

Chapter 6 Traffic Management

Various kinds of traffic management measures are already in place in the study area. They are intended to improve efficiency as well as the safety of road traffic in general. This chapter describes typical traffic management measures and systems being adopted in Istanbul. In addition, traffic accident situation and enforcement of traffic regulation are also presented.

6.1 Traffic Signal System

6.1.1 Existing Signal System

There are some 1300 traffic signals in Istanbul. Among them, about 800 signals are connected to the Traffic Control Center located in the municipality building in Merter. All hardware and software components of the system have been developed locally including signal controller, signal light and control software. A unique approach has been taken in the design of the system as described below.

Cellular phone technologies are adopted in the traffic control system and data communication between the local controller and the Center uses TCP/IP¹ protocol over GPRS². No data exchange is made between the Center and the local controllers under normal condition. Local controllers independently operate in a time-of-day mode with its built-in timing parameters.

In area traffic control (ATC) system commonly adopted in other cities, the data exchange between the center and the local controllers is much more frequent and normally done at one second intervals. In such system, signal control command and other downloading data are sent to the local controller, while local controller status data and vehicle detector data are sent to the Center. With the frequent data exchange between the local controller and the center, traffic signal operates very efficiently with traffic adaptive or traffic responsive control algorithms.

The Istanbul system was built based on the policy to reduce data communication costs as much as possible and limit the data exchange to a minimum. The use of GPRS achieves the goal but there is a risk associated with less frequent data transmission. If an emergency happens, the communication circuit could be congested and the data communication would not work properly.

If local controller detects any abnormality in its operation, it automatically informs the Control Center of the controller's status. On the other hand, it is possible to interrogate each local controller and determine its operating status from the Center anytime. Moreover, the data stored in the local controller can be uploaded or downloaded through the data communication system.



Source : Study Team

Figure 6.1.1 Camera Detector on Top of Signal Lantern

¹ Transmission Control Protocol/Internet Protocol: A data exchange technology used in Internet.

² General Packet Radio Service: Data transmission system over GSM (Global System for Mobile communications) cellular phone system.

Signal control is of the time-of-day type, in which each local controller has four sets of timing plan and the different plans are applied according to the time of the day. Thus signal operates with different systems timing at different times of the day to cope with the change in the traffic volume. Flashing operation is also possible by time-of-day control.

In addition to the existing inductive loop vehicle detector, traffic camera type vehicle detector was introduced recently and there are 100 units of the detector in operation. They detect presence of vehicles within its sensing zone and output the presence signal to local controller to enable actuated signal control. If an approaching vehicle is detected near the end of green, green signal is extended to allow the vehicle to pass the intersection without stopping. On the other hand, if no vehicle is detected, green signal is cut shorter than the preset duration. Such operation is effective in reducing the total waiting time at intersection. The actuation control is, however, not used to a series of signals closely located along an arterial street to maintain a “green wave” or offset between signals.

6.1.2 Traffic Signal Design and Maintenance

New signal is designed in the following manner:

- Geometric design of intersection is undertaken by Transportation coordination Directorate.
- Traffic Directorate will then design signal, and the location of signal post and local controller is decided. Minor modification of intersection design may be made but basic element such as road width or bus stop location cannot be changed.
- ISBAK, a company established by the Municipality engaged in signal installation and maintenance, carries out detailed design of signal including signal timing calculation.
- Commercially available signal timing software was used before. But the results were found not directly applicable to the signals in Istanbul. For example, SYNCHRO tends to produce longer timing than necessary. ISBAK wants to try any signal timing software that can produce better results than those they have used.
- In reality, the signal timing and coordination (green wave) is prepared based on the traffic volume data, site observation and the experience with the signal design at similar intersections. The signal timing software is used only to confirm the adequacy of the calculation.
- No evaluation study has been made comparing traffic condition before and after the signal installation or signal timing updating.

The signal maintenance and timing plan updating system is organized as follows: Whole Istanbul is divided into five areas. For each area, two teams are assigned and each team consists of two members; electronic engineer and computer engineer. They work in two shifts with first shift from 06:00 to 14:00 and the second shift from 14:00 to 22:00. There are 31 staff in total. Maintenance team routinely patrols the area assigned and checks the suitability of signal timing. If timing is found not properly set, the team modify the timing on the spot using notebook computer connected to the local controller.

The existing signal system still uses loop detector at about 300 locations. Because of inferior pavement condition, 30 – 35 % of them are always not working and maintenance

of them is very difficult and costly.

In order to reinforce the signal maintenance capability, additional four engineers are scheduled to join the team. They will engage not only in the review and updating of the signal timing but also in the design of traffic management improvement plan.

6.1.3 New Signal System

There is a movement to improve and upgrade the existing traffic signal system. In 2008, the Municipality is planning to introduce local adaptive signal control system. More sophisticated signal control software will be installed in the local controller and signal timing will be automatically adjusted to the changing traffic volume.

Traffic Directorate is also planning to introduce centrally operated dynamic traffic signal system in which signal timing is automatically adjusted in response to traffic demand. The candidate system to be introduced is called ITACA and supplied by SAINCO TRAFICO of Spain. The location of the pilot project has not yet been decided.

Traffic Directorate is aware of the limitation of GPRS data communication system and planning to introduce a system using fiber optical cable. In the new data communication system, 9600 Baud data transmission circuit system will be leased from a telephone company but the cost is very high at US\$120 per month per circuit or traffic signal. In comparison, the Municipality currently pays only US\$5.000 per month for the data communication using GPRS of the existing traffic signal system.

6.2 Traffic Monitoring System

Traffic on the major streets in the city is monitored through two systems; CCTV (closed circuit television) monitoring system and vehicle detector system. A total of 116 units of CCTV cameras are installed and 60 unit are planned mainly along the expressways and arterial streets. The cameras are equipped with pan, tilt, and zoom function that can be remotely operated from the Center to control the video coverage. These cameras send live video image of the site to the control center through the communication line leased from a telecommunication company. The system adopts MPEG4³ data compression technology over 2 Mbits/sec circuit. Due to the reduced frame rate, the video image on the monitor display is not as smooth as images that use higher speed communication lines. But it is sufficient to monitor traffic flows.

A large multi-screen wall map display measuring 15 columns by 5 rows capable of showing a maximum of 75 separate displays is installed at the Center. The wall map is also capable of showing a display over multiple screens from both video images taken by CCTV camera and other computer outputs.

The operators in the Center constantly monitor traffic conditions through the video image on the wall map. As the number of cameras is more than the number of multiple screens, the operator has to select the sites and cameras to monitor the specific location. In addition, watching as many as 75 screens constantly is a daunting task.

³ MPEG4: Moving Picture Coding Experts Group 4. One of the video signal compression methods.



Source : Traffic Control Center, IMM

Figure 6.2.1 Location of CCTV Camera, 2007

RTMS⁴ type vehicle detector is also installed at 279 locations along expressways. They detect vehicle within its sensing area and produce such data as traffic volume, average speed and average time occupancy for multiple lanes simultaneously. These data is processed and stored in each detector and sent to the Center every 2 or 5 minutes using GPRS.

Based on the traffic flow data gathered by vehicle detector, traffic condition at each section of expressway is determined and travel speed is calculated. Finally, travel time between major origins and destinations along the expressway is obtained based on the travel time of each section. The travel time data is available at the Center's web site.

⁴ RTMS: Remote Traffic Microwave Sensor. A kind of vehicle detector that uses microwave to detect presence of vehicle within its sensing area which normally covers multiple lanes.

6.3 Traffic Information

Three types of traffic information: congestion degree, travel time and traffic camera image from the video camera installed along expressways, are provided by the Traffic Control Center. Information dissemination is made through three systems, variable message sign, the internet and cellular phone.

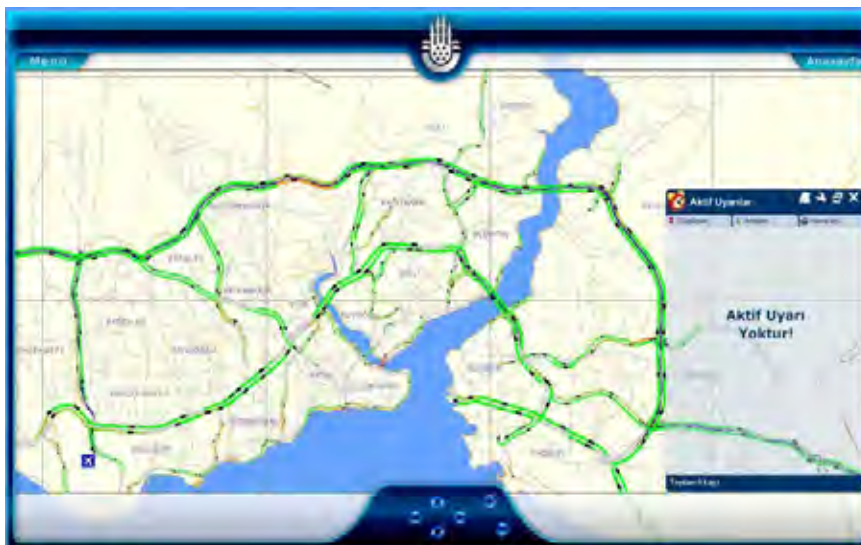
6.3.1 Congestion

Although traffic flow parameters (volume, occupancy rate and average speed) are measured by vehicle detectors, traffic condition is monitored and judged by the operator in the Center. There are no established clearly defined criteria to classify traffic conditions like normal, lightly congested or heavily congested. Judgment is left to the discretion of operators. Thus results may vary among the operators.

Another issue to be addressed is that the number of cameras that an operator has to monitor. It is very hard to notice any abnormal traffic condition on the multi-screen display that shows video images from as many as 75 cameras. Even though a camera at the site of abnormal traffic condition is selected, the camera may not cover the scene where troubles occur. The issue is compounded by the fact that there are nearly 200 cameras. The number of cameras is simply too many to be monitored by the operator. Some kind of automatic traffic control mechanism must be introduced.

The traffic condition thus judged are presented as traffic conditions or congestion maps of road networks, where congestion is indicated in red and other colors depending on the severity of congestion. The map is also accessible through the internet. The latter is also accessible from cellular phones equipped with GPRS.

Another way of congestion information dissemination is through variable message sign (VMS). There are 10 units of VMS in the city. Text message describing traffic congestion is displayed on it. As the congestion monitoring function is limited due to the manual method employed, the messages shown on VMS also are limited in terms of variety, coverage area, and promptness.

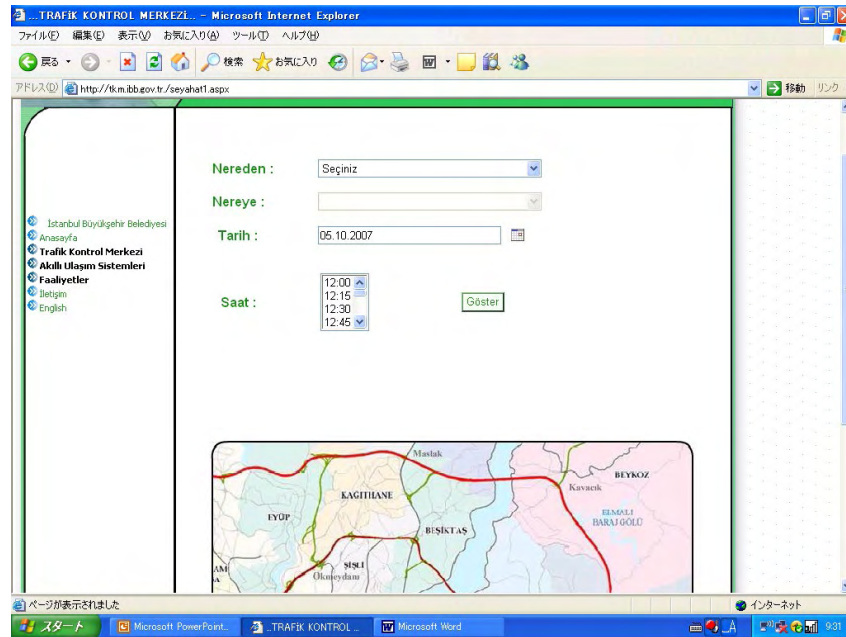


Source : Home Page of Traffic Control Center (<http://tkm.ibb.gov.tr>), IMM

Figure 6.3.1 Traffic Condition Map, 2008

6.3.2 Travel Time

Travel time between the selected locations on the D100, O-1 and O-2 is calculated based on the traffic condition parameters measured by the RTMS type vehicle detector. Expressways are divided into sections and travel time at each section is estimated. Then travel time along a route from origin to destination is obtained as the sum of the travel time at each section comprising the route. The travel time thus calculated is the instantaneous travel time of several minutes ago and not the forecast in the future. Nonetheless, it is a good indicator of traffic condition and useful for road users in understanding traffic conditions and helpful for their route selection.



Source : *ibid.*

Figure 6.3.2 Travel Time Information on Internet, 2008

6.3.3 Traffic Camera Image

Shots taken by traffic video camera are available on the internet. To view the image, a camera is selected on the camera location map first, and then three successive shots of image taken by the selected camera are shown cyclically in a short interval.



Source : *ibid.*

Figure 6.3.3 Camera Selection Screen, 2008



Source : *ibid.*

Figure 6.3.4 Image Taken by Traffic Camera

6.3.4 Traffic Information Through Cellular Phone

Access to the traffic information service is also possible through cellular phone equipped with GPRS capability. The service menu is the same as normal internet access by computer and consists of congestion map, travel time information and live traffic video camera image.

The traffic information service for cellular phone has been available since 2006 but it was announced officially in January 2008 by the mayor.

Unlike normal Internet access, registration is required to subscribe the service. There have been about 60,000 requests for registration in two weeks since the announcement. But only 10,000 subscribers have been accepted. There were many incorrect requests that caused troubles in application processing by the server.

The monthly subscription cost is about 10 YTL per month if live video is viewed 2 or 3 times a day in addition to the congestion information.

The Municipality receives 25% of subscription fee after deducting tax and the rest goes to the cellular phone company that provides data communication service.

6.3.5 Variable Message Sign

Variable message sign is a device installed at roadsides that displays text messages sent from the Center to disseminate information to road users. Currently there are ten (10) units of VMS in Istanbul as listed below.

- Airport
- Otogar
- Kozyatagi
- Barbaros boulevard – Yildiz entry
- Halic bridge exit – Okmeydani
- Zeytinburnu

- Piyale Pasa Bulvari
- Kartal intersection
- Gaglayan
- Haramidere

Types of message that VMS displays are:

- Congestion along routes
- Congestion caused by traffic accident
- Warning during adverse weather
- Road construction
- Service information by Municipality
- Guidance of people in case of earthquake, heavy rain, and other natural disaster

All types of message are manually inputted by an operator. Thus, the system is dependent on diligence and the capabilities of operator. There is a plan to automate the travel time display system. But the details are yet to be studied and designed.

6.4 Traffic Management Measures

Several typical traffic management measures are already in place in Istanbul. Some of them are briefly described below.

6.4.1 Reversible Lane

Reversible lane system is effective in handling tidal traffic flow that has larger volume toward the city center in the morning and less volume in opposite direction in the evening. In the study area, reversible lane system is adopted along the routes below.

- 1st Bosphorus bridge
- 2nd Bosphorus bridge
- Bakirkoy Sahil Yolu (Kennedy Street)
- Ciragan street



Source : Study Team

Figure 6.4.1 Start/End Point of Reversible Lane



Source : Traffic Control Center, IMM
Figure 6.4.2 Location of Reversible Lane, 2008

6.4.2 Truck Ban

In general, large trucks are prohibited from entering the area surrounded by shore line and the E5 as shown in Figure 5.4.3. Heavy vehicle are banned from 6:00 – 10:00 a.m. and 16:00 – 22:00 p.m. in the restricted areas. But vehicles having curb weights of less than 4000 kg are allowed to enter these areas. Also, heavy vehicles are prohibited to use the first Bosphorus Bridge except for official vehicle for technical reasons.



Source : *ibid.*

Figure 6.4.3 Truck Ban Area, 2008

6.4.3 Congestion alleviation

Transportation Coordination Directorate of the Municipality is working to mitigate traffic congestion problem. One of the activities they engage in is the arterial street improvement using a computer simulation program called VISSIM.

A small area with congested arterial streets is first selected. Turning movement count survey is then conducted at problematic intersections to obtain necessary data for the morning peak, noontime and evening peak. Traffic volume data are input into microscopic traffic simulation software VISSIM. Various improvement options are planned and evaluated using the simulation program. If the result is positive, the measure is implemented by other department.

These activities can be applied to many areas. But there is no systematic approach as to the area selection and formation of solutions. Another issue is that Transportation Coordination Directorate is in charge of designing improvement works, while implementation is not ensured as it is the task of other department.

6.5 Parking Management

6.5.1 Municipality Owned Parking Facility

Parking is one of the main causes of traffic congestion. But there is no clear parking management policy in the Municipality. The current practice of the Municipality is to construct as many parking spaces as possible at locations where land is available. There has been very few research or study about parking demands.

There is a new approach recently being taken by the Municipality. One is the introduction of build-operate-transfer (BOT) scheme to the development of parking facility on lands owned by the Municipality. The scheme is expected to accelerate the parking facility development.

There is a regulation regarding the requirement for parking space for each type of building. But enforcement of the regulation is lax and the regulation does not function well at the moment.

The Municipality is concerned mainly with the design of entry and exit points of off-street parking facilities and the impact caused by the vehicles entering into or exiting from them. There is no regulation about the details of the facility. The Municipality has no control over the privately owned and operated parking spaces. No consideration is given to them in the parking facility development by the Municipality.

The Municipal government is concerned with its own parking facilities. Parking facility operated by private entities is not controlled or managed by the city. Thus there is no data for privately operated parking facilities. According to a city official, each district may have the data about private parking facilities.

Table below shows the revenue from the parking facility. It is increasing. The increase can be attributed to the development of on-road parking facilities and the transfer of their operation to ISPARK.

Table 6.5.1 Revenue from the Parking Facility

| Year | Amount (YTL) | Remarks |
|------|--------------|--------------------|
| 2001 | 660,719 | |
| 2002 | 663,021 | |
| 2003 | 1,457,962 | |
| 2004 | 2,411,833 | |
| 2005 | 5,623,686 | |
| 2006 | 14,982,882 | |
| 2007 | 15,420,020 | Up to 20 September |

Source: Istanbul Metropolitan Municipality Web site

6.5.2 ISPARK

The parking facility of the Municipality is managed by ISPARK, one of the companies under the Municipality.

The tasks of ISPARK are stipulated in Articles 7 and 26 of Law 5216. Article 7 authorizes ISPARK to designate and operate roadside parking in Istanbul. Article 27 allows it to construct and operate off-street parking facilities.

ISPARK is tasked to take over the operation of all parking facilities that the Municipality possesses and the turn-over process is being implemented.

As of September 2007, ISPARK manages a total of 328 parking sites, (406 locations) with a total capacity of 33,109 parking spaces. The site refers to streets while there are multiple locations along a street. Most of the parking facility operates from 8:00 am to 8:00 pm but some operate 24 hours.

There is a special implementation of parking operation in which shopping plaza rents the parking spaces of ISPARK for a fee and offers these to its customers without collecting parking fees.

Another special implementation is free parking spaces operated by ISPARK. There are 58 locations with a total capacity of 1,345 cars. These locations are included in the total figures above.

There are 1 or 2 locations where private parking facilities are operated by ISPARK

Currently parking fee collection is done manually by parking personnel and there is no collection system that uses any kind of machine such as parking meter. The amount of fee is set relatively high (4 YTL for first 2 hours, for example) at the central area and low (3 YTL for whole day) at peripheral areas. Electronic payment system using cell phone is planned by the company.

With the establishment of ISPARK on December 1, 2005 and the introduction of an organized parking fee collection system, malpractices in the collection of parking fees by unauthorized persons has been significantly reduced.

Introduction of parking meter is not planned as the system is considered not suitable for Istanbul. ISPARK is planning to introduce a number of electronic parking fee payment



Source : Study Team
Figure 6.5.1 Roadside Parking Operated by ISPARK

systems.

One measure being planned is the use of PDA (personal digital assistant, hand-held computer) by ISPARK personnel. PDA is used to enter the parking data (location, plate number and time of parking) into central database. With the use of the system, disputes regarding parking time can be avoided.



Source : ISPARK

Figure 6.5.2 Parking Facility of Istanbul Metropolitan Municipality, 2007

6.6 Transfer Center (Park and Ride Facility)

In order to reduce private car use and promote public transport, the Municipality government is planning to set up transfer centers.

There are 33 planned transfer centers with a total capacity of 52,454 vehicles on the European side, while 28 transfer centers with the total capacity of 87,321 vehicles are planned on the Anatolian side. Some of the transfer centers have very large capacities. The largest transfer center will be Kartal Intersection Transfer Center with a capacity of 14,000 vehicles. Such a large facility would require long transfer time from parked private cars to public transport. As most of the transfer centers are still at planning or project preparation stage, the details such as number of stories, number of entry and exit points, and accessibility to public transport are not yet clear. It can be said, however, that some of the transfer centers are planned near the central business district and may not be helpful in encouraging use of public transport.



Source : Transport Planning Dept., IMM

Figure 6.6.1 Location of Transfer Centers Planned, 2008

6.7 Traffic Accidents and Safety

6.7.1 Number of Accidents

Traffic accident is a social problem for Turkey as well as for Istanbul. The table 6.7.1 below shows the number of accidents in the whole country and in Istanbul in 2006. The annual fatality is about 3,300 for the whole country and 262 in Istanbul. Istanbul has about the same share for injury accidents too. As to the property damage accident, however, Istanbul occupies much higher share of more than 30% as compared with the whole country. It is pointed out that one must be careful in interpreting these accident data. Because accident is judged as fatal if accident victim is already dead upon arrival at hospital. The practice is different from the international standards in which fatality count includes the persons who die within 30 days of accident. Thus, the number of fatalities would be much higher if the international standards are applied.

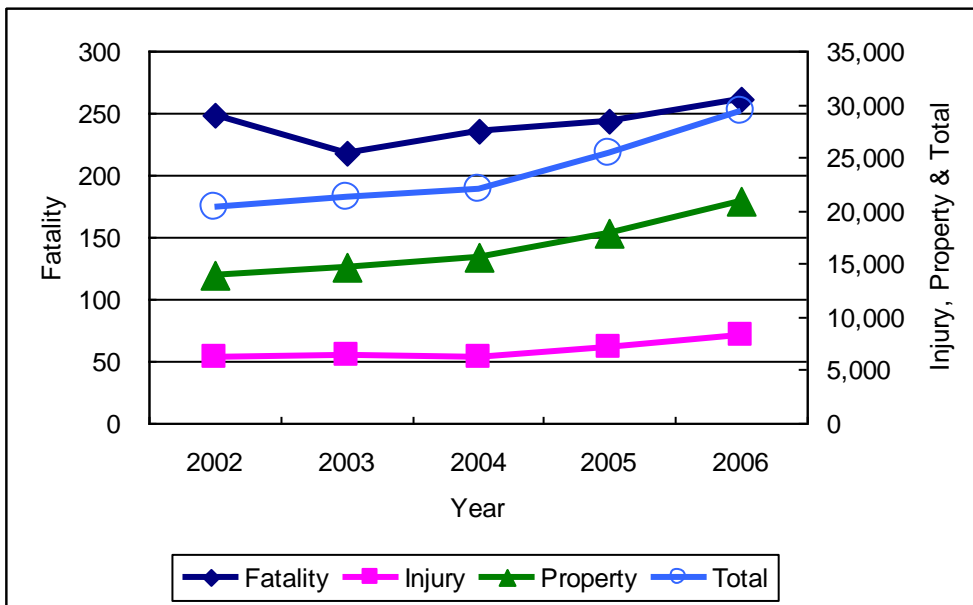
Notwithstanding the incorrectness caused by the accident recording system, fatality rate is considered much higher than the developed countries. The detailed accident data from the Traffic Police also shows a higher accident rate in younger generation as drivers while many aged people die as pedestrians.

Table 6.7.1 Traffic Accidents in Turkey and Istanbul, 2006

| | Nation | Istanbul | Share (%) |
|--------------------------|---------------|-------------|-----------|
| Fatal accident | 2,581 | 262 | 10 |
| Injury accident | 76,615 | 8,193 | 11 |
| Property damage accident | 585,344 | 209,544 | 36 |
| Total | 664,540 | 217,999 | 33 |
| Persons died | 3,365 | 282 | 8 |
| Persons injured | 135,224 | 12,809 | 9 |
| Property damage (YTL) | 1,152,919,799 | 349,279,296 | 30 |

Source: Istanbul Police Department

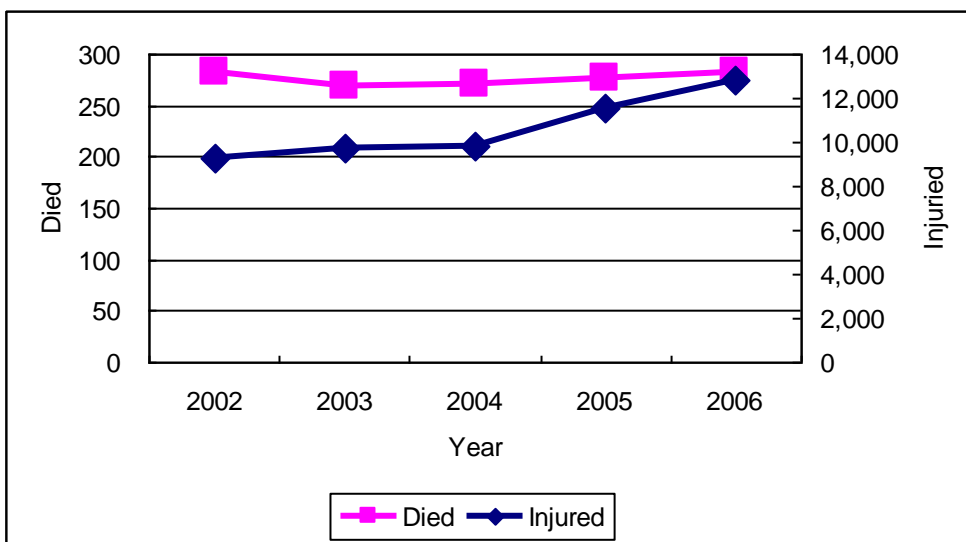
The yearly trend of traffic accident in Istanbul is shown in Figure 6.7.1 below. Total number of accidents has been increasing for the last five years. But the number of fatal accidents stays at the same level of 210 to 260 accidents per year.



Source : *ibid.*

Figure 6.7.1 Number of Accidents in Istanbul

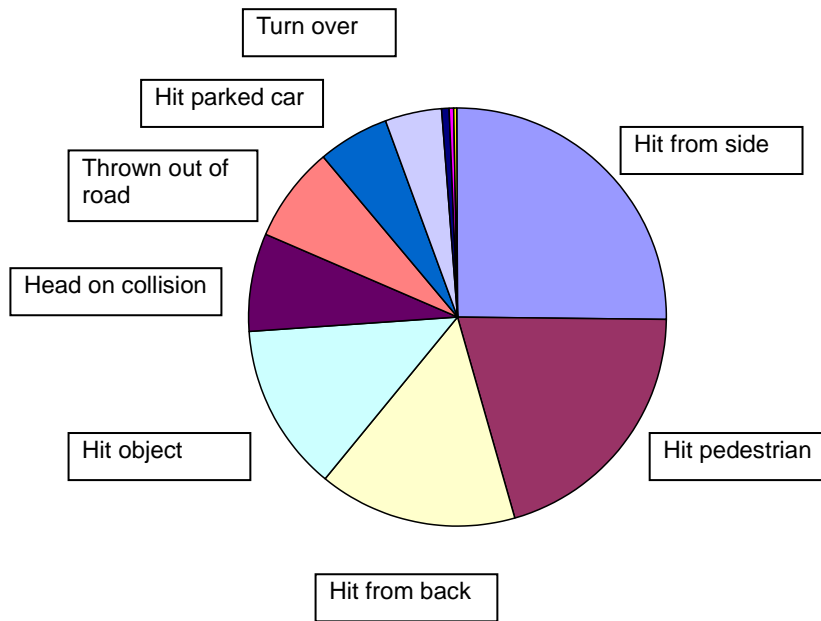
The number of people died or injured in traffic accident is shown in Figure 6.7.2 below. It indicates a similar trend as the number of accidents. The number of persons died stays at the same level while the number of persons injured increases every year.



Source : *ibid.*

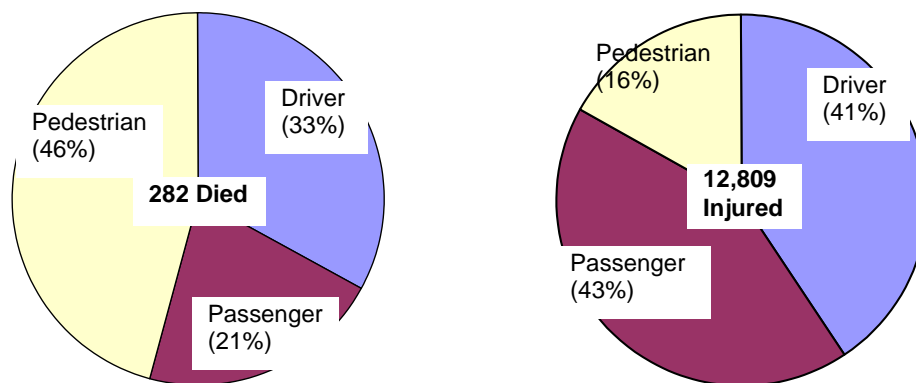
Figure 6.7.2 Number of Person Died and Injured

Figure 6.7.3 shows the type of accident. It is alarming that there are many accidents that involve pedestrians who are most vulnerable in road traffic. High risk for pedestrians is confirmed by the largest share of pedestrian in the number of persons died as shown in Figure 6.7.4. These data suggest the necessity of traffic safety measures that protect pedestrians.



Source : Traffic Police

Figure 6.7.3 Type of Accident, 2006



Source : Traffic Police

Figure 6.7.4 Accident Victims, 2006

6.7.2 Accident Data Recording System

Currently, when an accident happens, it is requested to call Traffic Police to the accident site for investigation. The traffic policemen then prepare accident report. The report includes the X and Y coordinates of accident site obtained by a GPS device provided to every traffic patrol car. All traffic accident data are sent to the Traffic Police Headquarter in Ankara for input into accident database.

Starting April 2008, it is planned to change the accident reporting system. Traffic Police will not be required to be at accident site for property-damage accident. This is to minimize the traffic congestion caused by the vehicles standing at the middle of road at accident site waiting for the arrival of Traffic Police.

Instead, insurance company will keep the record of property-damage accident. A computer system established by the insurance companies keeps traffic accident database. Accident data will be provided to Traffic Police from the center.

Another issue regarding traffic accident recording system is the two organizations, Traffic Police and Jandarma, both of them collect accident data. Some intercity roads are under the jurisdiction of Jandarma, an organization under the military. Accident records are kept by the respective organizations based on the classification of the road where accident occurred. Accident data on the intercity roads are collected by Jandarma and they have their own traffic accident data recording system. Thus, there is no consolidated accident data system at the moment.

6.7.3 National Traffic Safety Program

Turkish Government embarked the road improvement and traffic safety project in 1996 with a financial assistance from the World Bank. A component of the project is the National Traffic Safety Program aimed at reducing the number of traffic accidents. The program defined safety vision, safety objectives and safety targets. In order to attain these targets, institutional and technical action plans were developed.

As part of the program, necessary equipment was purchased and improvement works were implemented at more than 317 accident black spots all over the country. The results of black spot improvement were very positive and the number of accidents and fatalities were dramatically reduced.

The program was to be applied for 10 years from 2002 to 2012 with an interim evaluation of the results scheduled in 2006. The review was, however, not conducted, and the program was not updated. Most of the action plans proposed were also discontinued.

Although the National Traffic Safety Program is a nation wide project, many recommendations for improvement made in the program are a good reference and applicable to Istanbul in enhancing traffic safety.

6.7.4 Black spot analysis and improvement

The Municipality did black spot analysis in 2003. A total of 548 accident locations along D100 highway between Uskudar – Kadikoy section during 2001 and 2002 were input to GIS system. Then a location was identified as black spot if two or more accidents occurred within 250 meter distance. A total of 21 locations were found as black spot.

Deficits in road design, lack of safety devices such as signage and operational problem like loading and unloading of minibus at improper location were identified as cause of traffic accident. Improvement works were designed and implemented at these locations.

No evaluation works have been made to compare traffic accident data before and after the implementation of improvement works. Thus no data is available as to the effectiveness of the improvement works.

The black spot analysis and design of improvement works were carried out only once. Since then no similar project has been implemented.

6.7.5 Traffic Education

Efforts have been exerted by the Municipality and traffic safety education activities are carried out. One of such activities is Traffic Education Parks and Mobile Education Buses under Istanbul National Education Head Directorate. These projects are for the student of 8-14 year old age group.

There are two education parks, Topkapı Traffic Education Park and Florya Traffic Education Park. In addition, another traffic education park is planned at Maltepe. These education parks are equipped with facilities to provide modern traffic education and teach student the traffic rules and manner.

The Municipality has two units of traffic education bus, one unit each for European side and Asian side. The bus has the capacity to provide traffic education for 35 students and normally visit two schools a day.

The achievement of the traffic education park and traffic education bus is summarized below.

Table 6.7.2 Achievement of Traffic Education Bus and Traffic Education Park, 2007

| | No. of Schools trained | No. of Students trained |
|--------------------------------|------------------------|-------------------------|
| Traffic Education bus (Europe) | 60 | 81.471 |
| Traffic Education bus (Asia) | 61 | 52.893 |
| Topkapı Traffic Education Park | 115 | 6.862 |
| Florya Traffic Education Park | 84 | 4.354 |
| Total | 320 | 145.580 |

Source : Istanbul National Education Head Directorate

6.8 Traffic Enforcement

According to the data provided by Traffic Police, the number of apprehensions and amount of fine collected for traffic regulation violation is as shown below. 1.6 million violators were apprehended and 135 million YTL were collected as fine in 2007. Among the type of violation, “other violation” is the most common followed by illegal parking which occupies 34%. The third common violation is disobeying red light, a very dangerous violation that could lead to a serious traffic accident. In terms of fine, “other violations” have the largest share. Illegal parking is the second with a share of 21%. Average fine per violation is 83 YTL. The fine collected is general revenue of the Municipality. There is no provision to use part of it for traffic management and safety improvement.

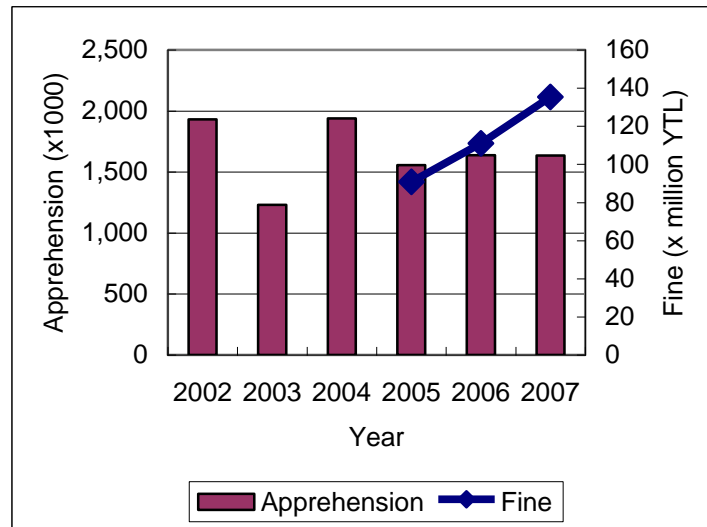
Table 6.8.1 Number of Apprehensions and Amount of Fine (2007)

| Violation | Number of Apprehensions | Amount of Fine Collected |
|--|-------------------------|--------------------------|
| Security lane (54/1A-B) | 86,430 | 9,334,440 |
| Speeding (51/2A-B) | 38,222 | 5,807,310 |
| No Helmet (78/1B) | 6,556 | 340,912 |
| Drunken driving (48/5) | 21,483 | 9,767,988 |
| Seat belt (78/1A) | 29,421 | 1,529,892 |
| Cell phone use (73) | 87,773 | 4,564,196 |
| Illegal parking | 555,049 | 28,862,548 |
| Excess passenger (65/1A) | 54,119 | 2,814,188 |
| Colored window (30/1B) | 5,518 | 595,944 |
| Carrying loads beyond the capacity limits (65/1-B) | 3,763 | 4,056,514 |
| Loading more than the total weight (65-5) | 6,017 | 13,556,301 |
| Disobeying red light (47/1B) | 114,873 | 12,406,284 |
| Other violations | 625,246 | 41,731,239 |
| TOTAL | 1,634,470 | 135,367,756 |

Source: Istanbul Police Department

The number of apprehensions has been more or less 1.5 million for the last six years, while the amount of fine has increased for the last three years. No clear explanation is

possible as to the increase in the total amount of fine.



Source : *ibid.*

Figure 6.8.1 Number of Apprehension and Fines Collected

Traffic police is interested in deputizing the enforcement of illegal parking to private organization. But amendment of the existing laws is required to introduce such a system.

6.9 Summary

Current traffic management systems and measures in the study area were briefly described above. The following comments are raised as a summary.

6.9.1 Technology Oriented Approach

It is very much appreciated that many new traffic engineering as well as information technologies have been vigorously introduced for traffic management in the study area. Current traffic conditions and expected travel time along expressways are available through cellular phones. Data stored in the traffic signal can be uploaded or downloaded from anywhere using data communication system of cellular phones. Instead of conventional inductive loop type vehicle detector, video camera type vehicle detectors are installed at some intersections for signal control. These are examples of the new technology being used.

Unlike the process control in a chemical plant, traffic management involves human factor as both road administrator and road user. In order to further upgrade the existing system, consideration must be given to the role of human factor in the traffic control system. Monitoring of traffic conditions through video camera is an important task of traffic control system and video monitoring has become a standard facility. But incidents such as congestion or accidents cannot be detected in a timely manner by an operator if there are too many cameras. When a system is designed, due consideration must be given to the operation of the system by the staff and a system that is balanced from the viewpoint of operation must be constructed.

Dissemination of expressway traffic condition and expected travel time through the internet including cellular phones is a technically interesting system. But usefulness of the

existing system is limited. Because coverage area is limited to expressways and there will be very few trips that start and end on or near expressways. Besides, reliability of the information has to be examined.

Although technically simple, collecting the traffic condition data on the general road network requires a laborious work to design, construct and maintain, the traffic control system will be more useful if the data on the general road network are available.

6.9.2 Traffic Signal Control

Currently about 800 traffic signals are connected to the Control Center. But the system is not a centralized control system as the signals are not controlled from the Center and their operation is not constantly monitored. Data communication between the Center and the controller is made only when an abnormality is detected in the controller, or if there is a need to examine or alter the data stored in the controller. Thus the system is actually a collection of individual signals and each signal operates in an isolated mode with fixed signal control patterns. Such system is rigid in a sense that it does not respond to changing traffic conditions.

The existing system was built with an objective of reducing initial and operating costs. Limitation of data exchange and use of GPRS are very effective way to meet the requirement compared with standard traffic control system in which each controller is connected to the control center through a dedicated communication line and data is exchanged every one second or shorter. Saving the data communication, however, results in the limitation of signal control.

More sophisticated traffic control system must be introduced as traffic conditions in Istanbul is already at critical level and small disturbances in the traffic flow have large impacts thus requiring a highly efficient signal system. The introduction of camera detectors is an improvement. But signals still operate in an isolated mode and their effectiveness is limited. Fundamental changes in the signal control system will be required.

The Municipality is already aware of the necessity of upgrading signal system. Some recommendations on the new signal system will be made later in this report.

6.9.3 Traffic Information System

In order to establish an effective and useful traffic information system, information collection function must be strengthened. In the existing system, the traffic monitoring relies on the operator to get traffic information. Amount, coverage area, frequency, and consistency are therefore very limited and may vary among operators. It is simply impossible to manually watch the traffic flow, judge the traffic condition and produce traffic information for an area as large as Istanbul. The process must be automated and an information collection system based on measured traffic condition data must be introduced. Installation of many vehicle detectors incurs both initial investment costs and maintenance costs, but the investment will be worth it considering the benefits it will bring about through an improved traffic information system.

Standards must be established so as to better define congestion and the description of traffic condition must be normalized. Message structures and terms used on variable message signs must also be defined to correctly convey traffic information to the road users.

Chapter 7 Institution, Finance and Environment

7.1 Institutional Framework

7.1.1 The Foundation of Metropolitan Governance

The municipality of Istanbul was created in 1854, a year after a decade Ottoman State was divided into provinces, districts and villages. Following the establishment of Republic of Turkey in 1923 as a unitary state, a local administration system was set up based on the principles of a strong central government. Local authorities were considered public corporate entities established to meet the needs of citizens in Turkey's provinces, municipalities and villages.

1) The Legal Framework

(1) The Law on Municipalities No. 1580 of 1930

The Municipalities Law No. 1580 of 1930 delineated the duties and responsibilities of the local authorities and remains the basic legislation for today's municipalities. During the early years local authorities were seen as an extension of the central government. The growing number of urban residents gradually began to make their voices heard and in the 70's formed an important power-base catching the interest of local politicians. So, the mayors emerged as an influential group and demands were made to secure financing for urban services.

The Municipal Law of 1930 failed to equip the municipal administrations to cope with the above-mentioned challenges.

(2) The Constitution of 1982

The Turkish Constitution of 1982 stipulates that in terms of its establishment and functions public administration constitutes a unified whole and is regulated by law (Article 123). Article 127 designates that the central administration has the legal authority to practice administrative tutelage (trusteeship) over local governments.

Some of the decisions of local authorities are subject to control by central administrative bodies. This control can be in the form to approve, postpone, cancel, decide on behalf, or to seek for prior permission. The central government exercises considerable control over local authorities, mainly through the Ministry of Interior. The central government oversight relies largely on *ex ante* controls to ensure compliance with laws.

The aims of this supervision are ensuring the functioning of local services in conformity with the principle of integral unity of administration, uniformity of public services, safeguarding public interest, satisfying and meeting local needs, increasing the effectiveness, efficiency and stability in local authorities' activities.

Local administration is governed by Article 123 and 127 of the 1982 Constitution. According to the Constitution, the central administration has "the power of administrative tutelage over local authorities with the objective of securing uniform public services and meeting local needs in an appropriate manner" (Article 127). While the central government oversight has worked in the past, it is becoming increasingly difficult to manage more than the 3,200 municipalities in an effective manner.

(3) The Law on Metropolitan Municipalities No. 3030 of 1984

Some important changes in the local government system that enhances the autonomy and local decision-making capabilities have occurred in the 1980's. According to the legislative system, there were four types of local authorities in Turkey:

- Special Provincial Administrations (81) – these cover areas that fall neither among municipal or village boundaries.
- Municipalities (3,226) - in areas which have more than 2,000 inhabitants.
- Metropolitan municipalities (16) - are main urban areas which the district municipalities are organized under umbrella organizations referred to as Metropolitan municipalities.
- Villages (about 35,000) – a village is governed by a head-man and average village has a population of about 500.

The metropolitan area of Istanbul consists of (i) the metropolitan administration called "Istanbul Metropolitan Municipality (IMM)", (ii) 32 district municipalities, (iii) 37 sub-districts municipalities, (iv) a Special Provincial Administration, (v) villages and (vi) Association of local authorities. The IMM has an authorization of only 46% of the land in Istanbul Province.

The Metropolitan Municipalities Law of 1984 established the new responsibilities and areas of action for metropolitan and district municipalities. Metropolitan municipalities' responsibilities are as follows:

- Preparation of master and investment plans.
- Construction of major roads.
- Building of passenger and freight terminals.
- Consumer product testing laboratories.
- Solid waste disposal sites and treatment plants.
- Wholesale markets.
- Implementation of city-scale joint venture.

The urban district municipalities are responsible for all basic municipal services which are not specifically assigned to the metropolitan municipalities.

In the metropolitan municipalities, water and wastewater management is the responsibility of semi-autonomous water and sewerage authorities. Solid waste collection is the responsibility of the district municipalities while waste transfer and disposal are the responsibility of the metropolitan municipalities. Construction and maintenance of the main road is the responsibility of the metropolitan municipalities, while the secondary roads are the responsibility of the district municipalities.

(4) The Settlement Law No. 3194 of 1985

The Settlement Law No. 3194 of 1985 has radically changed planning practices in Turkey. Before this law, planning was strictly a centralized effort. Planning processes and approval rights belonged to the Ministry of Public Works and implementations and control of the plans were the duties of municipalities within the municipal boundaries. With the legislative reforms in 1985, planning preparation, approval, planning implementation and

controlling rights and responsibilities were given to the municipalities within the municipal boundaries.

Specifically, the Settlement Law of 1985 included the allocation of powers within the planning hierarchies:

- The right of preparation and approval of regional and sub-regional plans having 1/500,000 and 1/1000, 000 scales falls under the control of the State Planning Organization (SPO). The preparation and approval of the development plans for coastal zones, major industrial development areas, or environmentally critical areas with a 1/25,000 scale, is the responsibility of the General Directorate of Technical Research and Application (TAU) of the Ministry of Public Works and Settlement
- The detailed development plan with 1/5000, 1/1000 and 1/500 scales became the duties of municipalities within the municipal boundaries.
- Whereas out of those boundaries the responsibility for preparation, approval and control of the implementations belonged to the local branches of the ministry.

(5) The Law on Metropolitan Municipalities No. 1850 of 2004

By the enactment of the Law No. 1850 on July 2004, the boundaries of IMM's authority area became the territorial boundaries of the province (see Figure 7.1.1). The Law on Metropolitan Municipalities (No.1850 of 2004) has, at first hand, transferred a substantial amount of governmental authorities of local governance to IMM. This has not only widened the spatial borders of authority, but also introduced a depending authority with increased responsibility of areas.

2) Legislative and Institutional Reforms Related to Metropolitan Governance and Spatial Planning and Development

Changes across the world and in Turkey have forced further developments and restructuring in the role of the state and its organization. Public sector reform in Turkey was aimed at:

- Decentralization in administrative structuring.
- Efficient and effective administrative structure.
- Decentralization of the administrative structure and getting rid of inert structures.
- Delivery of better quality services to citizens at the most appropriate locations in the shortest amount of time and with relevant cost effective solutions.

Public sector reform efforts in Turkey date back to the 1960's. Since then, official 5-year development plans and the report were prepared by the Public Administration Institute of Turkey and the Middle East (TODAIE) addressed the problems of public administration and local governments (i.e. Central Government Mechanisms Research Project 1963; Restructuring Administration: Principles and Proposals -1971: Public Administration Research Project-1991). The 1980's trend in western countries that favor smaller states had an impact on Turkey, resulting in an elevated official agenda for redefining the role of the state, downsizing its public sector, and increasing the efficiency of public service delivery. Nevertheless, lack of a strong political leadership impeded such plans from translating into concrete legislative reforms and actions. As a result, Turkey's public

administrative system remained ineffective and failed to match extensive economic liberalization that took place in the 1980's. Recognizing this gap and Turkey's low performance compared to many other countries around the world, AKP included public sector reform into its Urgent Action Plan in 2002, in addition to its government program.

In essence, the Urgent Action was intended to restructure intergovernmental relationships among the central government, provincial authorities (governors) and municipalities (mayors). They envisioned relegating some of the powers of the central government to regional and local administrative entities. By such a reform schedule, AKP government claimed to increase transparency and accountability, strengthen administrative capacities and productivity, and encourage a participatory and result-oriented decision-making process. To this end, it introduced through draft laws concepts such as "city councils", "voluntary participation in local government services", and the "right to information".

3) Public Sector Reform Efforts since 2003

Studies on restructuring the public management, carried out in Turkey since 2003, are based on the development of the world, the current situation of the country, the Urgent Action Plan and the Program of the 58th and 59th governments. In the light of these undertakings, it has become essential to adapt with the changes taking place in Turkey and throughout the world, to shift to a knowledge-based economy, to enhance the trust between citizens and the state by developing an effective and efficient organization in public services, public management reforms, which the government planned to achieve in a rolling process, including making cultural changes, and by introducing numerous methods which have been adopted by developing countries.

Restructuring efforts in public management launched in 2003 have a wide scope:

- a) To redefine the duties, powers and responsibilities of the central and local authorities.
 - To establish a legal infrastructure in accordance with redefined roles.
 - To restructure central public administration in line with their new roles.
- b) To identify the work procedures of central public departments and to fight red tape and bureaucracy in the public services.
- c) To undertake reforms on legislation in order to simplify the legislation and to reduce the administrative burden imposed by regulations. And,
- d) To improve the human resources management according to New Public Management.

4) Institutional Capacity Building through Strategic Planning at the Institutional Level

As the accomplishments of restructuring efforts since 2003, the legal infrastructure of the central and local administrations were established: The new legislative reforms, including the Law on Municipalities (No. 5393/2005), the Law on Metropolitan Municipalities (No. 5216/2005) and Law on Provincial Local Government (No. 5302/2005) and the Law on Public Financial Management and Control, require all public institutions, as well as municipalities and local governments, to prepare institutional strategic plans. Specifically, these legislative changes related to metropolitan governance and urban and regional development-management focuses on the following issues:

- Decentralization of authority to local authorities
New laws enable local municipalities to enjoy more local tax incomes generated by

real estate markets and other local resources, which provide the necessary funds for implementing a local strategic of development.

- Widening the borders of the Greater Municipality of Istanbul.
The new law on metropolitan municipalities has at first hand transferred a substantial amount of governmental authorities of local government to IMM. This has not only widened the spatial borders of authority, but also introduced a depending authority with increased responsibility over areas.
- Enabling private-public-non governmental organization partnerships
Though the municipalities have before been able to establish different types of partnership with the private sector, the new laws provide that a city council should be established to represent different groups of society. The Law on Regional Development Agency (No.5549/2006) is to enable a well defined organizational form of private-public and non-governmental organization partnership that would be the key to successful strategic planning at the urban-regional level.
- Enabling horizontal partnerships and cooperation between local governments:
The Law on Municipalities (No. 5393/2005), the Law on Metropolitan Municipalities (Nr. 5216/2005), the Law on Provincial Local Government (No.5302/2005) and the Law on Associations of Local Authorities (No. 5355/2005) enable the establishment of horizontal partnerships and cooperation between local governments' spatial planning and better management of space.

The Law on Municipalities, Law on Metropolitan Municipalities, Law on Provincial Local Government and the Law on Public Financial Management and Control has all changed in accordance with each other, and the Planning and Redevelopment law is changing. These developments which were meant for a unified planning approach touching on the issue of the borders of the Greater Municipality of Istanbul extended to the provincial borders, thus full spatial planning power was transferred to the municipality.

5) Evaluation of Current Legislative and Administrative Reforms

The years 2004-2006 were important periods for administrative reforms in Turkey. The adaptation of a transition plan for national development to synchronize national plans and budgets with the European Union (EU) Policy Period 2007-2013 was a necessary step. The 9th National Development Plan 2007-2013 is heavily influenced by the membership process to the EU. These policies which take place within the Community Strategy Guidelines for 2007-2013 has become more important for both national and regional development studies and approaches. Further decentralization of governance to local authorities and the introduction of other laws related to spatial planning and development in this recent period in Turkey has also introduced more opportunities for local governments to implement strategic development decisions, either in line with overall OECD or United Nations Millennium Goals.

- Administrative Reforms of Central, Regional and Local Governments
Legislative reforms have been brought into the administrative reforms of the central, regional and local governments to cope with the increase and diversification of the social and economic needs in parallel with economic reforms, although the structure and tradition of centralized public administration still persists in spite of many support

for self-governance and devolution of powers from the central government to the provincial governments.

- **Decentralization Policy and Local Administration Reform**

The government aim is to restructure the local governments to become compliant with the principles laid down in the European Charter of Local Self-Government and to be more efficient, accountable, participative and transparent. A reform process was started in respect with the organization, duties and power, financial resources, personnel and relations with the State government of the local administration in line with the Urgent Action Plan (2002), and also the government has brought two bills to the parliament for public administration reforms and local government administration. The administrative tasks and services between the state and local governments were demarcated in these bills.

6) **Distribution of Powers between the Various Categories of Central and Local Authorities**

A. Service Provided by Central Government

Public Administration systems in Turkey are basically composed of the central government and the local government. According to the 1982 Constitution, Turkey was divided into provinces. The administration is based on the principles of devolution. The functions and powers of this organization shall be regulated by law (Article 126). The central government is composed of the ministries and their field organizations. The country has been divided into provinces, sub-provinces and communities.

Central authorities directly provide many urban services through the field offices of relevant ministries or via some regional organizations of central government bodies. Among the most important of these services are security and police, planning, educational institutions at all levels, health services, museums and cultural facilities, major intercity expressways, postal and telecommunications services and electricity supply and distribution.

B. Service Responsibilities of Municipalities

The functional framework of municipalities was set by the Municipalities Law of 1930 which assigns a broad range of responsibilities to these institutions. The mandatory (compulsory) services for which municipalities are responsible according to the Law are:

- Urban planning and mapping, regulation of construction
- Land development
- Urban renewal
- Construction of social housing
- Mass transportation
- Construction of urban roadways, bridges
- Provision of water, sewerage
- Refuse collection and disposal
- Fire prevention
- Recreational, cultural, educational facilities
- Veterinary services
- Health and social welfare facilities
- Protection of areas of natural and historical value.

In addition, municipalities may carry out any type of optional (arbitrary) activity for the common well-being of their inhabitants.

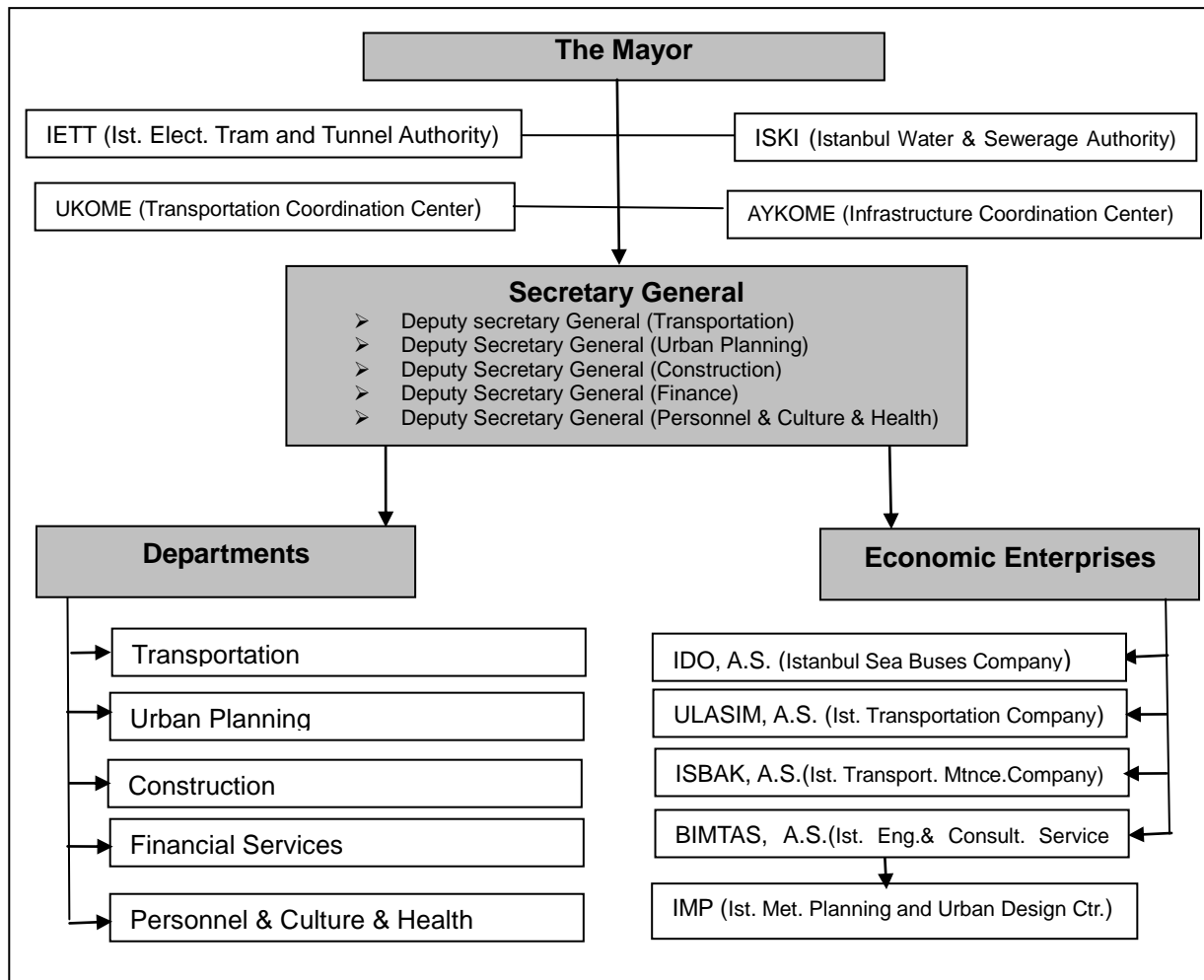
Since the 1930's, as a result of major socio-economic development, there have been significant changes in local level public needs and in the structure of urban settlements. In the 1970's, there has been a significant expansion in the scope of the municipal activities to meet the rapidly changing needs.

Today, the core municipality responsibilities are transportation, water and wastewater services and solid waste management. The services are provided by municipalities and municipal enterprises. There are also municipal enterprises that run commercial operations and are not directly connected to the core services.

7.1.2 Institutional Framework

1) IMM Administration of Urban Transportation and Land Use Planning and Management

The organization of IMM can be outlined as shown in Figure 7.1.2 in relation to urban transportation and land use control.



Source: Prepared by Study Team from various information

Figure 7.1.1 Organizational Chart of IMM Related to Urban Transportation and Land Use Planning and Management

2) Decision-making Bodies

The following bodies are responsible for the planning and implementation of urban transportation and land use development and management:

- (1) The Metropolitan Municipality Council (the “City Council”)
- (2) The Metropolitan Mayor (the “Mayor”)
- (3) IETT (Istanbul Electric, Tram and Tunnel Authority)
- (4) ISKI (Istanbul Water and Sewerage Authority)
- (5) UKOME (Transportation Coordination Center)
- (6) AYKOME (Infrastructure Coordination Center)
- (7) Secretary General
 - Deputy Secretary General (Transportation)
 - Deputy Secretary General (Urban Planning)
 - Deputy Secretary General (Construction)
 - Deputy Secretary General (Finance)
 - Deputy Secretary General (Personnel & Culture & Health)
- (8) Economic Enterprises
 - ULASIM, A.S (Istanbul Transportation Company)
 - IDO, A.S.(Istanbul Sea Buses Company)
 - ISBAK, A.S (Istanbul Transportation Maintenance Company)
 - BIMTAS, A.S.(Istanbul Engineering and Consultancy Services Company)
 - IMP (Istanbul Metropolitan Planning and Urban Design Center)
- (9) Departments and Directorates
 - Department of Transportation
 - (i) Directorate of Transportation Planning
 - (ii) Directorate of Transport Coordination
 - (iii) Directorate of Rail Transit Systems
 - (iv) Directorate of Road Maintenance and Repair
 - (v) Directorate of Traffic
 - (vi) Directorate of Public Transportation Services
 - Department of Urban Planning
 - Department of Construction
 - Department of Financial Services
 - (i) Directorate of Budget and Supervision
 - (ii) Directorate of Expenditures
 - (iii) Directorate of Revenues
 - (iv) Directorate of Finance
 - (v) Directorate of Financial Supervision
 - Department of Personnel & Culture & Health

3) Duties and Authorities

(1) The City Council

The City Council is the ultimate decision-making organ of IMM. It is composed of the representatives of district municipalities within the metropolitan boundaries, who gain the most number of electoral votes, and the mayors of the district municipalities. The council is chaired by the metropolitan mayor. The term of each member of the council is five years.

(2) The Mayor

The mayor is the highest authority of the municipal organization, directing and administering the municipal organization and protects the rights and interests of the municipality. The mayor has the power to conclude contracts on behalf of the municipality and represents the municipality in the courts as plaintiff or defendant.

(3) IETT

IETT, which is a public corporation, provides intra-city transportation services throughout Istanbul. IETT was founded in 1939 with the adaptation of Law No. 3645. It has a fleet of 2,377 busses on 531 Lines; 0.573 km tunnel and 1.7km Tunnel-Taksim Tram Line on 2500 km of the metropolitan area. IETT is also responsible for the management of the private buses (OZ) and double decker buses.

(4) ISKI

ISKI, a public corporation with its own independent budget, is attached to IMM.

It was initially set up in 1981 with the adaptation of Law No: 2560 and was under the control of Istanbul Governor's Office, before it was transferred to the control of IMM under the terms of Law No. 3009 in 1984. The services provided by the General Directorate of ISKI were confined to areas within the jurisdiction of IMM. However, its service area was extended to provide drinking water and sewage services for IMM. Duties and authorities of ISKI include the following:

- To manage all types of groundwater and especially surface water resources to provide a drinking and domestic water supply and to distribute water to demand centers.
- To collect wastewater and storm water and remove them from centers of habitation.

(5) UKOME

UKOME provides coordination among transportation services, determines routes, schedules, fares of public transportation, prepares or contracts out transportation plans and traffic commission.

Members of UKOME include:

- Mayor of IMM
- Secretary General of IMM
- Director of Transportation Department
- Deputy Secretary General
- 1st Legal Advisor

- Head of Science Affairs Department
- Representative of IETT Directorate General
- Representative of IDO, A.S. General Director
- Representative of ULASIM, A.S Directorate General
- Head of Transportation Coordination Directorate
- Director of Public Transportation Services
- Director General of Highways (TCK) 17. Region
- Representative of City Gendarmerie Commandership
- Representative of Turkish State Railways (TCDD)
- Representative of Istanbul Highway Transportation Region Directorate
- Coast Security Marmara and Bosphorus Region Commandership
- Representative of Marine Undersecretariat Sea Transportation General Directorate
- Representative of Country Airport Administration
- Representative of National Defense Ministry 1st Army Commandership Logistics Department'
- Deputy of Istanbul Security Director
- Representative of Railways, Harbors and Airport Construction (DLH) Directorate General

(6) Secretary General

Heads the secretariat of IMM and administers the municipal affairs supported by 5 Deputy Secretary Generals.

(7) Department of Transportation

- Directorate of Transportation Planning - Prepares the transport master plan for IMM authority area.
- Directorate of Transportation Coordination - Serves as the Secretariat for UKOME.
- Directorate of Public Transportation Services - Gives permits; determines routes, schedules, fares of public transportation (buses and trains excluded).
- Directorate of Rail Transit System - Construction of rail transit system projects.
- Directorate of Traffic - Road signalization and traffic monitoring.
- Directorate of Road Maintenance and Repair - Road Maintenance and Repair.
- Directorate of City Traffic Commission:-determines routes of public transportation.

(8) Economic Enterprises

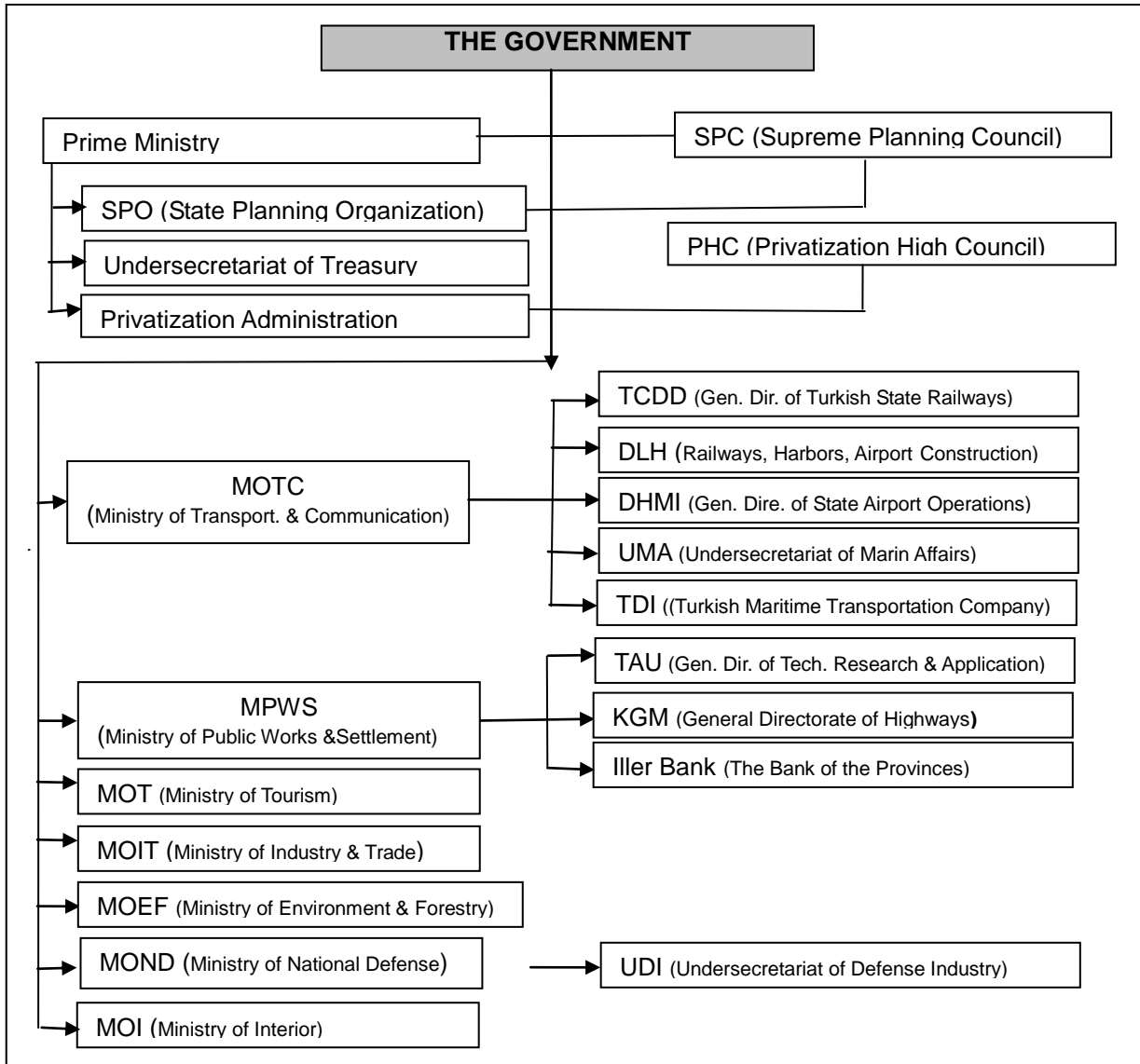
- IDO A.S. (Istanbul Sea Buses Company) - Operates the ferry services.
- ULASIM A.S. (Istanbul Transportation Company) -Operates Istanbul Metro system.
- ISBAK, A.S (Istanbul Transportation Maintenance Company) -Manufactures traffic signalization systems for IMM.
- BIMTAS A.S. (Istanbul Engineering and Consultancy Services Company) - Promotes project-based consultancy and engineering services.
- IMP (Metropolitan Planning and Urban Design Center) was established in September 2005 - IMP consists of over 400 urban planning professionals and

academics that work on 10 key areas of urban development, among them land use planning coordinated with transportation planning. IMP is attached to BIMTAS.

7.1.3 Roles of Central Government in Urban Transportation and Land Use Planning

1) Central Government is Responsible for Urban Transportation and Land Use Planning

The organization of the control government is shown in Figure 7.1.3 in relation to urban transportation and land use control.



Source: Prepared by Study Team from various information

Figure 7.1.2 Organizational Chart of Central Government Concerning Urban Transportation and Land Use Planning

(1) Decision-making bodies

The following bodies are responsible for the legislation and regulations concerning urban transportation and land use planning and management:

- A SPC: Supreme Planning Council
- B PHC: Privatization High Council
- C Prime Ministry
 - SPO State Planning Organization
 - Privatization Administration
 - Undersecretariat of Treasury
- D Ministry of Transportation and Communications (MoTC)
 - TCDD General Directorate of State Railways
 - DLH General Directorate of Railways Harbors and Airports Construction
 - DHMI General Directorate of State Airports Operations
 - UMA Undersecretariat of Maritime Affairs
 - TDI Turkish Maritime Transportation Company
- E Ministry of Public Works and Settlement (MoPWS)
 - KGM General Directorate of Highways
 - TAU General Directorate of Technical Research and Application
 - İller Bank Bank of Province
- F Ministry of Industries and Trade (MoIT)
- G Ministry of Culture and Tourism (MoCT)
- H Ministry of National Defense (MoND)
 - UDI Under secretariat of Defense Industry
- I Ministry of Environment and Forest (MoEF)
- J Ministry of Interior (MOI)

(2) Duties and Authorities

A Supreme Planning Council (SPC)

The authority to make policy and implement it rests with SPC which is composed of the following members:

- Prime Minister
- Deputy Prime Minister
- Minister of State (Economic Affairs)
- Minister of Finance
- Minister of Transportation
- Minister of Public Works and settlement
- Minister of Industries and Commerce
- Minister of Energy and National Resources
- Undersecretary of State Planning Organization (SPO)

B State Planning Organization (SPO)

SPO is responsible for the preparation and implementation of Five Year Plans. It comes under the Prime Minister's Office and policy direction from SPC. SPO is also responsible for the preparation of regional plans (whole or partial area of Marmara Region) or having them prepared through 1/500,000 and 1/100,000 scales.

C Undersecretariat of Treasury

Undersecretariat of Treasury is responsible for the legislation and regulations concerning Foreign Direct Investments (FDI)

D Privatization High Council (PHC)

PHC is the ultimate decision-making body for privatization in Turkey headed by the Prime Minister and composed of four ministers. PHC nominates the organizations for privatization through taking state-owned economic enterprises in and out of the privatization portfolio and is responsible from the methodology and timing of the privatization procedures by approving the final transfer procedures of the organizations to real people and /or legal entities

E Privatization Administration (PA)

The PA is the executive body for privatization process. It is a legal public entity with an exclusive budget, reporting directly to Prime Minister. The PA's major duties include the execution of PHC's decisions, advising the PHC in matters related to the transfer of SEE's into or out of privatization portfolios and the restructuring and rehabilitation of SEE's in order to prepare them for privatization.

F Ministry of Transportation and Communications (MoTC)

- General Directorate of Railways, Harbors and Airports Construction (DLH)
- General Directorate of Turkish State Railways (TCDD)
- General Directorate of State Airports Operations (DHMI)
- Undersecretariat for Maritime Affairs (UMA)
- Turkish Maritime Transportation Company (TDI)

The DHL is responsible for the legislation and regulation concerning the railways, harbors and airport constructions. It is the executing agency of the Marmaray Project which is under construction. It has been assigned as the executing agency for the proposed Istanbul Strait Road Tunnel Crossing Project.

TCDD is responsible for the legislation and regulations concerning commuter rail operations and it has been involved in the Marmaray Project

The DHMI is responsible for the legislation and regulations concerning airport operations and it serves as the executing agency for Ataturk International Airport under a lease contract with Tepe-Afken Joint venture (TAV).

TDI is responsible for the legislation and regulations concerning port operations and has been involved in the privatization of the Galata Port/Istanbul

UMA handles the legislation and regulations concerning maritime affairs and serves as the regulatory authority.

G Ministry of Public Works and Settlement (MoPWS)

- General Directorate of Technical Research and Application (TAU)
- Bank of Province (Iller Bank)
- General Directorate of Highways (KGM)

MPWS is a hierarchical bureaucracy composed of (i) The executive unit (the Minister/ Undersecretary/5 Deputy Under Secretaries), (ii) consultation and inspection unit, (iii) main service units, (iv) support units, (v) annexed units and (vi) provincial organizations.

TAU, one of the core units of MPWS, is empowered to prepare development plans of 1/50,000 and 1/25,000 scale for whole or partial areas in the IMM.

Iller Bank (The Bank of the Provinces) provides loans for investment projects of municipalities, in compliance with the bank's evaluation criteria.

KGM is one of the annexed units headed by general director who was supported by 5 deputy general directors who oversee 9 functional departments, e.g. Department of Bridges, Department of Motorways and Department of Strategic Development, etc.

KGM is responsible for the legislation and regulations concerning road and bridge construction and is the executing agency for the construction of two suspension bridges crossing the Bosphorus and the Seismic Reinforcement Projects for Large Scale Bridges in Istanbul (First and second Bosphorus Bridges and the Old and New Golden Horn Bridges and their approach viaducts). It is currently considering the construction of a new bridge crossing the Bosphorus ("The Third Bosphorus Bridge")

H Ministry of Industries and Trade (MoIT)

I Ministry of Culture and Tourism (MoCT)

J Ministry of Environment and Forest (MoEF)

MOIT, MOT and MOEF are approving and controlling government agencies for land-use plans.

K Ministry of Interior (MoI)

MoI is in charge of traffic police and City Traffic Commission.

L Ministry of National Defense (MoND)

- Undersecretariat of Defense Industry (UDI)

UDI is responsible for the legislation and regulations concerning airport construction and operations. It is the Executing Agency of the Sabiha Gokcen Airport/Istanbul which has recently awarded to the Limak-GMR-Malaysia Airport Partnership a 4.35 billion contract. The contract involves VAT and costs 250 million euro for a 20-year lease of the airport. UDI is also the executing agency of Antalya Airport under a \$3.2 billion lease contract with the Ictus Frankfurt Airport Consortium.

7.1.4 Decision-making on Land Use Plans and Implementation

1) Decision-making-at Central Level

The following bodies are responsible for the legislation and regulations concerning land use planning and management:

(1) State Planning Organization (SPO) is responsible for:

- The preparation of Five Year Plans.
- The preparation of Regional Plans (whole or partial area of Marmara Region) or having them prepared in 1/500,000 and 1/100,000 scales.

(2) The Ministry of Public Works and Settlement (MoPWS) is responsible for:

- The preparation of territorial plans, or having them prepared, and their approval through the Settlement Law No. 3194 (1985).
- The preparation of land use plans for areas subject to disaster and their approval through the Disaster Law No. 7269/1051 (1959).
- The approval of Tourism Area and Centers Master Plan through the Tourism Encouragement Law No. 2634 (1982).
- The approval of landfill in coasts or land gained by drying through the Coastal Law No. 3621 (1990).
- The approval of land use plans related to public institutions, important for transportation, and mass housing implementations through the Settlement Law No. 3194 (1985).
- The approval of land use plans of explosive and flammable material stores through the regulation announced relative to second article of the Law No. 6551 (1987).
- The preparation and approval of land use plans of Squatter Prevention Areas or Rehabilitation Zones through the Squatter Law No. 775/3384 (1966). And,
- The approval of Implementation Plans of National Park through the Law on National Parks No. 2873 (1993).

(3) The Ministry of Culture and Tourism (MoCT) is responsible for:

- The approval of tourism establishment implementation plan in tourism areas and centers through the Tourism Encouragement Law No: 2634 (1982).
- The approval of implementation plans on touristic uses continuing from landfill in coasts through the Coastal Law No: 3621 (1990).
- The plans within Greater Municipalities through the Law on Metropolitan Municipalities No: 3030 (1984).
- The Construction and Occupancy Permits through the Settlement Law No: 3194 (1985) and the Law on Metropolitan Municipalities No.3030 (1984).
- Approval of implementation plans of municipalities in Greater Municipality boundaries through the Law on Metropolitan Municipalities No: 3030 (1984).

(4) The Ministry of Environment and Forestry (MoEF) is responsible for:

The preparation of environmental basin plans with scale of 1/25,000 on sustainable and ecological basis through the Government Decree on the Establishment and Duties of the Ministry of Environment No: 443.

(5) The Institution of Specially Protected Areas is responsible for:

- The preparation and approval of every type and scale of plans specially in protected areas through the Government Decree on the Establishment. And,
- Duties of the Institution of Specially Protected Areas.

(6) The Bank of the Provinces (İller Bank) is responsible for:

The preparation of land-use plans by itself or through private tenders with the request of the municipalities, through the Law on the Bank of the Provinces No: 4759 (1945).

2) Decision-making at Regional Level:

(1) Bosphorus Higher Planning Coordination council is responsible for:

- The approval of plans or plan amendments in the coastal strip.
- The front view areas of the Bosphorus through the Bosphorus Law No: 2960 (1983).

(2) Southeastern Anatolian Project Regional Development Administration is responsible for:

- The use of rights and competence on planning and infrastructural issues in South-Eastern Anatolian Region Provinces relative to the Laws No: 1580 and 3194 through the Government Decree No: 399 (1989).

(3) Regional Councils of Cultural and Natural Resources Protection Councils are responsible for:

- The instructions on land-use plans with conservation objectives in urban and archeological natural conservation area through the Law on the Protection of Cultural and Natural Resources No: 2863/3386 (1983).

3) Decision-making at Provincial Level:

(1) The provincial government is responsible for:

- The preparation and approval of land-use plans outside the municipal and adjacent area boundaries through the Settlement Law No: 3194 (1985).
- The announcement of mass housing areas through Mass Housing Law No: 2985 (1984).
- The determination of village settlement areas through Settlement Law No. 3194 (1985).
- The determination of village settlement areas and approval of their plans through the Village Law No: 442/3367 (1987).

4) Decision-making at Settlement Level:

(1) Municipality is responsible for:

- The preparation of land-use plans within the boundaries of Municipalities and Adjacent areas through Settlement Law No: 3194 (1985).
- The determination of squatter areas and upgrading zones and preparation and approval of their land-use plans through the Squatter Law No: 775/3811.
- The preparation and approval of upgraded implementation plans through the Amnesty Law on Settlement Development No: 2981/3290/3386.
- The Construction and Occupancy Permits through the Settlement Law No: 3194 (1985) and the Municipality Law No: 1580 (1930).
- The approval of land-use plans related to land-uses other than tourism in touristic areas and centers through the Tourism Encouragement Law No: 2634 (1982).

(2) Metropolitan Municipality is responsible for:

- The preparation and approval of master or land gained by drying through the Law on Metropolitan Municipalities No: 3030 (1984).

(3) The Ministry of Culture and Tourism (MoCT) is responsible for:

- Making the decision for the regional or higher council to obey in urban, archeological, and natural preservation areas through the Law on the Protection of Cultural and Natural Resources No: 2863 (1983).

(4) Higher Council of Protection of Immovable Cultural and Natural Resources is responsible for:

- Taking the decisions of planning and constructing for urban, archeological and natural preservation areas through the Law on the Protection of Cultural and natural Resources No: 863 (1083).

(5) Ministry of Environment and Forestry (MoEF) is responsible for:

- The determination and protection of national and natural parks, and preparation of development plans through the Law on National Parks No. 2873 (1993).

7.2 Financing of Local Authorities

7.2.1 Income Sources of Local Authorities

According to Article 23 of Section 6 of the Law on Metropolitan Municipalities (No. 5216 of 2004) metropolitan municipalities are entitled to tap the following income sources:

- Shares to be transferred by Iller Bank (Bank of Province) from funds to be determined by the Council of Ministers over the total amount of general budget tax incomes for the country and first degree municipalities;
- Five percent share to be calculated over the general tax income collected within greater city municipal borders and deposited by the Finance Ministry until the end of the next month in the account of greater city municipality.
- Fifty percent of the entertainment tax to be collected by the greater city municipality from bets, including horse races, according to the proportions and principles set forth in Municipal Income Law No:2464. Twenty percent of the said amount is to be transferred to the municipality where the horse races are made and 30% to be distributed to other municipalities and first degree municipalities according to their population'.
- All kind of municipal taxes, charges and fees to be collected from the social and cultural facilities, sporting, entertainment and recreation, and green areas under the control of a greater city or municipality.
- Taxes and charges collected from the bill boards and advertisements are posted.
- The remaining 50%, after the distribution of 50% of incomes, is gained from the operation of designated parking places.
- Road, water and sewage expenses to be collected at the rate and according to the principles set forth in Municipal Income Law No:2464; these services should be performed by the greater city or municipality.
- Incomes gained from rents, interests and fines.

- Aids from public administrations and enterprises.
- Incomes are registered on the basis of final accounts of subsidiaries, and incomes are transferred as a result of surplus accrued in expenditure.
- Shares to be acquired from the net profits of economic enterprises of greater city or municipality at a rate to be determined by the greater city or municipality.
- Incomes gained from movable and immovable properties owned by the greater city or municipality.
- Fees to be collected against the rendered services.
- Conditional and unconditional donations.
- Other forms of incomes.

The Council of Ministers is authorized to double the 5% share mentioned above or to reduce it to legal rates, 75% of this share is deducted from this amount and is directly deposited to the account of concerned municipality; the remaining 25% is distributed to the greater city or municipalities according to their populations. Calculation and distribution transactions are executed by the Finance Ministry.

7.2.2 Financing Expenditures of Local Authorities

1) Revenues

- Tax Revenues

(a) Local Tax

(b) Tax Share from General Budget

- Non-Tax Revenues
- Factor Income
- Borrowing

(1) According to the Law on Municipal Revenue No. 2464 and the Law on Property Tax No. 1319 tax revenues are:

- Property Tax
- Announcement and Advertisement Tax
- Entertainment Tax
- Communication Tax
- Fire Insurance Tax
- Environment Cleaning Tax

(2) Tax Share from General Budget is (Law on Transfer of Tax Revenues of General Budget to Municipalities and Special Provincial Administrations No. 2380) consist of:

- Six percent of general budget tax revenues transferred to municipalities.
- One point twelve percent of the general budget tax revenues transferred to special provincial administrations.
- Five percent of general budget tax revenues collected within the metropolitan municipality area.
- Thirty five percent of tax share of municipalities within the metropolitan area.

2) Non-Tax Revenue

- Contribution to expenditures
- Revenues from the properties of municipalities

- Revenues from municipal duties
 - Fees
 - Fines
 - Grants
 - Others
- 3) Factor Income
- Sales revenues and profits of enterprises and utilities managed by local authorities.
- 4) Borrowings
- Borrowing decisions must be taken by the council of local authorities.
 - Foreign borrowing for projects in investment programs is regulated by the Law on Public Finance and Debt Management No. 4749.
 - Permission from the Treasury is necessary for all foreign borrowings.
 - Issuance of bonds is only possible for projects in investment programs (Law on Public Finance and Debt Management No. 4749 and the Law on Capital Market No. 2499).
 - Domestic borrowings of up to 10% of the revaluated value of the preceding annual budget revenues can be realized with the decision of City Council. Domestic borrowings which exceed this amount must be approved by the Ministry of Interior.
 - Local authorities can use investment credit and cash credit from the İller Bank (The Bank of the Provinces).
 - Domestic and foreign debt stock (including interest) of local authorities, their related institutions and the companies, of which more than 50% of capital belong to local authorities, can not exceed the revaluated value of the preceding year's budget revenues (one and half times for metropolitan municipalities).
 - These limits do not apply to infrastructure projects which satisfy the following:
 - (a) Excessive amount of financing requirements.
 - (b) Approved by the Council of Ministers.

7.2.3 Fiscal Decentralization

New laws enable local authorities to enjoy more local tax income generated by real estate market and other local resources, which provide the necessary funds for implementing a local strategy of development. In addition, there is a draft law on the revenues of local authorities which stipulates:

- Allocation of tax revenues between central and local administration to be redesigned.
- Amount of transfers from general budgets to local administrations to be increased.
- Rates and amounts of local taxes and fees to be increased.
- Transfer from local administrations revenues to various central government units to be eliminated.

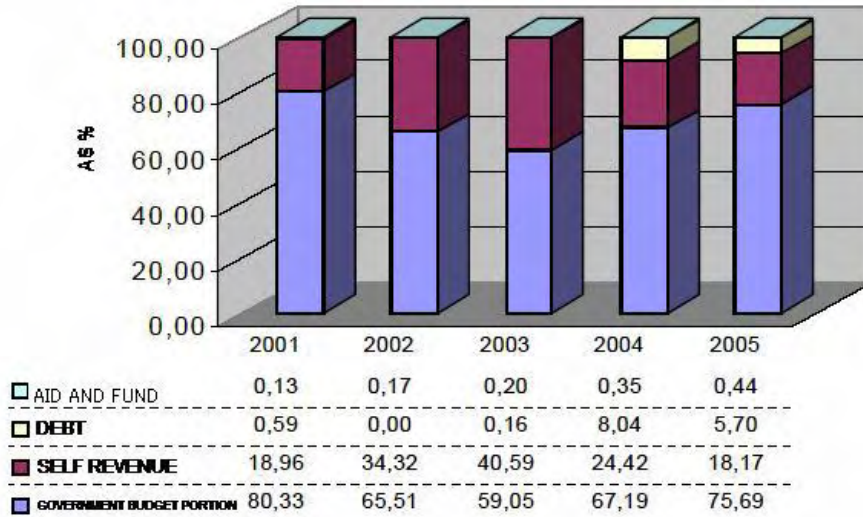
7.2.4 Revenues of Istanbul Metropolitan Municipality

IMM received approximately 75% of its revenues from the Central Government in 2006 (Table 7.2.1). Figure 7.2.1 shows the composition of revenues of IMM for the previous 5 years (2001-2005) and Figure 7.2.2 represents the further breakdown of the funds received from Central Government.

Table 7.2.1 Revenues of IMM, 2006

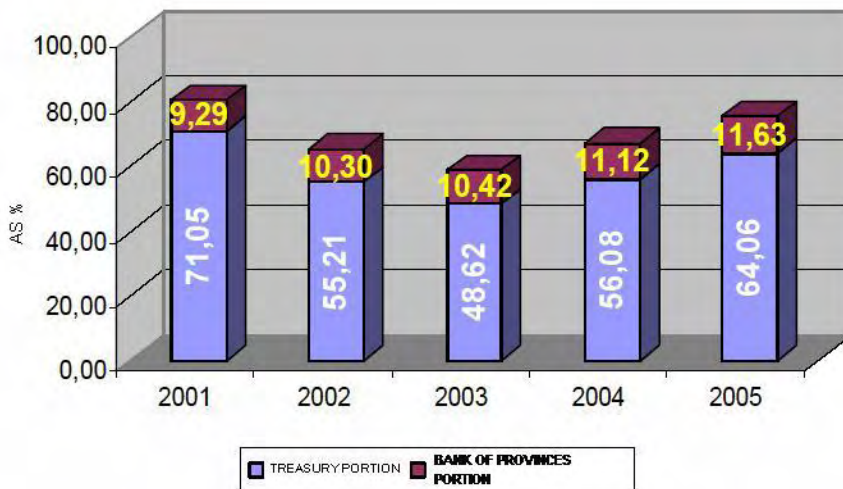
| Classification of Revenues | Estimated Revenues (2006) (YTL) |
|----------------------------|---------------------------------|
| Tax Revenues | 2,202,475,000 |
| Non-Tax Revenues | 405,560,000 |
| Capital Revenue | 60,390,000 |
| Donation and Aid | 30,620,000 |
| Debt Collection | 252,500,000 |
| Refusal and Refund | -1,545,000 |
| Total | 2,950,000,000 |

Source: Economic Statistics of IMM, 2006



Source: IMM 2007-2011 Strategic Plan

Figure 7.2.1 Composition of Revenues of IMM



Source: IMM 2007-2011 Strategic Plan

Figure 7.2.2 Composition of Revenues of IMM Received from Central Government

7.2.5 IMM Investments in Transportation Sector

1) Investments in 2007

For the 2007 fiscal year, the IMM has allocated 2,280,148,000YTL to the transportation sector, which is 53.5% of its total expenditures (4.263, 263,000YTL) (see Table 7.2.2).

Table 7.2.2 Investments in Transportation Sector through Directorates 2007

| | Directorates | 1,000 YTL |
|----|--------------------------------|------------------|
| 1 | Infrastructural Services | 1,089,096 |
| 2 | Rail System | 535,363 |
| 3 | Road Maintenance and Repairer | 446,350 |
| 4 | Transportation Planning | 76,729 |
| 5 | Traffic | 73,900 |
| 6 | Construction Works | 25,150 |
| 7 | Transportation Coordination | 24,500 |
| 8 | Public Transportation Services | 5,000 |
| 9 | Marine Service | 3,250 |
| 10 | Project | 810 |
| | Total | 2,280,148 |

Source: IMM

2) Investments in the 2007-2011 Periods

The IMM allocated 8, 407,856 YTL to the transportation sector for the 2007-2011 periods. The transportation sector is the most invested sector among all sectors both in 2007 and the 2007-2011 periods.

There are 233 projects (listed in the *Investment Book 2007*) and of 223 projects, 74 projects are under construction with a total cost of 888,858,000 YTL in 2006 and 107 projects are either under construction or are under study. In addition to these projects, there are 166 new projects with a total estimated cost of 5, 457,249,000 YTL.

7.2.6 Alternative Sources of Financing Transportation Infrastructure Development in Istanbul Metropolitan Area

1) Public-Private Partnership (PPP)

Several models such as Build-Operate-Transfer (BOT), Build-Operate (BO), Build-Lease-Transfer (BLT) and Transfer of Operating Right (TOR) are used to attract private financing for investments. The Legal Framework for PPP transactions and management consists of:

- The Law on Implementation of Certain Investments and Services under Build-Operate-Transfer Model No. 3996 (The BOT Law).
- The Law on Granting Authorities to Institutions other than the General Directorate of Highways for Construction, Maintenance and Operation of Motorways No. 3465.
- The Law on Long-Term Leases of the Airports and the Passenger Terminals to the Private Sector No. 5335.
- The Law on Granting Authorities to Institutions other than the Turkish electricity Authority for Generation, Transmission, Distribution and Trade of Electricity No. 3096.

- The Law on the Establishment and Operation of Electric Energy Production Plants and regulations of Energy Sales No.14238.
- The Law on Privatization Application No.4046.

There are PPP projects executed or planned for the Istanbul Metropolitan Area. These are:

- Ataturk International Airport (Lease) TEPE/ AFKEN Joint Venture (TAV)
- Sabiha Gokcen Airport (Lease) Limak-GMR-Malaysia Airport Partnership
- Galata Port (Privatization)
- Bosphorus Bridge and Beltway(BOT-Proposed)
- Istanbul Strait Road Tunnel Crossing(BOT-Proposed)

The 9th National Development Plan emphasizes the importance of private sector participation in the transportation sector. It states that “Transporting freights mainly by railways is the strategic objective of the transportation sector. To this end, train operation by private sector in railways will be developed. Freight transportation will be liberalized in order to benefit from the operational advantages of the private sector; and also TCDD will be restructured and financial burden on the public will be drawn back to a sustainable level. Railways connection line investments will be realized primarily in industrial regions by introducing partnerships with the private sector and vehicle investments will be left to the private sector”.

Passenger transportation with high-speed train will be started on the core network consisting of the Istanbul-Ankara-Sivas, Ankara -Afyonkarahisar-Izmir, and with Ankara being the central city. Public-private partnership models will be utilized in the construction and operation of the lines on this network.

2) Privatization and Foreign Direct Investment (FDI)

Turkey has secured an investment friendly environment for privatization with regulations matching European standards. With the enactment of Law 5189, the foreign ownership restrictions on foreign investors are lifted, the scope of the golden share has been limited and the satellite business has been taken out of Turk Telecom to function as a separate public entity. The Turkish Government has undertaken a “tailor-made plan” for the privatization of Turk Telekom. In this framework, an Informatory Process was launched prior to the official tender announcement whereby, the Privatization Administration has informed the interested parties about the forthcoming process and delivered information about the company and the sector at large. Some of the indicators of investment friendly environment are summarized as follows:

- Disinflation (9.7% in 2006 down from 68.5% in 2001)
- Tight fiscal and monetary policy
- High GDP growth (7.5% for the last five year)
- Lower inflation
- More predictable and more hospitable

The legal framework for privatization consists of the following:

(1) The Law on Privatization Application No.4046

The principles, procedures, authorized agencies and other issues regarding privatization are all set out in the Law No.4046 (1994), concerning Arrangements for the

Implementation of Privatization Amending Certain Laws and Decrees with the Force of Law (The “Privatization Law”)

The Privatization Law in essence regulates the principles of privatization namely; to improve productivity in the economy and to reduce public expenditures. This Law:

- Expands the scope of assets to be privatized.
- Provides adequate framework, funds and appropriate mechanisms to speed up the privatization and restructuring processes.
- Establishes a social safety net for workers who lose their jobs as a result of privatization.
- Establishes the Privatization High Council and the Privatization Administration to facilitate the decision making process in the privatization endeavor.

The “Law Regarding Making Amendments in Some Laws and the Decrees with the Force of Law Dealing with Establishment and Duties of the General Directorate Turkish National Lottery” No. 4971, prepared in order to speed up privatization, was put into effect with its publication in August 15, 2003.

In the framework of the aforementioned Law, stipulations have been placed in order to accelerate privatization applications through the arrangements that have been made to Law No. 4046. These include arrangements that have been made to privatize the Turkish National Lottery by a way of handling out licenses for the planning, organizing and arranging of game draws and those enabling the utilization of convertible bonds in the privatization of the Turk Telecom.

The 2004 privatization program that was announced by the government comprises many different sub-sectors of the economy, including power generation, telecommunications, transport, petroleum, agriculture, foreign direct investments, and may prove to be an important component of privatization in Turkey in the near future. The energy sector alone will require US\$ 3billion per year in investments. Within this perspective, the ability of Turkey to attract foreign investments in these sectors will determine the success of privatization in these areas.

Priority privatization projects included Turk Telekom, Turkish Airlines, Tupas, Petkim, Tekel, Halkbank and a number of energy enterprises. Turk Telekom was sold to the Oger Telecoms Joint Venture Group (Saudi Oger and Telecom Italy) for \$ 6.5 billion

Bodies Responsible from Privatization Law No. 4046 are:

- Privatization High Council (PHC)
- Privatization Administration (PA)

PHC is the ultimate decision-making body for privatization in Turkey headed by the Prime Minister and composed of four ministers. PHC nominates the organizations for privatization through taking state-owned economic enterprises in and out of the privatization portfolio and is responsible from the methodology and timing of the privatization procedures by approving the final transfer procedures of the organizations to real people and/or legal entities.

PA is the executive body for privatization processes. It is a legal public entity with an exclusive budget reporting directly to the Prime Minister. PA's major duties include the execution of PHC's decisions, advising the PHC in matters related to the transfer of SEE's

into or out of privatization portfolios and restructuring and rehabilitation of SEE's in order to prepare them for privatization.

(2) The Law on Foreign Direct Investments No. 4875

Law No. 4875 adapted in 2003 concerns foreign direct investments (The Foreign Direct Investment Law"). The objective of this Law is to regulate the principles to encourage foreign direct investments, to protect the rights of foreign investors, to define investment and investor in line with international standards, to establish a notification-based system for foreign direct investments rather than screening and approval, and to increase foreign direct investments through established policies. This Law establishes the treatment to be applied to foreign direct investments.

The Law describes foreign investors as foreign nationals or Turkish nationals residing in foreign countries as well as legal entities and international organizations established under foreign laws who effect direct investments in Turkey. It also describes liberal foreign investment environments through the following:

- Freedom to invest: Unless otherwise required by the international agreements and special statutory provisions, foreign investors are free to make direct investments in Turkey.
- Freedom of profit transfers through banks and private financial institutions.
- Expropriation of real estate: Foreign capitalized companies would be able to acquire real estate.
- Settlement of disputes, international arbitration: The law assures foreign investors of the right to apply in authorized local courts, or to national and international arbitration or other means of dispute settlements.
- Assessment of the value of no-cash capital: The non-cash capital valuation of foreign investors would be accepted as it is in their home countries. So, it is expected that the foreign direct investments would accelerate.
- Employment of foreign personnel: Previously, the General Directorate of Foreign Investment issued working permits for foreign personnel. This law will be issued by the Ministry of Labor and Social Security. So, it is expected that the regulation to determine concrete procedures and rules would be issued promptly. Moreover, the Ministry should allocate the duties of issuing working permits to its officials who have foreign languages skills, i.e. English, etc.

7.2.7 Institutional Framework of PPPs

1) Central Government Level

State Planning Organization (SPO) is responsible for the planning and review of public infrastructure investments. SPO serves as the secretariat of High Planning Council (YPK) which is the highest policy-making authority for PPPs in Turkey. YPK is composed of the Prime Minister and four (4) cabinet ministers. SPO comes under the Prime Ministry and receives policy direction from the YPK. YPK assigns executing agencies for the PPP projects based on the nature and scope of the projects and approves final draft contracts between private sector investors and executing agencies before signing the Contracts.

PPP projects are identified and feasibility studies are prepared by the relevant ministries

or public agencies by consultants and submitted to SPO and YPK for their reviews and approvals. Implementation of the projects including various guarantees, e.g. traffic volume guarantees, revenue guarantees, etc. are the responsibilities of the executing agencies.

Treasury plays important role in PPPs in virtue of its authorization of sovereign guaranties on subordinated loans or stand-by-loans to be provided in connection with the PPP projects, if such an arrangement is made. Treasury has recently decided not to provide any guarantee for energy projects to be implemented under PPP schemes.

2) Local Government Level

No significant PPPs projects have been undertaken at local government level to date except Yuvacik Dam (BOT) project in Izmir. IMM has undertaken several parking operation projects in Istanbul under a BOT financial scheme. Ispark A.S (Istanbul Parking Operation and Trade Company) was the sponsoring agency of the BOT projects. Extra-budgetary financing including PPP, privatization and FDI, are currently promoted by the Mayor of IMM. It is necessary to create a private sector participation cell in IMM for the development and implementation of PPP and other off budget projects.

7.2.8 Problems of PPP Applications to Transport Infrastructure Investments in Turkey

1) Reasons for the Difficulties to Attract Private Sector Investments to Transportation Sector

Attracting private sector capital to transportation infrastructure has not been successful in Turkey. Some of the main reasons are:

- Poorly developed domestic capital market.
- Lack of access to long-term debt, domestic and international.
- Absence of cohesive government policies.
- Absence of a credible legal and regulatory framework.
- Absence of a credible institutional and administrative framework.
- Absence of a clear government commitment to conclude the PPP deals in a reasonable time.
- Inherent risks in investment in the public works, particularly highways and motorways
- Lack of experience in PPP projects in public sector. Fundamental Problems in the PPP Applications to Transportation Sector in Turkey

Both public and private sectors has gained experience in PPP during the past 25 years. There were problems mainly deriving from lack of legal framework and risk distribution arrangements between public and private sectors. Negative result of the lack of legal framework was that arguments were focused on legal aspects and less or no attention was paid to the importance of technical and economic feasibilities of the projects.

Absence of a cohesive government policy and strategy (this includes regulation, dispute resolution, and legal enforcement), lack of institutions facilitating PPP transactions and management, at both central and local government levels and exposure to political and regulatory risks over a long PPP period remain constraints.

2) Problems of Existing Legal Framework

One of the weaknesses of Turkey's legal framework for PPP operations is the absence of a special general legislation to regulate PPP projects. In addition, there are many shortcomings in the legislations and the followings are critical ones:

- There are a limited number of PPP models in the laws and limited scope of the existing PPP legislations; Legislations are limited to Build-Operate-Transfer (BOT), Build-Operate (BO), Build-Lease-Transfer (BLT) and Transfer of Operation Rights (TOR).
- Lack of harmonization among PPP Laws. There are several sector-specific PPP laws, all of which have "holes" and "no teeth".
- There are duplications in the BOT laws, e.g. Law No.3996 (1994) and Law No.4346 (1988) related to highway construction. The former should have replaced the later.

3) Problems of Existing Institutional Framework

An Institutional framework for PPP operations in Turkey are almost non-existence. There is no central public body responsible for setting PPP policies and coordination and implementation of PPP projects are assigned to different public bodies which lack experiences and knowledge of PPPs. At the local government level there are no institutions, facilitating PPP transactions, management and coordination.

7.3 Environmental Policy and Legislations in Turkey

7.3.1 Outline of Environmental Policy

In Turkey, as in many other countries, awareness on environmental issues significantly increased in the 1970s¹. As a result, main environmental issues were identified and a framework on environmental policies drawn up and administrative structures are formed to implement the establishment of these policies.

The Environment Law (Ministry of Environment No.2872, 1983) is Turkey's first framework of environmental legislation. It is based on the "polluter pays" and "user pays" principles and handles the environment in a holistic manner albeit in rather broad terms. It continues to provide a legal framework for many regulations scattered throughout Turkish legislation that seek to clarify and elaborate its intentions, including Environmental Impact Assessment (EIA). The aim of the Law is not only to prevent and eliminate environmental pollution, but also to ensure the management of natural, historical, and cultural assets and land in such a way as to utilize its richness while preserving it for future generations.

Before the establishment of the national environmental authority, a General Directorate of the Environment was designated under the Prime Ministry in 1978. In 1991, this organization was reorganized as the Ministry of Environment (MoE). In 2003, MoE was combined with the Ministry of Forestry to form what is now the Ministry of Environment and Forestry (MoEF). The former MoE and the present MoEF have been responsible for the formulation of policy, strategies and standards on pollution prevention and environmental protection.

¹ National Environmental Policy was firstly articulated in the Third Five Year Development Plan (1973-1977)

The EU EIA Directive (85/337/EEC) was issued on 3 July, 1985 and amended by Council Directive 97/11/EC (14 March 1997) and Council Directive 2003/35/EC (25 June 2003). Deadlines for transposition were 3 July, 1988, 14 March, 1999, and 25 June, 2005 respectively for each Member State. The National Programme for Adoption of the *Acquis* (NPAA) for Turkey formally states that the adoption of the EU Directives for EIA is a national priority.

In Turkey, the EIA Regulation was drafted by the former MoE based on United States of America and European Union procedures and enacted on 7 February, 1993. This was the first piece of EIA legislation in Turkey. This legislation was amended on 23 June, 1997 and 16 December 2003.

7.3.2 Environmental Legislations

Turkey's environmental legislation includes the 1982 Constitution, the Environment Law and various other laws that affect the environment². The Constitution states that citizens and the government are obliged to cooperate to protect and upgrade the environment. It also addresses the need to protect the shores, land and water resources, forests, and natural, historical and cultural assets. Protection and development can only be achieved with relevant authority, the document authorizes enforcement powers.

The **Environment Law No. 2872 of 1983** embodies the "polluter pays" principle adopted by other countries, and sets forth the concept of absolute liability in order to operate it. It also defines activities to prevent and solve environmental problems. These involve banning certain polluting operations, requiring environmental impact assessments (EIAs) for specific activities (effective in 1993), identifying sensitive locales to be defined as special environmental protection areas, providing sanctions to prevent the discharge of hazardous chemical substances and wastes, banning noise, promoting incentives to pollute less, creating an environmental fund, and securing participation in decision making bodies such as the Environment Council (ENC), Higher Council for the Environment (HCE), and Local Environment Committees (LECs).

The Environment Law is the primary tool for managing the environment as a regulatory mechanism. Regulations specify procedures to be followed, plans to be prepared, standards to be met, and activities to be prohibited. Also, enforcement powers are assigned to agencies, fines and other penalties are specified, and monitoring is promoted to ensure compliance. Few economic instruments are discussed, although, as mentioned above, the Law adopts a "polluter pays" principle and the Five Year National Development Plan calls for an appropriate economic and regulatory approaches.

7.3.3 Institutional Organizations

1) General

In response to the magnitude of environmental issues, national institutions were established to identify, improve, coordinate, monitor and supervise activities, as well as

² Other legislation that affects the environment includes: the Water Act, Water Products Act, Municipalities Act, General Hygiene Act, Tourism Incentives Act, Protection of Cultural and Natural Assets Act, National Parks Act, Forest Villages Development Act, Bosphorus Act, Metropolitan Municipalities Act, Agricultural Reform Act, Game Act, Urban Development/Construction Act, Mining Act, Coastal Act, Reforestation and Erosion Control Act, and Forest Act.

procure resources. The first institution was the Permanent Board of Consultants for Environmental Problems in the early 1970s. Then, in 1978 an Environment Organization was attached to the Prime Minister's office, later to become the General Directorate of Environment in 1984, which was transformed into the Undersecretariat of Environment in 1989.

2) The Ministry of Environment and Forestry

Ministry of Environment was established by Government Decree No. 443 of 1991, which empowers it to conduct activities to protect and improve the environment. These activities involve ensuring appropriate land uses, protecting natural resources, plants and animal species, and preventing pollution. Its duties include drafting laws, preparing rules and internal regulations, creating institutions (such as village environment associations and commissions to manage waste), supervising and planning environmental designs, interventions and actions as appropriate, managing watershed water quality and regional waste, creating environmental policies and strategies, coordinating environmental activities at international and national levels, conducting research, applying measurements, monitoring compliance, collecting data, managing finances, and carrying out extension and training.

The Ministry of Environment has special consultative organs at three levels to ensure the participation of people in line with the requirements of environmental protection and development activities: The Environment Council (ENC), the Higher Council for the Environment (HCE), and Local Environment Committees (LECs). At the provincial level, is the "Provincial Directorates of Environment" which, as of 1995, were organized in 33 provinces. The National Assembly is considering proposals to reorganize the ME's structure to improve efficiency. The draft reorganization of the Ministry of Environment includes establishing a Sustainable Development Council and it is to increase public participation, allowing more flexible hiring of experts, as well as improving salaries to attract more qualified personnel.

In 2003, the Ministry of Environment and Ministry of Forest were merged into Ministry of Environment and Forest.

3) The Agency for the Protection of Special Areas (APSA)

It is attached to the Ministry of Environment, which works on Ecological Management Plans for 12 special environmental protection areas, and identified by the Council of Ministers (1988-1990). APSA is organized as a Special Environmental Preservation Council with departments at the centre, and directorates at the regional and branch levels. Its duties include preparing and revising environmental regulations specific to these areas and land use plans, conducting research, and running training courses.

4) The State Planning Organization (SPO)

It is under the Prime Minister's Office which is responsible for developing economic, social and environmental policies for the 5-year development plans and preparing annual programs and public investment programs. It is also responsible for the approval of all public investment projects as well as those proposed by municipalities to be financed by either domestic or foreign resources. One of its, Local Authorities, Environment and Technological Research Department, formulates environmental policy recommendations

for the Five-year plan, evaluates the MoEF's investment projects and programs, and prepares annual environment programs.

5) Higher Council for Planning (HCP)

It is chaired by the Prime Minister and is responsible for making decisions on macroeconomic and social policies and the evaluation and allocation of financial resources for large scale investment projects. The ministers of agriculture, forestry, energy, transport, settlements, finance and undersecretary of SPO are the members of HCP.

6) Local Governments

Municipalities are responsible for municipal infrastructures and services for protecting and managing the environment. They are legally responsible for managing solid waste, installing and operating water, gas, and urban transport services, and the construction and maintenance of streets. Although sewerage and bus services are not specified among municipal duties, they have been assumed by the local governments in practice. Moreover, municipalities have an important planning role of approving building/construction permissions including building plan and foundation design³ that affect all forms of development within their boundaries.

7) Istanbul Metropolitan Municipality

Istanbul Metropolitan Municipality is a local government explained above clause and it is indirectly responsible for EIA in coordination with Provincial Directorate of Environment which is main responsible body of EIA system in Istanbul Metropolitan Municipality Area.

7.3.4 Environmental Instruments

1) Planning

Plans are key features in Turkey's command-and-control style of environmental management. These include:

- Urban development plans

Two types are required for all municipalities:

(a) Structure plan (General Plan), which are 1/5,000 scale maps along with detailed reports indicating patterns of land use, types of zones, projected population densities, building densities, growth directions, magnitudes of settlement zones, and transport systems.

(b) Implementation plans (Local Plan), which are 1/1,000 scale maps that indicate buildings in various zones, their densities and order, roads, and stages for providing urban services. The plans can be designed by municipalities or assigned to the Bank of Provinces or private firms, and they become effective after city councils approve them.

- Territorial and environmental plans

Territorial plans, which were introduced in the 1960s, are expected to guide land use and settlement decisions, especially regarding housing, industry, agriculture, tourism,

³ Building permission in Turkey is divided by four steps such as plan, foundation, construction and dwelling permission in the course of the procedure.

and transport. In general, these are formulated and approved by the Ministry of Public Works and Settlements. Recently, the regional environmental plans were introduced and formulated by the MoEF; it is supposed to ensure that natural resources are used in such ways that sustain development. Both territorial and environmental plans are 1/25,000 scale or larger.

- Other plans

Various other plans are formulated by 22 agencies and organizations under various laws. These include:

- (a) Regional plans are prepared by SPO or are assigned to others.
- (b) Forest management plans are prepared by the General Directorate of Forestry.
- (c) Long-term Development and Local Development plans are prepared by the General Directorate of National Parks, Game and Wildlife to manage national parks.
- (d) Master plans are to direct territorial activities such as tourism, transportation and energy.
- (e) Management plans are for specially protected areas.
- (f) Forest village development plans are prepared and implemented scale by the General Directorate of Forest-Village Relations.

2) Environmental Impact Assessment System

The flowchart shown in following page illustrates the current (after 16 December 2003) EIA process in Turkey. For projects with major environmental impacts and national significance, the Ministry of Environment and Forestry (MoEF), through its General Directorate of EIA and Planning (reporting to a deputy under secretary) and its local organizations, is responsible for coordinating EIA matters and related matters of permission with other governmental agencies as well as provincial governors. The MoEF is also the responsible body for examination of Annex II activities that are expected to have environmental impacts of a more minor nature.

EIA procedure includes four steps such as screening, application, scoping and reporting. In screening, a two-stage screening mechanism is set in place. Screening is guided by lists of activities included in Annexes I and II to the 2003 EIA Regulation, as well as by the criteria specified in Annex IV.

It is noted that Annex I and Annex II of the Regulation are reflective of Annexes I and II of Directive 97/11/EC, respectively. Annex I projects listed in the Regulation require a full EIA regardless of circumstances, while listed Annex II projects may or may not require full EIA, as explained below.

During the screening process, MoEF makes a decision on an EIA which is required whether or not there is a given Annex II project. This may happen when MoEF receives notification of an intention to submit a development consent application, or the developer may make an application for a screening opinion (in fact a decision), which must be recorded and made public. The screening process is as follows:

- 1) If the project is listed in Annex I of the EIA Regulation, it requires an EIA, and MoEF will be the competent authority.
- 2) If the project is listed in Annex II, MoEF decides on a case-by-case basis whether an

EIA is required or not, based on several “selection and elimination” criteria stipulated in Annex IV of the Regulation.

Annex IV, shown in next page, includes requirements for descriptions of the site itself, the nature of the project, the potential impacts on the environment, and the potential alternatives. Annex V shown in next page, which is a listing of areas classified as “sensitive” in Turkey must also be taken into account in the screening process. Preparing such descriptions is referred to as a preliminary EIA report (‘pre-EIA’ or “The Project Introductory File” (direct translation from Turkish); and □if it is in neither Annex, no EIA is required.

In deed, urban transport projects are mostly listed in Annex II of the regulation except a few intercity motorways which are listed in Annex I.

In practice, insufficient capacity of environmental authorities at the national and local levels; weakness of public participation, review process and the set-up of the EIA scope determination, inspection and evaluation commission; and insufficient quality of the report are pointed out⁴ as issues in the current EIA system in Turkey.

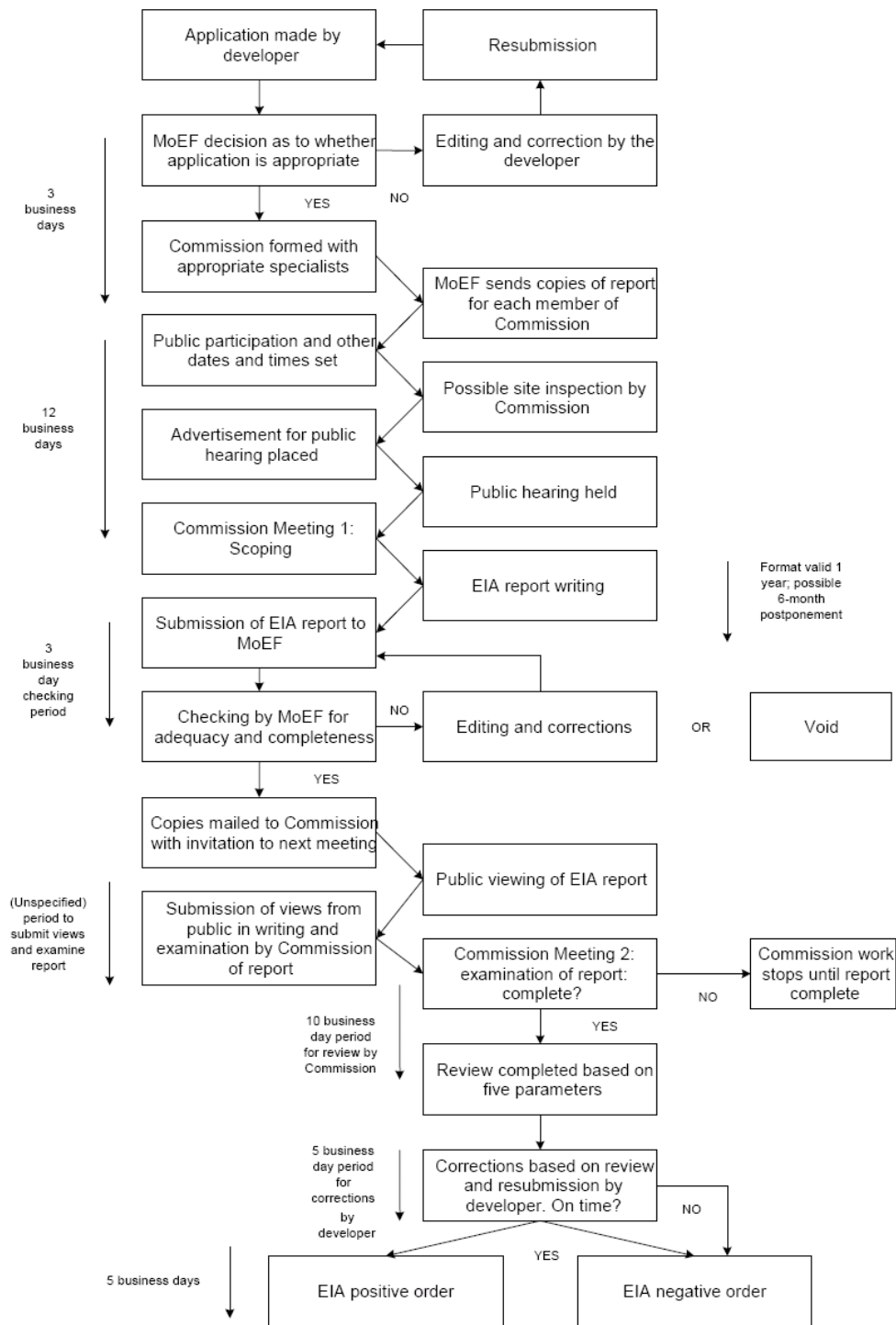
Table 7.3.1 Projects in EIA Regulation No.25318, 2003

| | |
|-----------------|--|
| Annex I | <p>8- Roads, leading lines and air ports</p> <p>a) Intercity railway lines, b) Air ports whose runway is 2,000 m and over, c) Construction of motorways, express roads and government roads,</p> <p>9- Water routes, sea ports and shipyards</p> <p>a) Construction of water routes, that allows naval vessels weigh 1.350 DWT and over to pass inside continent and the sea ports that will be constructed for waterborne traffic inside continent, b) The sea ports, port wons, sea walls where naval vessels that weigh1.350 DWT and over can race and that are constructed for commercial purposes, c) Shipyards that are constructed for the purpose of building, maintenance, repairing of vessels of charge and passenger vessels, d) The activities of dismantlement of ships, e) Marinas,</p> |
| Annex II | <p>Transportation, infrastructure and coastal structures in Annex II</p> <p>i) The railway lines (that do not take place at Appendix I) j) The facilities, which have a changing purpose, which is used in the railway transportation and the construction of railway terminals, k) Trams, the railway lines which are elevated and pass underground, similar lines used for carrying passengers (metros, light rail transportation systems, etc.), l) The air ports (which do not take place at Appendix I) m) Province roads, n) Widening the roads which have two or less lanes to roads that four or more lanes with a 10 km continuous length;</p> |
| Annex IV | <p>1. The features of the Project</p> <p>The matters those are stated below should be considered at the features of the projects</p> <p>a) The flow chart, capacity, the area of the place, technology, the number of personnel that will work of the project b) The usage of natural sources (land use, water usage, the type of energy that is used etc.) c) The amount of wastes that will be produced (solid, liquid, gas) and the chemical, physical and biological features of the wastes d) The risk of accident that may be growth out of the technology and the materials those has been used e) The precautions that will be taken against the probable environmental impacts of the project</p> <p>2. The place of the Project</p> <p>The matters those are stated below should be considered when the sensitivity of the place where is likely to be affected by the project.</p> <p>a) The present land use and its quality (agricultural land, forest area, planned area, water surface etc.) b) The wetlands, sea sides, mountainous districts and forest regions, agricultural areas, national parks, specially protected areas, dense areas in terms of population, historical, cultural, archaeological and similar important areas, erosion districts, landslide districts, forestation fields, potential erosion and forestation fields, with taking into consideration of the list of Sensitive</p> |

⁴ Innanen. S (2004), Environmental impact assessment in Turkey: capacity building for European Union accession, Impact Assessment and Project Appraisal, volume 22, number 2, June 2004, p.p.141–151

| | |
|-----------------------|--|
| | <p>Districts that takes place at Appendix V and aquifers that should be protected in accordance with the Law About Ground Water numbered 167.</p> <p>3. The alternatives of the Project and Its Place (the reasons of why that project technology and that project place are chosen)</p> <p>Results The summaries of the explanations which are made in this part and the general assessment, at which the important environmental impacts of the project are listed and comparisons of its alternatives are made, will be done.</p> <p>ATTACHMENTS: The environmental condition plan, main city plan, development plan, plan of site or the proposals of revision of these plans if they exist for the place that is determined for the project, A brief explanation of the information that indicates the data related to the locations of residential areas, transportation networks, energy transmission lines, present facilities and the other areas (in the case of being in the project area or its surrounding) take place at the Sensitive Districts List at Appendix V of the Regulation by showing them on the actual map (environmental condition plan if it exist; if it does not exist, topographical map) on a scale 1/25000 in order to assess present land uses of the place of the project and near surroundings. The geological map of the project area with scale, representation of ground and aboveground waters on this map, the statement of the earthquake characteristic of the area)</p> <p>Notes and Sources: Introduction of the persons who prepare the Project Introduction File Name, surname, profession, curriculum vitae, references and the signature which indicates that he is responsible for the file. The project Introduction report should be prepared by a working group consisting of at least 3 persons who are members of related trade branches by considering the type and place of the project.</p> |
| <p>Annex V</p> | <p>SENSITIVE DISTRICTS The detailed presentation of the legislation which should be referred during the process of studies related to the projects which are involved in this regulation's scope. The probable changes in the legislation are integral part of this chapter.</p> <p>1. The areas that should be protected in accordance with legislation of our Country</p> <ul style="list-style-type: none"> a) 'National Parks', 'Natural Parks', 'Nature Monuments' and 'Nature Protection Zones' which are identified at the article numbered 2 of the Natural Parks Law numbered 2873 and specified in accordance with the article numbered 3 of this law, b) 'The Wildlife Protection Areas' and 'The Wild Animals Naturalization Areas' those are determined by Ministry of Forestry in accordance with the Land Hunting Law numbered 3167, c) The areas defined as 'Cultural Heritages', 'Natural Heritages' and 'Protected Areas' at the sub-paragraphs numbered 1, 2, 3 and 5 of 'a- Definitions' paragraph of 2. article of the Law on the Protection of Cultural and Natural Heritage numbered 2863 and the areas whose ascertainment and registration are performed in accordance with relevant articles of the same law and of the law numbered 3386 (The Law on Change of Certain Articles of the Law on the Protection of Cultural and Natural Heritage numbered 2863 and Adding Certain Articles to This Law) d) The Areas of Fishery Products Production and Reproduction those are within the scope of the Fishery Products Law numbered 1380, e) The areas which are defined at the article numbered 17 of the Regulation of Check of Water Pollution that has been published at the Official Journal numbered 19919 and bear the date of 4/8/1988 and different articles numbered 18, 19 and 20 of the regulation that has been published at the Official Journal numbered 23742 and bear the date of 1/7/1999, f) The 'Sensitive Pollution Districts' those are defined at the article numbered 49 of the Protection of Air Quality Regulation that has been published at the Official Journal numbered 19269 and bear the date of 2/11/1986, g) The areas those are ascertained and promulgated as 'Specially Protected Environment Areas' in accordance with the article numbered 9 of the Environment Law numbered 2872 by the Council of Ministers, h) The areas those are protected in accordance with the Boğaziçi Law numbered 2960, i) The areas promulgated as forest areas in accordance with the Forest Law numbered 6831, j) The areas those are restricted districts in accordance with Coast Law numbered 3621, k) The areas those are indicated at the Law about Improvement of Growing of Oils and Inoculation of Wilds numbered 3573, l) The areas those are stated Pasture Law numbered 4342, m) The areas those are stated at 'Regulation of Protection of Wetlands' which came into force after published at the Official Journal numbered 24656 and bear the date of 0/01/2002. <p>2. The areas that should be protected in accordance with international agreements those we become a party to</p> <ul style="list-style-type: none"> a) The I. and II. Protection Areas, 'The Habitats and Reproduction Areas of The Mediterranean Seals' those are stated at 'Important Reproduction Areas of Sea Turtles' which are from the areas those are protected in accordance with 'The Agreement of Europe Wildlife and Habitat Protection' (BERN Agreement) which came into force after published at the Official Journal numbered 18318 and bear the date of 20/2/1984. b) The areas those are protected in accordance with the 'Agreement of Protection of Mediterranean Sea Against Pollution' (Barcelona Agreement) which came into force after published at the Official Journal numbered 17368 and bear the date of 12/6/1981, i) The areas those are determined as 'Specially Protected Areas' as required by 'Protocol Relating to Protection of Specially Protected Areas at Mediterranean' which has been published at the Official Journal numbered 19968 and bear the date of 23/10/1988, |

| | |
|--|---|
| | <p>ii) The areas those take place at the list of '100 Coastal Historical Protected Area of Common Significance at Mediterranean' that has been published by United Nations Environment Program chosen as required by Genoa Declaration bear the date of 13/9/1985,</p> <p>iii) The coastal areas those are habitats and nutrition environment of the 'Sea Species, Endemic For Mediterranean, Whose Generation are Under the Risk of Vanishing' that takes place at the article numbered 17 of the Genoa Declaration,</p> <p>c) The cultural, historical and natural areas those are protected as being given the status of 'Cultural Heritage' and 'Natural Heritage' by the Ministry of Culture in accordance with the articles numbered 1 and 2 of the 'Protection of World Culture and Natural Heritage Agreement' which came into force after published at the Official Journal numbered 17959 bear the date of 14/2/1983,</p> <p>d) The areas those are protected in accordance with the 'Agreement of Protection of the Wetlands Those Especially Have International Importance As Habitats of Waterfowls' (RAMSAR Agreement) which came into force after published at the Official Journal numbered 21937 bear the date of 17/05/1994.</p> <p>3. The areas those should be protected</p> <p>a) The areas those have been ascertained as restricted districts as the areas whose present characteristics will be protected at the Environmental Condition Plans those is approved (the areas whose natural character will be protected, biogenetic reserve areas, geothermal areas etc.)</p> <p>b) Agricultural Areas: The areas of agricultural development, irrigation areas, the areas that it is possible to irrigate and the areas whose land use ability classes are I, II, III and IV, the whole areas of I. and II. class and the areas of special crop plantation where are used in agriculture depends on rain,</p> <p>c) Wetlands: All of the waters, swamps, rushy those are natural or artificial, permanent or temporary, whose waters are quiet or streamy, fresh, briny or salt, those contain depths not exceeding 6 meters during the reflux period of ebb and flood, those are important as being habitats of living creatures in the first instance waterfowls, and the areas of well-watered marshy from these areas to black and dry land as from the trend of the coastline ecologically,</p> <p>d) Lakes, rivers, the areas of operating underground waters,</p> <p>e) The areas those are important for scientific researches and/or habitats for the species that are vanishing or likely to vanish and are endemic for our country, the areas of biosphere reserves, biotypes, biogenetics reserve areas, the areas of the geological and geomorphologic formations those have unique characteristics.</p> |
|--|---|



Source: Innanen. S (2004), Environmental impact assessment in Turkey: capacity building for European Union accession, Impact Assessment and Project Appraisal, volume 22, number 2, June 2004, p.p.141–151

Figure 7.3.1 EIA Procedure in Turkey as of 16th December 2003

3) Environmental Standards

Turkey has many elements that are needed to monitor and enforce its environmental policies, laws and regulations. For example, air pollution standards, which are based on German norms, were set by the Ministry of Environment (MoE) in 1986. The Water

Pollution Control Regulation (2004) presented the principles for classifying inland water resources as well as discharging and treating wastewater. The Noise Control Regulation (2003) set maximum levels of noise for indoor and outdoor spaces as well as mitigation measures. Moreover, a number of regulations on waste management were approved, including those on solid waste (1991), medical waste (1993), toxic chemicals and their products (1993), and hazardous wastes (1995), based on West European norms. In relation to transport, vehicle emission, noise, fuel quality standards are considered.

7.3.5 Land Acquisition

1) Procedure

This article is mostly relied on the text prepared for Land Acquisition and Resettlement Policy Framework of Istanbul Municipal Infrastructure Project by World Bank. The process of constructing a public facility goes through three main steps.

The first step in the process is to obtain the approval of the district municipal council and be integrated into the municipal land use plan. In consideration by the council and entry into the plan are both preceded by public announcements in newspapers and posting in the municipality office, a public planning meeting, and during a 60-day period, a 60-day period during which the public is invited to comment. If substantive negative feedback is obtained, the decision will be reviewed by the municipal council and will either be approved or rejected.

The second step occurs on the metropolitan municipality level, where the council must grant approval and the land use plan must be changed to integrate its facilities. Both actions are also preceded by similar notifications, public meetings and feedback period. If the response is negative, the proposal will be submitted to the council for re-consideration.

After the site proposal completes the first two steps, documentation is prepared to request a location permit. In addition to the decisions and confirmation on the site entering into the respective plans, the documentation should consist of feasibility studies; preliminary design; environmental assessment; ownership status; estimated land cost replacement value of above ground assets, based on a professional valuation; estimated construction and supervision costs; and confirmation that adequate funds are available. Once the location permit is issued, the land can be acquired.

2) Land Ownership and Use Status

Land ownership status can include one or more of the following four scenarios:

- a) Owned by the municipality and either vacant or used by the municipality, a municipal company or a private entity under a lease or an informal arrangement.
- b) Owned by the Treasury or other state agency and either vacant or used by the owner.
- c) Owned by the state or state agency or enterprise and used by another party through a lease or an informal arrangement.
- d) Private land either used by the owner or another private individual or enterprise or used informally by a third party through a lease or an informal arrangement.

Each scenario has different implications for entitlements and action which are noted briefly below and in the following Table “Entitlement Matrix”.

(i) Municipal Ownership

The land is owned and used by the municipality and transferred to the solid waste management office. If the land is used by a third party under a lease, the metropolitan municipality adheres to conditions of the lease, which may or may not include the obligation to transfer the activity to another site. If the land is used informally, the metropolitan municipality compensates the user for assets that are lost and assists the user to relocate the activity.

(ii) Ownership and Use by the Treasury or Other State Entity

If the land is owned and used by the State or one of its agencies, the solid waste management office negotiates with the owner/user to transfer the land to the metropolitan municipality. Depending on circumstances, the land will be transferred to the metropolitan municipality without cost or leased or sold to the metropolitan municipality after compensating the user for lost assets.

(iii) Ownership by the Treasury or Other State Entity and Used by a Third Party

If the land is leased to a third party, the owner will vacate the land and transfer or lease it to the metropolitan municipality, adhering to the conditions of the lease, which may or may not require compensation for lost assets or disruptions in use. If the land is used informally, the owner will vacate the land, compensating the user for lost assets, and assist the user to find another suitable location.

(iv) Private Ownership

If the land is privately owned, the metropolitan municipality will commission a property assessment and contact the owner by giving notification that the land is needed for the facility. The metropolitan municipality will then invite the owner to negotiate for purchase, based on the assessment. The objective of negotiation is to reach an agreement on the value of the land, assets, loss of income (if relevant) due to relocation, and the cost of relocation and re-establishment. The owner must be compensated fully before work can begin.

3) Other Method of Land Expropriation for Public Purpose

“Chapter 18 of Settlement Law No.3194, 1985” has stipulated to expropriate lands for public use by land readjustment system. This system has been applied in suburban area of Istanbul such as housing developments or housing improvement areas.

According to the law, maximum 35% of the project area can be utilized for public use such as roads, rails, parks, open space and other public purposes without any payment to land loads. If exceeds more than 35%, the land will be expropriated by Law No.2942. In other word, reduction rate is up to 35%.

Table 7.3.2 Entitlement Matrix: Istanbul Municipal Infrastructure Project by World Bank

| Investment | Ownership Status | Use Status | Final Status | Transfer Mechanism | Compensation | Principles |
|----------------------|-----------------------------------|------------------------|---|--|---|--------------------------------------|
| | Municipality | Vacant | Transfer to User | Simple Transfer | None | |
| New Transfer Station | | Leased to Private User | Vacate , Transfer to User | Terminate Lease, Transfer | Lost Assets, Relocation Cost, Temporary Income Cost , Depending on Lease Provisions | Assets at Full Replacement Cost |
| | | Informal/Illegal Use | Vacate , Transfer to User | Relocate, Transfer to User | Lost Assets, Relocation Cost | Assets at Full Replacement Cost |
| | Treasury, other Government Entity | Vacant | Transfer to Municipality | Transfer or Purchase | Land, Subject to Negotiation between Parties | |
| | | Leased to Private User | Vacate , Transfer to Municipality/ User | Terminate Lease, Transfer | Land, Subject to Negotiation: Lost Assets, Relocation Cost, Temporary Income Cost, Depending on Lease Provisions | Assets at Full Replacement Cost |
| | | Informal/Illegal Use | Vacate, Transfer to municipality/ User | Relocate, Transfer to Municipality/ User | Land subject to Negotiation: Lost Assets, Relocation Cost to user | Assets at Full Replacement Cost |
| | Private | Vacant | Ownership by Municipality/ User | Purchase and Transfer | Land, Subject to Negotiation or Expropriation, if negotiation fail | Full Replacement Cost (Market Value) |
| | | Residential | Ownership by Municipality/ User | Relocate, Purchase and Transfer | Land, and above ground assets, Relocation Costs, subject to Negotiation or Expropriation if Negotiation fail | Full Replacement Cost (Market Value) |
| | | Commercial | Ownership by Municipality/ User | Relocate, Purchase and Transfer | Land, and above ground assets, Relocation Costs, Temporary income Loss, subject to Negotiation or Expropriation if Negotiation fail | Full Replacement Cost (Market Value) |

Source: World Bank (2007), Appraisal Document on a Proposed Loan for a Istanbul Municipal Infrastructure Project

4) Expropriation

If negotiation fails, the metropolitan municipality can request the court to issue an expropriation order based on the Public Expropriation Law No.2942 of 1983, documenting the failure to reach a settlement through negotiation. The court will commission an independent assessment prior to issuing the order and setting the price. When the order is issued, the metropolitan municipality compensates the owner at the level set by the court and obtains title. Work cannot commence before the payment is fully made.

If the owner is not satisfied by the court decision, he or she can appeal the financial settlement, but cannot reverse the expropriation order. Although the metropolitan municipality has the authority to request and obtain an expropriation order, expropriation inevitably generates strong public criticism and thus it is rarely used.

5) Responsibility

The metropolitan municipality is ultimately responsible for land expropriation and expropriation. The process is managed by the office that will use the land, however, in collaboration with the municipal cadastre office.

7.3.6 Issues and Problems

1) General

Spatial planning and development of the Istanbul Metropolitan Area are controlled by a mosaic of decision-making bodies in the form of super national, national, regional and local legislative, legal and institutional frameworks. Meanwhile, the Istanbul Metropolitan Municipality is faced with the realities and factors such as overcrowding, immigration, insufficient policy programs, illegitimacy, lack of execution of legislative power, etc. within inefficient control system in the spatial development. With all these factors, disorganization and insufficiency of planning and implementation systems appeared to have failed.

IMM has carried out comprehensive planning as an approach since mid-1990. Some of the planning studies were directed toward the spatial development for the expanded boundaries of IMM: In 1995 Istanbul Metropolitan Planning Office has completed the Istanbul Provincial Spatial Development Plan (1/50,000 scaled, Istanbul, Metropolitan Sub Region City Plan Report, Belbim Co. Istanbul). The new legislations, which enable IMM to cover the whole province for the first time in spatial planning work, were enacted in 1995. However, it was reported that the plan was challenged in court by local professional organizations questioning the legitimacy of the IMM's authority on planning over expanded areas. Subsequently, the plan was cancelled.

Istanbul Metropolitan Planning and Urban Design Center (IMP) was created in September by the metropolitan mayor in September 2005. IMP consists of over 400 urban planning professionals and academics. It works on 10 key areas of urban development, and among them land use planning is coordinated with transportation planning. In the summer of 2006, a household travel survey was conducted among 36,000 households and work has begun on the next generation of the transportation master plan. While IMP was preparing a future land use plan, the city council and the government announced a set of "mega projects", among them are (i) Tunnels under 7 hills, (ii) A new Bosphorus bridge and beltway (The Third Bridge Project) and (iii) Bosphorus Road Tunnel Crossing. These mega projects, particularly, the Third Bridge Project faced massive oppositions from professional organizations and NGOs and, is reportedly, being challenged in court, but not on the ground of legitimacy of IMM's authority but on the ground of environmental and land development issues.

2) Need for Further Decentralization and Administrative Reform

The Turkish administrative and financial system is still overwhelmingly centralist. Legislative reforms have been brought into the administrative reforms of the central, regional and local governments to cope with the increase and diversification of social and economic needs parallel to economic reforms. The structure and tradition of centralized public administration has still persisted in spite of the many supports for self-governance and devolution of powers from the central government to the provincial government. Membership negotiations with the EU have been the most important influence on the reform process, which recently introduced a complete new legal framework. Legal and institutional changes during 2004-2006 have prepared better conditions for the decision making and implementation of strategic plans, but planning approach itself has remained relatively conventional, without clear identification of roles of actors, and forms of

cooperation between these actors.

Much legislation, regulatory and controlling mechanisms at central, regional and local levels interfere with the planning and implementation process of IMM. There seems to be power struggle between local and central administration bodies as well as among metropolitan, districts and sub-districts municipal administrations in the metropolitan area. The problem is especially critical considering that the interests of central government and the local government would require to be solved through institutional means. The passage of the Regional Development Agency Law in 2006 (No.5449) and the creation of a regional development agency may offer a required institutional system.

3) Lack of Coordination among Different Ministries and Agencies

Overlapping laws and institutions exist today to govern the implementation of institutional and spatial plans. Lack of coordination among different ministries and agencies at the central administration causes a major problem for decision making at the regional and local levels. The 9th National Development Plan emphasizes the need for administrative reforms at the central, regional and local levels to strengthen the coordination in decision making on urban and regional development and management. The National Development Plan states that “The necessary regulations defining the duties, authorities and responsibilities of the units responsible for the decision, policy, implementation and supervision of urban transportation at the national and local levels need to be put in place. There is, however, no concrete proposal for such a coordination mechanism. The National Development Plan also stipulates that an administrative structure must be established to ensure coordination on decision making and programming processes by gathering the institutions in the transportation sector under a single organizational structure. As Turkey shapes up to become a full member of the European Union, further decentralization will emerge as a major issue.

4) Needs for Appropriate Regulatory Framework for Privatization and Foreign Direct Investment (FDI) in Infrastructure and Land Development

(i) Infrastructure

The 9th National Development Plan 2007-2013 emphasizes the importance of private sector investment in infrastructure, i.e. power, transport. FDIs may prove to be an important component of infrastructure development and privatization in Turkey. Foreign investors consider the privatization of infrastructure even more important and infrastructure privatizations among all have the strongest impact on attracting additional FDI into the country. Not only do they attract investment to power, telecommunications, transport, and water sectors but they also improve the condition of infrastructure services, which is an important component of FDI attraction and productivity increases. In order to make an opportunity out of a challenge, Turkey needs greater persistence in creating the necessary regulatory bodies for infrastructure. The establishment of an appropriate regulatory framework is needed to introduce real competition in the infrastructure sectors.

(ii) Real Estate and Land Use Planning

Turkey already has the basic principle and system supporting the transfer of state land to the private sector, but the process needs improvement. The problems

encountered so far in the process can not be just attributable to procedures but they also have roots in legislative ethics. The improvement of procedures, therefore, will take a lot more effort related to privatization and civil service reform than simply removing administrative barriers.

5) Need for further Fiscal Decentralization

All municipalities responsible for infrastructure development suffer from budgetary constraints and weak institutional capacities.

The concept of the intergovernmental fiscal relations is the relations between the tiers of government and the problems of sharing expenditures and revenues. In this context, the first step is to determine the principles concerning the sharing of powers and functions, and the expenditures. The second step is to share the revenues in order to meet the expenditures.

Earlier fiscal decentralization of the 1980s has been assimilated and internalized. There seems to be greater demand for further decentralization in the country.

6) Needs for Building Capacity for PPP Management at both Central and Local government levels

As reviewed, Turkey already has the legal framework for PPP transactions and management. However, the absence of a cohesive government policy and strategy and lack of institutions facilitating PPP projects, particularly BOTs at the central government still remain as constraints.

Attracting private sector finance and optimizing its financial, socio-economic and political advantages is an important and complex task and it is under the responsibility of central government. Such a task dictates the creation of a dedicated organization in government with skills necessary for management of all the phases in development and implementation of PPP projects.

The central administration-local administration relations are important for ensuring necessary incentives to transfer foreign investment to local authorities. Under the present administrative structure, local authorities can not access themselves into the international capital market. Institutional and financial systems, which enable local authorities to plan, develop and implement PPP projects, may be needed. Presently, the authority to grant and govern concessions is in the hands of the central government. This authority can be decentralized and the transfer of authority to grant concession to local governments should be made an integral part of administrative reforms and fiscal decentralization.

Chapter 8 Planning Issues

Based on the fact and findings stated in antecedent chapters, main transportation problems existing in the Istanbul Metropolitan Area are summarized in this chapter. They will comprise an important part of planning issues for Master Plan Development. However, this work is still on the way and to be continued in the next phase.

8.1 General Problems

A series of discussion on current transportation problems were made in the Joint Task Force of IMM Study Team and JICA Study Team. Finally, most of discussed problems were classified into the general problems listed in Table 8.1.1.

Table 8.1.1 General Transportation Problems in Istanbul

| Transportation Problems | |
|-------------------------|--|
| 1 | <p>Lack of Productive, Sustainable, Multi-scale and Multi-centralized Urban Plans</p> <ul style="list-style-type: none"> • Around one center, due to the linear spreading urban tissue, increase on the demand of central business areas and the transportation infrastructure in the city center is not qualified enough to meet this demand. • Because the implementation plans which are agreeable with the strategic plans cannot be implemented in the same period of time, the city development cannot be actualized adequate to the targets • For better access to the main public transit lines, there are no adequate pedestrian and bicycle paths to improve the accessibility by non-transport modes. |
| 2 | <p>Lack of Attractive and High Capacity Public Transportation System</p> <ul style="list-style-type: none"> • Due to non-existence of widespread rail system network, accession from all regions cannot be ensured • The low network speeds in the widely used rubber wheeled public transportation system • There is no synchronize integration between sea transportation and other systems |
| 3 | <p>Capacity Deficiency of Transportation Infrastructure (Roads, Intersections and Parking Lots)</p> <ul style="list-style-type: none"> • Due to the parking lot deficiency in house and business areas, the increase in the road side parking ratios and related to this, decrease in the road capacity • Due to the failure in the land route network, decrease in the road capacity • New land-use developments are proposed without the remedy plan for their adverse affects, i.e., additional traffic load produced by a new development is not accommodated by a proportion of new geometric site/street plan. |
| 4 | <p>Lack of an effective Control and Management System</p> <ul style="list-style-type: none"> • Slowness on spreading smart/ intelligent technologies for traffic detection, control and management and information systems. • The smart signalization systems are not widely spread and experts to handle new technologies are insufficient. • The deficiency of the demand management and driver information systems with the usage of smart transportation systems • Not enough law enforcement on traffic management |

| Transportation Problems | |
|-------------------------|---|
| 5 | <p>Lack of Necessary Transportation Mentality of Drivers, Passengers and Pedestrians</p> <ul style="list-style-type: none"> • The control deficiency on obeying of the traffic rules • Difficulties on the changing the costumes of people's transportation use • Public transportation drivers don't conform the passenger stop locations |
| 6 | <p>Deficiency in Controlling Population Growth</p> <ul style="list-style-type: none"> • As a result of the pressure of the availability of vast amount of land belonging to government, rapid population growth due to migration from rural cannot be prevented. • As a result of the population development going over the plan targets, the planned transportation infrastructure is inadequate. • Due to the intense migration, forming new resident areas where there is no adequate transportation infrastructure |
| 7 | <p>Multiple Agencies Regarding to Authority and Responsibility</p> <ul style="list-style-type: none"> • Lack of proper cooperation between the agencies of Central and Local Government can be named as an example regarding transport infrastructure investment. Also, traffic enforcement is done by the police who are not controlled by the Local Government. However, in general, cooperation among various transit operators in the city is overseen by the council, called UKOME led by the secretary of municipality. • Local Government cannot impose local taxes and policies concerning transportation. |

Source : Study Team

8.2 Current Transportation Problems to Passengers

1) Outputs of Home Interview Survey

The IMM Study Team conducted "Person Trip" Surveys by home interview in two phase: the first one was done in the mid-May to the mid-June of 2006 and the second in October, 2006 to January, 2007. Trip data of 72,000 households were obtained by the surveys.

In the first phase survey, a question was added, asking users' opinion about problems and troubles concerning the public transport service they are using. Table 8.2.1 classified the opinions by transport mode and categories of problems and shows the number of responses in percentage by mode. The total is over 100% because multi-answer was allowed.

More than half of respondents indicate some problems on route of service in every mode. Second highest indications are concerning waiting conditions, congestion, operators and accessibility to station and bus-stop. On the other hand, comparatively few claims are made to safety, fare system, comfortableness and operating hours. Thus, passengers have a keen interest in such factors as relating directly to convenience.

Table 8.2.1 Public Transport Problems Identified by Users

(Unit: percent)

| Users' Perception | Bus | Mini-Bus | Dol-mus | Sea-bus | Ferry | Metro | Train | Tram | Total |
|--|-------|----------|---------|---------|-------|-------|-------|-------|-------|
| Access to Station and Bus-stop | 21.1 | 14.4 | 16.5 | 0.0 | 7.1 | 9.7 | 11.0 | 10.1 | 17.2 |
| Drivers' Attitude | 12.4 | 15.7 | 13.2 | 0.0 | 1.4 | 4.9 | 4.9 | 5.0 | 11.2 |
| Operating Hour | 0.8 | 0.6 | 0.5 | 0.0 | 2.9 | 0.3 | 0.0 | 0.2 | 0.6 |
| Operator Type | 22.5 | 14.2 | 37.8 | 16.7 | 11.4 | 9.5 | 3.7 | 8.1 | 19.0 |
| Waiting Condition | 21.1 | 14.4 | 16.5 | 0.0 | 7.1 | 9.7 | 11.0 | 10.1 | 17.2 |
| Comfort | 4.0 | 4.5 | 4.1 | 8.3 | 10.0 | 9.1 | 4.9 | 9.8 | 5.3 |
| Congestion | 12.0 | 23.7 | 14.0 | 25.0 | 27.1 | 20.5 | 20.7 | 21.4 | 15.9 |
| Fare | 6.6 | 7.1 | 7.9 | 12.5 | 12.9 | 5.0 | 3.7 | 4.8 | 6.4 |
| Frequency | 2.1 | 0.8 | 1.5 | 0.0 | 4.3 | 0.6 | 0.0 | 1.1 | 1.6 |
| Maintenance | 1.9 | 2.2 | 1.5 | 8.3 | 5.7 | 2.3 | 9.8 | 1.5 | 2.1 |
| Route | 45.6 | 45.9 | 37.1 | 58.3 | 51.4 | 63.8 | 43.9 | 64.6 | 49.1 |
| Safety | 2.1 | 3.6 | 3.6 | 0.0 | 4.3 | 2.2 | 28.0 | 1.8 | 2.7 |
| Total | 152.2 | 147.0 | 154.1 | 129.2 | 145.7 | 137.6 | 141.5 | 138.5 | 148.4 |
| Number of Respondents who identified problems | 4393 | 1170 | 394 | 24 | 70 | 1110 | 82 | 457 | 7700 |
| Number of Respondents who identified no problems | 5431 | 1116 | 388 | 62 | 150 | 2204 | 100 | 848 | 9451 |

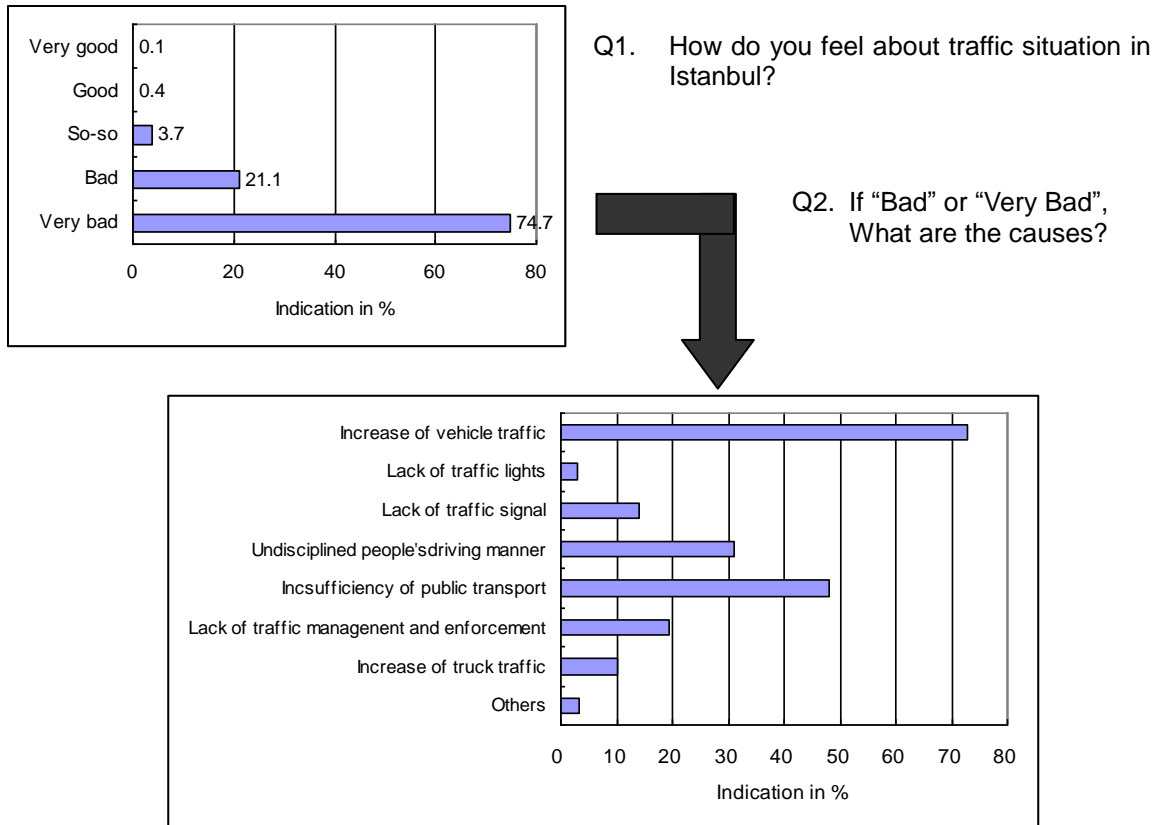
Source: IMM Person Trip Survey, 2007

2) Results of Opinion Survey

JICA Study Team conducted an opinion survey on transportation conditions together with a stated preference survey, by interviewing to 1,000 passengers and drivers in September to October of 2007. The results of the survey are stated in Chapter 7. Figure 8.2.1 illustrates a part of general opinions about transportation in Istanbul.

In fact, 75% of interviewees chose "very bad" and people with opinion of "very bad" or "bad" exceed 95%. As for the causes of such bad conditions, "Increase of vehicle traffic" was the top at 73% (by dual choices). In other words, people consider that vehicles have increased beyond the capacity of road network.

The following causes are "Insufficient public transport" (48%), "Undisciplined driving manner" (31%) and "Lack of traffic management and enforcement" (19%). These results are explicitly indicating a basic direction of the Master Plan.



Source : Study team

Figure 8.2.1 People's Perception on Transportation in Istanbul

8.3 Problems of Transportation Network

Through data processing and field investigation, the following problems were identified upon the transportation network configuration and its services offered by each mode. However, these are still provisional and need to be verified in the next phase.

Table 8.3.1 Current Problems of Transportation Network

| Transportation Problems | |
|-------------------------|--|
| 1 | <p>Road Network</p> <ul style="list-style-type: none"> • Absolute deficiency of arterial roads in the urbanized area, especially in the NW-SE direction. There is no East – West highway in such densely inhabited area as Gungoren and Bagcilar Area. • Parking lots are insufficient especially in down town and curbside parking is common which decreases road capacity and hinders smooth traffic flow. • Road construction does not catch up with demand in rapidly growing area in the suburbs such as Gaziomanpasa and Esenler in the European side and Maltepe and Kartal in the Asian side. • Pedestrian facilities such as sidewalk and crossing are underdeveloped. |
| 2 | <p>Rail transit Network</p> <ul style="list-style-type: none"> • Rail transit has not composed a network yet. It is in the cradle age. • Rail transits lines both existing and under construction are rather short in length |

| | |
|---|---|
| | <p>which forces passengers to transfer frequently.</p> <ul style="list-style-type: none"> At inter-modal points, transfer to another service is often inconvenient due to lack of such facilities as a plaza, bus terminal and parking lots. |
| 3 | <p>Bus/Minibus Network</p> <ul style="list-style-type: none"> Too many lines are operated (About 1000 bus lines and 500 mini-bus lines). Trunk / Feeder bus network has not realized yet. |
| 4 | <p>Sea-bus/Ferry Network</p> <ul style="list-style-type: none"> Sea transport does not work effectively due to limited capacities of fleet and piers and also due to inconvenient access to piers. <p>Some fleet is decrepit and needs to be renewed.</p> |

Source : *ibid.*

8.4 Problems of Traffic Management

Current transportation management system in Istanbul is reviewed in this chapter and the problems are summarized as shown in Table 8.4.1.

Table 8.4.1 Current Problems in Traffic Management

| Transportation Problems | |
|-------------------------|--|
| 1 | <p>Excessively Technology Oriented Approach</p> <ul style="list-style-type: none"> Application of most advanced technology such as video camera type vehicle detectors should be well balanced with human factors for efficient monitoring. Effectiveness of the introduced new technology is often limited due to narrow service coverage, unreliable information collection, etc. (e.g. expressway traffic information system) New technology seems to have been introduced for the sake of technology itself, while simple and time-consuming work to support the technology tends to be neglected. |
| 2 | <p>Traffic Signal Control</p> <ul style="list-style-type: none"> Although about 800 signals are connected to the Control Center, each signal actually operates in an isolated manner with fixed signal patterns due to lack of continuous monitoring. |
| 3 | <p>Traffic Information System</p> <ul style="list-style-type: none"> The current system of traffic information collection depends largely on the operators. But the operators provide limited information that may differ by operators. Definition of traffic congestion and description of traffic congestion are not standardized at present. |

***Part II. Land Use Plan and
Demand Forecast***

Chapter 9 Urban Development Plan and Socio-Economic Framework

9.1 Regional Development Planning

The economic sphere of Istanbul is much wider than the administrative area. Therefore, it is necessary to plan the future transport network from the wider regional perspective and requirement. The aforementioned Land Use Plan for the metropolitan region, especially the socioeconomic frame defined for land use planning, assumes the introduction and implementation of the policy commitment that aims at easing the population pressure on Istanbul by developing the outlying regions. This makes it all the more important to consider the existing plans of wider regional implications.

1) Regional Development Policy

In Turkey, State Planning Organization (SPO) is responsible for social, economic and cultural development, and the policies has been developed in the quest to alleviate the development disparities among regions and provinces, increasing the revenue levels in underdeveloped regions, diversification of economic activities, reinforcement of local governments, encouragement of the initiatives members and among Turkey's regions, which has gained importance.

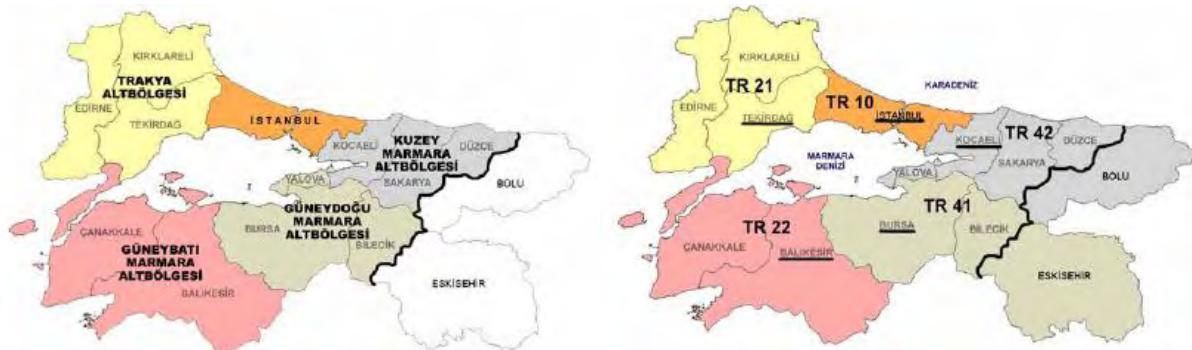
In Istanbul, continuous expansion of the metropolis as a national growth pole has failed to take into account of demographic conditions and socioeconomic development disparities among others. Hence, decentralization of Istanbul urban area with adjacent provinces is a key issue how to deliver the sustainability of economic growth, reducing rapid population growth and transformation of current mono centric urban development form.

2) The Marmara Region and Thrace Sub-region Studies

There are two regional plans, 1) Evaluation of Istanbul Metropolitan Area in relation with the Marmara Region (1/100,000), completed in July 2007 and 2) Evaluation and Proposal Towards Harmonization of Ergene Basin Environmental Regulatory Plan and Istanbul Environmental Regulatory Plan in Thrace Sub-region (1/100,000), which is on-going and it is expected to be completed by the end of year 2008. In the course of the study, a development policy of Marmara Region was proposed and building sub-regional development policy is under gone.

(1) Marmara Regional Planning Area and NUTS II Region

Regional division in Turkey is based on NUTS II region, 26 divisions in total, which is EU statistical area and the Turkish government adopted it during EU accession negotiation. Marmara Region is defined in the course of the study and it consists of five sub-regions namely 1) Istanbul, 2) Trakya, 3) South West Marmara, 4) South East Marmara and 5) North Marmara shown in following left figure based on NUTS II region. TR22 of Eskisehir and TR44 of Bolu areas are excluded due geographical extent.



Source: IMM (2006), Consideration in Planning the Marmara Region and the Metropolitan Area of Istanbul

Figure 9.1.1 Marmara Regional Planning Area and NUTS II Region

Total population of the region is approximately 20.6 millions (2007), which is 27.8% of Turkey's population, and the region generates at 38.8 % (2001) of Turkey's GRDP shown in following table respectively. All sub-regions of Marmara Region account among top 10 on the ranking of socio-economic development based on NUTS II division. It can be said this region is economic growth pole of Turkey.

Table 9.1.1 Regional Division by NUTS and the Marmara Regional Planning Area

| Functional Region | NUTS-I | NUTS-II | NUTS-III | Prime Municipality | Urban Pop. | Rural Pop. | Total | GDP share (2001) | Pop. Share (2007) |
|-----------------------|--------------|----------------|-----------|--------------------|------------|------------|------------|------------------|-------------------|
| 1. Istanbul | Istanbul | Istanbul TR10 | Istanbul | Istanbul | 11,174,257 | 1,399,579 | 12,573,836 | 21.30% | 14.80% |
| | | | Sub-total | | | | | | |
| 2. Thrace (Trakya) | West Marmara | Tekirdag TR21 | Tekirdag | Tekirdag | 494,342 | 234,054 | 728,396 | 2.50% | 2.30% |
| | | | Edirne | | | | | | |
| | | | Kirklaeli | | | | | | |
| | | | Sub-total | | | | | | |
| 3. South West Marmara | | Balikesir TR22 | Balikesir | Balikesir | 649,423 | 468,890 | 649,423 | 2.20% | 2.20% |
| | | | Canakkale | | | | | | |
| | | | Sub-total | | | | | | |
| 4. South East Marmara | | Bursa TR41 | Bursa | Bursa MM | 1,979,999 | 459,877 | 2,439,876 | 5.20% | 4.50% |
| | | | Bilecik | | | | | | |
| | | | Sub-total | | | | | | |
| 5. Northern Marmara | East Marmara | Kocaeli TR42 | Kocaeli | Kocaeli MM | 894,242 | 543,684 | 1,437,926 | 7.60% | 4.00% |
| | | | Sakarya | | | | | | |
| | | | Duzce | | | | | | |
| | | | Yalova | | | | | | |
| | | | Sub-total | | | | | | |
| Region-Total | | | | | | | 20,579,388 | 38.80% | 27.80% |

Source: Census 2007, Turkish Statistical Institute and National Program 2008

Note: TR22 Balikesir excludes Eskisehir and TR42 Kocaeli excludes Bolu in the Marmara Regional Planning Area

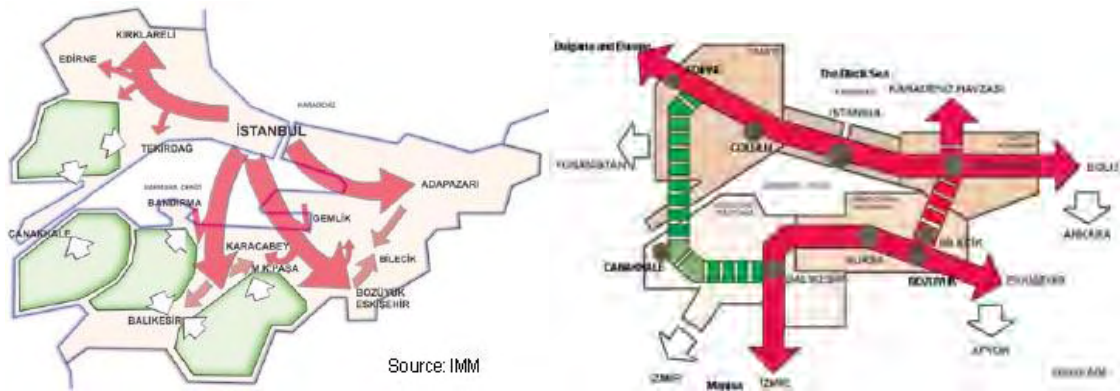
NUTS: The Nomenclature of Territorial Units for Statistics (EU Statistical area). Turkish government adopted during the EU accession negotiation.

(2) Marmara Regional Development

The outlying areas of the Metropolitan Region consist of those provinces surrounding Marmara Sea, collectively known as the Marmara Region. Three most important provinces are Kocaeli immediately to the east, Trakya (Thrace) in the west and Bursa on the opposite shore of the sea.

The regional planning group of IMM/IMP made public the perspective plan for Marmara regional development in June 2006. The plan aims to relocate industries out of Istanbul as well as promote new industrial investments in Marmara Region. In this regard, dispersion policy and four major axes shown in following figures were examined and proposed.

- Industrial and commerce Axis: a. Thrace – Istanbul - Adapazari (East-West) and b. Balikesir – Brusa – Bilecik
- Green Axis (Agricultural and Nature Preservation): c. Balikesir – Canakkale – Edirne – Gallipoli N.P.
- Connection “a” and “b” Industrial and commerce Axis: d. Bozuyuku - Bilecik – Adapazari (North South axis of Northern Sub-region)



Source: IMM (2006), Consideration in Planning the Marmara Region and the Metropolitan Area of Istanbul

Figure 9.1.2 Dispersion Policy and Development Axis in Marmara Region

Table 9.1.2 Development Direction of Marmara Sub-regions

| The Marmara Region | Development Directions |
|----------------------------------|---|
| 1. Istanbul Sub-region | Decentralization of Istanbul Metropolitan Area • Developing Bozyuk-Bilecik-Adapazari Corridor as a regional function (dispersing congestion) |
| 2. Thrace (Trakya) Sub-region | Economic Intensity Axis • Istanbul- Babaeski and Pehlivan koy • Edirne and Kırklareli (northern direction; EU) Development Corridor • Edirne-Corlu corridor To Anatolia by maritime transport • Tekirdag – marmara Ereğli by ro-ro line Towards eco-tourism • Saros Bay (black sea) and Gallipoli National Park (nature preservation) |
| 3. South West Marmara Sub-region | Development Corridor • Strengthening the connection to Manisa and Izmir from Bandirma • Canakkale in the north and Edremit in the south • Brusa, Karacabey, Mustafakemalpaşa to Balikesir, Manisa and Izmir by highway and railway |
| 4. South East Marmara Sub-region | Development Axis by road access: • Bandirma – Karacabey – Mustafakemalpaşa – Susurluk – Balikesir • Bursa – Karacabey • Bursa – Mustafakemalpaşa • Gemlik- Bursa – Inegol – Bozuyuku – Eskisehir • Inegol – Yenisehir Maritime Transport • Gemlik and Mudanya Ports |
| 5. Northern Marmara Sub-region | Development Corridor • Alongside of Izmit-Adapazari-Duzce Highway connecting to Ankara (Bolu Tunnel) • Connection of Bozyuk-Bilecik-Adapazari for the south access and northern access to the Black Sea (decentralization of Izmit Bay and Yalova) |

Source: Study Team prepared based on IMM information.

In addition, development direction in each sub-region was also examined and proposed shown in Table 1.x.2, and the envisioned transport network proposes the strengthening of the east-west axis that crosses Istanbul, another east-west axis of Badirma – Bursa – Bozuyuk on the opposite shore and the axis of Bilecik – Bozuyuk that connects the two shown in following figure.

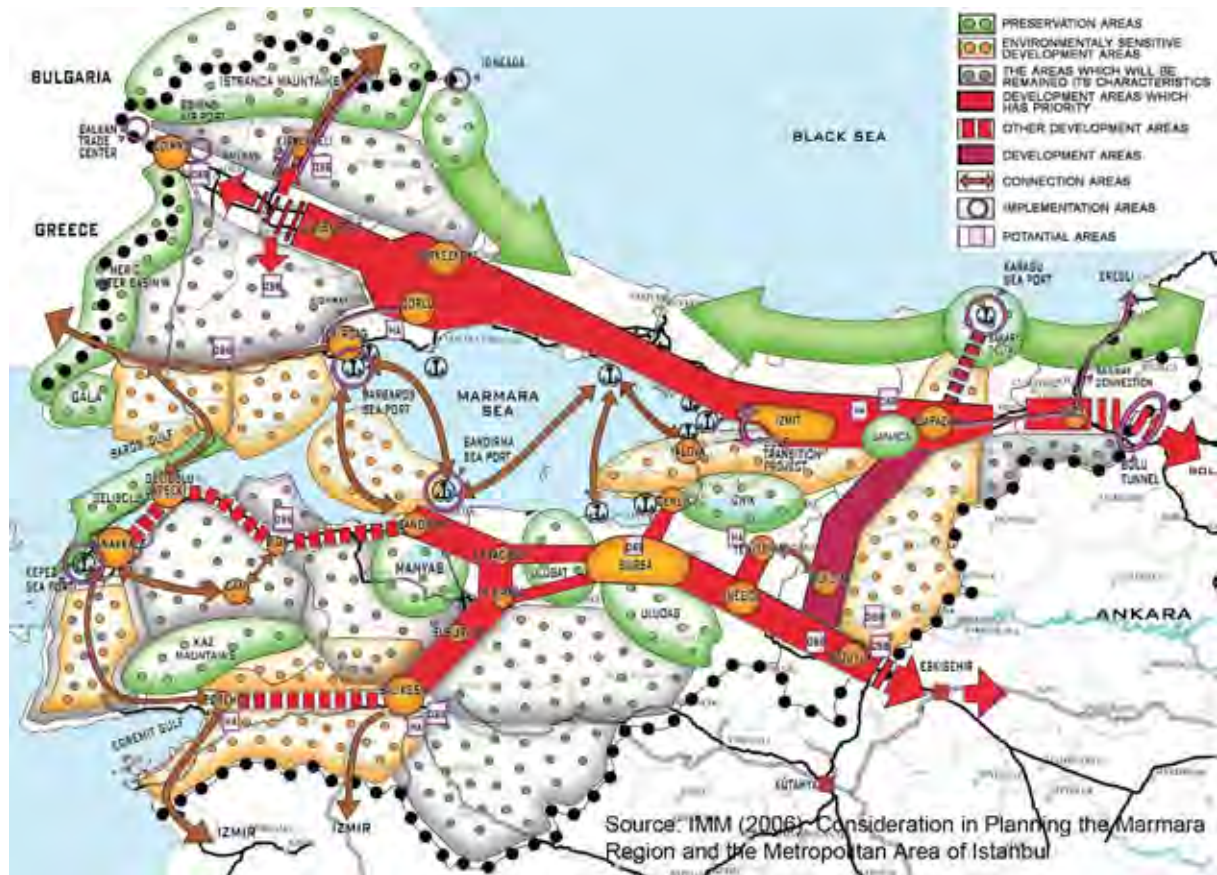


Figure 9.1.3 Development Diagram in Marmara Region

(3) Trakya Sub-Regional Development

The same IMM/IMP group formulated this plan with Silivri as the future urban growth pole in Trakya regional development. The existing industrial agglomerations in Corlu and Cerkezkoy found along the axis from Silivri toward Europe will be integrated into the regional development. Major development policies are;

- Functional and special Integration of Silivri-Gumusyaka (western part of Istanbul) and adjacent area of Corlu-Cerkezkoy as a 2 million population area
- Functional linkage of Silivri-Gumusyaka and Tekirdag- Marmara Sea Coast
- Connecting Corlu-Cerkezkoy to Edirne Luleburgaz-Babaeski which leads to Europe
- Ecological axis (water basin conservation) Istrancalar - Terkoz where is the Black Sea side

Major proposed transport infrastructures are the international port and the associated logistic center at Gumusyaka, with the airport at Corlu also contributing to international traffic.



Figure 9.1.4 Environmental Regulatory Plans of Ergene Basin and Istanbul (1/100,000)

3) Istanbul Regional Logistics Development

Major development proposals by the logistics planning group of IMM/IMP shown in following figure are as follows:

- Application of the Ro-La system that carries trucks on railways
- Utilization of Ro-Ro ships that ply Marmara Sea (Ambarli - Bandirma/Mudanya and Tekirdag - Bandirma)
- Development of logistic facilities at Hadimkoy (similar to the logistic center in Paris or Barcelona)
- Pipeline for petroleum products
- Improvement of container cargo handling efficiency at ports (the increase from 1.1 million TEU in 2005 to 2.5 - 4.0 million by 2015), development of a container depot behind Ambarli Port and transshipment of container cargo at Bahcesehir to the Halkali - Edirne railway
- Relocation of the cargo terminal at Ataturk Airport
- Construction of two emergency landing logistic terminals



Source: IMM (2006), Consideration in Planning the Marmara Region and the Metropolitan Area of Istanbul

Figure 9.1.5 Logistic Development Plan in Marmara Region

9.2 Review of Istanbul Metropolitan Area Master Plan

9.2.1 Turkey's Long-Term Development Strategy (2001-2023) and Five-Year Development Plan

In 2001 Turkey's Long-Term Development Strategy (2001-2023) set forth long term strategies which, among others, declared the following goals: (1) Make Turkey an influential global power in the 21st century, (2) Ensure transformation into an information society, (3) Transform the country's social and economic structure, (4) Shift to an export-oriented, technology-intensive production structure with an emphasis on generating a high value added, consistent with the international standards and likely to activate local resources. Consequently, it is expected that Turkey's society GDP is due to develop at about 7% annually so to reach higher economic levels and per capita income for its eventual converging with that of the level of the European Union countries by 2023.

In conjunction with the long-term strategy, the 8th Five-Year Development plan (2001-2005) was laid down and executed, where a rapid economic growth was performed as represented in its GDP growth rate from 2002 to 2005 shown in Chapter 1. Subsequently, 9th Five-Year Development Plan (2007-2013) was prepared with the vision of making "Turkey, a country of information society, growing in stability, sharing more equitably competitive and fully completed her coherence with the European Union" within the framework of the long term strategy. With its reform process and tight monetary/fiscal policies, the past high growth performance is expected to continue with a GDP growth at about 7% annually till 2013 lifting the per capita income to 10,100 dollars in 2013, which would make Turkey the 17th biggest economy in the world (Chapter Targets and

Projections for the Plan Period)

The 9th Five-Year Development Plan changed the former planning concept of accumulating district-wise detailed plans to a strategic approach that included institutional and structural regulations, prioritization of problems, focusing on basic goals and priorities, such as effective monitoring and establishment of evaluation mechanism.

More specifically, the strategic objectives have been determined as “development axes” to realize the vision of the 9th Five-Year Development Plan, which : 1. Increasing Competitiveness, 2. Increasing Employment, 3. Strengthening Human Development and Social Solidarity, 4. Ensuring Regional Development, 5. Increasing Quality and Effectiveness in Public Services, and 6. Ensuring Regional Development.

According to the new understanding of planning concept as mentioned above, the development axes are detailed in the Medium-Term Program (2007-2009 and 2008-2010), which is updated every year with due consideration of annual implementation results, and internal and external changes. Finally, based on the Medium-Term Program, the Annual Program is set forth for implementation. As such, the 2007 Annual Program is currently in effect in the Republic of Turkey.

With regard to one of the development axes of “Ensuring Regional Development” started in the 2007 Annual Program, the past and current performances were monitored and evaluated. Then, the policies and measures were elaborated for execution as stated below.

- Increasing the effectiveness of regional development policies at the central level.
- Enhancing development based on local dynamics and internal potentials.
- Improving the institutional capacities at local level.

The main target of this development axis of regional development in Turkey is linked with the alleviation of development disparities among regions and hence the reduction of intense migration. Thus the proposed of policies and measures focus mainly on regional development initiatives (regional growth centers) in the less- or under-developed regions in the country, such as Aegean Foundation for Economic Development (EGEV), the Foundation of Adana Gucbirligi and Adana Investment Research and Development Center (AYAGEM), the Council of Mersin Development and Co-operation (MEKIK), the Council of Samsun Regional Economic Development (SABEKAK), and the Foundation for the Economic Development of Western Mediterranean (BAGEV). Correspondingly, the 2007 Annual Program started that the national regional development strategy studies have commenced, and the national framework for regional development would be developed in the plan period of 2007. This forthcoming national framework plan and its implementation will definitively affect the future of Istanbul Metropolitan Region in terms of population (scale of in-migration), employment size and its role and function as a potent social and economic engine of Turkey.

9.2.2 Review of Istanbul Metropolitan Area Master Plan

In 2006, when the 9th Five-Year Development Plan (2007-2013) was established, the Istanbul Metropolitan Area Master Plan was also formulated by IMM and was officially

approved by the Istanbul Metropolitan Municipality Council. In this JICA transport study the Master Plan was reviewed with a main focus on the socio-economic framework and its distribution by 2023, which is essential for the transport network study, especially traffic demand forecast.

1) Standpoints for Review

Reviewing the 2007 Master Plan study, the most important planning issue for future sustainable growth of Istanbul is the proposed urban transformation including the impacts or benefits of “Industrial structure” and “Urban Structure”. Industrial restructuring aims at developing Istanbul into a global city in response to worldwide globalization (accelerated market economy, free trade and capital investment associated with information technology development) and integration/into EU (now in the negotiation process). This industrial restructuring also necessitates change in the old and traditional existing urban structure of the city, which can no longer accommodate its growing population and the industrial innovation required for a global city.

Industrial Structure

The transformation of industrial structure of Istanbul will dictate the reform of the following two sectors, taking into consideration the advantages such as geo political position, cultural heritage, and economic and social developments:

- Past and current manufacturing industry plagued with low productivity and labor-intensive production must shift to export-oriented, technology-intensive production with emphasis on generating high value added factors.
- In order for Istanbul to be a global city, it must grow from an industrial city to city of service in line with the national target of transformation into an information society. This includes development of international and national financial, technological, information, and service industries.

The former supports the latter, and vice versa. The former is related to industrial relocation planning and the latter to trade and commercial center development in Istanbul mentioned in the Master Plan.

Urban Structure

It is a common knowledge that the urban structure of a city must be changed or transformed when the city reaches a certain level of urban growth, especially where the old urban structure can no longer accommodate the increasing population and activities in terms of quantity and quality. It is recognized that Istanbul has reached this turning point where it has to change its urban structure into a mega city of more than 10 million people. However, the serious barrier for urban expansion and restructuring in Istanbul is its natural restriction on space for development, the narrow strip of land limited by sea and strait, its hilly and steep land areas, its serious environmental vulnerability, and other factors compared with other mega cities in the world that have mostly grown on alluvial plains. In this respect it may be appropriate for the master planning to first prioritize environmental sustainability within which urban restructuring concepts and plans should be devised.

2) Objectives and Policies

It is certain that the Master Plan was prepared in a period of radical economic and social changes in the world, and Istanbul also planned to transform herself into a global city integrated with the changing social and economic global networks. For this end the plan employed a basic principle of sustainability on the urban transformation policies were established for socio-economic and urban growth for the city. This is because the plan was firstly formulated under the title: Istanbul Environment Plan which sought a way for urban growth while keeping environmental sustainability.

More specifically the Master Plan was elaborated in such manner as integrating the sector studies and planning. The plan included the following documents: 1) The Marmara Region, 2) Natural Resources of Istanbul Province, 3) Housing and Quality of Life in Residential Areas, 4) Service Sector, 5) Industrial Sector, 6) Culture and Tourism, 7) Transportation System, and 8) Urban Logistics Planning for Istanbul. Among others the analysis on the city's natural resources is most in directing future urbanization expansion over which the new urban structure of Istanbul Metropolitan Area was proposed.

"1/100,000 Scale Master (which is now under revision) Plan" set forth the objectives and policies as follow:

Objectives:

Improving the quality of life, including "sustainability of natural assets" and "improvement of the standard of living"

Policies:

- Sustainable development.
- Economic structural changes, including shifts from predominantly industrial economic structure to a competitive service economy that is based on information and technology development.
- Consolidating industries in Istanbul and directing industrial growth to the region.
- Decentralization of centers.
- Improvement of transportation and logistics infrastructure.

3) Urban Growth

It is apparent that the scale and magnitude for future urban growth of Istanbul will significantly influence its urban structure. However the Istanbul Master Plan is silent about the target socio-economic growth size (GDP, employment, and population) in 2023 or 2025 except its population size.

In this situation JICA Study Team reviewed the population projection of the Master Plan, and re-estimated other socio-economic indicators, compliance with the planning framework and the development concepts of the Master Plan. This was necessary for traffic demand forecast.

(1) Population

Urban growth in terms of population was projected in 2 cases in the Master Plan: 1) Un-checked (uncontrolled), and 2) Checked (controlled) as listed in Table 9.2.1. The Master Plan shows that if necessary measures are not taken, it is estimated that at the current un-checked population growth rate (3.2%), will continue and the population of Istanbul will increase to 22,037,990 in 2025, while it will be 17,396,595 in 2025 assuming a population control that the population growth rate will decline and reach zero growth by 2045.

Table 9.2.1 Population Projection of Istanbul in Master Plan

| | | 2000 | 2005 | 2010 | 2020 | 2025 | 2045 | 2050 |
|-----------|----------------------|--------|--------|--------|--------|--------|--------|--------|
| Case (1) | Population (1000) | 10,018 | 11,729 | 13,732 | 18,823 | 22,037 | 41,405 | 48,476 |
| Unchecked | Growth rate/year (%) | | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 |
| Case (2) | Population (1000) | 10,018 | 11,546 | 13,098 | 16,077 | 17,396 | 20,367 | 20,367 |
| Checked | Growth rate/year (%) | | 2.88 | 2.55 | 2.07 | 1.59 | 0.79 | 0.00 |

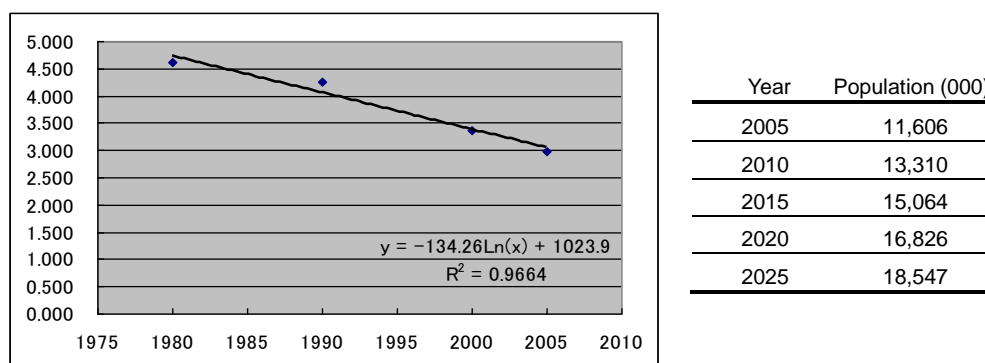
Case (1): Increase at un-checked population growth rate of 3.2%

Case (2): Population growth rate will decline and reach zero growth in 2045

Source: Istanbul Comprehensive Master Plan, 1996-2003 (under revision)

In addition to these population projections of the two cases, IMM calculated the environmental capacity of Istanbul and pegged the figure at 16,000,000, which is deemed to be the limit on urban growth for maintaining environmental sustainability. Based on these discussions the IMM decided a population target for Istanbul at 16,000,000 to 17,000,000 in 2023.

It seems an overestimate if the population is assumed to increase at un-checked population growth rate of 3.2 % up to the year 2025, taking into account the past trends that show consistent decrease in annual population growth ratio as shown in Chapter 1. Population was estimated based on the past trends of declining annual growth rates. This leads to a 2025 population 18,547,000 (Figure 9.2.1).



Source : Elaborated by Study Team Based on census data

Figure 9.2.1 Trend Based Population Estimation

Table 9.2.2 summarizes the population estimates discussed above. The Master Plan included land use plans and infrastructure plans, and established IMM's target population at 16,000,000. In this regard JICA Study Team's remarks are as follow:

- Needless to say, necessary measures and strong commitments of both the

Central and Local governments on population control are indispensable for controlling and attaining the population target of 16,000,000 in Istanbul. Otherwise the most likely population estimate will be trend based 18,500,000 (The gap is more than 2,500,000). That the Master Plan is silent about this issue.

- Environmental capacity is set at 16 million to maintain Istanbul's environmental sustainability. However, the Master Plan does not show how this was calculated and what were the natural factors that constrain the population growth were.
- Strict enforcement of regulations for containing the urban and housing development (either legal or illegal) in limited areas and controlling population density is needed to keep population volume under the environmental capacity. The Master Plan does not explain now.

In a sense, planning is the provision of future favorable and unfavorable possibilities. Since the planning direction of the Master Plan is considerably different from the likely trend, it is recommended to prepare for the possible deviation from the target population.

Table 9.2.2 Population Projection of Istanbul

| Cases | 2025 Population (000) | Growth Rate (%) |
|-------------------------------------|-----------------------|-----------------|
| IMM Estimation (Zero balance 2045) | 17,396 | 2.07 |
| IMM Target (Environmental capacity) | 16,000 | 1.64 |
| Trend Estimation | 18,547 | 2.40 |

Source : Study Team

(2) Employment

The general employment situation in Istanbul is shown in Table 9.2.3. Istanbul's employment rate of 42.6 % is quite low compared with the European averages and in the OECD countries (Table 9.2.4). This is attributable to its lower share of women in employment in Istanbul and Turkey.

Table 9.2.3 Labor Force and Employment of Istanbul in 2006

| | | | |
|-------------------------------|--------|---------------------------|-------|
| Population (000) | 11,923 | - | - |
| Population with age <15 (000) | 8,636 | - | - |
| Labor force (000) | 4,143 | Labor force participation | 48.0% |
| Employment (000) | 3,677 | Employment rate | 42.6% |
| Unemployment (000) | 466 | Unemployment rate | 11.2% |
| | | Employment/Population | 30.8% |

Source: Turkey' Statistical Yearbook 2006

To estimate the employment size of Istanbul in 2025 a target employment rate was set at 54.6%, which is equivalent to the middle between Istanbul and EU in 2005. This target translates to employment per population ratio at 39.5%. Thus the total number of employment of Istanbul was calculated at 6,400,000 in 2025 as shown in Table 9.2.5.

Table 9.2.4 Comparison of Employment and Labor Force with EU in 2005 (%)

| | Istanbul | Turkey | EU | OECD | |
|---------------------------|--------------------|--------------------|------|------|------------------------------------|
| Labor force participation | ¹⁾ 48.0 | ¹⁾ 47.4 | 72.2 | 70.9 | Labor force/Population with age>15 |
| Employment rate | 42.6 | 52.5 | 66.6 | 66.3 | Employment/Population with age>15 |
| Unemployment rate | 11.2 | 9.8 | 7.8 | 5.9 | Unemployment/Labor force |
| Employment/Population | 30.8 | | | | Employment/Total Population |

Note: ¹⁾ Share of women of working age (15 to 64 years) in employment: 27.3% in Turkey, 46.0% in EU(15 countries) 46.2% in Greece (OECD Fact book 2007)

Source: OECD Economic Outlook No. 81 - Statistical Annex Tables

Table 9.2.5 Employment Projection

| | Population (000) | Employment (000) | Employment/Population (%) |
|--------------------|------------------|------------------|---------------------------|
| 1996 ¹⁾ | 8,377 | 2,505 | 29.9 |
| 2005 ²⁾ | 11,606 | 3,863 | 33.3 |
| 2006 ³⁾ | 11,923 | 3,677 | 30.8 |
| 2025 | 16,000 | 6,400 | 40.0 |

Source: ¹⁾ 1996 Transport M/P Study, ²⁾ 2005 Transport M/P Study, ³⁾ Turkey's Statistical Yearbook 2006

(3) GDP and Household Income

T.R. Prime Ministry State Planning Organization and several world organizations including World Bank, OECD, IMF, and others have presented GDP forecasts for Turkey and Istanbul as listed in Table 9.2.6.

Table 9.2.6 GDP Forecast of Turkey and Istanbul

(% p.a.)

| | | | 2004 | 2005 | 2006 | 2007 | 2008 | 07-09 | 07-13 | 08-10 | 05-20 | 01-23 |
|----------|--|---------|------|------|------|------|------|-------|-------|-------|-------|-------|
| Turkey | World Bank | Real \$ | 8.9 | 7.4 | 6.0 | 5.0 | 5.0 | - | - | - | - | - |
| | OECD | Real \$ | 8.9 | 7.4 | 6.0 | 5.7 | 6.2 | - | - | - | - | - |
| | IMF | Real \$ | - | 7.4 | 6.0 | 5.7 | 6.0 | - | - | - | - | - |
| | STO Medium Term 07-09 ¹⁾ | Real \$ | - | - | - | - | - | 7.0 | - | - | - | - |
| | 9 th Development Plan 07-13 ²⁾ | | - | - | - | - | - | - | 7.0 | - | - | - |
| | STO Medium Term 08-10 ³⁾ | Real \$ | - | - | - | - | - | - | - | 5.6 | - | - |
| | STO Long Term Strategy ⁴⁾ | Real \$ | - | - | - | - | - | - | - | - | - | 7.0 |
| Istanbul | PWH Coopers (05-20) ⁵⁾ | PPP \$ | - | - | - | - | - | - | - | - | 5.2 | - |

Note: PPP: Purchasing Power Parity

Source: ¹⁾ and ³⁾ T.R. Prime Ministry State Planning Organization: Medium Term Program, ²⁾ 9th Development Plan 07-13, ⁴⁾ Long-Term Strategy and Eighth Five-Year Development Plan 2001-2005, ⁵⁾ Pricewaterhouse Coopers UK Economic Outlook March 2007

It seems rational that Istanbul's GDP will grow parallel to the national GDP of Turkey taking into consideration that the city's share to Turkey in terms of GDP has been constant around 21-22 % for the past 10 years, as shown before in Chapter 1. In this respect, it is anticipated that Istanbul's GDP growth will maintain the level of the national GDP as listed in Table 9.2.6. The most updated forecast of GDP growth rate 5.2% of Istanbul, in particular, was announced by Pricewaterhouse Coopers UK (see Table 9.2.7). Although this figure falls short of the level of national forecast, this seems to be on the safer side.

Table 9.2.7 Estimated GDP of Urban Agglomeration of Istanbul

| | | 2005 | 2020 | Growth(%/year) |
|------------|------------------|------|-------|----------------|
| Population | Millions | 9.70 | 11.84 | 1.3 |
| PPP GDP | \$Bn at 2005 PPP | 133 | 287 | 5.2 |

Source: PricewaterhouseCoopers UK Economic Outlook March 2007 (Turkey 2006
 Total GDP: 402.71 million \$, PPP GDP: 661.65 million \$)

On this premise, growth rate of GDP for Istanbul was set at 5.2 % annually (2005-2025). Accordingly growth rate of per capita GDP was calculated at 3.21% per year given a population growth rate at 1.61%, which is IMM's population growth target. And finally it was assumed that average household income will increase at the same annual growth rate of per capita GDP.

Table 9.2.8 Per Capita GDP and Household Income

| | 2005 | 2025 | 2005-2025 (%/year) |
|---|-------|--------|--------------------|
| Per Capita GDP per year (YTL) | 5,482 | 12,078 | 3.21 |
| Average Household income per month (YTL) | 1,144 | 2,521 | 3.21 |

Assumption:

1. Growth of GDP is set at 5.2 % (2005-2025)
2. Growth of GDP (5.2 %) = Population Growth rate (1.62%)x Growth rate of Per capita GDP = 3.21 %/year
3. Average Household income will increase at the same annual growth rate of Per capita GDP

Source : Study Team

(4) No. of Students

The student per population ratio was estimated at 0.22 as shown in Table 9.2.9. The factors that change this ratio toward 2025 include 1) Population aging and 2) Schooling ratio as show in Table 9.2.10. Firstly, the ratio of 6-25 year old population/total population in 2005 and 2025 was estimated to obtain the aging ratio at 0.88 as seen in Table 9.2.10.

Table 9.2.9 Number of Student by Educational Institute

| | Istanbul | | | | Turkey | |
|-------------------------------|-----------|------------------------|------------|------------------------|------------|------------------------|
| | 1996 | | 2005 | | 2005 | |
| | Student | Student/ population | Student | Student/ population | Student | Student/ population |
| Total Student | 1,462,617 | 0.16 | 2,566,554 | 0.22 | 16,113,406 | 0.22 |
| Primary education | - | - | 2,309,031 | - | 10,673,935 | 0.15 |
| Secondary education | - | - | - | - | 3,258,254 | 0.04 |
| Higher education | - | - | 257,523 | - | 2,181,217 | 0.03 |
| Population in 1996 Study area | 9,349,965 | | 11,766,554 | | 72,972,000 | |

Source: Planning Dept., IMM/IMP

Table 9.2.10 Factors to Change Student/Population Ratio

| Factors | 2005 | 2025 | 2025/2005 |
|--|-------|-------|-----------|
| Ratio of 6-25 year old Population/Total Population | 0.359 | 0.317 | 0.88 |
| Schooling Ratio | 9.74 | 12.40 | 1.27 |
| Change in Student/population Ratio | | | 1.12 |

Source: Planning Dept., IMM/IMP and Study Team

Secondary, schooling ratio was estimated at 1.27 as shown in Table 9.2.11 assuming an enrollment ratio in 2025 by educational institutions: Primary education – 100%, secondary education – 100%, and higher education – 35 %. Thus the student/population ratio was

calculated at 1.12, and the total number of students at 3,919,000 (0.22 x 1.12 x 16,000,000) for 2025.

Table 9.2.11 Schooling Ratio Change

| | Period (year) | Schooling ratio | | |
|--------------------------|---------------|-----------------|--------------------|------------|
| | | 2005 | 2025 | |
| | | 2005 | 2025 | 2005-2025 |
| Primary education | 8 | 0.90 | 1.00 | Compulsory |
| Secondary education | 3 | 0.58 | 1.00 | Compulsory |
| Higher education | 4 | 0.20 | 0.35 ¹⁾ | |
| Total number of students | | 9.74 | 12.40 | 1.27 |

Note: ¹⁾ Basic Targets and Strategy for Long Term Development (2001-2023) set this target at 0.50.

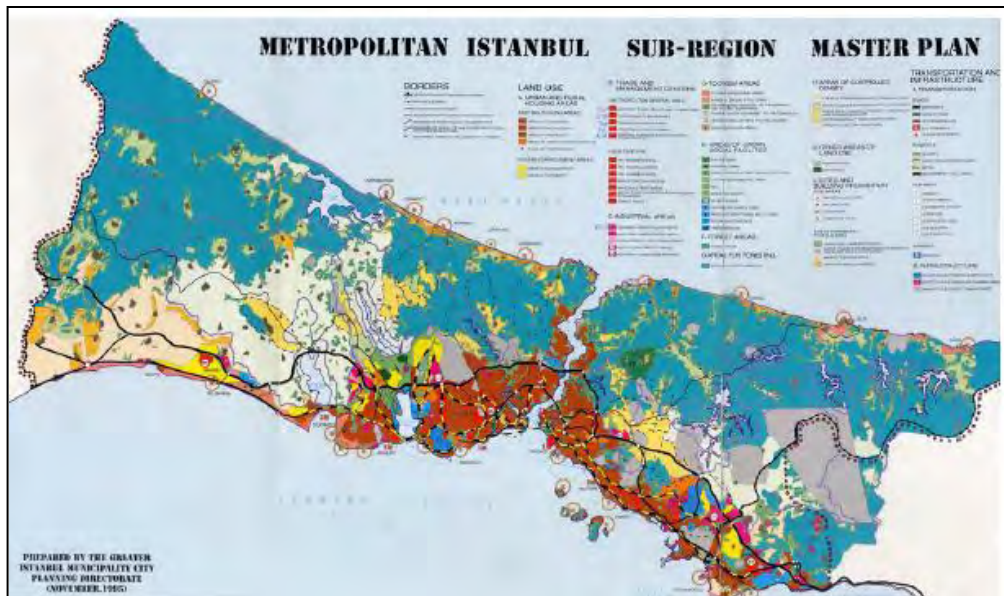
Source : Study Team

4) Review of Master Plan Land Use and Urban Structure

Sector studies were incorporated into the Istanbul Master Plan under the framework of environmental sustainability, and embodied in the 2006 Comprehensive Master Plan (2007-2023) as shown in Source : 2006 Master Plan, IMM

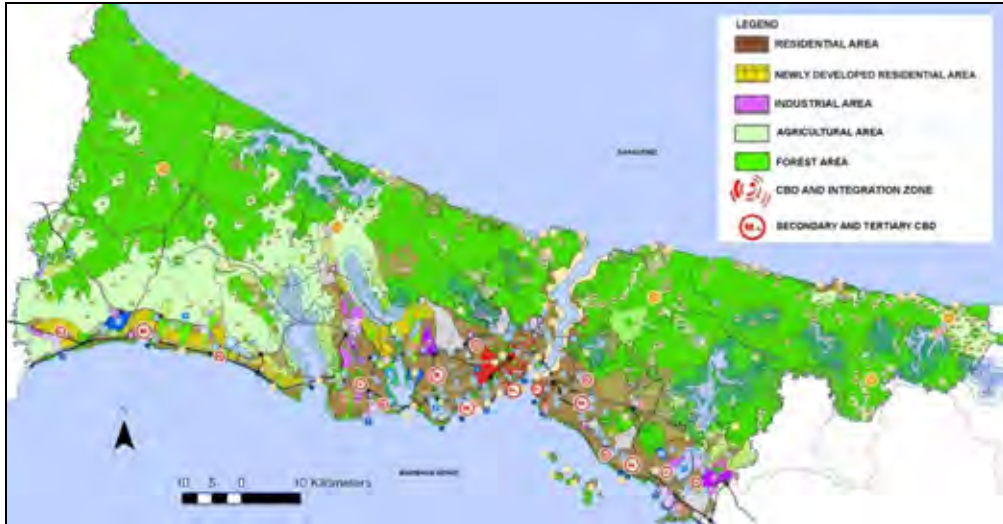
Figure 9.2.3, which replaced the 1995 Master Plan Land Use Map (1995-2010) shown in Source : 1995 Master Plan, IMM

Figure 9.2.2. The proposed urban structure in the Master Plan is discussed in the following section.



Source : 1995 Master Plan, IMM

Figure 9.2.2 Land Use Map (1995-2010) of 1995 Master Plan



Source : 2006 Master Plan, IMM

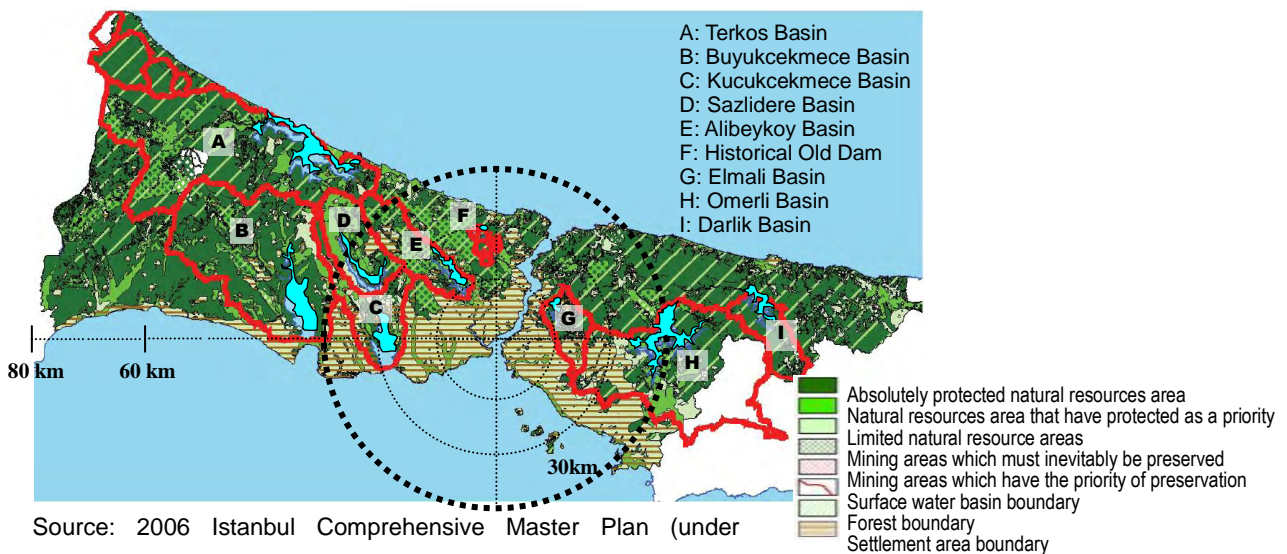
Figure 9.2.3 Land Use Map (2007-2023) of 2006 Master Plan (Presently under revision)

(1) Urban Area Expansions

a) Natural Threshold Synthesis

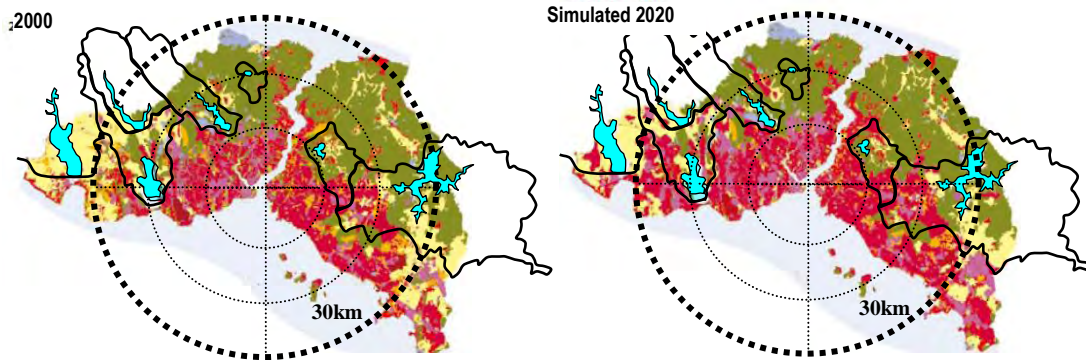
Directing and designating the future urban area expansion of Istanbul is the first important task of the present master planning since it is likely to determine the future environmental/ecological system of the region as well as the spatial system of social and economic lives.

Natural Threshold Synthesis, which was elaborated in the IMM Master Planning, through the risk and potential analysis on natural resources including, agricultural land and soil, and forest area and ecology. The result is shown in Figure 9.2.4. This works as an urban development framework directing future urban expansion, land use plans, and most importantly, the urban structure of Istanbul.



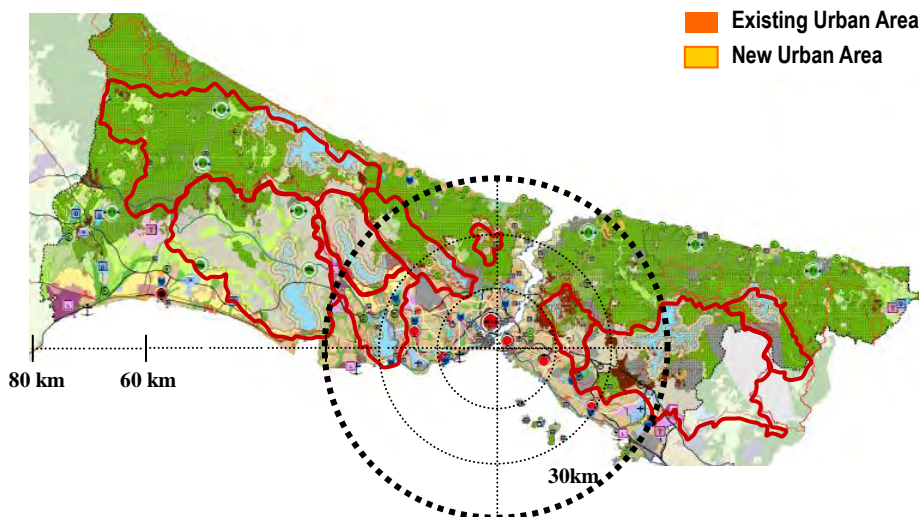
Source: 2006 Istanbul Comprehensive Master Plan (under

Figure 9.2.4 Natural Threshold Synthesis



Source: Urban sprawl in Europe, The ignored challenge, EUROPEAN COMMISSION Directorate-General Joint Research Center, European Environment Agency, EEA Report No 10/2006, MOLAND (JRC) and Kasanko et al., 2006

Figure 9.2.5 Urban Area in 2000 and 2020



Source: 2006 Istanbul Comprehensive Master Plan (under revision)

Figure 9.2.6 Extent of Urban Area in 2020 in the Master Plan

This synthesis map presented protected and limited natural areas and water basin areas which are deemed important for maintaining ecological balance and hence the environmental sustainability of Istanbul.

b) Forecast of Urban Expansion in 2020

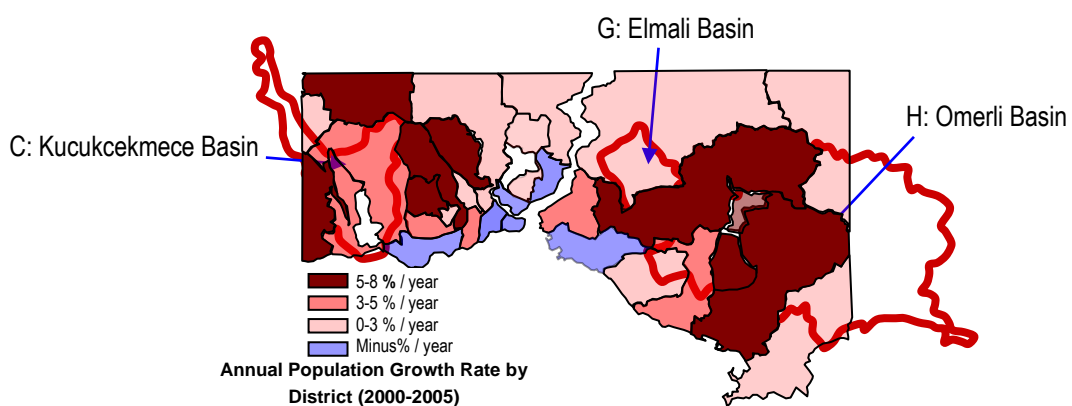
It is undeniable that forecasts for future urban expansion, based on the existing development trends is quite important in identifying development potentials and in determining future land use in harmony with natural preservation in addition to depicting the natural areas to be protected against urbanization, Fortunately, one of the reliable forecasts of urban expansion of Istanbul in 2020 is available in European Environment Agency Report, titled "Urban Sprawl in Europe, the Ignored Challenge", by the European Commission Directorate-General Joint Research Center, Report No 10/2006, as shown in

Figure 9.2.5. The forecast was made using the MOLAND model. The urbanization trends and directions presented in the report are consistent with that of the JICA Study Team as analyzed and observed in the site survey.

The EEA Report identified three clear development tendencies; 1) the filling in of available land within previously built-up areas, 2) the growth along the coastlines both in westward and eastward direction, which is particularly noticeable on the west side (large new residential areas in Bukucekmece). And 3) the conservation of the forested areas north of Istanbul which have relatively little new residential developments. Future development paths were set forth presuming to follow those development trends.

The built-up areas extending from the center toward the east and west already reached a 30 km radius from the geographical center of Istanbul's urban area in as early as 2000 as shown in Figure 9.2.5. It is apparent that the expansion of built-up areas have already encroached into the critical three water basins within the vicinity of the existing urban settlements; that is C: Kucukcekmece Basin, G: Elmali Basin, and H: Omerli Basin. The lakes there are all threatened with water pollution through housing and urban development

The simulation of 2020 in Figure 9.2.5 tells that while urbanization will expand further east and west beyond the 30 km radius, urban areas within the 30 km radius will be continuously filled up with built-up areas. In addition, the conspicuous feature of urbanization up to 2020 is the 3 water basins where the encroached built-up areas will be covering bigger areas of land. This implies that the 3 water basins are endowed with the highest potential for urban and housing development in spite of the necessity and importance of preservation for ecological sustainability as claimed in the Master Plan. The highest potential of the three basins is evidenced by the highest population growth rates (most recently 2000-2005) of the administrative districts including the three water basins, either partially or totally as shown in Figure 9.2.7. Consequently, the impending planning issue is whether to pursue preservation or development in the three water basins or, if neither, to what extent should the balance be.



Source : Study Team

Figure 9.2.7 Population Growth in the Water Basins

c) Planned Urban Areas in 2020 in Master Plan

Restrictive Future Urban Expansion limited to Linear Patterns along the Coastline

As shown in Figure 9.2.6, the future urban area has no alternative but to stretch linearly as long as 110 km (30 km + 80 km) along the coastline between the easternmost and westernmost administrative boundaries. This is due to the IMM's firmly hold environmental policy of preventing urbanization from penetrating the water basins especially in the north except in C: Kucukcekmece. Preventing urban and housing development in the water basins is a solid principle of the Master Plan, which limits future urban expansion and consequently determines urban structures and land use plans as described in the following chapter.

Very little New Urban Area within 30 km and Massive Expansion beyond 30 km

The above-mentioned direction of future spatial urbanization created the uniqueness of Istanbul Master Plan, where future urban areas are planned mainly in existing built-up areas with new urban and housing areas being marginally developed at the fringes of the 30 km radius (see very few sites for new urban and housing development in the color of yellow within the 30 km radius in Figure 9.2.5). In contrast, the massive new urban areas are planned far beyond the 30 km radius especially the western part of Istanbul, i.e. the district of Silivri. This is mainly due to the fact that most land areas, excluding the protected water basins, have already been covered with built-up areas within the 30km radius. However one exception is allowed, that is C: Kucukcekmece Basin where new urban and housing areas are planned/designated on considerably larger open lands. As described above, in the C: Kucukcekmece Basin rapid population increases are prominent currently and are forecast to continue.

The extent of urban expansion of Istanbul as described above is attributed to the IMM' idea of concentrating on existing settlements rather than having new settlement due to the difficulty in determining zones for new settlements, which was explicitly stated in the Master Plan as follows:

The restrictions that the natural structure demonstrate that it is difficult to determine the zones suitable for settlement in Istanbul and it is therefore prudent to concentrate or focus on improving the quality of the present settlements while taking necessary technical precautions and reducing the pressure on the natural areas.

(ISTANBUL MASTER PLAN Summary -English version)

As a result urban expansion was pushed off westward far beyond 30 km radius from the center.

(2) Transformation of Urban Structure

a) Linear Development Model

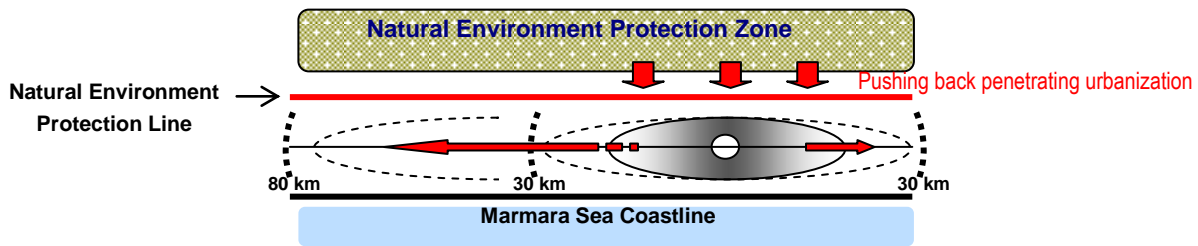
The IMM's environmental policy indicates the direction of the urbanization in the Master Plan to the narrow lengthening of future urban areas (10 km x 110 km) along the coastline (Figure 9.2.8). The Master Plan tells that the narrow and lengthy urban areas should be structured into "Linear development model extending on an east-west oriented axis" or

“Linear axis with multi-centered structure or hierarchical urban center system”.

b) Diagram of Urban Structure Transformation in the 2023 Master Plan

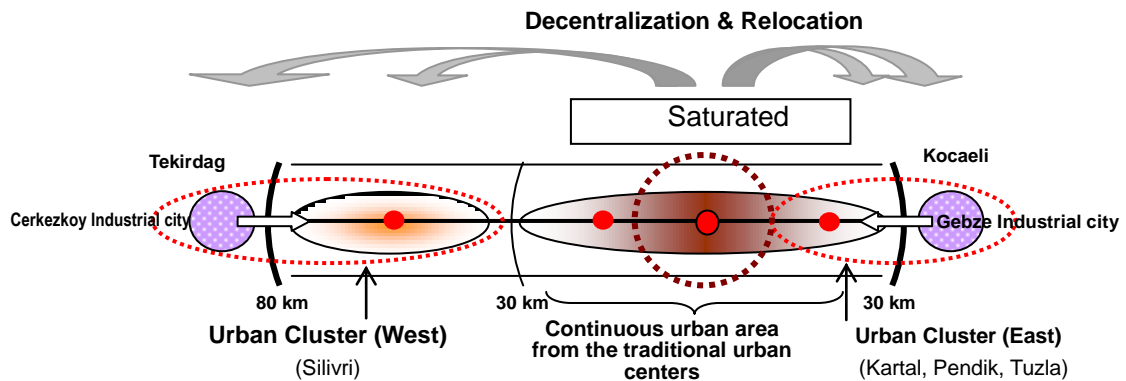
The urban structure transformation of Istanbul that the 2023 Master Plan aims at can be roughly put in a shape as shown in the diagram of Figure 9.2.9, considering and interpreting the policies and strategies of urban and industrial spatial development as proposed in the Master Plan. A consistent concept to the Istanbul Comprehensive Master Plan is represented by the key word “decentralization,” meaning that the saturated urban and industrial accumulation in the built-up areas will be decentralized or relocated into suburban areas toward east and west along the “linear development model” so as to relieve the saturated urban areas on one hand, and to develop new urban settlements in the suburban areas to accommodate the relocated industries from the saturated/congested urban areas and to promote new industries less dependent on the existing built-up areas, on the other hand. It is expected that less dependency of the new urban settlements (self-reliant town) on the existing urban centers will lessen the pressure or burden on the congested urban centers.

In the diagram of urban structure, development areas are classified as shown in Table 9.2.12. Among others, the most important six (6) districts in spatial development are specified: Kartal, Pendik, Tuzla, Kucukcekmece, Buyukcekmece and Silivri which altogether will accommodate as much as 98.7% of population increase and 85.2% of employment increase during the plan period between 2005 and 2023.



Source: *ibid.*

Figure 9.2.8 Expansion of Urban Areas: Narrow and Lengthy Urban Area



Source: *ibid.*

Figure 9.2.9 Transformation of Urban Structure: Decentralization and New Urban Clusters

Table 9.2.12 Area Classification for Urban Development

| Development Area | Definition | Administrative Districts |
|--|--|---|
| Exiting Urban Structure | | |
| Emerging urban area (East) | Rapid urbanization on the fringe of Eastern urban expansion with large amount of population allocated in M/P | Kartal, Pendik, Tuzla |
| Emerging urban area (West) | Rapid urbanization on the fringe of Western urban expansion with large amount of population allocated in M/P | Kucukcekmece, Buyukcekmece |
| Saturated urban areas in 2005 | Urban areas with less or no room for further growth | All urbanized districts except the above listed districts within the 30 km radius |
| East | Built-up areas on the Anatolia side | Districts on the eastside of Bosphorus Strait |
| Central | Built-up areas north of Historical Peninsula | Districts between Bosphorus Strait and Golden Horn |
| West | Built-up areas on the European side | Districts on the westside of Golden Horn |
| New Urban Structure | | |
| Continuously built-up urban area in 2023 | Istanbul built-up areas stretching as far as 30 km from the urban center in 2023 | All urbanized districts within the 30 km radius |
| New Urban area | New urban settlement developed beyond 30 km | Silivri |
| Urban cluster (East) | New urban settlement covering the industrial city of Gebze, centering on new urban center of Kartal | Kartal, Pendik, Tuzla, and Gebze |
| Urban cluster (West) | New urban settlement covering the industrial city of Cerkezkoy, centering new urban center of Silivri | Silivri and Cerkezkoy |

Source: *ibid.*

c) Structure of Population and Employment Distribution

The IMM translated 1/100,000 master plan into 1/25,000 land use plan, based on population and employment of each traffic zone was calculated as shown Table 9.2.13. This shows the basic directions and policies of human settlement/housing development of urban areas of Istanbul. The following landuse classification was used to calculate population by traffic zone : a) Hyper density (over 351 persons / ha), b) High density (151 - 350 persons / ha), c) Medium density (51 – 150 persons / ha), d) Low density (below 50 persons /ha) and 4) suburban.

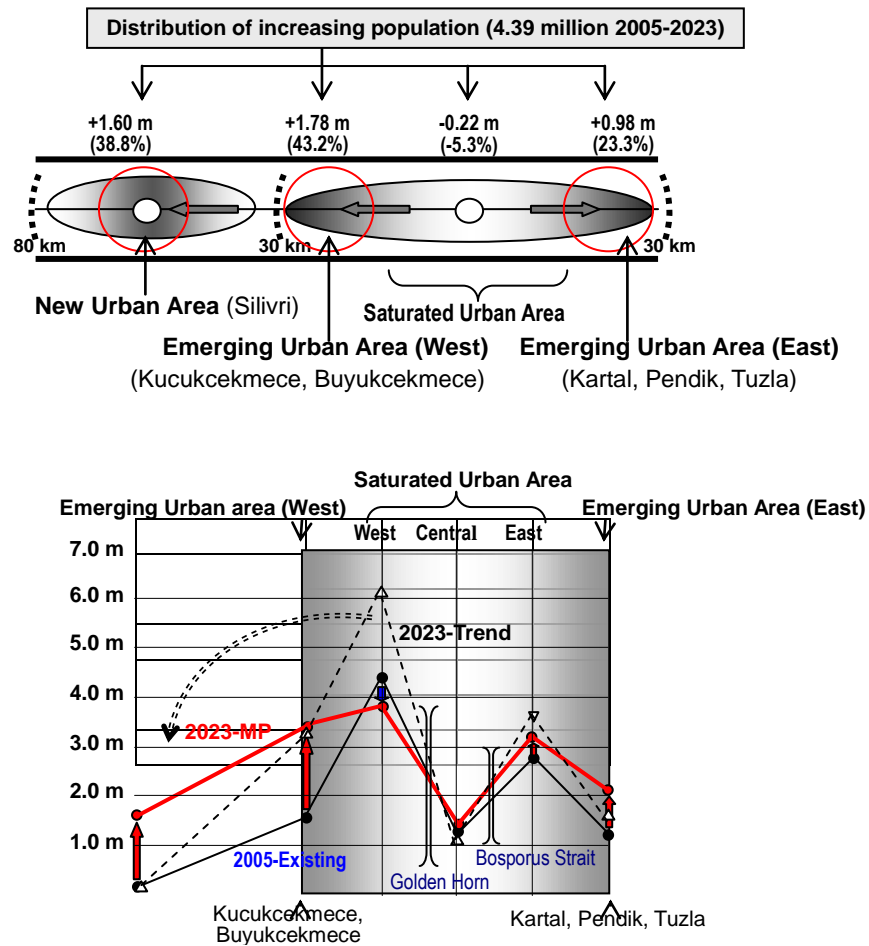
Table 9.2.13 Population and Employment Distribution by District Proposed in the MP

| No. | District (ilce) | Population | | | | Employment (Day Time) | | | Employee (Night Time) | | Day/Night | |
|-----|-----------------|------------|------------|--------------------------|------------|-----------------------|-----------|--------------------------|-----------------------|-----------|-----------|------|
| | | 2005 | 2023 IMM | Increment (fm. 05 to 23) | 2023 Trend | 2005 | 2023 | Increment (fm. 05 to 23) | 2005 | 2023 | 2005 | 2023 |
| 1 | Adalar | 16,592 | 56,080 | 39,488 | 8,988 | 3,834 | 326 | -3,508 | 5,087 | 20,424 | 0.75 | 0.02 |
| | Islands | 16,592 | 56,080 | 39,488 | 8,988 | 3,834 | 326 | -3,508 | 5,087 | 20,424 | 0.75 | 0.02 |
| 3 | Kadikoy | 597,906 | 793,333 | 195,427 | 300,775 | 225,179 | 265,416 | 40,237 | 213,435 | 338,062 | 1.06 | 0.79 |
| 11 | Uskudar | 585,087 | 637,928 | 52,841 | 738,578 | 146,124 | 120,504 | -25,620 | 204,316 | 267,058 | 0.72 | 0.45 |
| 5 | Maltepe | 400,851 | 527,861 | 127,010 | 427,901 | 70,474 | 158,456 | 87,982 | 132,450 | 208,317 | 0.53 | 0.76 |
| 10 | Umraniye | 800,737 | 860,413 | 59,676 | 1,512,376 | 233,433 | 233,969 | 536 | 271,381 | 348,758 | 0.86 | 0.67 |
| 2 | Beykoz | 230,628 | 152,637 | -77,991 | 220,474 | 51,062 | 60,300 | 9,238 | 70,220 | 52,061 | 0.73 | 1.16 |
| 7 | Sultanbeyli | 239,231 | 195,502 | -43,729 | 502,939 | 37,186 | 14,146 | -23,040 | 66,958 | 66,343 | 0.56 | 0.21 |
| | Saturated East | 2,854,440 | 3,167,674 | 313,234 | 3,703,042 | 763,458 | 852,791 | 89,333 | 958,760 | 1,280,599 | 0.80 | 0.67 |
| 4 | Kartal | 473,429 | 702,767 | 229,338 | 560,334 | 118,918 | 395,060 | 276,142 | 159,186 | 279,903 | 0.75 | 1.41 |
| 6 | Pendik | 508,386 | 998,611 | 490,225 | 916,573 | 104,680 | 193,155 | 88,475 | 160,705 | 395,975 | 0.65 | 0.49 |
| 9 | Tuzla | 133,733 | 390,728 | 256,995 | 124,255 | 72,752 | 591,941 | 519,189 | 41,227 | 141,888 | 1.76 | 4.17 |
| | Emerging East | 1,115,548 | 2,092,106 | 976,558 | 1,601,162 | 296,350 | 1,180,156 | 883,806 | 361,119 | 817,766 | 0.82 | 1.44 |
| 8 | Sile | 35,180 | 66,249 | 31,069 | 32,574 | 21,727 | 74,558 | 52,831 | 8,262 | 18,904 | 2.63 | 3.94 |
| | East Area | 4,005,168 | 5,326,029 | 1,320,861 | 5,336,778 | 1,081,535 | 2,107,505 | 1,025,970 | 1,328,141 | 2,117,269 | 0.81 | 1.00 |
| 18 | Beyoglu | 226,664 | 196,461 | -30,203 | 144,481 | 122,877 | 116,603 | -6,274 | 69,636 | 76,873 | 1.76 | 1.52 |
| 31 | Sisli | 277,879 | 352,090 | 74,211 | 213,075 | 246,054 | 354,418 | 108,364 | 100,909 | 166,119 | 2.44 | 2.13 |
| 17 | Besiktas | 179,299 | 203,634 | 24,335 | 99,175 | 128,170 | 89,321 | -38,849 | 64,515 | 94,343 | 1.99 | 0.95 |
| 27 | Kagithane | 374,890 | 371,411 | -3,479 | 349,028 | 108,146 | 159,494 | 51,348 | 129,579 | 156,349 | 0.83 | 1.02 |
| 29 | Sariyer | 274,742 | 257,727 | -17,015 | 297,817 | 52,280 | 71,874 | 19,594 | 95,167 | 110,061 | 0.55 | 0.65 |
| | Saturated | 1,333,474 | 1,381,323 | 47,849 | 1,103,575 | 657,527 | 791,710 | 134,183 | 459,806 | 603,745 | 1.43 | 1.31 |
| | Central Area | 1,333,474 | 1,381,323 | 47,849 | 1,103,575 | 657,527 | 791,710 | 134,183 | 459,806 | 603,745 | 1.43 | 1.31 |
| 21 | Eminonu | 45,158 | 66,180 | 21,022 | 14,746 | 171,198 | 104,696 | -66,502 | 15,424 | 29,576 | 11.10 | 3.54 |
| 24 | Fatih | 369,133 | 327,769 | -41,364 | 185,399 | 115,997 | 109,794 | -6,203 | 113,310 | 125,522 | 1.02 | 0.87 |
| 23 | Eyup | 261,203 | 314,314 | 53,111 | 194,584 | 77,047 | 108,641 | 31,594 | 82,963 | 121,285 | 0.93 | 0.90 |
| 32 | Zeytinburnu | 287,821 | 227,682 | -60,139 | 342,105 | 145,881 | 182,625 | 36,744 | 94,696 | 92,035 | 1.54 | 1.98 |
| 16 | Bayrampasa | 255,150 | 279,141 | 23,991 | 201,367 | 130,970 | 167,769 | 36,799 | 81,867 | 109,206 | 1.60 | 1.54 |
| 25 | Gaziosmanpasa | 997,398 | 778,860 | -218,538 | 1,904,302 | 197,673 | 112,813 | -84,860 | 309,232 | 291,917 | 0.64 | 0.39 |
| 22 | Esenler | 462,306 | 385,079 | -77,227 | 864,969 | 91,228 | 103,870 | 12,642 | 147,532 | 147,685 | 0.62 | 0.70 |
| 26 | Gungoren | 296,145 | 188,328 | -107,817 | 274,887 | 127,928 | 92,326 | -35,602 | 103,707 | 78,287 | 1.23 | 1.18 |
| 13 | Bagcilar | 721,073 | 626,727 | -94,346 | 1,267,973 | 210,332 | 255,572 | 45,240 | 231,148 | 243,417 | 0.91 | 1.05 |
| 14 | Bahcelievler | 574,070 | 477,238 | -96,832 | 764,531 | 152,149 | 173,246 | 21,097 | 194,063 | 195,973 | 0.78 | 0.88 |
| 15 | Bakirkoy | 174,658 | 191,441 | 16,783 | 64,001 | 107,660 | 234,100 | 126,440 | 64,292 | 84,956 | 1.67 | 2.76 |
| | Saturated West | 4,444,115 | 3,862,759 | -581,356 | 6,078,863 | 1,528,063 | 1,645,452 | 117,389 | 1,438,234 | 1,519,857 | 1.06 | 1.08 |
| 28 | Kucukcekmece | 742,568 | 1,506,082 | 763,514 | 1,144,222 | 258,753 | 309,908 | 51,155 | 235,370 | 562,322 | 1.10 | 0.55 |
| 12 | Avclar | 283,114 | 266,781 | -16,333 | 390,532 | 57,642 | 98,553 | 40,911 | 101,524 | 115,834 | 0.57 | 0.85 |
| 19 | Buyukcekmece | 578,053 | 1,608,063 | 1,030,010 | 1,742,730 | 170,728 | 563,450 | 392,722 | 199,927 | 676,032 | 0.85 | 0.83 |
| | Emerging West | 1,603,735 | 3,380,926 | 1,777,191 | 3,277,484 | 487,123 | 971,911 | 484,788 | 536,821 | 1,354,188 | 0.91 | 0.72 |
| 20 | Catalca | 82,035 | 267,523 | 185,488 | 57,897 | 62,078 | 249,569 | 187,491 | 24,841 | 101,690 | 2.50 | 2.45 |
| 30 | Silivri | 123,230 | 1,725,360 | 1,602,130 | 136,415 | 42,661 | 633,527 | 590,866 | 38,418 | 682,827 | 1.11 | 0.93 |
| | West Area | 6,253,115 | 9,236,568 | 2,983,453 | 9,550,658 | 2,119,925 | 3,500,459 | 1,380,534 | 2,038,314 | 3,658,562 | 1.04 | 0.96 |
| | Total | 11,608,349 | 16,000,000 | 4,391,651 | 16,000,000 | 3,862,821 | 6,400,000 | 2,537,179 | 3,831,348 | 6,400,001 | 1.01 | 1.00 |
| | Saturated | 8,632,029 | 8,411,756 | -220,273 | 10,885,480 | 2,949,048 | 3,289,953 | 340,905 | 2,856,800 | 3,404,202 | 1.03 | 0.97 |
| | East | 2,854,440 | 3,167,674 | 313,234 | 3,703,042 | 763,458 | 852,791 | 89,333 | 958,760 | 1,280,599 | 0.80 | 0.67 |
| | Central | 1,333,474 | 1,381,323 | 47,849 | 1,103,575 | 657,527 | 791,710 | 134,183 | 459,806 | 603,745 | 1.43 | 1.31 |
| | West | 4,444,115 | 3,862,759 | -581,356 | 6,078,863 | 1,528,063 | 1,645,452 | 117,389 | 1,438,234 | 1,519,857 | 1.06 | 1.08 |
| | Emerging East | 1,115,548 | 2,092,106 | 976,558 | 1,601,162 | 296,350 | 1,180,156 | 883,806 | 361,119 | 817,766 | 0.82 | 1.44 |
| | Emerging West | 1,603,735 | 3,380,926 | 1,777,191 | 3,277,484 | 487,123 | 971,911 | 484,788 | 536,821 | 1,354,188 | 0.91 | 0.72 |
| | New urban | 123,230 | 1,725,360 | 1,602,130 | 136,415 | 42,661 | 633,527 | 590,866 | 38,418 | 682,827 | 1.11 | 0.93 |

Source : Elaborated Study Team based on the Census Data

i) Population Distribution

Nearly 94% of the population increase of 4.39 million up to 2023 is distributed in mainly 6 districts while population decreases are assumed throughout the saturated urban areas; new urban area (Silivri): 1.60 million (38.8%), emerging urban area (West) (Kucukcekmece, Buyukcekmece): 1.78 million (43.2%), emerging urban area (East) (Kartal, Pendik, Tuzla): 0.98 million (23.3%) and saturated urban area: -0.22 million (-5.3%) (Figure 9.2.10).



Source : Study Team

Figure 9.2.10 Population Distribution in 2005, 2023

However there are still some districts in the saturated urban areas that have persistently increasing population (See Chapter 1). When this increasing trend continues as they are, the population of the saturated areas, especially in the west will reach around 6 million (Figure 9.2.10). This will create a gap of 2 million with the target of the Master Plan. Also, in the previous Figure 9.2.5, the urban areas in 2000 and 2020 show the tendency of population concentration within the 30 km radius from the urban center. Since population change is likely to represent the current potential for housing development or people's preference on where to live, drastic measures in city planning and development are be indispensable in order to realize the proposed population distribution.

ii) Employment Distribution

The 2023 Comprehensive Master Plan of Istanbul recognizes that Istanbul's industrial structure must be reformed in order to develop into a global city as it faces an intensifying economic globalization in association with the development of information and communication technology.

Industrial structural reform of Istanbul includes two innovative tasks, which are complementary with each other:

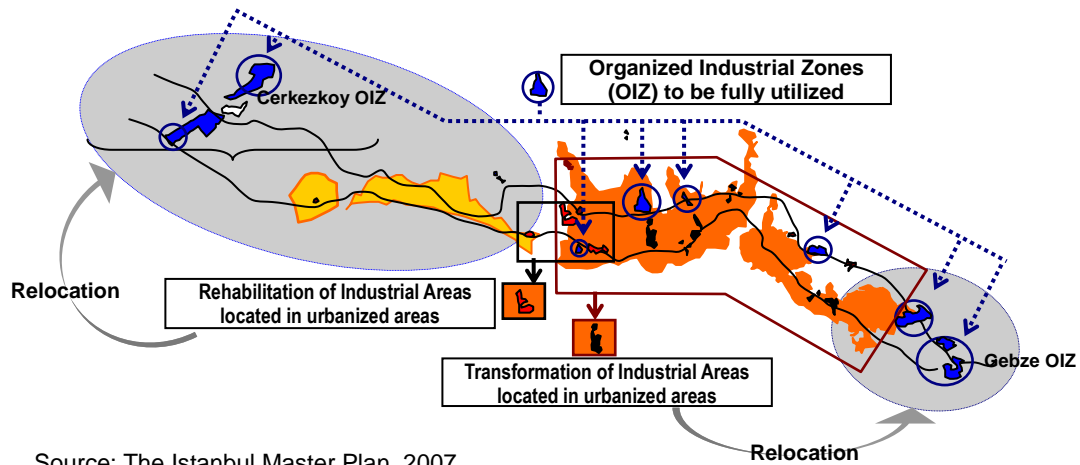
- Shift of the traditional manufacturing industry to high-value added industries such as hi-tech industry and technology intensive production.
- Conversion to, and development of service industry including “advanced producers services” such as accountancy, advertising, management, finance and legal service which are all necessary in a globalizing city.

The Master Plan advocates that the industrial structural reform should be accomplished in the process of urban structure transformation as diagrammed in the previous Figure 9.2.

In line with the proposed urban structure transformation, the industrial development policies (decentralization and transformation) were set forth as shown in Figure 9.2.11 and summarized as follows:

- “Organized Industrial Zones” aim to realize their full potential by alleviating existing problems (İkitelli, Tuzla, Dudullu, Beylikduzu, and Tekstilkent).
- “Functional Transformation (Regeneration) of Industrial Areas” is determined for the industrial activities located in the central zones, which have expansion limitations and are in conflict with surrounding condition such as increasing land values. The industrial areas in Zeytinburnu, İkitelli Axis, Bayrampasa, and Kartal should be considered as potential transformation areas from industry to service activities.
- “Rehabilitation of Industrial Areas within Existing Boundaries” envisages no new investment but allows better actions in these areas. The neighboring regions of Istanbul should also be taken into consideration from the perspective of the entire metropolitan region. Gebze and Cerkezkoy are the neighboring districts of Istanbul in the east and west. These districts not only enjoy the advantages of being close to the IMA and its consumption markets, but also have OIZs which are yet to be fully utilized. Provision of transportation and logistics facilities to these areas will accelerate the agglomeration of economies for industrial establishments. Therefore, these regions should be developed as industrial regions with problem solving intentions.

(Quoted from Key Intervention Areas of the Master Plan)

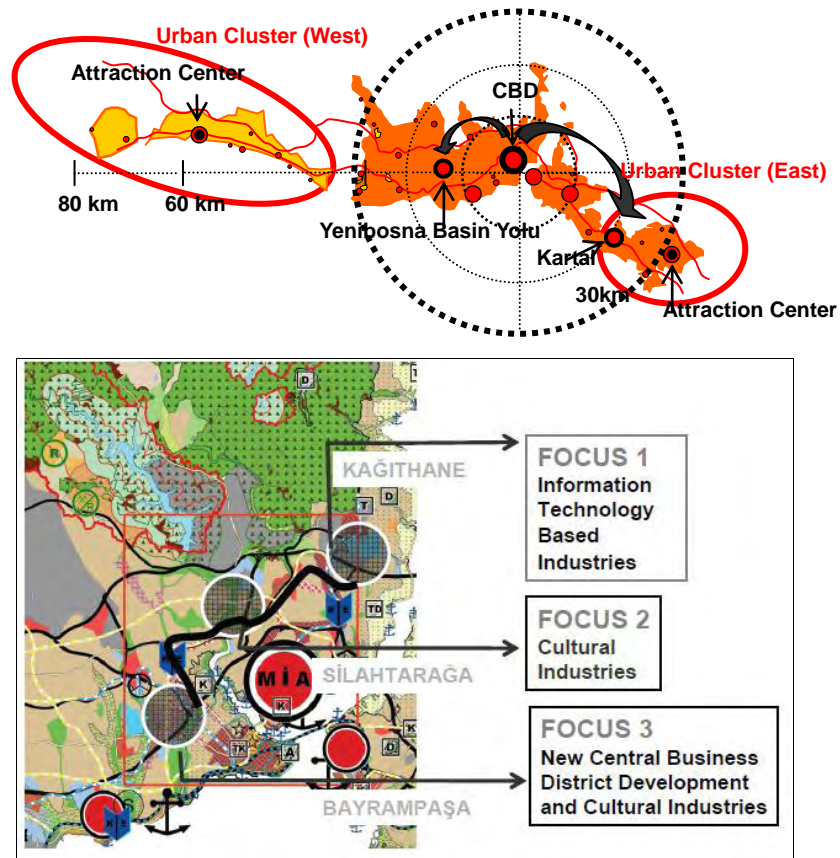


Source: The Istanbul Master Plan, 2007

Figure 9.2.11 Industrial Decentralization and Transformation Policies

The Master Plan set forth the strategies for developing the trade and service industries as follows:

- Transforming Istanbul from an industrial city to a metropolis with a special focus on the services sector.
- Polycentric urban development is necessary for improving the efficient functionality of the services sector in the spatial reorganization of the metropolitan area. Principally, the development should be dispersed throughout the metropolitan area through “Advanced Centers”, “Sub Centers”, and “Pull Centers” as outlined in Figure 9.2.12.



Buyukdere- Maslak and Kagithane in a network for orienting CBD

Advanced Centers (Centers of High Order Services)

- **CBD**
 - 1. Historical Center - Historical Peninsula-Beyoglu-Sisli-Besiktas axis
 - 2. Prestige Center - Buyukdere- Maslak and Kagithane in a network for orienting CBD
- **Advanced Centers for decentralization of the CBD in the East and the West**
 - 1. Kartal
 - 2. Yenibosna Basin Yolu

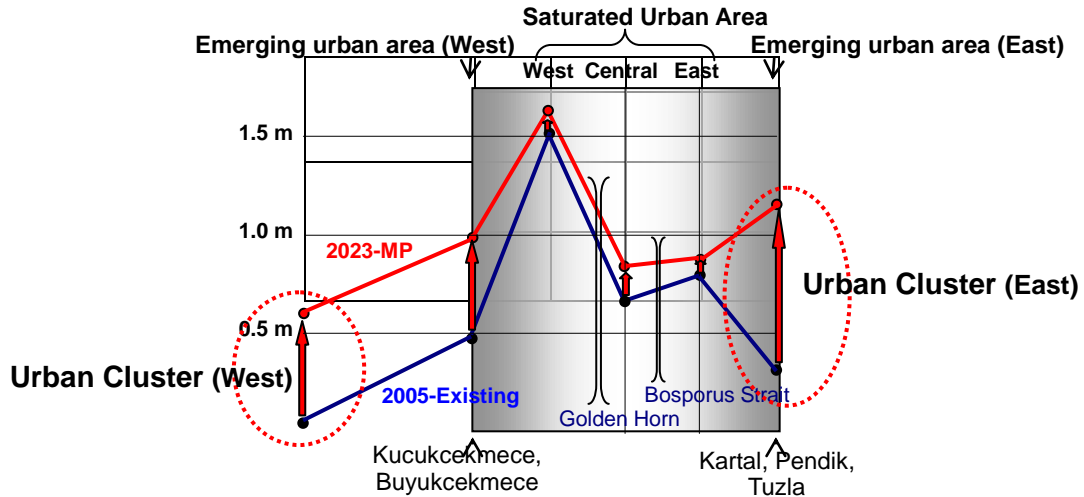
Sub and Pull Centers

- 1. Grade 1 Sub Centers - Bakirkoy-Bahcelievler, Kadikoy
- 2. Grade 2 Sub-Centers - District centers
- 3. New pull-Centers - Silivri and Kartal

Source: The Istanbul Master Plan, 2007

Figure 9.2.12 Polycentric Urban Development with Hierarchy of Centers

Future employment distribution as projected based on the policies and strategies of urban and industrial development in the Master Plan is summarized in Figure 9.2.13. 85 % or 1.96 million of employment is envisioned to increase by the year 2023 in the eastern and western fringes of Istanbul; emerging urban area (East): 38% or 0.88 million, emerging urban area (West) 21% or 0.48 million, and new urban area Silivri 26% or 0.59 million while only 15 % or 0.34 million in the saturated urban area. This lopsided distribution is the natural result of the decentralization policy, more specifically the relocation of urban industries (manufacturing and trade/services) in the existing built-up areas.



Source : Study Team

Figure 9.2.13 Summary of Employment Distribution in 2005, 2023

iii) Spatial Balance between Population and Employment

The intention of the Master plan is expressed in the distribution of population and employment in the east and west areas. Ratio of daytime employment to nighttime employment stands for the balance between number of residents and job opportunities.

Table 9.2.14 Spatial Balance between Population and Employment

| | Population increase | Employment increase | Ratio of day time employment to night time employment | |
|-------------------------|---------------------|---------------------|---|------|
| | (Night time) | (Day time) | 2005 | 2023 |
| | 2005-2023 | 2005-2023 | | |
| 1. Saturated Urban Area | -220,273 | 340,905 | 1.03 | 0.97 |
| East | 313,234 | 89,333 | 0.81 | 0.67 |
| Central | 47,849 | 134,183 | 1.43 | 1.31 |
| West | -581,356 | 117,389 | 1.06 | 1.08 |
| 2. Emerging East | 976,558 | 883,806 | 0.82 | 1.44 |
| 3. Emerging West | 1,777,191 | 484,788 | 0.91 | 0.72 |
| 4. New urban (Silivri) | 1,602,130 | 590,866 | 1.11 | 0.93 |
| 1. East Area | 1,320,861 | 1,025,970 | 0.81 | 1.00 |
| 2. Central Area | 47,849 | 134,183 | 1.43 | 1.31 |
| 3. West Area | 2,983,453 | 1,380,534 | 1.04 | 0.96 |
| Total | 4,391,651 | 2,537,179 | 1.00 | 1.00 |

Source : Elaborated Study Team based on the Census Data

The ratio of 0.81, which is less than 1.0, in the East area in 2005 implies the lack of employment opportunities in the eastern part, so that employees living there must commute somewhere else like the central and western areas, which have high ratios of 1.43 and 1.06 respectively. The Master Plan intends to correct this imbalance through population and employment allocation; that is “larger employment to the east and larger population to the west”. According to the projection, employment will increase by as large as 1.03 million compared with a 1.32 million increase of population in the eastern area. In contrast population will increase by as large as 2.98 million compared with only a 1.38 million increase in employment in the western area. Consequently, the ratio will increase

from 0.81 to 1.00 in 2023 in the eastern area, which shows a perfect balance between population and employment. The engine which increases the employment in the east, as a whole, is the district of Tuzla. Its ratio will increase from 1.76 in 2005 to 4.17 in 2023. It is projected that in Tuzla employment grows by 519 thousand while population increase only by 2567 thousand.

9.3 Special Project Areas of the Istanbul Master Plan, 2006 - 2023

The Special Project Area is determined in the entire city area in relation to the vision and objectives of the Istanbul Master Plan's (August 2007), and it plays an important role for realizing the general vision comprising of three themes; 1) Environmental sustainability, 2) Economic development and 3) Social sustainability strategically. The total number of Special Project Areas is 48, of which 6 areas are for environmental sustainability, 22 areas for economic development and 20 areas for social sustainability as shown in the following table:

Table 9.3.1 Outline of Special Project Areas of Istanbul Comprehensive Master Plan, 2006 – 2023 (under revision)

| The Master Plan's Objectives | Special Areas' Type | Selected Project Areas |
|---|--|---|
| Environmental Sustainability (6 areas) | <ul style="list-style-type: none"> - Rehabilitation of river protection areas occupied by industries - Rehabilitation of polluted lakes that have great ecological significance - Rehabilitation of water catchment areas | 1. Kucukcekmece Lake Rehabilitation and Environmental Management Special Project Area |
| | | 2. Kamil Abdus Lake Rehabilitation Special Project Area |
| | | 3. Dudullu Organized Industry Area Basin Rehabilitation Special Project Area |
| | | 4. Kirac Esenyurt Bahcesehir High Technology Based Production Special Project Area |
| | | 5. Cendere Valley Rehabilitation Special Project Area |
| | | 6. Cebeci Valley Rehabilitation Special Project Area |
| Economic Development (22 areas) | - Transformation from industry to service (10 project areas) | 7. Media Express Way High Level Center Special Project Area |
| | | 8. Kagithane Center And Boulevard Connection Special Project Area |
| | | 9. Bayrampasa – Topkapi – Maltepe CBD Expansion Special Project Area |
| | | 10. Kartal High Level Center Special Project Area |
| | | 11. Tuzla Specialized Center Special Project Area |
| | | 12. Pendik Secondary Center Special Project Area |
| | - Transformation from port and train station to center (1) | 13. Maltepe Dragos Center Special Project Area |
| | | 14. Gaziosmanpasa Center Special Project Area |
| | | 15. Gurpinar Center Special Project Area |
| | - New center development areas (4) | 16. Selimpasa Center Special Project Area |
| | | 17. Harem Haydarpasa Primary Center Special Project Area |
| | | 18. Silivri High Level Center Special Project Area |
| - Existing center rehabilitation (1) | 19. Esenyurt Primary Center Special Project Area | |
| | 20. Ispartakule Secondary Center Special Project Area | |
| | 21. Basaksehir Secondary Center Special Project Area | |
| - Port and logistic development (3) | 22. Buyukdere CBD Rehabilitation Special Project Area | |
| | 23. Ambarli Port Special Project Area | |
| | 24. Gumusyaka Logistic Center & Port Special Project Area | |
| - Techno parks and university development (3) | 25. Hadimkoy Logistics Center Special Project Area | |
| | 26. Degirmenkoy Technology Development Park Special Project Area | |
| | 27. Canta University Special Project Area | |
| | 28. Armutlu University Special Project Area | |

| | | |
|-------------------------------------|---|---|
| Social Sustainability (20 areas) | - Historical area conservation (1) | 29. Okmeydani Conservation Special Project Area |
| | - Creation of culture, recreation and tourism areas (9) | 30. Bakirkoy Kazlicesme Coastal Area Special Project Area 31. Halic Culture Corridor And Silhouette Area Special Project Area 32. Karadeniz Recreation And Tourism Special Project Area 33. Riva Tourism Culture And Recreation Special Project Area 34. Avclar Firuzkoy Fair Area Special Project Area 35. Kinali Fair And Recreation Area Special Project Area 36. Kumburgaz Tourism Area Special Project Area 37. Kucukcekmece – Avclar Inner – Outer Waterfront Recreation Area 38. Beylikduzu Recreation Center Special Project Area |
| | - Social infrastructure and recreation (8) | 39. Mimar Sinan Health Park And Recreation Special Project Area 40. Gaziosmanpasa Regional Park Special Project Area 41. Silivri Health Park Special Project Area 42. Silivri Regional Park Special Project Area 43. Gungoren Bahcelievler Regional Park Special Project Area 44. Bagcilar Bahcelievler Regional Park Special Project Area 45. Maltepe Regional Park Special Project Area 46. Eyup Regional Park Special Project Area |
| | - Creation of living environment (2) | 47. Bahcesehir Transformation From Industry To Housing 48. Beylikduzu Gurpinar Center Special Project Area |

Source: The Istanbul Comprehensive Master Plan, 2006 – 2023 (under revision)

The special project area intends to promote the following key points to protect the environmental assets and meet the social needs.

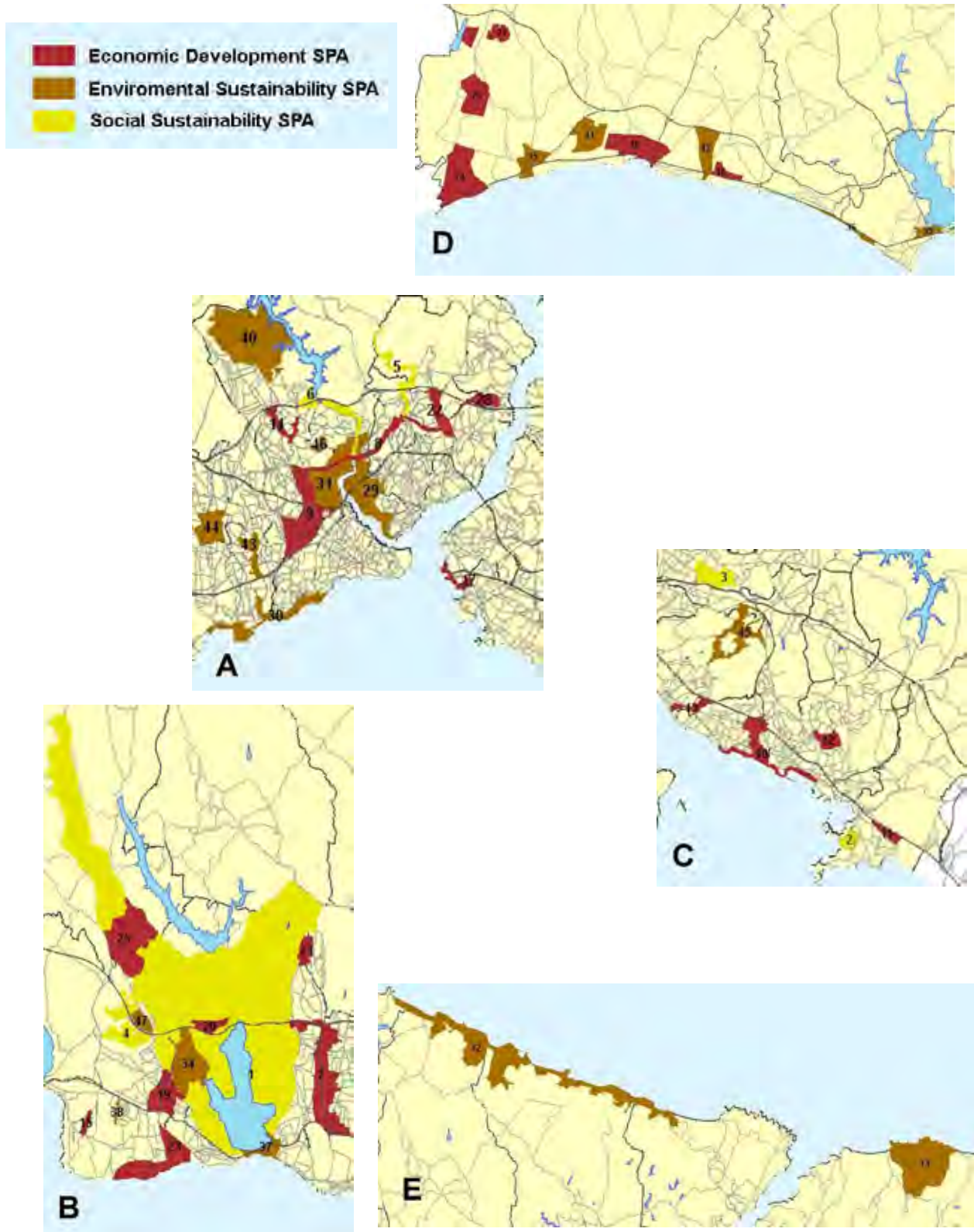
- Control of population distribution and development of new urban centers
- Upgrading of disaster-free residential area
- Enhancement of industrial economic transformation from secondary to tertiary
- Linear poly-centric urban structure

At present, the Istanbul Master Plan, particularly of the 1/25,000 scale, is still under discussion.

In practice, Istanbul Greater Municipality invited certain firms both domestic and international to submit design proposals on some projects in the Special Project Areas. Actually implementation of the Special Project Areas needs financial arrangement by both public and private resources.

Project will be implemented after design and funding arrangements. An implementation unit for the Special Project Areas will be established by consortium of stakeholders and investors, and Istanbul Greater Municipality will set up an implementation management unit within its organization. District office will take responsibility of the Special Project Area mainly.

Realization of proposed master plan depends largely on the successful development of the proposed Special Project Areas with appropriate funding by both public and private sectors, and it will play a vital role to meet the proposed socio-economic framework of the Master Plan.



Source: Special Project Areas in the Istanbul Comprehensive Master Plan, 2006 – 2023 (under revision), IMM
Figure 9.3.1 Special Project Areas by the Istanbul Master Plan

Chapter 10 Transportation Demand Forecast

10.1 Travel Demand Model

10.1.1 Model Structure and Procedure

After completing the person trip survey and the analysis of the present traffic data, the Study Team has developed a demand forecast model following commonly known "Four-Step Method" using TransCAD and JICA STRADA. The four-steps are predictions of (1) zone-wise trip production and attraction by purpose, (2) trips between origin zone to destination zone by purpose, (3) zone-to-zone trips by transport mode and (4) traffic volume on each link of a transport network.

The flowchart in Source: *ibid.*

Figure 10.1.1 shows the process taken for demand forecast. The model was prepared separately by category such as motorized or non-motorized households, trip purposes and transport modes corresponding to each step, as shown in Table 10.1.1. This is because the number of daily trips for motorized household members is considerably higher than the non-motorized households, and the analysis of travel demand structure by person trip has revealed that trip conditions differ by trip purpose and by transport mode.

Trip purpose is classified into home-based work (HBW), home-based school (HBS), home-based others (HBO) and non-home based (NHB). Note that the trips by zone include trips from/to home in the zone and trips with non-home trip end in the zone. In contrast, trips going back home are classified as "To home" purpose in Japan. For example, "To work" purpose excludes "return to home" trips in Japan. In this Study, however, the Study Team decided to follow the Turkish (or international) way of trip classification.

The classifications of household car ownership, trip purpose and transport mode are shown below.

1) Classification of Household Car Ownership

- a) Motorized Household: Household owning at least one vehicle
- b) Non-Motorized Household: Household owning no vehicle

2) Trip Purposes

- a) Home Based Work (HBW)
- b) Home Based School (HBS)
- c) Home Based Others (HBO)
- d) Non Home Based (NHB)

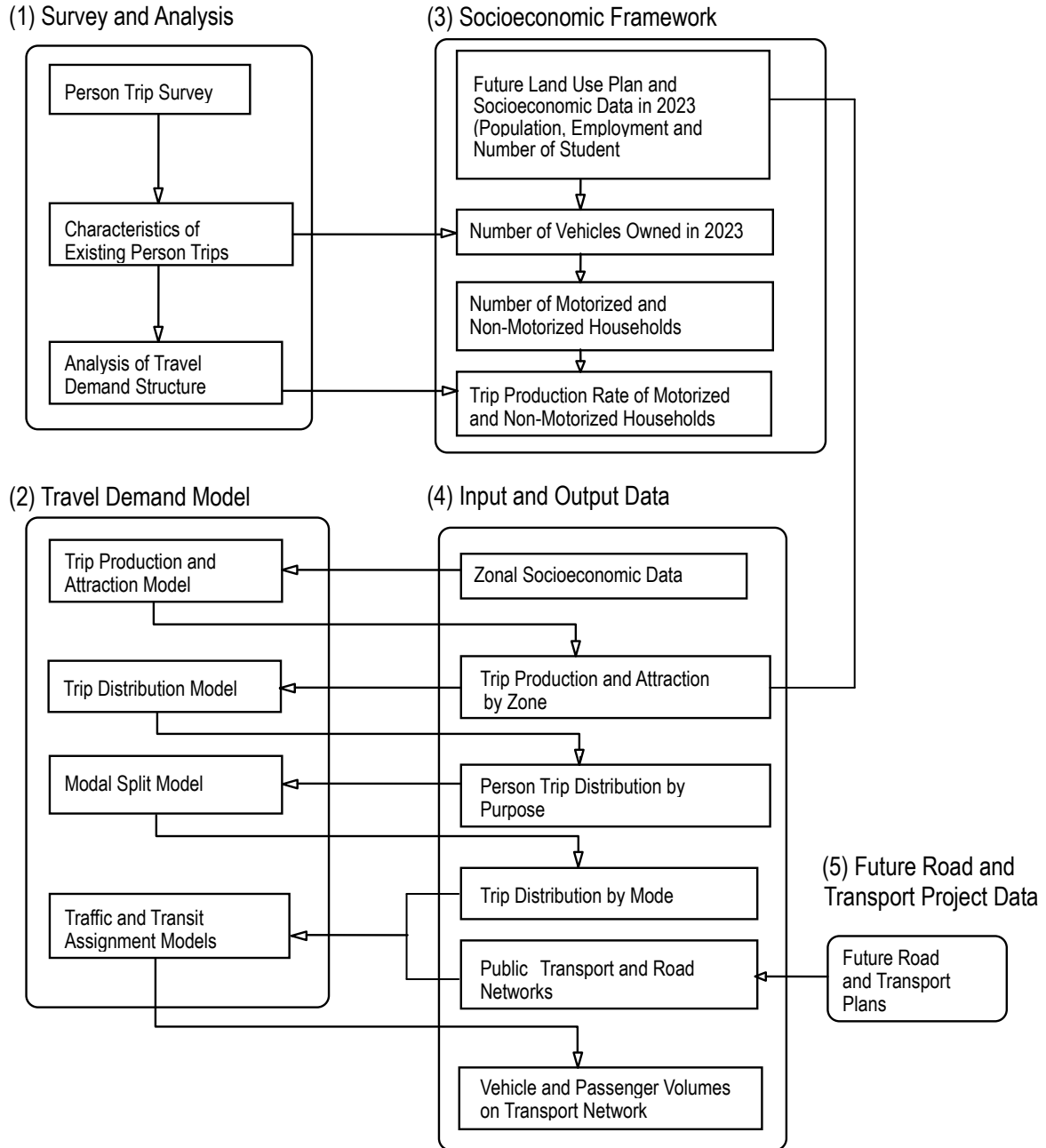
3) Transport Modes

- a) Walking
- b) Car: Car, taxi and motorcycle
- c) Service: Company bus for employees and school bus
- d) Public: Shared taxi (Dolmus), mini bus, public bus, metro, tramway, tunnel, ferry boat, sea bus, and sub-urban railway

Table 10.1.1 Model Structure

| Step | By Household car ownership | By Trip Purpose | By Mode |
|--|----------------------------|-----------------|---------|
| 1) Trip Generation and Attraction Model | - | v | - |
| 2) Trip Distribution Model | - | v | - |
| 3) Modal Split Model | - | v | v |
| 4) Traffic Assignment (including transit assignment) | - | - | v |

Source: Study Team



Source: *ibid.*

Figure 10.1.1 Procedure for Transport Demand Forecast

10.1.2 Trip Production and Attraction Model by Zone

Trip production and attraction, including walking mode, were forecasted by zone and by the aforementioned trip purpose. Trip production and attraction models for HBW and HBS were forecasted using trip rates while HBO and NHB models were developed by linear regression. Table 10.1.2 shows the list of variables used in the production and attraction models. The parameters are shown in the following related sections.

In trip production, models were prepared to predict production and attraction separately by purpose. Each number of produced trips was adjusted to make the total in accordance with the control total antecedently predicted.

Table 10.1.2 Variable List in Production and Attraction Model

| Trip Purpose | Production | Attraction |
|--------------|--|--|
| HBW | Workers in Home | Employment in Working Place |
| HBS | Students in Home | Students in School Place |
| HBO | Population Average Income Workers in Home | Population Student in School Employment in Working Place |
| NHB | Students in School Employment in Working Place | Population Student in School Employment in Working Place |
| | Control Total Population Students in Home Number of Vehicles Average Income Employment in Working Place | |

Source: *ibid.*

1) HBW and HBS

Trip production and attraction models in HBW and HBS are shown below:

1) Production and Attraction Model of HBW

- HBW Production = Net Trip Rate (1.94) * Working Ratio (0.88) * Number of Workers (Home Place) by zone
- HBW Attraction = Net Trip Rate (1.94) * Working Ratio (0.88) * Number of Employment (Working Place) by zone

2) Production and Attraction Model of HBS

- HBS Production = Net Trip Rate (2.02) * Studying Ratio (0.87) * Number of Students (Home Place) by zone
- HBS Attraction = Net Trip Rate (2.02) * Studying Ratio (0.87) * Number of Students (School Place) by zone

2) HBO and NHB

Linear regression models were developed to estimate the trip production and attraction. The equation is shown below:

$$G_i = a + b_1 * X_{i1} + b_2 * X_{i2} + b_3 * X_{i3} + \dots$$

$$A_j = a + b_1 * X_{j1} + b_2 * X_{j2} + b_3 * X_{j3} + \dots$$

where;

- Gi: Production trip from zone i
 Aj: Attraction trip to zone j
 Xin, Xjn: Socioeconomic data in zone i or j
 a, bn: model parameters

The parameters are shown in Table 10.1.3. In case of NHB trips, control total was used. Then, numbers of trips resulted from regression models were adjusted to make their total meet the control total.

Table 10.1.3 Parameter of Trip Production and Attraction Model

| Trip Purpose | Gen/Att | Y = a + b1*X1 + b2*X2 + b3*X3 + b4*X4 + b5*X5 | | | | | R Squared | |
|--------------|-----------------------------|---|--------------------|--------------------|--------------------|----------------|------------|-------|
| | | a | b1 | b2 | b3 | b4 | | b5 |
| HBO | Generation | -748,943 | 0.425737 | 1,163,230 | 0.558952 | | 0.986 | |
| | | | Population | Average Income | Workers | | | |
| HBO | Attraction | 1,063,040 | 0.44342 | 0.290994 | 0.257524 | | 0.849 | |
| | | | Population | Students at School | Employment | | | |
| NHB | Generation | 511,731 | 0.089921 | 0.296634 | | | 0.718 | |
| | | | Students at School | Employment | | | | |
| | Attraction | 464,118 | 0.015623 | 0.03754 | 0.286727 | | 0.641 | |
| | | | Population | Students at School | Employment | | | |
| | Control Total of Generation | | | | | | | |
| | | -33,342 | 0.091362 | -0.0225442 | 0.426405 | 0.100278 | -0.00149 | 0.990 |
| | | | Population | Students in Home | Number of Vehicles | Average Income | Employment | |

Source: *ibid.*

10.1.3 Trip Distribution Model

A Doubly Constrained Gravity Model was developed to predict trip distribution by purpose. This model forecasts intra- and inter-zonal trips.

The Gravity Model is expressed by the following formula.

$$T_{ij} = A_i B_j * [(O_i D_j) / d_{ij}^\beta]$$

- T_{ij} : Trips between zone i and j
 A_i : Constant balance trips originating from Zone i
 B_j : Constant balance trips destined for Zone j
 O_i : Total number of trips originating from Zone i
 D_j : Total number of trips destined for Zone j
 d_{ij} : Travel time between zone i and zone j (hr)

The model parameters are shown in Table 10.1.4.

Table 10.1.4 Parameters of Trip Distribution Model

| Trip Purposes | β |
|-------------------------|---------|
| Home based work (HBW) | 1.913 |
| Home based school (HBS) | 3.022 |
| Home based other (HBO) | 2.410 |
| Non-home based (NHB) | 1.736 |

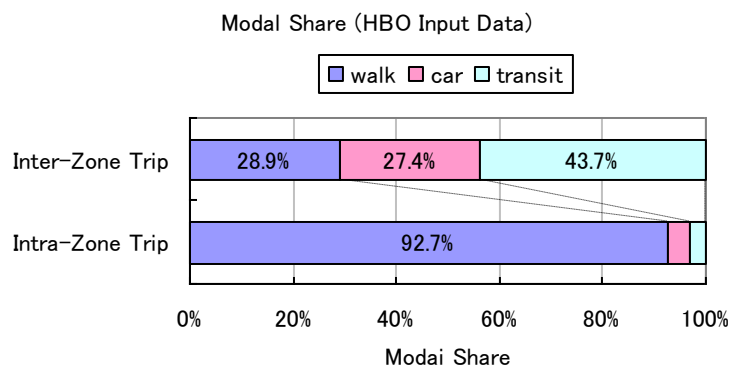
Source: *ibid.*

10.1.4 Modal Split Model

1) Present Characteristics of Modal Choice

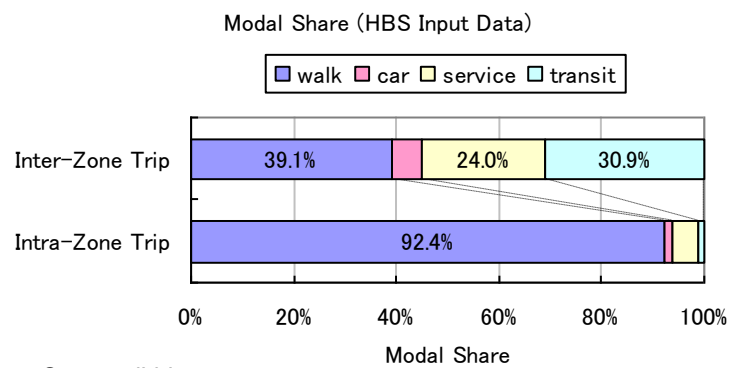
The modal choice between walking, car, service and public transport was forecasted after estimating the P-A matrix by trip purpose using a multi-nominal logit model. In the modal split model, transport modes were aggregated into 4 modes: walking, car, service, and public transport which includes all kinds of buses, rail transit and ferry/sea-bus.

Before developing the modal split model, present characteristics in modal choices were analyzed. Figure 10.1.3 and Figure 10.1.4 show observed modal shares for inter-zonal and intra-zonal trips. In both figures, share of walking trips is predominant in intra-zone trips exceeding 90%, while in the inter-zone trips shares are more evenly distributed among modes. This suggests that the model should be built for inter- and intra-zone trip individually.



Source: *ibid.*

Figure 10.1.2 Observed Modal Share for Inter- and Intra-Zone Trips in HBS and HBO



Source: *ibid.*

Figure 10.1.3 Observed Modal Share for Inter- and Intra-Zone Trips in HBW and NHB

2) Multi-nominal Logit Model

Table 10.1.5 shows the mode coefficient of utility function. The following is a utility function in the logit model:

$$U_{walk} = \beta_4 \times \ln(\text{distance}) + \beta_7 \times \ln(\text{time})$$

$$U_{car} = \beta_1 + \beta_5 \times (\# \text{car in zone}) + \beta_6 \times (\text{income}) + \beta_7 \times \ln(\text{time}) + \beta_8 \times \ln(\text{cost})$$

$$U_{\text{service}} = \beta_2 + \beta_7 \times \ln(\text{time}) + \beta_8 \times \ln(\text{cost})$$

$$U_{\text{transit}} = \beta_3 + \beta_7 \times \ln(\text{time}) + \beta_8 \times \ln(\text{cost})$$

Where:

U_i: Utility of mode i: mode option (walking, car, service, public transport)

β₁, β₂, β₃, β₄, β₅, β₆, β₇, β₈: coefficient of mode

$$P_i = \frac{\exp(U_i)}{\sum \exp(U_j)}$$

Where:

P_i: probability to choose the mode i

Table 10.1.5 Coefficient of Utility Function

| Variables | Mode | HWB | | HBS | | HBO | | NHB | | |
|-------------------------|-----------------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|--------|
| | | Parameter | t-value | Parameter | t-value | Parameter | t-value | Parameter | t-value | |
| Constant | Walk | - | - | 3.0727 | 71.1576 | 2.5849 | 65.8393 | - | - | |
| | Car | -2.3238 | -73.7083 | - | - | - | - | -0.4231 | -9.0435 | |
| | Service | -0.792 | -47.6597 | 0.8892 | 15.6461 | - | - | -2.3242 | -41.7576 | |
| | Public | -0.514 | -26.5976 | 2.0237 | 49.1897 | 2.0058 | 55.7112 | -0.8527 | -14.7288 | |
| Distance(km) | Walk | -0.1447 | -35.5083 | - | - | - | - | -0.1739 | -13.744 | |
| No. of Car in Zone(000) | Car | 0.0148 | 7.4743 | 0.0582 | 11.3493 | 0.0362 | 14.1175 | - | - | |
| Income (000YTL/month) | Car | 1.3005 | 55.658 | 0.8559 | 22.9582 | 1.0137 | 35.7756 | - | - | |
| | Service | - | - | 0.8559 | 22.9582 | - | - | - | - | |
| Time (min.) | | -0.001 | -3.6152 | -0.0128 | -49.0195 | -0.0149 | -63.8115 | -0.0063 | -7.6158 | |
| Cost (YTL) | | -0.0329 | -11.7483 | -0.0249 | -3.2841 | -0.0304 | -6.5124 | -0.0349 | -4.5157 | |
| Dummy | Bosporus | Car | -0.1886 | -8.0685 | -1.5672 | -17.8023 | -0.0499 | -1.154 | 0.1242 | 1.9358 |
| | | Service | -0.1886 | -8.0685 | - | - | - | - | - | - |
| | Rail at origin | Public | 0.2792 | 18.6877 | 0.2382 | 8.4628 | 0.2201 | 11.0071 | 0.2503 | 6.6521 |
| | Rail at destin. | Public | 0.2651 | 17.5781 | 0.1934 | 6.8762 | 0.1275 | 6.3068 | 0.2682 | 6.9991 |
| | Port at origin | Public | 0.4911 | 18.858 | 0.7259 | 15.9726 | 0.5461 | 18.2421 | 0.4909 | 9.1017 |
| | Port at destin. | Public | 0.4467 | 17.2155 | 0.6906 | 15.2328 | 0.504 | 16.4824 | 0.4038 | 7.6754 |

Source: *ibid.*

Note: HBS and HBO are only applied to inter-zonal trip while HBW and NHB are applied to all trips such as intra- and inter-zonal trips.

10.1.5 Peak OD Table

Road and railways are planned based on the travel demand in peak hours. Transit operational and physical parameters such as service frequency, fleet size and bus stops/ railway station facilities are also determined based on the peak hour demand. On the other hand, daily demand will be used for economic evaluation.

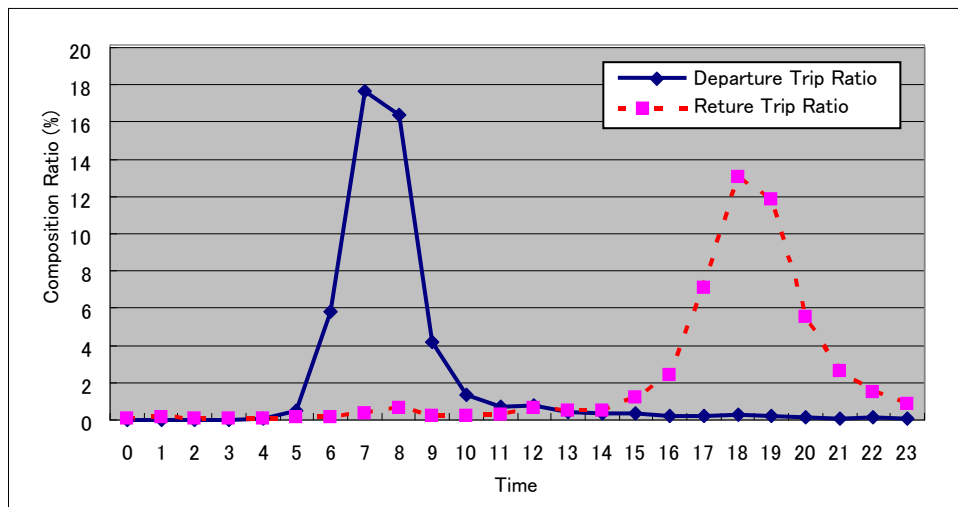
By the modal split model, the daily Production and Attraction (P-A) matrix by mode was predicted. In the P-A matrix, trip production in a zone includes the home-end of home based trips and the origin end of non-home-based trips. Since the assignment algorithms require origins and destinations as inputs, production and attraction were converted into OD matrices. The conversion of P-A matrix to OD table and time of day transformation were done in following steps. These steps were processed through TransCAD.

- Convert productions and attractions to origins and destinations.
- Decompose 24-hour trip matrix into peak hour trip table using peak hour ratio.

- Convert person trips to vehicle trips

Translating productions and attractions into origins and destinations is based on the information when trips depart and return. Then, decomposition to the peak hour trip table from 24-hour trip table is done based on the information about the percentage of flow that occurs in each hour throughout the day. The peak hour is 7:00 a.m. to 8:00 a.m. in the morning. Then finally, the peak hour trip table is converted from person trips to vehicle trips using the PCU values and average occupancy by vehicle type.

In the conversion to hourly trip table, since these percentages typically vary by trip purpose, the study team prepared the flow percentage data for each trip purpose. Figure 10.1.4. shows the flow percentage data of HBW trips.



Source: *ibid.*

Figure 10.1.4 Departure and Return Trip Ratio of HBW Trips

10.1.6 Traffic Assignment Model

1) Average Occupancy and Passenger Car Unit (PCU)

The person base trip OD tables (trips/person) by mode have to be modified into vehicle base in terms of passenger car unit (trip/PCU). These OD tables were firstly modified into vehicle base by dividing by the average number of passengers (occupancy) and then, multiplied by PCU factor determined by vehicle type. The average occupancy and PCU factor used for the conversion are shown in Table 10.1.6. The average occupancy of bus was estimated from the counting data on the screen lines. For car and “service” the occupancy data was obtained from IMM.

Table 10.1.6 Average Occupancy and PCU

| Vehicle Type | Average Occupancy | PCU Factor |
|--------------|-------------------|------------|
| Car | 1.57 | 1.0 |
| Service | 10.00 | 2.0 |
| Bus | 30.40 | 3.0 |

Source: *ibid.*

Note: Public Transport occupancy was estimated from counting data on the screen lines. That of car and service was from IMM.

2) Traffic Assignment Model

The last step in the four-step method is the assignment of the predicted modal flows of each origin-destination pair to actual routes on the transport network. In this study, the traffic assignment model has two systems. For the private mode such as cars and service vehicles on roads, traffic assignment was done by loading traffic volume on roads composing minimum impedance routes. The travel speed of vehicles is controlled by the speed-flow relationship. Hence, speed of vehicle is determined according to the speed-flow curves which are determined by road section according to road characteristics such as number of lanes, and land-use conditions.

On the other hand, Minimum-impedance route for public mode was searched on public transport network taking into account the waiting and transfer time at stops and stations, and public transport passengers are assigned on the network along the selected route. The minimum-impedance route is determined in terms of generalized cost including travel time, waiting time, transfer time, and fare. The transport capacity of each route is also taken into account.

For a long-term demand forecast, the same way as for private mode was adopted also to assignment of bus mode because bus routes were flexibly changed according to demand change.

10.2 Estimate of Future Vehicle Ownership

10.2.1 Zonal Vehicle Ownership

There is a close relationship between vehicle ownership and household income by traffic zone as shown by the analysis of the Person Trip Survey data. This relationship was used for the estimate of the number of motorized households, i.e., vehicle-owning households by zone. Future distribution of household income in Istanbul is presented in Figure 10.2.1. The number of multi-vehicle owning households was estimated together with that of one-vehicle owning household by using the relationship between car ownership and household income.

Since household income is assumed to grow in parallel to GDP per capita, the future number of vehicles was estimated based on the relationship between vehicle ownership and GDP per capita as follows:

- To estimate zonal vehicle ownership (vehicles/1000 person)
- To estimate number of vehicles by zone by multiplying population by vehicle ownership.

Table 10.2.2 shows vehicle ownership and number of vehicles in 2023. The estimated number of vehicles in 2023 is approximately 4.19 million, thus, vehicle ownership will be 245 vehicles per 1000 persons. The number of vehicles will increase approximately by 3.14 times for 18 years from 2005.

10.2.2 Motorized and Non-motorized Households

The number of motorized and non-motorized households was estimated in the following process:

- To estimate future income distribution based on future GDP/capita see (Figure 10.2.1).
- To estimate percentage of motorized and non-motorized household based on the future income distribution.
- To estimate the number of motorized households adjusting to the estimated number of vehicles.

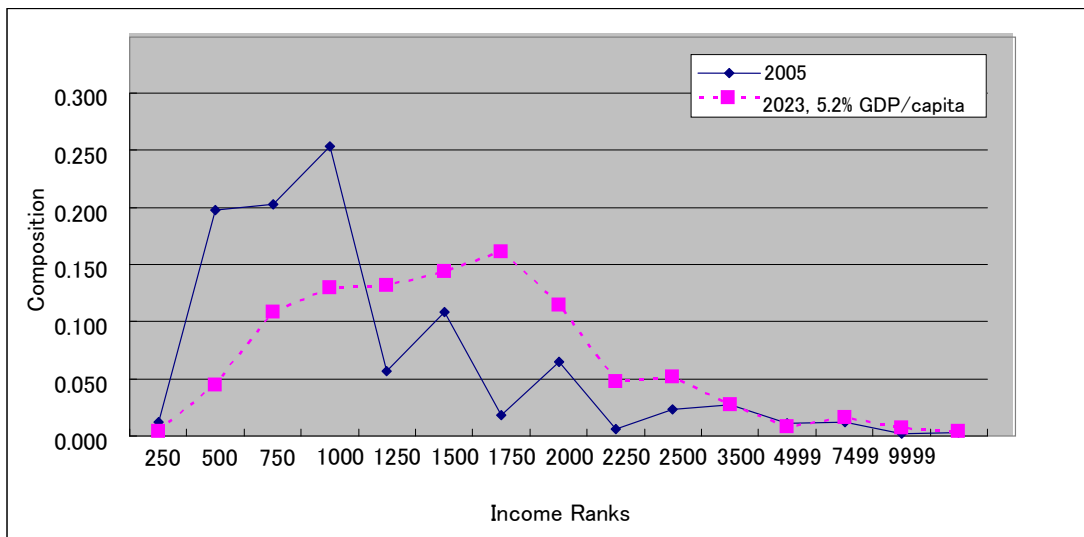
The projected number of motorized and non-motorized households is shown in Table 10.2.3. The ratio of motorized households (vehicle base) is 0.67 in 2023, This ratio was 0.33 in 2005. This is a 1.9 times increase. Non-motorized households will be half of the present. As for private car ownership, the ratio of motorized households is 0.61 in 2003, while that of non-motorized households is 0.39.

The number of multi-vehicle owing family will remarkably rise by 4.4 times of the present.

Table 10.2.1 Future Framework in Istanbul

| Items | 2005 | 2023 | 2023/2005 | Growth Ratio /annum |
|------------------------------|------------|------------|-----------|---------------------|
| Population in Istanbul | 11,608,349 | 16,000,000 | 1.378 | 0.0180 |
| GDP | | | 2.490 | 0.0520 |
| GDP/capita (YTL) | 5,482 | 9,681 | 1.766 | 0.0321 |
| Household Income/month (YTL) | 1,144 | 2,020 | 1.766 | 0.0321 |

Source: Transportation of Planning Dept., IMM



Source: *ibid.*

Figure 10.2.1 Distribution of Households by Income Rank in 2005 and 2023

Table 10.2.2 Estimated Vehicle Ownership and Number of Vehicles in 2023 in Study Area

| | 2005 | 2023 | 2023/2005 |
|-----------------------------|-----------|-----------|-----------|
| No. of Vehcles/1000 persons | 111.1 | 244.9 | 2.20 |
| No. of Vehicles | 1,334,630 | 4,194,569 | 3.14 |

Source : *ibid.***Table 10.2.3 Motorization of the Study Area in 2005 and 2023**

| | 2005 | 2023 | | 2023/2005 |
|----------------------------|---------|---------|-------------|-----------|
| | vehicle | vehicle | Private car | vehicle |
| Non-Motorized | 64.8% | 33% | 39.4% | 0.51 |
| Motorized (1-car) | 31.1% | 49% | 46.8% | 1.57 |
| Motorized (2-cars or more) | 4.1% | 18% | 13.9% | 4.44 |
| Motorized Households | 35.2% | 67% | 60.6% | 1.91 |

Source : *ibid.*

10.3 Projection of Travel Demand

10.3.1 Total Number of Trips

Table 10.3.1 shows the future travel demand in 2023. The total number of trips per day in the study area in 2023 is approximately 30.82 million. The trip increase ratio from 2005 to 2023 is approximately 1.47, higher than the population growth ratio of 1.43. The trip production rate in terms of number of trips per person per day rises from 1.74 to 1.80. This indicates that by 2023, the increased share of motorized household contributes to the increase of the production rate. Summary of socio-economic framework and travel demand is shown in Table 10.3.2.

Table 10.3.1 Travel Demand in 2023 in Study Area

| Year | | Total | Non-Motorized | Motorized Household | Note |
|-----------|-------------------|------------|---------------|---------------------|--------------------------|
| 2005 | Population *) | 12,007,045 | 7,624,222 | 4,382,823 | |
| | Composition Ratio | 1.00 | 0.63 | 0.37 | |
| | Trips | 20,924,052 | 13,182,153 | 7,741,899 | |
| | Trips/person | 1.74 | 1.68 | 1.86 | |
| 2023 | Population *) | 17,130,000 | 5,652,900 | 11,477,100 | |
| | Composition Ratio | 1.00 | 0.33 | 0.67 | Vehicle Owned Households |
| | Trips | 30,699,116 | 11,120,708 | 22,578,408 | |
| | Trips/person | 1.80 | 1.68 | 1.86 | |
| 2023/2005 | Trips | 1.47 | 0.74 | 2.62 | |

Note: *) Population in Gebze is included

Source : *ibid.***Table 10.3.2 Summary of Socioeconomic Indices and Travel Demand in Study Area**

| Items | 2005 | 2023 | 2023/2005 |
|--|------------|------------|-----------|
| Population in Study Area | 12,007,045 | 17,130,000 | 1.43 |
| GRDP/capita | 5,482 | 9,681 | 1.77 |
| Number of Trips by All Modes (Numbers) | 20,924,052 | 30,699,116 | 1.47 |
| Number of Vehicles Owned by Households (Vehicle) | 1,334,630 | 4,194,569 | 3.14 |
| Vehicle Ownership (/1000) | 111.1 | 244.9 | 2.20 |
| Trip Production Rate / pop (trip/day)(All Mode) | 1.74 | 1.80 | 1.03 |

Source : *ibid.*

10.3.2 Trip Production and Attraction

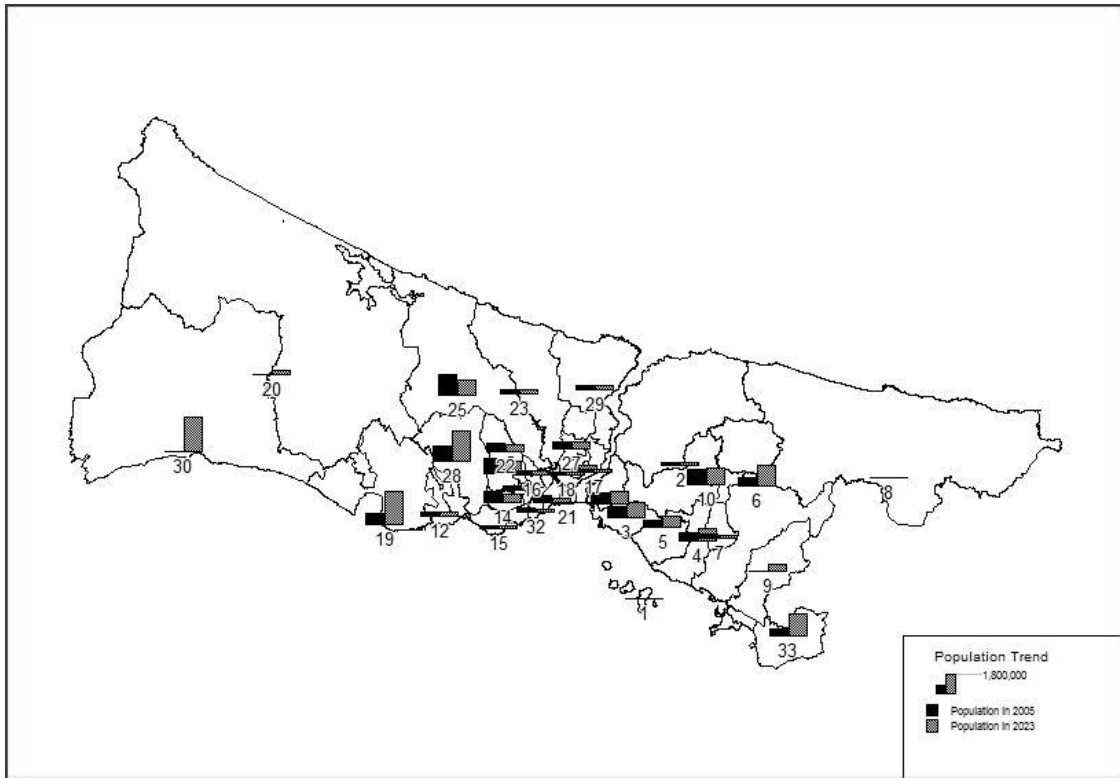
1) Socio-economic Framework by Zone

Source : *ibid.*

Figure 10.3.1 through Source : *ibid.*

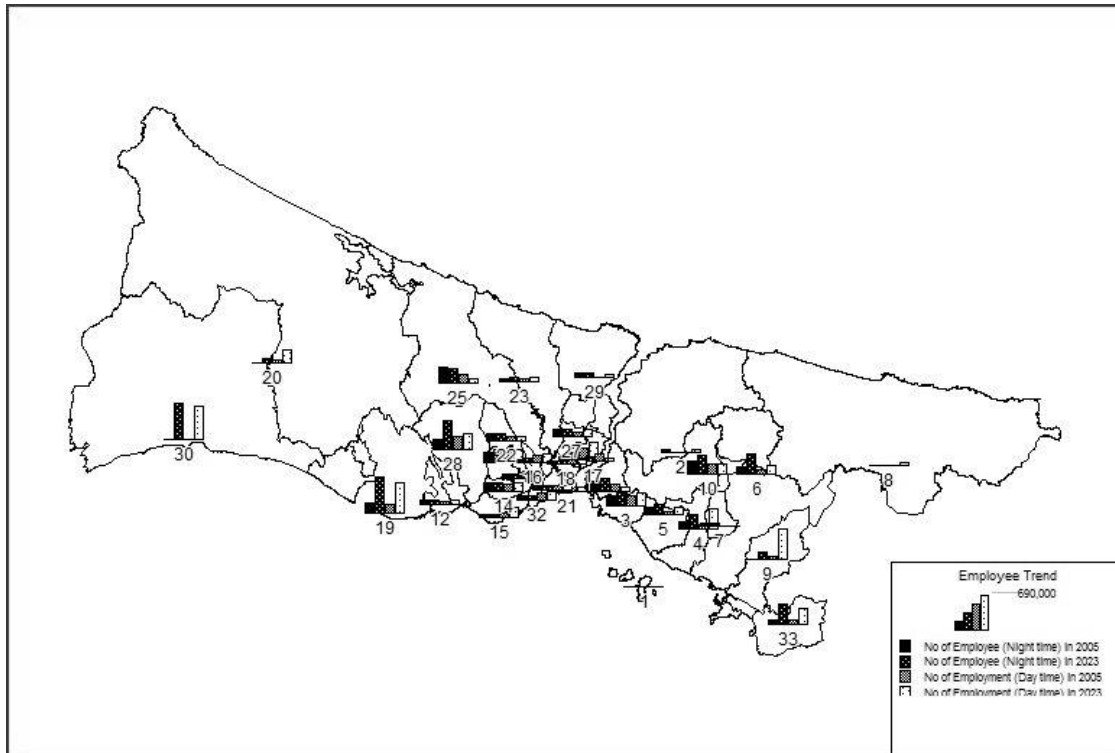
Figure 10.3.3 show the population, employment and number of students in 2005 and 2023 by the integrated zone system. The employment and number of students were projected in both daytime and nighttime basis. Population growth ratio is high for zone nos. 19 (Buyukcekmece), 28 (Kucukcekmece) and 30 (Silivri) in the suburban areas in the European side, and no. 33 (Gebze) in the Asian sides. The growth of employment and number of students show similar tendencies to that for population.

On the other hand, existing urban areas show low growth. These socioeconomic indices by zone are in accordance with the future land use plan. The growth ratio in the central urban area is controlled, while suburban areas in the Asian and European sides are prepared for receiving new residents.



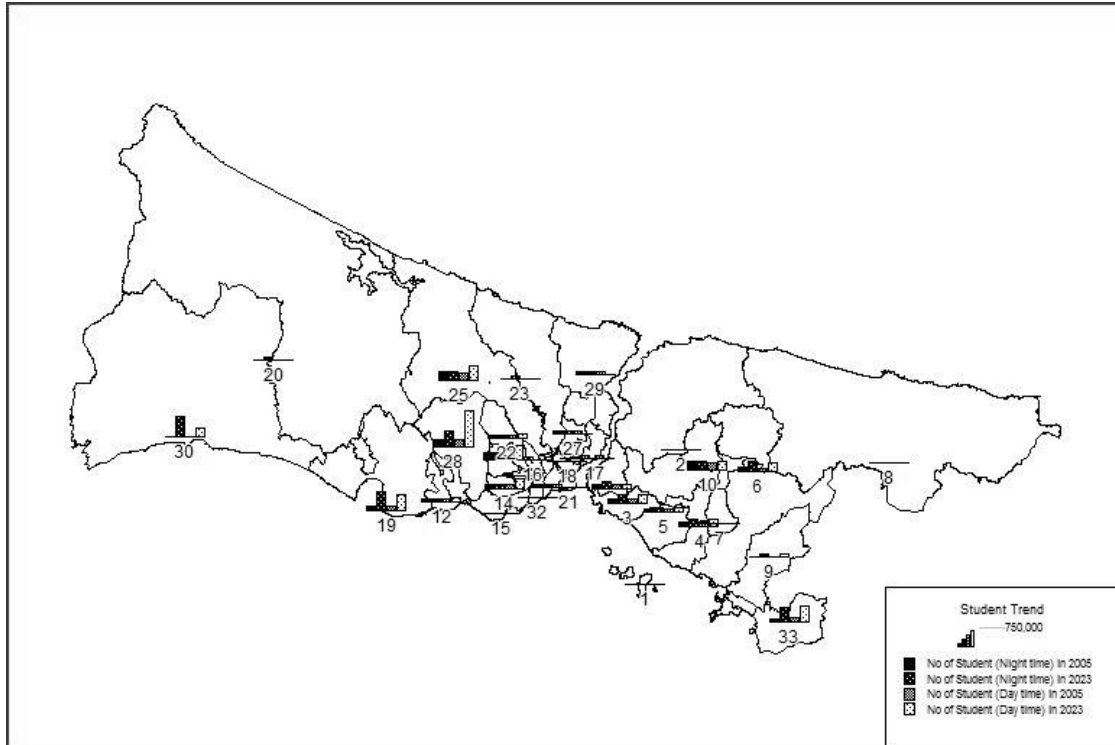
Source : *ibid.*

Figure 10.3.1 Population by Zone in 2005 and 2023



Source : *ibid.*

Figure 10.3.2 Night and Daytime Employment by Zone in 2005 and 2023



Source : *ibid.*

Figure 10.3.3 Number of Night and Daytime Students by Zone in 2005 and 2023

2) Trip Production and Attraction

The trip production and attraction in the years 2005 and 2023, according to the integrated zone system are shown in Table 10.3.3. and Figure 10.3.4 are for all purposes. Trip production and attraction in zone no. 19 (Buyukcekmece), no. 28 (Kucukcekmece) and no. 30 (Silivri) have larger volume of trips. The increase ratios in these zones are higher than the others. Their ratios are 2.88, 2.01 and 14.2 times, respectively. In 2023, transport demand will concentrate in these zones.

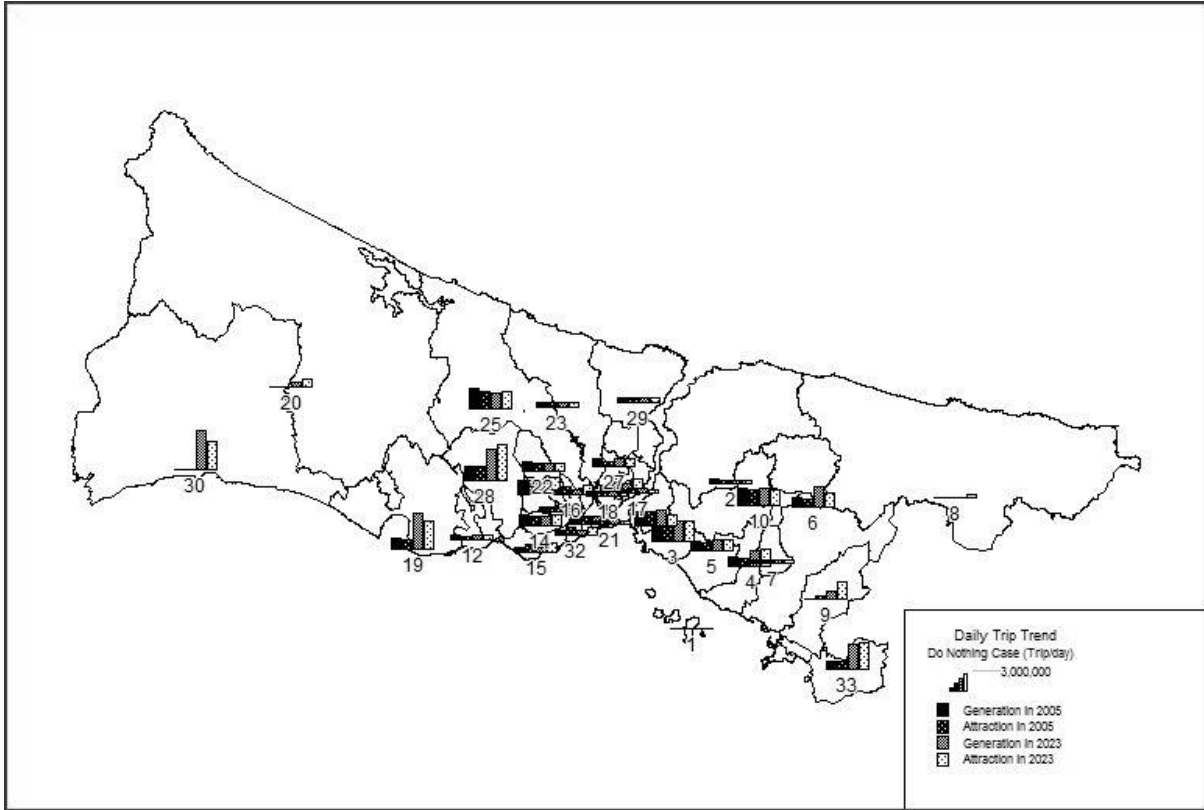
Trip production and attraction by purpose in the years 2005 and 2023 according to the integrated zone system are shown in Figure 10.3.5 through Figure 10.3.8. The tendencies of the volume and growth ratio by 2023 are similar to those for all purposes, exclusive of NHB.

Table 10.3.3 Daily Trip Production and Attraction by Integrated Zone in 2005 and 2023

| Sq | Present (2006) | | | | | | | | | |
|-------|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | HBW | | HBS | | HBO | | NHB | | Total | |
| | Production | Attraction | Production | Attraction | Production | Attraction | Production | Attraction | Production | Attraction |
| 1 | 8,705 | 9,495 | 6,076 | 2,324 | 22,699 | 19,639 | 3,811 | 1,260 | 41,319 | 32,758 |
| 2 | 120,099 | 84,982 | 89,776 | 72,954 | 182,625 | 168,638 | 37,296 | 40,360 | 430,979 | 368,198 |
| 3 | 365,378 | 407,268 | 213,152 | 216,566 | 518,886 | 600,700 | 164,231 | 194,450 | 1,262,248 | 1,419,630 |
| 4 | 272,528 | 211,201 | 179,448 | 176,123 | 279,795 | 264,154 | 50,673 | 52,166 | 783,395 | 704,625 |
| 5 | 226,713 | 131,774 | 153,115 | 138,027 | 286,259 | 270,847 | 57,981 | 68,906 | 724,358 | 610,050 |
| 6 | 275,061 | 191,691 | 193,456 | 168,401 | 276,242 | 276,515 | 44,007 | 52,229 | 789,988 | 689,991 |
| 7 | 114,624 | 55,054 | 104,230 | 96,068 | 149,636 | 142,766 | 15,088 | 18,950 | 383,793 | 313,146 |
| 8 | 13,857 | 17,733 | 13,675 | 9,947 | 26,368 | 27,410 | 7,480 | 7,850 | 62,510 | 63,664 |
| 9 | 70,519 | 135,737 | 51,979 | 64,719 | 69,997 | 61,889 | 21,412 | 17,732 | 214,358 | 280,509 |
| 10 | 464,614 | 377,514 | 313,463 | 267,683 | 451,255 | 414,844 | 85,308 | 99,507 | 1,315,517 | 1,160,511 |
| 11 | 349,665 | 248,005 | 235,237 | 230,337 | 453,037 | 440,804 | 109,695 | 122,825 | 1,149,370 | 1,043,614 |
| 12 | 173,810 | 121,031 | 104,105 | 113,617 | 181,200 | 164,304 | 30,455 | 32,480 | 489,719 | 431,677 |
| 13 | 395,667 | 336,738 | 276,823 | 239,750 | 357,081 | 332,143 | 59,389 | 69,649 | 1,089,254 | 978,723 |
| 14 | 332,185 | 256,195 | 220,450 | 220,195 | 254,780 | 222,014 | 46,973 | 53,532 | 854,590 | 752,176 |
| 15 | 109,920 | 187,907 | 62,406 | 85,099 | 187,733 | 302,730 | 73,066 | 74,534 | 433,688 | 650,668 |
| 16 | 140,108 | 203,060 | 93,424 | 95,784 | 199,298 | 215,833 | 45,536 | 48,933 | 478,516 | 563,765 |
| 17 | 110,181 | 246,269 | 56,216 | 128,629 | 147,008 | 177,578 | 82,521 | 72,124 | 397,015 | 625,560 |
| 18 | 118,803 | 218,497 | 86,241 | 80,276 | 204,553 | 215,081 | 96,494 | 70,820 | 507,450 | 585,886 |
| 19 | 342,093 | 361,145 | 209,456 | 204,182 | 278,660 | 261,300 | 61,480 | 67,272 | 892,608 | 895,022 |
| 20 | 42,238 | 90,676 | 31,465 | 24,225 | 142,998 | 45,256 | 15,038 | 14,332 | 133,034 | 175,456 |
| 21 | 26,225 | 295,830 | 13,089 | 73,183 | 126,938 | 153,642 | 168,493 | 64,883 | 335,118 | 587,908 |
| 22 | 252,504 | 133,621 | 171,671 | 150,942 | 241,177 | 192,810 | 26,232 | 33,360 | 691,939 | 511,075 |
| 23 | 141,990 | 124,654 | 95,927 | 100,661 | 212,065 | 207,666 | 34,253 | 40,018 | 484,655 | 473,569 |
| 24 | 193,429 | 197,398 | 133,753 | 142,403 | 267,399 | 337,465 | 84,773 | 65,901 | 681,267 | 745,169 |
| 25 | 529,364 | 326,238 | 352,422 | 303,807 | 674,507 | 623,619 | 71,946 | 87,337 | 1,628,537 | 1,341,476 |
| 26 | 177,493 | 196,911 | 111,129 | 86,975 | 149,609 | 128,275 | 34,788 | 37,122 | 473,240 | 449,481 |
| 27 | 221,777 | 186,626 | 136,305 | 121,056 | 217,424 | 175,468 | 33,358 | 38,622 | 609,425 | 522,485 |
| 28 | 402,914 | 396,403 | 256,815 | 250,528 | 368,358 | 321,078 | 64,796 | 70,626 | 1,093,168 | 1,039,007 |
| 29 | 162,840 | 92,677 | 104,566 | 113,500 | 203,179 | 173,038 | 31,832 | 35,803 | 503,613 | 416,661 |
| 30 | 65,496 | 66,923 | 42,910 | 37,669 | 69,303 | 70,568 | 14,494 | 15,083 | 193,435 | 191,321 |
| 31 | 172,343 | 445,206 | 98,777 | 164,593 | 218,062 | 331,583 | 125,212 | 117,351 | 615,542 | 1,059,472 |
| 32 | 162,064 | 236,257 | 93,955 | 89,415 | 216,911 | 192,838 | 48,907 | 53,365 | 522,059 | 571,971 |
| 33 | 197,348 | 161,839 | 159,440 | 195,314 | 258,530 | 261,077 | 42,815 | 50,451 | 658,339 | 668,827 |
| Total | 6,752,555 | 6,752,555 | 4,464,952 | 4,464,952 | 7,793,572 | 7,793,572 | 1,889,833 | 1,889,833 | 20,924,051 | 20,924,051 |

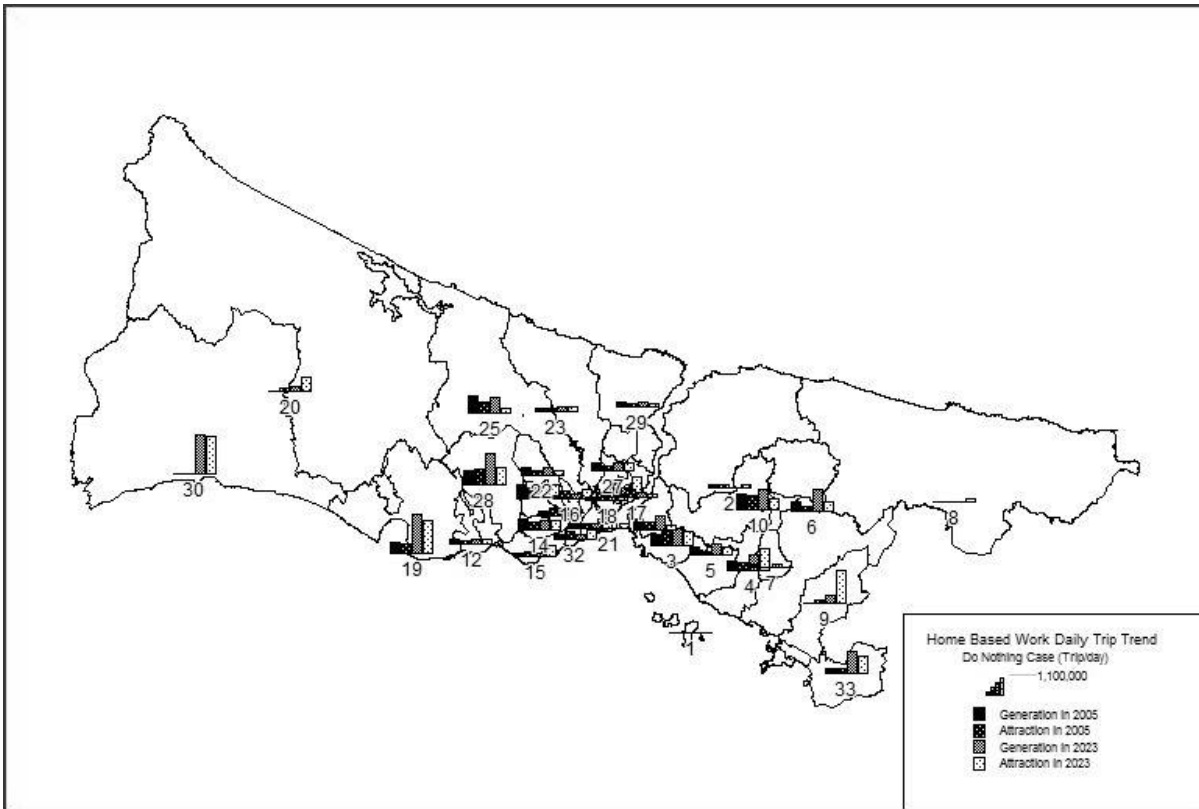
| Sq | 2023 | | | | | | | | | |
|-------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | HBW | | HBS | | HBO | | NHB | | Total | |
| | Production | Attraction | Production | Attraction | Production | Attraction | Production | Attraction | Production | Attraction |
| 1 | 34,860 | 532 | 24,128 | 3,597 | 40,719 | 28,438 | 832 | 1,625 | 100,565 | 34,252 |
| 2 | 88,658 | 104,090 | 65,418 | 16,942 | 115,110 | 114,469 | 30,652 | 31,541 | 300,785 | 267,936 |
| 3 | 577,100 | 458,821 | 341,320 | 321,695 | 564,445 | 524,477 | 110,220 | 111,887 | 1,593,477 | 1,417,430 |
| 4 | 477,703 | 683,090 | 302,345 | 256,130 | 478,802 | 505,782 | 147,611 | 148,810 | 1,407,164 | 1,594,488 |
| 5 | 355,602 | 273,917 | 227,108 | 213,324 | 354,996 | 342,342 | 66,851 | 68,072 | 1,004,816 | 898,047 |
| 6 | 675,839 | 333,822 | 429,747 | 342,438 | 665,496 | 605,523 | 88,394 | 93,230 | 1,860,249 | 1,375,840 |
| 7 | 113,214 | 24,382 | 84,103 | 99,940 | 123,867 | 119,650 | 12,445 | 12,493 | 333,888 | 256,739 |
| 8 | 32,003 | 128,872 | 28,327 | 7,108 | 43,803 | 65,574 | 29,788 | 29,743 | 134,715 | 231,643 |
| 9 | 242,180 | 1,023,556 | 168,112 | 122,536 | 253,973 | 377,635 | 197,307 | 196,577 | 861,910 | 1,720,546 |
| 10 | 595,299 | 404,241 | 370,177 | 373,692 | 586,798 | 562,230 | 105,585 | 106,801 | 1,658,518 | 1,448,014 |
| 11 | 455,753 | 207,939 | 274,238 | 203,644 | 477,169 | 402,479 | 63,613 | 66,674 | 1,272,149 | 882,235 |
| 12 | 197,745 | 170,262 | 114,810 | 183,082 | 185,028 | 190,930 | 43,650 | 41,893 | 541,284 | 586,189 |
| 13 | 415,536 | 441,518 | 269,737 | 541,900 | 416,775 | 472,708 | 115,177 | 107,678 | 1,217,388 | 1,563,887 |
| 14 | 334,542 | 299,226 | 205,401 | 441,728 | 325,668 | 358,446 | 82,198 | 75,758 | 947,875 | 1,175,268 |
| 15 | 144,873 | 404,390 | 82,336 | 55,924 | 160,419 | 177,265 | 82,819 | 82,491 | 470,986 | 720,499 |
| 16 | 186,394 | 289,895 | 120,056 | 109,448 | 193,791 | 206,526 | 63,242 | 63,330 | 563,617 | 669,205 |
| 17 | 160,933 | 154,149 | 87,336 | 37,348 | 212,039 | 149,937 | 40,959 | 41,691 | 501,944 | 384,363 |
| 18 | 130,908 | 201,298 | 84,284 | 22,775 | 159,369 | 156,125 | 50,700 | 51,589 | 426,608 | 432,845 |
| 19 | 1,154,028 | 973,359 | 692,116 | 606,399 | 1,094,768 | 1,042,554 | 220,255 | 225,226 | 3,161,536 | 2,847,964 |
| 20 | 173,368 | 431,132 | 115,025 | 21,430 | 180,012 | 216,097 | 87,930 | 89,674 | 557,231 | 758,922 |
| 21 | 50,318 | 180,863 | 28,373 | 8,570 | 51,252 | 71,873 | 38,395 | 38,246 | 168,825 | 299,842 |
| 22 | 252,112 | 179,361 | 165,692 | 208,379 | 261,731 | 258,597 | 49,349 | 48,581 | 729,088 | 695,088 |
| 23 | 207,023 | 187,615 | 135,135 | 70,718 | 221,403 | 205,878 | 45,189 | 47,099 | 608,952 | 511,787 |
| 24 | 213,820 | 189,356 | 140,791 | 52,224 | 240,970 | 228,353 | 53,105 | 55,114 | 650,847 | 526,908 |
| 25 | 498,357 | 194,811 | 335,165 | 582,557 | 511,712 | 517,182 | 74,415 | 69,007 | 1,419,758 | 1,363,710 |
| 26 | 133,600 | 159,489 | 81,014 | 110,791 | 134,952 | 140,692 | 38,381 | 37,447 | 388,093 | 448,457 |
| 27 | 266,827 | 275,565 | 159,634 | 93,754 | 272,381 | 253,195 | 63,554 | 65,366 | 762,773 | 688,417 |
| 28 | 959,968 | 535,407 | 648,266 | 1,327,937 | 974,014 | 1,043,041 | 175,407 | 159,143 | 2,757,848 | 3,065,645 |
| 29 | 187,707 | 123,850 | 110,596 | 79,983 | 217,582 | 180,380 | 38,689 | 39,180 | 555,495 | 424,852 |
| 30 | 1,165,604 | 1,094,239 | 742,565 | 319,856 | 1,131,390 | 1,063,983 | 225,242 | 240,403 | 3,265,513 | 2,719,198 |
| 31 | 283,343 | 612,346 | 151,240 | 87,230 | 290,483 | 303,331 | 127,964 | 128,276 | 853,961 | 1,131,842 |
| 32 | 157,077 | 315,493 | 97,954 | 88,755 | 160,002 | 181,485 | 66,204 | 66,052 | 481,431 | 651,941 |
| 33 | 618,424 | 483,832 | 774,379 | 645,094 | 617,844 | 651,586 | 125,074 | 120,499 | 2,135,826 | 1,901,116 |
| Total | 11,540,718 | 11,540,718 | 7,656,928 | 7,656,928 | 11,718,763 | 11,718,763 | 2,761,196 | 2,761,196 | 33,695,115 | 33,695,115 |

Source : *ibid.*



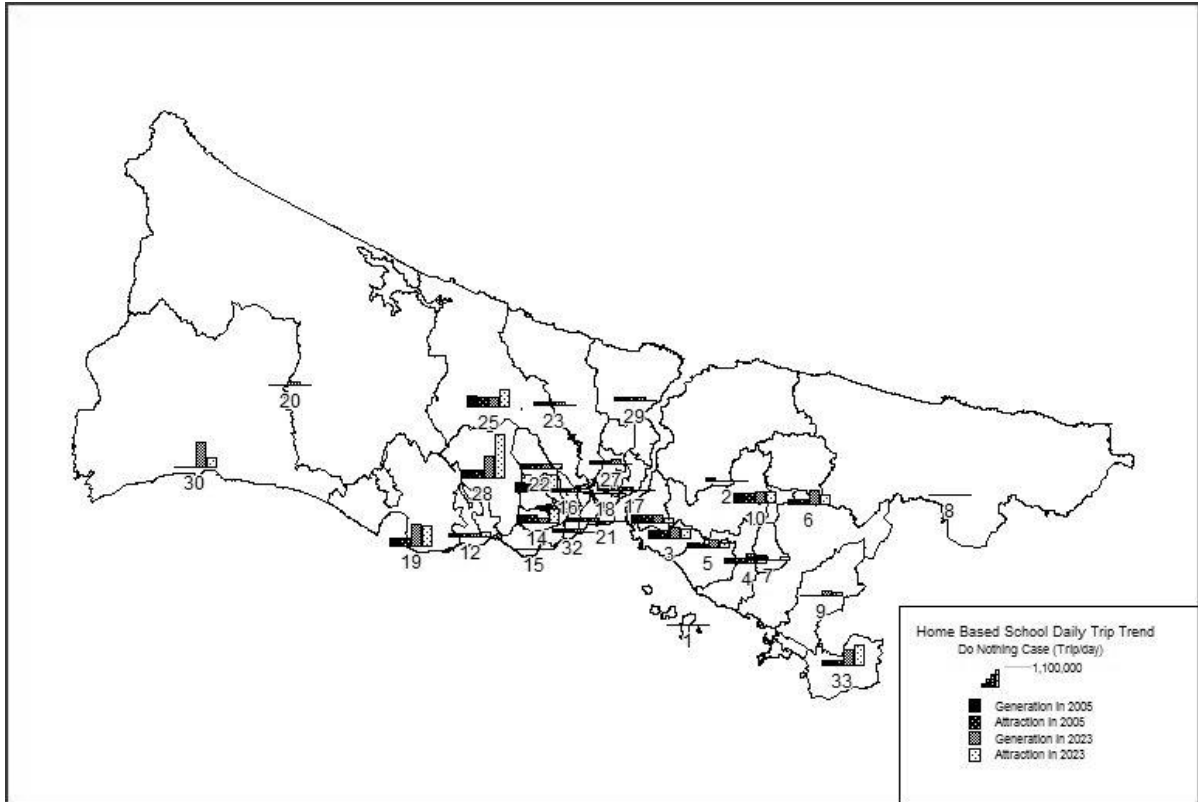
Source : *ibid.*

Figure 10.3.4 Daily Trip Production and Attraction in 2005 and 2023 (All Purposes)



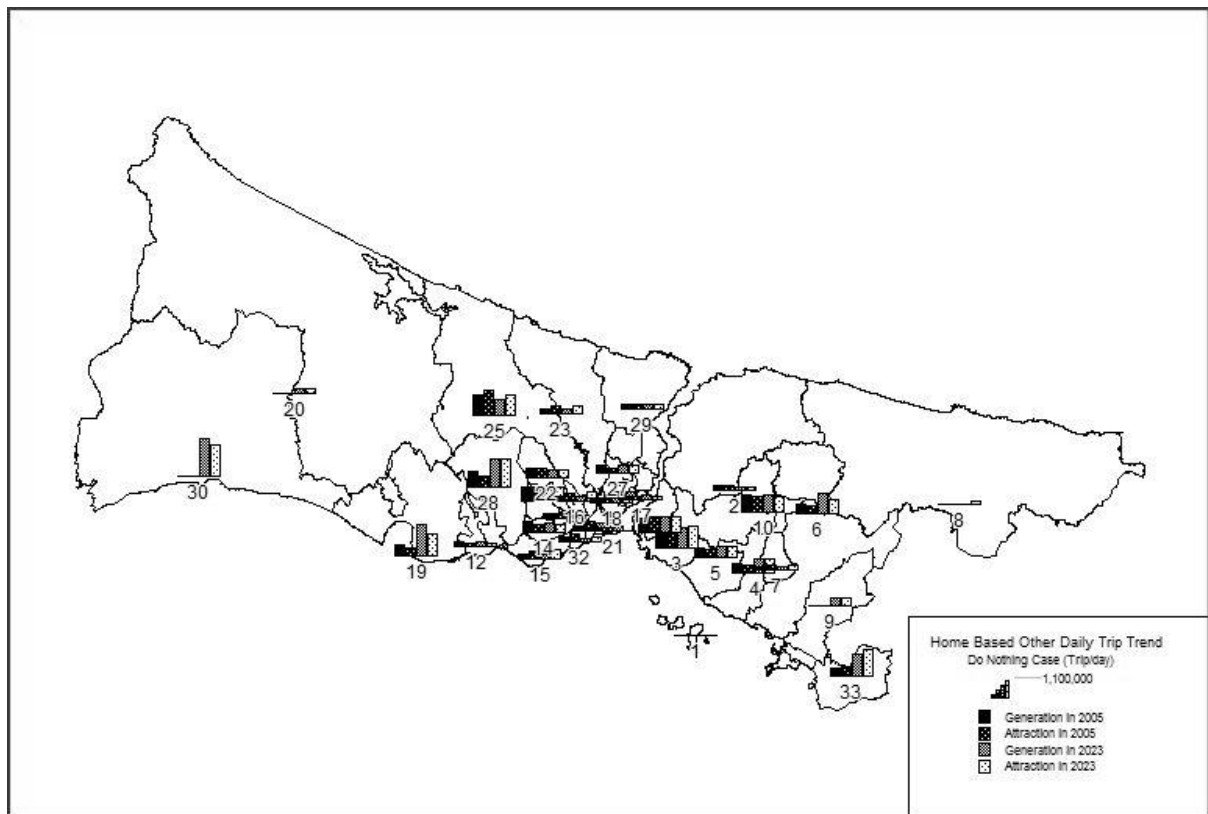
Source : *ibid.*

Figure 10.3.5 Trip Production and Attraction in 2005 and 2023 (HBW)



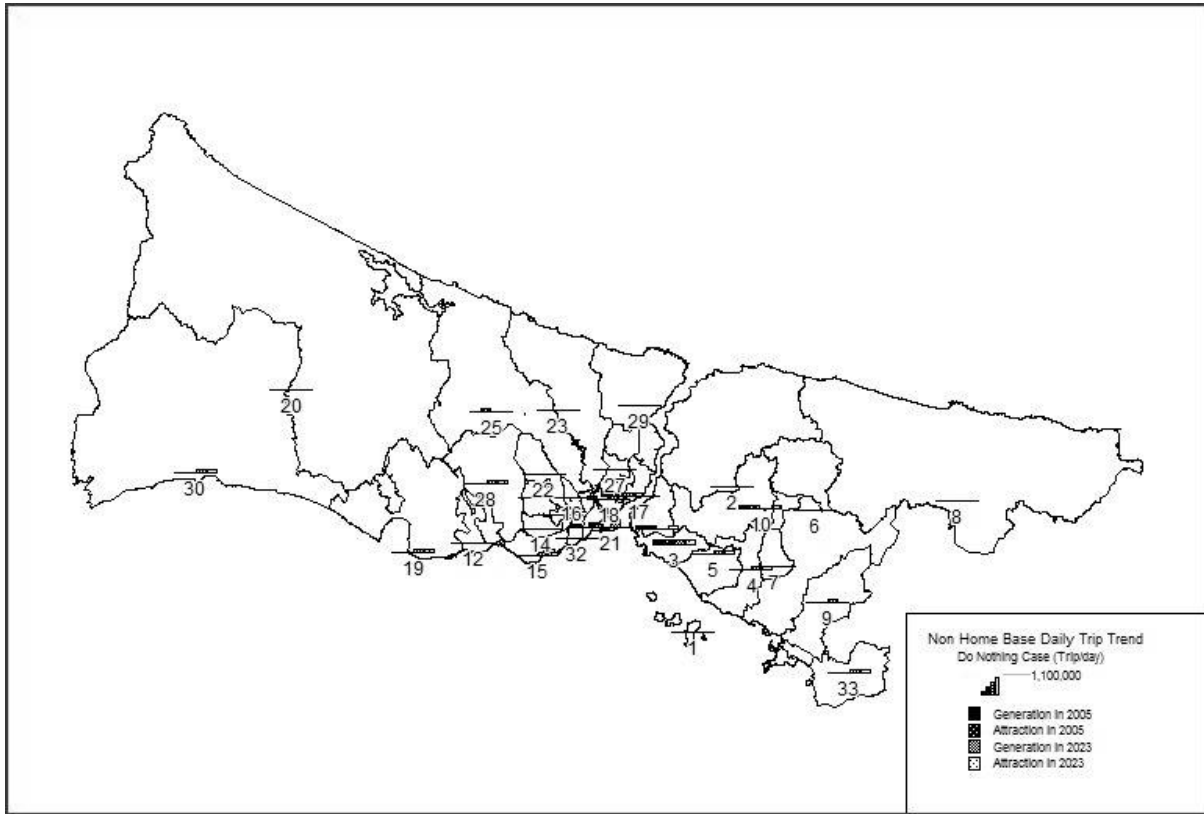
Source : ibid.

Figure 10.3.6 Trip Production and Attraction in 2005 and 2023 (HBS)



Source : ibid.

Figure 10.3.7 Trip Production and Attraction in 2005 and 2023 (HBO)



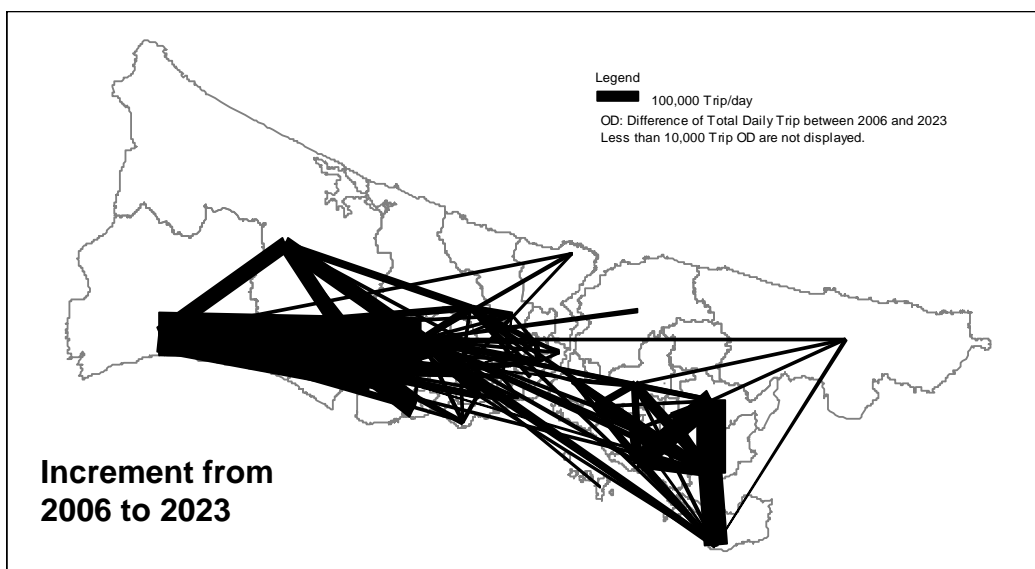
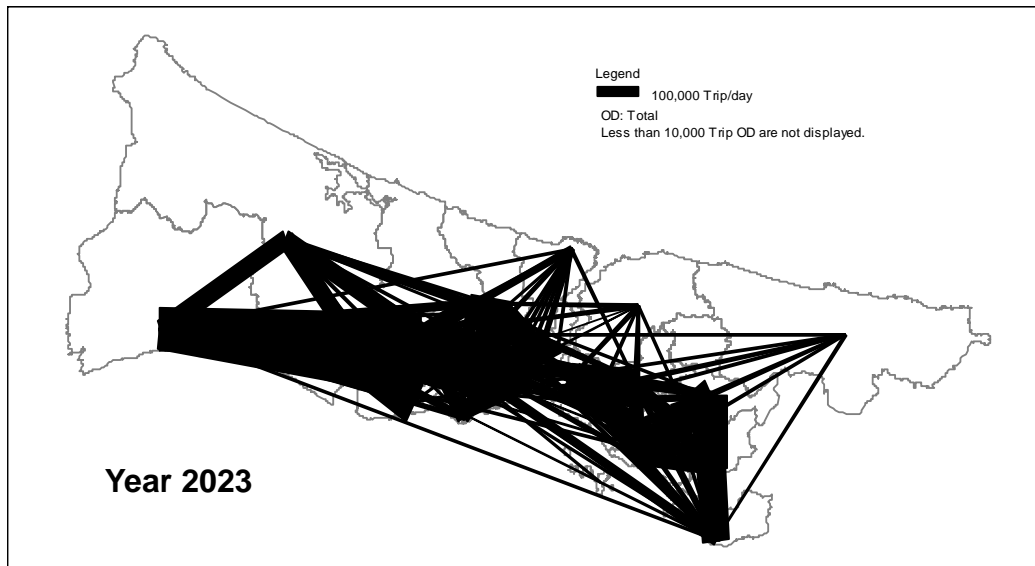
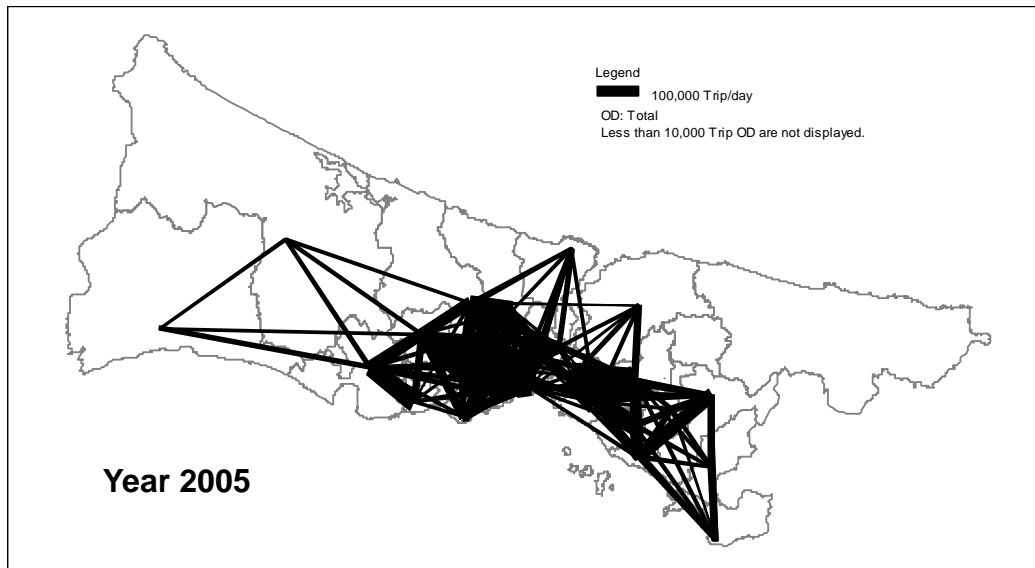
Source : ibid.

Figure 10.3.8 Trip Production and Attraction in 2005 and 2023 (NHB)

10.3.3 Trip Distribution

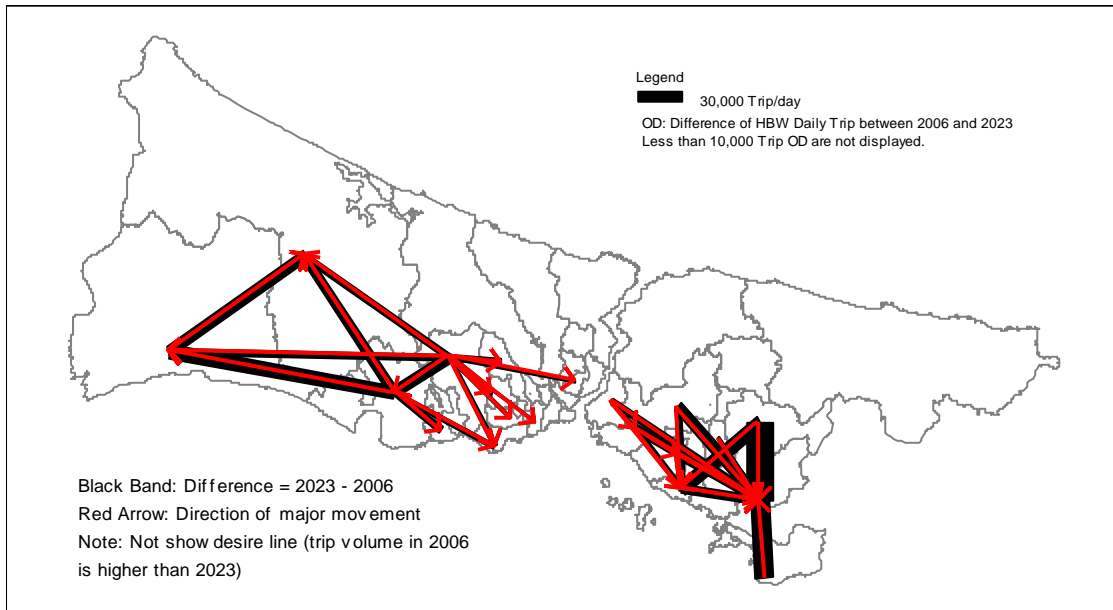
Figure 10.3.9 illustrates the desire lines of trips of all purposes for inter-zonal trips in 2005 and 2023, and the difference between both years. Trip distribution is projected in a “Do-nothing” case assuming no future projects. Heavy trip flows in 2023 will occur between the central urban areas and new suburban areas. Compared to the strong desire lines, seen within the central area in European and Asian sides in 2005, OD trips in 2023 between the central and suburban areas in the fringe of the study area will increase considerably. The characteristics of these large movements in 2023 are remarkably different from that of 2005 caused by the planned change of land use pattern.

As to the difference of the desire lines between 2005 and 2023, the high increase area is located in suburban areas in the fringe of the study area. Figure 10.3.10 also shows the difference for the HBW trip desire line between 2005 and 2023 as well as the major trip directions shown with the red arrow. The major movements in the new suburban areas show both inbound and outbound directions.



Source : *ibid.*

Figure 10.3.9 Daily Trip Desire Line in 2005 and 2023 (All Purposes)



Source : *ibid.*

Figure 10.3.10 Trip Difference of HBW Desire Line between 2005 and 2023 with Major Trip Direction