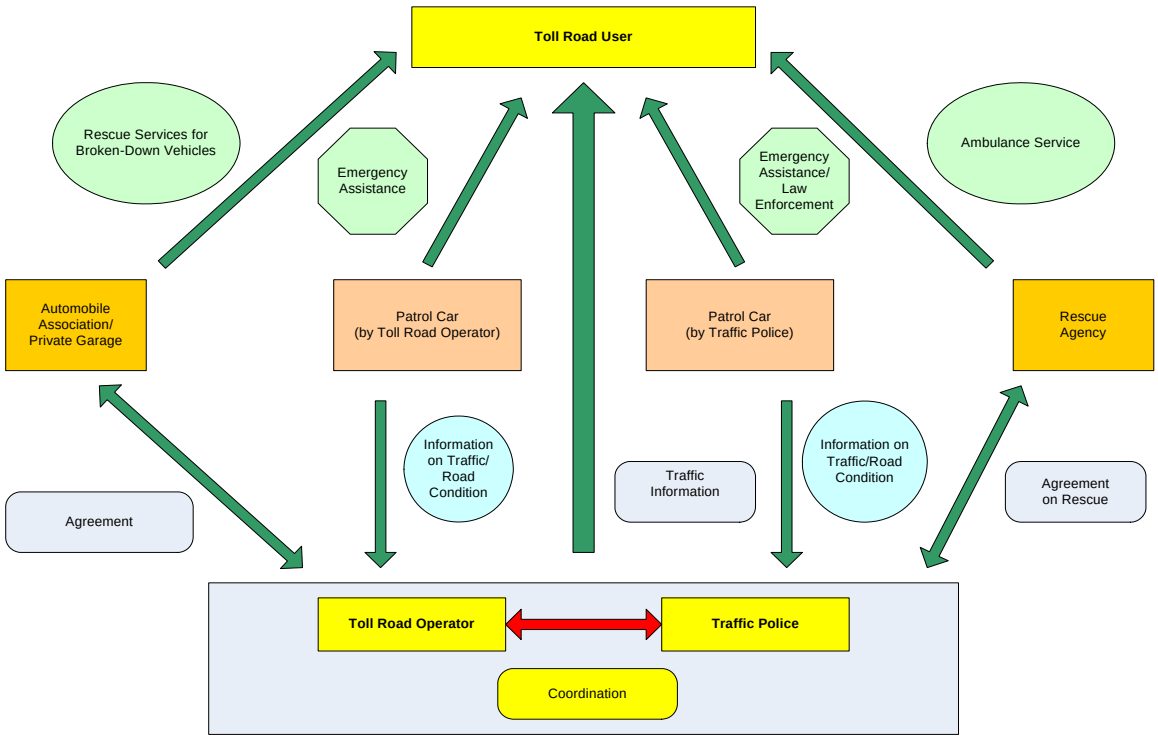


Figure 9.2-4 Relation among Relevant Parties

9.2.8 Route Numbering System

It is strongly recommended, from viewpoint of traffic management, that each route (line) of the expressway network is given a route number such as E1, E2, etc.

The route numbering system has in comparison with the system where the road names, such as "6th October", the following advantages:

- Simple and easy-to-recognize on signboards
- Simple and easy-to-recognize on road maps

9.2.9 Proposed Physical Tolling System for Expressway in Cairo

Tolling system is examined for the network after the completion of F/S and Pre-F/S routes and their connection to the existing network.

(1) Alternative A

A proposed tolling system for the toll expressway network will consist of three tolling zones

as illustrated in Figure 9.2-5.

Zone A: Collection at entrance ramp

Toll booths will be installed at every on-ramp and collect toll there.

Zone B: Collection at main line toll barrier

A toll barrier at main line of E2-1 section will be installed and collect half the amount of Zone A, because expressway length is relatively short.

Zone C: No toll collection

Based on the present ramp configuration of 15th May Bridge segregation of central portion of the Bridge for toll expressway is impossible, unlike 6th October Bridge. The toll free section will extend in Zamalek Area, as the existing section in Zamalek is narrow, only 4 lanes, and converting this section to toll expressway will encounter opposition of road-users.

(2) Alternative B

By this alternative, Zone A will be applied only for the newly constructed sections, where toll booth will be installed at every on-ramp. Zone B will be applied for the existing sections. Toll booths in main line (toll barrier) will be installed at suitable location, instead of at every on-ramp. Because, to install booth, elaborative works such as widening ramps and extending merging lanes at every on ramp seems to be not practical, if not impossible. However, there exit some toll free sections for short range trips in this Alternative.

At River Nile Area, both 15th May and 6th October Bridges will be toll free section. Because, to segregate central 4 lanes for expressway on 6th October Bridge might cause congestion on the rest portion of the bridge, depending on future traffic demands.

Long-trip users may be imposed to pay toll at 2 or 3 toll plazas. To avoid this situation, some exemption measures will be introduced.

Configuration of these Alternatives is shown in Figure 9.2-5.

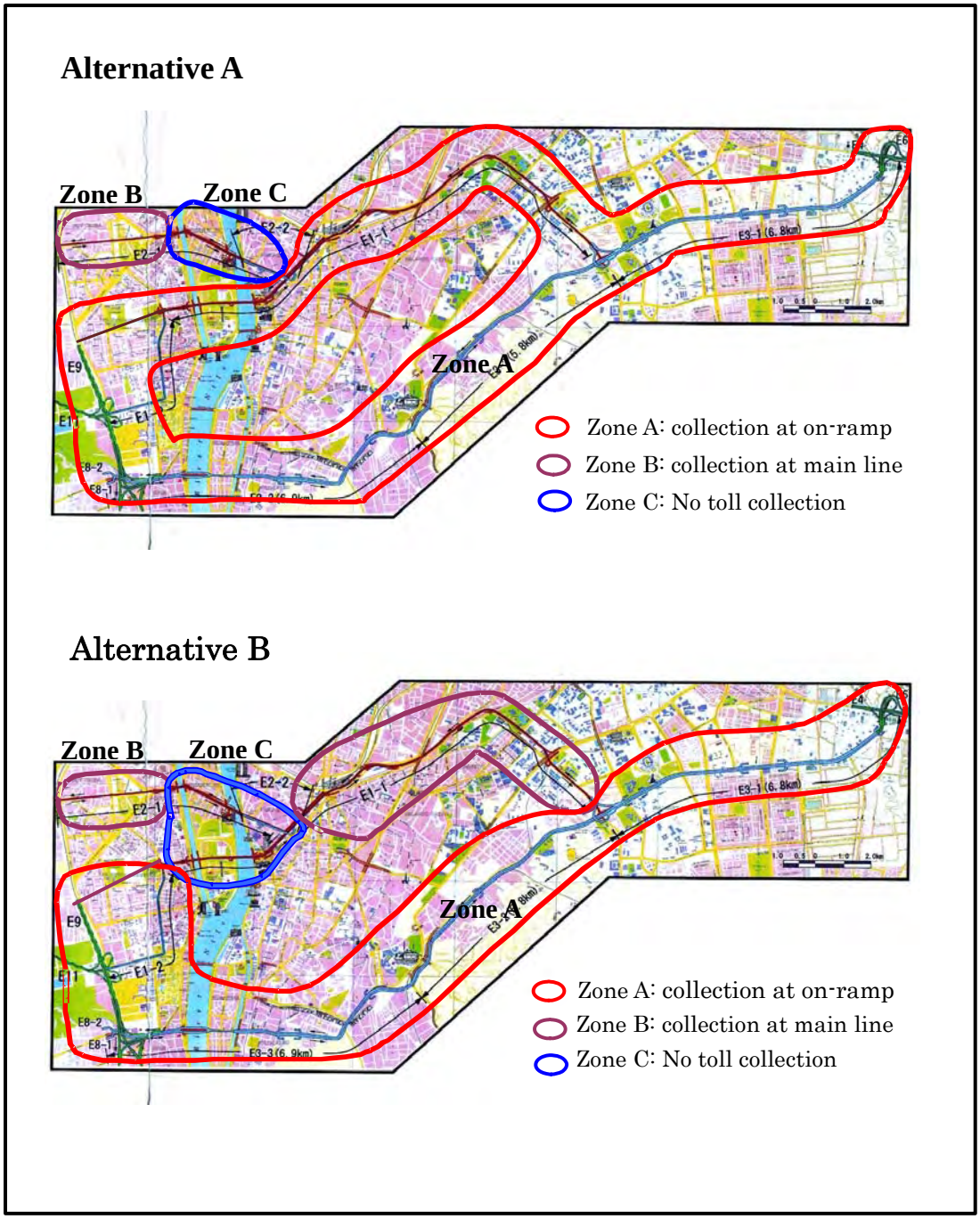


Figure 9.2-5 Proposed Systems of Tolling

(3) Exemption Measure

a. Basic Concept

As the principle idea of flat toll system is colleting toll once at entry, so some exemption measures should be introduced to avoid double paying.

In the Alternative A, for example, for the traffic go thoroughly Zone A via Zone C to Zone B,

and vice versa, one possible solution will be: for the Westbound traffic, letting the users keep receipt obtained in Zone A, and by showing it they can pass freely at Zone B. For East bound traffic letting users keep their receipt obtained in Zone B, then by showing it they will be imposed half the amount in Zone A. This procedure is for manual collection. However, with Electric Toll Collection (ETC), the procedure will be much simpler.

b. Introduction of Tokyo's Practice of Exemption Measure

There is one toll free section among toll expressway network in Tokyo. Toll booths are installed at both entrance and exit ends of toll free section. At a toll booth (Booth (1)) of entrance, "ticket" is issued to all users, and at another toll booth (Booth (2)) of exit toll is collected as the basic function. Actual tolling varies according to users' traffic routes as shown in Figure 9.2-6.

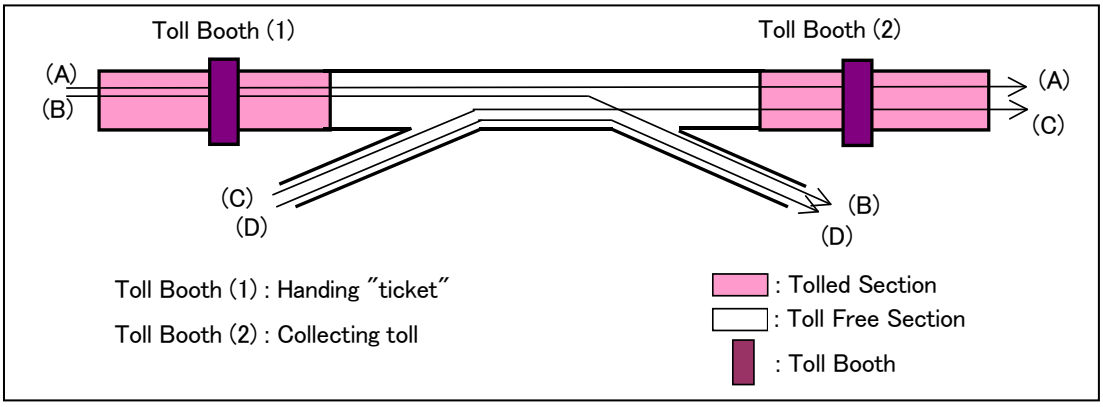


Figure 9.2-6 Exemption Measures for Toll Free Section in Tokyo

(A): No toll collected by showing the ticket at booth (2), (already paid toll to use tolled section)

(B): Toll is not collected. When being re-entered to expressway via route (c), toll is not collected, if the time is less than 30 minutes after exit.

(C): Toll is collected at booth (2)

(D): No toll collection

This toll free section is located in the busiest area in Ginza, Tokyo as presented in Figure 9.2-7. It is operated by Tokyo Expressway K.K. and this expressway was constructed at roof of shopping arcade, and there are many shops, boutiques and restaurants located underneath the expressway structure. The company runs its business by getting rent from those commercial entities.

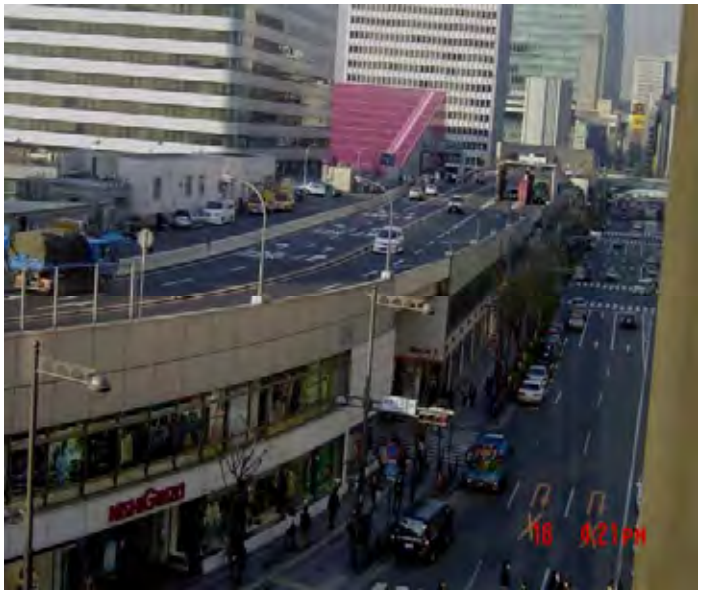


Figure 9.2-7 Expressway at Ginza, Tokyo

9.2.10 Proposed Traffic Management System for Cairo Urban Toll Expressways

(1) The purpose of the traffic management system for Cairo urban toll expressways are:

1. To prevent unforeseen delay in trip of road users, by presenting necessary information such as occurrence of incidents and by controlling traffic flow.
2. To ensure traffic safety by warning to road users and indicating unusual traffic condition
3. To maintain suitable traffic volume by suggesting using appropriate route, thus contributing to increase toll revenue.
4. To collect and accumulate traffic data automatically to be used to plan traffic management and future expansion expressway network.
5. Rescue and Restoration

   When accident occurs, rescue work will start cooperating traffic police. The procedures would be as follows:

   i) Reporting the accident, photographing of the site by traffic police
   ii) Rescue of the accident victims by ambulance
   iii) Towing the wrecked vehicle
   iv) Restore expressway condition as before

(2) Facilities and devices to be installed are:

1. Vehicle Detector

Location:

Vehicle detectors will be installed on roadway at interval of 500m to 1,000m, which is recommended in Study on Traffic Control and Management System of Malaysian Expressway and Toll Highway by JICA, in 1990, in addition to where traffic volume changes such as merging and diverging from ramps and interchanges. Also at every entrance ramp, traffic detector shall be installed. This is for requirement from toll managing section.

Type:

Induction loop coil type is basically recommended, except the section where steel slab is employed, because induction effect will be weakened on steel slug. For such a section, ultrasonic wave type is recommended. In Cairo parking meter with loop coil can be seen everywhere in down town. The technology used for parking meter is same as for expressway. An example of ultra-sonic vehicle detector is shown in Figure 9.2-8.

2. Emergency Telephone Set

Location:

Emergency Telephone set will be installed at interval of 500m to 1,000m as described above. The most suitable place to be installed is emergency parking bay. Vehicles can stop there and talk to telephone sets free from main line traffic.

Function:

Unlike ordinal telephone set, emergency telephone set is designed to have a speaker and a microphone, and once lid is pulled out, the users can easily talk with the personnel in Traffic Control Center.

3. Close Circuit TV

Location:

To monitor the place where incident tends to occur, such as merging point of ramps and interchange, entrance point to tunnel section and sharp curve section. CCTV camera will be installed nearby higher place or install post for that purpose.

Function:

The camera will be remote controlled with function of tilt, pan, zoom and focus. Color TV is used and the amount of information is much bigger than mono-color TV. An example of CCTV camera is shown in Figure 9.2-9.

4. Weather Detectors

Devices for weather condition is shown in Figure 9.2-10

5. Various Message Sing Board (VMS)

Location:

VMS is installed at diverging points of interchange or major ramps, where the users can take appropriate option by reading the messages.

Function:

There are two types of VMS, a message that is conveyed by words and a message is conveyed by diagrammatic way. Examples of VMS are shown in Figure 9.2-11 and Figure 9.2-12.

Installation plan of these devices is illustrated in Figure 9.2-13.

Figure 9.2-8 Ultra Sonic Vehicle Detector Head

Figure 9.2-9 CCTV Camera

Figure 9.2-10 Devices for Weather Condition

Figure 9.2-11 Variable Message Sign by Words Type

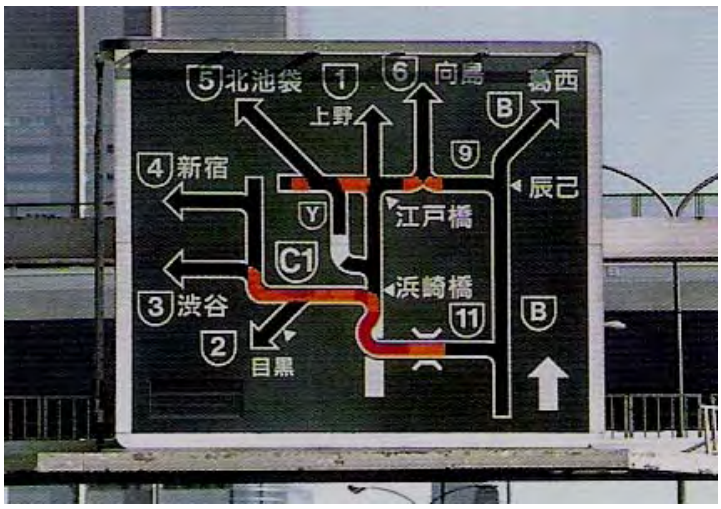


Figure 9.2-12 Variable Message Sign Diagrammatic

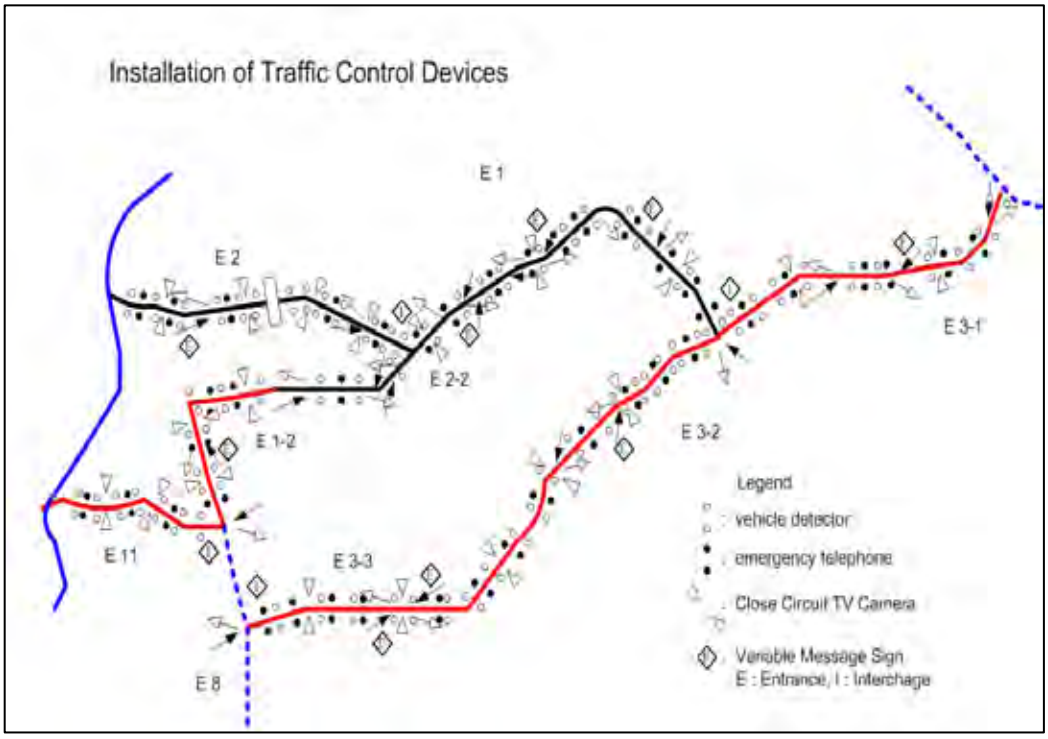


Figure 9.2-13 Installation Plan of Traffic Control Devices and Facilities

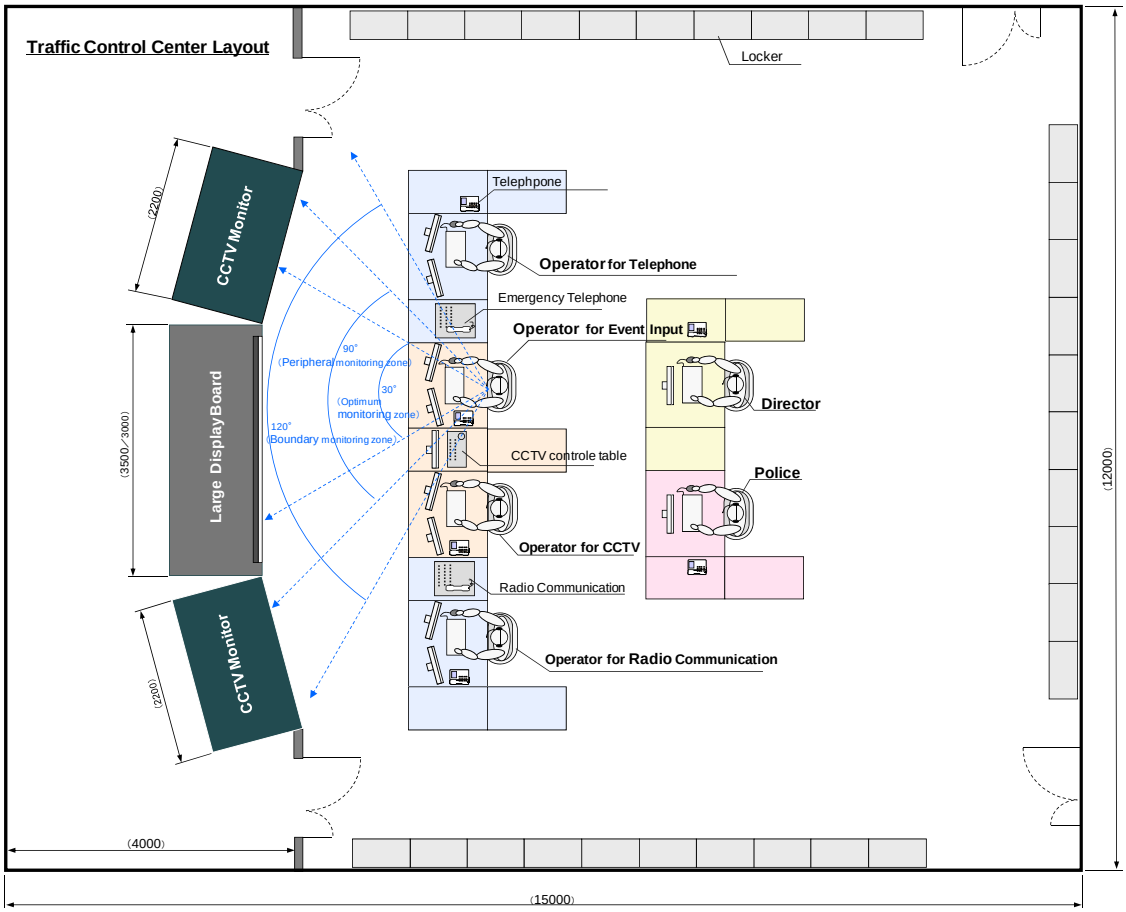


Figure 9.2-14 Layout of Operating Room of Traffic Control Center

(3) Traffic Control Center

Traffic control center with operating room and computer room with interface shall be constructed in appropriate place near the expressway. An example of operating room is illustrated in Figure 9.2-14. It is convenient to have rooms for “highway patrol squad” and car pool for patrol cars and towing vehicles in this building.

(4) Concept of Traffic Surveillance and Control

Urban Expressway is a road facility having high traffic capacity to handle high traffic demands, and this function has to be always maintained. Once traffic demand exceeds its road capacity, congestion occurs which result in relatively low travel speed and lasting long travel time.

Traffic surveillance aims at collection of data and information on road and traffic using vehicle detector, CCTV, emergency telephone, patrol cars and so on. Traffic data collected are processed and the most suitable traffic control measures are shown.

Those measures will include ramp metering or closure, traffic regulation, presentation of

information to road users, and sometimes include special measures for unusual condition such as traffic accident, regulation caused by repair works and adverse weather.

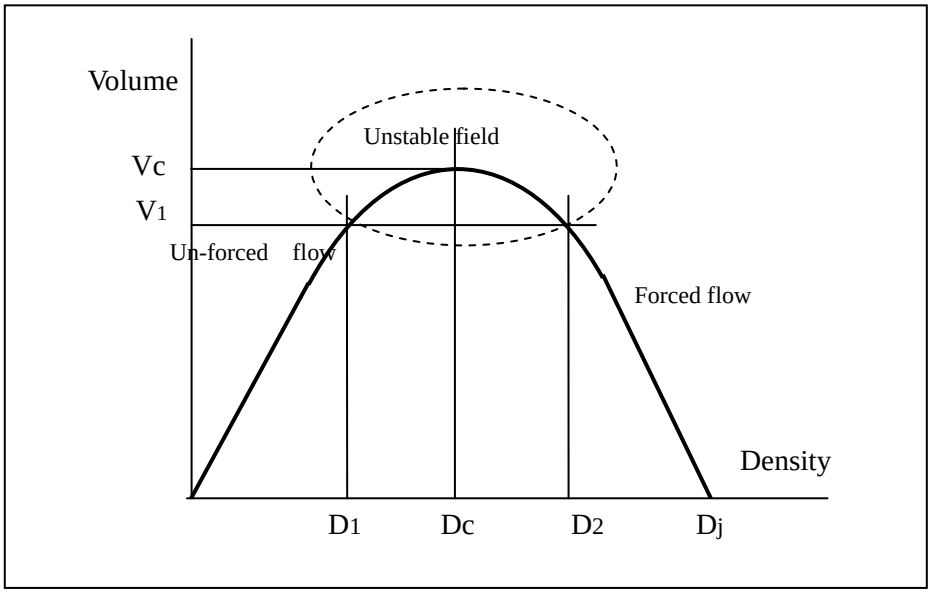


Figure 9.2-15 Relationship of Traffic Volume and Density

Figure 9.2-15 shows well known fact of relationship between traffic volume and density. As volume increases density also increases. At density Dc (critical density) volume reaches to capacity at Vc (critical volume).

In the field where density is below Dc, traffic flow is un-forced flow, however if it exceed Dc traffic flow becomes forced flow. As demand increases beyond capacity, density increases beyond Dc, however traffic volume passable in particular section begins to decrease.

Traffic flow becomes unstable when density comes around Dc, and volume comes around Vc. Traffic Volume V1 can be attained at density of D1 and D2. Traffic flow is unforced flow at density D1 and forced flow at density D2. In this unstable field, traffic flow easily change to D2 (forced flow) from density of D1 (unforced flow), keeping same volume of V1. At this situation vehicles are forced to operate go and stop operation. This unstable situation spreads up-stream of traffic flow and is prevailing for a long time. And it will take time to recover normal stable situation.

Traffic control aims to keep traffic flow always stable condition, so that efficiency of expressway facility will be attained. For this purpose traffic condition should be surveyed all the time, and proper control measures such as ramp metering, presentation of information will be employed.

(5) Historical Evolvement

Urban expressways were constructed as an access controlled road facility, the necessity to control traffic flow aroused in the last decades. In 1950's Sates of California, Illinois, Michigan and Texas in the United Sates, ramp metering measures was firstly introduced for freeways, and the influence of the measures to traffic flow was studied. In line with development of electronic facilities and devices such as CCTV and vehicle detector, traffic surveillance and control evolved rapidly. Also, software using online data such as vehicle detector has been developed, to analyze traffic flow and to calculate suitable control measures.

(6) Traffic Surveillance and Control of Expressway

Figure 9.2-16 shows the relationship of traffic management level and traffic condition. While traffic volume is not so high and impact of incidents is not so severe, management level 1 or 2 will be enough. These levels are usually applied for inter-city expressway.

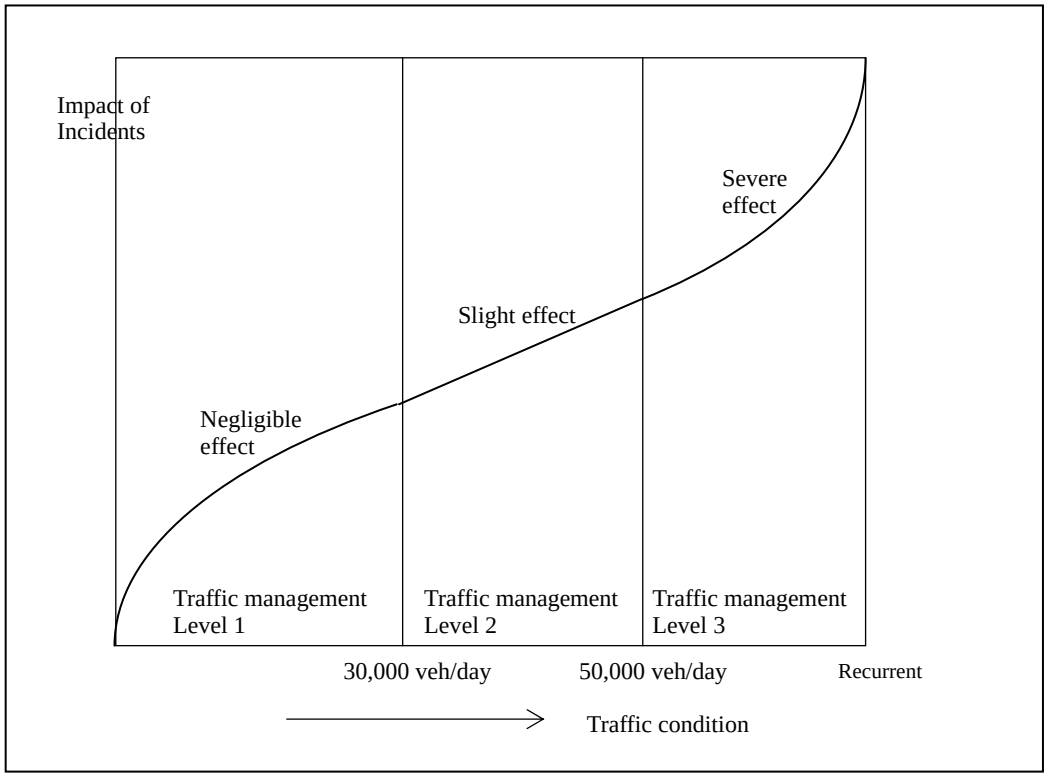


Figure 9.2-16 Relationship of Traffic Management Level and Traffic Condition

(Source: Study on Traffic Control and Management System of Malaysian Expressway and Toll Highway by JICA, in 1990)

Traffic management level 3 will be necessary for section facing recurrent traffic congestion where traffic congestion occurs every day and danger of secondary incidents are high. Even if a minor incident occurs, quick and prompt countermeasures are demanded against any incident, as they would cause severe congestion and adverse effects. The relationship of traffic management level and necessary equipments is shown in Table 9.2-5.

Urban expressway has high traffic volume and once incidents occur their impact will affect wide area where a higher traffic management level of 3 will be needed. Also, demand for higher level of traffic safety, convenience and comfort will required a new type of traffic surveillance and information presentation facilities have to be installed.

Table 9.2-5 Traffic Management Level and Equipment

Level	Objectives	Facility/Equipment	Section Applied
Level 1	1. Provide road users with means of communication for incident reporting or assistance 2. Provide road users with elementary road and traffic information 3. Establish communication network among related agencies and facilities	• Emergency telephone • Exclusive telephone • Wireless system • Weather observation equipment • Changeable message sign • Changeable speed limit sign	• Applicable to the section having free flow traffic with a daily traffic volume of below 30,000 vehicle/day for 4-lane section
Level 2	In addition to 1 to 3 of Level 1 above:- 4. Upgrade the traffic monitoring function 5. Upgrade the information dissemination function to road users	In addition to the facilities and equipments of Level 1 above :- • CCTV system • Radio broadcasting	• Applicable to the section having traffic volume of between 30,000 – 50,000 vehicle/day for 4-lane section
Level 3	In addition to 1 to 5 of Level 1 and 2 above:- 6. Strength function of traffic surveillance, incident detection and information dissemination.	In addition to the facilities and equipments of Level 1 and 2 above :- • Highway radio	• Applicable to the section having traffic volume of more than 50,000 vehicle/day for 4-lane section

Source: Study on Traffic Control and Management System of Malaysian Expressway and Toll Highway by JICA, in 1990

(7) Traffic Management of Urban Expressway

a. Purposes

The purpose of the traffic management of Cairo urban expressways are:

(i) To prevent unforeseen delay in trip of road users, by presenting necessary information such as occurrence of incidents and by controlling traffic flow.
(ii) To ensure traffic safety by warning to road users and indicating unusual traffic condition
(iii) To maintain suitable traffic volume by suggesting using appropriate route, thus contributing to increase toll revenue.
(iv) To collect and accumulate traffic data automatically to be used to plan traffic management and future extension of expressway network.

b. Surveillance

(i) Contents of Data Collection

In order to control expressway necessary data to be collected are:

- Traffic Condition (volume, occupancy, and speed)
- Occurrence of Incidents and the Affected Traffic Condition
- Weather Condition

(ii) Method of Data Collection

Data are collected by:

- Vehicle Detector
- CCTV Camera
- Emergency Telephone
- Patrol Car

(iii) Installation of Devices

- Vehicle Detector

To monitor traffic flow quantitatively (traffic volume by vehicle type, speed and occupancy) vehicle detectors are installed on mainline of expressway and on/off ramp. Induction loop type and ultra-sonic type are used usually.

Installation interval is normally 300 m to 1,000 m for urban expressway. For the case of Cairo expressway, where data are densely needed, an interval of 500m is recommended. Also, they should be installed on/off ramp and interchanges where

traffic volume changes.

To distinguish vehicle type and to measure vehicle speed, detectors are installed doubly with interval of 1.5m to 5.0m at every 3 to 5 installation to measure time elapse for the vehicle to pass through the interval in order to estimate vehicle speed. The data of vehicle detector are transmitted to control center and input to computer to be processed.

- CCTV

CCTV is installed to monitor traffic flow qualitatively where incidents are tend to occur like merging and diverging area of interchange and ramp. However, due to limited visible range, it is considered as auxiliary equipments. It will be used to confirm incidents precisely, after the occurrence is alarmed by traffic detector.

- Emergency Telephone

A telephone installed at roadside to be used exclusively by road user to control center. By the telephone user can ask rescue in case of accidents or any other incident. Also they can inform occurrence of incidents. It was considered only communication measure between users and control center, however, the recent prevailing of mobile phone has reduced its necessity. Installation interval is 1000m for normal section, and shorter interval for tunnel section is recommended.

- Processing of Collected Data

1. Vehicle Detector
The data from vehicle detector input to central computer via interface, then traffic related parameter such as volume, speed, and occupancy are automatically produced. The scanning time depend on the situation, for urban area 5 to 10 minute is usually used.

The computer also calculate and produce messages to be presented at variable message signs and recommend traffic control actions such as ramp or main line closure.

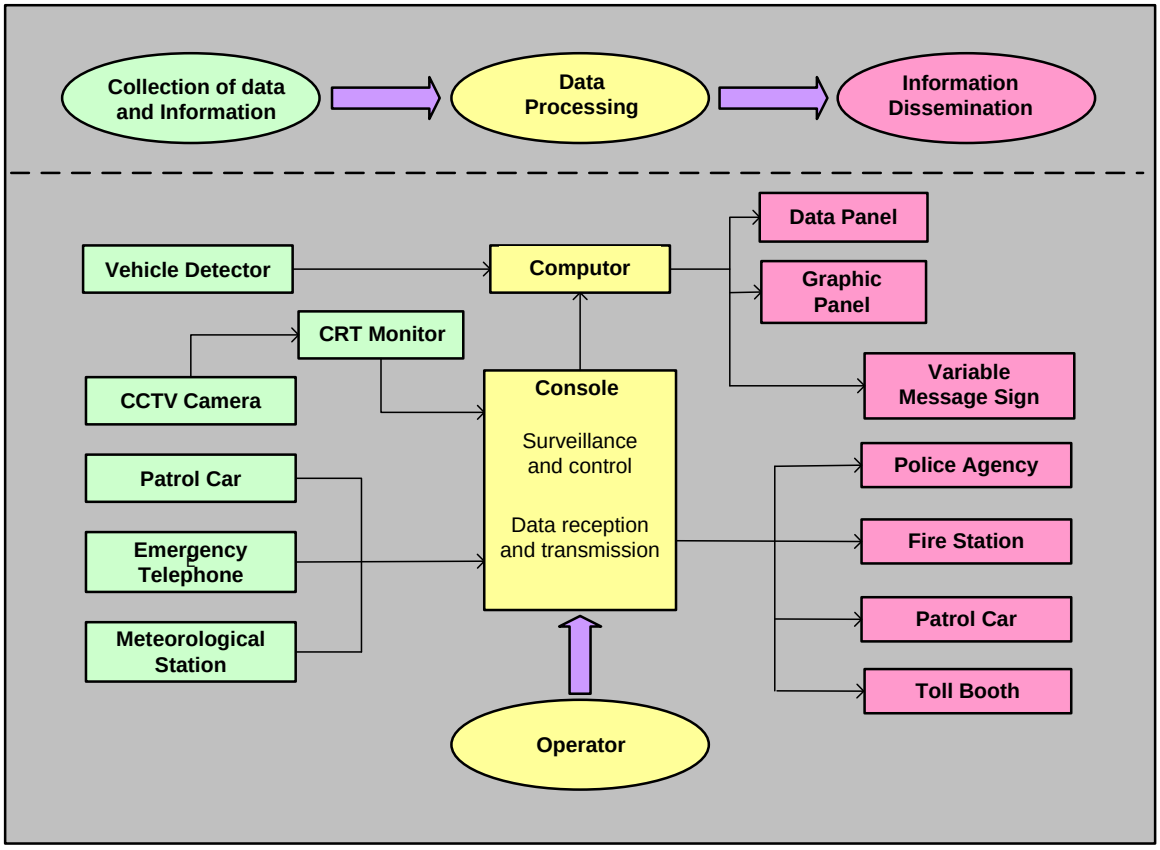
2. CCTV
By watching CCTV operator inputs to the computer the incidents as accidents or broken down vehicle. After finding the reasonable measures, messages to be presented at variable message signs, and recommend traffic control actions as ramp

or main line closure are displayed.

3. Other Means

The data and reports by users through emergency telephone or mobile phone and through patrol cars are also input by operator, and the same procedure as CCTV will follow.

Traffic Control System applied by Tokyo Metropolitan Expressways is presented in Figure 9.2-17



Source: Tokyo Metropolitan Expressway Corporation Brochure 2006

Figure 9.2-17 Traffic Control System (Configuration of Equipments)

c. Traffic Control

In order to maintain the maximum efficiency and the traffic safety of the expressway, appropriate traffic control measures will be taken. The measures include control with enforcement by traffic police and inducing or recommendation through sign and message.

(i) Traffic control by enforcement

Based on the recommendation of the computer output (sometimes by software predicting near future traffic condition) and judgments of operators, traffic control measures as ramp entry control (ramp metering, ramp closure) and closure of main line will be taken place.

Regulation such as speed limit (lower than usual) will be also imposed according to the situation.

(ii) Presentation of Information

Processed information is presented at variable message sign board. The sign board consists of three blocks as shown in Figure 9.2-18.

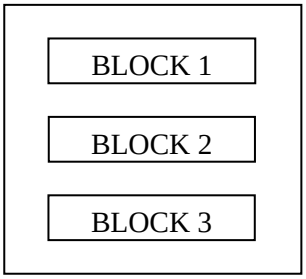


Figure 9.2-18 Configuration of Variable Message Sing Board

Each block presents information as follows:

Block 1: Location or Direction, example; Nasser City, 15th May Bridge, etc.
Block 2: Incident, example; traffic congestion, accident, sandy storm, etc.
Block 3: Indication to user, example; no entry, careful driving, lane closed etc.

In unusual condition such as heavy traffic accidents or disaster, special traffic control measures will be executed taking over the normal procedure.

(iii) Rescue and Restoration

When accident occurs, rescue work will start cooperating traffic police. The procedures are:

- Reporting the accident, photographing of the site by traffic police
- Rescue of the accident victims by ambulance
- Towing the wrecked vehicle
- Restore expressway condition as before.

9.3 TOLL COLLECTION SCHEME

In order to evaluate the tolling scheme proposed in this chapter so far, the actual number of vehicle passing through the toll ramps or toll booths is estimated by using the future OD demand matrix and network data developed in Chapter 3. Moreover the revenue for the financial analysis of F/S and pre F/S route later is also forecasted.

(1) Scenarios of Toll Charge Schemes

Table 9.3-1 is the scenarios for toll road users and revenue estimation.

Scenario 1: Maximum Revenue Case (All expressways including newly constructed, existing, on-going and Ring Road are toll)

Scenario 2: Minimum Revenue (Newly constructed routes are toll, and existing and on-going expressways including Ring Road are free)

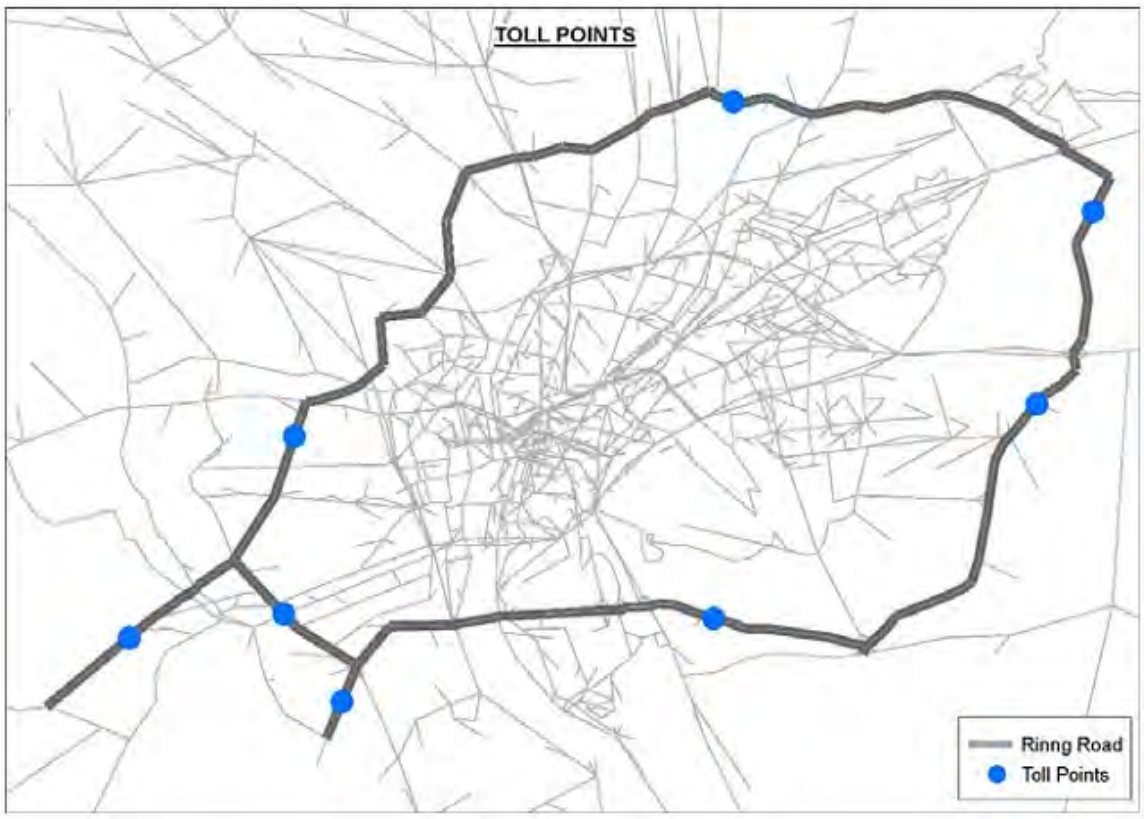
These scenarios are established based on the characteristics and functions of the different components of the expressway network. With existing Ring Road and existing elevated expressways, which are already constructed by public funds and will be connected to the newly constructed expressways, the concept of applying toll on such roads is considered here as governmental participation toward the sustainable development of the urban toll expressway network.

Table 9.3-1 Combination of Toll Charge for Traffic Volume and Revenue Simulation

	Section	Scenario 1 Maximum Revenue	Scenario 2 Minimum Revenue	Remarks
New Construction Expressway	E1-2	Toll	Toll	
	E2-2	Toll	Toll	
	E3-1	Toll	Toll	
	E3-2	Toll	Toll	
	E3-3	Toll	Toll	
Existing	E1-1	Toll	Free	
	E2-1	Toll	Free	
	E11	Toll	Free	On going
	Ring Road	Toll	Free	8 toll booths

Concerned with the toll system on ring road, this Study follows the proposal by Ring Road Project named as: “Upgrading of Greater Cairo Regional Ring Road to an Integrated Transport Corridor, March 2008” illustrated in Figure 9.3-1. In Ring Road Project report, a partial toll system is proposed so as to avoid difficulties in a complete toll system of the ring road. It consists in installing few traditional toll gates in strategic points of the Ring Road. In

these points there is space enough for a wide toll booth to include automatic and manual toll systems. The toll booths have been chosen, after checking available space, in order to "capture" as much traffic as possible. The locations of the eight tolling stations are proposed considering land availability and trip gaining.



Source: Report of Upgrading of Greater Cairo Regional Ring Road to an Integrated Transport Corridor, March 2008,GARBLT

Figure 9.3-1 Toll Collection System on Ring Road

(2) Level of Toll Charge

The assumption of the level of toll charge is set up based on willingness to pay and affordability to pay surveys, conceiving the assumption of toll level in the simulations. In the PPP study in 2004, the toll level was set up as 5.0 LE in year 2022 after analyzing the Willingness to Pay survey in 2003. In this study, new survey of Affordability to Pay was carried out in order to make up date of the toll level charging to toll road. Table 9.3-2 shows the comparison result of both Willingness to Pay in 2003 and Affordability to Pay in 2007. Considering the growth trend of economy in resent years and the accentual gaining response for Willingness and Affordability to Pay for toll road among the 4 years period, the new level of toll charge is assumed as 6.5 LE in 2022, with growth rate from PPP study about 30% as shown in Table 9.3-3.

Willingness-to-Pay and Affordability-to-Pay results in Table 9.3-2 also show that the majority of existing driver reject to use the toll road with about two-thirds in 25% time reduction and one-third in 50% time reduction. From this result, the toll level of existing expressway and Ring Road is charged as a half of newly constructed expressways.

Table 9.3-2 Comparison of Affordability-to-Pay and Willingness-to-Pay Survey

Time Reduction	Survey Name	No	1 L.E.	2 L.E	3 L.E	4 L.E	5 L.E.	> 5 L.E.	Ave. (LE)
25%	Willingness to Pay in 2003	72.5%	17.7%	5.3%	1.6%	0.4%	1.5%	1.0%	1.34
	Affordability to Pay in 2007	62.2%	25.1%	7.0%	1.9%	1.1%	1.9%	0.8%	1.75
50%	Willingness to Pay in 2003	61.0%	19.9%	10.7%	2.7%	0.9%	2.3%	2.5%	1.46
	Affordability to Pay in 2007	39.9%	28.7%	16.7%	5.5%	3.2%	2.9%	3.0%	2.23

Table 9.3-3 Level of Toll Charges

		2012	2017	2022	2027
New Construction Expressway	E1-2,	4.0LE	5.0LE	6.5LE	8.0LE
	E2-2				
	E3-1				
	E3-2				
	E3-3				
Existing Expressway	E1-1	2.0LE	2.5LE	3.25LE	4.0LE
	E2-1				
	E11				
	Ring Road	2.0LE	2.5LE	3.25LE	4.0LE

The toll level shown in Table 9.3-3 expresses that of PCU base, represented by passenger car size with 4 or 5m length. Therefore, the toll level of large size truck should be considered based on vehicle size or weight, e.g. PCU rate of a heavy truck is about 2.5 time of passenger car, then toll level of a heavy truck becomes 2.5 times of a passenger car.

9.4 EXPRESSWAY FACILITIES

9.4.1 Toll Booth

Toll collection works are conducted at toll booth. A toll booth is installed at on ramp or main line toll barrier. Toll collection work continues 24 hours, usually 2 or 3 shift. So, toll booth should be equipped not only facilities for collecting toll, but also facilities for toll collectors comfortable and resting. There are two kind of toll booth:

(i) Toll collection booth: equipped with toll collection desk and safe
(ii) Toll collection and resting booth: equipped with toll collection desk, safe, toilet, kitchen and beds.

These toll booths are illustrated in Figure 9.4-1 and Figure 9.4-2. An example of installation of toll booth at the existing on ramp is shown in Figure 9.4-3, and at the section of new construction is shown in Figure 9.4-4.

The alignment of expressway where the toll booths will be installed should be as flat as possible. The gradient should be less than 2%. As for horizontal alignment, the radius should be greater than 300m.

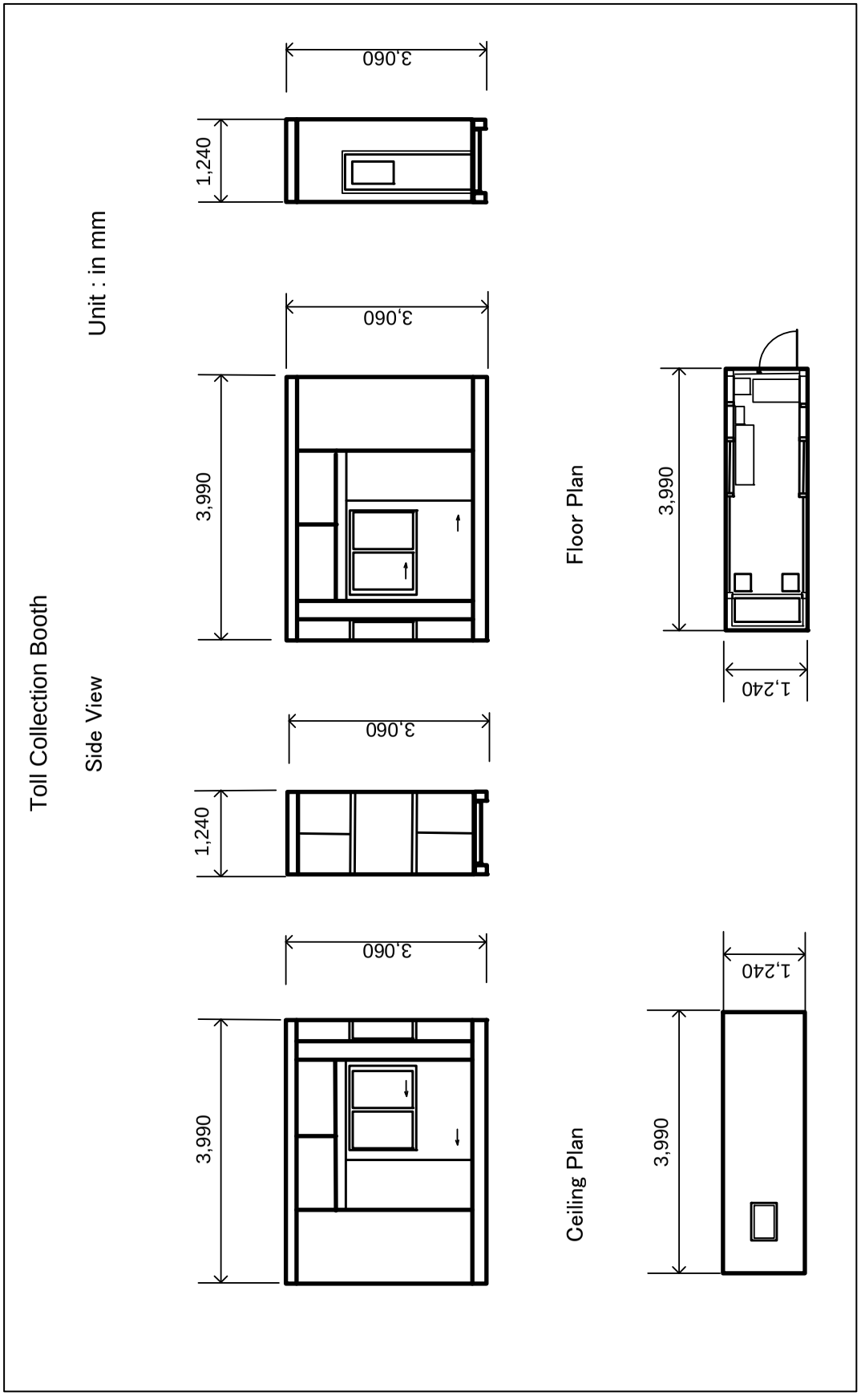


Figure 9.4-1 Toll Collection Booth

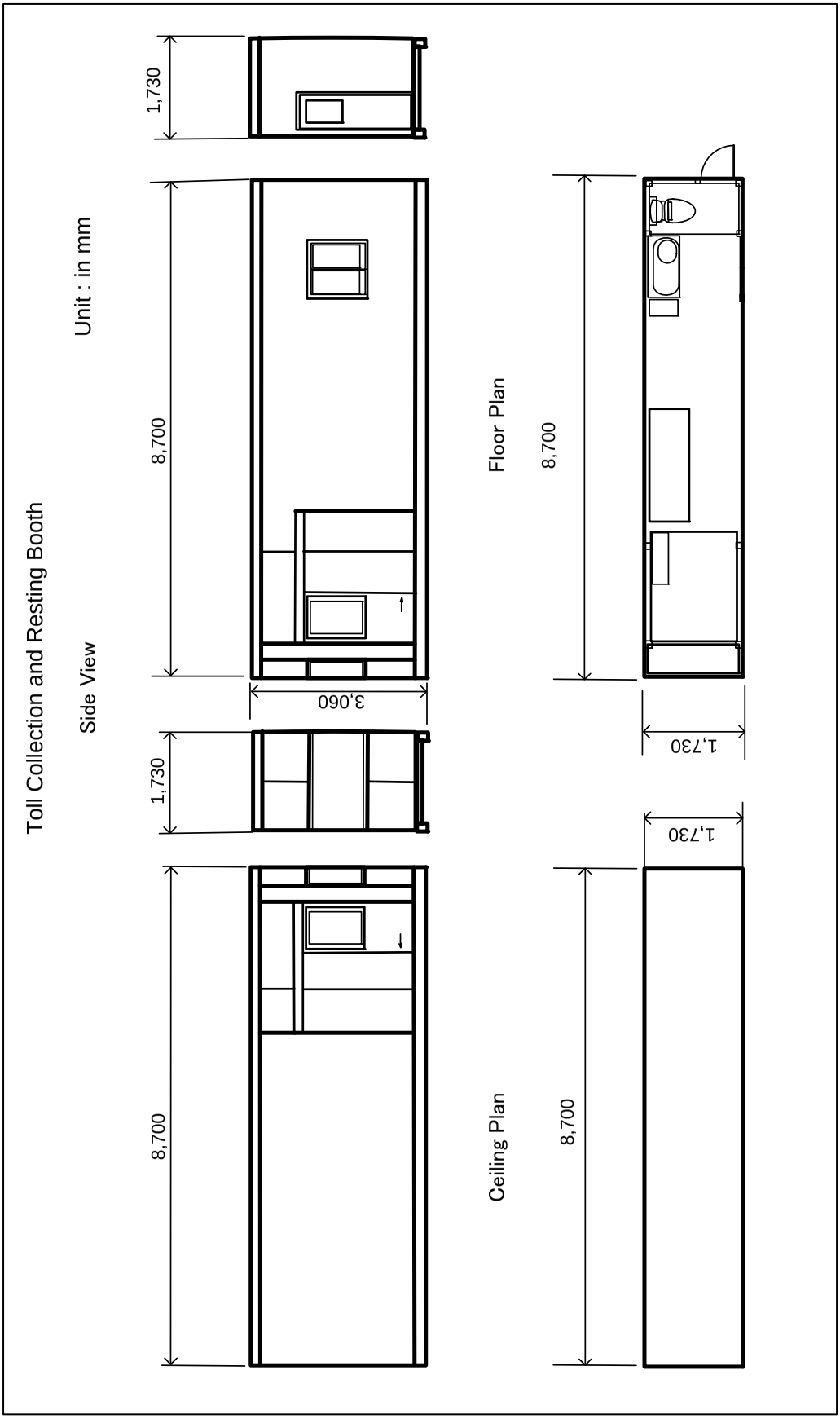


Figure 9.4-2 Toll Collection and Resting Booth

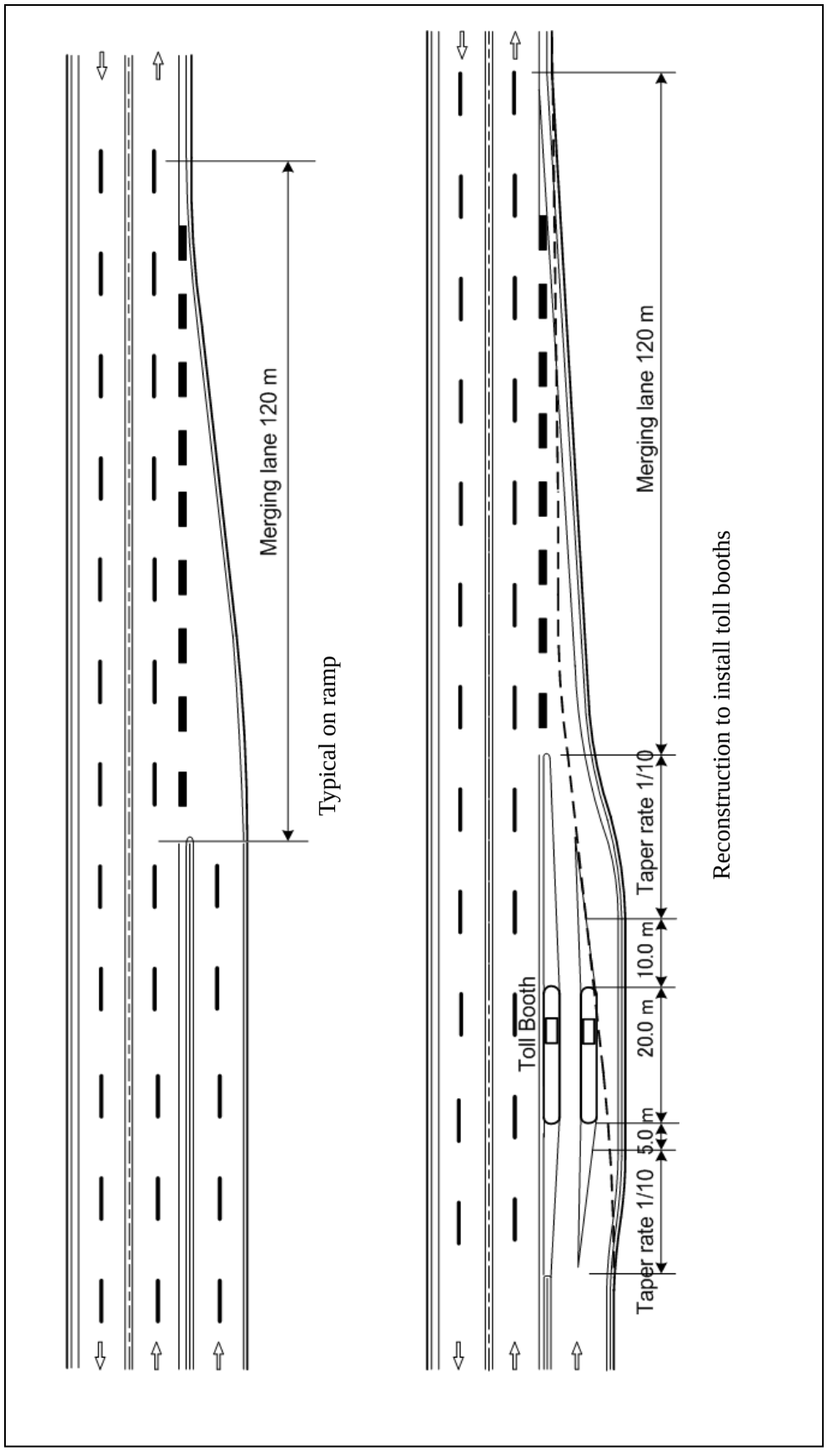


Figure 9.4-3 Typical Installation of Toll Booth at the Existing on Ramp

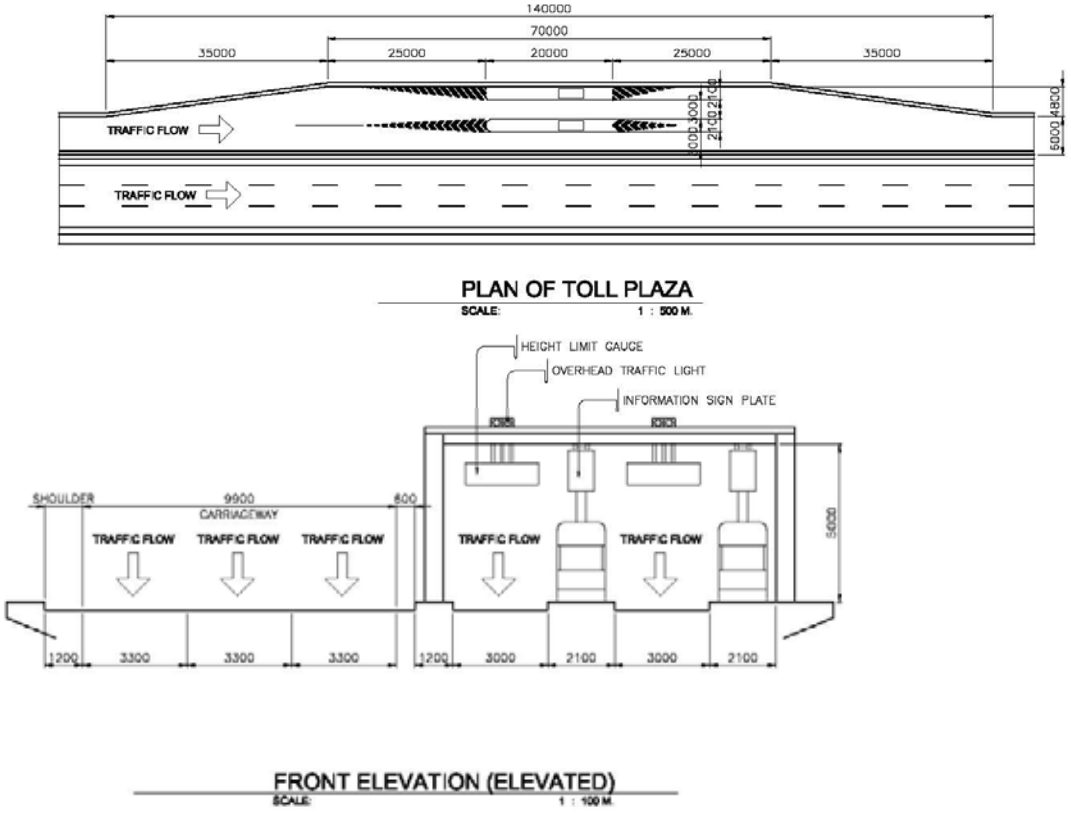


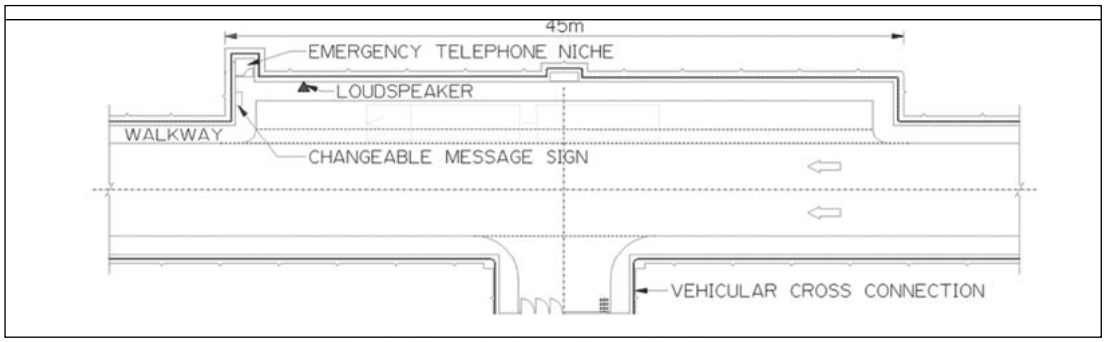
Figure 9.4-4 Installation of Toll Booth at the section of New Construction

9.4.2 Emergency Parking Bay: Viaduct / Tunnel

Tunnel section will be constructed along the expressway E3-1 and E1-2. Method of construing will be cut and cover method or shield tunnel method. The expressways tunnel section in case of shield tunnel will consist of two bores.

Emergency parking bays in case of Tunnel recommended to be located opposite the vehicular cross connections in average every 500 to 1,000m along the main tunnel to provide emergency parking in the event of vehicular breakdown or accidents and to provide additional space for vehicle moving in and out the cross connections as presented in Figure 9.4-5.

In case of Viaduct, the emergency parking pay should be also provided. However, larger spacing up to 1,500 m can be considered in case that the carriageway width per direction is more than 2 traffic lanes. In case of 2 traffic lanes shorter distance in average every 500 to 1,000m will be recommended.



Source: Hsueshan Tunnel

Figure 9.4-5 Emergency Parking Bay Layout

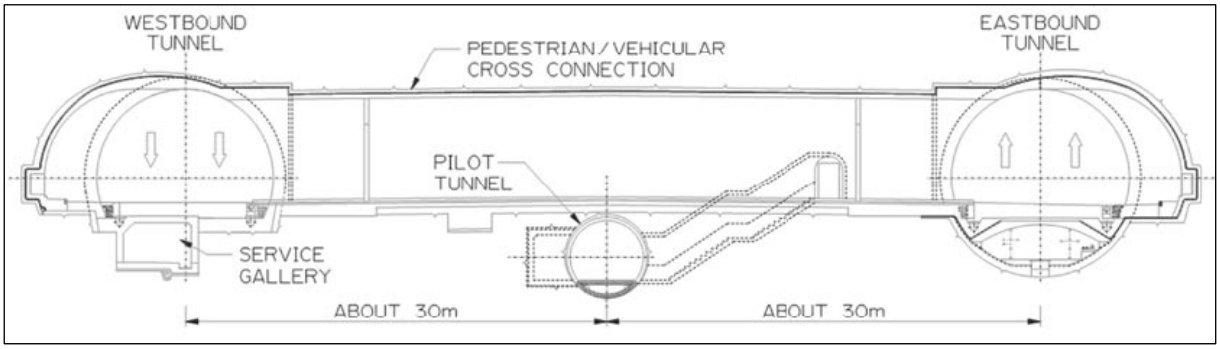
9.4.3 Escape Shelter: Viaduct / Tunnel

In case of Shield Tunnel, Pedestrian Cross Connections are designed to be small shelter spaces, and are constructed between the Eastbound and Westbound tunnels every 300 ~ 350 m along the main tunnel. In the event of an emergency, people inside the tunnel can escape to these cross connections and access the pilot tunnel for emergency evacuation.

Also in case of Tunnel the Vehicular Cross Connections are designed to be large shelter spaces, and are constructed between the Eastbound and Westbound tunnels every about 1,000 m along the main tunnel. In case of a fire or a serious accident, the vehicles inside the tunnel can access one tunnel from the other via the vehicular cross connections and people inside the tunnel can also use these cross sections to access to the pilot tunnel for emergency evacuation.

In case that cross connection can not be provided due to geometrical planning restrain, the pilot tunnel should be constructed and escape shelter to this tunnel should be provided every about 300 m. The Eastbound and Westbound can use the same pilot tunnel located in between the two directions as shown in Figure 9.4-6 or two pilot tunnels can be constructed separately under the each of main vehicle tunnel.

In case of Viaduct, the ladder usually constructed for maintenance objectives, can be utilized as escape shelter in case of emergency or special stairs escape shelter can be designed as shown in Figure 9.4-7. The reasonable spacing will be about 300m. Therefore, the escape ladder shelter can be fixed on selected supporting column along the viaduct or supply the stairs shelter at the location provided with parking bay at column location. Supply such kind of escape shelter in case of viaduct will be sufficient since viaduct is less danger than tunnel in case of fire accident.



Source: Hsueshan Tunnel

Figure 9.4-6 Pedestrian and Vehicle Cross-Shelter

Source: JICA Study Team (Japan Expressways)

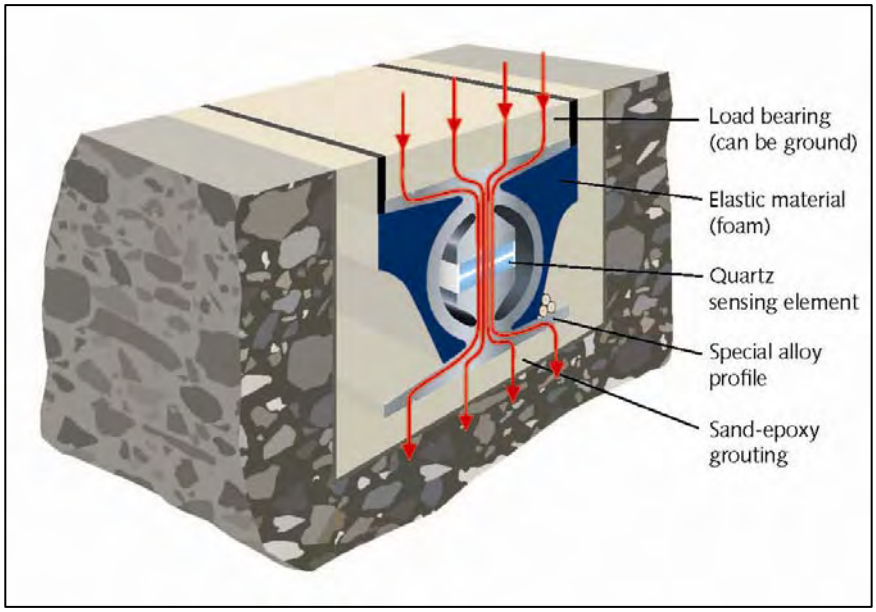
Figure 9.4-7 Typical Example of Viaduct Escape Shelter

9.4.4 Scales: Axle Load / Vehicle Load / Vehicle Height

Control over illegal axle weight and height is very important to secure safety for expressway users and maintain the expressway infrastructure high asset.

Deteriorations of pavement and expressway structures can be minimized through the right control over excess loads and heights. If height can be controlled by constructing steel frame with height based on the allowable vertical clearance but control of overloaded vehicle needs to construct a weigh scale. Since stopping of all heavy vehicles for checking is not practical and causes recognizable delays at the toll gate, it is highly recommended to check only the large vehicles suspected to be overloaded. In this regard, using the weigh-in-motion system will be the best alternative. By the weigh-in-motion system all large vehicle will be subjected for checking. Only, the suspected overloaded vehicle based on the results of the weigh-in-motion will be instructed to forward to the truck scale.

Recently, very advanced system becomes available such as the WIM Sensor with Quartz Technology. It covers all speeds from walking pace to highway driving. It is sensor that can be reworked in case ruts or cracks appear in the pavement. With its modular design the adaptation to the road width and surface is very easy. For the installation only a small intrusion in the road is required. It is maintenance free and very safe, as it is well secured in the road (without frames or screws). Figure 9.4-8 shows a typical example of Quartz Force Sensor.



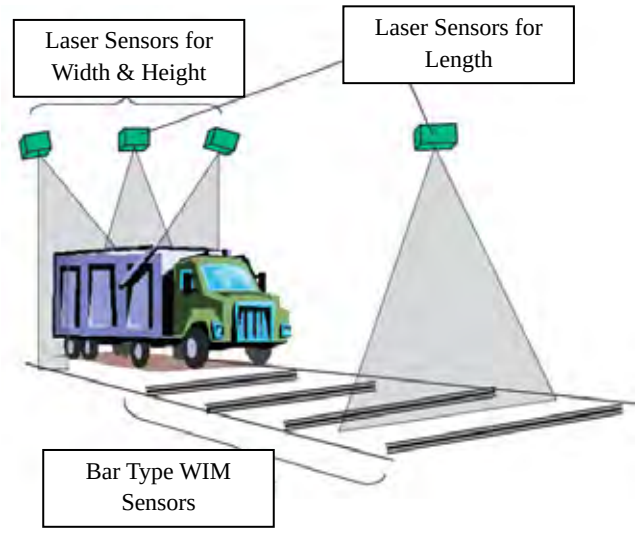
Source: Kistler Instruments AG

Figure 9.4-8 New Method of WIM System

In Japan now Automatic Vehicle Identification (AVI) becomes very common. AVI was developed aiming to protect from the damage of road infrastructure and to keep the road traffic safety. Requirement for AVI System are:

- To detect vehicle size and weight automatically
- Dynamic data compiling system and information road sign system

Figure 9.4-9 shows the specification adopted by one of well- known Japanese Manufacture.



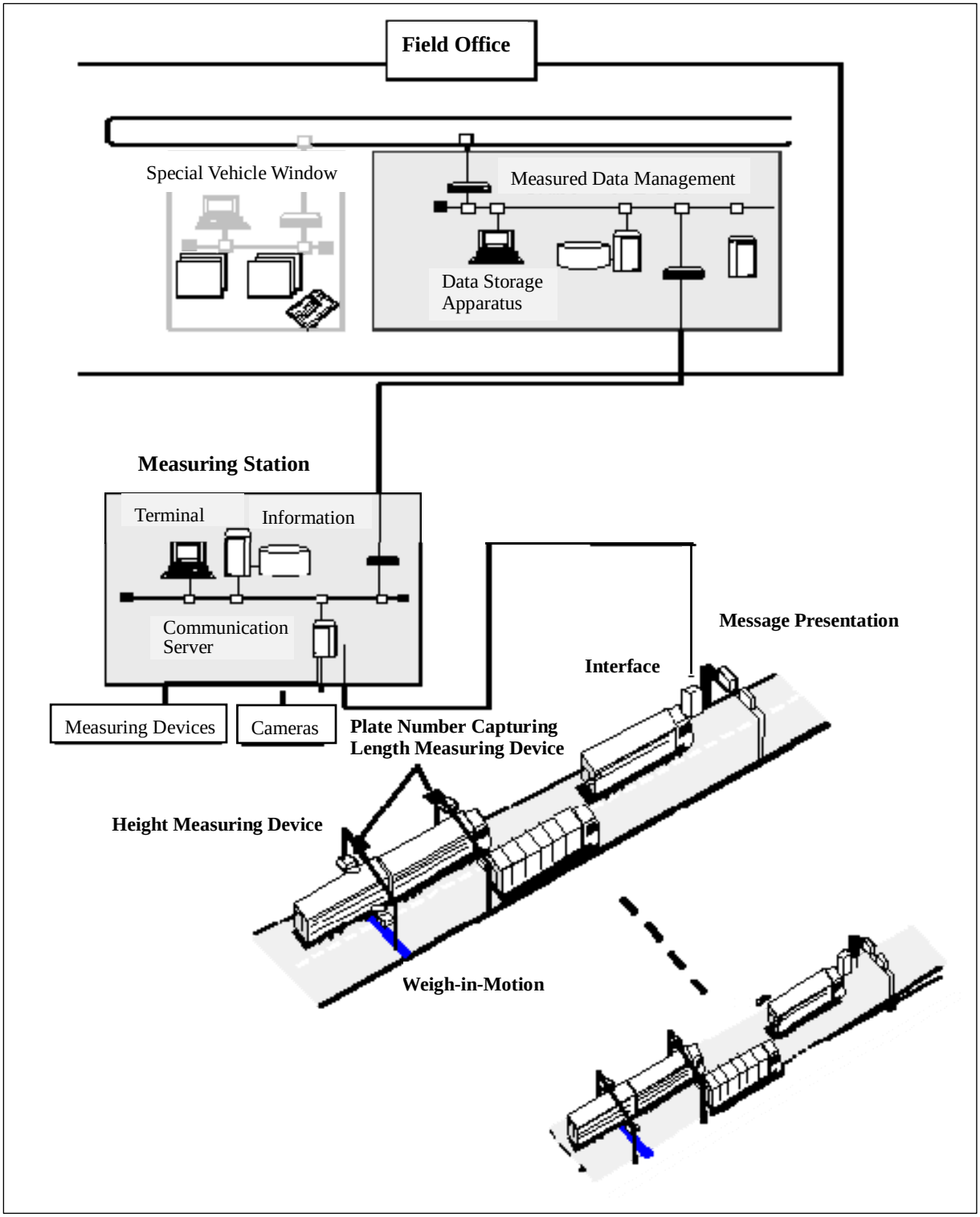
DIM Specification	
Velocity	10 ~ 60 kph
Height	1.5 ~ 4.5 m
Width	1.5 ~ 3.5 m
Length	11 ~ 14 m
Error Level	±200mm with 85% Accuracy
WIM Specification	
Velocity	10 ~ 80 kph
Total Weight	10 ~ 180 t
Axle Weight	1 ~ 20 t
Axle Distance	3 ~ 20 m
No. of Axis	2 ~ 7 axis
Error Level	With 95% Accuracy for Total Weight: ±10% Axle Weight: ±20% Axle Distance: ±0.15m

Source: JICA Study Team

Figure 9.4-9 Typical AVI Specification in Japanese Urban Areas

The system components as shown in Figure 9.4-10 are:

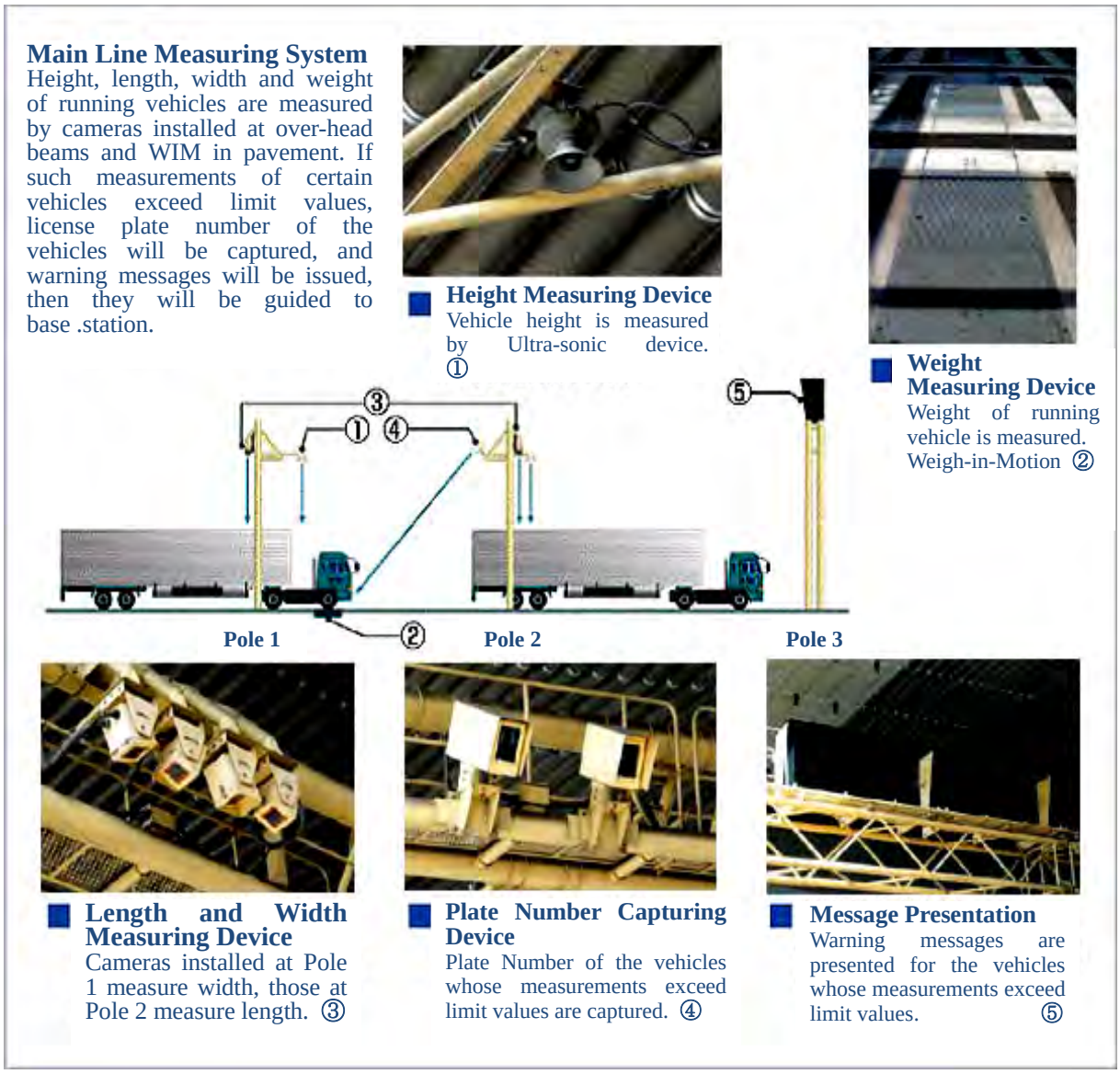
- Weight-In-Motion System (WIM)
- Dimension-In-Motion (DIM)
- Number Plate CCD Camera
- Road Sign (Real Time System)
- Computer and Network System



Source: JICA Study Team

Figure 9.4-10 AVI System

Figure 9.4-11 presents the equipment photos of this system applied in Japanese highway.



Source: JICA Study Team

Figure 9.4-11 Equipments of AVI System

9.4.5 Sign Boards

Road sign is device to convey message for road users by words and symbols. The sign consists of regulatory signs, warning signs and guiding signs. The functions of those signs are:

- Regulatory signs: to give notice of traffic laws or regulations,
- Warning signs: to give notice of situation that might not be readily apparent,
- Guide signs: to show route designations, destinations, directions, distance, service, points of interest, and other geographical, recreational, or cultural information.

Installation of those signs usually follows installation manual of signs and markings of the country. If such manual is insufficient, Manual on Uniform Traffic Control Devices (MUTCD by Federal Highway Administration, USA) can be good reference.

Although worldwide effort to uniform road signs has been devoted for several decade, there are still two main tendencies. The first attempt was "Convention on Road Traffic at Vienna" November 1968 by United Nation. One uses mainly words and this is prevailing in USA . The other uses mainly symbols and this is prevailing in European countries and Japan. Egyptian road signs seem to follow European style, so, Japanese standard would be more familiar than MUTCD.

Those signs listed below will be installed at appropriate locations of the urban expressway.

At the actual installation, axially signs indicating time duration, effective sections will be attached.

(1) Regulatory Signs

The shape of most regulatory sings is circle.

- Speed limit sign: permissible highest speed (R-1) at the sections, sometimes permissible lowest speed(R-2),
- Do Not Pass sign: interchange area and sharp curve or steep gradient sections (R-3),
- Do not Enter sign: at off ramp merging point to ordinary street (R-4),
- No Parking: all the extension of expressway shall be No Parking (R-5),
- No Stopping: all the extension of expressway shall be No Stopping (R-6),
- Weight Limit sign: vehicle weight more than posted tonnage are prohibited to pass (R-7).

(2) Warning Sing

Warning signs are diamond-shaped with a black legend and border on a yellow background, or triangle shape unless specifically designated otherwise.

- Horizontal Alignment sign: where horizontal alignment is sharp (W-1)
- Vertical Grade sign: where vertical alignment is steep (W-2)
- Road Narrow sign: carriageway narrowing is ahead (W-3)
- Slippery When Wet: slippery when wet or somewhere at the tunnel entrance (W-4),
- Advance Traffic Control sign: advance traffic signal at off ramp (W-5),
- Merge sign: merging area ahead (W-6)

(3) Guide Sign

There are several kinds of guide sign. Typical ones are:

- Location, direction and distance: (G-1, G-2)
- Important Facilities Nearby: airport (G-3), railway station (G-4)
- Facilities for Expressway Users: emergency telephone (G-5), parking area (G-6)
- Interchange Guide: (G-7) and lane designation by direction (G-8)

(4) Variable Message Sign

1- General

Variable message signs are used to inform drivers of regulation or instructions that are applicable only during certain periods of the day or under certain traffic conditions. The need for and use of variable message signs have increased considerably over the past several years.

These variable message signs, which can be changed manually, by remote control or by automatic control that can detect the conditions requiring special sign message, have applications in each of the functional usage classification. Examples for urban expressway include:

- Regulatory: Speed Limit under abnormal condition,
- Warning: Accident Ahead,
- Guide: Alternative Route and Stadium Access,
- Information: Congestion Ahead, Travel Time to Destination.

2- Practice of Tokyo Expressway

The VMS's are introduced from the practice of Tokyo that will be necessary for Urban Expressway Cairo, presented in Figure 9.4-12.

- Direction and length of congested section (VMS-1)
- Direction and necessary time to destination (VMS-2)
- Diagrammatically shown congested area (travel speed below 20km/h) (VMS-3),
- Diagrammatically shown necessary time to destination (VMS-4),
- Congested area ahead (VMS-5),
- Wind speed at long span bridge (VMS-6).

VMS-1

VMS-2

VMS-3

VMS-4

VMS-5

VMS-6

Figure 9.4-12 Example of Variable Message Signs in Tokyo Expressway

9.4.6 Mini-Parking Spaces and Mini Way

Parking areas and other facilities on expressway are provided in Japan. The parking areas are equipped with road information terminals, restaurants, vending machines, public telephones and other facilities.

Extra spaces on expressways have been used in Japanese expressway to create mini-parking spaces. At mini-parking spaces restrooms and public phones are installed.

To keep roads in sound condition, ongoing maintenance work and inspection are required. As repair work can create traffic jams, one of a useful measure adopted in Japan is a Mini Way that can provide a temporary overpass for vehicles as shown in Figure 9.4-13.

Figure 9.4-13 Mini Way

9.4.7 Intelligent Traffic System (ITS)

ITS is initialized to have the function of:

(i) Alleviation of traffic congestion
(ii) Improvement of traffic safety
(iii) Environmentally friend transport system
(iv) Reduction of CO_2 emission by saving fuel consumption
(v) Efficient freight distribution
(vi) Improving the quality of life.

ITS was promoted as a national project in European countries, USA and Japan in middle of 1990.

There are many areas in ITS to be discussed, and one major area is international standardization for the equipment used for ITS. As mentioned in the previous section, communication system using 5.8 GHz-band DSRC for ETC is considered as international standard.

In Japan architect of ITS was authorized as shown in Table 9.4-1 . Those areas that can be applied in Egypt in relation the feasibility study of expressway (support for public transport and commercial vehicle, etc. are omitted) would be:

- Electronic Toll Collection Systems (ETC)
- Optimization of traffic management
- Increasing efficiency in road management

(1) Electronic Toll Collection Systems

This area further divided into:

- Electronic toll collection on toll road
- Electronic charge of fare collection of parking lot, ferry and others

At first unification of devices to be used every toll road with one OBU in the Country should be pursued, then as a next stage project, spread it to other facilities such as parking lot and ferry.

(2) Optimization of traffic management

This area further divided into

-Optimization of traffic flow
-Provision of traffic restriction information in case of incident

Wider area of traffic control optimization needs intensive traffic data including information of travel speed provided by prove cars in ordinary street. Using those data, a traffic prediction system will work to predict adversely affected area in near future and remedial measures.

For expressways, as proposed, traffic data collection devices are rather densely installed, and this traffic prediction system will forecast traffic situation all over the extension of expressway in near future, and also suggest appropriate measures to be taken for the section adversely

affected.

(3) Increasing efficiency in road management

In order to increase efficiency of road management, asset management technology is applied to road facility management field. And it is considered as sub-system of road facility management. It needs intensive and precise data of road facility as structure, foundation and pavement.

As first step, construction of facility database of the objective expressway is crucial work to be undertaken, also administrative data such as available budget, maintenance level are necessary data input. Moreover, included is “improvement of road management works”.

Table 9.4-1 Development Area of ITS Architecture of Japan

No.	Development Areas	User Service
1	Advances in Navigation Systems	- Provision of route guidance traffic information - Provision of destination-related information
2	Electronic Toll Collection Systems	- Electronic toll collection
3	Assistance for Safe Driving	- Provision of driving and road condition information - Danger warning - Assistance for driving - Automated highway systems
4	Optimization of traffic management	- Optimization of traffic flow - Provision of traffic restriction information in case of incident
5	Increasing efficiency in road management	- Improvement of maintenance operations - Management of specially permitted commercial vehicles - Provision of roadway hazard information
6	Support for public transport	- Provision of public transport information - Assistance for public transport operations and operations management
7	Increasing efficiency in commercial vehicle operations	- Assistance for commercial vehicle operations management - Automated platoon of commercial vehicles
8	Support for pedestrians	- Pedestrian route guidance - Vehicle-pedestrian accident avoidance
9	Support for emergency vehicle operation	- Automated emergency notification - Route guidance for emergency vehicles and support for relief activities

CHAPTER 10

MAINTENANCE SYSTEM

CHAPTER 10

MAINTENANCE SYSTEM

10.1 MAINTENANCE SYSTEM

Maintenance works for toll expressways are basically same to those for ordinary, non-toll highways. However, higher level of works is required because of the high travel speed of the vehicles and the expectation of the road users for “return for the toll”.

Maintenance is very important to maintain the traffic safety of the expressways where heavy traffic is traveling at high speed. The traffic does not stop 24 hours a day and 365 days a year. Some of the drivers may not be experienced. Any defect of road surface/structure may result in severe accidents. The following subsections describe the works of maintenance.

10.1.1 Cycle of Procedures and Types of Maintenance Works

(1) Cycle of Procedures

The terminology “maintenance system” usually refers to a series of procedures which form a cycle as shown in Figure 10.1-1.

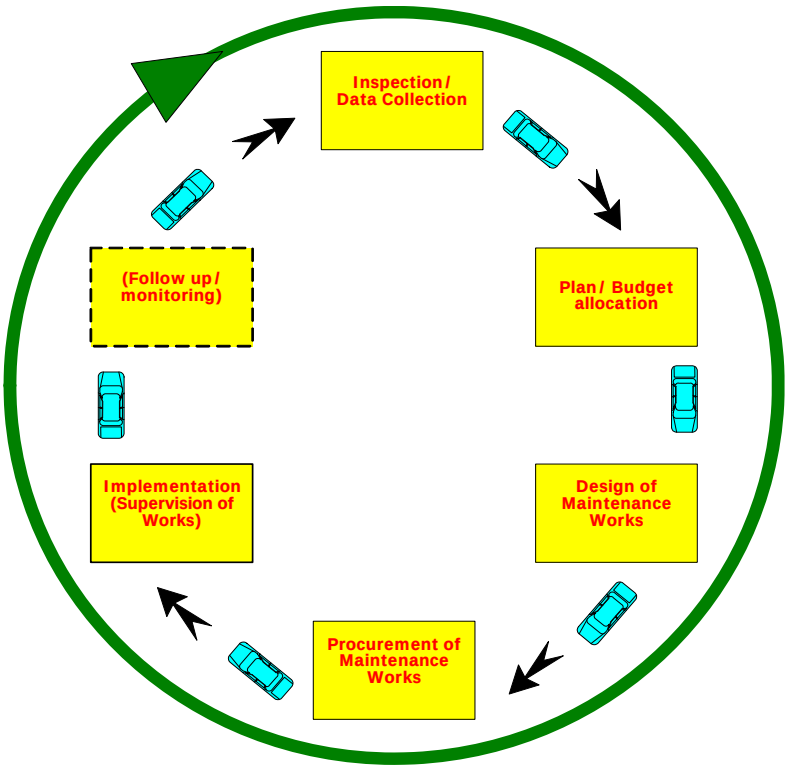


Figure 10.1-1 Cycle of Procedures of Maintenance System

In view of the objective of this Study (proposal for the scheme of the implementation of toll expressway network), the discussions in this section focus mainly on inspection/data collection and planning of maintenance. In Cairo consultants and contractors with satisfactory capacities to design/implement ordinary maintenance works are available, provided that adequate instruction/supervision by the road administrator/operator is given.

Therefore, the capacities of consultants and contractors can be utilized in designing and implementation once proper maintenance plan is formulated.

(2) Types of Maintenance Works

Usually, road maintenance works are categorized into the following three types.

(i) Routine maintenance,
(ii) Periodic maintenance, and
(iii) Emergency maintenance.

"Routine maintenance" refers to the works with features as listed below.

(i) Need to be implemented more frequently than "periodic maintenance". Time interval or frequency may vary from more than once a day to once a year.
(ii) Relatively simple or small in scale.
(iii) Often interval of implementation is less dependent on the traffic volume than in case of periodic maintenance and is relatively regular compared with that of periodical maintenance.

In contrast to routine maintenance, periodical maintenance has the following features:

(i) Longer interval of implementation (once a year to once per 10 years),
(ii) Relatively large in scale: Often requires closure of lane(s) or even several sections of the expressway, and
(iii) Often, the interval of implementation is influenced by traffic volume, especially that of heavy vehicles.

Emergency maintenance mainly refers to the repair work for damages caused by natural disasters or large-scale accidents.

The following subsections describe these types of maintenance works.

10.1.2 Routine Maintenance

Actually, there is no clear logical boundary between routine maintenance and periodic maintenance. In practice, the work items as listed in Table 10.1-1 are usually categorized as routine maintenance.

Table 10.1-1 Work Items of Routine Maintenance

Work Item	Description	Typical Interval	Remarks
Road Cleaning	Removal of trash, debris, soil, stone, etc. on shoulders, usually using specially designed Vehicles	1 – 2 times/day	Less frequent on the left shoulder
Grass Cutting	Cutting of grasses on embankment slope, cut slope	1 – 4 times/year	Greatly dependent on climate condition
Cleaning of Drainage Facilities	Removal of trash and sediments in side ditch, catch basin, culverts, etc.	1 – 2 times/year	Before rainy season
Repair of Minor Defects of Pavement	Patching, sealing of cracks, etc.	As soon after the defect is found as possible.	
Maintenance of Appurtenant Facilities	Maintenance of lightings, guard rails, traffic signs, etc.	As soon after the defect is found as possible.	Interval depends on climate

10.1.3 Periodic Maintenance

Periodic maintenance usually includes the work items listed in Table 10.1-2.

Table 10.1-2 Work Items of Periodic Maintenance

Work Item	Description	Typical Interval	Remarks
Pavement Overlay	Laying 3 – 5 cm thick surface course material	Once/ 5 - 13 years	Interval depends on traffic volume
Pavement Resurfacing	Rehabilitation of surface course to rectify rutting, colligation, etc.	Once/ 5 – 13 years	Interval depends on traffic volume, climate & pavement characteristics
Pavement Rehabilitation	Removal of deteriorated pavement and laying new pavement	Once/10 – 20 years	Interval depends on traffic volume & pavement structure
Replacement of Expansion Joints of Bridges/Viaducts	Replacement of damaged expansion joints	Once/ 5 – 10 years	Interval depends on traffic volume of heavy vehicles
Replacement of Bearing Shoes of Bridges/Viaducts	Replacement of damaged bearing shoes	Once/10 – 30 years	Interval depends on climate
Repainting of Steel Bridges	Repainting of steel bridges	Once/ 3 – 10 years	Interval depends on climate, distance from sea & bridge structure

10.1.4 Emergency Maintenance

Emergency maintenance refers to the kinds of works to urgently rectify serious defects of road structure. Quite often the defects occur or are found unexpectedly. There are various forms of such defects and it is very difficult to anticipate what happens when.

The followings are some examples of such defects:

(i) Failure of embankment/cut slope during/after heavy rain
(ii) Damage due to earthquake (Bridge/viaduct, cut/embankment slope, retaining wall, pavement, etc.)
(iii) Cracks in deck slab, beam or pier of bridge/viaduct (often caused by repeated loading of heavy vehicles)

As anticipated from the above examples, these types of defects are very hazardous to the traffic and closure of lane(s) or the section of expressway is often required, resulting in considerable confusion in the regional traffic. To minimize traffic confusion, repair works for these defects are often implemented in two stages; urgent temporary repair to secure traffic-ability and full-scale repair including some strengthening to prevent recurrence in future.

10.1.5 Inspection

Basic objective of inspection is to find out defects of road facilities and take necessary actions. This includes finding out the signs of future defects which are often found well before the actual defects occur. Inspection is often categorized into the following three kinds:

(i) Routine inspection
(ii) Periodic inspection
(iii) Emergency inspection

Main features of these types of maintenance are compared in Table 10.1-3. Items to be inspected (major items).

(1) Routine inspection

In routine inspection, inspection is made mainly in the patrol car traveling on the shoulder or rightmost lane. Accordingly, items to be checked are concentrated on those what can be observed from the road surface. They include the following:

- Pavement condition,
- Water-logging (drainage),

- Condition of cut slope,
- Appurtenant facilities (guard rail, lights, traffic information devices, etc).

It should be emphasized that serious defects in the main structure of expressway, such as bridges, are often found through routine inspection.

Table 10.1-3 Main Features of Inspection

Type of Maintenance	**Routine**	**Periodical**	**Emergency**
Purpose	To find defects of facilities visible from vehicles	To check conditions of major facilities	To check safety of expressway
Frequency	Once/1 day – 1 week	1 – 4 times/year	Before/during/after abnormal incident such as heavy rain
Method	• Eye-inspection with simple tool such as binocular • Aboard patrol car, running at low speed: on-foot as necessary	• Close-up eye-inspection with simple tool such as test hammer • On-foot	• Eye-inspection with simple tool such as binocular • Aboard patrol car • Close-up inspection on-foot if abnormality is found
Typical Place from where Inspection is made	Road surface, aboard patrol car	Beneath bridges/ viaducts, cut slope, embankment slope, etc.	Various
Items to be Inspected	See explanation below the table		
Typical Format of Record	Check list	Updating of data in inventories of individual bridges/ viaducts, culverts, cut slopes	Various
Problems to be Detected	• Minor defects (patrol, crack of pavement, defects of lighting, message board, etc.) • Sign of serious incidents such as land slide	Defects of bridges/ viaducts, culverts drainage, slope protection, retaining wall, etc.	Damage due to natural disaster, etc.
Usage of Data/ Information Obtained	• Repair of minor defects such as pothole, crack of pavement, damaged traffic signs, etc. • Urgent actions for unexpected incident	• Annual maintenance plan for next year • Revision (as necessary) of the maintenance plan for the current year	• Emergency actions including closure of the expressway

(2) Periodic Inspection

In periodic inspection, the items of inspection are determined first, and the methods and place of inspection are planned. The items commonly inspected include the following:

- Bridge: Cracks in deck slabs, piers, etc., bearing shoe, expansion joint, guard fence/ rail, drainage, paint
- Cut slope: Condition of slope protection works (shotcrete, retaining wall, etc.), drainage
- Embankment slope: Sign of slope failure, slope protection works, condition of vegetation
- Culverts: Physical condition, water flow

(3) Emergency Inspection

Emergency inspection is mainly conducted after, during or before natural disasters such as torrential rain or earthquake. (In case of earthquake, inspection can be conducted only after it happened.) The main purpose of emergency inspection is to check the safety of expressway. Accordingly, the inspection focuses on the following items:

- Soundness of bridge/viaducts
- Soundness of embankment and cut slopes
- Soundness of pavement

10.1.6 Procurement of Maintenance Works

Maintenance works for a toll expressway is usually contracted out. Force account is rarely adopted because it is not economically efficient. The following types of contract are often adopted.

(1) Routine Maintenance

- Long-term contract with contract period 1 – 3 years
- Unit rate of each work item is agreed in the contract, and payment is made based on the quantities of the works actually implemented.

(2) Periodic Maintenance

- Ordinary contract of civil works
- Contract packages are designed considering types of works, location and traffic regulation

(3) Emergency Maintenance

- Special form of contract, such as direct appointment, to urgently start necessary works.

- It is often effective to establish a system where by equipment and labor force of private contractor can be mobilized quickly when emergency occurs.

In case of routine maintenance, long-term contract, such as with contract period of 3 years have the following advantages.

(i) Workload for tendering/contracting is greatly reduced resulting in reduction in the costs both on the side of the employer and on the side of contractor.
(ii) Maintenance crews can become familiar with the detailed conditions of the site, resulting in quick and adequate actions.
(iii) The contractor can make a plan for efficient usage of equipment and labor, resulting in cost reduction.

The largest drawback of long-term contract is that the contractor tends to loose the sense of "competitiveness".

(4) Performance Based Contract

In recent years, a new type of road maintenance contract called "Performance Based Contract" (PBC) is being adopted in some countries. (In UK, PBC has been used for more than 10 years.) In this type of contract, only the results, or "the performance" of the maintenance works are stipulated and the methodologies involved are left to the option of the contractor.

The expected advantage of PBC is that the know-how possessed by the contractor is fully utilized resulting in the cost reduction.

10.1.7 Maintenance Planning

As discussed in the preceding sections, maintenance of the expressways involves road inspection, cleaning, and minor repairs as daily works for preserving road functions and periodic maintenance works such as painting and reinforcing bridges, repairing/rehabilitating pavements. An efficient and systematic maintenance work plan can be drawn out based on the frequency of activities required because they are usually performed on a regular time cycle depending on the type of work item. Thus, the budget for the maintenance works needs to be incorporated in the business operation plan of the expressway.

Attention has to be paid to minimize the disturbance of the traffic since many of the works are carried out on the road shoulders or by restricting driving on a single or multiple numbers of lanes, influencing the flow of traffic. In some cases, the expressway has to be completely closed for some period. It has to be always born in mind that the traffic is supporting the socio-economic activities of the nation and any disturbance of it may cause serious impacts on

these socio-economic activities. In addition, a poorly prepared maintenance plan may increase the chances of traffic accidents.

Because of such impacts on the traffic, close coordination/consultation with relevant parties is required in maintenance planning. Such relevant parties include traffic police (including traffic police in charge of the related roads), affected roadside residents and frequent users such as trucking companies. In case of planned closure of the expressway for maintenance works, prior announcement through mass media and other channels is required to minimize the confusion.

To minimize the adverse impact on the traffic, it is often effective to plan to execute several maintenance works on same days by closing the expressway. This method is often adopted in Japan to minimize the number of days required for the maintenance works and thus, minimizing the disturbance of the traffic.

It is recommended that the administrator of the expressway network, such as MEA, to work out and prepare a maintenance manual, by which the regular maintenance works and periodical repair works including large scale rehabilitation can be conducted with optimum efficiency, minimum cost and minimum adverse impact on the traffic flow.

10.1.8 Traffic Regulation for Maintenance Works

As stated above, many of the maintenance works are executed on the carriageway and need some kind of traffic regulation. Such traffic regulation needs to be carefully designed to avoid any hazardous situation and to minimize the disturbance to the traffic.

(i) The planned traffic regulation needs to be agreed upon by the traffic police.
(ii) The traffic regulation should be removed as soon as it becomes unnecessary.
(iii) The location of the regulated area needs to be informed to the drivers well in advance. Exiting information boards can be used for this purpose. In addition, warning signs temporarily installed at such locations as 2 km, 1 km, 500 meters and 300 meters before the regulations starts are also effective. At the beginning point of the regulation, the lane or shoulder needs to be gradually narrowed, with tapering length of 20 ~ 30 meters to allow the final merging of the vehicles.

10.1.9 Strengthening and Upgrading

The works included in this category are to increase or improve the function(s) of the existing expressway to cope with the change in the environment of the expressway.

These works are usually not foreseen at the time of planning or designing. The followings are some examples of such types of works:

- Strengthening of the structure Installation of noise barrier
- Alteration of asphalt concrete (AC) surface to permeable, low-noise AC surface

These works are similar with large-scale rehabilitation works from the viewpoint of the methodologies of planning, design and execution. Therefore, these works are usually planned together with the maintenance works. However, necessities for these works do not occur regularly or in a foreseeable manner, and thus, these works have to be planned on ad-hoc basis as the necessities arise. Accordingly, these works cannot be incorporated in the general program of toll road network development.

Although the works of strengthening and upgrading are similar to large-scale rehabilitation works from engineering point of view, they need to be distinguished from rehabilitation or other maintenance works from viewpoint of asset management and accounting. The maintenance and rehabilitation works are implemented to “maintain” or “recover” the function, or the value, that the road initially have. On the other hand, strengthening and upgrading works are to “add” a new function that the road does not initially has.

10.1.10 Asset Management

In the recent years, the viewpoint of “asset management” is emphasized in the maintenance planning of roads. As mentioned earlier, maintenance can be interpreted as the actions to preserve the functions or values of the road facilities. Construction of roads, especially expressways, needs huge amount of investment. On the other hand, little attention has been paid to the importance of maintenance and there are many cases where the road infrastructure suffers from deterioration caused by poor maintenance. Maintenance works implemented at appropriate timings allow the preservation of function/value of the road facilities with the minimum total expenditure.

To establish an adequate asset management system, the operator must have a sophisticated inventory system. Basic data such as road name, road sections, nodes and location reference points should be designed to allow importing of database items such as inventory elements, and condition survey data.

Inventory elements and attributes include a number of traffic lanes, carriageway width, right of way, junction, bridge, pavement type, pavement thickness, median, shoulder, sidewalk, drainage facility, side slope, sign, marking, hazard, gradient, lighting and etc., while condition survey data include surface condition, roughness, crack, deterioration and etc.

Management of road assets should be properly undertaken based on an accurate periodically updated inventory surveys with relevant documentations.

The organization in charge of management of infrastructures (MEA could be the organization) shall specify the following items to be included in the asset management plan.

(1) Determination of the Object of Structures

Asset managements plan will be arranged for each structure such as roads, bridges, tunnels for toll expressway network. Once the object of structures is determined, the organization shall design the asset management plan considering the characteristics of each structure. The characteristics will include type of demand, infrastructure (i.e. life cycle, critical safety) and inspection (i.e. easy/difficult or simple/complex).

(2) Identification of Field Management

For example, the road management work includes the daily activities of a cleaning, grass treatment and patrol as well as structural maintenance, repair and rehabilitation of the road structures. In this example, the organization (MEA) shall determine which activities are included in the scope of their asset management. Once the coverage of the asset management work is determined, it shall implement the asset management plan for the determined field.

(3) Estimation Future Maintenance and Rehabilitation Costs

One of the main objectives of the asset management is to minimize the life cycle cost of infrastructure. Budget allocation will be different from the case of new construction. Therefore, future maintenance and rehabilitation costs shall be estimated deliberately, and shall be arranged in a proper manner.

(4) Building of Organization Structure

MEA (or other appropriate organization) shall decide the organizational structure for asset management, and put the relevant personnel to each section. Since asset management is a newly adopted concept for Egypt, it is recommended that a new sub-organization should be established in order to execute the asset management work under the special commitment. Since the asset management shall be applied for the assets of the toll expressway network, financial resources shall be arranged separately from the construction costs and the specific department for the asset management shall be responsible to carry out required tasks.

10.2 LEVEL OF MAINTENANCE AND STANDARDIZATION OF WORK PROCEDURES

It may not be necessary to explain that fulfilling the required level is essential in the practice of maintenance. In addition, securing a uniform level/manner of maintenance over the entire

expressway network is very important for traffic safety. If there is a large obstacle on the carriageway, it creates very dangerous situation. It is especially hazardous on the otherwise well maintained carriageway, because the drivers can not anticipate such a situation. For such reasons, the minimum level of maintenance has to be determined and the maintenance works need to be planned/designed to fulfill the established maintenance level.

Setting the level of maintenance is also necessary as one of the items agreed upon between the PPP entity and MEA (or the Government) and clearly stipulated in the contract of concession.

Better level of maintenance is preferable but may result in the increase in the cost. Since the maintenance cost is covered by the toll that the road users pay, the level of maintenance should not be set unreasonably high.

Further, some work procedures, such as the manner of traffic regulation for the maintenance works executed on the carriageway need to be standardized, regardless of who does it (MEA or PPP entity). Variation in such procedures possibly cause confusion on the side of drivers and may result in accident.

Standardization of work procedures is often discussed from the viewpoint of work efficiency. Standardization can be achieved by preparation of various guidelines and manuals. This task should be considered as a part of “capacity building” in the section of “institutional set up”.

10.2.1 Level of Maintenance and Legal Aspects

(1) Legal Aspects

In many countries, it is assumed that the government, as the road administrator, is responsible for maintaining the public roads in the conditions not hazardous to the general traffic. This rule may or may not be explicitly written in the relevant legislation.

Accordingly, the first priority criterion for considering the level of maintenance is this written or unwritten duty of the road administrator. This required level of maintenance is closely related to the drivers’ expectation or behavior. Thus, it is often related also to cultural or social background. The following cases in Japan and USA may show the difference of social background of road maintenance.

Japan

[The law case for the accident on National Highway No. 41 along Hida River occurred in August 1968.]

In this accident, two sightseeing buses were washed away into the nearby river (Hida River) by a freshet and 104 people drowned. The families of those drowned sued the Government (the Ministry of Construction at that time) for not taking necessary actions to prevent the accident (the Government should have closed the road). Both the decisions by Lower Court (Mach 1973) and Regional Higher Court (November 1974) judged that the road administrator (the Ministry of Construction; its road works office) did notimplement the required task and was responsible for the accident. Since then, road administrators are obliged to close roads in their jurisdictions when natural disasters such as freshet or failure of cut slopes are possible.

USA

In the winter of 1976 – 1977, a severe cold front attacked the Mid-West Region of USA.

The temperature did not go above 0 degree Fahrenheit (or about minus 17 degree Celsius) even in daytime. Harsh blizzard continued for 3 days (72 hours). The roads including the interstate highways became impassable because of snow on the road surface. In the state of Illinois alone, a total of 33 people were frozen to death on the highways stopped by the snow on the road surface. No voice was heard blaming the road maintenance (snow removal operations).

In both of the above cases, the first causes of the deaths of road users were “severe weather”. But the evaluation on the responsibilities of the road administrators by the societies of the two countries differed completely.

Currently, it seems that Egyptian drivers are used to see abnormal incidents such as bumps and holes on the road surface. However, as the road condition in Egypt will be improved, such anticipation/behavior of Egyptian drivers may change in future and higher level of maintenance may be required.

It should be also noted that it is usually the duty of the driver in the traffic law to be always cautious on the road and traffic condition and exert his/her best effort to secure the safety.

(2) Example of Level of Maintenance

As explained in the above, it is very difficult to assume the required level of maintenance. However, the required level of maintenance needs to be stipulated in the contract of concession with PPP entities ,if the maintenance works are entrusted to PPP entities. The criteria listed in Table 10.2-1 are tentatively proposed as examples of the maintenance level to be agreed upon between PPP entity and the Government.

Table 10.2-1 Examples of Criteria for Maintenance Works

Item	Criteria/Required Level	Remarks
Hazardous Obstacles	1. Definition: (i) Solid item with dimensions of 5 cm in width, 5 cm in height and 50 cm in length or larger, (ii) "Sheet-shaped" objects with size of 1 m x 1 m or larger. 2. Requirement: Shall be removed within 2 hours after being found or informed by the road user.	
Potholes	1. Definition: A depression on the pavement surface with dimensions of 10 cm x 10 cm and 3 cm in depth or larger 2. Requirement: Shall be repaired within 2 days after being found: An adequate warning sign shall be placed to draw the attention of drivers.	
Step-wise Unevenness of Road Surface	1. Definition the abrupt uneven surface occurring for example, but not limited to, at the abutment or expansion joints of bridges/viaducts. 2. Requirement: The depth/height of "step-wise unevenness" of road surface shall not exceed 4 cm.	
Roughness of Pavement	1. Definition: The roughness is expressed in terms of the International Roughness Index (IRI) 2. Requirement: IRI should not exceed XX.	Measure once a year.
Skid Resistance of Pavement Surface	1. Definition: Skid resistance measured by "British Portable Skid Meter" 2. Requirement: Coefficient of friction of the dry surface shall be 0.4 or large	Measured only when low skid resistance is suspected.
Road Cleaning	1. Definition: Cleaning of right and left shoulder of the carriageway using a vehicle specially constructed for this purpose (road sweeper). 2. Requirement: The interval of road cleaning shall not exceed 12 hours or twice a day.	
Repair of Damaged Traffic Safety/Control Facility	1. Definition: Damage of guard rails, traffic signs (except pavement markings), median divider and other similar facilities or devices. 2. Requirement: Shall be repaired within one month provided that adequate warning shall be placed until the damaged item is repaired.	(Should not be excessively demanding level)

It should be noted that these criteria are tentative proposal and need verification. It may be worth actually practicing these maintenance works on a trial basis and evaluate their practicability, social acceptability and cost effectiveness. (This is one of the reasons that the establishment of MEA is recommended). Considerable modification may become necessary after experience of maintenance and traffic management of urban toll expressway network is accumulated. It should be noted that the required level ever changes as the average level of road conditions in Egypt is improved.

10.2.2 Standardization of Work Procedures

The procedures of some types of maintenance works give considerable impact on the flow of traffic and the chances of traffic accidents. One of the typical examples of such work procedures is the manner of traffic regulation implemented for execution of maintenance works on the carriageway. The warning signs should be installed well before the location of the maintenance work. The locations of these pre-warning signs should be designed following logically unified policy. The following factors are usually considered in designing the manner of traffic regulation.

(i) Traffic volume
(ii) Traffic characteristics (share of heavy vehicles and etc.)
(iii) Geometric elements of the location/section
(iv) Time of day (daytime or night)
(v) Structure of road (road section, bridge/viaduct or tunnel)

CHAPTER 11

TOLL EXPRESSWAY AND PPP LEGISLATION

CHAPTER 11

TOLL EXPRESSWAY AND PPP LEGISLATION[1]

11.1 OVERVIEW ON CURRENT PPP RELATED LEGISLATION AND PROCEDURES IN EGYPT

In Egypt, concession is allowed until 99 years. PPP and/or BOT road projects are not regulated by a general law, but Prime Minister decree is issued instead for an each project according to the sector law based on the article 12 (Bis-E) of law No. 84 of the year 1968 in connection with the public roads added as per law No. 129 of the year 1996.

11.1.1 Roads Legislation

(1) General

Under any law-abiding states, any governmental actions are principally implemented based on the laws/regulations. As far as the road administration is concerned, the principal items in the laws and regulations consist of the following essential items:

a. Definition of 'Public Road' and 'Road Classification'
b. Authorities and responsibilities of roads and bridges
c. Road financing

In addition, the following items in the laws and/or regulations concerned to implementation of the road projects and maintenance and management are as follows:

a. Environmental impact assessment
b. Procurement of consultants and contractors
c. Land acquisition and relocation of project affected people (PAP)
d. Traffic roles and regulations
e. Road transport ordinance and regulation

(2) Framework of Law for Roads

The framework of laws on Roads in Egypt is illustrated in Figure 11.1-1.

[1] This chapter is mainly based on the relevant chapters of the PPP Study.

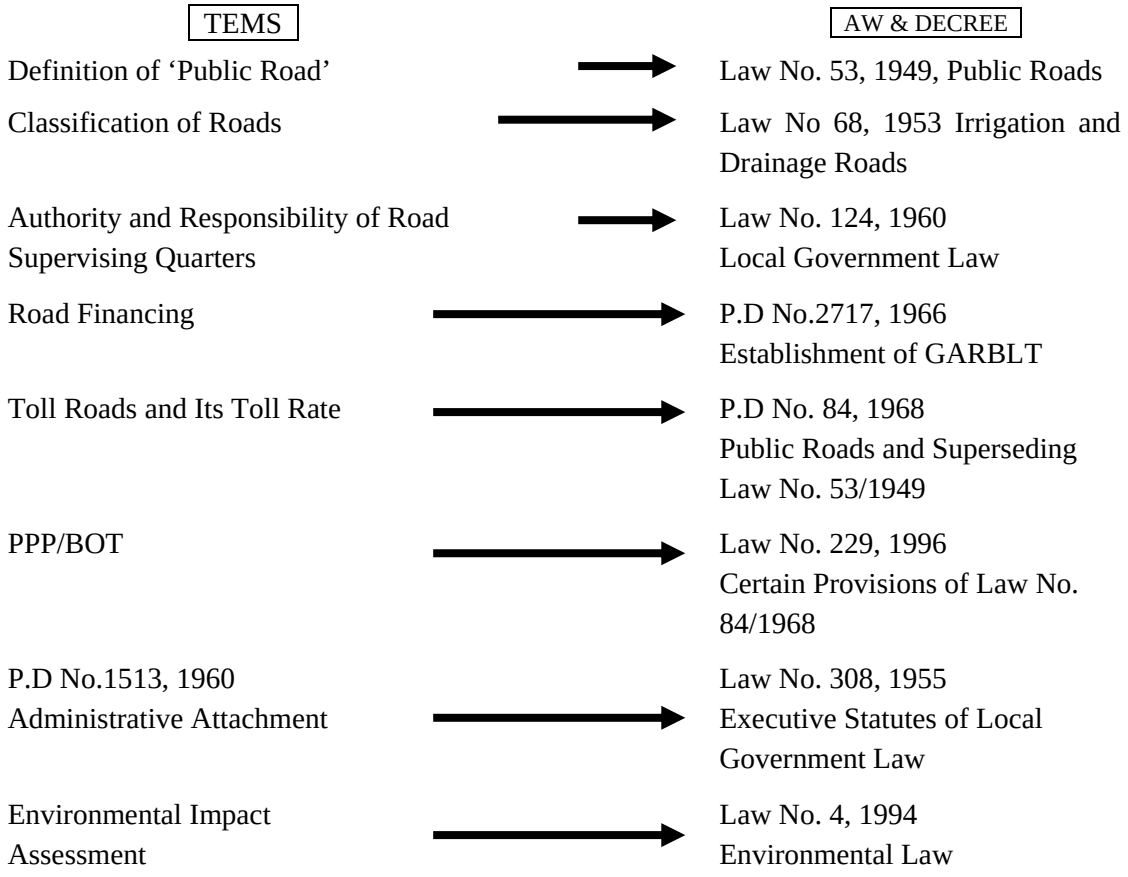


Figure 11.1-1 Framework of Law on Roads in Egypt

The Presidential Law No. 229 of the year 1996 on Public Roads is amending certain provisions of Law No. 84 of the year 1968 on Public Roads as described in the following sections.

(3) Authority and Responsibility of Roads

The authority and responsibility of the roads is defined in Article 1 of the Public Roads Law, which states that '*Freeway, highways and main roads shall be established and modified. And their types shall be determined by the virtue of a decree of the Ministry of Transport. The General Authority for Roads, Bridges and Land Transport shall supervise these roads while the Local Government Units shall supervise the local roads*'.

This provision has some exceptions of the following:

a. All roads lying within the limits of Greater Cairo and those of Alexandria Governorate,
b. Local roads lying within the limits of towns and villages that have town councils or village councils, but fast-traffic roads and main roads shall be subject to these provisions.

c. Embankments of the River Nile, canals, drains, basins and public enclosures as supervised by the Ministry of Irrigation.

(4) Financing of Roads

According to this item, road financing is defined in Article 3 of the Public Road Law, which states that "*the Public Treasury of the State shall sustain the costs of building freeways, fast-traffic, main roads, the road structure necessary therefore and their maintenance, while the local government units shall sustain the forgoing costs with regard to the local roads*".

Under the Law 229/1996 that amends Law 84/1968, the new Article sub No. (12-bis) regarding public roads is added, reading as follows: "In exception of the provisions of Articles 1,3 and 9-bis of this law, *public utility concessions may be granted to local and foreign investors, whether natural or moral persons, for the purpose of building freeways, highways and main roads, and for their management, exploitation and maintenance along with collecting traffic charges, without being restricted by the provisions of law No. 129 of the year 1947 concerning Public Utility Concessions and law No. 61 of the year 1958 concerning the grant of concessions connected with investment of natural wealth resources and public utilities, and the amendment of the concession conditions*".

(5) Toll Roads and Toll Rates

The Public Road Law Part 2 article 9-Bis, which includes "*for the fast traffic roads as determined by decree of the Prime Minister, and which have alternatives to replace them, fees on their use by vehicles may be collected according to the following rates:*

- *Private cars LE 1*
- *Pick up vehicles LE 2*
- *Buses LE 2*
- *Trucks or Lorries LE 3*
- *Heavy duty vehicles LE 5*

This law mentioned that an application to the toll road shall be necessarily provided alternative route to replace vehicle users.

Regarding to the toll rates, based on the suggestion made by the Ministry of Transport (MOT), an application of toll road or non toll road and its toll rate are determined by the Prime Minister with issuing Prime Ministers' decree. It was noted that municipal consent will not be required to introduce toll when MOT holds a contract with a concessionaire. However the level of toll will need to be negotiated among these stakeholders. Current level of toll is varied depending on the route.

(6) PPP/BOT

The Road Law is Item 12-Bis of the Public Road Law, which includes "*public utility concessions may be granted to local and foreign investors, whether normal or juridical, for* ***building*** *freeways, fast traffic roads …..".*

It was understood that only newly constructed roads can be under BOT system, not projects for upgrading existing roads. In January 2002, the Councilors of the Cabinet re-defined the word "***building***" to include construction works of interchanges and toll gates that will upgrade existing roads to freeways. Therefore, the upgrading of Cairo-Alexandria-Matroh and other roads is legalized now. A new PPP law is under preparation that regulates concessions for exploitation of public utilities.

11.1.2 GOE's Investment Promotion Policy

Investment Law No. 8 of 1997 and Companies Law No. 3 of 1998 are two key laws that regulate the investment environment for foreign investors in Egypt:

(1) Investment Incentives and Guarantees Law 8 of 1997

Law 8 of 1997 succeeded Investment Law 230 of 1989. It made one authority responsible for investor incentives and guarantees--the General Authority for Investment and Free Zones (GAFI). It also grouped some 20 exemptions and incentives under one law, and specified activities that would automatically accrue benefits to investors. It allows 100% foreign ownership of ventures and guarantees the right to remit income earned in Egypt and to repatriate capital.

Key provisions include: the guarantee against confiscation, sequestration and nationalization; the right to own land; the right to maintain foreign currency bank accounts; freedom from administrative attachment; the right to repatriate capital and profits; free hiring of Egyptian staff, absence of price control or restrictions, exemption of foreign expatriates' salaries from income tax if they reside in Egypt for less than a year, and equal treatment regardless of nationality.

Under Law 8, investments are approved automatically for projects in 16 distinct fields, effectively creating a "positive list." These fields include land reclamation; fish, poultry and animal production; industry and mining; tourism (covering hotels, motels, tourist villages and transportation); maritime transportation; refrigerated transportation for agricultural products and processed food; air transportation and related services; housing; real estate development; oil production and related services; hospitals and medical centers that offer 10% of their services free of charge; water pumping stations; venture capital; computer software

production; projects financed by the Social Fund for Development; leasing; and guarantees for subscription in securities[3].

In April 2000, new activities were added to the package of incentives to include development of new urban zones, software design and production of electronics, establishment and management of technology zones, credit classification, deductions, river transportation activities, management of industrial projects and utilities, and waste collection and treatment projects.

Law 8/1997 also establishes that a one-stop shop for investors will be located at the General Authority for Investment and Free Zones (GAFI) to facilitate and simplify approval, registration, licensing and certification for new projects instead of having to go to 25 separate ministries.

(2) Companies Law

Companies Law 3 of 1998, amending law 159 of 1981, covers investors in any sector not covered by Law 8 of 1997; including shareholders, joint stock, and limited liability companies and representative and branch offices.

The law allows for automatic registration of a company upon presentation of the application to the Ministry of Foreign Trade and for acquisition of legal status 15 days after appearance in the Commercial Register.

Founders of joint stock and limited liability companies must submit a bank certificate showing a 10% deposit of the issued capital to the Companies Department. The law also provides for the right of petition for denial of incorporation, removes the restriction that 49% of shareholders must be Egyptian, allows 100% foreign representation on the board of directors, and redefines accounting standards.

11.1.3 Challenges in Facilitating Private Investment in Infrastructure

The World Bank report noted that more and better infrastructure is needed in Egypt to help the private sector become more competitive. While certain infrastructure services are provided at subsidized prices (e.g. power and water), inefficient or inadequate provision of other services (e.g., transportation) increases costs for the private sector. In most cases, pricing and management reforms are called for while, in some cases, additional public investments are also needed. In addition, institutional arrangements for infrastructure financing need to be addressed in many infrastructure sub-sectors in order to improve their overall efficiency.

With respect to facilitating the involvement of the private sector in infrastructure services, priority concerns which the report pointed out include:

- Removal of unjustified restrictions on private sector participation in infrastructure projects and creation of a level playing field between public and private sector players;
- Improvement of the regulatory framework for the private sector participation;
- Review of the BOOT regulations for infrastructure; and
- Establishing tariff structures and targeted subsidy systems compatible with opening of the sector to competition.

Recent legislative movement

Preparation of new PPP law is underway in Egypt. It, however, has not yet been discussed in the parliament as of the end of August 2008 and may take at least another one year to be approved and enacted. The main objective of the new law is introducing more transparent selection criteria and bidding process in order to attract local and international private sectors for infrastructure investments.

The Study Team reviewed the summary of the draft new PPP law. Main points discussed include selection of concessionaires, monitoring procedures, the government roles. It describes that the selection of concessionaire is to be in a competitive, open, and transparent way to guarantee selecting the best bidder from the technical, financial, economical and environmental aspects. It also requests monitoring procedures and penalty clauses when a concessionaire falls short of its obligation should be determined.

The maximum concession period is defined as 40 years and is different from the generally accepted rules of 99 years in Egypt. The draft new law also states that: (i) the President determines the level of monitoring and supervision; (ii) Cabinet will decide the interests of general public which will be the bases of granting concession, determining its conditions and provisions, modifying them, determining the government's interests for a project, and renewing the concession period partially or completely. The draft law states that after the Cabinet approval, the authority granting the concession can reach an agreement with the concessionaire upon modifying the conditions of the concession whenever it is required for the general public's interests or unforeseen events beyond control of concessionaire.

11.2 GENERAL LEGISLATIVE GUIDELINES FOR PPP DEVELOPMENT

There are two useful references which are considered as possible standard documents for legislative guidelines for PPP development. One is "Standardizations of PFI contracts" published by the United Kingdom's economics and finance ministry, HM Treasury. The aim

was to provide guidance on the key issues that arise in PFI projects in order to promote the achievement of commercially balanced Contracts, and enable public sector procurers to meet their requirements and deliver best value for money.

The first edition was published in July 1999 followed by the second and third editions which were published in 2002 and 2003 and incorporated a number of improvements which had been identified over the period[5].

Another reference is "Legislative Guide on Privately Financed Infrastructure Projects" (Guide) published by the United Nations Commission on International Trade Law (UNCITRAL). The purpose of the present Guide is to assist in the establishment of a legal framework favorable to private investment in public infrastructure. The advice provided in the Guide aims at achieving a balance between the desire to facilitate and encourage private participation in infrastructure projects, on the one hand, and various public interest concerns of the host country, on the other. The Guide discusses a number of concerns of fundamental public interest, which, despite numerous differences of policy and legislative treatment, are recognized in most legal systems.

The Guide contains a set of recommended legislative principles entitled "legislative recommendations." The legislative recommendations are intended to assist in the establishment of a legislative framework favorable to privately financed infrastructure projects. The Guide is intended to be used as a reference by national authorities and legislative bodies when preparing new laws or reviewing the adequacy of existing laws and regulations.

The process of PPP includes a wide range of actions and it is not easy to describe PPP processes comprehensively. Based on these references, this chapter shows areas of law that are typically most relevant to private capital investment in public infrastructure projects and discusses the content of those laws which would be conducive to attracting private, national and foreign capital.

11.2.1 General Legislative and Institutional Framework

UNCITRAL identifies general guiding principles that may inspire the legal framework for privately financed infrastructure projects. It further points out the possible implications that the constitutional law of the country may have for the implementation of these projects and possible choices to be made regarding the level and type of instrument that might need to be enacted and their scope of application.

(1) General guiding principles for a favorable constitutional and legislative framework

In considering the establishment of an enabling legal framework or in reviewing the adequacy of the existing framework, domestic legislators may wish to take into account some general principles that have inspired recent legislative actions in various countries. UNCITRAL pointed out three key points, transparency, fairness, and long-term sustainability.

a. Transparency

A transparent legal framework is characterized by clear and readily accessible rules and by efficient procedures for their application. Transparent laws and administrative procedures create predictability, enabling potential investors to estimate the costs and risks of their investment and thus to offer their most advantageous terms. Transparent laws and administrative procedures may also foster openness through provisions requiring the publication of administrative decisions, including, when appropriate, an obligation to state the grounds on which they are based and to disclose other information of public relevance.

b. Fairness

The legal framework is both the means by which Governments regulate and ensure the provision of public services to their citizens and the means by which public service providers and their customers may protect their rights. A fair legal framework takes into account the various (and sometimes possibly conflicting) interests of the Government, the public service providers and their customers and seeks to achieve an equitable balance between them. The private sector's business considerations, the users' right to adequate services, both in terms of quality and price, the Government's responsibility for ensuring the continuous provision of essential services and its role in promoting national infrastructure development are but a few of the interests that deserve appropriate recognition in the law.

c. Long-term sustainability

An important objective of domestic legislation on infrastructure development is to ensure the long-term provision of public services, with increasing attention being paid to environmental sustainability. Inadequate arrangements for the operation and maintenance of public infrastructure severely limit efficiency in all sectors of infrastructure and result directly in reduced service quality and increased costs for users.

From a legislative perspective, it is important to ensure that the host country has the institutional capacity to undertake the various tasks entrusted to public authorities involved in infrastructure projects throughout their phases of implementation. Another measure to enhance the long-term sustainability of a national infrastructure policy is to achieve a correct balance between competitive and monopolistic provision of public services.

(2) Scope of authority to award concessions

a. Authorized agencies and relevant fields of activity.

It is particularly important to state clearly in the law the authority to entrust entities other than public authorities of the country with the right to provide certain public services. Where general legislation is adopted, it is also advisable to identify clearly the public authorities of government competent to award infrastructure projects and to act as contracting authorities. In order to avoid unnecessary delay, it is particularly advisable to have rules in place that make it possible to ascertain the persons or offices that have the authority to enter into commitments on behalf of the contracting authority (and, as appropriate, of other public authorities) at different stages of negotiation and to sign the project agreement.

b. Purpose and scope of concessions

It may be useful for the law to define the nature and purpose of privately financed infrastructure projects for which concessions may be awarded in the country. One possible approach may be to define the various categories of projects according to the extent of the rights and obligations assumed by the concessionaire. However, given the wide variety of schemes that may come into play in connection with private investment in infrastructure, it may be difficult to provide exhaustive definitions of all of them. As an alternative, the law could generally provide that concessions may be awarded for the purpose of entrusting an entity, private or public, with the obligation to carry out infrastructure works and deliver certain public services, in exchange for the right to charge a price for the use of the facility or premises or for the service or goods it generates, or for other payment or remuneration agreed to by the parties. The law could further clarify that concessions may be awarded for the construction and operation of a new infrastructure facility or system or for maintenance, repair, refurbishment, modernization, expansion and operation of existing infrastructure facilities and systems, or only for the management and delivery of a public service.

Another important issue concerns the nature of the rights vested in the concessionaire, in particular whether the right to provide the service is exclusive or whether the concessionaire will face competition from other infrastructure facilities or service providers. The decision whether or not to grant exclusivity rights to a certain project or category of projects should be taken in the light of the host country's policy for the sector concerned. As discussed earlier, the scope for competition varies considerably in different infrastructure sectors. While certain sectors, or segments thereof, have the characteristics of natural monopolies, in which case open competition is usually not an economically viable alternative, other infrastructure sectors have been successfully opened to free competition.

It is desirable therefore to deal with the issue of exclusivity in a flexible manner. Rather than excluding or prescribing exclusive concessions, it may be preferable for the law to authorize

the grant of exclusive concessions when it is deemed to be in the public interest, such as in cases where the exclusivity is justified for the purpose of ensuring the technical or economical viability of the project. The contracting authority may be required to state the reasons for envisaging an exclusive concession prior to starting the procedure to select the concessionaire. Such general legislation may be supplemented by sector-specific laws regulating the issue of exclusivity in a manner suitable for each particular sector.

(3) Authority to regulate infrastructure services

The Guide assumes that the host country has in place the proper institutional and bureaucratic structures and human resources necessary for the implementation of privately financed infrastructure projects. Nevertheless, as a contribution to domestic legislatures considering the need for, and desirability of, establishing regulatory agencies for monitoring the provision of public services, this section discusses some of the main institutional and procedural issues that may arise in that connection.

The Guide provided five instructive recommendations on regulatory body:

- The authority to regulate infrastructure services should not be entrusted to entities that directly or indirectly provide infrastructure services.
- Regulatory competence should be entrusted to functionally independent bodies with a level of autonomy sufficient to ensure that their decisions are taken without political interference or inappropriate pressures from infrastructure operators and public service providers.
- The rules governing regulatory procedures should be made public. Regulatory decisions should state the reasons on which they are based and should be accessible to interested parties through publication or other means.
- The law should establish transparent procedures whereby the concessionaire may request a review of regulatory decisions by an independent and impartial body, which may include court review, and should set forth the grounds on which such a review may be based.
- Where appropriate, special procedures should be established for handling disputes among public service providers concerning alleged violations of laws and regulations governing the relevant sector.

11.3 ILLUSTRATIVE PPP PROCESS

Once the country defines a possible PPP project under a legislative framework, the project will enter into a preparation and implementation stage.

11.3.1 Preparation Stage

(1) Clear Objective and Priority of PPP

It is essential to clarify the objective of PPP in order to promote PPP with stakeholders who have different incentives. In addition, the prioritization of these purposes is a necessary step. PPP cannot be done with satisfying all parties at the same time. For example, if the country introduces a market competition and weakens a monopoly power of government function, it will be difficult to maximize the sales profits of the existing functional assets. Maximizing fiscal gains and reducing price and revitalizing the industry by the introduction of competition can be a tread-off.

(2) Basic Structure

– Methodology: On a Case-by-case Basis or with a Master Plan

Two types of countries can be seen: some countries proceed PPP on a case by case basis; and other countries proceed PPP under the comprehensive master plan. The countries which privatize relatively small sized enterprises adopted the former method in order to manage characteristics of specific cases. On the other hand, PPP/privatization program under a comprehensive master plan can promote the program efficiently. In addition, it attracts investors and private sectors if they can expect a series of PPP/privatization program in order to invest their resources.

– Government Institutional Structure: One agency or Separate agencies

If countries plan relatively a large number of PPP/privatization or different ministries have to be coordinated to implement legislative framework, one agency approach is preferable. The most frequently recognized structure is Ministry of Finance initiates the PPP/Privatization, since the fiscal merit is considered to be the highest incentive.

Sometimes special taskforce is established outside of the existing ministries, so that the objective of the taskforce becomes clear and taskforce members can concentrate the task and promote quick decision-making. However, it is important what kind of authority the taskforce has and members who have enough knowledge can proceed PPP/Privatization in due fairness. On the other hand, a competent authority of targeted business can be a main actor who precedes PPP/Privatization. Sometimes it is difficult to attract private participation, since each authority adopts different procedures.

– Legislative Framework: Comprehensive or Sector-Specific

It is not unusual to enact a new law for PPP/Privatization. Some countries, for example,

France, Italy, Austria, take a comprehensive approach to build a general legislative framework for providing a uniform treatment to issues that are common to privately financed projects in different sectors. In other countries, such as England and Germany, adopt specific legislation in respect of individual enterprises/projects. It is difficult to include all issues which are regulated under existing law in order to adopt a comprehensive law, and the amendment of existing law and the supplementary enactment of new law for a specific case will be required.

11.3.2 Implementation Stage

This section considers a broad PPP process which includes PFI, concession, BOT/BOO, and outsourcing. Although these methods have different characteristics on the range of business which will be transferred to the private sector, asset ownership, financiers, duration, and risk sharing, they have a common procedure on selection of private partners.

The first step is clarifying the objectives of the business itself and private participation. The government has to clarify what it expects to the private sector and what kind of knowledge and skills should be required. At the next step, a feasibility study will be conducted in order to examine what would be the benefits of introducing PPP, what are the challenges, how can the government deal with these issues, which scheme will be most appropriate, how public and private share works and risks, etc. If the feasibility study shows that adopting PPP method is appropriate, the government will start the selection of private partners. PPP requires financial, legal and technical expertise, and professional advisors should be selected. Advisors will support the government to set up practical schemes of PPP projects, legal documents, conditions for bidding, and evaluation methods. After defining detail procedures, the government will issue bidding announcement to the public and request a bid. If there are many bidders, long and short lists will be prepared, and the detailed proposals or price will be requested to the bidders for final selection. The public sector will select the private participant which submitted the most favorable proposal for the public sector, and award the contract.

11.3.3 Tender Regulation

(1) General

The Tenders Law 89/1998 governs all supply, service and construction contracts signed with an Egyptian governmental entity and stipulates thresholds of applicable procurement methods depending on the nature of the bidding. In addition, guidelines on tendering (1367/98) was issued by MOF. Government contracting on the purchase of goods works, and services, including transport, consultancy studies and technical works, must be by way of public tenders or by public practices (negotiations). A decree issued from a competent authority according to circumstances and the nature of the contract will define any one of the two methods the tender will adopt. Nevertheless, a decree issued from part of the competent authority will

exceptionally permit and justify entering into contract by way of (a) limited tender, (b) local tender, (c) the limited practice (negotiation) and (d) direct agreement.

a. A limited tender may be used where the nature of the contract requires certain types of suppliers, contractors, consultants, technicians or other experts in Egypt or abroad, provided that they shall have technical and financial efficiency as well as good reputation provisions.
b. A local tender may be used where all contracts (up to a value of LE 200,000) are confined to local suppliers.
c. Limited practice (negotiations) may be used where items manufactured are only available from certain contractors or certain production locations, where technical works require certain specialists or where national security dictates confidentiality.
d. Direct contracting would take place in urgent cases which cannot tolerate applying the tender or the practice (negotiation) procedures, when contract amounts less than LE 50,000 for goods and services and LE 100,000 for works.

There is no standard government contract except the guideline from MOF. Each Ministry or Government agency uses its own form of contract (conforming to the provisions of the Tenders Law). Public tenders must be advertised in a daily newspaper locally or abroad, depending on the nature of the contract and must ensure equal opportunity and free competition. Although a government contract must be awarded on the basis of the best qualified and lowest bid, and Egyptian domestic contractor is accorded priority if its bid does not exceed the lowest foreign bid by more than 15%.

Each tender must be accompanied by the payment of a provisional deposit up to 2%, which is returned to unsuccessful tenders. A final deposit of up to 5% must be paid by the winner within 10 days of their tender being accepted. The contract may be cancelled if payment of the final deposits is not made and any losses suffered as a direct result may be recovered. A maximum fine of up to 10% of the value of construction contracts and up to 3% of the value of supply contracts and up to 4% for technical assistance contracts may be levied on contractors for late performance or late delivery. The Public Tender Law permits government entities to terminate contracts where the bidder has acted fraudulently, declared bankruptcy or induced governmental officials to act contrary to the provisions of the Public Tender Law. Tenders may be rejected upon receipt.

(2) Public interest and welfare

If only one tender was submitted, or the lowest tendered price exceeds the estimated value of the contract, a contract may be terminated by the government entity at any time if the contracting party defaults. In case of late performance or non-performance, the concept of

force majeure is recognized in accordance with principles of the Egyptian Civil Code, under which certain types of hindrances must be clearly stated in the contract if they are to be considered force majeure (e.g. strikes and shipping delays).

11.4 GUIDELINES FOR SELECTION PROCEDURES AND EVALUATION CRITERIA

11.4.1 Three Objectives of Selection Procedures by UNCITRAL

For the award of contracts for infrastructure projects, the contracting authority may either apply methods and procedures already provided in the laws of the country or establish procedures specifically designed for that purpose. In either situation, it is important to ensure that such procedures are generally conducive to attaining the fundamental objectives of rules governing the award of public contracts. UNCITRAL sets out (1) economy and efficiency, (2) promotion of the integrity and confidence in the selection process, and (3) transparency of laws and procedures as general objectives of selection procedures.

(1) Economy and efficiency

In connection with infrastructure projects, "economy" refers to the selection of a concessionaire that is capable of performing works and delivering services of the desired quality at the most advantageous price or that offers the best commercial proposal. In most cases, economy is best achieved by means of procedures that promote competition among bidders. Competition provides them with incentives to offer their most advantageous terms and it can encourage them to adopt efficient or innovative technologies or production methods in order to do so.

"Efficiency" refers to selection of a concessionaire within a reasonable amount of time, with minimal administrative burdens and at reasonable cost both to the contracting authority and to participating bidders. In addition to the losses that can accrue directly to the contracting authority from inefficient selection procedures (for example, owing to delayed selection or high administrative costs), excessively costly and burdensome procedures can lead to increases in the overall project costs or even discourage competent companies from participating in the selection proceedings altogether.

(2) Promotion of the integrity of and confidence in the selection process

Another important objective of rules governing the selection of the concessionaire is to promote the integrity of and confidence in the process. Thus, an adequate selection system will usually contain provisions designed to ensure fair treatment of bidders, to reduce or discourage unintentional or intentional abuses of the selection process by persons administering it or by companies participating in it and to ensure that selection decisions are taken on a proper basis.

(3) Transparency of laws and procedures

Transparency of laws and procedures governing the selection of the concessionaire will help to achieve a number of the policy objectives. Transparent laws are those in which the rules and procedures to be followed by the contracting authority and by bidders are fully disclosed, are not unduly complex and are presented in a systematic and understandable way. Transparent procedures are those which enable the bidders to ascertain what procedures have been followed by the contracting authority and the basis of decisions taken by it.

One of the most important ways to promote transparency and accountability is to include provisions requiring that the contracting authority maintain a record of the selection proceedings. A record summarizing key information concerning those proceedings facilitates and the exercise of the right of aggrieved bidders to seek review.

That in turn will help to ensure that the rules governing the selection proceedings are, to the extent possible, self-policing and self-enforcing. Furthermore, adequate record requirements in the law will facilitate the work of public authorities exercising an audit or control function and promote the accountability of contracting authorities to the public at large as regards the award of infrastructure projects.

An important corollary of the objectives of economy, efficiency, integrity and transparency is the availability of administrative and judicial procedures for the review of decisions made by the authorities involved in the selection proceedings.

11.4.2 Special Features of Selection Procedures for Privately Financed Infrastructure Projects

The traditional public procurement also adopts a competitive procedure as a principle. Competitive procedure assures optimal conditions for economy, transparency and efficiency. Under the traditional selection procedure of goods, services and works, the specifications and conditions for procurement are set out in advance and proposed price from bidders is the primary factor for the selection of suppliers. On the other hand, PPP approach has several characteristics which require a different methodology for procurement. Under PPP approach, (i) a contract lasts for a long-term; (ii) since the main purpose of the project agreement is not only building a facility but also providing public services, the private sector holds a wide range of responsibility and is not be able to be awarded in a simple contract; (iii) it is not always the best way that the public sector sets out all the details of procurement conditions and a price becomes a dominant factor for the selection; and (iv) rights and duties of the public and private sectors are different from the traditional public sector procurement. These characteristics make it difficult for the government to adopt a simple procurement procedure.

International experience in the award of privately financed infrastructure projects has in fact revealed some limitations of traditional forms of competitive selection procedures, such as the tendering method. In view of the particular issues raised by privately financed infrastructure projects, UNCITRAL set out four areas for the Government to consider adapting particular procedures for the selection of the concessionaire. These four areas include (i) range of bidders to be invited, (ii) definition of project requirements, (iii) evaluation criteria, and (iv) negotiations with bidders. These are partly because (a) PPP projects typically involve complex, time-consuming and expensive proceedings, (b) the output expected from the project is more emphasized than technical details of the works to be performed, and (c) projects are typically expected to be financially self-sustainable, with the development and operational costs being recovered from the project's own revenue.

11.4.3 Selection and Contract Award

Public and private partners embarking on a PPP choose to develop a long relationship; they want it to last and to be as fruitful and peaceful as possible. For each party, the choice of the adequate partner is of paramount importance. The objective of the bidding process is to choose a suitable partner, on the best possible terms a partner with the skills, experience and resources necessary to secure the desired improvements in services to consumers in the most efficient way possible.

To bid or not to Bid

During the selection and award process, the public entity launching the PPP will make efforts to attract the best potential partners. On their side, private firms are eager to find the adequate project in the adequate environment, promoted by public parties with whom they will be willing to enter into partnership.

Except in very specific cases, experience has shown the greater efficiency of competitive bidding over direct negotiation. Competition is all the more important when private companies are bidding for a monopoly right to provide services over some period of time (3 to 5 years for a management contract, 25 to 30 years for a concession).

On both public and private sides however, not everyone is convinced that competitive bidding is the best way to initiate the close relationship required to develop successful PPPs. Choosing the appropriate selection process should be a Government's first task.
This section addresses the question of how to design a bidding process so as to bring this kind of competitive pressure to bear and to get the best possible outcome.

The bidding process is not an isolated event. Rather, it is the beginning of a partnership between the government and a private sector partner. The institutional and regulatory framework established to guide that relationship may, over the long term, have an even more important impact on the quality of outcomes for consumers than the bidding process—and bidders can be expected to take this fact into account. Issues relating to this framework are discussed further in the next section.

The first part of this section discusses the relative strengths of competitive bidding processes and negotiated contracting. The next two parts assume that a competitive approach has been chosen and focus on the design of prequalification procedures and the design of bidding processes. The fourth part looks at final negotiations with the selected private partner and financial closure.

Choosing a Process for Awarding the Contract

Although there are a wide variety of possible contract bidding and award procedures, they can be grouped into three categories:

- Competitive bidding.
- Competitive negotiations.
- Direct negotiations.

Competitive bidding

The International Financial Institutions emphasized the importance of the competition. Competition in the market is not easily introduced in PPPs. Such projects are regulated by long-term contracts and once the agreement is signed, the private party enjoys a quasi-monopolistic situation. When the private operator is being paid by the Government, prices are usually pre-determined by the contract and only fluctuate to a very limited extent. When the operator gets its revenue from road users (mainly toll roads), the competition it faces is limited to possible alternative free roads that the user could use if not satisfied by the service offered for the price he/she pays.

The selection process provides an opportunity to bring in fair competition "for" the market and optimize the quality of the services to be delivered over the cost of the project for the community.

A competitive bidding process generally has the following parts:

- Public notification of the government's intention to seek a private partner for the provision of public services, including a request for expressions of interest from private companies.
- Distribution of bidding documents and draft contracts to potential bidders.
- A formal process for screening potential bidders and finalizing a list of qualified bidders.
- A formal, public process for presenting proposals, evaluating them, and selecting a winner.

The main advantages of competitive bidding

(i) It ensures transparency;
(ii) It provides a market mechanism for selecting the best proposal; and
(iii) It stimulates interest among a broad range of potential partners.

The main disadvantages

It works best where outputs are standardized and all technical parameters can be clearly defined. It may encourage underbidding if renegotiation is possible later.

Designing a competitive bidding process—and getting the best possible result with it is easiest when the product or service required is a fairly standard one and the technical outputs can be defined with reasonably certainty in the bidding documents.

Competitive negotiations

Competitive negotiations, a variant on competitive bidding, generally involve the following stages:

- The government specifies its service objectives, and seeks proposals from private operators for meeting these objectives, through a request for proposals.
- The government reviews the proposals and selects those that are technically responsive to the request for proposals.
- The government then negotiates contract terms and conditions with the selected bidders.

Competitive negotiations may involve simultaneous negotiations with two or more bidders with the objective of awarding one contract, or they may result in the award of several contracts. Competitive negotiations are well suited to projects in which many technical variations are possible, there is much scope for innovation, and it would be difficult to secure project financing on the basis of standardized contract documents.

The approach has some risks, however. In particular, it is less transparent than a pure competitive bidding approach. Evaluating proposals on a variety of technical and price grounds increases the opportunities for giving preference to favored bidders. The government can try to reduce this risk by specifying publicly, and as clearly as possible, what the evaluation criteria will be, by standardizing the negotiation processes across bidders, and by keeping a detailed record of the process.

The main advantages of competitive negotiations

(i) They permit bidders to be more creative and innovative;
(ii) They reduce the incentive for bidders to deliberately underbid in order to win projects; and
(iii) They offer a richer means of screening bidders than price alone.

The main disadvantages

(i) Bids can be difficult to compare; and
(ii) Competition is less transparent than with competitive bidding.

Direct Negotiation

Direct negotiations occur most often where a project idea originates with a private sector sponsor rather than with the government. A developer or operator seeks to negotiate directly with a government or a public utility the terms and conditions for a management contract, BOT or concession. Allowing direct negotiations can be a good way of attracting innovative projects and securing private sector involvement in smaller cities and towns (where the costs of entering competitive bidding contests may be high relative to the expected returns). But direct negotiations make it difficult to ensure transparency in the selection process and an efficient outcome. Without competition, it is much harder to assess the reasonableness and cost-effectiveness of a proposal. Also, direct negotiations can increase the risk of reversal for a contract, especially where there is some public resistance to privatization.

The main advantages of direct negotiations

(i) They provide incentives for private companies to find innovative solutions to local service problems; and
(ii) Where the costs of competitive bidding would be high relative to expected revenues (as in small towns), they increase the chance of private sector interest.

The main disadvantages

(i) The approach lacks transparency;
(ii) The absence of competition reduces pressures for cost-effectiveness; and
(iii) Political sustainability may be a problem.

If direct negotiations are allowed, governments must take extra steps to ensure transparency and efficiency. For example, a government might establish an independent advisory panel to advice on whether direct negotiations are appropriate for a particular project. Requiring all contracts to be approved by the representative body of the government (national or local) and audited by the government auditor could enhance transparency. And assessing proposed projects using benchmark comparisons of construction costs or service tariffs from comparable projects and operations could increase the chances of an efficient outcome. (But comparable projects might not be easily identified.)

Although most governments state a preference for competitive bidding to select private partners, some allow direct negotiations under certain circumstances and have adopted rules for handling them aimed at reducing their risks.

Summary

In general, the more competitive and transparent the process for choosing a contractual partner is, the greater the likelihood that the best possible deal will be achieved and that the deal will be politically sustainable is. For these reasons, most governments—and also multilateral agencies such as the World Bank—favor or explicitly require competitive bidding of private sector contracts. As many countries have laws that explicitly forbid direct negotiations, in Egypt the direct contracting is limited to mainly urgent cases.

As indicated above, however, there may be circumstances that make it difficult to achieve perfectly competitive bidding, if information about what is being bid is substantially incomplete, for example, or there are a range of possible solutions to the service problems the government tries to solve, the government may wish to enter into a dialogue with potential bidders to work out how best to specify the contracts. This approach does not preclude competition, but it does reduce transparency and the chance that bidders will be able to bid on equal terms. In these cases governments might need to implement special rules, processes, and auditing procedures to ensure that the best possible partner is found, on the best possible terms, and that the resulting deal will stand up to political scrutiny.

11.4.4 Bidding Procedure

Pre-qualifying Bidders

A government entering into a contract for private sector participation in infrastructure is establishing a long-term relationship with its contractual partner. To be confident that the relationship will work, it needs to be able to assess the quality of the partner's bid (what it promises to do and on what terms), but also whether the partner is truly qualified to do what is needed. Prequalification is a way to ensure that potential bidders have the technical and financial capacity the task demands and a track record in performing similar tasks.

Prequalification can also reduce the costs of bidding processes. Those involving large numbers of bidders can be complex and costly without necessarily increasing the quality of the winning bid. For this reason, governments often choose to limit bidding to a few pre-qualified firms. Limiting the number of bidders can also increase firms' motivation to participate in bidding, because it increases each bidder's chance of winning.

Prequalification criteria generally include some combination of the following:

- Minimum share capital of the bidder company.
- Length of experience in the business.
- Size of the customer base currently served by the bidder company.
- Number of countries in which the bidder has similar experience.
- Efficiency and performance of recent projects.

The criteria may be either qualitative or quantitative. Qualitative criteria allow greater flexibility and discretion, but they are also less transparent and more likely to produce complaints by bidders that fail to pre-qualify.

The Bidding

In a bidding process, prospective private partners make proposals that set out the terms under which they are willing to provide the services required by the government.

Ensuring that the proposals are high quality requires detailed planning and decision-making by the government. The first step is to design the bidding process, which calls for decisions about:

- The information to be provided to bidders and the form it should be provided.

- The extent to which there will be discussions with bidders before the formal bidding begins and the form these discussions will take. The instructions to bidders on what their proposals should contain.
- The rules and scoring mechanisms that will be used to evaluate bids.
- How complaints and appeals will be handled.
- The timetable for bidding.

Information for Bidders

The better the information available to bidders about the state of business and about what the government wants a private partner to do, the better the chance that:

- Bidders will be able to prepare bids that are responsive to the government's requirements.
- Bidders will have a common understanding of what is needed and can enter bids that are competitive with one another.
- The risk of complaints about fairness and transparency both from bidders and from political critics will be kept to a minimum.
- Preparing and assembling this information will be one of the primary tasks of the advisers assisting the government with the transaction. Information which will be made available for bidders include:

(i) The set of bidding documents provided to bidders, focus on the form of private sector arrangement that the government seeks and the form that proposals should take, including draft contractual documents; and
(ii) The state of the infrastructure business including the results of technical audits and evaluations, financial information, information on staffing.

Bidding documents often include background (National development plan, the rational of PPP tender, project description, authority in the Government), schedule of the tender, requirements for submission of tender, technical information required (conceptual design and work details, operation and maintenance details, tolling system, traffic forecasts), commercial information required (implementation entity, guarantee and/or insurance), financial information required (financial strategy and funding commitment), and evaluation criteria.

Pre-bid Contacts with Bidders

In deciding what form a private sector arrangement should take, governments need to think not only about what they would like to happen, but also about how the private sector is likely to react to their proposals. For example, if a government might want the private sector to make large investments in new capacity and take all the commercial risks associated with them, the

private sector judges its country to be too high a risk to do so. Or a government might assume that local circumstances are so unattractive that the best it can hope for is a fixed fee management contract and unknowingly preclude initiatives by private companies that would be prepared to take more commercial risk.

To come up with the best possible private sector arrangement and avoid surprises at the bidding stage, it is generally a good idea to have informal discussions with bidders before finalizing the bidding documents. Bidder feedback on early drafts of the bidding documents or regulatory design can help identify changes that would make the transaction more attractive to private firms with no loss to the government or other stakeholders and result in better, more affordable bids.

11.4.5 Selection Criteria and Phases of the Procedure

There are two broad approaches to establish bid selection criteria. The first is based on a qualitative scoring of technical and financial proposals: the second is based on objective and quantifiable factors such as the maximum toll rate or the minimum government contribution to the project. The qualitative scoring approach allows the selection committee to consider a range of important factors in choosing a concessionaire. It also affords the concessionaire the flexibility to propose innovative solutions. This approach, however, generally requires comparing non-uniform proposals on a somewhat subjective basis, and thus reduces the transparency and competitiveness of the process.

The objective approach allows for a transparent and competitive process focused on the factors of most importance to the government. This approach, however, requires that all other actors, such as road design and risk-sharing terms, be held constant. Doing so may limit the private sector's flexibility to propose what it considers to be an optimal project.

In addition, when this approach uses numerous factors that are evaluated through a formula, the competitive focus on the one or two most important factors may be diluted.

The decision between having single or two-stage procedure for requesting proposals will depend on the nature of the contract, on how precisely the technical requirements can be defined and whether output results are used for selection of the concessionaire.

UNCITRAL recommends a two-stage procedure for privately financed infrastructure projects, when it is not feasible for the contracting authority to formulate project specifications or performance indicators and contractual terms in a manner sufficiently detailed and precise to permit final proposals to be formulated[9].

One-stage procedure

When the Government has a precise idea on the technical options and specifications to be chosen, private participants are asked to submit bids in strict accordance with the specifications imposed by the Government. Final selection is made on a price basis alone and little room for negotiation is left to the selected candidate.

Two-stage procedure

In particular when uncertainties remain on technical options to be retained, it may be undesirable or impractical to prepare complete technical specifications in advance. This is typical for large and complex PPP projects. In such a case, a two-stages bidding procedure may be used. In stage one, technical proposals based on a conceptual design or performance specifications are invited. They then are subject to technical and commercial clarifications and adjustments. In stage two, amended bidding documents are issued and final technical proposals and priced bids are submitted and evaluated.

Bid Contents and Evaluation

Bid requirements and evaluations will differ according to such factors as:

- What kind of private sector arrangement is sought (bids for management contracts will differ from bids for concessions).
- How complete the available information is.
- How fully the services being sought can be technically specified.

Most projects use a two-stage bidding system in which bidders submit a technical envelope and a financial envelope.

The technical envelope may have purposes ranging from simply obtaining an indication of firms' fitness and willingness to participate in bidding, to eliciting detailed proposals from bidders on how they would satisfy the government's requirements.

11.5 CONTRACT

11.5.1 Types of Contract

(1) Service Contracts

Service contracts secure private sector assistance for performing specific tasks installing or reading meters, monitoring losses, repairing pipes or collecting accounts. They are typically

for short periods, from six months to two years. Their main benefit is that they take advantage of private sector expertise for technical tasks or open these tasks to competition. They leave the responsibility for coordinating these tasks with the public utility managers. They also leave the responsibility for investment with the public sector.

Although relatively simple, service contracts must be carefully specified and monitored.

If a utility is poorly managed, its service contracts probably will be too. Service contracts are at best a cost-effective way to meet special technical needs for a utility that is already well managed and commercially viable. They cannot substitute for reform in a utility plagued by inefficient management and poor cost recovery.

(2) Management Contracts

Management contracts transfer responsibility for the operation and maintenance of government-owned businesses to the private sector. These contracts are generally for three to five years. The simplest involves paying a private firm a fixed fee for performing managerial tasks. More sophisticated management contracts can introduce greater incentives for efficiency, by defining performance targets and basing remuneration at least in part on their fulfillment. To be worthwhile, these more complex management contracts must produce efficiency gains large enough to offset the regulatory costs of establishing targets and monitoring performance against them.

Specifying clear and indisputable targets is often difficult, especially when information about a system's current performance is limited. Some targets may be beyond the private sector partner's power to achieve. Because management contracts leave all responsibility for investment with the government, they are not a good option if a government has as one of its main objectives accessing private finance for new investments. And because they do not necessarily transfer any of the commercial risk to the management contractor, they draw little on private sector incentives to reduce costs and improve the quality of services.

Management contracts are most likely to be useful where the main objective is to rapidly enhance a utility's technical capacity and its efficiency in performing specific tasks, or to prepare for greater private involvement.

Management contracts-a step towards greater private sector participation

Management contracts can be a good first step toward more full-fledged private sector involvement where conditions make it difficult for the government to commit to a long-term

arrangement or to induce the private sector to undertake capital investment or accept commercial or political risk. A management contract might be chosen, for example, where:

- Tariffs/user fees are too low to support a commercial operation, and the government needs time to increase tariffs/user fees or develop a system of public subsidies compatible with private sector participation.
- The regulatory framework has defects that need to be remedied before a long-term private sector arrangement can be secured.
- The country lacks a good track record in public-private partnerships.
- The government faces difficulties in getting key stakeholders to agree to long-term involvement of the private sector.

In such conditions, a management contract can provide a window of opportunity for developing trust between the public and private sectors and for the government to create an environment more conducive to private sector risk-taking.

Where lack of information about the system is a problem, a requirement to collect and disseminate this information can be included in the management contract. But making the contract holder responsible for gathering information could give it an advantage in bidding for a longer-term lease or concession. Appointing an independent engineer or auditor can help ensure equitable access to the information produced by the management contractor.

(3) Leases

Under a lease arrangement, a private firm leases the assets of a utility from the government and takes on the responsibility for operating and maintaining them. Because the lessor effectively buys the rights to the income stream from the utility's operations (minus the lease payment), it assumes much of the commercial risk of the operations. Under a well-structured contract, the lessor's profitability will depend on how much it can reduce costs (while still meeting the quality standards in the lease contract), so it has incentives to improve operating efficiency.
Leases leave the responsibility for financing and planning investments with the government. So if major new investments are needed, the government must raise the finance and coordinate its investment program with the operator's operational and commercial program.

Leases are most appropriate where there is scope for big gains in operating efficiency but only limited need or scope for new investments. Leases have also sometimes been advocated as stepping stones toward more full-fledged private sector involvement through concessions. But their administrative complexity and the demands they place on governments for commitment

are nearly as great as those of concessions, so a lease is a much bigger first step than a management contract.

"Pure" leases are rare, however. Most place some responsibility for investment on the private partner, if only for rehabilitation works. These contracts operate as a hybrid between a lease and a concession contract.

(4) Concessions

A concession gives the private partner responsibility not only for the operation and maintenance of a utility's assets but also for investments. Asset ownership remains with the government, however, and full use rights to all the assets, including those created by the private partner; revert to the government when the contract ends—usually after 25 to 30 years. Concessions are often bid by price: the bidder that proposes to operate the utility and meet the investment targets for the lowest tariff wins the concession. The concession is governed by a contract that sets out such conditions as the main performance targets (coverage, quality), performance standards, arrangements for capital investment, mechanisms for adjusting tariffs, and arrangements for arbitrating disputes.

The main advantage of a concession is that it passes full responsibility for operations and investment to the private sector and so brings to bear incentives for efficiency in all the utility's activities. The concession is therefore an attractive option where large investments are needed to expand the coverage or improve the quality of services.

On the government's side, administering a concession is a complex business, however, because it confers a long-term monopoly on the concessionaire. The quality of regulation is therefore important in determining the success of the concession, particularly the distribution of its benefits between the concessionaire (in profits) and consumers (in lower prices and better service).

(5) Build-Operate-Transfers Contracts

Build-operate-transfer (BOT) arrangements resemble concessions for providing bulk services but are normally used for greenfield projects. In a typical BOT arrangement a private firm might undertake to construct a new infrastructure, operate them for a number of years, and at the end of the contract relinquish all rights to them to the public entity. The government or the utilities would pay the BOT partner for services from the project, at a price calculated over the life of the contract to cover its construction and operating costs and provide a reasonable return. The contract between the BOT concessionaire and the utility is usually on a take-or-pay basis, obligating the utility to pay for a specified quantity of services whether or not that quantity is consumed. This places all demand risk on the utility. Alternatively, the utility

might pay a capacity charge and a consumption charge, an arrangement that shares the demand risk between the utility and the BOT concessionaire.

(6) Full or Partial Divestiture

Divestiture of infrastructure assets through a sale of assets or shares or through a management buyout can be partial or complete. A complete divestiture, like a concession, gives the private sector full responsibility for operations, maintenance and investment. But unlike a concession, a divestiture transfers ownership of the assets to the private sector, so the nature of the public-private partnership differs slightly. A concession assigns the government two primary tasks: to ensure that the utility's assets which the government continues to own are used well and returned in good condition at the end of the concession, and, through regulation, to protect consumers from monopolistic pricing and poor service. A divestiture leaves the government only the task of regulation, since, in theory, the private company should be concerned about maintaining its asset base.

But private companies may not always take the long view. Even with an asset sale, the regulator may need to scrutinize the utility's plans for renovating or enhancing its assets.

In England and Wales the regulator requires utilities to report the serviceability of their assets.

11.5.2 Contents of Contractual and Regulatory Documents

Basic factors to be included

Each of the three types of contract—concession, BOT and management—needs to address the following issues:

- Parties to the contracts that constitute the arrangement
- Object and scope of the contractual arrangement
- Duration of the arrangement, events for early termination
- Obligations and rights of the concessionaire
- Obligations of the Government
- Key regulatory provisions
- Key risks to be managed
- Performance to be measured and monitored; key performance indicators
- Assets (including land) transfer
- Consents required
- Disputes resolution

11.6 PRINCIPLE OF WORK AND RISK SHARING BETWEEN THE PRIVATE AND PUBLIC SECTORS

Basic Concept of Work and Risk Sharing

The substance of the project agreement is defining risk allocation between the public sector and the private sector and clarifying who takes what kind of risks according to the project structure. When cash flow generated by the project will be used as a source to pay back the funding costs under PPP scheme, the project agreement needs to identify factors which will affect project cash flow and define entities who will take a responsibility for additional costs due to the change of these factors during the contract period.

Although each risk associated with the project specifics needs to be reviewed for the decision of risk sharing, in principle, the implementation/operating risks of the project will be undertaken by the project implementing agency who is allowed to define detail services. Each risk transferred from the public sector to the private sector must be realized when the private sector is best able to manage or absorb each particular risk. Excess risk transfer will cause additional costs for the private sector and the project will not be able to achieve maximum VFM.

11.6.1 Illustrative Work Sharing for Cairo Expressway PPP

Even when the government conducts public services on road under a traditional public procurement, a part of public works, such as construction and maintenance, has been undertaken by the private sector. The major interest of the government is procuring the cheapest upfront capital expenditure, while the private sector is responsible for delivering an asset on time and budget.

In contrast, PPP requires the private sector to compete to deliver services over the long-term at the most economically advantageous price. The public sector is not interested in simply procuring the cheapest upfront capital expenditure. With PPP, the public sector is looking to achieve the best value over the life of the asset and project. The private sector has to design and implement projects with a view to their long-term cost to the taxpayer rather than the immediate capital spend.

For expressways in general, land acquisition and relocation works are usually remained in the public sector. Ownership of the road assets is another item which needs to be considered. Usually this is retained by the party that also bears the financing risks as the assets are often utilized and required as security for mobilizing funding. In Egypt, concessionaires had not been generally allowed to own infrastructure assets. However, in order to correct this

constraint for private sector participation, Presidential Decrees have been issued on each BOT transaction.

We assume that design, construction management, construction work, toll collection, clearance of traffic accident, maintenance management, maintenance work and rehabilitation work will be transferred to the private sector in a phased manner. Toll collection is a labor intensive work so that this function will be transferred to the private sector in order to avoid enlarging MEA and increasing operation cost. Output based and package contract will delegate construction and maintenance management to the private sector in an efficient manner and minimize MEA's role and organization.

On the other hand, the government including MEA would be responsible for core roles such as setting up a new institutional framework, conducting overall planning, coordinating, undertaking most of the financing responsibilities and related risk including currency risk.

Based on our analysis on the expressway projects and road sector development, we provide general concept of work sharing between GOE/MEA and the private sector as shown in Table 11.6-1.

Table 11.6-1 Summary of Work Sharing among GOE, MEA and Private

Work sharing	GOE	MEA	Private
Establishing institutional framework	++	*	
Network planning	*	++	
Financing	*	++	*
Negotiation and monitoring private sector		++	
Land acquisition	*	++	
Design approval & Construction management		*(early stage)	++
Design & construction work			++
Traffic management	*	++	
Toll collection		*	++
Clearance of traffic accident			++
Maintenance management		*(early stage)	++
Maintenance work			++
Upgrading & rehabilitation planning		++	
Upgrading & rehabilitation work			++

*++: main, *: sub*

11.6.2 General Principle of Risk Sharing for Cairo Expressway PPP

Various risks are defined and allocated to appropriate parties who are able to manage risks in minimum costs. Taking the above assumption on work sharing into account, proposed risk sharing matrix is shown in Table 11.6-2.

Force Majeure: The parties face the risk that the project may be disrupted by unforeseen or extraordinary events outside their control, which may be of a physical nature, such as natural disasters floods, storms or earthquakes or the result of human action, such as war, riots or terrorist attacks. Such unforeseen or extraordinary events may cause a temporary interruption of the project execution or the operation of the facility, resulting in construction delay, loss of revenue and other losses. Severe events may cause physical damage to the facility or even destruction beyond repair. This risk will be Political Risk: The project company and the lenders face the risk that the project execution may be negatively affected by acts of the contracting authority, another agency of the Government or the host country's legislature. Such risks are often referred to as "political risks" and may be divided into three broad categories: "traditional" political risks (for example, nationalization of the project company's assets or imposition of new taxes that jeopardize the project company's prospects of debt repayment and investment recovery); "regulatory" risks (for example, introduction of more stringent standards for service delivery or opening of a sector to competition) and "quasi-commercial" risks (for example, breaches by the contracting authority or project interruptions due to changes in the contracting authority's priorities and plans).

In addition to political risks originating from the host country, some political risks may result from acts of a foreign Government, such as blockades, embargoes or boycotts imposed by the Governments of the investors' home countries.

Construction and Operation Risks: The main risks that the parties may face during the construction phase are the risks that the facility cannot be completed at all or cannot be delivered according to the agreed schedule (completion risk); that the construction cost exceeds the original estimates (construction cost overrun risk); or that the facility fails to meet performance criteria at completion (performance risk). Similarly, during the operational phase the parties may face the risk that the completed facility cannot be effectively operated or maintained to produce the expected capacity, output or efficiency (performance risk); or that the operating costs exceed the original estimates (operation cost overrun). It should be noted that construction and operation risks do not affect only the private sector.

Commercial Risks (Traffic demand and toll revenue risks): "Commercial risks" relate to the possibility that the project cannot generate the expected revenue because of changes in market prices or demand for the goods or services it generates. Both of these forms of commercial

risks may seriously impair the project company's capacity to service its debt and may compromise the financial viability of the project.

Exchange rate and other financial risks: Exchange rate risk relates to the possibility that changes in foreign exchange rates alter the exchange value of cash flows from the project. Prices and user fees charged to local users or customers will most likely be paid for in local currency, while the loan facilities and sometimes also equipment or fuel costs may be denominated in foreign currency. In addition to exchange rate fluctuations, the project company may face the risk that foreign exchange control or lowering reserves of foreign exchange may limit the availability in the local market of foreign currency needed by the project company to service its debt or repay the original investment.

Another risk faced by the project company concerns the possibility that interest rates may rise, forcing the project to bear additional financing costs. This risk may be significant in infrastructure projects given the usually large sums borrowed and the long duration of projects, with some loans extending over a period of several years.

Table 11.6-2 Summary of Risk Sharing among, GOE, MEA, Private and Expressway Users

Risk Category	GOE	MEA	Private	Expressway Users
Political risk	++			
Legislative and regulatory risk	++	*		
Force majeure	*	++		
Network planning risk		++		
Devaluation and exchange rate risk	++	*		
Interest rate risk		++	*	
Financing risk		++	*	
Inflation risk		*	*	++
Land acquisition risk	*	++		
Traffic demand and toll revenue risk	*	++	*	
Design and construction risk			++	
Operation risk (MEA's responsibility)		++		
Operation risk (Private responsibility)			++	

*++: main, *: sub*

CHAPTER 12

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

CHAPTER 12

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

12.1 GENERAL

This chapter summarizes results of the EIA (Environmental Impact Assessment) study consisting of the Environmental Impact Assessment (EIA) based on the Egyptian law and Social Impact Assessment (SIA).

The purposes of the studies are:

- To collect, analyze and synthesize relevant the necessary primary and secondary physico-chemical, biological and socio-economic data
- To identify and assess beneficial and adverse impacts of the project at various stages of its implementation (i.e., pre-construction, construction, and operation)
- To recommend mitigation measures that will minimize effects of the adverse impacts
- To obtain the necessary environmental permits and approvals for the project from concerned agencies
- To instill awareness about the project by generating activities for public participation and by soliciting their opinion in such venues in the course of the studies

Details of the said studies are presented under separate volumes: Environmental Impact Assessment, 2008 and Social Impact Assessment and Resettlement Action Plan.

12.2 ENVIRONMENTAL CONSIDERATION

12.2.1 Project Impacts

(1) Positive Impact

The project will bring about the following positive environmental impacts:

- On the national and local economies
  - Acceleration and efficient movement of people and materials
  - Increase of investment opportunities
  - Promotion of industries, commercial activities and tourism.
- On road-users and other beneficiaries
  - Safe and convenient trips (commuters)

- Comfortable driving (drivers)
- Time savings (drivers, commuters, other road-users)
- Increase in the volume of business (businessmen)
- Clearance of slum areas thereby improving the living conditions/standard of the people

- On ambient
  - Relief of traffic congestion
  - Cleaner air/improved air quality
  - Reduced noise
  - Reduced vibration
  - Safer transport infrastructure
  - Contribute to the reduction of green house gas emissions causing global warming

(2) Negative impact

The following negative impacts may be caused by the project during construction and even after implementation/during operation and they must be properly mitigated at the cost of beneficieries:

- Pollutions may be worsened about (mainly during construction):
  - Air quality
  - Noise
  - Vibration
  - Water contamination
  - Waste
- Culture and daily life conditions may be affected by:
  - Traffic congestion (during construction)
  - Landscape
  - Safety and health risks
  - Cultural assets
  - Sensitive facilities
- Social issues may arise for
  - Local economy including employment and livelihood
  - Use of land and local resources
  - Unity of local economy
  - Present social facilities and services
  - Poor and socially vulnerable people
  - Confrontation between benefited and non-benefited (damaged) groups, and between such communities
  - Gender

- Children's labor
- Landscape of culturally important
- Landscape from the view of residents facing proposed highway
- Privacy of residents near the viaduct

12.2.2 Outline of the Project

Present studies can be classified as follows:

Table 12.2-1 Outline of the Project

	Section	Length (km)	Major Structures
Feasibility Study	E1-2	5.56	Single Deck, Tunnel (Shield)
	E2-2	1.88	Double Deck
	E3-1	6.52	Tunnel (Cut and Cover) / Depressed
Pre-feasibility Study	E3-2	6.88	Single Deck
	E3-3	5.50	Double Deck

The location of each section is shown in Figure 12.2-1.

The above structures will require the following volume of materials:

Table 12.2-2 Material to be used for Construction

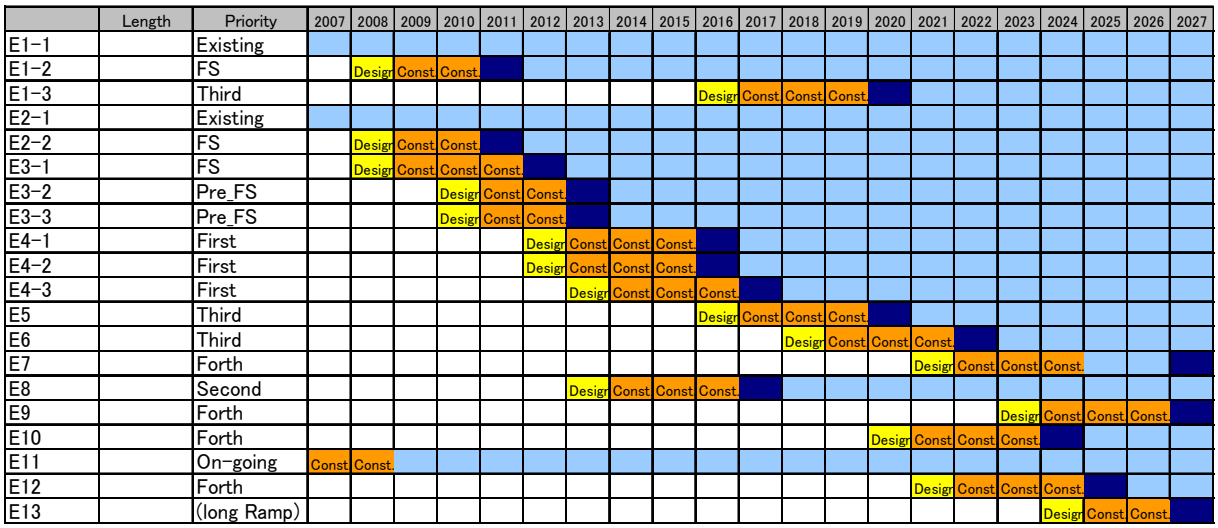
Type of Construction	Materials	Unit	Quantity
Structure Construction	Fresh Concrete	m^3	601,924
	Steel	ton	465,818
Pavement	Asphalt Concrete Paving	m^2	606,278
	Concrete Paving (t = 250mm)	m^2	9,610

Construction costs are estimated at approximately USD 1,200 million for F/S sections and about USD 800 million for Pre-F/S sections.

Figure 12.2-1 Location of Study Route

All construction work should be completed by 2012. Construction schedule is given below.

Figure 12.2-2 Proposed Construction Schedule



12.2.3 Pre-EIA Activities and Review of IEE

(1) Pre-EIA Activities

In May 2007, the preparatory Study Team for the "Feasibility Study on High Priority Urban Toll Expressways in Cairo" have arrived in Cairo to conduct scoping and screening. Results were reviewed by more detailed site reconnaissance and pre-EIA activities, as shown in Table 12.2-3

Table 12.2-3 Outline of Pre-EIA Activities

Title	Items		Location	Duration
24 Hours Monitoring	Air Pollution, Noise and Vibration	NO_2, SO_2, CO, O_3, PM_{10}, L_{Aeq} and L_{10}	5 locations (studios, recreational, residential, commercial and historical heritage areas)	Nov. 2007 and Jan. 2008
7 Days Monitoring	Air Pollution, Noise and Vibration	NO_2, SO_2, CO, O_3, PM_{10}, L_{Aeq} and L_{10}	1 location (commercial area)	Mar. 2008
Monitoring Between Tall Buildings	Air Pollution and Noise	NO_2 and L_{Aeq}	E2-2	Mar. 2008
Simplified Prediction	Air Pollution and Noise	NO_2, SO_2, CO, PM_{10}, L_{Aeq}	E1-2, E2-2, E3-1, E3-2 and E3-3	Mar. 2008
Social Survey	Interviews	Perception, Social and Economic Conditions	500 samples near the site	Sep. 2007 to Jan. 2008

The results are summarized hereunder while the detailed data are presented in **Appendix 12.1(CD-ROM)**.

1) The 24 Hours Monitoring

This monitoring was made to understand the present situation of air pollution, noise and vibration at five typical areas along the study route. Results are shown in Table 12.2-44.

Together with the results of the *7 Days Monitoring*, indicate that almost all levels of air pollution monitored were within the allowable limits of Egyptian standards.

Monitoring details are presented in the *24 Hours Monitoring Report* and the *7 Days Monitoring Report*, respectively.

Results on monitoring of noise and vibration for 24 hours and for 7 days are presented in Table 12.2-55.

Table 12.2-4 Results of Air Pollution Monitoring for 24 Hours and 7 Days

			SO_2				NO_2				O_3				CO				PM_{10}			
			micro-gram/m^3				micro-gram/m^3				micro-gram/m^3				milli-gram/m^3				micro-gram/m^3			
			Nov. 07	Jan. 08	Mar. 08	Aug. 08	Nov. 07	Jan .08	Mar. 08	Aug. 08	Nov. 07	Jan. 08	Mar. 08	Aug. 08	Nov. 07	Jan. 08	Mar. 08	Aug. 08	Nov. 07	Jan. 08	Mar. 08	Aug. 08
			24 hrs	24 hrs	7 days	24 hrs	24 hrs	24 hrs	7 days	24 hrs	24 hrs	24 hrs	7 days	24 hrs	24 hrs	24 hrs	7 days	24 hrs	24 hrs	24 hrs	7 days	24 hrs
Studio Area	Cairo University	Road	15	20	-	-	52	73	-	-	72	30	-	-	4.2	1.9	-	-	99	81	-	-
		Behind	9	8	-	-	54	54	-	-	32	37	-	-	1.2	1.4	-	-	25	27	-	-
Recreation area	Zamalek	Road	27	22	-	-	129	100	-	-	30	32	-	-	1.4	1.6	-	-	63	58	-	-
		Behind	10	25	-	-	40	92	-	-	46	25	-	-	2.5	2.1	-	-	60	59	-	-
Residential Area	Azhar University	Road	24	21	-	49	35	59	-	53	27	23	-	63	2.8	1.7	-	2.0	63	65	-	66
		Behind	-	-	-	4			-	34			-	84			-	1.0			-	26
Historic Area	Citadel	Road	47	42	-	-	151	83	-	-	25	33	-	-	2.9	3.4	-	-	93	84	-	-
		Behind	37	33	-	-	71	79	-	-	37	40	-	-	3.2	1.9	-	-	102	96	-	-
Comm'l. Area	Giza	Road	73	43	28	-	131	90	63	-	25	27	46	-	2.9	2.3	2.7	-	102	96	75	-
		Behind	16	12	10	-	126	68	45	-	26	24	41	-	1.3	1.5	1	-	86	59	53	-
Average		Road	37	30	-	-	100	81	-	-	36	29	-	-	3	2	-	-	84	77	-	-
		Behind	18	20	-	-	73	73	-	-	33	30	-	-	2	2	-	-	68	60	-	-
Method			UV Fluorescence				Chemiluminescene				Non-dispersive IR				UV Absorption				B-Ray Absorption			
Equipment			Environment SA, Model AF21M				Environment SA, Model AC31M				Environment SA, Model O3 41M				Environment SA, Model CO11M				Environment SA, Model MP101M			
Lower Detectable Limit			1.5				0.7				0.9				0.06				0.5			
Allowable Limits in Egypt		1 hr	350				400				200				30							
		8 hrs									120				10							
		24 hrs	150				150												150			
		1 year	60																70			

Table 12.2-5 Results of Noise and Vibration Monitoring for 24 Hours and 7 Days

			Noise Average				Vibration Average			
			L_{Aeq}, dB(A)				L_{10}, dB			
			Nov. 07	Jan. 08	Mar. 08	Aug. 08	Nov. 07	Jan. 08	Mar. 08	Aug. 08
			24 hrs	24 hrs	7 days	24 hrs	24 hrs	24 hrs	7 days	24 hrs
Studios Area (25-45dB)	Cairo University	Foreground	74	72	-	-	71	62	-	-
		Background	56	53	-	-	73	73	-	-
Recreation Area (35-60dB)	Zamalek	Foreground	66	69	-	-	65	64	-	-
		Background	57	66	-	-	62	50	-	-
Residential Area (40-60dB)	Azhar University	Foreground	76	74	-	73	66	80	-	68
		Background	-	-	-	48	-	-	-	68
Historic Area (60 dB)	Citadel	Foreground	74	73	-	-	65	54	-	-
		Background	63	39	-	-	62	81	-	-
Commercial Area (45-65 dB)	Giza	Foreground	72	68	70	-	71	70	67	-
		Background	55	59	59	-	64	57	68	-
Average		Foreground	72	71	-	-	68	66	72	71
		Background	58	54	-	-	65	65	58	54
Method			BS 5969 and BS 6698 Type 1				JIS C1510			
Equipment			Bruel & Kjaer, Denmark, No. 2260				Bruel & Kjaer, Denmark, No. 2513			
Allowable Error			1 dB(A)				1 dB			

Note: ( ) indicates allowable limits, interpolated as may be applicable in that area. There is no vibration standard in Egypt. As for Japan, 70 dB is the maximum allowable level of L_{10} which is caused by traffic vibration.

For noise, the average level obtained at background is within the quiet level [less than 60 dB(A)], as is the maximum allowable level for residential areas (the minimum allowable level is only 25). The average at the foreground is greater than 70 dB(A), which is the maximum allowable level set for a heavy industrial area.

Although there is no specification for vibration in the Egyptian Standards, the averages are 67-68 dB for foreground or background, which is slightly less than the maximum allowable vibration level by traffic.

2) Monitoring Between Tall Buildings

To see the effect of the viaduct constructed between buildings on pollution, monitoring of air pollution (NO_2) and noise (L_{Aeq}) between tall buildings were implemented at several floors of these buildings. The results are shown below.

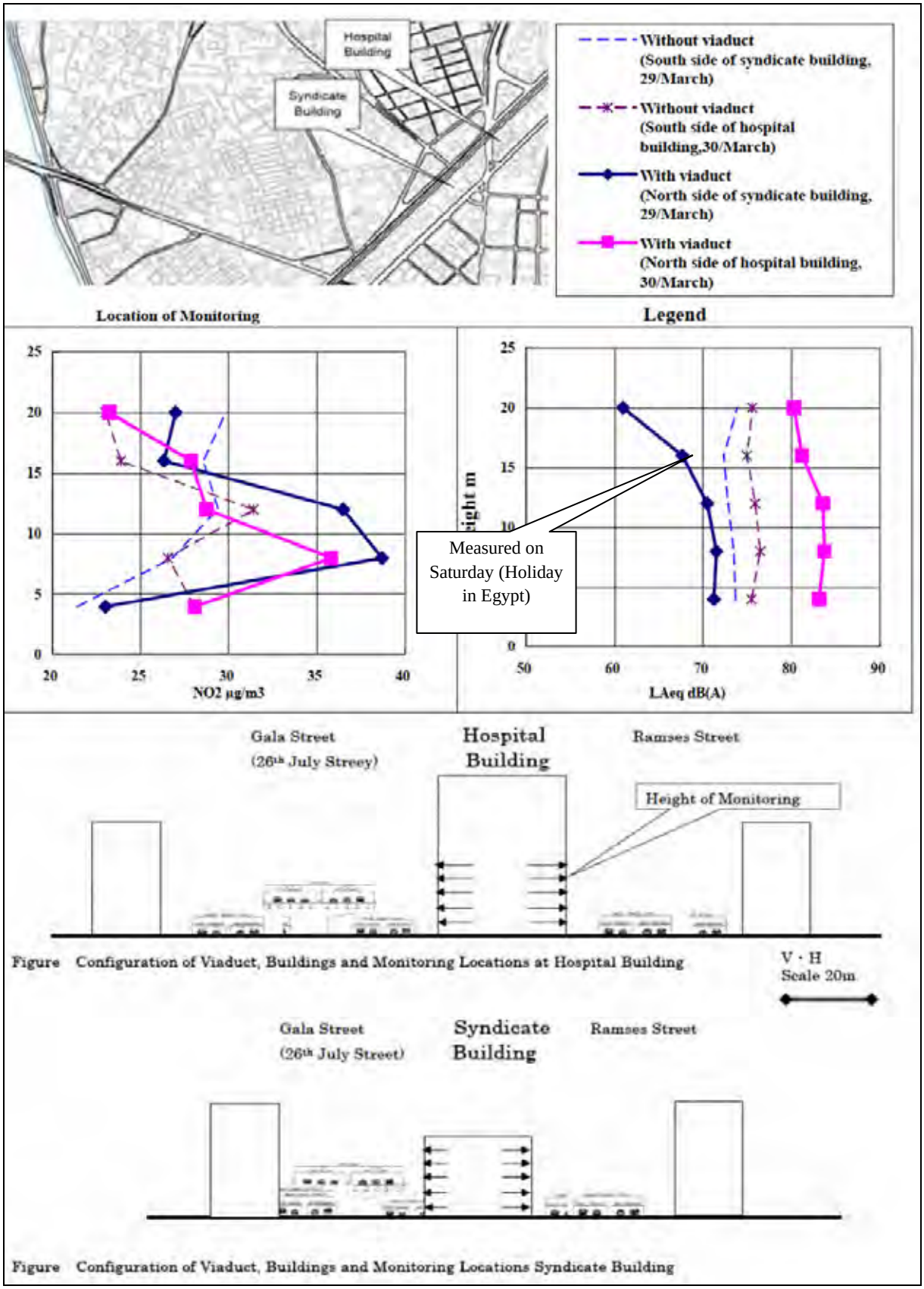


Figure Configuration of Viaduct, Buildings and Monitoring Locations at Hospital Building

Figure Configuration of Viaduct, Buildings and Monitoring Locations Syndicate Building

Figure 12.2-3 Results of Monitoring Between Tall Buildings

As for NO_2, it is clear that concentrations are always higher at the height of 10m where the viaduct is constructed. Noise decreases in proportion to height of the viaduct, while no such change is observed in the point without the viaduct. Details are presented in *Between Tall Buildings Monitoring Report*.

3) Simplified Prediction*

Prediction of air pollution and noise were made based on traffic volumes estimated for 2017 and 2027 at the five sections - E1-2, E2-2, E3-1, E3-2 and E3-3. Details are presented in the *Simplified Prediction Report*, together with the contour maps of concentrations and noise.

a. Air Pollution

Data obtained from the *7 days monitoring* was used as basis in the prediction of air pollution. Table 12.2-66 presents results of the prediction.

Table 12.2-6 Prediction of Air Pollution With and Without Project Cases

Substances and Units	Sections	Average Concentration for 1 Hour				Allowable Limits for 1 Hour
		2017		2027		
		Without Project	With Project	Without Project	With Project	
CO, mg./m^3	E1-2	1.4	1.4	1.4	1.4	30
	E2-2	1.4	1.4	1.4	1.4	
	E3-1	1.4	1.4	1.4	1.4	
	E3-2	1.4	1.4	1.4	1.4	
	E3-3	1.5	1.5	1.4	1.4	
NO_2, µg./m^3	E1-2	50	49	47	47	400
	E2-2	53	51	48	48	
	E3-1	52	49	48	47	
	E3-2	51	50	47	47	
	E3-3	57	57	51	51	
SO_2, µg./m^3	E1-2	11	11	12	11	350
	E2-2	12	11	12	12	
	E3-1	12	11	12	11	
	E3-2	11	11	11	11	
	E3-3	13	14	16	15	
SPM, µg./m^3	E1-2	55	54	53	53	-
	E2-2	56	55	53	53	
	E3-1	55	54	53	53	
	E3-2	55	55	53	53	
	E3-3	57	57	54	54	

** Daytime average results*

As shown in the table, all the results predicted are within Egypt's allowable standards limits. Furthermore, the concentrations improve or at least do not worsen by the construction expressway. Thus, the proposed expressway is considered at least not to worsen the air quality conditions.

b. Noise*

The situation is different for noise. The noise was predicted with same traffic condition as the prediction of air pollution. Noise levels predicted always exceeded the allowable Egyptian environmental limits of 60 dB for commercial/residential areas. However, when countermeasures are taken, the noise levels at-grade can be reduced less than 60 dB(A).

Table 12.2-7 Prediction of Noise With and Without Project Cases at Night Time

[Unit dB(A)]

		2017		2027		
		Without Project	**With Project**	**Without Project**	**With Project**	**With Project, Mitigation Measures* Taken**
E1-2	North	65	69	65	69	56
	South	66	68	66	67	59
E2-2		70	69	71	69	(Noise level improved by project)
E3-1		71	68	72	68	
E3-2	North	71	70	71	70	
	South	66	69	66	70	(Not much residents close to the road)
E3-3		72	74	74	75	60

* The table presents the results predicted at the edge of the pedestrian lane at the height 1.2m only.

** As mitigation measures, (1) 5m-high noise barrier, (2) noise absorbing panel at the reverse side of the deck and (3) porous pavement were assumed.

4) Social Survey

Results of the Social Survey are presented under **Section 12.3**.

(2) Review of IEE Results

Based on the foregoing pre-EIA activities, including site reconnaissance and information collection, conclusions were made, as summarized under Table 12.2-88a through 12.2-8c.

Table 12.2-8a Review of Previous Screenings (1/3)

	Results of IEE in Preparatory Study (July 2007)		Results of Present Study (March 2008)				Scoping (TOR for EIA)
			During Construction		During Operation		
	Category	Screening	Category	Re-screening	Category	Re-screening	Scoping
Traffic Congestion			A	Heavy traffic jam can be caused during construction stage	B	Traffic jam will be reduced by new traffic systems	Environmental management planning and environmental monitoring plan
Air Pollution	A	Increase of exhausted gases and dust during construction and operation at some routes with increase traffic volume	B	Exhausted gases from heavy equipment	B	Generally, air pollution will be improved with increased driving speed; in addition, elevated road and barriers promote the dispersion of pollutants in the most area, resulting in reduction of air pollution	
Water Contamination	B	Discharge of liquid waste from construction work in Nile River and penetration or leakage of painting material/fuel	B	The groundwater table is said to be very high (GL-1.5m), implying that groundwater is vulnerable to pollutants percolating from ground surface	C	No water is contaminated	
Soil Contamination	C		B	Leakage of fuel oils may be caused from construction vehicle/fuel tank	C	No soil is contaminated	
Waste	A	Generation of huge volume of construction waste and excavated soils, although present waste management system is not with sufficient capacity	A	Design length of tunnel and depressed sections is likely to be increased, hence will the volume of excavated soil; in addition, demolition of existing viaducts will produces concrete waste, however, both soil and concrete wastes are harmless to human health; the problem could be the indiscriminate mixing of waste and materials for reuse	C	No waste is generated	
Noise and Vibration	A	At construction and operation stages	A	Noise of heavy equipment can be a problem	A	Noise will be increased with increased driving speed of vehicles	Environmental management planning and environmental monitoring plan
Ground Settlement	B	Unknown; to be confirmed		Field Investigation		Field Investigation	
Offensive Odor	C	No information about odor	B	Exhausted gas from heavy construction equipment	B	Exhausted gas from heavy vehicles	
Topography and Geology	C	No impact since the project is improvement of existing traffic network					

Table 12.2-8b Review of Previous Screenings (2/3)

	Results of IEE in Preparatory Study (July 2007)		Results of Present Study (March 2008)				Scoping (TOR for EIA)
			During Construction		During Operation		
	Category	Screening	Category	Re-screening	Category	Re-screening	Scoping
Fauna and Flora	C	No impact since the project is improvement of existing traffic network	C		C		
Water Right	C	No impact	C		C		
Accidents	B	Traffic accident caused may be increased at the detour sections at construction stage	B	Due to traffic congestion, number of traffic accidents may be increased	C		Investigation
Global Warming	C	Negligible since no deforestation or installation of generation sources is planned			C	Emission of CO2 will decrease with increased driving speed	
Involuntary Resettlement	A	Resettlement of residents may be generated, of more than 200 people	B	Some temporary relocation may be necessary	B	Some permanent relocation may be necessary	Public consultation through interviews and small group discussions; resettlement action planing or resettlement policy framework
Local Economy including Employment and Livelihood	A	Decline of some industries, including agriculture, and increase in the number of unemployed	A	Shopkeepers and street vendors may suffer from business loss by blockade of the road	B	Business can be affected by the opening of the new highway	
Use of Land and Local Resources	B	Present land-use, among all nationally important - the agricultural land-use, may be disturbed			C	No agricultural land is within the project site; an area of about 5m x 2,500m along section E3-1 may be acquired for road widening, but it is presently an open space	
Unity of Local Community	B	Loss of community's unity/identity by relocation of community member			B	Some permanent relocation may caused, resulting in the split of the community unit	
Present Social Facilities and Services	B	Impact to hospital/school and emotion opposing to introduction of toll system			A	Amount of toll charge is a critical issue	Check affordable prices through interviews

Table 12.2-8c Review of Previous Screenings (3/3)

	Results of IEE in Preparatory Study (July 2007)		Results of Present Study (March 2008)				Scoping (TOR for EIA)
			During Construction		During Operation		
	Category	Screening	Category	Re-screening	Category	Re-screening	Scoping
Poor and Socially Vulnerable People	A	Relocation of the poor and socially vulnerable people	B	Some vulnerable groups may be relocated in the DD stage			Small group discussions and full resettlement plan/ resettlement framework
Confrontation between Benefited and Non-benefited (damaged) Groups, and between Such Communities	B		B	Some confrontation may be caused	B	Some confrontation may be caused	Interviews and small group discussion
Gender	B	Gender gap, especially among the vulnerable groups, can be widened when they are further impoverished	B	Some gender gap can be deepened	B	Some gender gap can be deepened	
Children Labor	B	Child labor may be intensified when vulnerable people are further impoverished			B	Child labor can be intensified	
Landscape of Culturally important monuments	A	Historically and nationally important monument may be affected	C	Temporary blocking of culturally/ nationally important landscape shall be within endurable limits for residents	A	Permanent blocking of culturally/ nationally important landscape may be a problem	Interviews and small group discussions
Change of Landscape from the View of Residents facing the Proposed Highway			C	Blocking while construction period shall be within the endurable limit	B	Permanent change may be a problem (however, during the interviews, nobody raised the issue)	
Privacy of Residents near the Viaduct					B	Residents feel their privacy may be invaded by vehicles passing over the viaduct	

Full Resettlement Plan includes a statement of involuntary resettlement objectives and strategy, with (1) organization responsibility, (2) public participation and disclosure arrangement, (3) findings of socio-economic survey and social and gender analysis, (4) legal framework with eligibility criteria and entitlement matrix, (5) mechanism of resolution of conflicts and appeal procedure, (6) access to training, employment, credit, social shelter and other social services available.

As indicated above, some environmental impacts were considered as being severe and implementation of the EIA has been confirmed based on the rules and guidelines both of Egypt and international donors. The Terms of Reference (TOR) approved the following parameters to be studies at the First Stakeholders' Meeting:

- Traffic Congestion
- Air Pollution
- Water Contamination
- Offensive Odor
- Noise and Vibration
- Resettlement
- Local Economy
- Unity of Community
- Social Services and Facilities
- Poor and Vulnerable
- Confrontation between Benefited and Non-Benefited
- Gender
- Right of Children
- Landscape
- Privacy of Residents near Proposed Viaduct

Study results are presented in the following sections.

12.2.4 Public Participation

In accordance with Egypt's Environmental Law No. 4 and JICA's Guidelines on Environmental and Social Considerations, activities/venues for public participation were organized and conducted, as shown in Table 12.2-99.

Table 12.2-9 Implemented Public Participation Activities

Activities		Content	No. of Participants	Date/Duration
Stakeholders' Meetings	1st Stakeholders' Meeting	Explanation of the TOR	100 persons	13 March 2008
	2nd Stakeholders' Meeting	Reporting the Progress of EIA	120 people	23 June 2008
	3rd Stakeholders' Meeting	Presentation of EIA Results	120 people	4 September 2008
Group Discussions		Perception about the Project and Consultations	50 groups *	May to August 2008
Interviews		Perception about the Project and Consultations	2,000 households	May to August 2008
Open House	Borrowed Rooms of NGO Offices, Government Branch Offices and Youth House	Project Information Dissemination, Solicitation of Public Opinion and Group Discussions	5 locations	May to August 2008
Website		Project Information Dissemination and Solicitation of Public Opinion and Acceptance		May 2008 to August 2008
Newspapers	Two papers of nationwide publication	Announcement of Stakeholders' Meetings and Invitation of Interested		Before the 2nd and 3rd Stakeholders' Meetings, respectively

* Each group consists of about 10 people

As shown in the above table, the following activities were implemented:

(1) Stakeholders' Meetings

At the three Stakeholders' Meetings, TOR of the EIA, progress of the EIA and draft results of the EIA were presented and discussed. Minutes of these meetings are presented in **Appendix 12.2(CD-ROM)**. Participants were mostly government officials, private contractors and consultants. Although a small number of NGOs was there, no resident participated in spite of the invitation to them during interviews and group discussions with the promise to refund their transportation. The reasons for their non-attendance are:

- They have no experience presenting their opinions and discussing with government officials in a large meeting hall.
- They prefer to have a group discussion in a nearby place at a time of their convenience with their familiar neighbors, friends or people.

(2) Interviews and Group Discussions

Two thousand (2,000) people were interviewed and 50 group discussions (each with 10 participants) were held. The following were made at these forums:

- Project information including environmental impacts and mitigating measures were presented
- Participants' perceptions about the project and environmental impacts were collected
- Mitigating measures were discussed
- Minutes of the interviews/discussions were made and analyzed

These interviews and group discussion activities can be considered as small scale of stakeholders meetings for those who are unable (or reluctant) to participate in larger size stakeholders meetings. However, it has to be noted that, in these interviews/group discussions, there was overhead projector used to explain or present the project. Instead, project brochures were distributed and some drawings indicating the proposed routes/structures were demonstrated to them. The duration of explanation and discussion is of course much shorter than at the regular stakeholders meetings. It was also been noted that it may be necessary to improve the method of presentation at these small scale of stakeholders meetings to provide as much information as necessary.

(3) Open House

Total five open houses were set up along the study routes for information dissemination and solicitation of opinions. Rooms of NGO offices, youth houses and government branch offices were utilized for the following purposes:

- Preparation of project brochures for distribution
- Demonstration of route maps, montage photos, drawings of proposed structures
- Collection of opinions, comments or requests

(4) Website

The study team constructed a website in order to open the project information to, not only residents in Cairo but also people interested around the world. The website has the following contents:

- Invitation to stakeholders meetings
- Project background, including previous studies
- Proposed routes and structures
- Agreed scope of the study
- Organization of the study
- Contact details of the five open houses
- Environmental Impact Assessment (EIA) results, including results of stakeholders meetings with presentation materials (power point files)
- Montage photos of proposed structures

12.2.5 Alternative Study

(1) Planning Stage

Optimal infrastructure development and management was studied in the Transportation Master Plan and Feasibility Study of Urban Transport Project in Greater Cairo Region in the Arab Republic of Egypt (CREATS – Cairo Regional Area Transportation Study).

A number of different future scenarios (Scenario A to D) with different network conditions in both roads and public transport systems were studied in order to identify the optimal transport network to meet future demand. As a conclusion, "Scenario D: Optimized Core Network", as shown below, has been chosen.

Table 12.2-10 Components of "Scenario D (Optimized Core Network)

Modes	Project Components
Road Network	Committed Network + Proposed Improvements Urban Express Network (78km)
Public Transport	
MRT	Committed Net, Metro Line 4, Line 2 Extension Satellite Cities Corridors (The Wings)
LRT	Supertram System + Network Improvements
Bus/Shared Taxi	Optimized Route Structure Coordination with MRT/LRT Network

Source: CREATES

The following table briefly compares two scenarios – "Scenario A: Committed Network" consisting of implementation of committed project only and "Scenario D: Optimized Core Network" which includes committed network (Scenario A) + proposed improvements including the urban expressway network (78 km).

Table 12.2-11 Comparisons in Selected Criteria between Scenarios A (Committed Network) and Scenario D (Optimized Core Network)

Scenario	Present Situation 2001	Scenario A 2022	Scenario D 2033
Economically Efficient Transportation System			
Cost (LE billion)	-	18.2	59.8
Economy (B/C)	-	-	1.77
Trip Speed (km/h)	19.0 km/h	11.6 km/h	18.0 km/h
Modal Share of Public Transport (%)	70.9%	61.7%	57.9%
No. of Pax of Public Transport (Million)	13.3	18.2	20.3
Daily Vehicle-km (106pcu-km)	62.8	127.3	139.7
Congestion (V.C)	0.67	1.11	1.00
Equitable People's Mobility			
Population within 800m along Major PT (Million)	2.04	3.09	8.20
Employment within 800m along Major PT (Million)	1.11	1.70	4.20
Student within 800m along Major PT (Million)	0.74	1.08	2.70
Low Income Population within 800m along Major PT (Million)	46,300	68,400	188,300
Alleviation of Environmental Pollution			
CO2 Emission (106ton)1)	12.2	15.9	13.6

Notes; 1) A comparative analysis based on the Japanese vehicle emission factors

As shown in the table, Scenario D has been chosen for the following reasons:

- Economically efficient urban transport system: The reduction in trip speed will be recovered with the reduction in land congestion
- Equitable people's mobility: the population that will have access to public transportation will increase by four times with Scenario D
- Alleviation of environmental problems: with Scenario D, the CO2 emission will be 15% less than Scenario A

(2) Route Selection

Table 12.2-1213 presents the results of our alternative studies in the views of environmental considerations. In the route selection, following factors were taken into account:

- Government land is fully utilized to minimize the land acquisition from private owners
- To minimize resettlement
- Landscapes are an important property for the people of Cairo/Egyptians. There are many historic heritages in Cairo and blocking of these landscapes is discouraged. Alternatives such as tunneling or human relocation may be justified for this reason.
- The government's (Prime Minister's) request is also taken into consideration as one of the alternatives

Table 12.2-12 Alternative Studies and Environmental Considerations

Score	1	3	5
Length	Long	Intermediate	Short
Configuration	Underground	Viaduct	At-grade
Geometric (m)	< R120	R120 - R240	> R240
Land Acquisition (ha)	> 1.0	0.1 - 1.0	< 0.1
Community Accessibility	Fully Limited	Partially Limited	Non-limited
Traffic Diversion ('000 pcu/day)	> 10	5 - 10	< 5
Public Utilities	Large	Intermediate	Small
Landscape	Reserved	Partially Reserved	Urbanized
Environmental Impact	Large	Intermediate	Small
Other Infrastructures	Large	Intermediate	Small

The locations of the study routes are shown in **Appendix 12.3(CD-ROM)**.

Table 12.2-13 Results of Route Selection

Section	Routes	Length (km)	Structures	Possible Environmental Issues		Proposed Alternative
				Common Issues of the Section	Particular Issues to Respective Alternative	
E1-2	Via al-Duqqi Street	4.40	Viaduct		• Encroaching school and Oman Garden • Affecting landscape for Cairo University	
	Via al-Tahir Street	6.10	Viaduct		• Encroaching railway police building • Encroaching informal settlers residents at NAT site • Affecting landscape along River Nile	
	Via Al-Giza	5.10	Viaduct		• Encroaching Giza Police Station Building • Affecting landscape along River Nile	
	Via Al-Saera	5.56	Underground and viaduct		• Encroaching railway police buildings • Encroaching informal settlers residences at NAT and ENR site	Selected
E2-2	26th July	1.88	Single Viaduct parallel to existing one (proposed by the Prime Minister*)	East ramp passing over government shops	• Encroaching huge number of residential buildings (several hundreds of households)	
			Replacement of Present Viaduct (Double)		• Nil	Selected
E3-1	Autostrad	6.52	Viaduct	Large land is required for interchange (government land – desert) at the east end	• Affecting landscape for Monument of Unknown Soldiers	
			Depressed		• Nil	Selected
			At-grade		• Some land is required	
E3-2	Salah Salim-Autostrad	6.88	Viaduct above Railway	Encroaching private land (empty); deck passing above the edge of northern cemetery	• Affecting landscape of historic heritage Aqueduct	
			Viaduct above Autostrad		• Affecting landscape of historic heritage Citadel • Affecting landscape of historic heritage Aqueduct	
	Through Southern Cemetery**		Viaduct above Railway		• Nil	Selected
			Viaduct above Autostrad		• Affecting landscape of historic Citadel	
E3-3	Al-Salah Salem	5.50	Single Deck	Deck passing over the edge of Cairo University Land	• Large land acquisition at densely built-up residential area	
			Double Deck		• Nil	Selected
			Combination		• Some land acquisition	

* Settlement is located in the cemetery and 500 hundreds households can be affected by Ministry of Housing Project.

** The Ministry of Housing is planning to construct a road through the southern cemetery and the viaduct is proposed to be constructed only after that road becomes ready. Relocation of a large number of people will be implemented by the Ministry of Housing.

12.2.6 Outline of Infrastructure in Cairo

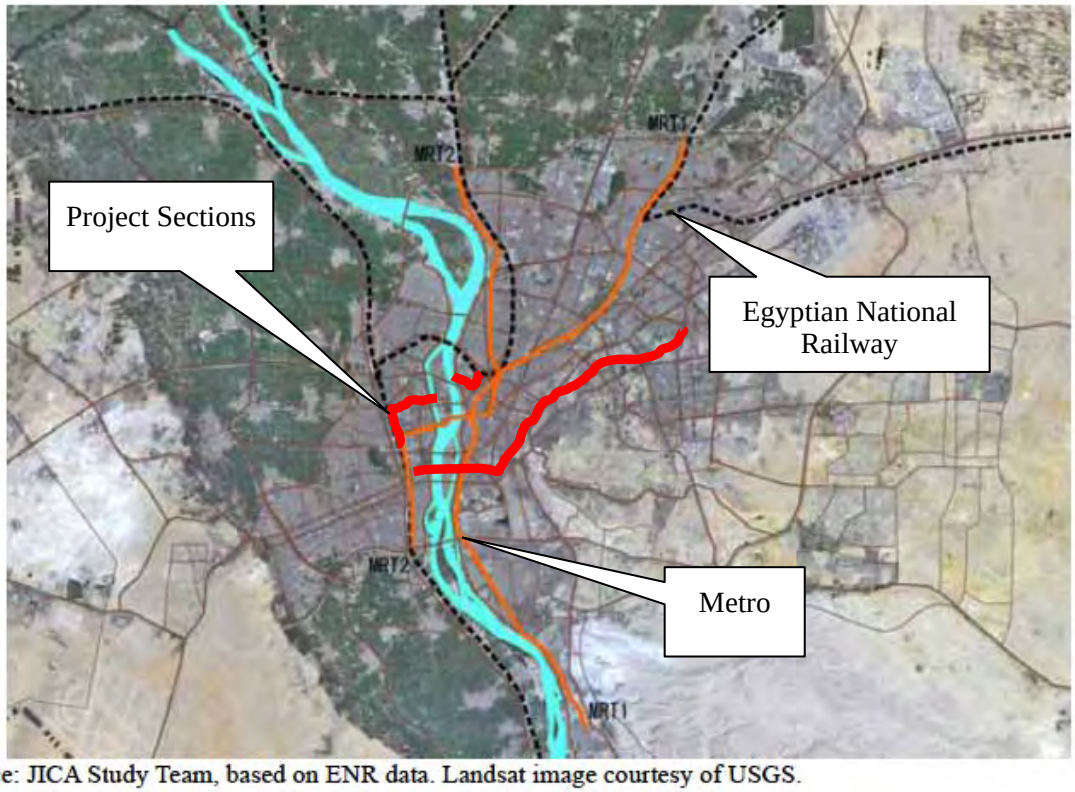
(1) Transportation System

Table 12.2-14 below summarizes the present condition of major transportation systems in GRC.

Table 12.2-14 Major Transport Systems in GRC

Means		Capacity/Scale	Daily Users/Car Owners
Metro		Line 1 (43 km) and Line 2 (21 km) with 52 stations in total	2,000,000 (2005 / 2006)
Egyptian National Railway			140,000 (2005 / 2006, GCR only)
Bus	Cairo Authority of Transport	4,100 Buses	4,100,000
	Private	7,300 Buses	7,600,000
Road Network		127 km including E1 to E13	1,000,000 (no. of car owners in GCR)

Source: CREATS and Statistical Year Book 2005



Source: JICA Study Team, based on ENR data. Landsat image courtesy of USGS.

Figure 12.2-4 Configurations of ENR and METRO Lines

(2) Water Supply

Water is supplied from 13 water purification plants operated by the Greater Cairo Water Supply Company (GCWSC), at about 6,000,000 tons per day, covering almost the entire demand in of the 18,000,000 population of the GCR. Mostly river water is used and only the rapid sand filtering method is employed for purification. For drinking water, the river water quality is reported to be not so bad per *Annual Environmental Report, 2005*.

(3) Wastewater Treatment

There are six wastewater treatment plants in GCR, most of which is of the Activated Sludge Method, with a total capacity of 4,000,000 tons per day. About 85% of the urban area and 11% of the suburb area are connected to the wastewater network. In areas not covered by the network, liquid waste is untreated and directly discharged into the drains and the desert, causing a high risk of pollution. What is worse monitoring of water quality is not properly done, hence, no mitigation is being implemented.

(4) Solid Waste

The amount of garbage generated daily in the GCR is estimated at 1,000 tons per day. Of this garbage:

- 50% is collected by private firms
- 20% is recycled by small-scale collectors; 80% of what they have collected is reused
- 30% is uncollected

There are eight dumping sites in GCR. Types are from the sanitary landfill system with leachate treatment plant attached to just open dumping without any control.

(5) Power Generation

There are 10 power plants in the GCR. The total generated power (2004/2005) was 22,000 kW. Air pollution from these plants is a major issue.

12.2.7 Traffic Congestion

The present traffic congestion in the GCR poses the biggest environmental issue. This situation is considered to be moderately improved by the implementation of the project. However, further congestion may be caused during the construction stage of the project, if not properly mitigated.

The Team has studied the traffic volume at each section and identified the possible detours based on the proposed construction routes. The following are recommended:

- A detailed detour plan shall be developed in the detailed design stage
- Proposed detour roads should be fully utilized to accommodate the traffic volume that will be generated by the construction
- Parking should be completely prohibited along the proposed detour roads
- Strong enforcement should go hand-in-hand with the awareness campaign

Table 12.2-15 Proposed Detours during Construction

Section	Major Roads	Width (m)
E1-2	El Cornich	28
	El Tahrir	30
	Wizart Al Zeraah	33
	Al Batal Ahmed Abd Al Aziz	33
	Al Said Al Ali	16
	Al Mathaf Al Zirai, (6 Oct.)	12
	El Nile	32
E2-2	Comiche-Al Nile	-
	Al Shikka Al Hadid	-
	Ramses	-
	El Tahrir	-
	Umm Kalsum	-
E3-1	Able to accommodate within the present route	-
E3-2	Not studied	
E3-3	Not studied	

Locations of these roads are shown in the following figures:

Figure 12.2-5 Locations of Possible Detours for Construction Work at E1-2 Section

Figure 12.2-6 Locations of Possible Detours for Construction Work at E2-2 Section

12.2.8 Air Pollution

(1) General

1) Present Condition of Air Pollution

Present conditions of air pollutions in the GCR were studied based on:

- Monitoring by the Study Team
- Examination of data obtained from the EEAA
- Reference to other sources such as Environmental Statement Report

Locations of air pollution monitoring sites by EEAA are as shown below:

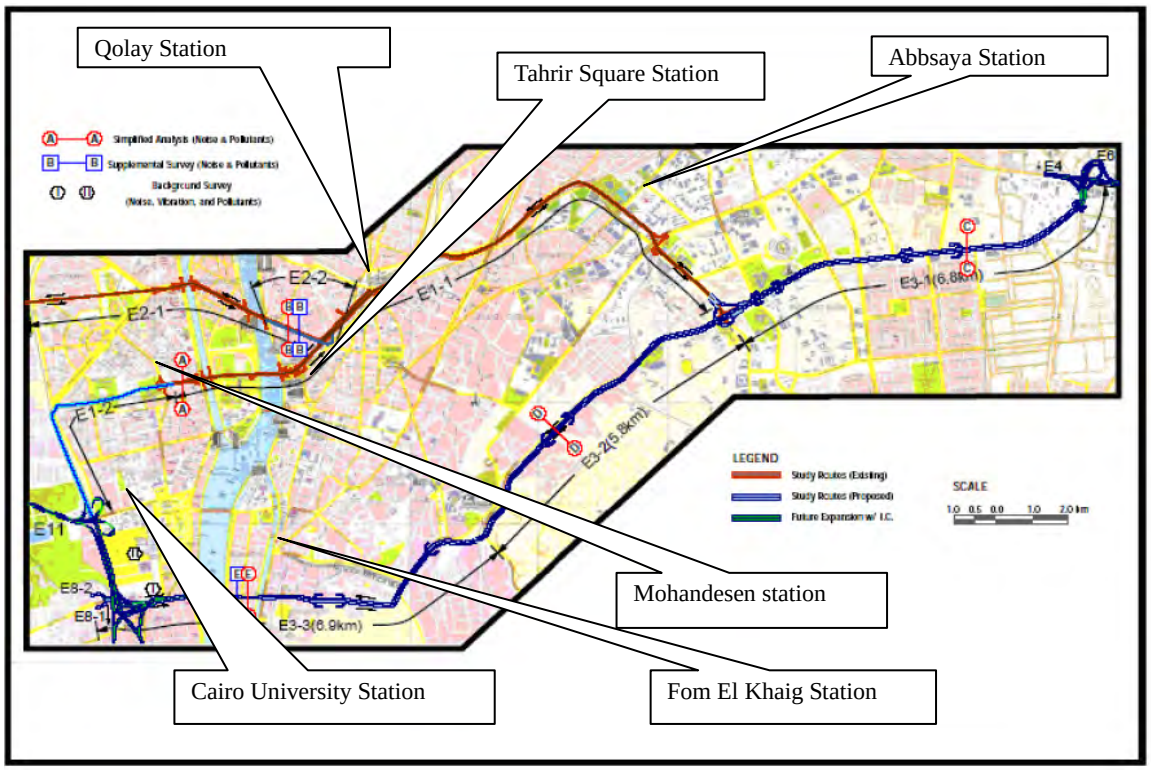


Figure 12.2-7 Locations of Air Quality Monitoring Stations near the Project Site

Results were obtained using EEAA equipment and are summarized in Table 12.2-16.

Table 12.2-16 Present Conditions of Air Pollutions in GRC

Pollutants		Concentrations, micro-gram/m^3	Measured	Allowable Limit, micro-gram/m^3	Exposure Period
SO_2	Sulfur Dioxide	0 – 124	Nov. 2007~Mar. 2008 by Study team	350	1 hr
		10 – 50		150	24 hrs
		30 – 50	1999~2007 by EEAA	60	1 year
CO	Carbon Monoxide	0.1 – 11 (milli-gram/m^3)	Nov. 2007~Mar. 2008 by Study Team	30 milli-gram/m^3	1 hr
		-	-	10 milli-gram/m^3	8 hr
		1 – 4	Nov. 2007~Mar. 2008 by Study team		24 hours
		3 – 4	2006~2007 by EEAA		1 year
NO_2	Nitrogen Dioxide	5 – 250	Nov. 2007~Mar. 2008 by Study Team	400	1 hr
		40 – 150		150	24 hrs
		40 – 80	2006~2007 by EEAA		1 year
O_3	Ozone	6 – 150	Nov. 2007~Mar. 2008 by Study Team	200	1 hr
		-	-	120	8 hr
		40 – 130	1999~2007 by EEAA		1 year
SPM	Suspended Particles Measured as Black Smokes	-	-	150	24 hrs
		40 – 60	2004~2005, Egypt State of Environmental Report 2006	60	1 year
TSP	Total Suspended Particles (TSP)	-	-	230	24 hrs
		-	-	90	1 year
PM_{10}	Respirable Particles (Pm 10)	20 – 100	Nov. 2007~Mar. 2008 by Study Team	150	24 hrs
		110 – 210	1999~2007 by EEAA	70	1 year
Pb	Lead	0.8 - 1.1	2004~2005, Egypt State of Environmental Report 2006	1	1 year

Conditions of air pollution were assumed not to be serious based on the following findings:

- SO_2 is continuously within the permissible range from 1999
- CO is within the permissible range at least for these few years
- NO_2 is mostly within the permissible range for these few years
- O_3 seems to be within permissible range in 1999, although no hourly data has been examined
- SPM is within the permissible range at least in 2005 and 2006
- PM10 is within the permissible range according to monitoring results from the end of 2007, although it had been much higher than the permissible level from 1999 to 2007; results were confirmed by repeating the monitoring for 1 week and during which, similar results were obtained
- Pb is slightly higher than the permissible limit in 2004 and 2005

Polycyclic Aromatic Hydrocarbons (PAHs) are of primary concern due to their carcinogenic and mutagenic potency to humans. Main emission of PAHs sources include cigarette smoke, vehicle exhausts, asphalt roads, coal, coal tar, wildfires, agricultural burning, residential wood burning, municipal and industrial waste incineration and hazardous waste sites. PAHs can be absorbed through the mouth, skin and can be contained in food. The following table summarizes the concentration of Polycyclic Aromatic Hydrocarbons monitored Autostrad (E3-1~E3-2) in 2006.

Table 12.2-17 Concentrations of Polycyclic Aromatic Hydrocarbons Monitored in 2006 at Autostrad

Compound	**Concentration, ng/m^3**	WHO Guidelines in Ambient Air*, ng/m^3	**Exposure Time**
Naphtalene	1.5	-	-
1-methyl-naphtalne	0.6	-	-
2-methyl-naphtalne	0.9	-	-
Acenaphthylene	0.7	-	-
Acenaphthene	1.5	-	-
Fluorene	1.3	-	-
Pheneanthrene	1.7	-	-
Anthracene	0.8	-	-
Fluoranthene	3.4	-	-
Pyrene	2.3	-	-
Benzo(a)anthracene	1.0	-	-
Chrysene	2.4	-	-
Benzo(b)fluoranthene	2.4	-	-
Benzo(k)fluoranthene	1.8	-	-
Bnzo(a)pyrene	2.4	1.2	Lifetime
Indeno(c,d)pyrene	0.9	-	-
Dibenzo(a,h)anthracene	3.8	-	-
Benzo(ghi)perylene	7.7	-	-

(Source: EEAA)

* Level to cause cancer with probability 1/10,000 for life time exposure

As shown, Benzo(a)pyrene monitored already exceeds the limit set by the WHO Guidelines.

2) Concerned Agencies and Their Mandates

The list of concerned agencies for air pollution monitoring and control and their respective mandates are given in Table 12.2-18.

Table 12.2-18 Concerned Agencies for Air Pollution Control

Responsible Agency		Mandate/Activity
Ministry of Environment	Egyptian Environmental Affairs Agency (EEAA)	• Primary agency in-charge of air pollution control • Preparation of national plan, laws, decrees, norms for environmental protection • Supervision of emission from factories • Monitoring of air pollution • Training
Ministry of Interior	Traffic Department	• Vehicle emission testing during renewal of vehicle licenses
	Environmental Police Department	• Daily campaign for vehicle emission testing on road
Committee for Greater Cairo Transport Planning		• Overall transport planning for Greater Cairo Region
Ministry of Petroleum		• Production of lead free gasoline and promotion of the use of compressed natural gas
Ministry of Industry		• Prohibition of the production of 2-stroke engines
Ministry of Foreign Trade		• Prohibition of the importation of 2 stroke motorcycles

3) Laws and Regulations

The following laws are in effect:

- **Law 4/1994** is the primary law that provides the definition of air pollution, detailed regulations, mandate and functions of EEAA and the maximum limits of outdoor air pollution.
- **Ministry of Health Decree No. 470/1971** established the regulations for pollution levels within the workplace: "Norms for Atmospheric Pollution in Establishments and Industrial Units".
- **Law 3/1982** on "physical planning" acknowledges the value of land-use planning in redressing the problem of industrial emissions in urban centers.
- Decrees establishing the New Industrial Cities affect the spatial distribution of industry. **Laws 159/1981** and **8/1997** encompass private sector and private investment companies that are concentrated in the New Industrial Cities.
- Since 1996, those companies being privatized have been subject to **Public Enterprise Law 203/1981**, which affects the regulatory and implementation roles of various government agencies with respect to environmental compliance.
- **Customs Tariffs set by Presidential decrees** (e.g., **No. 429/2000**) affects the ultimate retail market price of imported goods and equipment, which in turn influences their consumption. This is especially important with respect to influencing decisions of firms and individuals on the replacement or maintenance of industrial plant equipment or vehicles, which in turn influences the emissions related to plants and vehicles.

- The decrees that establish energy prices based on **Laws 20/1976 and 230/1989** have a major impact of the consumption of fuel and therefore the amount of pollution emitted by the transport and industrial sectors.
- Decrees such as the **Ministry of Industry Decree 193/1998** require the installation of catalytic converters on vehicles to reduce emissions. **Cairo Governorate Decree 694/1998** requires owners of "service" motorcars (vehicles) to transfer to compressed natural gas (CNG) fuel. **Ministry of Industry Decree 9/2001** discontinues new licenses for production of 2-stroke engines of all sizes. These decrees influence the supply of and specifications for vehicles.

4) Policy and Activities to Reduce Air Pollution

The following measures are being implemented to reduce air pollution:

- Provision of Unleaded Gasoline: The Ministry of Petroleum started supplying unleaded gasoline since October 1996. As present, 95% of Egypt's fuel consumption is unleaded gasoline. As a result, the air pollution by lead in the GCR has been significantly reduced.
- Use of Compressed Natural Gas (CNG): For economic and environmental benefits, the Ministry of Petroleum has requires the use of compressed natural gas for fuel by the transport sector. The total numbers of CNG-powered vehicles in Egypt has significantly increased, from 10,640 units in 1998 to 87,000 units in 2007. The ratio of CNG-powered vehicles per type is as follows:

Table 12.2-19 Ratio of CNG-powered Vehicle Type

Type of Vehicle	Ratio of Vehicle Type with 89,000 CNG-Powered Vehicles
Taxis	75%
Private Cars	13%
Busses	2%
Light-duty Trucks	9%

The policy aims to expand the number of private cars using CNG to 100,000 in 2011. Taxis are the highest number of CNG users while busses are the smallest, but they generate the highest emission among all vehicle types.

- Vehicle Emission Testing: A vehicle emission testing, engine tuning and certification program was established in GCR in 2004 and is being implemented. This program includes purchasing of testing units and training of personnel for each governorate in Egypt.
- Rehabilitation of Old Taxis with New Ones Operated with CNG: The Ministry of Environment is conducting a national program of rehabilitating 40,000 old taxis (Model 1979 and older) with CNG powered vehicles in GCR.

- Limiting Motorcycle Emission: Due to the high amount of Hydro-Carbon (HC) from 2 stroke-motorcycles, the Ministry of Industry has prohibited the production of 2-stroke engines with the issuance of **Decree No. 85 in 2004**. The Ministry of Trade has likewise issued **Decree No. 466 in 2004** to regulate importation of 2-stroke motorcycles.
- Monitoring of Air Pollution and Early Warning System: The EEAA has established 42 Air Quality Monitoring Stations in Egypt. Among them is a station close to the project site, which is presented in **Appendix 12.4(CD-ROM)**.
- Awareness campaigns to discourage and stop open burning of agricultural waste, which produces SPM, is being implemented and emissions from factories are also being controlled.

5) Environmental Target

For the project to create better ambient air condition, the following are proposed:

- The allowable limits should be defined to comply with Egyptian standard during construction and operation
- The measures including emission control and construction of barriers on highway , should be taken to mitigate air pollution level, should it worsen, whether it is within allowable limits or not

(2) Air Pollution Predicted During Construction

During construction, the maximum hourly concentration has been predicted, as shown in Table 12.2-20.

Table 12.2-20 Maximum Hourly Concentration of Air Pollution Predicted during Construction

[micro-gram/m^3]

Section	NO_2	SO_2	PM_{10}
E1-2	224	42	41
E2-2	151	31	28
E3-1	254	96	47
E3-2	294	108	55
E3-3	293	68	52
Hourly Allowable Limit	400	350	-

It is concluded that the air pollution caused by the project during construction might be within the allowable standards limits. Ii is, however, recommended that, although the air quality allowable limits seem to be satisfied during construction, measures should be taken to reduce the levels of air pollution further to create better circumstances. Proposed measures include:

- Use catalytic converter for all heavy equipment and generators
- Construction of noise barrier that is effective to disperse the concentration of air pollution
- Limiting equipment operating hours as it is usually in the evening when concentrations of air pollution may become higher compared to other times of the day because of less wind and more evening traffic congestion
- Preparation of an effective traffic diversion plan

(3) Air Pollution During Operation

Construction of the expressway is considered to improve the air pollution conditions since it will:

- Mitigate traffic congestion by reducing the amount of emission
- Disperse the pollutants into the sky effectively with elevated viaduct

However, no effect or positive impacts can be caused when:

- The number of vehicles drastically increase and traffic congestions occur
- The viaduct is constructed between narrow spaces between tall buildings where the dispersion of pollutants is interrupted

To mitigate above possible negative impacts, two studies were conducted as “Simplified Prediction” and “Between Buildings Monitoring”. According to the results;

- Air pollution prediction for 1 day average was made and the results are presented in the report. Based on the prediction, contour maps of concentrations and noise levels were prepared on SPM and noise in 2007, 2017 and 2027, assuming both cases of with and without project.. In **Appendix 12.5(CD-ROM)**, air pollutions predicted at any height and any location in all sections satisfy the allowable limits in Egypt. In addition, noise barrier is proposed to be constructed. Although its primary purpose is to reduce the noise levels, the barrier is effective to disperse the concentration of air pollutants emitted from vehicles.
- As for the effect of the viaduct built in narrow space between buildings, it is concluded that air pollution seemed to worsen with the height of the viaduct, although the level is within the allowable limits, while noise may decrease with height if the viaduct is there.
- Air pollution in the following sections will be worsened by the project, although all of them are within the allowable limits. Monitoring should be implemented during operation and further mitigating measures should be taken, if necessary.

    - South side of E2-2 in 2027
    - Both sides of E3-2 in 2017 and 2027, and north side in 2027

- Both sides of E3-3 in 2017 and 2027

12.2.9 Noise

(1) General

1) Present Condition

Main sources of noise in the GCR can be classified as:

- Transportation such as vehicles, railways and airplanes
- Commercial and human activities
- Loudspeakers
- Building construction/factories

Noise levels measured by the Study Team in March 2008 continuously for one week at Giza, one of the noisiest places in GCR, are presented below.

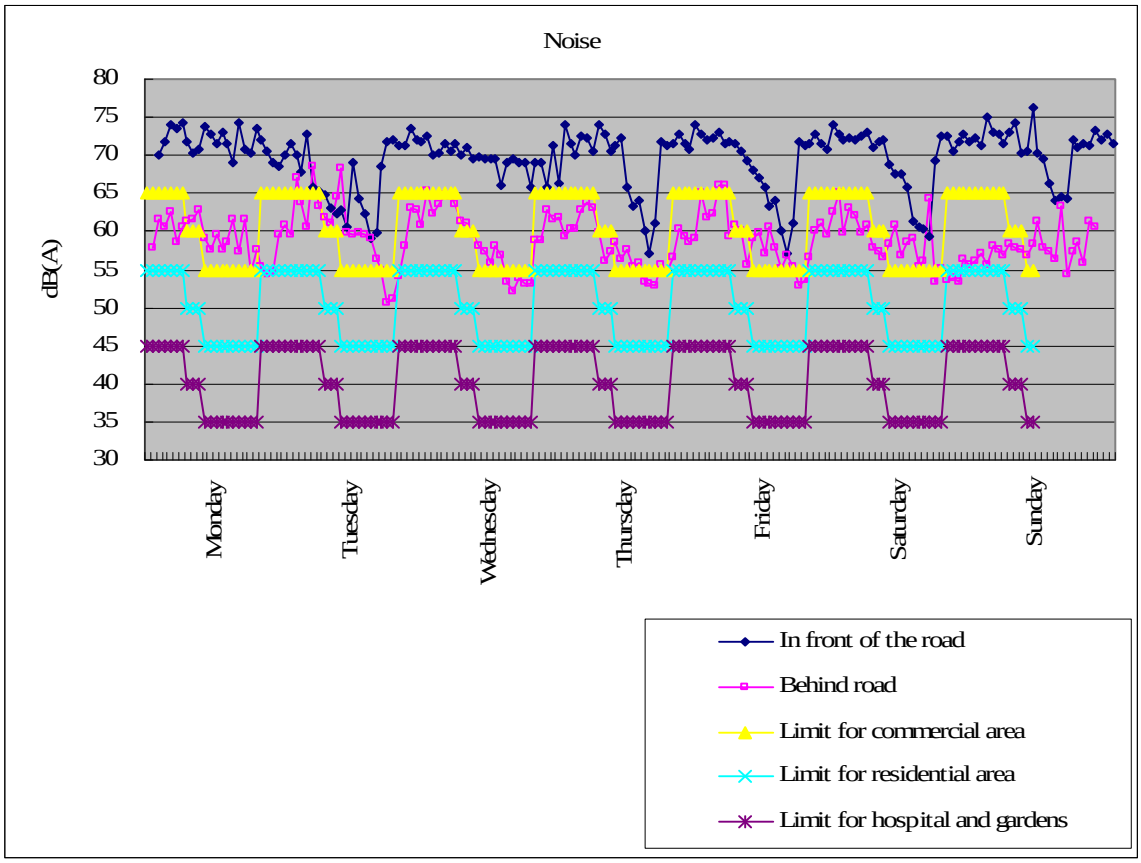


Figure 12.2-8 Noise Level Monitored in Giza, March 2008

Allowable limit of noise level at foreground of the road is always greater than industrial areas, while one at background is always beyond residential areas, no matter it is weekday or not.

2) Concerned Agencies for Noise and Their Mandates

The agency primarily responsible for monitoring and regulation is the EEAA. Other concerned agencies are listed in Table 12.2-21.

Table 12.2-21 Concerned Agencies for Noise

Responsible Agency		Mandate/Activity
Ministry of Environment	Egyptian Environmental Affairs Agency (EEAA)	• Primary agency in-charge of noise level control • Preparation of national plan, laws, decrees, norms for environmental protection • Training
Ministry of Interior	Traffic Department	• Responsible for implementing the national program for vehicle noise emission testing, speed limits and misuse of hornes
	Environmental Police Department	• Conduct of regular noise measurements at selected locations around Cairo
Committee for Greater Cairo Transport Planning		• Overall transport planning for Greater Cairo Region

3) Laws and Regulations

The permissible limits on noise levels are set in the **Executive Regulation of Environmental Law 4/1994**. They are specified depending on the nature of the areas exposed, as shown in Table 12.2-22 below.

Table 12.2-22 Allowable Levels of Noise

[Unit: dB(A)]

	Day (From 7AM To 6 PM)		Evening (From 6PM To 10PM)		Night (From 10PM To 7AM)	
	From	To	From	To	From	To
Commercial, administrative and downtown areas	55	65	50	60	45	55
Residential area in which can be found some workshops or commercial establishments or which are located on a main road	50	60	45	55	40	50
Residential areas in the city	45	55	40	50	35	45
Residential suburbs with low traffic	40	55	35	45	30	40
Residential rural areas, hospitals and gardens	35	45	30	40	25	35
Industrial areas (heavy industries)	60	70	55	65	50	60

4) Policies and Activities to Reduce Noise Levels

The National Noise Reduction Plan has been prepared to reduce noise levels including:

- Implementation of a 6-year national program for noise-fighting and controlling its sources which started in 2007

- Joint campaigns by the EEAA and the Ministry of Interior to streamline discipline and control noise at sources, which includes:
  - Control of stationary sources (commercial areas)
  - Control of mobile noise sources (vehicles, loudspeakers, railways, subways, river cruises)

- Periodic inspection of facilities and measurement of noise levels inside and outside these given facilities and by preparing a database of evidences, legal action will be taken against violators
- Conduct of media campaigns to update environmental awareness of the Egyptian citizens and encourage their participation in noise-reducing efforts; workshops in noise risk and control are held in youth centers, clubs and associations for the public.

5) Environmental Target

According to the environmental regulations, the maximum allowable noise level is 70dB (A). For areas other than industrial areas, the maximum allowable level is 60 dB(A) at night time. It was, therefore, proposed that the target noise level to be achieved by the project should be:

- 70 dB(A) at the maximum regardless of the area
- 60 dB(A) as the recommended level for areas other than industrial areas at night time

Noise mitigating measures are planned based on the above targets.

(2) Noise during Construction

The maximum noise predicted during operation is assumed to be greater than 80 dB(A) when characteristics of heavy equipment is considered. Table 12.2-23 provides the measures proposed to be undertaken to reduce noise in general.

Table 12.2-23 Mitigation Measures for Noise, Vibration and Dust during Construction

Stage	Mitigation Measures			Noise	Vibra-tion	Dust/ SPM
Construction Stage	By Source	Equipment	Use of low noise emission type equipment	✔		✔
			Use of mufflers	✔		✔
		Operation control	No night time work	✔	✔	✔
			No overloading, no idling of engines	✔	✔	✔
			No operation close to houses	✔	✔	✔
	By Structure		Temporary noise barrier	✔	✔	✔
	By Construction Method		Temporary pavement	✔	✔	✔
			Spraying of water			✔
			Washing of tires of heavy vehicles when going out			✔
			Employment of low noise construction method (pile driving → bored type)	✔	✔	✔
	Monitoring		Monitoring	✔	✔	✔

(3) Noise During Operation

Noise predicted during operation and the proposed mitigating measures are presented in Table 12.2-24. Measures assumed are:

- Construction of noise barrier wall on viaduct and at-grade with a height of 5m
- Use of porous pavement
- Installation of noise-absorbing panels at the reverse side of decks

Table 12.2-24 Predicted Noise at Various Heights of the Building at Night Time during Operation Stage(2027)

[Unit: dB(A)]

Section	Height Prediction from Ground Level, m	Without Project	With Project	
			W/out Mitigations	With Mitigations
E1-2 North	16.2	70	70	67
	13.2	70	70	67
	10.2	70	71	67
	7.2	70	70	61
	4.2	69	69	57
	1.2	68	69	56
E1-2 South	16.2	70	70	66
	13.2	70	70	66
	10.2	70	70	62
	7.2	69	69	58
	4.2	66	67	53
	1.2	65	67	52
E3-3 (Symmetrical)	16.2	72	72	69
	13.2	72	72	70
	10.2	72	72	71
	7.2	73	73	70
	4.2	73	74	61
	1.2	74	75	60

For other sections not indicated in the above table, the same effect will be obtained if such measures are taken.

As for the noise level at ground floor (1.2m high) if the proposed mitigation measures are taken, noise will decrease drastically to a level equal or less than 60 dB(A), which is the maximum allowable limit for residential areas mixed with commercial facilities. However, potential problems are:

- Landscape will be completely blocked by the construction of the 5m-high barrier at-grade

- Shopkeepers along the road may or may not agree if the 5m-high barrier to be constructed will be in front of their shops as their sales may be affected. Their opinion will have to be carefully taken into account before finalization of the construction plan of such barriers.

Although noise transmitted to the ground floor from the deck will be largely reduced by barriers due to its diffraction, noise transmitted to floors above deck is not so effectively diffracted. As a result, the noise levels predicted at elevations higher than deck are still more than the maximum permissible level of 60 dB(A).

Cairo is considered as one of the noisiest cities in the world. Nevertheless, the noise issue has been seldom raised even through the social interviews of 2,000 samples and focus discussions with 50 groups. But even though there have been no complaints that appeared so far, it is recommended that measures be taken to control traffic or vehicles itself, in addition to the road structure measures, especially for vulnerable groups (hospital, junior schools).

12.2.10 Vibration

(1) General

1) Present Conditions

There had been no vibration measurements taken before since there is no vibration standard. No people raised vibration as an environmental issue in the social survey made by the Study Team. There have been no reports regarding damages of buildings caused by vibration except earthquake. However, the impact of vibration to environments and human health is being recognized and allowable limits for vibration are being established.

Under this situation, the Study Team implemented the vibration measurement. The results of vibration levels monitored were a little less than 70 dB, which is equivalent to the maximum allowable vibration level caused by traffic, although the recommended level is 60 dB for residential area at night time according to Japanese Standards.

2) Concerned Agency and Policies

The EEAA is presently preparing the legislations for vibration.

3) Environmental Target

The maximum allowable vibration level shall be less than 70 dB in any case, and preferably less than 60 dB for residential areas.

(2) Construction Stage

The ground condition along the study routes is quite good and no serious vibration/liquefaction of the ground is expected to take place. Nevertheless, many people fear serious noise and vibration during the construction period. Hence, measures to avoid or minimize unnecessary vibrations from pile driving or some types of earth compactors which may cause serious vibrations in the vicinity shall be taken during construction.

(3) Operation Stage

The number of heavy vehicles traveling in Cairo is very low (only 1%) and no serious vibration can be expected. However, to reduce the present vibration level and minimize the generation of vibrations, the following are required, but no details of structure have yet been finalized:

- To keep the road surface flat
- To minimize the difference of height of surface level at the expansion joint of deck
- To recommend vehicle improvement and traffic control measures by concerned agencies

12.2.11 Water Contamination

(1) General

1) Water Quality

Nile River Water Quality

The data on Nile River water qualities are being sampled at upstream (Giza Bridge) and downstream (El Sahel Bridge) of Cairo downtown respectively, as shown in Figure 12.2-9.

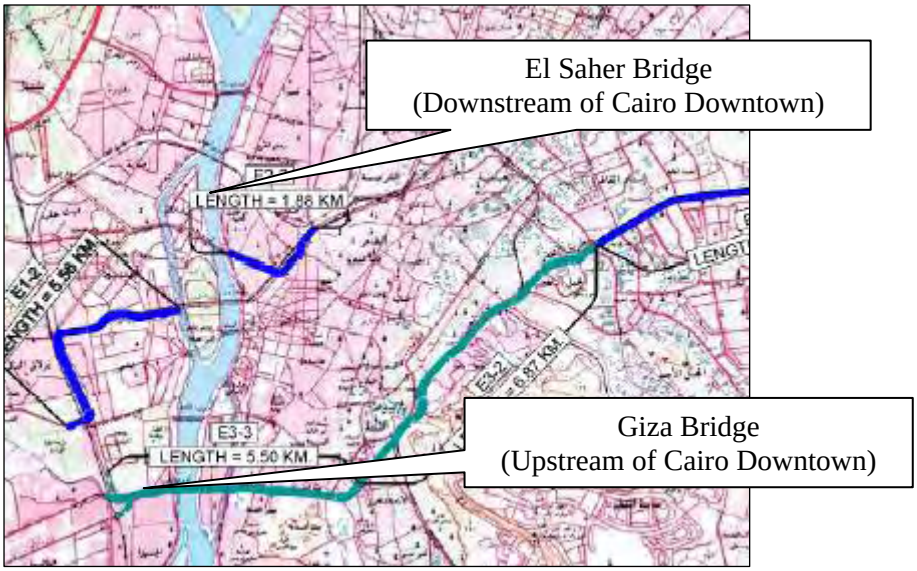


Figure 12.2-9 Locations of Water Sampling

Table 12.2-25 presents results of the water sampling.

Table 12.2-25 Qualities of Nile River Water Upstream and Downstream of Cairo Downtown

Substances	Unit	Upstream of Cairo	Downstream of Cairo	Change	Ambient Water Standard
COD	mg/l	7	17		15
BOD	mg/l	4	13		6
TOC	mg/l	4	4		
Ortho-P	mg/l	0.005	0.02	Increased	
Total-P	mg/l	0.21 (Aug. 2006)	0.15 (Aug. 2006)		1
NH3	mg/l	0.9	1.2	Increased	0.5
NO3	mg/l	0.5	0.2		45
NO2	mg/l	0.2	0.2		
Na	mg/l	14	15		
K	mg/l	5	5		
Ca	mg/l	32	33		
Mg	mg/l	11	11		
Cu	mg/l	0.01	0.01		1
Fe	mg/l	0.2	0.2		1
Mn	mg/l	0.01	0.01		
Al	mg/l	0.01	0.01		
Ba	mg/l	0.03	0.03		
Sr	mg/l	0.24	0.21		
Zn	mg/l	0.005	0.005		1
As	mg/l	0.01	0.01		0.05
Sb	mg/l	0.03	0.03		
Se	mg/l	0.03	0.03		
Sn	mg/l	0.03	0.03		
Cd	mg/l	0.0005	0.0005		
Co	mg/l	0.005	0.005		
Cr	mg/l	0.002	0.002		
Ni	mg/l	0.005	0.005		
Pb	mg/l	0.005	0.005		
Fecal Coliform	Group/100ml	557	320		
Total Coliform		1953	887		5000?

(Source: Nile Research Institute 2008)

As shown in the table above, the concentration of 0.9 mg/l of ammonia (NH3) at the upstream of Cairo downtown exceeds the allowable limit of 0.5 mg/l, and is worse at the downstream of Cairo at 1.2 mg/l. The source of NH3 is said to be human excretion. The present treatment method for sewage water, which is the Active Sludge Method, is not so effective in the removal or treatment of NH3.

In Egypt, the quality standard for drinking water is considered as ambient water standard since drinking water is taken from the ambient water, mostly from River Nile, and delivered after filtering only. The contamination of Nile River is a critical issue to the drinking water requirement of Cairo.

Irrigation Canal Water

The major impacts of agriculture on water quality in Egypt are:

- Increased salinity
- Deterioration of quality due to fertilizers and pesticides
- Possible eutrophication of water bodies due to an increase in nutrients from fertilizers

In Egypt, as in many other agricultural countries, pesticides are widely used to control harmful pests mainly on cotton, maize and rice. Pesticides used are of different types, such as organochlorine, organophosphorus, cabamates, ureas, anilides and pyreethroid.

There are four general categories of pesticides: herbicides, insecticides, fungicides and bactericides. Herbicides control unwanted vegetation, insecticides kill insects, fungicides destroy fungi and bactericides are lethal to bacteria. The data on the concentrations of these substances are not available since they are not included in the ambient water standard and monitoring is not systematically done.

Groundwater

Presently there are two issues about groundwater:

- Contamination by leakage from sewage (coliform) and irrigation water with high fertilizer (nitrogen-oxides) concentrations
- Excessive withdrawal

2) Concerned Agencies and Their Mandates

The institutions involved with water quality management in Egypt are generally line management ministries with responsibilities in areas that are related to, but not necessarily coincident with, environmental protection. The Ministry of Health and the Ministry of Industry have many similar functions which conflict with each other. Egypt lacks a relatively strong central coordinating or managing body, although the Egyptian Environmental Affairs Agency (EEAA) has some of the appropriate rules (coordination, studies and evaluations). Table 12.2-26 lists the institutions and their major roles in water quality management.

Table 12.2-26 Concerned Agencies for Water Control

Responsible Agency	Mandate/Activity
Ministry of Water Resources and Irrigation	• Central institution for water quality management • Formulation of national water policy • National Water Research Center maintaining a nationwide monitoring network • Overall responsibility for management of the Nile System • Issuance and discharge of licenses to the Nile River
Egyptian Environmental Affairs Agency	• Provision of advisory services to the Prime Minister • Preparation of the National Environmental Plan • Responsible for seawater/brackish water only
Ministry of Health and Population	• In charge of safeguarding drinking water • Responsible for monitoring potable water resources
Ministry of Housing, Utilities and New Communities	• Responsible for planning and constructing municipal drinking water system and sewage water system
Ministry of Agriculture and Land Reclamation	• Responsible for the delivery irrigation water • The Soil, Water and Environmental Research Institute is set for water and soil qualities on pollution, bioconversion of agricultural waste, reuse of sewage water and so on
Ministry of Higher Education and Scientific Research	• Equipped with advanced technology
Ministry of Interior	• Environmental police
NGO	• Responsible for the indispensable role of raising public awareness on environmental water

3) Laws and Regulations

A legal basis for controlling water pollution exists through a number of laws and decrees.

- **Law 4/1994** mandates that the EEAA is the agency responsible for preparing laws and legislations regarding all environmental protection in Egypt, including the water environment.
- **Law 48 of 1982** deals with discharges to water bodies. This law prohibits discharge to the Nile River, irrigation canals, drains, lakes and groundwater without a license issued by the MWRI.
- **Article 65** provides that before lifting drainage water or water from drains to potable water surface, the standard measures listed in Table 12.2-27 must first be satisfied.

Table 12.2-27 Ambient Water Allowable Limits

Description	Standard Measures (milligram/liter) Unless Otherwise Mentioned
Color	Not more than 100 unit
Total Solid Material	500
Temperature	5 degrees centigrade over norm, 2 degrees when cold
Smell	
Dissolved Oxygen	Not less than 5
Hydrogen (Basis) Exponent	Not less than 7 and not more than 8.5
Consumed Chemical Oxygen (Dichromeate)	Not more than 15
Consumed Chemical Oxygen (Permanganate)	Not more than 6
Ammonia	Not more than 0.5
Oil and Grease	Not more than 1
Total Alkalinity	Not more than 200, not less than 50
Mercury Compound	Not more than 0.001
Iron	Not more than 1
Manganese	Not more than 1.5
Copper	Not more than 1
Zinc	Not more than 1
Industrial Detergent	Not more than 1.5
Nitrate	Not more than 45
Fluoride	Not more than 0.5
Phenol	Not more than 0.02
Arsenic	Not more than 0.05
Cadmium	Not more than 0.01
Hexavalent Chromate	Not more than 0.01
Cyanide	Not more than 0.1
Tannin and Lignite	Not more than 0.5
Phosphate	Not more than ?1
Carbon Extracts - Chloroform	1.5 gram/liter
Probable Counting for the Colon Group $1000cm^3$	5000

- The **Implementing Decree 8 of 1983** specifies the water quality standards for the following categories:
  - The Nile River and canals into which discharges are licensed (Article 60)
  - Treated industrial discharges to the Nile River, canals and groundwater
  - Upstream the Delta barrages discharging more than 100m3/day (Article 61)
  - Downstream the Delta barrages discharging more than 100m3/day (Article 61)
  - Upstream the Delta barrages discharging less than 100m3/day (Article 62)
  - Downstream the Delta barrages discharging less than 100m3/day (Article 62)
  - Drain waters to be mixed with the Nile River or canal waters (Article 65)
  - Treated industrial and sanitary waste discharges to drains, lakes and ponds (Article 66)

- The drains, lakes and ponds into which discharges are licensed (Article 68)

Discharge of treated sanitary effluents to the Nile River and canals is not allowed at all (Article 63) and any discharge of sanitary waste into other water bodies should be chlorinated (Article 67). The water quality standards are generally based on the drinking water standards and are not linked to all other functions a water body may have.

4) Policies and Activities

- The Ministry of Water Resources and Irrigation formulated a National Program for Water Quality Monitoring in the Nile, canals and drains and Lake Nasser
- The Central Laboratory, affiliated with the National Water Research Center, carries out the substantial lab work for Environmental Quality Management and the monitoring program includes 300 locations for surface water and 230 locations for groundwater
- The long-term policies to control pollution include covering open conveyance system passing through urban system to closed conduits
- Coordination with other concerned ministries to set priorities for wastewater treatment plants due to budget limitation
- Introduction of environmentally safe weed control methods, either mechanical, biological or manual and banning the use of chemical herbicides
- Removal of the subsidies on fertilizers and pesticides and banning of those agricultural chemicals with long-lasting
- Introduction of public awareness programs to promote the issue of conserving Egypt's water resources in terms of quality and quantity

5) Difficulties

Egyptian environmental laws have not been enforced adequately for a variety of reasons, including:

- Lack of authorities and the necessary resources to carry out inspection and enforcement
- Lack of public awareness regarding the magnitude of the environmental problems and their negative effects
- Ineffective regulatory approach as the standards generally do not allow the flexibility necessary for the polluter and the regulatory agency to negotiate a quick agreement on a compliance schedule. Instead, Egyptian regulators concentrate on informing the polluter of a violation without giving provisions for facing compliance measures after the violation has been announced
- Insufficient coordination and cooperation among the ministries and government institutions regarding the issue of environmental protection

6) Environmental Target

Laws and regulations shall be abided with. No materials shall be dumped into Nile River.

Percolation of oil/gasoline into the ground shall be prevented during construction.

(2) During Construction

Some of the most serious impacts to the water environment can arise during the project's construction phase, if not properly supervised. And although the cause of these may be over a relatively short period, the consequences may be permanent. Sources of these impacts include:

- Littering of the site from movement of excavated/fill materials to, from and around the site
- Pollution of Nile water with mud and particulates, turbidity
- Pollution of the groundwater and adjacent surface Nile water by oil and diesel spills from machinery used in the construction
- Disposal of solid wastes from construction activities
- Dust from the construction activities
- Setting-up of temporary offices and housing for construction workers
- Construction of foundations on Nile River

In order to eliminate and/or mitigate such impacts, the following measures shall be strictly applied:

- To establish a proper environmental plan to minimize such impact surrounding the site, including installation of barriers and control of traffic/operation of equipment
- To minimize excavation and movement of materials around the site and to bring only coarse materials with no fine fractions onto the site to minimize water turbidity and contamination
- To strictly control the storage of oil and fuel through the installation of a concrete pavement with firewall so as not to cause leakage into the ground
- To dispose all construction wastes and wastes from contractors' camps and offices to designated sites only (wastes shall include paper, plastic sheets and bags, cement bags, woods, paint holders and food residues)
- To provide all camps and offices with the approved sanitary facilities and to give care to workers' excreta disposal in order to eliminate potential sources of infection and unsightly conditions
- To keep food residues of construction workers in closed containers in order to prevent migrant birds' flocks from being attracted as they can create serious aviation problems
- To segregate and safely dispose in landfill sites dedicated for hazardous wastes all hazardous materials generated during construction such as fuel oil containers, paint containers, used batteries, spent crank oils from machinery

- To take proper measures while piers of the bridge in the Nile River are being constructed

(3) During Operation

No serious surface water/groundwater contamination is supposed to be caused, except the leakage of oil/gasoline, which are matters relating to the discipline and control of drivers themselves. Awareness campaigns not to cause such accidents have to be promoted.

12.2.12 Waste

(1) Reduction of Waste Dumping

It is predicted that the construction wastes listed under Table 12.2-28 may be generated during construction and its proper treatment/dumping shall be planned.

Table 12.2-28 Construction Wastes Predicted

Types of Waste		Unit	Amount	Source
Solid Waste	Asphalt Waste	m^3	63,323	Demolition of pavements/sidewalks (t=0.2m)
	Concrete Waste	m^3	5,820	Demolition of structures at E1-2 (370m), E2-2 (170m)
	Soil/Rock	m^3	2,653,299	Excavation for E1-2 (4.7 km tunnel) and E3-1 (Depression)
Liquid Waste	Drilling of Mud for Bored Piles	m^3	298,013	Assumed as 2 times of bored pile volume

The total cost to demolish existing bridges is estimated at about USD1.5 million and total 6,000 labor/operator days for the case of E1-2, in five months.

To reduce the impact of wastes on the environment, the following are recommended:

- To remove steel from reinforced concrete waste and recycled
- To reuse/recycle asphalt/concrete waste as construction materials
- To have wood waste, if generated, converted to other resources such as wood tip
- To directly utilize soil/rock as filling material
- To transport drilling mud to section under construction and to have it reused
- To reduce the volume of liquid waste as much as possible before dumping.

For the above, wastes shall be stock piled separately depending on the material.

(2) Waste Dumping Bond

The Cairo Governor collects, as deposit, money equivalent to the volume (m^3) of the buildings to be demolished multiplied by LE25. The amount is returned to the contractor after they confirmed that construction wastes have been properly dumped at designated places.

12.2.13 Cultural Heritage

(1) General

1) Present Condition

The whole city of Cairo has been classified a world heritage by UNESCO. Among them there are two culturally protected areas:

- Historic Cairo
- Khedivian Cairo

Historic Cairo is the area where ancient to medieval monuments/buildings with high historical/ aesthetical values were constructed. The Supreme Court of Antiquities (SCA) has identified 619 numbered monuments and 136 unnumbered monuments, most of which have been constructed in the 5^{th} to 15^{th} centuries.

Khevian Cairo is the name of the area where modern buildings are concentrated. These buildings were constructed about a hundred years before in various styles such as Arabic, Classic, Art Deco, Baroque, Renaissance and so on. Preservation of the buildings and protection of landscape of this area is requested by the Ministry of Culture.

Outside these areas, there also are many historically/religiously/aesthetically important buildings distributed all over GCR. The locations of these areas are indicated in Figure 12.2-10 along with the study route. Although the study routes do not touch any of these structures, some pass close to the buildings. The impacts of the project to these landscapes are discussed in the sections that follow.

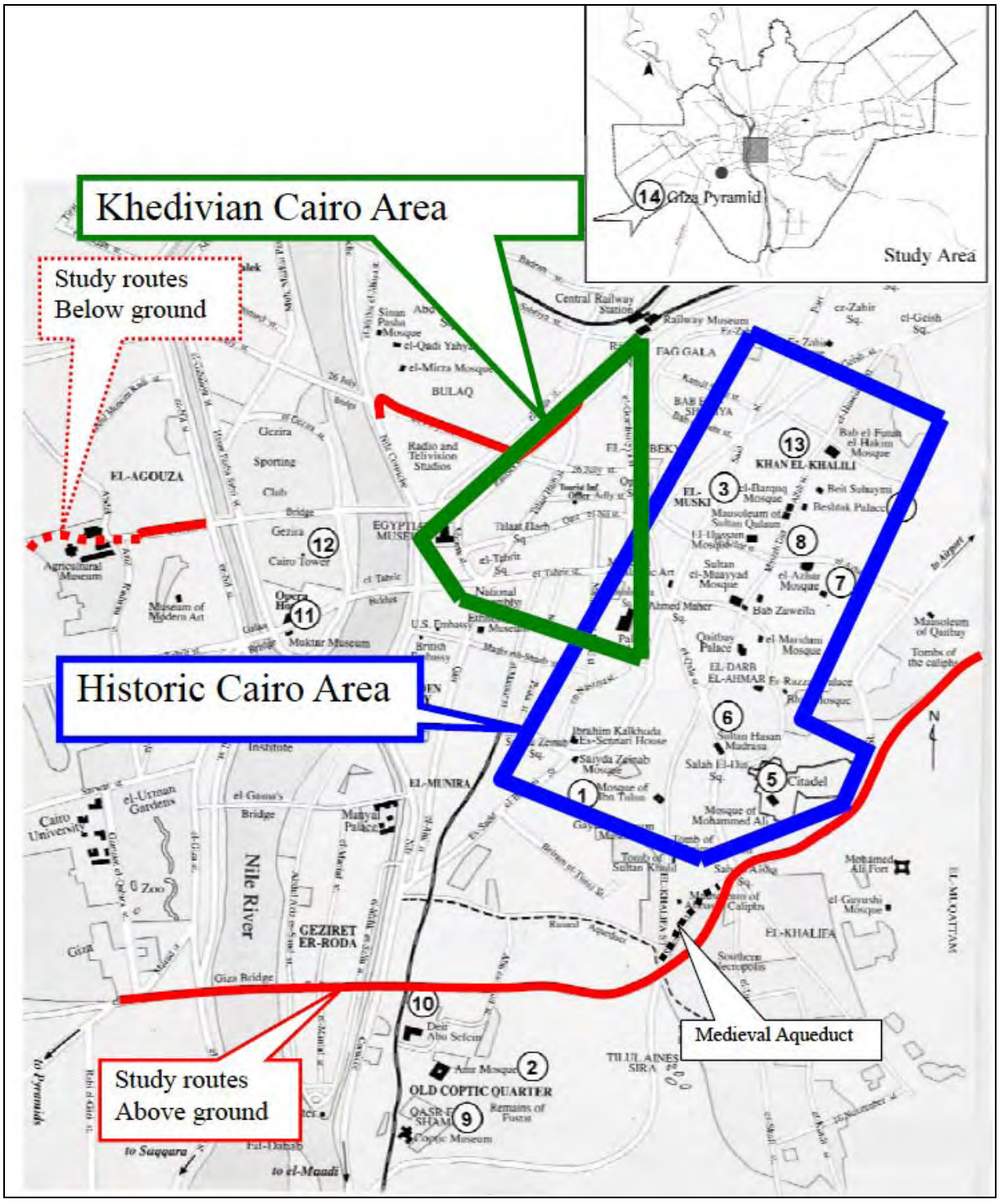


Figure 12.2-10 Location of the Protected Areas

Table 12.2-29a Names of Culturally Important Facilities/Spaces (1/2)

NO.	Name	Description
Islamic Monuments		
①	Mosque of Ibn Tulun	Built between 876 and 879 A.D. It is one of the oldest intact mosque in cairo ,characterized by its unique minaret and still in use nowadays.
②	Mosque of Amr Ibn El Aas	It is the first mosque built in Egypt and Africa, founded in 642 A.D by Amr ibn El-Aas, which represents schools of architecture from different periods.
③	Al-Nasser.Al-Mansour Qalawun and Sultan Barquq Complex	A medieval complex of mosques, mausoleums and madrassas (schools) built by three Mamlke Sultans.
④	Amir Bishtaq Palace	It was established by Amir Sayef El-Din Bishtaq El-Nasserty, which dates back to 740 A.D. with a unique style in the civil architecture of the Mamluke era.
⑤	The Citadel of Saladin (Salah El-Din)	Bilt between 1176 and 1182 A.D. It provides panoramic view of Cairo from Al moqattam Hill. The citadel complex includes the Alabaster Mosque of Mohamed Ali,"Al Gawhara palace", the Military Museum and the citadel outdoor theatre.
⑥	Mosque and Madrassa (school)of Sultan Hassan	A masterpiece of Mamiuke architecture, which includes bronze door inlaid with gold, silver and marble panels. It has the grand entrance of the Islamic monuments in Egypt.
⑦	Al-Azhar Mosque	The first fatimid mosque and the oldest islamic university in the world, founded in 878 A.D.
⑧	El-Hussain mosque	It was established in 549A.D. - 1154A.D during the region of the fatimid caliph El-Zaheir Beamr Allah, and was renewed many times.
Christian Monuments		
⑨	Old Cairo (Qasr El-Shama′a) Al Moallaqa (the Suspended church)	Bilt on the remains of the Roman fortress of Babylon at the turn of the fourth century. It houses about ninety rare icons of basilican style.
	Saint Barbara Church	Dates back to the early 5th century A.D. and it lies the eastern section of the fortress of Babylon and is considered one o f the most beautiful coptic churches of the basilican style.
	Greek Orthodox Church of Mari Guirgis	Built on one of the towers of Babylon fortress. This basilica has a round structure with a domed roof.
⑩	Churches of Abu Seifein Monastery	It comprises three churches: Anba Shenouda church, Abu Seifein church (Sant Marcurius) which contains the cave of Saint Barsoum El Erian, the Church of the Viegin in El Damshirya.
	Saint Mark Cathedral	The largest cathedral in Africa, recently built in Abssiya district. The relics of Saint Mark, the Evangelist who first preached Christianity in Egypt, are kept in this cathedral
	The virgin′s tree in Materia	The Holy Family rested next to the blessing tree, which is two thousand years old.

Table 12.2-29b Names of Culturally Important Facilities/Spaces (2/2)

NO.	Name	Description
Landmarks of Modern Cairo		
⑪	The Cultural Center (Opera house)	It was inaugurated in 1988 A.D an artistic architectural masterpiece of Islamic style, equipped with the latest audio-visual facilities, which consists of three theatres.
⑫	Cairo Tower	Over 187 meters high, which is the most outstanding attraction of modern Cairo. There are two-story rotating restaurant and cafeteria. Visitors can enjoy a panoramic view of Cairo from the observation platform.
Townscape		
⑬	Khan El-Khalili Bazaars and Sagha	It comprises an array of shops dating back to the 14th century A.D.
	European style building facades in Cairo CBD area	European townscape with old turn of the century buildings that needs to be preserved
	European style building facades in Muhandesin area	European townscape with old turn of the century buildings that needs to be preserved
	Garden City concept and buildings in Heliopolis	A city developed in the concept of the Garden City with a number of European style buildings
Ancient Monuments		
⑭	Giza Pyramids Area	On the west bank of the Nile facing Cairo, three pyramids which are one of the ancient seven wonders of the world surrounded by small pyramids and hundreds of mastabas (tombs) for kings and nobles.

2) Concerned Agencies

The protection of Egypt's culture heritage is regulated by Supreme Council of Antiquities (SCA) belonging to the Ministry of Culture and its President is the Minister himself. The National Organization for Urban Harmony (NOUH), chaired by Dr. Soheir Zaki Hawas, is responsible for the buildings in Khedivian Cairo Area.

3) Laws and Regulations

Public Law 117/1983 is the only and principal law that assigns power to the central and public offices concerned with the different cultural heritage categories in Egypt, which belong to the following juridical sectors of the SCA:

- Prehistoric, Ancient Egyptian and Greco-Roman Sector (all sites all over Egypt)
- Islamic and Coptic Sector (all monuments and sites in Egypt).
- Museums Sector (all central and local museums)
- Technical Affairs (Architecture, Restoration, Engineering) Sector for all Antiquities

4) Policies and Activities

According to **Law 117**, the term "antiquity" is applied to any building or movable object resulting from the different civilizations that span the totality of the Egyptian History (reflecting human, artistic, technical, military, religious aspects) and of more than one hundred years old. However, a building or a movable object of great cultural value could be listed as national heritage, regardless its age, by a decree of the Prime Minister after the presentation of a specialized report to the permanent committee of the sector concerned and the approval of the committee and the Minister of Culture. Following are the major policies and activities implemented:

- Private owners of listed antiquities are responsible for their preservation
- Islamic and Coptic Sectors control mosques and churches in service
- The Government of Egypt, based on the UNESCO Convention of 1970, bans illegal import and export of cultural property (**Presidential Decree 114/1973**)
- The permanent committees of Egyptian antiquities, Islamic and Coptic antiquities, as well as the Board of Trustees of Museums are responsible for studying the problems of antiquities, urban and habitation problems and foreign missions undergoing excavations by applying **Law 117**
- The Police of Antiquities and the Central Police authorities support the above activities
- The Ministry of Environment is responsible for environmental interests, Egyptian antiquities and for Islamic and Coptic antiquities, through the Information Centre of the SCA (computer) and by collaboration with the Centre of Information and Decision Making of the Ministries Council, inventory of antiques and museums
- The NOUH group is in the position to construct new viaducts in the Khedivian Cairo Area

5) Environmental Target

Law forbids demolition of historic heritage, therefore, no structure(s) appointed in the identified protected areas will be touched.

(2) During Construction

There are two important areas close to the study route:

- Citadel in Historic Cairo
- Buildings inside Khedivian Area

The possible environmental impacts of the project to these areas were studied and discussed hereunder.

1) Vibration

Citadel

Study route E3-2 may be located tens of meters away from the outside wall of Citadel, the primary historic monument of Egypt. However, the wall including Citadel was erected on the firm limestone hill and no impact is considered during construction.

Buildings in Khedivian Area

The ramp to E2-2 is to be constructed between old buildings preserved by law. The potential of liquefaction of the underlying ground below these old building was examined so that they will not be affected during construction.

Several exploratory boreholes were sunk along this route and the results are presented in **Appendix 12.7(CD-ROM)**. According to the subsurface conditions revealed, the strata underlying are:

- 0~3.2 m; loose dry fill with SPT N-values less than 10 (non-liquefiable)
- 3.2~4.5m; loose submerged fill under groundwater level
- 4.5~7.5m; medium to firm clay with N-values greater than 5 (non-liquefiable)
- 7.5m or deeper; dense sand layer (non-liquefiable)
- Groundwater level is 3m below the ground surface

The layer susceptible to liquefaction is the submerged loose fill with a thickness of 1.3m only. This very thin liquefiable layer underneath the thick non-liquefiable layer of 3.2m is considered non-liquefiable even with moderate to strong level of vibration. Therefore, the old buildings are not likely to be affected by vibration caused by the construction of ramp. However it is recommended not to use driven piles for the foundations, not because of vibration but because of the noise that will be caused.

2) In Case New Heritages Were Found

There is no confirmed information regarding underground heritages so far. Therefore, it is essential to provide strict instructions to contractors and construction crew to pause construction work and excavations in case new heritages or any archeological items were found during excavation. Such discoveries should be reported to the concerned authority (Supreme Council of Antiquities).

12.2.14 Landscape

(1) General

There are three issues regarding landscape, such as:

- Blocking of landscape of historic heritages and nationally important monuments
- Blocking of common (familiar) landscape by construction of viaduct
- Invasion of the privacy of residents by the newly constructed viaduct

(2) Blocking of Important Landscape

One of the major sources of foreign currency for Egypt is tourism. Every year nearly 10 million tourists visit the country, hence, the protection of landscape is vital for the World Heritage Town of Cairo. There are several important structures along the study routes and the landscape that may be blocked by the proposed structures. The degree of impact and mitigating measures were studied. The locations of these historically important areas are shown in hereinafter;

1) Consideration for Unknown Soldiers' Monument

The Unknown Soldiers' Monument is facing route E3-1 and ceremony is made annually at locations covering both sides of the route. The viaduct will block the view of the monument from the opposite side of the road where the ceremony is being held. Therefore, a depressed/tunnel type of structure is being proposed for this section so that it would not block the view of monument from opposite side.

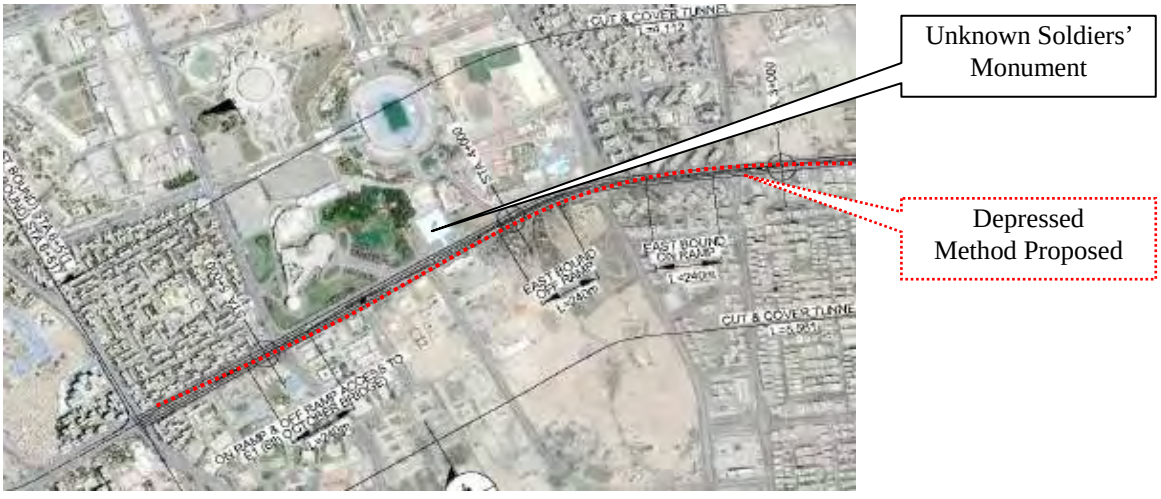


Figure 12.2-11 Locations of Unknown Soldiers' Monument and Depressed Method Proposed

2) Suppression of the Height of Viaduct around Citadel

The Citadel is the one of most famous tourist spots and object of religion. It is proposed that the height of the proposed viaduct is suppressed so it will not be beyond the height of existing highway (Salah Salem Street).

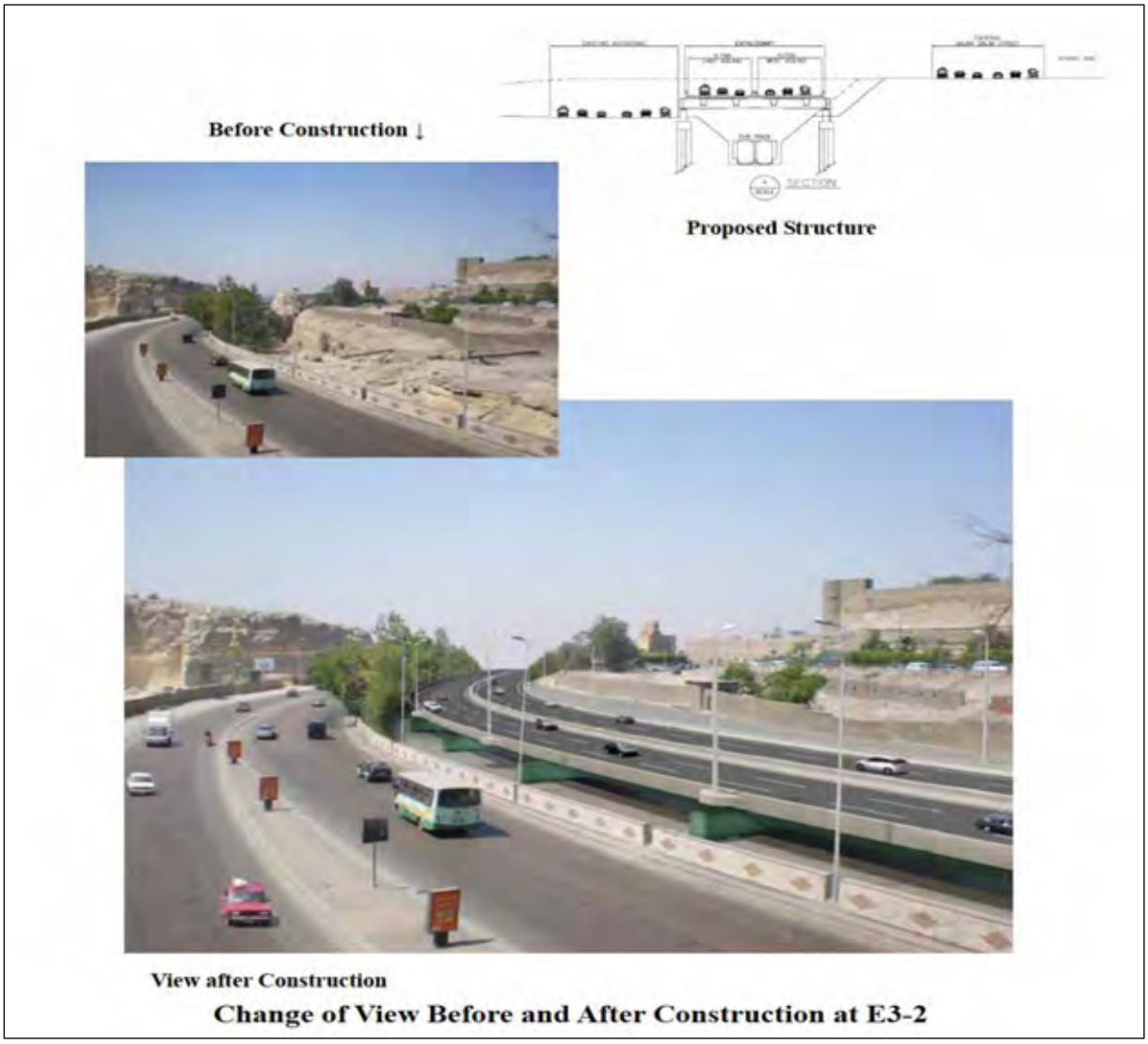


Figure 12.2-12 Montage Photo Assuming Expressway is Constructed Next to Citadel

3) Re-routing from Medieval Aqueduct

Initially, construction of viaduct along Salar Salem was proposed. However to avoid blocking the view of Citadel and Medieval Aqueduct, its route has been changed to another place in the cemetery.

Figure 12.2-13 Present Views of Citadel and Aqueduct from Salah Salem Street

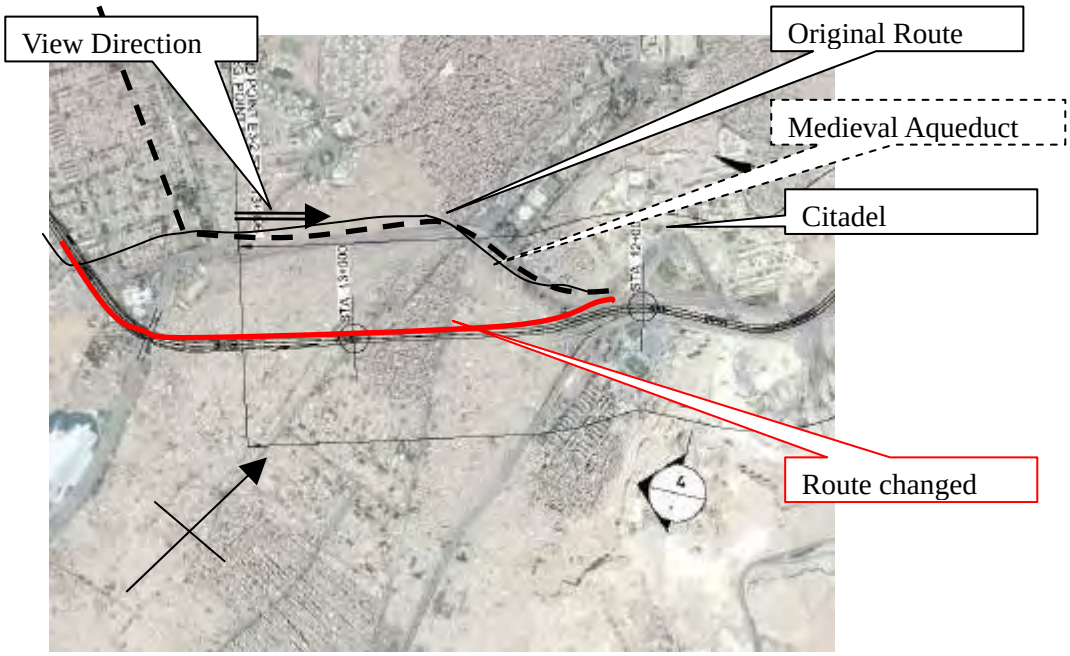


Figure 12.2-14 New Alignments to Minimize Impact to Landscape

4) Minimizing Visual Impact for Old Fashion Style Buildings

There is an area in the west of the Historic Cairo, where hundreds of modern buildings constructed about a hundred years before, are concentrated. The ministry of culture designated this area as landscape protection area and construction of new structure, not fitting to the scenery, was discouraged. The eastern ramp of E2-2 section is located within this area and we studied the shape, color and location so that the visual impact becomes minimized.

Figure 12.2-15 Montage Photos assuming Expressway is constructed beside Protected Buildings

(3) Blocking of Familiar Landscape

Perception survey was made to know if the familiar views are blocked by the project. Almost all respondents replied that they don't mind it.

Before construction→

After construction↓

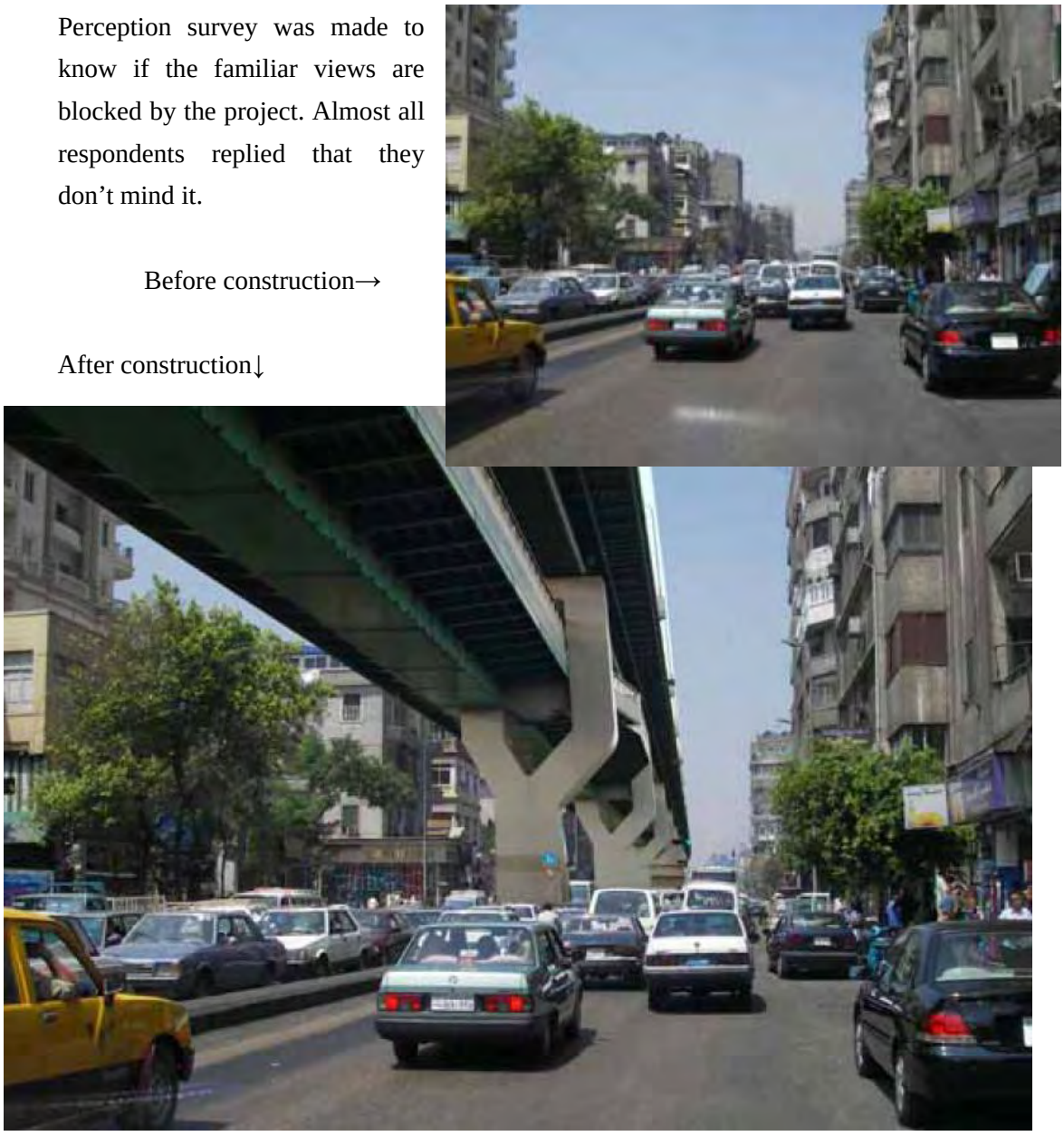


Figure 12.2-16 Change of Landscape of Daily Life

(4) Privacy invasion from viaduct

Some people expressed their fear that their privacy of life can be invaded if vehicle drivers passing over the new viaduct may peep into their room inside. For this mitigation measures, noise barriers of non-transparent type will be constructed on the deck.

12.2.15 Safety and Health

(1) General

This subsection defines principal requirements for Safety and Health including construction

workers and residents during construction activities. The objective is to ensure that adequate precautions are taken to avoid accidents, occupational illness, and harmful effects on the environment during construction.

An environmentalist shall also be included in the project team to ensure the measures outlined in the Environmental Impact Assessment, and the more detailed Environmental Management Plan. People living near the route shall be kept informed of the hours of work, the working arrangements and the total duration of construction activities.

(2) Safety

Safety plan shall be prepared about:

- Working at height: Work at height should be minimized through design and planning, subject to Risk Assessment, method statements, good access equipment and other precautions, recognizing that this is a major cause of fatalities
- Fire prevention: Every supplier should develop, as part of the project, fire safety management plan and implement the plan for their works, specifically dealing with fires and hot work.
- Hazardous substances: Work with hazardous substances (paint and thinner) should be minimized through design and planning. All such materials should be subject to an assessment and proper precautions communicated to the workers.
- Excavations: Excavation works should be assessed, planned, managed, supervised and carried out to prevent accidents avoiding undermining structures or falling materials and collapsing through contact with underground services.
- Control of construction vehicle traffic: Allowable speed in the construction site shall be suppressed for any emergency case.
- Loading / off loading: Safety plans should cover traffic routes, loading and storage locations and working procedures.
- Existing service lines: Careful planning should identify existing services lines, and risk assessments shall be used to develop method statements for safe working including suitable testing during construction.
- Security Requirements: Followings are required:
  - Perimeter guarding.
  - Restricted areas.
  - Checks of entries and exits
- Emergency Preparedness: Organization plan (during / outside office hours) with personnel, line of command, areas of responsibility, instructions

(3) Health

To promote the health following is required:

- Noise: Noise exposure should be minimized through design and planning, subject to assessment and controls including work methods which limit noise emissions, maintenance of equipment (this issued in discussed in other subsection)
- Vibration: Like noise, exposure needs to be minimized and controlled through risk assessment and appropriate precautions to prevent high vibration level(this issued in discussed in other subsection)
- Air quality: Reducing impacts should be considered such as: dust suppression, carbon dioxide, nitrogen dioxide, nitric oxide and sulfur dioxide(this issued in discussed in other subsection).
- Hygiene: Prepare neat camp with proper sanitary facilities and disposal of domestic waste

12.2.16 Socially Sensitive Facilities

This subsection discussed how to mitigate the impact for socially sensitive/vulnerable facilities. Distribution and type of socially sensitive facilities located within 100 m from the study routes are identified and tabulated together with their location maps in Appendix 12H. .

The types and number of sensitive facilities identified are summarized in the table below.

Table 12.2-30 Types and Number of Socially Sensitive Facilities within 100m from Study Routes

	School	Hospital	Mosque	Churches	Grave	Tourist Destination	Other*
E1-2	8	10	10	1		1	4
E2-2	2	5	1	3			1
E3-1	10	4	10				7
E3-2	3	2	11		2	3	1
E3-3	13	7	16	1	2		6
Total	36	26	48	5	4	4	19

*Islamic shelters, Institutes are included

Presently, there is no environmental standard to protect above facilities in Egypt. All of these facilities require the peace and quiet. Therefore, following measures are recommended:

- Operation of heavy equipment near these facilities shall be minimized during construction.
- Diversion route, construction office and workers' camp are to be situated not too close to them.
- Installation of noise barrier and other mitigation measures are to be taken to reduce noise level from the expressway especially the facilities are facing the road.

- Monitoring of noise and air pollution is implemented periodically.

12.2.17 Preliminary Environmental Management Plan

This sub-section summarize the preliminary environmental management plan proposed in the earlier discussion made. Basically, proper detailed environmental management plan shall be established after the details of construction area, method and procedures have been determined at the detailed designing stage.

Table 12.2-31a and 12.2-31b present out preliminary proposal for environmental management based on the environmental target set.

Table 12.2-31a Summary of Predicted Possible Environmental Impact during Construction and Proposed Operation, and Mitigation Measures (1/2)

Issues	Environmental Target	Possible Impact	Mitigation Measures	Monitoring
Traffic Congestion	Not to worsen the present situation	Traffic jam at construction stage	• Proper diversion plan based on traffic prediction • Traffic control	
Air Pollution	To fulfill the Egyptian Standard and, further more, to improve by the project	Emission of air pollutants from heavy equipment at construction stage and from operations stage although they are assumed as within the allowable limits	• Attach catalyzer to heavy equipment • Installation of barrier surrounding construction site • Installation of barrier along expressways	Regularly monitoring of PM10
Noise	To reduce the noise level not greater than 70 dB(A) in any case and preferably not greater than 60 dB(A) for residential area	Large noise from piling driving machine, concrete breakers, rock excavation/blasting during construction and traffic noise while operation	• To use equipment not to generate large noise and attach silencer • Regulate operating time • Installation of noise barrier functioning as safety fence as well during construction • Installation of noise barrier, 5m high on decks and at graded at operation stage • Attach noise absorbing panel on the reverse side of decks • Employ porous pavement • Quick repair of potholes	Regularly monitoring of LAeq
Vibration	To reduce vibration level not greater than 70 dB(A), in any case and preferably not greater than 60 dB(A) for residential area	Serious vibration while pile driving and sub grade compacting	• Use proper equipment not to cause serious vibration during construction • To finish road surface very flat • No height differences at expansion joints • Shock absorbing apparatus to reduce the transmission of traffic vibration	Visual inspection

Table 12.2-31b Summary of Predicted Possible Environmental Impact during Construction and Proposed Operation, and Mitigation Measures (2/2)

Issues	Environmental Target	Possible Impact	Mitigation Measures	Monitoring
Water Contamination	To fulfill the allowable limits	Contamination of groundwater/river water caused by improper storage/transportation/dumping of solid/liquid construction waste in general Turbinate the Nile River by construction of piers in the river	• Not to dump any thing into Nile River • Fuel tank be installed properly not to cause leaking • Proper sanitation facility be prepared for workers' camp	Visual inspection
Odor	To minimize the odor	Unpleasant odor, feeling sick	• Proper management of food residues and sanitation at construction site • Prohibit incineration of waste at the construction site	Visual inspection
Health and Hygiene	To follow Egyptian Rules for Health and Hygiene	Unsanitary condition created by non-discriminated dumping of solid/liquid wastes around working places/camp by the construction workers Noise can be problem for health beyond the maximum allowable level	• Proper management/control of workers' camp • Proper management of food residues and sanitation • Measures for noise shall be taken as above	Visual inspection
Cultural heritage	Never touch any structure inside Historic Cairo and Khevian Cairo	Loss/damage of cultural heritages underground while excavation/tunneling	• Full witness of excavation work by personnel appointed by the ministry of culture	Full time witness
Landscape	To minimize the impact to the landscape of cultural importance in above areas	Blocking/disturbing the culturally/nationally important landscape such as Citadel, Unknown Soldiers' Monument	• Study the impact by montage photos and, if necessary, to carry out following: • Re-align the route • Use depression/tunneling • Suppress of the height of structure	
Sensitive Facilities	To reduce the noise level if they are facing to our study route	Noise, traffic congestion	• Detour control • Construction of noise barrier, etc.	

12.2.18 Global Warming

We estimated the change of global warming gas in case project is implemented (With) and in case not implemented (Without) in 2017 and 2027 respectively. Following table is our conclusion.

Table 12.2-32 Prediction of CO_2 Emission from Vehicles

Section	Length of Expressway, km	2007 Existing			2017 Without			2027 Without		
		Daily Traffic Volume, N/day	Ave. Speed kph	CO_2 Emitted, ton/year	Daily Traffic Volume, N/day	Ave. Speed kph	CO_2 Emitted, ton/year	Daily Traffic Volume, N/day	Ave. Speed kph	CO_2 Emitted, ton/year
E1-2	5.56	102,750	51.4	73,612	132,913	46.8	84,034	161,088	42.2	95,095
E2-2	1.88	108,020	24.1	30,590	126,431	22.0	38,799	135,901	18.3	48,560
E3-1	6.52	90,715	43.7	63,739	147,746	34.1	107,551	174,218	30.0	140,046
E3-2	6.87	97,771	52.3	89,133	122,458	47.0	95,917	123,006	47.2	96,824
E3-3	5.5	59,984	41.8	34,932	81,882	33.0	51,398	115,910	25.7	90,694
Subtotal, ton/year				292,007			377,700			471,219
Section	Length of Expressway, km				2017 With			2027 With		
					Daily Traffic Volume, N/day	Ave. km/h	CO_2 Emitted, ton/year	Daily Traffic Volume, N/day	Ave. km/h	CO_2 Emitted, ton/year
E1-2	5.56				88,387	34.6	54,359	144,871	36.1	86,975
E2-2	1.88				55,703	52.9	14,161	84,483	54.7	22,903
E3-1	6.52				133,353	52.2	114,900	153,776	54.6	143,828
E3-2	6.87				62,800	40.6	45,463	76,946	34.6	58,394
E3-3	5.5				107,154	51.6	76,329	172,194	50.2	117,496
Subtotal, ton/year							305,211			429,596
Reduction (Without-With), ton/year							72,488			41,623

Emission is estimated:
EF=1.97x(546.449-20.0497・V+0.251666・V^2)・ℓ・N・365
where:
EF: Emitted CO_2, ton
V: Speed, km/h
N: Number of vehicle per day
ℓ : Length of Expressway
Source: Environmental Agency in Japan, 1992

As shown in the above table, the global warming gas decrease 40,000 to 70,000 ton/year which is equivalent of 0.05% of total amount emitted 2005/2006 (Environmental Report 2005) within the study routes only. When the total network in GCR is considered, that ratio will be improved.

12.3 SOCIAL CONSIDERATION

In this section, the followings are discussed:

- Perception, socio-economic conditions of directly and indirectly affected people around the study route (in the Appendix I),
- Among all, for the people seriously affected, the resettlement action plan has been prepared and is presented in the Appendix 12J.

12.3.1 Description of the Site

Profile of Project Sites

(1) Geography

The GCR stretches across three of Egypt's administrative Governorates; which are Qalubiya Governorate to the north-east, Giza Governorate to the west, and Cairo Governorate to the east and south-east. Qalubiya is excluded from this survey because the project will not reach this region of the GCR.

Cairo, the capital of Egypt, is the most densely populated area in Egypt. Cairo covers an area of more than 3,085.12 sq km and is divided into 31 administrative districts. Surrounded by the desert to the east, south, and west; and the Nile delta to the north, the inhabited areas cover 96.52 sq km, whereas agricultural lands cover about 15.45 sq km.

Giza is the gate to Upper Egypt and is located on the banks of the Nile. Giza covers about 13,184 sq. km, which is equivalent to 8.5% of the area of Egypt. Giza governorate is divided into Giza town that includes seven districts and 42 Shiakha (sub-districts); 9 Markaz (urban units); 52 rural units; 170 villages; and 637 Izba (small villages). The inhabited areas cover 1,191 sq. km, whereas agricultural lands cover about 776 sq. km.

(2) Population Size and Structure

The total population of Cairo is estimated to be 7,899,000 (CAPMAS 2006), of which 48.9% are females. Cairo’s population represents around 11.09% of Egypt’s total population. Population size varies among the districts. The number of households is about 1,657,081 (CAPMAS 2006). In addition to the 7.8 million residents of Cairo, there is an additional 2 million migrants. The population of Cairo is increasing rapidly due to the unorganized rural migration.

The total population of Giza is around 5,536,000 (CAPMAS 2006), of which 48.4% are

females. Giza's population represents about 8.06% of the total Egyptian population. In Giza, the total number of households is 1,081,606 (CAPMAS 2006).

Social impact survey was conducted in the following 6 areas where poor vulnerable people are concentrated:

1) Southern Cemeteries

It is located near Salah Salem St. and Ein El Seira district. It contains lots of tombs (residential tombs) and very few numbers of houses. The toll expressway will be crossing through the area, and therefore it might be affected by the project. The underground water affected the tombs and made the soil fragile. Some of the tombs were considered as human heritage. The area has never faced any relocation activities. Most people are of poor socioeconomic conditions. They have some vocational activities. Some residents are working as guards for the tombs. People were neutral concerning the project and cooperated with the survey team.

2) El Saida Aisha

It is one of the biggest unorganized squatter area. It expands from El Emam El Laithy Street to Highway Road. The houses are in bad condition, and most of them were constructed over the tombs. Most people are working as marble tiles craftsmen (cutting marble and preparing them for flooring tiles, in addition to installing floor marble tiles). Their dependence on the area is merely work-related. Workers meet there and arrange for work with the marble workers. The area will be potentially relocated. Due to the fact that the houses are in poor condition, the houses might be demolished because of the construction of the toll expressway and the resulting vibration. This area faced a relocation activity before. After the earthquake of 1992 and the collapse of their houses, they were relocated to new areas. They could not bear being out of the area, as job opportunities were so rare and they became penniless, hence, they went back to the area and reconstructed it. They were of poor class; however, they were the landlords. They were totally against the project to the extent that they attacked the interviewers and harassed them.

3) Manshiet Nasser

It is located near the highway. Near this area, a railway station expands to Nasr City. This area faced relocation of the tombs to construct the highway. People are of poor and middle class. They have different activities such as commercial, administrative and vocational activities. People were not satisfied with their area as it faces and overlooks the tombs. They treated the survey team in a nice way and were very cooperative as the toll expressway will reduce the number of accidents on the highway and save the lives of children.

4) Northern Cemeteries

This area faces the highway and Manshiet Naser. It is more likely to be non residential tombs ("gabbanat"). The only residents are in the area that does not face the main road. People work as guards for the tombs. They were cooperative with the team as they felt that they will not be affected by the project.

5) Bolaq El Daqrour

The area where the project will be implemented is the area that expands from the Wooden Bridge to Hamferes St. in addition to Tharwat Huts that are located near El Zomor Canal. It is an overcrowded area and different social classes live in the same area. Based on the type of dwelling, upper middle class live in El Sudan St. whereas, the poor and ultra poor live in the back area next to the railway line. People have lots of activities: administrative, commercial and services activities.

6) Bolaq Abu El Ela

It is the area which expands from El Gala'a Hospital to the 26th of July Street. It is one of the most important commercial areas in Cairo. The houses are also very old and some are appointed to be preserved. Important religious monument El Sultan Abu Ela Mosque is located in the area.

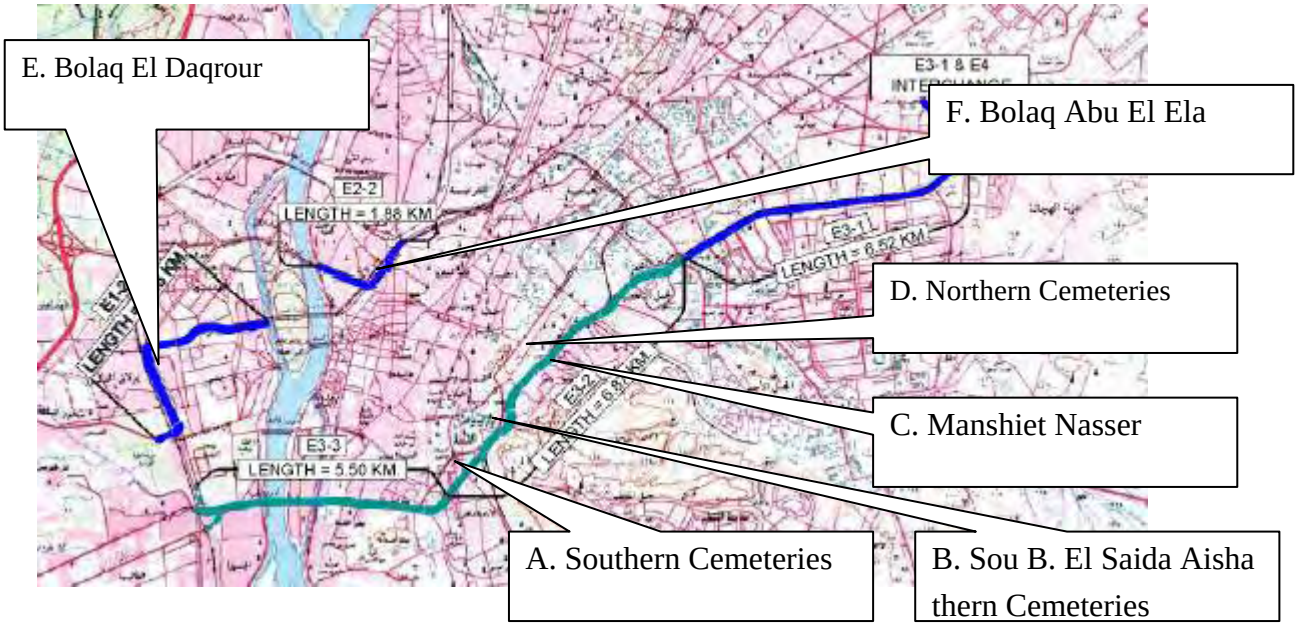


Figure 12.3-1 Location of Area Studied

12.3.2 Potential Impact

(1) Project Data and Adverse Impact

The following chart describes ratio between socially affected area and total length of study routes.

Table 12.3-1 Ratio of Affected Length to Total Project Length

Description		m	Ratio %
Total Length of Study Routes		26,340	100
Affected Length	Relocation (ENR site)	80	0.3
	Relocation (NAT site)	120	0.5
	Land loss at Arab Contractor	600	2.3
	Temporary business loss (E2-2)	1,880	7.1
	Total of Affected Length	2,680	10.2

It is noted that the maximum effort was taken to reduce the number/area of resettlement/land acquisition so far feasible and, in the most case, viaduct over present highway, tunnelling or use of government land.

The resettlement/land acquisition possible caused is summarized as below:

Table 12.3-2 Numbers and Types of Affected Persons/Properties

Area		Characteristic	Land Area m2	Building Area m2	Number* of Affected Households	Number of Affected Venders/Shopkeepers
E1-2	Wooden Bridge inside ENR Land	Informal Settlers	400	400	50	
	Tharwat Hut inside NAT Land	Informal Settlers	1,500	4,500	50	
E2-2	Baloq ElElla	Street Venders				500
		Shop keepers				200
E3-1	Nil					
E3-2	Arab contractor	Private land				
E3-3	Nil					
Total			221,900		100	700

* Number of households is presumed figures only by the best judgement, since it is F/S stages and should be determined by survey when the alignment is finalized at the detailed design stage.

Locations of people affected are shown in following figures.

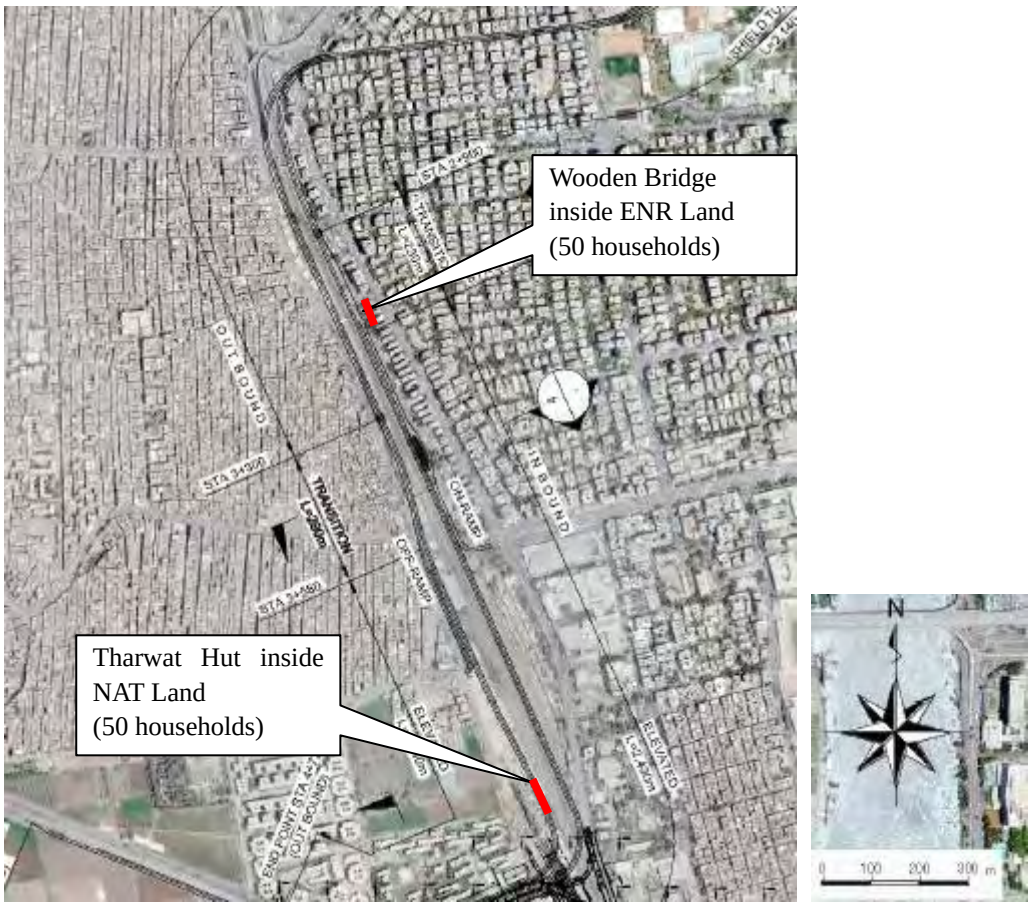


Figure 12.3-2 Locations of Possible Resettlements in E1-2

As shown, all of the residents to be relocated are informal settlers occupying the land f either of Egyptian National Railways (EBR) or National Authority of Tunnelling (NAT).

Those who may get temporary business loss are the vendors and shopkeeper in Bolaq El Ella along E2-2 section, since the study route in this section will be completely closed and no vehicle can access to the shops along the route of 1.8km approximately as below.

Figure 12.3-3 Locations of Business Loss Potentially Caused in E2-2

Following figure indicates the location of land acquisition can be caused.

Figure 12.3-4 Location of Possible Land Acquisition inE3-1

This is a private land believed to belong to the Arab Contractor, one of the biggest companies in Cairo. The land required is 10-20m wide x 600m long along the present highway. It is vacant now and, it is preferable to inform Arab Contractor not to sell, modify, or construct something on the land as soon as the implementation of the project has been determined.

12.3.3 Socio-Economic Studies

Socio-economic studies were implemented, consisting of 2,000 interviews and 50 Focus Group Discussions as presented in the table 12.2-9.Followings are findings of these studies.

(1) Characteristics of Households and Poverty Indicators

1. The head of the household is mainly the husband or the father (83.3%), while, the household headed by a wife or mother was only 10.7% of which some are divorced or widowed.
2. 73.7% of the sample was at the age range between 36 and 65, which is considered an old age to some extent. In addition, those above 65 years of age constituted 5.7% of the sample.

3. 40.8% of the head of households were illiterate, while 20.7% have secondary certificates. A small percentage of the head of the households hold a university degree.
4. 22.8% were merchants and 12.1% were sales persons, which is an indicator of the activities of the areas where about one third of the sample work in commercial activities.
5. The data revealed that the high percentage of households with family units composed of four to five persons amount to 48.6% of the sample, which is an indicator of the high fertility rates among squatter areas.
6. 75.1% of the sample households surveyed are composed of less than six persons. Strangely enough, that was approximately the same percentages mentioned in the feasibility survey and the perception survey conducted in 2007, which serves as an indicator of the consistency among the three surveys.
7. For 95.1% pf the sample surveyed, the sanitation system is the public sewers
8. About half of the sample spends between L.E. 500 and L.E. 1,000. Those who spend more than L.E. 1,500 are no more than 8.4%.
9. The reliability of income data increased due to the fact that is consistent with expenditures' data. The data revealed that about 45.6% of the sample earn between L.E. 1,000 and L.E. 1,500.
10. 7.0% earn more than L.E. 2,000 and 30.7% of the sample earn between L.E. 500 and L.E. 1,000, meaning that most of the sample answers are consistent with the expenditure data.
11. The stability of income is a vital indicator of the wellbeing of households. Regarding changes in income, about 57.1% of the sample reported that they have no change in income. However, a quarter of the sample reported that their salary has decreased. Only 18.5% of the sample reported an increase in income

(2) Perceptions of the Toll Expressway Project

1. As a total, 54.9% are with the project while 27.6 % are against the project. The rest 17.5% is neutral position. Following indicates the perception of people depending on the area. It is noted, in the table, that the 93% of residents at Bolaq El Daqrour-Tharwat Huts, who are to be relocated, supports that project since they want to move out of that area due to the area is filled with rubbery, alcohol, drug and jobless youths as indicated in the record of group discussion held here.

Table 12.3-3 Results of Perception Survey

Area		Perception towards the Project			Type of Impacts
		Good (%)	Area	Perception towards the Project	
E1-2	Bolaq El Daqrour - Wooden Bridge	58.8	35.3	5.9	Relocation of 50 households
	Bolaq El Daqrour - Tharwat Huts	92.9	0	7.1	Relocation of 50 households
	Bolaq El Daqrour	65.9	15.0	19.1	Indirect impact only, facing to the route
E2-2	Bolaq Abu El Ela	52.6	24.4	23.0	Temporary business loss during construction because of road closing
E3-2	Southern Cemeteries	76.0	14.0	10.0	Relocation by Ministry of Housing Project*
	El Saida Eisha	46.6	39.0	14.4	Relocation by Ministry of Housing Project*
	Mansheit Nasser	31.6	45.6	22.8	Indirect impact only, facing to the route
	Northern Cemeteries	30.8	15.4	53.8	Indirect impact only, facing to the route
E3-3	El Malek El Saleh	55.0	31.7	13.3	Indirect impact only, facing to the route
	Total	54.9	27.6	17.5	

2. 18.1% of the sample ever heard of the project, of which the percentage of female sample was slightly higher than those of the males. However, people are still unaware of the project.
3. Regarding the Focus Group Discussions and NGOs interviews, a negligible difference was reported, since most of the people being surveyed and interviewed have never heard about the project
4. 45.6% were not in favour of the project, closely followed by El Saida Eisha, where 39.0% were against the project. Bolaq El Daqrour - Tharwat Huts reported the highest percentage of acceptance (92%), as the area consists mostly of people living in informal huts that have the potential for relocation.
5. Based on the gender of interviewees, female interviewees were in favour of the project slightly more than the males. 53.7% of females sampled in Cairo were in favour of the project, whereas, 48.1% of males were in favour of it. The percentage in Giza was different, where 72.9% of females accepted the project, while 62.2% of males were in favour of the project. 21.4% of males sampled in Giza were against the project. However only 11.8% of females reported that the project is not good.

(3) Reasons for Acceptance of the Project

1. About one quarter of the sample surveyed reported that the project might save time. 16.8% mentioned that it would save time because the traffic along the toll expressway will be fast. 24.9% of the sample surveyed reported that it might reduce congestion. 11% of the sample surveyed reported that it might alleviate the pressure from downtown.
2. Most of the NGOs were of the opinion that it is a good project because it might solve the "Chronic Traffic Problem"

(4) Reasons for Rejection of the Project

1. 88.2% of sample reported expropriation is one of the disadvantages.
2. The second major reason is congestion during construction (43.5%).
3. The third major reason is the reduction of commercial activities. 35.8% of the sample reported that it might negatively affect commercial activities, particularly during construction.
4. The fourth most important reason was the narrowing of the street lanes (25.1%).

(5) Potential Barriers that Might Face the Project

1. Expressway toll payments. Many people reported that the toll price will probably increase , which might prevent people from using the toll expressway.
2. Expropriation of dwellings in some areas. Most people is unwilling to leave their homes. However, those who are willing to leave their homes are demanding a very large sum of money for compensation.
3. Housing laws and regulations might result in that some people can not receive the appropriate compensation.
4. Traffic congestion that may be caused during the construction phase of the project, especially in the commercial areas like Bolaq Abu El Ela and Bolaq El Daqrour.
5. Potential conflicts between the microbus drivers and customers. Although the toll will be paid by the customers instead of the drivers, the latter is responsible for paying the additional cost resulting from the rising fuel prices, for example..
6. Lack of awareness regarding the project, where most people has little knowledge of the project and thus might cause problems during the construction phase.
7. The lack of having a clear and reasonable expropriation map, which will hinder the expropriation process and fail to inform people of its contents at most appropriate time.

(6) Alternatives

1. Regulate traffic by reducing the number of cars on the road and by increasing the number of buses with more traffic enforcers;
2. Construct new cities in the suburbs which will result in alleviating the congestion in the heavily populated areas; and
3. Widen the streets to accommodate the large numbers of cars and buses.

(7) Strategies to Change Negative Perceptions

1. They mentioned that one of the ways is awareness raising through the media (72.1%);
2. Reducing the fees and giving people appropriate compensation.

(8) Willingness to Pay

1. Regarding payments on a monthly basis, the data collected revealed that a high percentage of motorcycle drivers should pay nothing. Regarding public transportation, 39.7% reported that these vehicles should pay nothing, as they are public service.
2. Regarding the willingness of the respondents to pay on a daily and monthly basis, the data collected earlier revealed that about 89.9% of the sample does not posses a vehicle. Those who have a vehicle mentioned that they are willing to pay between L.E 1 (2.7%) and L.E. 2 (1.1%), whereas 1.1% were willing to pay 50 piasters only.

(9) Strategies to Support people

1. Providing the needed information about the toll expressway through the media including television.
2. Raising people's awareness about various issues pertaining to the toll expressway through the radio and newspapers.
3. Adjusting toll payments so that they are appropriate and reasonable.
4. Trying to coordinate expropriation activities to the minimal level possible.
5. Ensuring transparency of communication with the community..
6. Making compensation for expropriation on market prices, because people who are subject to expropriation will oppose to the project if compensations are not valued adequately.
7. Ensuring that the construction is expedited as people tend to get frustrated if projects take longer time and much more cost.
8. Raising awareness of the community about the project using different types of media and NGOs.
9. Exempting all handicapped individuals from paying the toll as they are among the most vulnerable groups.
10. Defining the fees and categorizing the people who should be exempted from payment. This should be addressed by the People's Assembly.

(10) Community Participation

1. The data collected revealed that there are many different types of organizations. However, in most areas, individuals were unaware of these organizations except for the political parties.
2. 16.2% of the sample surveyed mentioned the a political party was easily accessible. NGOs who provide financial support to poor families were also known to the community.
3. The most important contribution is advocacy. 42.3% in Giza and 32.4% in Cairo reported

that advocacy is the most important intervention for the community.

4. Secondly, raising people's awareness concerning the project is one of the main means of contribution. Thirdly, assisting people in receiving their compensations is important..
5. The role of the community people is crucial because if the community people feel responsible for the project, they will ensure project's success.
6. People reported that the community might assist the project in Cairo (10.5%) and in Giza (7.7%) if information about the project was provided.
7. People also might support the project if needed assistance in raising awareness was provided. Rich people expressed to provide money to the affect persons, if necessary.

(11) Impacts of the Project

Positive impacts

1. Reduction of congestion, as the toll expressway will facilitate the movement of traffic
2. Reduction of accidents
3. Many areas will become clean as the vendors on the streets will be moved elsewhere
4. Feeling comfortable as people will be able to move without taking longer time which will relax them.
5. Social contact among people might be accelerated as less traffic jams will make it easier to visit each other.
6. Those who will be relocated will get new residential units (this will be good to them who live in poor housing conditions).
7. Saving time for the drivers that might enable them relax and the maximum use of their time.
8. Children will feel secure from free from car accidents.
9. Reduction of quarrels and fights among people stems from the congestion.
10. People will keep good health due to the reduced pollution and sitting time in the car. "People's backs are badly pained due to the long and tiring waiting time in the traffic jam", said a male participant in Giza.
11. The driver will be relaxed as he is able to drive without trouble..
12. People will contact each other easily since the toll expressway will facilitate moving around the city.
13. Accelerating the moving of goods among areas
14. Reduction of fuel consumption
15. Increase in the turnaround of taxi drivers
16. Less time for commuters which enables them more productive throughout the day
17. Accelerating of tourism as tourists might be happy to visit a country where they can move around fast. "At present, we have to start very early in the morning to reach our destination. Tourists really get bored for the traffic delay" said a male respondent working in a travel agency.

Negative impacts

1. Air pollution due to the excessive use of fuel since the number of vehicles on the road will be most likely to increase;
2. The streets might be narrowed due to the construction activities;
3. The possibility of pedestrian's crossings roads and bridges during the construction activities;
4. The possibility of using the underside of the toll expressway (area beneath the elevated sections of the toll expressway) by drug addicts and other illegal activists
5. Poor maintenance of the toll expressway might cause environmental problems such as potholes on the surface of the road which collects water in puddles when it rains
6. Lots of noise, dust and vibration during construction will be brought about; and
7. The transfer of the corpses from the tombs might result in numerous environmental problem
8. Deformation of streets in case of the bad designs of the toll expressway.
9. People's lives will be confused due to expropriation
10. People might have some psychological problems due to expropriation and transfer from the place they used to live
11. Affecting the privacy of people, particularly to those who live along the toll expressway and have their homes exposed to the traffic outside
12. Not receiving the appropriate compensation
13. People, especially vendors among others, might lose their work opportunities during construction
14. If toll is very high, people will not be able to pay for it.
15. Forced use of the toll expressway despite of unwillingness to pay the toll.
16. As the toll revenues affect the budget of the government, there will be a case people are poorly compensated due to insufficiency in the budget., and
17. The increase in the cost of construction materials due to the implementation of the toll expressway project.

12.3.4 Legal Framework

(1) Government of Egypt Relevant Legislation

It is the Government of Egypt's policy to compensate or assist people whose property is affected government projects. This section of the report addresses the means, causes, and the competent authorities in charge of the implementation of the administrative law, civil law, and specific laws related to the expropriation of private property for public interest. In addition, this section covers the restrictions, procedures at the administration's disposal, and the consequences of property expropriation. This section also covers the legal procedures concerning the possession of private property.

Followings are the types of possession in the present legal framework..

Table 12.3-4 Type of Possession of Properties

Type of Dwelling Possession	Description
Owned	A landlord owns the dwelling (Shop or Apartment).
Owned Partially	A landlord owns part of the dwelling (Shop or Apartment).
Rented (Old Housing Law)	The resident rents the apartment or the shop for a long period and paying a monthly fees (some people pay a big down payment "Khelow" to be able to rent the unit).
Rented (New Housing Law)	The resident has the right to rent the unit for no more than two years, then the property owner can renew the contract (the renter pays a particular amount of money equivalent to two months rent and then pays monthly fees).
Furnished	The property owner furnishes the unit for the resident. These command the highest rent.
Allowance to Stay	This type of possession is rare; most of them are doorkeepers and guardians. They have the right to stay in a small apartment to watch over the dwelling. They don't pay any rental fees.

(2) Decision Making Responsibilities

According to Article 34 of the Constitution, "Private ownership shall be safeguarded and may not be placed under sequestration except in the cases defined by law and in accordance with a judicial decision. It may not be expropriated except for the general good and against a fair compensation as defined by law. The right of inheritance shall be guaranteed in it." According to this article, procedures for private property expropriation are exceptional. The competent jurisdiction, therefore, must recognize lawsuits raised by individuals against the administration regarding compensation.

Other relevant laws governing expropriation and compensation include:

- Law 557/54, which was later amended by Law 252/60 and Law 13/162, and establishes the provisions pertaining to the expropriation of real estate property for public benefit and improvement.
- Law No. 27 of 1956, which stipulates the provisions for expropriation of districts for re-planning, upgrading, and improvement, and the amended and comprehensive Law No.10 of 1990 on the expropriation of real estate for public interest.
- The general provisions guiding expropriation of private property (according to Law 577/54, Law No. 27 of 1956, Law No. 252 of the year 1960, and Law 577/54) include the following:
  - Property expropriation shall be only on tangible real estate property, there shall be no expropriation of movable possessions.
  - Applicable only to property privately owned by individuals, thus, public property is excluded from the procedures.

- The expropriation shall include land and constructions (structures).
- The purpose of expropriation shall only be for realizing public interest.
- The administrative authority has the right to assess the circumstances related to expropriation as well as the authority for implementation of property expropriation, which is justifiable by the objective of achieving public benefit. The administrative authority may not be challenged or judged on the grounds that it could have chosen more appropriate real estate property to achieve public benefit than the one that it has already chosen.
- The administration shall estimate the area it sees necessary for the establishment of a project. This right shall not be only restricted to the real estate property required for the project; but the legislator empowered the administration to also include expropriated property.

- According to Article 23 of Law 577/1954: "If the purpose of the property expropriation is the establishment of a squares, streets, or their expansion, modification, demarcation, or the establishment of a new district, or for its improvement/ upgrading or beautification, or for any health related matter; property expropriation may include, in addition to the real-estate property needed for the project, any other real-estate property which the administration in charge sees to be necessary to achieve the project's objective or any other property whose current state (whether in size or form) is not consistent with the required improvement."
- The first article of Law No. 27 of 1956 allows for the expropriation of districts for their improvement, upgrading, re-planning, and reconstruction. Article 24 of Law 577/54 also stipulates that in case only partial expropriation of real estate property is required, and the remaining un-expropriated part will not be of benefit to the owner; the owner shall be given the right to submit a request within 30 days (beginning from the date of final disclosure of the list of the expropriated property) for the purchase of the entire area. It should be noted, that the new law has not restricted the right to request the purchase of the remaining un-expropriated portion of real estate whether it is a building or land.
- Law No. 252 issued in 1960 and amended by Law 577/54, was promulgated to balance the rights and guarantees of individuals with the rights of the state in expropriating private property. This law, moreover, stipulated that any judgment that justifies property expropriation for public benefit / interest must be made by presidential decree.

(3) Transfer of Ownership and Compensation

These procedures are administrative. There is no judicial interference except during the compensation assessment.

- Article 1 of Law 252/60 (amended by Law 577/54) states that the determination of public benefit for the expropriation of private real estate property is subject to Presidential Decree.
- On the other hand, according to Article 2 of Law 27/1956, the determination of public interest for the expropriation of districts for re-planning and upgrading is subject to a Decree from the Cabinet. Included with the decree are the following:
  - A memorandum that demonstrates that the required project is for the benefit / interest of the public (published with the Decree in an official newspaper and in relevant local administrative units).
  - Two weeks following the publication and promulgation, the official commissioned to carry out the expropriation property procedures is permitted to enter into the property to perform the technical and surveying operations and all the necessary demarcations of the expropriated real estate.

The steps for transfer of ownership are the following:

1. Preparation and Execution of a Property Census

   The census shall be performed by a commission that consists of a delegate from the entity commissioned to perform the expropriation (i.e the Governorate, Ministry of Agriculture, etc.) and local officials from the Governorate. A registered notice shall be sent to notify all concerned persons. All owners and those with rights or entitlements to the expropriated property shall meet up with the commission in the project area during the census process in order to inform the commission members about their property rights. The commission shall report the minutes of the procedures, which shall include all property and their owner names and addresses. The members of the commission and the owners shall sign the census report. If anyone refuses to sign, this will be noted in the minutes of the session along with reason for refusal. Entering the expropriated properties from then on shall be subject to the notification of the concerned person.

2. Preparation of Statements and Evacuation Notification

   The expropriating entity shall prepare statements with the number and types of property to be expropriated. The statement will include the size, location, owner's names and addresses, and values of each property (as per the census report). These statements will be published in an official newspaper. Owners and tenants shall be notified that they have a 5-month period during which they must evacuate the property. Owners shall be given a period of 30 days (from the date of submission for the statements) to present complaints or grievances regarding statements. If complaints are not submitted during this 30-day period, the statements shall be considered conclusive and not subject to any litigation or claim. Compensation amounts indicated in the statements will be sent to the identified owners.

3. Transfer of Ownership

   Transfer of ownership is done when property owners sign forms for pertaining to the transfer of ownership. In cases where owners have not signed the forms of transfer, the competent minister shall issue a decision to expropriate the property. The forms and the statement detailing the ministry's decision will be sent to the relevant notary office. Following this process, the property will be transferred to the administrative authority that expropriates the property, and the rights incumbent on the real estates shall be transferred to the compensation amounts.

4. Property Appraisal and Compensation

   Fair compensation will be given for all properties expropriated in accordance with constitutional provisions. The legislator has put forth some principles, which should be taken into consideration during property appraisal and compensation:

   a. Property appraisal shall not include structures, plants / crops, improvements / additions, or tenant agreements performed in order to increase compensation. The legislator considers every act taken after the publication of the decision for expropriation, an act performed for increasing the property value. These acts, therefore, will be excluded from appraisal. (Article 25: Law No. 577 of 1954, and Article 7: Law No. 27 of 1956).
   b. If the compensation amount for the un-expropriated part, in projects other than urban planning, increases or decreases (due to activities causing general public benefit), the increase or decrease in amount should be taken into consideration and added or subtracted. This amount will not exceed 50% of the compensation value of the expropriated property (Article 19: Law No. 577 of 1954).
   c. If the value of the property subject to expropriation increases due to the implementation of a project for the public benefit, the increase in value will not be included in the compensation if the property expropriation is performed within five years of the date of implementation in the previous project (Article 20: Law No. 477 of 1954).
   d. Property owners are obliged to pay for public works that improve their property, such as district or city upgrades. Their payments, however, should not exceed 50% of the actual upgrade, i.e. street expansion, which improved their holdings. This also applies if a section of private property is expropriated for public works leads to an overall improvement of the remaining property still possessed by the private owner. The payments requested by the authority in charge of organizing the public works project shall not be subject to any appeal (Law No. 577 of 1954).

So that property compensation is distributed in a timely manner, Law No. 14 of 1962, Article 21 states: "Half of the value of the expropriated property that has entered into the improvements areas shall be disbursed, while the second half of the value shall be deposited in the trust funds of the competent authority, until the owner submits a certificate issued from the competent authority that demonstrates the payment in return for the improvements made to the property."

(4) Disputes

Most expropriation procedures are final and carried out in a timely manner. Actions to cancel or delay the expropriation of property cannot halt the expropriation procedures. The property owner's right to compensation is addressed (Article 26: Law No. 577 of 1954). Expropriation procedures, likewise, should not be carried out in such a way that prevents owners and concerned persons from claiming and ensuring their rights. As a result, the legislator created two different mechanisms to address the issue of disputes. They are the following:

1. Compensations beyond property value: These are related to the actual right of the expropriation. In this case, the authority in charge of the expropriation process shall be responsible for investigating these disputes in order to pay the due compensation value (Article 11: Law No. 11 of 1954 and Law No. 11 of 1956).
2. Disputes compensation value: the authority in charge of the expropriation procedures shall refer the disputes over the compensation value to the court. The court shall examine the complaint quickly and its judgment shall be conclusive.

(5) Gaps in the Egyptian Laws Concerning Resettlement Action

Gaps in the Egyptian Law concerning resettlement actions are discussed in order to have a broad and in-depth knowledge about the gaps that exist in the Egyptian laws pertaining to relocation: They are as follows:

- Compensation is not paid until the affected people are moved/displaced.
- Compensation is traditionally below market value due to a lack of experience on property appraisal, absence of real market rate, and exaggeration of property value by its owner.
- Individuals are not compensated for assets.
- The vendors and illegal salespeople do not receive any compensation.
- The affected people are not supported by means of a soft-loan that compensates the difference in value between the old and new property.
- Affected people do not have access to full information about the resettlement process and options for compensation.
- Participatory planning and decision-making is not applicable in resettlement options and compensation.
- Disputes may take years to be resolved.
- The differences between Egyptian regulations and World Bank policies are summarized in the following table:

Table 12.3-5 Gaps Between Egyptian Regulations and World Bank Policies

Issue	Egyptian Requirement	World bank Policy	Practical Implementation
Calculation of Compensation	According to prevailing prices in the affected area and assessed by a specialized committee for that purpose	Full replacement cost	✓ This issue is crucial since all previous Egyptian practices of valuation have been substantially below the market rate due to lack of valuation experience in implementation authority and no real market rate is defined due to taxes and fees charged on properties
Squatters	Not included in the legislation (Applied cases for resettlements revealed that squatters have been compensated as a result of political sensitivity)	Are to be provided resettlement assistance (but no compensation for land) so that the life level will not be worsen by the project	✓ This has to be clearly considered in any resettlement action and offered options whether through alternative shelters or fair compensation that enables them to find other shelter.
Resettlement	Affected occupants who are physically displaced are to be provided with another residential housing. They do not have the rights to object to the location of the resettlement, but only the housing suitability in terms of area, design or relevant issues. Their objection is submitted within 15 days after receiving the notification of the new housing, to a dedicated committee for that purpose, which should respond within one month.	Affected people who are physically displaced are to be provided with residential housing, or housing sites, or, as required, agricultural sites at least equivalent to the old site. Preference is to be given to land-based resettlement for displaced persons whose livelihoods are land-based.	✓ Affected people should be offered various options for resettlements (not only one option) at least equivalent to the old property or site. ✓ The affected people should be supported also with a sort of soft-loan that compensates the difference in value between the old and new property.
Resettlement assistance	Not included	Affected people are to be offered support after displacement, for a transition period.	✓ This assistance should be included in any resettlement project
Vulnerable Groups	Not Included	Particular attention to be paid to vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, indigenous peoples, ethnic minorities.	✓ Considerable attention should be for informal settlers' groups and give them priority in selecting resettlement options and receiving financial support.
Information and Consultation	Displaced persons are provided timely and relevant information. Not consulted on resettlement options Not able to participate in planning, implementing and monitoring resettlement	Displaced persons and their communities are provided timely and relevant information, consulted on resettlement options, and offered opportunities to participate in planning, implementing, and monitoring resettlement.	✓ Affected groups should get access to full information about the resettlement process and options for compensation. ✓ Participatory planning and decision making should be applied in resettlement options and compensation
Grievances	Specialized committees for that purpose and time One month to object to the decision of resettlement Four months to object to the compensation value	Appropriate and accessible grievance mechanisms to be established.	✓ There is a need for ensuring that affected groups are offered the direct channel for grievance and receive redress in proper time prior to resettlement. ✓ The receiving of full compensation should be prior to resettlement.

Source: Resettlement Policy Framework, Alexandria Governorate, December 2006

12.3.5 Institutional Framework

(1) Executing Agency

Generally, the government authority in charge of the implementation of the expropriation activities designated for public interest is the Egyptian General Authority for Land Survey except for projects handled by other entities and governmental authorities. ESA is in charge of the formation of expropriation and compensation committees.

The executing body is GARBLT and GARBLT would be responsible for compensation payments to PAPs through the implementation authority, offering alternative resettlement options, and implementing the resettlement activity. The proposed implementation authority is Resettlement Committee that would be responsible for the implementation of resettlement activities. RC shall be sub-divided as:

1. The valuation subcommittee is the most important element as they might settle disputes in case of having a clear and transparent valuation system. At least 6 personnel who have at least 5 years experience should be included.
2. The second is the administrative auditing subcommittee that is responsible for revising all paperwork to make sure of the eligibility criteria, as well as monitor the process of administrative permissions.
3. The third is regulatory and religious subcommittee. Having lawyers who have experience in such relocation activities is essential. Such goal is not to work against the people but to try to find the best compensation strategy that abides by the laws and regulations. The same is applicable for people of religious authority, who will be responsible for moving the tombs in acceptable manner.
4. The fourth is the community support subcommittee. NGOs are essential to support the people and provide them with the needed information about project activities.

(2) Experience of Previous Implementing Agency

This topic was covered in focus group discussions and NGOs interviews in order to shed light on the previous resettlement activities that caused damage to people in order to avoid repeating the unacceptable resettlement activities. Most areas in some how faced a resettlement or relocation actions due to expropriation or demolishing of their houses.

1. El Sayda Eisha

After the strong earthquake of 1992 some houses collapsed, particularly in El Kharta El Qadeema. The government relocated people in another area named “El Nahda”. People completely refused to move. Within two years, most people who have been relocated came back to their area and rebuilt their collapsed houses.

2. Mansheit Nasser

During the construction of the highway, the government wanted to expropriate the tombs. Participant of the focus group discussions in Manshiet Nasser reported that the expropriation process was hurtful to their feelings.

3. Bolaq El Daqrour

In order to widen one of the streets named "Nahia" people were expropriated. They were totally unwilling to leave the area, and the government forced them to leave without paying an appropriate compensation for them. Whatever the compensation that people receive, they never feel satisfied, as it is well-known that people exaggerate in evaluating the value of their assets.

The three abovementioned areas illustrate the following:

- The government does the expropriation actions without discussing it with people
- Most expropriation processes are applied by force
- The process in most cases is spontaneous and not organized except for the earthquake events
- People do not play any role in expropriation

12.3.6 Resettlement Action Plan

(1) Purpose

To minimize the impacted discussed above, Resettlement Action Plan (RAP) is proposed. In this F/S stages of study, only a draft RAP has been prepared and detailed RAP are to be prepared after the alignment has been confirmed. This RAP is based on current GOE legislation on land ownership and acquisition, Japan International Cooperation Agency Guidelines for Environmental and Social Considerations (JICA's guideline) and the policy on involuntary resettlement adopted by other international financing agencies. It is primarily based on the findings of the SIA conducted in June to August 2008. (See Supporting SIA Report of different volume for details). In the SIA following public participation was implemented to focus the environmental issues including social (resettlement) issues.

The primary purpose of this RAP is to describe (1) outline of project, (2) compensation policy to PAPs, (3) schedules for project and resettlement activities and (4) with a total budget for compensation. The objective of RAP is to ensure the losses of PAPs incurred are redressed so that PAPs can share the project benefits and can be assisted to develop their social and economic potential. It is noted that RAP will need to be revised after DMS and also during the Design and Implementation, and Rehabilitation stages. Draft RAP is prepared and presented in Appendix 12J.

(2) Proposed Guidelines on Land Acquisition and Resettlement

Resettlement of the affected persons and commercial/business enterprises will be implemented in accordance with the JICA guidelines. The policy on involuntary resettlement requires that (a) project planning and implementation carefully considers alternative options to minimize resettlement; (b) prepare resettlement plan beforehand to mitigate any negative impact.

Land acquisition and resettlement of the PAPs in this Project will be carried out in accordance with the following guidelines in a manner satisfactory to the JICA.

- Resettlement will be carried out in a way to minimize the adverse impacts on the PAPs. This will be done in consultation with the people to be affected.
- The people whose place of residence and business is affected will receive alternative sites for living, trading and livelihoods.
- Owners of residential/commercial units will be compensated at replacement costs regardless of his/her entitlement to those properties.
- If community structures or common property resources are affected, they will be re-built or replaced at market price under project financing.
- The needs of women and other vulnerable groups will be identified.
- The compensation committee, established under GARBLT will assist PAPs in all aspects regarding relocation and resettlement. GARBLT itself will also involve all stakeholders in the decision-making process concerning relocation and resettlement.
- External Monitoring Consultant (EMC) will monitor the land acquisition, compensation payments, and resettlement of the PAPs including grievances redress and resolution of disputed claims for compensation.

(3) Information Dissemination

Public information meeting shall be carried out among PAPs in the related community for resettlement. According to the results of the SIA completed on August 2008, more than 50% of the affected households express consent basically at the initial step before starting negotiation about actual compensation. If relocation is required, land to which houses are relocated is secured and basic agreement from host community/landowner which receive the relocated personnel shall also be obtained.

The Resettlement Committee (RC) shall publish resettlement brochure, posters, leaflets, etc. explaining the impact of the Project, compensation policies for PAPs, resettlement options / strategies for households and commercial /business enterprises, and tentative implementation schedule of the project. Further steps will be taken to:

- keep the affected people informed about the land acquisition and project plan, compensation policy and payments,
- involve political parties and NGOs for advocacy, raising awareness and assisting people to get compensation
- ensure that PAPs will be involved in making decisions concerning relocation and implementation of the RAP.
- explain the relevant details of the Project;
- explain the RAP and the various degrees of project impact;
- provide details of the entitlements under the RAP and what is required of PAPs in order to claim their entitlement;
- explain the implementation schedule with a timetable for the delivery of entitlement;
- explain the compensation process and set out compensation rates;
- provide a detailed explanation of the grievance process;
- solicit the help of community leaders and other influential community leaders for encouraging the participation of the PAPs in the RAP and
- attempt to ensure that all vulnerable groups understand the process and that their needs are specifically taken into consideration.

It will also be essential that PAPs have the exact method of the calculation of their compensation explained to them when required. This process has to be carried out by RC and its working group.

The information dissemination will be followed by strategic approach for collection of data and opinions from the PAPs in the form of feedback. These data will be processed for identification of potential PAPs entitled for compensation and in determination of the entitlements.

(4) Community Participant

Community participation is one of the main pillars of achieving sustainable development (the National Strategy for Sustainable Development, NSSD, emphasized the role of different organizations and NGOs especially in the implementation phase of projects). Putting into consideration the critical economic condition of the Egyptian society, the need to have participation from all parties (NGOs and Social Associations) is brought forward. Following indicates the perception about civil organization:

Table 12.3-6 Civil Organizations Identified Active

Description	Ratio, %
Political Party	89
Social association NGO	7
Final supporting NGO	2
Religious NGO	1.7
Community development association	0.3
Don't know	

Table 12.3-7 Potential Participation of Social Organization

Description	Ratio, %
Advocacy	36
Raising awareness about the project	29
Assist people to get compensation	17
Provide money for people	1
Consultation	0.
No contribution	1
Don't know	16

Table 12.3-8 Potential Participation of Community people

Description	Ratio, %
No contribution	77
Encourage the project	10
At least not to reject the project	4
Rich people can donate	1
Prohibit taking way construction material	1.
Raise the awareness to keep children away	0.
Don't know	5
Missing	2

It is noted that 3 quarters of people believes they can not contribute the project.

(5) Compensation Measures

General

Compensation is made to regardless of titled or non-titled PAPs so that the life level will not be worsen by the project in accordance with JICA guidelines and other international rules. The encroacher of landlord into government land shall be strictly punished in accordance with the Egyptian laws. We don't discuss about the land taking of other government since there is other rules between them.

Compensation to land

Compensation shall be made to the formal land owner. No compensation is made to the

occupants of government land. The price should be the market price fairly evaluated by the RC, able to purchase alternative nearby place.

Compensation to Dwelling/Shop

Compensation to the owner of superstructure shall be made, regardless the land is owned or just occupied. The price shall be market price. The compensation amount shall be fully remitted before they move.

Compensation to tenancy

Tenant borrowing the residents also shall be compensated. Similar quality dwelling shall be introduced by RC and tenant fee shall be prepaid by RC for 6 month in the maximum depending of the situation of PAPs .

Compensation to permanent business loss

In addition to the compensation of shop itself, the PAP shall have the right to be provided with "Other Assistances" when he requested and RC shall consider it.

Compensation to temporary business loss

For the street vendors, some compensation shall be made, to cover that they have to suspend business or go to other place. The amount shall be not more than LE 500 per a vendor. It is noted that all these vendors shall be properly registered as PAPs before cut-off –day,

Allowance to resettlement

PAPs who have to be relocated shall be provided with resettlement allowance to cover the time looking for new residents until completion of moving. The amount shall be estimated based on his income and shall not be more than 6 months' income.

Special allowance to vulnerable households

Special attention shall be paid for vulnerable PAPs such as aged, very poor, handicapped or widowed. These allowance are money, food, cloth or whatever necessary for them, determined by RC and NGO.

Other Assistance

Other than compensations/allowance, following assistance may be provided based on the necessity of PAPs to maintain the life level

- Introduction of soft loan
- Job training
- Introduction of job

Table 12.3-9 Compensation/Mitigation Policy

Type of Loss		Entitlement
Loss of Land	Entitled	✓ To be compensated with market price with which alternative land is obtained in the same area which shall be determined by the compensation committee under GARBLT ✓ Otherwise, same quality and area of land is provided at nearby place. ✓ Compensation shall be remitted before taking
	Informal settlers	✓ No compensation is made for land
Loss of Dwelling/Shop	Entitled and Informal settlers	✓ In principle, compensation for structures is made in accordance with market price able to purchase alternatives at nearby place, as is evaluated by the compensation committee ✓ (LE15,000 in the minimum for one room) ✓ Full compensation amount shall be remitted before moving
Loss of Tenancy	Entitled Informal settlers	✓ Equivalent tenant dwelling is searched and provided from GARBLT ✓ Tenant fee for 6 month in the maximum are owed by GARBLT beforehand
Permanent Business Loss	Shopkeeper	✓ Other assistance as below may be provided
Temporary Business Loss	Street vendor	✓ One time allowance is paid LE500 in the maximum.
Allowances for resettlement	Entitled and Informal settlers	✓ Disruption allowance equivalent to the income of 6 months in the maximum are provided per household
Special Allowance to Vulnerable Households	Entitled and Informal settlers	✓ Food, Cloth or other necessary material may be additionally provided depending on the vulnerability of affected people
Other assistances	Entitled and Informal settlers	✓ Provision of soft loan ✓ Provision of job training ✓ Introduction of working place

(6) Verification of Entitlement

At the time of payment of compensation the identity of all PAPs will have to be verified. A PAP verified entitled for any compensation is called an Entitled Person (EP). The verification procedure will entail checking the recorded address and verifying assets recorded in the Census/DMS and the recipient producing a valid identity card. The exact method of the calculation of compensation will be explained to PAPs during Census.

Upon payment of compensation the PAP or his/her representative is to sign an “Acceptance of Payments” form that is also to be signed by the representative from the RC and countersigned by the local authorities and the independent monitoring or auditing agency. The form lists assets affected and rates of compensation paid for them and other assistance provided to the

PAP, including special provisions for PAPs identified during the survey as members of vulnerable groups.

By signing the form, the PAPs confirm that the amount of compensation provided has been calculated correctly.

(7) Grievance and Redress Process

In the process of resettlement, PAPs raise disputes relating to ownership of the property and sharing of compensation. Sometimes, loss recorded against somebody can also be an issue. In order to resolve any problem or constraints for smooth operation of resettlement, Grievance Committee (GC) should be vital within the project for the affected people to suit their complaints and have solutions.

The main objective of the grievance procedure is to provide a mechanism to mediate conflict and reduce lengthy litigation that can delay infrastructure projects. It also provides people who have objections for concerns about their assistance with a recognizable procedure through which to raise their objections and have them resolved. The grievance committee member shall be consisting of GARBLT Staff and representatives of PAPs, chaired by neutral consultant or NGO.

(8) Taxes and Government Fees

The government will be responsible for all fees and taxes PAPs have to pay as a result of any transaction associated with their relocation or compensation/assistance.

(9) Management of Future Encroachment

After relocation some people settle on COI and demand compensation again. Such an illegal occupant of this land is not entitled to any indemnity for any works and improvements carried out on the land or the building. Penalty shall be collected from the in accordance with Egyptian law.

GARBLT and the provincial authorities must make regular announcement in communities along the road regarding government ownership of COI and sanctions against violating the existing laws. They should encourage local leaders to inform people that no compensation will be given to people who move on to COI and such individuals risk losing their buildings.

(10) Relocation Options and Strategies

Following is the strategy recommended for relocation by Asian Development Bank:

1. No relocation
   Although the corner of house/yard is encroached, basically there is no need for relocation with compensation paid.
2. On-site relocation
   To set back several meters or within the same commune so that job place and human network can be kept.
3. Self relocation
   To determine wherever he/she wants to go with his/her satisfaction and responsibility
4. Group relocation
   This is the least recommended because it costs a lot to prepare infrastructure and housing. PAP also is not so positive to relocation

(11) Gender and Vulnerability Planning in Resettlement

The RAP has special provisions for the project affected women, ethnic groups and poorer households to meet their needs and means of subsistence for provision for additional assistance. The RC may utilize the services of a Gender Specialist from the supervision consultants to organize affected women in groups and to involve them in income generating activities if necessary.

Vulnerable groups like those who will experience a greater degree of disruption socially or economically than the general population, female headed households, disabled head of households and households below the Egyptian poverty line will be provided with special assistance as above.

12.3.7 Monitoring, Evaluation and Reporting

(1) Monitoring, Planning and Implementation work of RAP

Monitoring of the resettlement implementation works enables the executing agency and its deputed agencies to perform all activities efficiently. Through monitoring, constraints, obstacles and loopholes of the implementation process, if any, will be identified and corrective measures for polishing the performance will be suggested. Monitoring of the implementation works will be carried out with the clear realization, so that each of the PAPs have to be fully resettled, giving them all their entitlements as per the Compensation Entitlement Matrix of the RAP so that they become at least as well off as before.

The GARBLT is responsible for ensuring well-being of the project affected people through planning and implementing the RAP properly. The JICA and its appointed agency(ies) will be monitoring project implementation methods and achievement of targets by the GARBLT. Both

internal and external monitoring will be resorted to for achieving the goals.

Internal monitoring and reporting

The Resettlement Committee will be responsible for internal monitoring of the project impact mitigation measures and their outcomes. The Administrative Subcommittee will ensure timely payment of compensation to the PAPs and preparation of resettlement operation on schedule. Baseline database will be needed for the resettlement monitoring system to be created.

The Administrative Subcommittee will develop a project performance reporting structure. This will quantify the number of PAPs fully or partially compensated during the reporting period, the number of PAPs resettled from specific stretches of road and the outcome of grievance process.

External Monitoring

An External Monitoring Consultant (EMC) will be appointed for external project monitoring. The NGOs may have good access to the people affected and have sufficient personnel to monitor the activity at the field level. The EMC will be appointed at the time of very inception of the project and should be financed from the Japan Grant Aid to ensure independent monitoring of the planning and implementation works of the RAP. The EMC will be responsible for progress monitoring and the well-being of the PAPs.

(2) Evaluation of RAP Implementation

The RC shall undertake two evaluations of the RAP implementation. These evaluations will focus on the success of RAP measures in meeting their objectives, identify lapses and recommend mitigating measures, if necessary. Each evaluation will also report on implementation progress according to the specified timetable and recommend changes in implementation process where necessary.

The evaluations will have sufficient space so as to ensure application of the recommendations and achievement of the objectives of the RAP at the standard and up to the expectation of the JICA.

(3) Reporting progress

Objectives

Exchange of information among stakeholders on the status of performance of various actions relating to resettlement of the project affected persons as per the Resettlement Action Plan is a pre-condition to effective co-ordination and success. There should be a supporting tool for understanding as well as foreseeing the targeted actions and achievement thereon for ensuring timely actions for any laps. An analytical report on various actions, their effectiveness,

performance in achieving its objectives, sketching constraints and probable solutions to them can instantly help the stakeholders with an insight of the matters relating to proper resettlement. A reporting on progress of resettlement activities on a regular interval is very crucial to monitor the overall position of the activities. The project inputs for progress reports cover monthly target and achievements of resettlement activities.

Process of reporting

The RC will prepare and submit reports on the progress and achievement while the EMC will prepare and submit reports on monitoring in a timely basis.

The reporting will cover the following:

1. Understanding the requirement of the policy makers and its implementers in connection with the RAP and thereby prepare a set of precisely designed monitoring formats for reporting;
2. Setting up targets in a time bound milestones segregated into monthly targets so as to ensure timely identification of laps and taking corrective measures;
3. Monthly Report from the field reflecting the performance of the field operatives;
4. Preparation of Monthly Progress Report compiling the area wise reports with the observation from senior operatives of the EMC.
5. Preparation of the Inception Report, On-call Reports, Draft Completion Report and Final Completion Report.

Distribution of reports

The inception and achievement reports will be required by :

- Chairman of GARBLT
- Community Supporting Subcommittee and NGO
- Open house/information center if any
- Japan International Cooperation Agency
- The Construction Supervision Consultants

12.3.8 Implementation Schedule

The implementation of the project will consist of four major stages in conformity with the construction timetable. The stages are:

a. Preparatory Stage

b. Implementing Stage

c. Supervising and Monitoring

The process of resettlement activities shall be in collaboration with the study schedule of Japanese Side. The implementation time schedule is given in Table 12.3-10. The implementation time schedule has to be developed based on practical requirement

.

Table 12.3-10 Planning and Implementation Schedule (Tentative)

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A. Preparatory Stage																								
1. Perception-socio economic survey																								
2. Cut-off-date																								
3. Draft RAP Preparation																								
4. Basic Design Study																								
5. Census/DMS																								
6. Public Consultation																								
7. External Monitoring										..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8.Stakeholder Meeting																								
9. Formulation of Grievance Committee																								
10. Detailed Design Study																								
B. Implementing Stage																								
11. Secure of Relocation Housing																								
12. Cash Disbursement to PAPs																								
13. Relocation of Self-relocated Households																								
C. Supervision and Monitoring																								
14. Submission of External Monitoring Report				..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

12.3.9 Cost for Resettlement

The Resettlement Budget will be prepared on quantity losses estimated through the DMS and Census and the rates determined by Resettlement Committee (RC) Total budget for resettlement and implementation of the RAP comes to LE13,400,000/- subject to updating after the Census completed.

Table 12.3-11 Cost of RAP Implementation (Tentative)

Affected Area		Characteristic	Compensation for Land								Compensation for Room			Assistance for Households / Shopkeeper / Vendors			Total, '000 LE
			Government land			Private Land			Subtotal								
			Area m^2	Unit Price LE/m^2	Sum, '000 LE	Area m^2	Unit Price LE/m^2	Sum, '000 LE	Sum, m^2	Amount. '000 LE	Area m^2	Unit Price LE/m^2	Amount, '000 LE	Households	Unit Price LE /unit	Amount, '000 LE	
E1-2	Wooden Bridge	Informal Settlers	400						400		400	750	300	50	6,000	300	600
	Tharwat Hut	Informal Settlers	1,500						1,500		4,500	750	3,375	50	6,000	300	3,675
E2-2	Baloq ElElla	Street Venders											0	500	250	125	125
		Shop Keepers														0	0
E3-1	Inter-change	Govern-ment Land	220,000						220,000								
E3-2	Arab Contractor	Private land			0	9,000	1,000	9,000	9,000	9,000			0			0	9,000
E3-3					0			0	0	0	0		0			0	0
Subtotal			221,900		0	9,000		9,000	230,900	9,000	4,900		3,675	600		725	13,400

In addition to direct compensation costs of the RAP, there will be implementation costs associated with the RAP. These will involve monitoring, evaluation and reporting by the RC and resettlement unit and the independent monitoring of the RAP by the EMC. The incremental cost is anticipated as follows:

Table 12.3-12 Cost for RAP Implementation

Item	Unit	Quantity	Unit Rate (LE)	Total Cost (LE)
Community Consultation	Month	24	25,000	600,000
Monitoring	Month	13	25,000	325,000
Reporting	Month	4	50,000	200,000
Administration	Month	4	100,000	400,000
Total				1,525,000

12.3.10 Other Social Issues High-lighted

(1) Socially vulnerable group

Children

The first group is children. The sample surveyed was fully aware about children's rights, which made them able to address the impacts on the children. 63.0% of the total sample reported that the child has the right to lead a good life. 65.0% reported the right to be educated. 15.0% mentioned the right to be healthy. Followings are impacts and mitigation measures:

- They might have accidents either during the construction and/or the operation phase. At the operation stage, the traffic safety will be increased and the chance of traffic accidents is considered to be reduced. However at construction stage, the possibility of accidents will be increased and the control of detour route or route for construction vehicles are not properly planned and implemented.
- Children are most vulnerable to pollution (dust during construction and gaseous exhaust emissions during the operation phase). Both at construction and operation stages, the concentrations of air pollution will be within the environmental limits. However, efforts will be made such as to attach air cleaner to equipment to reduce emission of pollutant and installation of barrier fence as is effected to dispersion of air pollution.
- In case of relocation, children will be stripped out of their schools, sent to remote areas which create psychological problems. Our resettlement plan include to compensation to the people, regardless of titles (formal or informal residents), are provided with the compensation of market values by which able to purchase alternative residence nearby place, so that the children don't have to change school.

- In addition, children might find themselves homeless if the relocation was implemented in unfair way. Compensation is made properly and there is no chance that children become homeless by relocation.
- Finally, due to the resulting noise from construction activities, they might be unable to concentrate or study. Presently, the noise level in study route is already beyond the allowable limits. However to improve this situation, mitigation measures for socially vulnerable facilities including school and hospitals, construction of noise barriers/porous pavement are planned where practical and feasible.

Poor People

The second group that was investigated in-depth was the poor people.

- 37.8% of the total sample surveyed reported that the poor might suffer from the increase in the prices, as transportation expenses might increase. : It is not sure if the prices will go up by the project or not.
- 29.3% of the sample reported to be afraid of losing their houses by relocation since many of them are informal settlers. : Regardless of his formal title to his properties, compensation with market prices able to purchase alternatives nearby the present place is provided and there is no chance to become homeless.
- 22.3% of the sample reported that poor people might have no source of income as they will be sent away from their working areas, particularly those who live in El Saida Eisha working as cement tiles workers. “I used to work as a cement tile worker. All my clients come to me here in this area. If you send me out of this area I will be jobless”, said one of respondents in El Saida Eisha. : For this, compensation to be able to purchase similar residence at nearby place is provided. He can continue the same job.
- Only 2.7% of the sample reported that people in poverty are used to receiving informal financial aid from their neighbors. Transit allowance equivalent to 6 months income will be provided.
- Among these poor people, the baseline data for these who have to be relocated are presented in separate volume, “Resettlement Action Plan”

Vendors

The third group investigated was the vendors.

- 68.0% of the sample surveyed reported that they might lose their income during construction or become penniless. Excavation for construction activities takes years. However, the sample surveyed added that the vendors might move to other locations. : A lump sum of allowance will be provided to the vendors to change the place of business.

For these vulnerable groups, proper social assistance including food, cloth, or other necessary material will be additionally provided, regardless if he is entitled residents or informal settles, in addition to compensation proposed.

Gender

Gender is also quite critical issues in Cairo. Followings tables reveal the socio-economic conditions of female households as the results of interviews for 1,500 samples.

Table 12.3-13 Distribution of Family Size

Household Headship		Male (%)	Female (%)	Total (%)
Ratio		89.1	10.9	100.0
Number of Family Members	1	3.9	20.9	5.7
	2	5.7	16.6	6.9
	3	13.1	20.2	13.9
	4	25.7	16.6	24.7
	5	25.1	14.7	23.9
	6	14.5	4.9	13.5
	7	7.1	4.3	6.8
	8	2.7	1.2	2.5
	9	1.0	-	0.9
	10	1.0	0.6	0.9
	11	0.1	-	0.1
	12	0.2	-	0.2
	Missing	0.2	-	0.2
Total		100.0	100.0	100.0

About 10% of households interviewed are the female headed household. The number of family members is 3 or less for 57% while it is 4 or less for 50% of male headed household.

Table 12.3-14 Distribution of Age

	Gender of Head of Households		Total (%)
	Male (%)	Female (%)	
Less than 25	3.4		3.0
25 - 35	19.1	5.5	17.6
36 - 45	27.8	19.6	26.9
46 - 55	28.2	30.1	28.4
56 - 65	16.5	33.7	18.4
66+	5.0	11.0	5.7
Total	100.0	100.0	100.0

About 45% of female household head are older than 56 years old, while about 50% of male household head are older than 46 only.

Table 12.3-15 Distribution of Income

Income Range (LE per Month)	Male Householder (%)	Female Householder (%)	Total (%)
Less than 500	28.2	50.9	30.7
500 – 1,000	46.2	40.5	45.6
1,001 – 1,500	16.5	6.7	15.4
1,501 – 2,000	5.5	0.6	5.0
2,001 – 2,500	1.0	0.6	1.0
2,501 – 3,000	0.6	0.6	0.6
3,000 +	0.4	-	0.4
Missing	1.5	-	1.3
Total	100.0	100.0	100.0

It is noted that half of the female household heads get income of less than LE500 (about $100) per month, while male gets bigger.

Table 12.3-16 Tenure of Dwelling

Type	Male Householder (%)	Female Householder (%)	Total (%)
New Housing Law Renting	10.1	6.1	9.7
Old Housing Law Renting	48.0	43.6	47.5
Furnished House	0.1	-	0.1
Allowed to Stay in	7.3	6.7	7.2
Governmental	0.4	2.5	0.6
Owned	27.3	28.2	27.4
Owned Partially	6.8	12.3	7.4
Missing	0.1	0.6	0.1
Total	100.0	100.0	100.0

Nearly half of male and female household heads respectively are tenants under the old housing renting law which is quite favorable for tenant compared to the new law fortunately.

Thus, households headed by female are much older than those of male and the monthly

income of female householders is quite less compared to that of male. The female householders may be in the worst conditions among vulnerable group. In these unfavorable situations for female headed households, they shall be supported with further assistances than male household. The supports include:

- Provision of food, close, money and any other materials necessary
- Provision of soft loan,
- Job training
- Introduction of proper working place

Above shall be made through government agents and local organization. Below table is the support provided from the government based on the results of interviews.

Table 12.3-17 Aids provided from Government for Poor People

Aids Provided		Male	Female
Number of Households Interviewed		1,337	163
Economic support	A lump sum money (%)	3	16
	Food (%)	2	5
	Close (%)	1	2
No Economic Support (%)		94	77
Total		100	100

It is likely that female households get more supports from the government.

(2) Other social issues

Splits of the Community

Basically, no splits of communities will be caused since F/S study route will be always located within existing route/underground. However, there are one hundred informal settlers have to be displaced from the governmental land they now are illegally occupying. In this case, compensation will be made to all of these occupants so as to able to purchase alternative residences nearby and can maintain the network similarly as before, if they want.

Conflict of interest

The value of land/building along the study route may rise. As a result, rental fee for tenant may also be raised. Although it is not problem for the tenant under the old house renting law because they can continue to stay with quite cheap fee for tens of years without renewal of rental contract, it may affect the tenant under the new house renting law without such an advantage. They have to renew the contract every year, resulting in the rise of rent. The ratio of samples with old house renting laws was 43% while with new renting law, 9.6%. It is

unlikely that the rent will suddenly jump up right after the project implementation. However in such a case when the rent increases year by year and press the family finance, some assistance shall be provided from the government/private organizations/NGO.

Local economy

In general, economic condition of overall GCR will be more activated due to:

- Smooth movement of man and material,
- Time saving due to reduction of congestion among above
- Huge construction projects which activates the economy
- However, the 90% of interviewed does not own vehicles. Their perception is that such a benefit has nothing to do with them. Followings are their fears and mitigation measures proposed:
- Their base of economic activities/residences (shop/working place) will be lost by the land acquisition: Proper compensation with market prices for shop will be made so that they can purchase same base nearby previous location.
- If the working place is to be lost, job training/job introduction/provision of soft loan shall be considered
- Affected by congestion at construction stage: Proper detour plan is prepared at the time of construction so that congestions becomes not so much.
- Lump sum may be paid to vendors and shopkeepers for temporary business loss
- Above information is properly disseminated as soon as the implementation of project has been determined and, through the consultation, their awareness should be raised.

HIV/AIDS

In the area of Tharwat Hut and Wooden Bridges of informal settlements, it is reported in the minutes of Focus Group Discussion that drug addicts are around. However they use Marijuana as is traditional drug in Egypt. Therefore, the possibility of transmission of virus through expensive injecting needles is very low.

In the most Muslim countries prostitution/free sex is not allowed and the number of HV-positive is reported as only 1,150 people in Egypt in 2007. The causes and ratio are considered as below table:

Table 12.3-18 Causes of Transmission of HIV/AIDS

Cause of Transmission	Ratio, %
Heterosexual Iintercourse	49.1
Homosexual Intercourse	22.9
Renal Dialysis	12.0
Blood Transfusion	6.2
Injecting Drug Use	2.9
Mother to Child Transmission	1.6
Unknown	5.2

Source: Wikipedia

12.4 CONCLUSION AND RECOMMENDATION

- Environmental and social considerations study has been made for Feasibility Study on High Priority Urban Toll Expressways in Cairo. This result is presented to EEAA for the review and approval.
- The outline of project is as:

	Section	Length(km)	Major Structures
Feasibility Study	E1-2	5.56	**Single Deck**
			Tunnel (Shield)
	E2-2	1.88	**Double Decks**
	E3-1	6.52	**Tunnel (Cut and Cover)/Depression**
Pre Feasibility Study	E3-2	6.88	**Single Deck**
	E3-3	**5.50**	**Double Deck**

- Although there are so many benefits predicted by the project, there are some adverse impacts and they should be properly mitigated as a project cost. Followings are adverse impacts predicted and mitigation measures proposed:
- Traffic Congestion: Heavy traffic congestion can be generated at the construction stage. Proper detour planning with strict traffic control, with the help of other agents, can minimize this impact.
- Air Pollution: No severe air pollution is predicted either at the construction stage or operation stage. However, precautions will be taken not to emit unnecessary pollutant from heavy equipment or not raise excess dust during construction.
- Water Contamination: Contamination of groundwater/Nile water can be caused at construction stage due to improper handling of construction waste, fuel, sanitation facilities. To prevent this, proper environmental management plan shall be prepared and

strictly be implemented. Among all, most care shall be taken to minimize disturbance of Nile while constructing piers on water.

- Offensive Odor: Sources of odor can be from improper sanitary facilities, residues of food, smoke of incinerations of waste at the site. These are properly managed in accordance with the environmental management plan
- Noise: Present noise levels are already higher than environmental limits along the study route. By the project, it may be reduced more or less at some sections but will be always higher than the allowable limits. Mitigation measures are considered, consisting of (1) noise absorbing (porous) pavement, (2) noise absorbing panels below the deck, and (3) tall noise barriers along the route are constructed/attached. High raised barriers may affect the landscape and business of shop facing to the route. To be discussed with residents before construction of tall barriers.
- Vibration: No serious vibration is predicted in the future since number of heavy vehicles is very less and the ground condition is better. None the less, effort will be taken to minimize the vibration during construction and operation by choosing suitable equipment and proper design of viaduct.
- Health, safety and Hygiene: Proper construction management plan will be prepared to minimize the issues of health, safety and hygiene in accordance with Egyptian law
- Information dissemination, as one of the purpose of the EIA/SIA, implemented were as follows:
  - Stakeholders meetings: 3 times of more than 300 participants in total
  - Interviews: 2,000 samples
  - Group discussions: 50 times
  - Open houses: 5 locations
  - Web
  - Newspaper
- Resettlement: This is the most critical issues and about 100 households are supposed to be relocated in this moment. Our compensation policy is “equal or better life level than the life before project implementation” in accordance with international donors’ rule. Following are proposed:
  - Resettlement Action Plan is prepared and disseminated, based on which the resettlement activity is implemented.
  - Necessary information such as the project content, required area/land for project, detailed location of people displacement, compensation and support, grievance procedure will be disseminated before the project start. These information are to be delivered directly to affected people and posted up at the key locations.
  - Basically, the compensation is made in accordance with Egyptian laws.
  - Assets to be lost will be properly compensated with market prices able to purchase alternatives at the nearby place, regardless if he/she is formal or informal settlers, so

that they don't have to be afraid that they will be just kicked out penniless or displaced to far away place, losing job.
- Transit allowance will be provided, while relocation duration
- Above should be remitted basically before relocation
- Further supports such as food, close, money will be provided for vulnerable households whenever necessary

- Local Economy: Local economy is improved by the project as a whole. However, people believe they are not shared with the direct benefit of the project since most of them do not own vehicles. In addition they fears loss of shop/working place. For these, consultation and campaign for raising awareness shall be made to inform them business losses caused by the construction will be properly compensated before hand regardless of his title.
- Unity of Community: No split of community is caused by our project.
- Social Services and Facilities: Sensitive facilities will be protected during construction and operation stages respectively. To plan the detour or construction material transport route keeping away from these facilities. Noise barriers will be constructed to reduce the noise below the allowable noise level if necessary.
- Poor and Vulnerable: In addition to the proper compensation for their assets, regardless of land title, support shall be provided so that life level will be better off than before project.
- Confrontation between Benefited and Not Benefited: The present ratio of tenants of poor group in new house renting laws (not favorable to tenant) is less than 10%. They may suffer from the hike of rental fee in the future since the price of properties along the new expressway may be increased. Some support, such as soft loan should be considered for these vulnerable groups.
- Local economy: The local economy, as a total, will be improved at operation stage. During construction, business loss shall be properly compensated.
- Gender: Female headed households are most vulnerable group. They shall have to be properly consulted not only providing compensation predetermined. Further studies are required for what type of support is necessary and how to implement it, especially for these ultra vulnerable groups at the stage of planning detailed RAP.
- Right of Children: By the proper compensation/support, the chance that the children suffers, for example, relocation to distant place, unable to go same school or subjected to children labor due to economic problem caused by displacement, are very less.
- Landscape: Rerouting, suppressing the height of deck, tunneling/depression are being proposed for the area where landscape of historical relics/importance is seriously affected. For other than serious cases, montage photos are presented and opinion is studied.
- Privacy of Residents near Proposed Viaduct: noise barriers will be constructed where their privacies can be invaded by the car driver passing the deck.