

Chapter 2 Trip Characteristics

2.1 Outline of Person Trip Survey

2.1.1 Outline of the Survey

The Person Trip survey was carried out from 2006 to 2007 as a part of the Istanbul Transportation Master Plan undertaken by IMM/Bintas (Turkish counterpart). Number of traffic surveys including the person trip survey and the analysis of the present traffic demand were conducted by the Turkish counterpart. These surveys and demand analysis were completed at the end of June 2007.

Three master plans were formulated for Istanbul in the past. The 1984 plan mainly focused on the strait crossing railway tunnel (Marmaray), the 1987 plan was an update review of the previous plan. The 1997 plan was chiefly formulated by Istanbul Technical University (ITU) in cooperation with IMM. These master plan studies also carried out person trip surveys and other related surveys. However, in the 2007 study, the survey size, such as number of samples, is larger than the three previous surveys and the following major traffic surveys were also carried out besides the person trip survey.

- Cordon Line Survey at the boundary of the study area.
- Screen Line Survey in the study area.

This section focuses on the person trip characteristics which are analyzed by the Person Trip Survey data in cooperation with the Turkish counterpart who has completed the basic data analysis and already presented its results in the report of "Istanbul Transportation Master Plan". After joining of JICA consultants, the joint study team conducted further data analysis to identify travel demand characteristics such as trip conditions of motorized and non-motorized households. This analyzed information was used for the trip production model through a 4-step model.

2.1.2 Person Trip Survey

The Person Trip Survey began in the beginning of March 2006 and was completed by the end of March 2007 including the preparation of data input and checking. The Person Trip Survey was conducted through household interviews in which interviewers directly visited houses on random sampling basis. 72,280 household samples (263,768 persons interviewed) were collected from the study area. This is equivalent to a sampling rate of 2.2% of the total in Istanbul.

Figure 2.1.1 shows the zoning map in the study area composed of Istanbul municipality and Gebze within Kocaeli municipality. Gebze borders Istanbul in the west, and it is actually a satellite town of Istanbul. The number of traffic zones is 451 within the study area and 9 are located in the outside of the study area. Figure 2.1.2 shows the traffic zone of the central study area.

Survey information collected from the field covers various items such as household and personal information, and trip information including trip conditions and modal choices. These collected data were used for making the travel demand model.



Source: Study Team

Figure 2.1.1 Zoning Map of the Study Area (Whole Study Area)



Source: *ibid.*

Figure 2.1.2 Zoning Map of the Study Area (Central Area)

2.2 Person Trip Characteristics

2.2.1 Total Number of Trips

1) Total Number of Trips and Trips per Person

Table 2.2.1 shows the total number of trips and trips per person. As can be seen, the total number of trips per day in the study area in 2005¹⁾ is approximately 20.9 million for all modes and 10.3 million excluding walking modes. Number of trips per person per day is 1.74 for all modes and 0.86 for motorized modes. For a person of 6 years old or more, this rate 1.91 for all modes and 0.95 for motorized modes, as shown in Table 2.2.1.

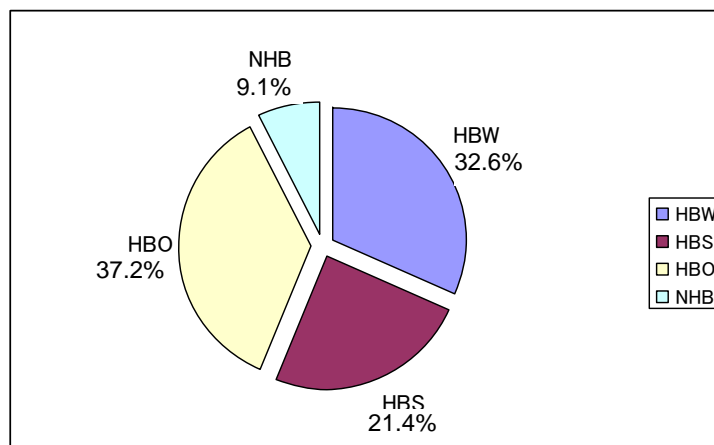
Table 2.2.1 Total Number of Trips and Trips per Person, 2005

Items	Classification		Trips or Rate
Population in 2005	All		12,006,999
	6 years above		10,940,173
No. of Trips	All Modes		20,915,132
	Excluding Walking		10,312,875
Trips /all population	Gross	All Modes	1.74
		Excluding Walking	0.88
	Net	All Modes	2.40
Trips / 6 years or above population	Gross	All Modes	1.91
		Excluding Walking	0.95

Source: Elaborated by Study Team base on OD HH2006

2) Trip Composition by Purpose

Figure 2.2.1 shows the trip purpose composition for all modes. The percentage of HBO purpose is the highest (37%), followed by 32% for HBW, 24% for HBS and 7% for NHB. The definition of trip purpose differs between Japanese and Western traffic engineers. For example, the Home-Based Work (HBW) purpose includes “return to home” trips in the Western way. This is also true for Home Based School (HBS) and Home Based Others (HBO) purposes. On the other hand, in Japanese definition, “To work” purpose excludes “return to home” trip, which is defined separately as “To home” purpose. Therefore, “To home” trip accounts for almost half of the trips in Japan.



Source: *ibid.*

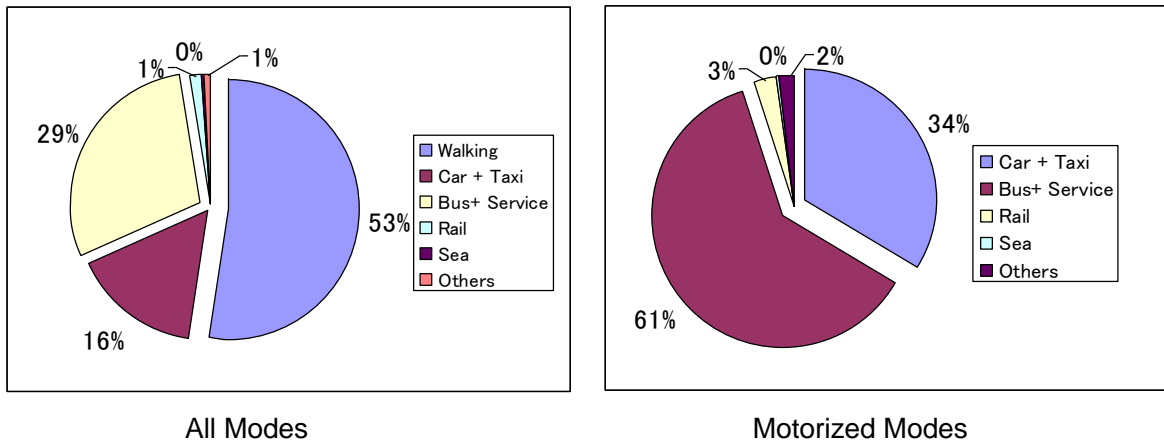
Figure 2.2.1 Trip Composition by Purpose, 2006

¹⁾ The person trip survey was conducted in 2006-07. However, the socio-economic indicators such as population were taken from 2005 figures.

3) Trip Composition by Mode

Trip modes are summarized in Figure 2.2.2 which shows a breakdown of all trips in a day. As can be seen, approximately 16% are cars and taxis, 29% are buses and service, rail is 1.4%, sea 0.2%, and walking 53%. Trip composition of motorized modes, excluding walking, bus and Service transport (61%) is predominant over the other modes.

In relation to the ratio of private and public transport to all modes, excluding walking, approximately 65% is public transport including buses, service and rails. The remaining 35% is private.



Source: *ibid.*

Figure 2.2.2 Trip Composition by Mode, 2006

2.2.2 Trip Production Rate

Trip production rate is defined to be the number of trips per person in a day. This involves two facets: one is the gross rate which is for all the persons regardless whether a trip is made or not, and the other is the net rate calculated only for the person who makes the trip.

1) Trip Production Rate by Sex

Trip production rate for all modes by sex is 1.98 for male, and 1.50 for female as shown in Table 2.2.2. The ratio of male trip rate to that of female is high at 1.32. This may be due to the fact that women usually stay in their houses for house keeping and thus, trip opportunities for them remain low. This lower trip rate of female reduces the trip rate in Istanbul as a whole.

Table 2.2.3 also shows trip composition ratios by purpose according to sex. Trip purpose composition is quite different in HBW, HBO and NHB purposes by sex. The figures in HBW are 42% for male and 19% for female. The ratio of NHB for male is 9%, in contrast to 5% for female. On the other hand, Female's HBO has a higher ratio than that of male. These composition ratios by sex present characteristics of the daily life in Istanbul. Male, who mainly works outside his domicile has high percentage in HBW' and NHB ratios and female in charge of affairs of the household in HBO ratio.

Table 2.2.2 Trip Production Rate by Sex, 2005

(Gross, all modes)

Sex	Trip /person
Male	1.98
Female	1.50
Total	1.74
Male/Female	1.32

Source: *ibid.*

Table 2.2.3 Trip Composition by Purpose and by Sex, 2006

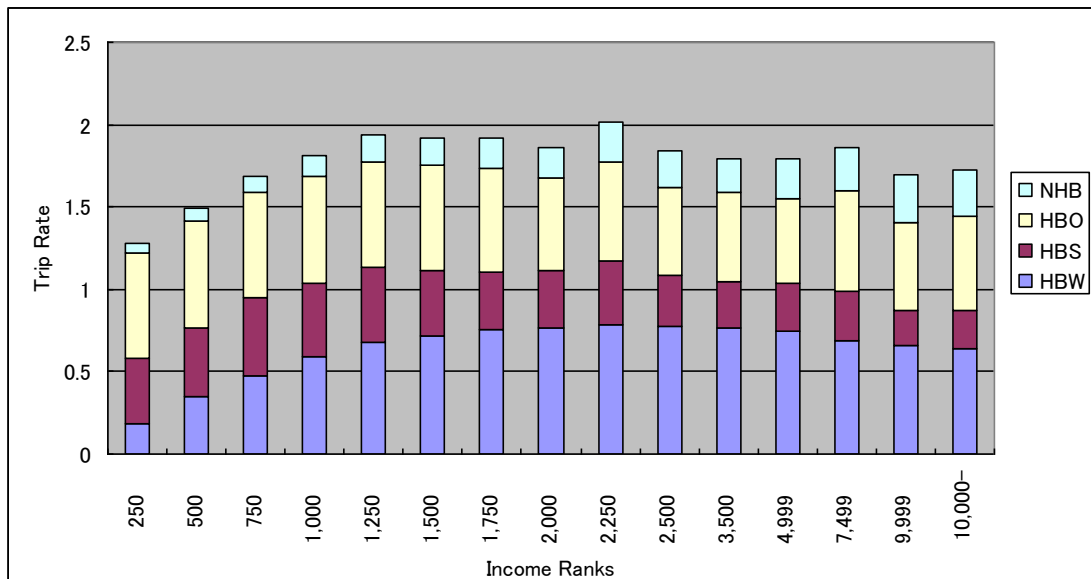
(Unit: %)

Trip Purpose	Male	Female
HBW	42.1	18.6
HBS	21.1	27.9
HBO	28.1	48.8
NHB	8.8	4.7
Total	100.0	100.0

Source: *ibid.*

2) Trip Production Rate by Purpose and Income Rank

Figure 2.2.3 shows trip production rate by household income levels according to trip purpose. As can be seen, the higher the household income level is, the higher is the trip production rate. However, the higher income level over 8,000 YTL/month has a lower trip rate. The composition of purposes shows that the share of HBW increases in proportion to the income level, if it is over 5,000YTL. The share of NHB also increases in proportion to the income level.



Source: *ibid.*

Figure 2.2.3 Trip Production Rate by Trip Purpose and by Income Rank

3) Trip Production Rate by Purpose and by Household Car Ownership

Table 2.2.4 shows the trip production rate by purpose separately for motorized and non-motorized households. Obviously, the trip rate of motorized households is higher than that of non-motorized households. The figures show 1.86 for motorized and 1.68 for non-motorized households. The total trip production rate of the whole households is 1.74. HBW and NHB have larger differences between two classified households in comparison to HBS and HBO.

Table 2.2.4 Trip Production Rate by Purpose and by Household Car Ownership, 2005

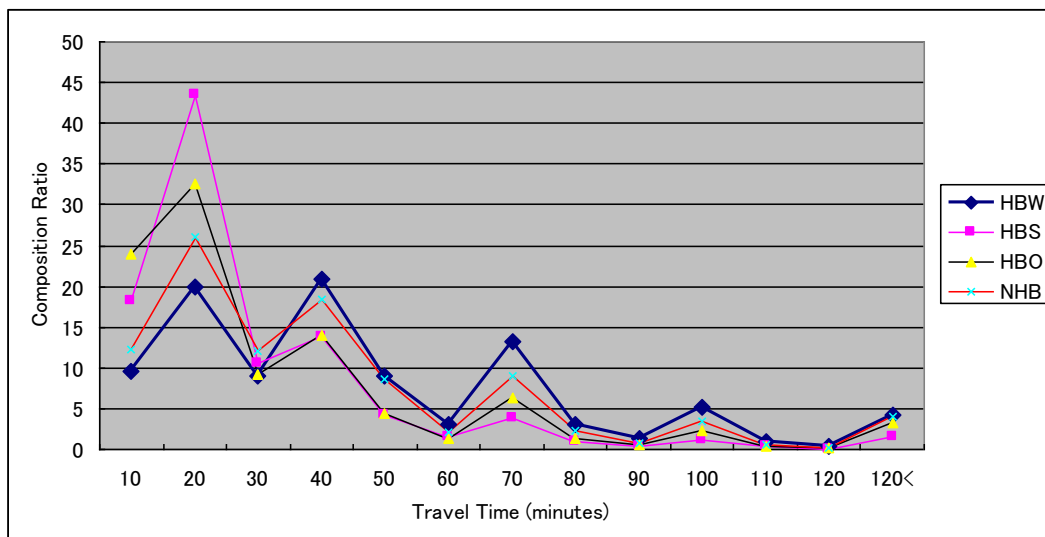
Purpose	Total	Non-Motorized Household	Motorized Household
HBW	0.55	0.53	0.59
HBS	0.43	0.42	0.44
HBO	0.63	0.62	0.65
NHB	0.13	0.10	0.18
Total	1.74	1.68	1.86

Source : *ibid.*

2.2.3 Travel Time Characteristics

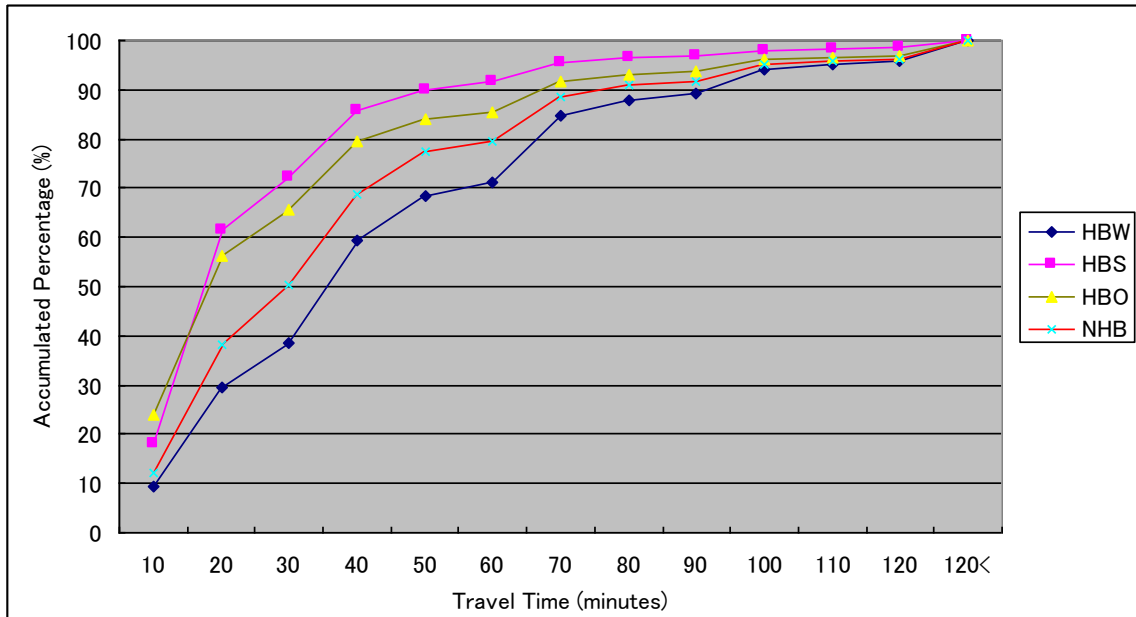
1) Travel Time by Purpose

Figure 2.2.4 shows travel time distribution by purpose from home to destination for home-based trips and from origin to destination for non-home-based trips. Travel time is adjusted through the traffic assignment in reference to the person trip survey data. Figure 2.2.5 shows the accumulated percentage of travel time distribution by purpose. Approximately 70% of total HBW trips have travel time less than 60 minutes and the percentage of travel time exceeding 90 minutes is approximately 6% of the total. As for HBS, approximately 70% of the total have a travel time of less than 30 minutes. Travel time of HBS trips is shorter than other purposes. About 80% of NHB trips have a travel time less than 60 minutes.



Source: *ibid.*

Figure 2.2.4 Travel Time Distribution by Purpose, 2006

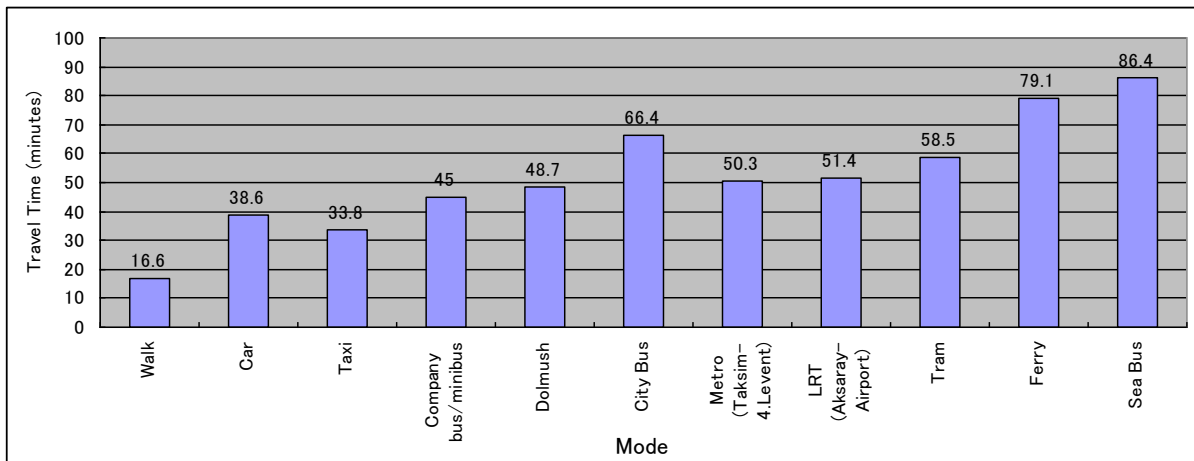


Source: *ibid.*

Figure 2.2.5 Accumulated Percentage of Travel Time Distribution by Purpose, 2006

- 2) Travel Time by Mode
- (1) Average Travel Time by Mode

Average travel time by major mode is shown in Figure 2.2.6 in which access and egress time in a trip between origin and destination is included. The modes with longer travel time are sea, ferry and city bus. Those travel time is 86, 79, and 66 minutes, respectively. Car and taxi travel time is 39 and 34 minutes, respectively.



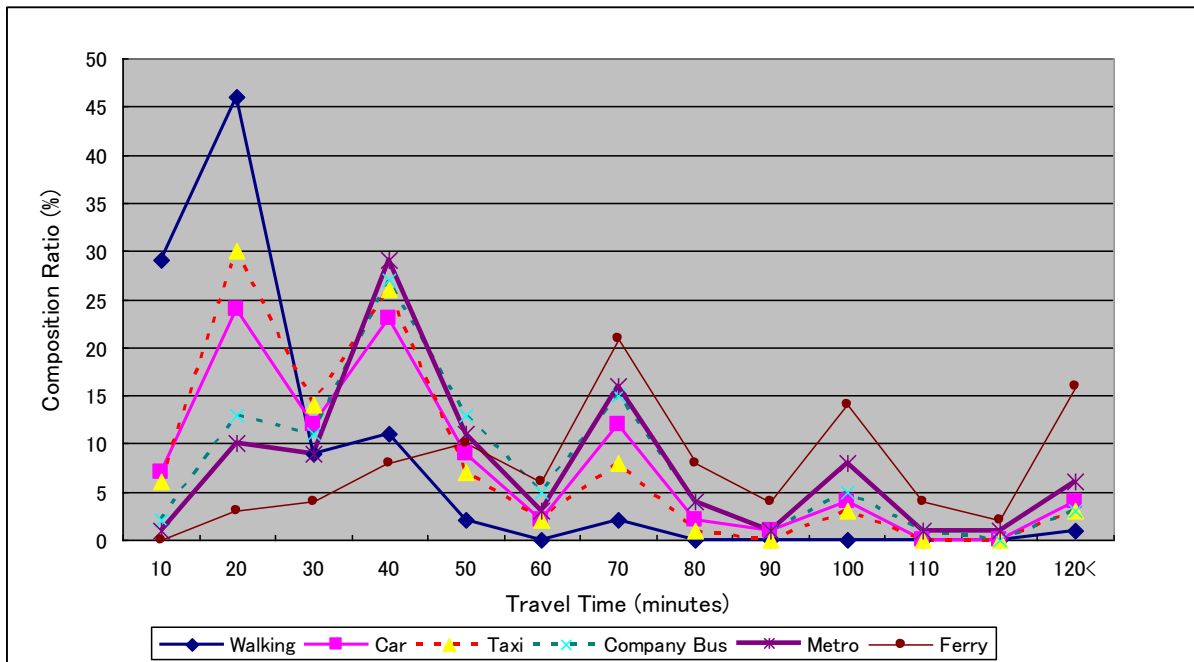
Source : *ibid.*

Figure 2.2.6 Average Travel Time by Mode, 2006

- (2) Travel Time Distribution by Mode

Figure 2.2.7 shows travel time distribution by mode. This also includes the access and egress times in a trip. Approximately 85% of the total walking trips have a travel time of less than 30 minutes and the percentage of travel exceeding 60 minutes is approximately 3% of the total. For cars, approximately 43% of the total has a travel time of less than 30

minutes. As for company bus, travel within 60 minutes shares approximately 70% of the total.



Source: *ibid.*

Figure 2.2.7 Travel Time Distribution by Mode, 2006

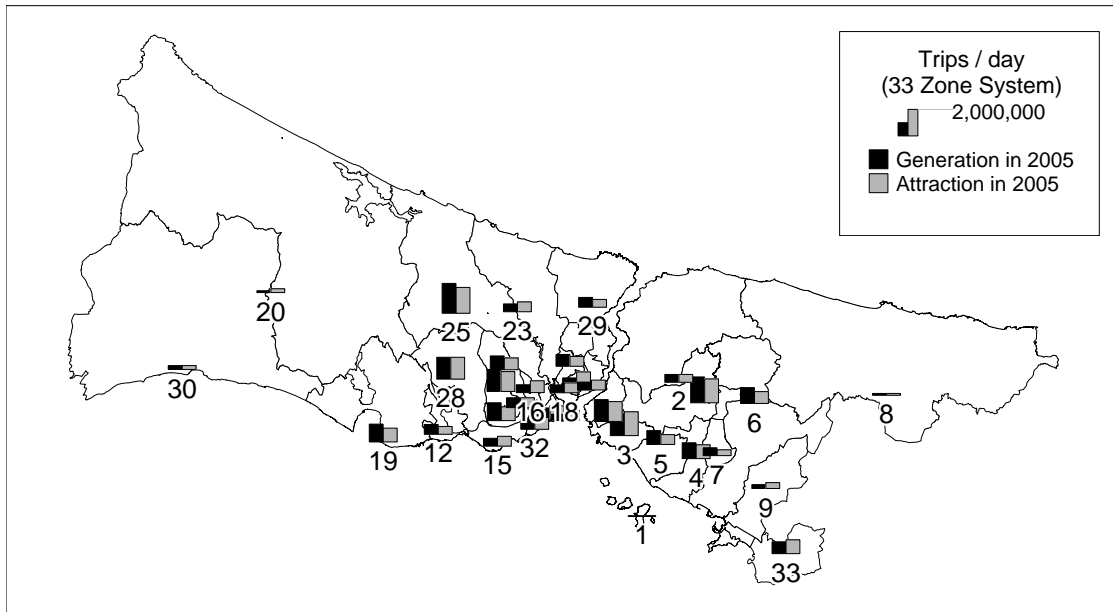
2.2.4 Trip Generation (Production) and Attraction

1) Trip Production and Attraction by Purpose

As mentioned earlier, trip purpose is classified into HBW, HBS, HBO and NHB. They include trip-to-return-to-home. Trip generation and attraction are the number of trips that are generated by and attracted to each zone in a study area. Therefore, the trip *production* by zone contains the trip from and to the home end of home-based trips, or the origin end of non-home-based trips, while trip *generation* by zone does not contain the trip-to-return-to-home end. In this section, trip production is used, instead of trip generation.

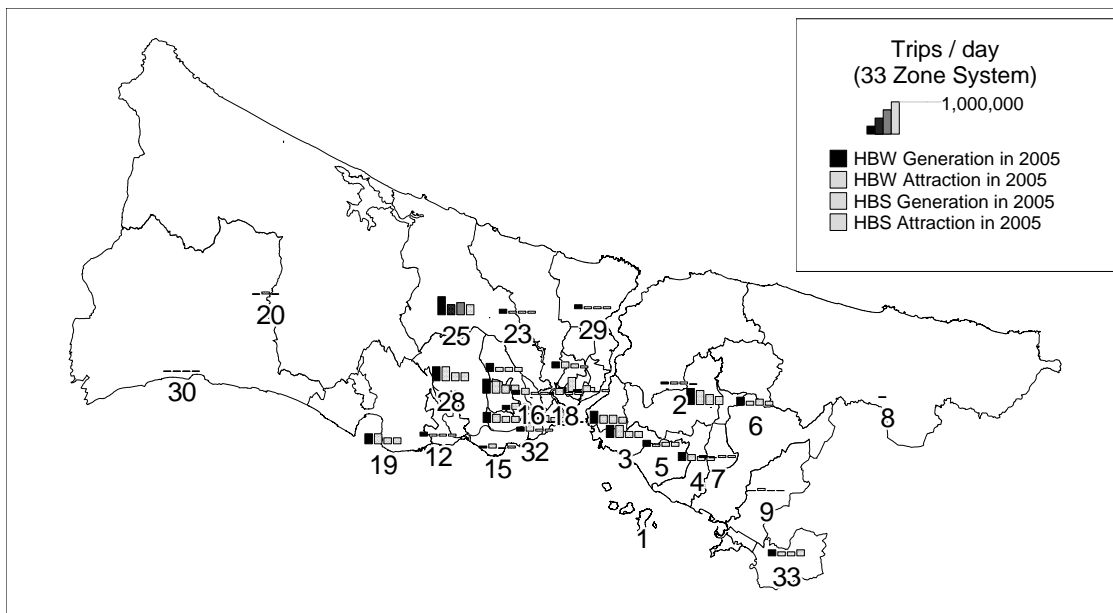
Trip production and attraction according to the integrated zoning system are shown in Figure 2.2.8 for all purposes. The integrated zones where trip production and attraction are higher, are No. 3, 10 and 11 on the Asian side, and Nos. 13, 25 and 28 on the European side. The zones with high density (trips/km²) of production and attraction are 13, 14, 18, 21, 24, 26 and 32. Those zones are on the European side.

For the HBW trips shown in Figure 2.2.9, trip attraction density in zones No.16, 21 and 32 is remarkably higher than others, while trip production in those zones is considerably lower than the average. This is because these zones are business activity centers and there are many workers concentrated in these zones.



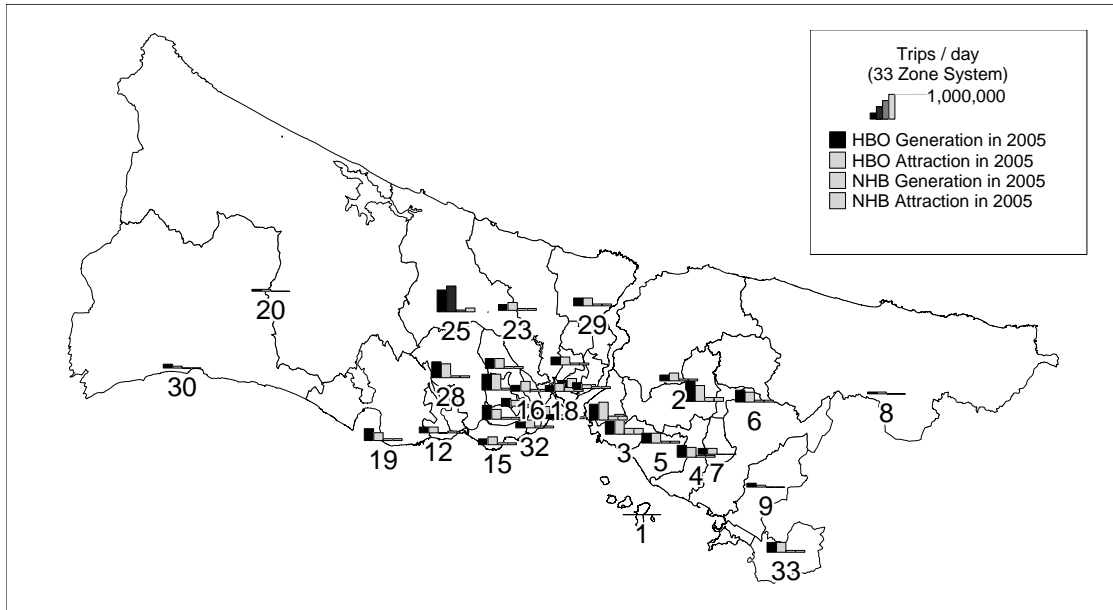
Source: *ibid.*

Figure 2.2.8 Trip Production and Attraction for All Purposes, 2005



Source: *ibid.*

Figure 2.2.9 Trip Production and Attraction for HBW and HBS Purposes, 2005



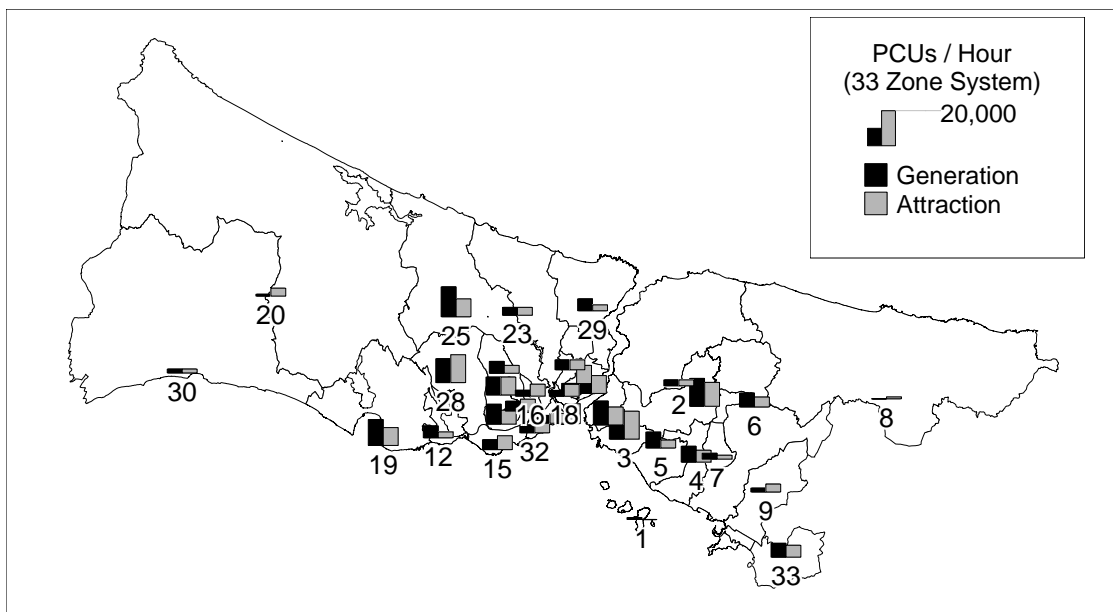
Source : *ibid.*

Figure 2.2.10 Trip Production and Attraction for HBO and NHB Purposes, 2005

2) Peak Hour Trip Generation and Attraction by Mode

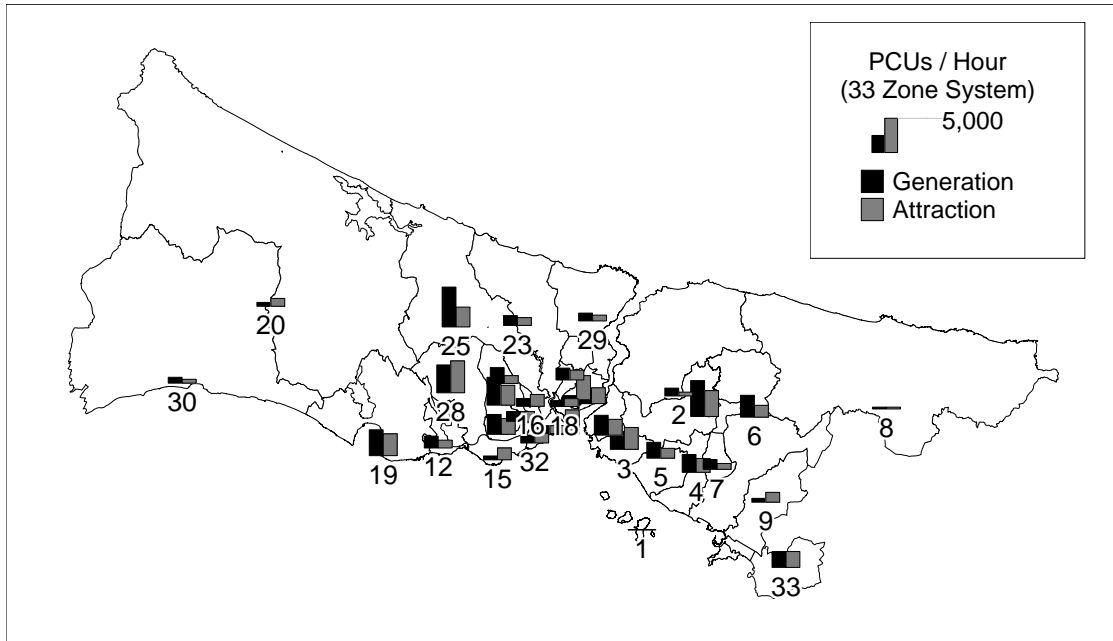
Source : *ibid.*

Figure 2.2.11-2.2.13 show peak hour trip generation and attraction by transport mode; Car, Service and Public transport. Since this trip data was extracted from the peak hour trips in the OD table by mode, this figure shows trip generation and attraction. Cars and services are converted to PCUs/hr, while public transport is shown in “person” trips/hr in the morning peak hour during 7:00 to 8:00. The zones, with higher car trip generation and attraction are 8 and 10 on the Asian side, and 12, 15, 27, 28 and 32 on the European side. It is noted that the highest numbers of public transport (bus) also takes place in similar zones to those for the cars.



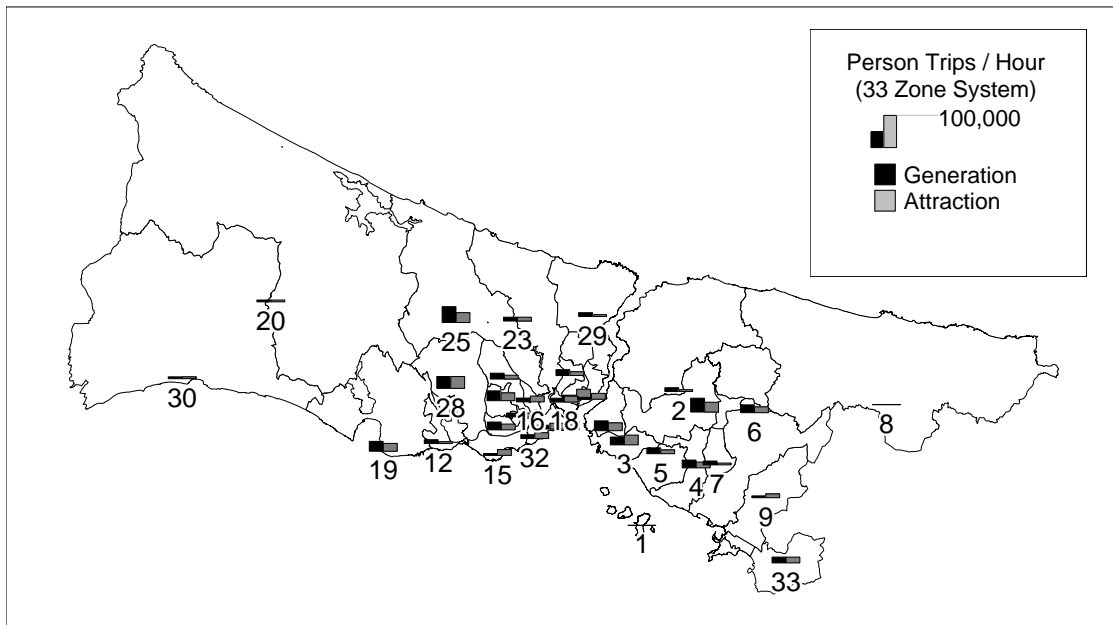
Source : *ibid.*

Figure 2.2.11 Hourly Trip Generation and Attraction by Car (PCU/hr) during 7:00 to 8:00, 2005



Source : *ibid.*

Figure 2.2.12 Hourly Trip Generation and Attraction by Service (PCU/hr) during 7:00 to 8:00, 2005



Source : *ibid.*

Figure 2.2.13 Peak Hour Trip Generation and Attraction by Public (person/hr) during 7:00 to 8:00, 2005

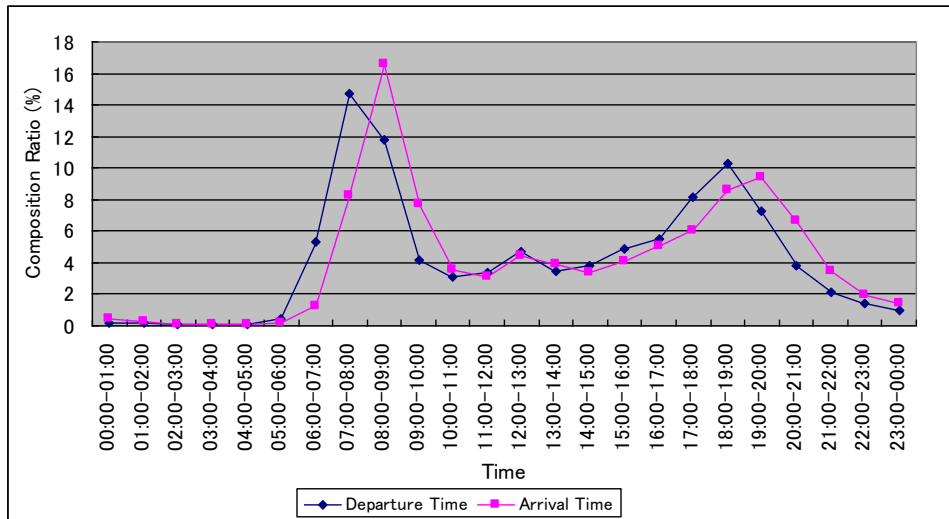
3) Hourly Trip Distribution by Purpose

Hourly number of trips for all purposes is shown in Figure 2.2.14, which reflects the hourly fluctuation of trips and the departure and arrival time. The morning and evening peak hour ratios in departure for all purposes are approximately 14% and 10%, which occur between 7:00 a.m. and 8:00 a.m., and between 6:00 p.m. and 7:00 p.m., respectively. The hourly

fluctuation of the arrival peak time is similar to the departure time, although it is about one hour behind.

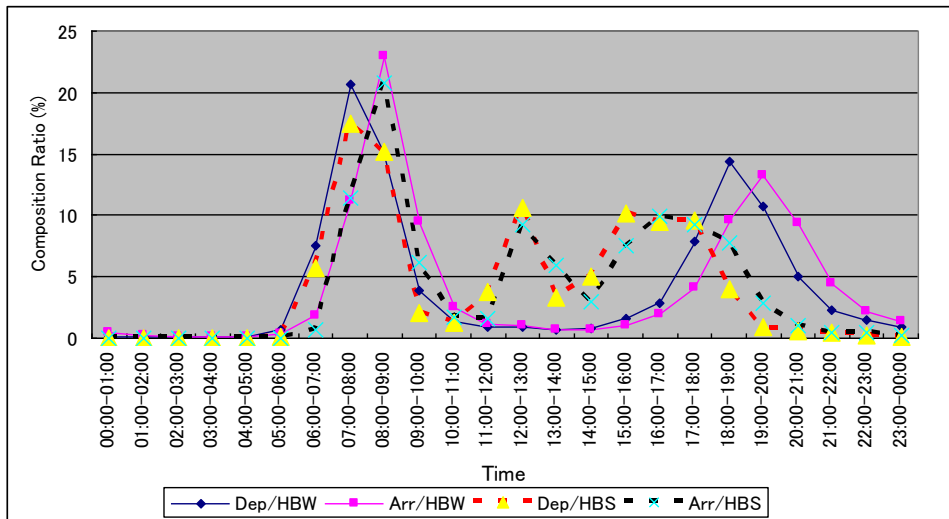
Departure peak hour percentage for HBW rises to 20% in the morning from 7:00 a.m. and 8:00 a.m. HBS trip fluctuation indicates a different pattern with that of HBW. It has three peaks; one is in the morning peak from 7:00 to 8:00 a.m., the second is during noon time from 12:00 to 1:00 p.m. and the last is in the afternoon from 3:00 to 4:00 p.m.

HBO and NHB's fluctuations, they ascend in a gradual slope to the crest. The fluctuation of both purposes is considerably similar. They show similar activity patterns from 10:00 a.m. to 7:00 p.m.



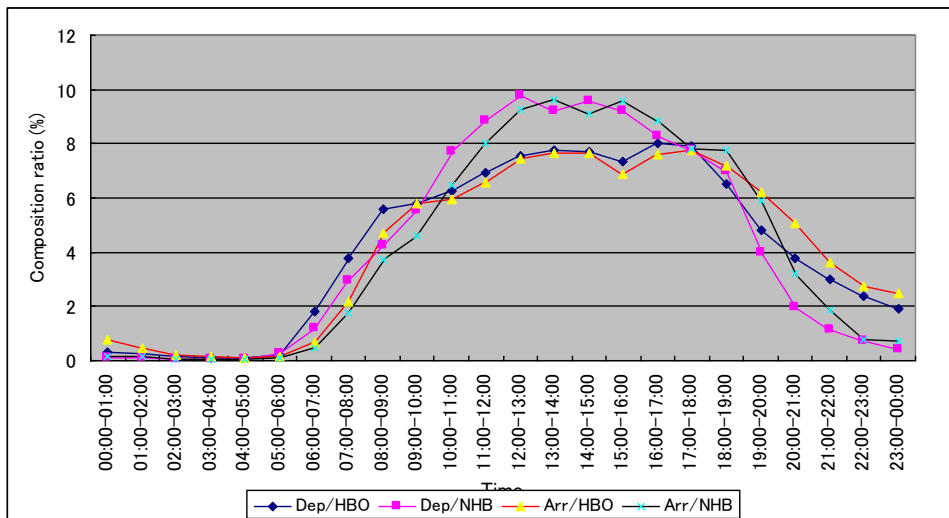
Source : *ibid.*

Figure 2.2.14 Hourly Trip Distribution, All Purpose, 2006



Source : *ibid.*

Figure 2.2.15 Hourly Trip Distribution, HBW and HBS, 2006



Source : *ibid.*

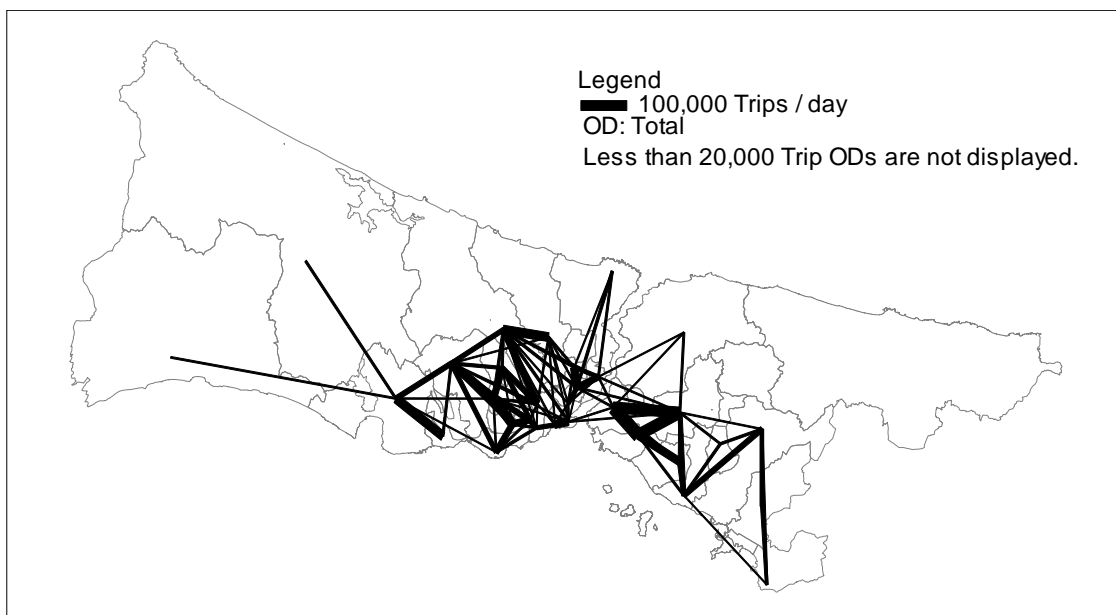
Figure 2.2.16 Hourly Trip Distribution, HBO and NHB, 2006

2.2.5 Trip Distribution

1) Trip Distribution by Purpose

Overall trip distribution by all modes and purposes is shown in Figure 2.2.17. In this figure, the two-directional movements between integrated zones are drawn by a straight line whose width is proportional to the number of trips. It shows that the large trip movement is classified into two parts, one on the European side and the other on the Asian side. These movements are restricted by the Bosphorus crossing. On the European side, there are large movements between the central commercial/business areas composed of zones 16, 18, 21, 27, 31 and 32, and its surrounding residential areas such as zones 19, 28, 22, 23, and 25. Strong desire lines are radiating from the central area to outside zones.

On the Asian side, the desire line shows that there is heavy traffic between the business/commercial areas of zones 3, 5, 10 and 11, and their surrounding areas.

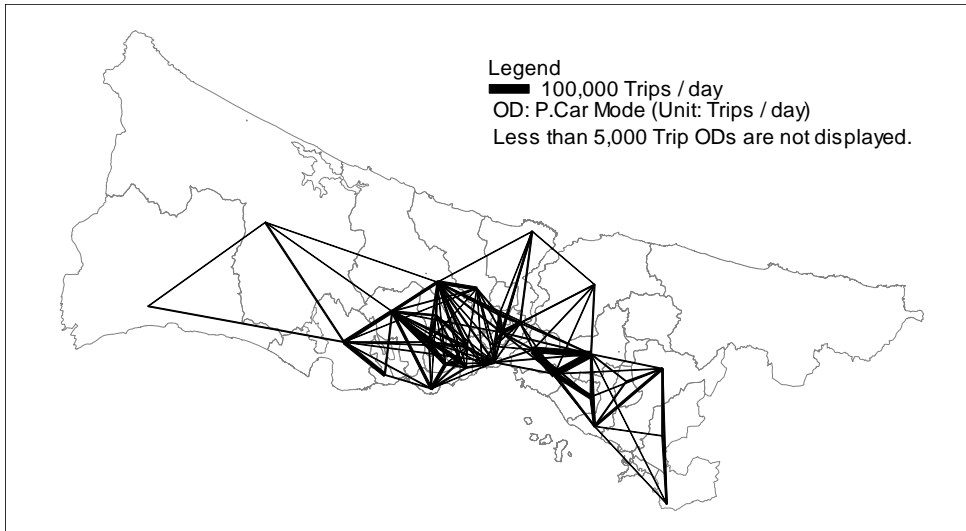


Source : *ibid.*

Figure 2.2.17 Trip Distribution, All Purposes, 2005

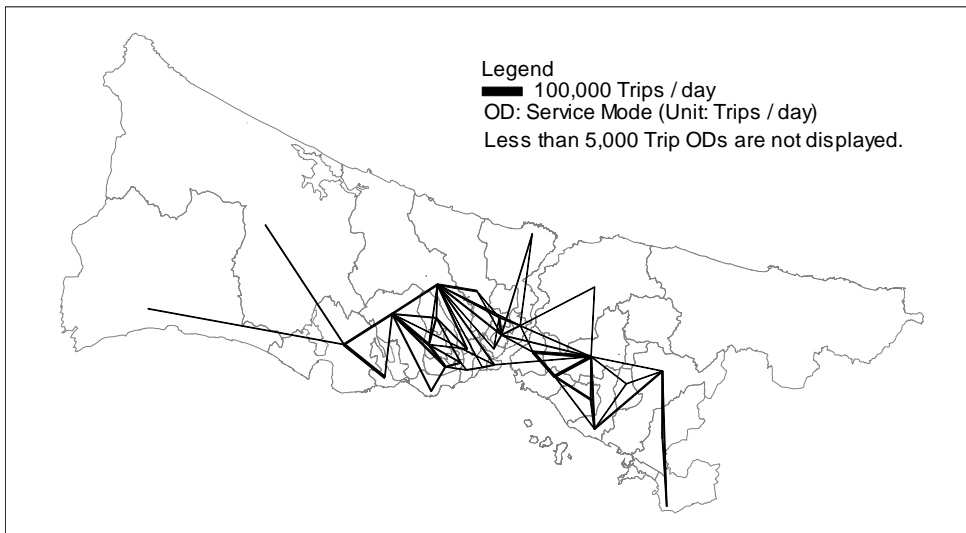
2) Daily Trip Distribution by Mode

Daily trip distribution by car, service and public transport are shown in Figure 2.2.18 through Figure 2.2.20. It shows trips of car, service and public transport. Those movements are restricted by the Bosphorus crossing. These movements are similar among transport modes.



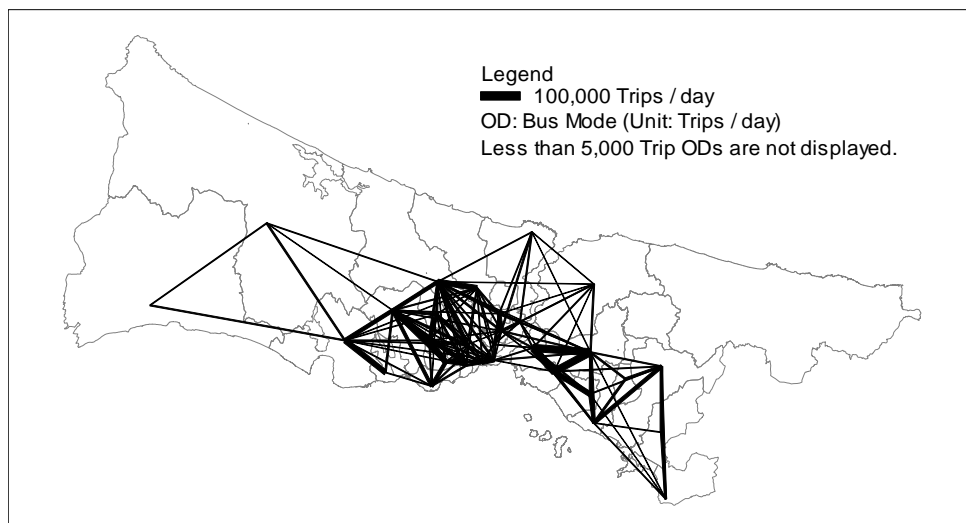
Source : *ibid.*

Figure 2.2.18 Daily Trip Distribution by Car, 2005



Source : *ibid.*

Figure 2.2.19 Daily Trip Distribution by Service, 2005



Source : *ibid.*

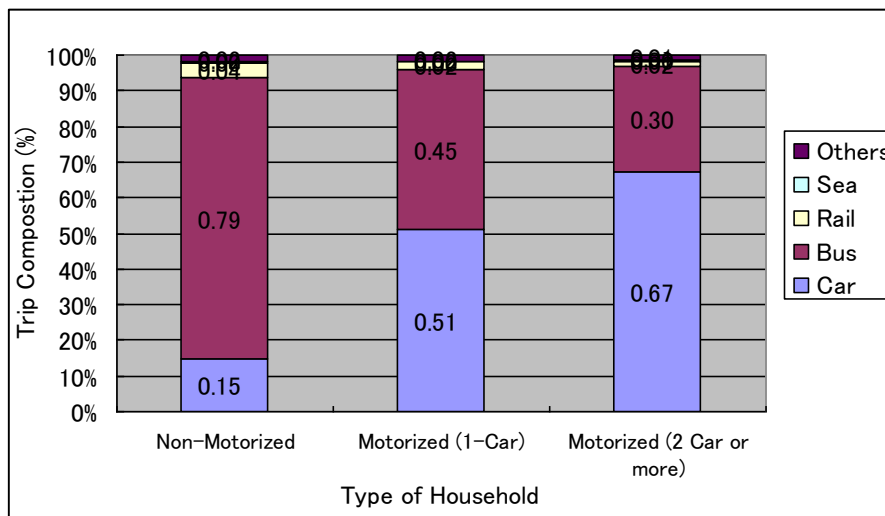
Figure 2.2.20 Daily Trip Distribution by Public Transport, 2005

2.2.6 Household Trip Characteristics

1) Modal Share by Household Car Ownership

(1) Modal Share by Integrated Mode

Trip composition of modes used by non-motorized and motorized households is shown in Figure 2.2.21. In this figure, household is classified into 3 categories; non-car owning, single-car owning and multi-car owning. Car owning household mainly uses car (single car owning: 51%, and multi-car owning: 67%) and bus (single: 45 %, and multi: 30%), while on-motorized households is supported mostly by buses (79% of the total excluding walking).



Source : *ibid.*

Figure 2.2.21 Modal Shares by Household Car Ownership (integrated mode, excluding Walking), 2006

(2) Modal Shares by Mode

Table 2.2.5 shows the breakdown of modal shares for motorized and non-motorized households. The modes shown in Figure 2.2.21 integrate 11 modes into 5 modes while Table 2.2.5 uses combined modes of 11 types. Car includes car and taxi and rail means subway, tramway and suburban railway.

Excluding walking, car owning household mainly uses car (53% of the total) followed by bus (40 %), while the transport of non-motorized household is supported by bus (75%). Looking at the “park & ride” mode, the share is very low at 0.6% for non-motorized and 0.7% for motorized households. At present, since public transport network is not yet sufficient, it is hard to force car users to use public transport such as bus and railway.

Among the combination modes, “bus to railway” mode is somewhat high at 2.4% for non-motorized and 1.4% for motorized households. Non-motorized family tends to make a little more transfers from bus to railway, compared with motorized family.

Table 2.2.5 Modal Shares by Household Car Ownership, 2006 (Unit: %)

Modes	All Modes			Excluding Walking		
	Total	Non-Motorized	Motorized	Total	Non-Motorized	Motorized
Walking	52.3	59.6	40.8	-	-	-
Car	15.7	5.8	31.2	32.9	14.3	52.8
Park & Ride	0.3	0.2	0.5	0.7	0.6	0.8
Bus	27.6	30.2	23.5	57.9	74.9	39.7
Bus + Rail	0.9	1.0	0.9	1.9	2.4	1.4
Bus + Sea	0.6	0.5	0.6	1.2	1.3	1.1
Bus + Sea Rail	0.1	0.1	0.2	0.3	0.3	0.3
Rail	1.3	1.5	1.1	2.8	3.7	1.8
Rail + Sea	0.1	0.1	0.1	0.1	0.2	0.1
Sea	0.2	0.2	0.2	0.4	0.4	0.4
Others	0.8	0.8	0.9	1.7	1.9	1.6
Total	100	100	100	100	100	100

Note: * Car=Car+Taxi, **Rail=Subway+Tramway+Suburban railway
 Source : *ibid.*

2) Trip Composition by Purpose and by Household Car Ownership

Table 2.2.6 shows trip composition by purpose for motorized and non-motorized households. The composition is similar in ratio for both households, though modal share is considerably different between two households. This shows that the car owning family uses a car during trips. On the other hand, non-car families use a bus for travel, even though their trip purposes are the same.

Table 2.2.6 Trip Composition by Purpose and by Household Car Ownership, 2006

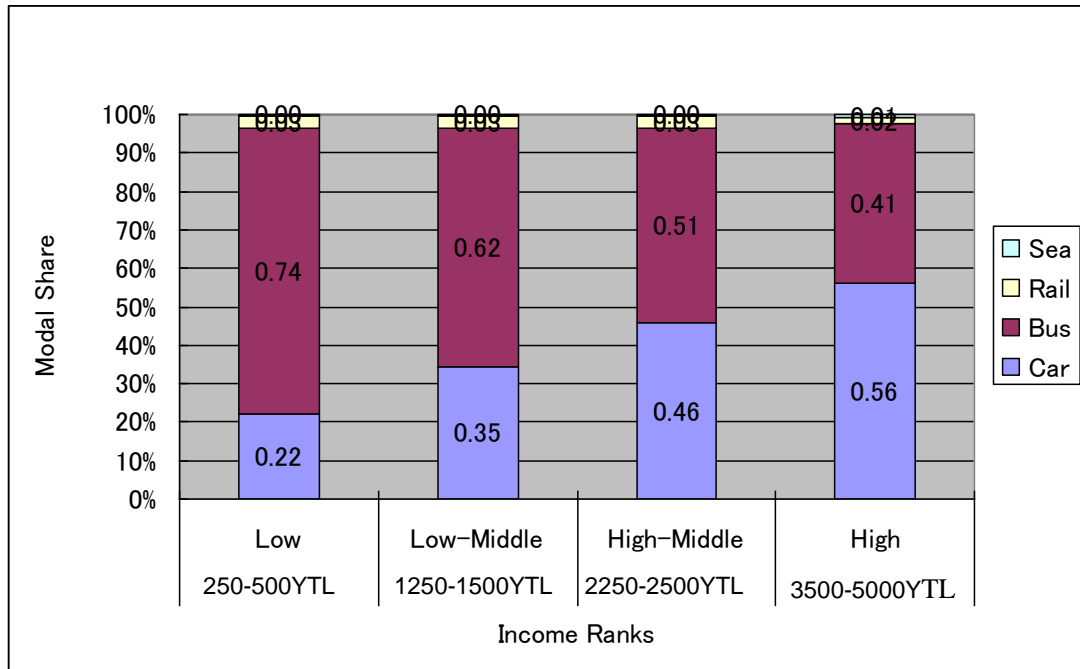
PURPOSE	TOTAL	Non-Motorized Households	Motorized Households
HBW	0.32	0.32	0.32
HBS	0.24	0.25	0.24
HBO	0.36	0.37	0.35
NHB	0.07	0.06	0.10
TOTAL	1.00	1.00	1.00

Source : *ibid.*

3) Trip Composition by Mode and by Income Rank

Trip composition by mode and by household income rank is shown in Source : *ibid.*

Figure 2.2.22. In this figure, 4 typical income ranks were selected; Low income (250-500YTL), Low-middle (1,250-1,500 YTL), High-Middle (2,250-2,500 YTL) and High (3,500-5,000 YTL) from among 15 income ranks. The tendency by income rank is similar to that of motorized and non-motorized households. This is because car ownership and income rank have a closed relationship. The higher the income rank is the higher is the car ownership. On the other hand, the lower the income rank is, the higher is the bus use. This will show that in the future, if economic growth continues, car share will likewise become larger.



Source : *ibid.*

Figure 2.2.22 Modal Share by Income Rank, 2006

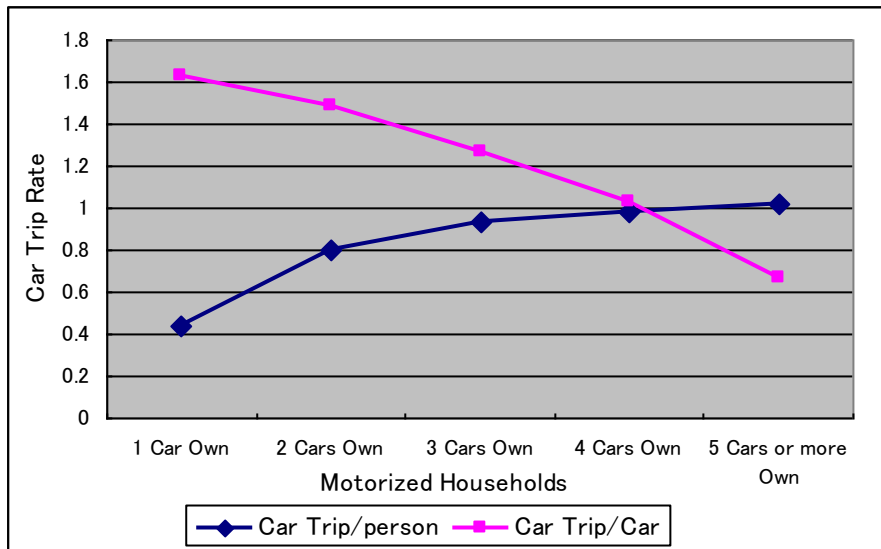
4) Car Trip Production Rate of Motorized Households

Source : *ibid.*

Figure 2.2.23 shows the relationship between number of cars owned by motorized households and car trips. If number of car trips per person per car is used as an index, it is noted that, when car ownership increases then number of trips per car will decrease.

In the future, further increases will take place in the number of multi-car owning households. However, multi-car owning household tends to decrease the number of car trips per car, not per person. For example, in case of a 5-car owning family, the number of car trips per person is bigger 2.3 times and the number of car trips per car is as small as 41%, comparing to single-car owning household.

From the above discussion, in the future, when car-owning families increase through economic growth, it doesn't necessarily mean that car trip production rates will decrease. This will depend on future increase of multi-car owning households.



Source : *ibid.*

Figure 2.2.23 Relationship between Number of Cars Owned and Trips per Car, 2006

2.2.7 Vehicle Ownership

1) Number of Vehicles Owned by Ownership Type

The characteristics of vehicle ownership in Istanbul, such as type of ownership and type of vehicle, are revealed by the person-trip survey data. Table 2.2.7 shows car ownership by type of ownership and vehicle. The total number of passenger cars owned in Istanbul is approximately 1,283,000, of which approximately 1,159,000 are privately owned. The figures for cars estimated from the PT survey are very close to the number of cars registered in Istanbul according to the statistical data (1,522,521 in 2005). Privately owned vehicle ratio to registered number is 0.76. However, it seems that this figure includes the vehicles owned by companies or by the government but are used privately. This is because interviewers visited private houses, not company or government offices. Thus the number of privately owned vehicle indicated here could be an overestimate.

Table 2.2.7 Number of Vehicles Owned Privately and by Company, 2005

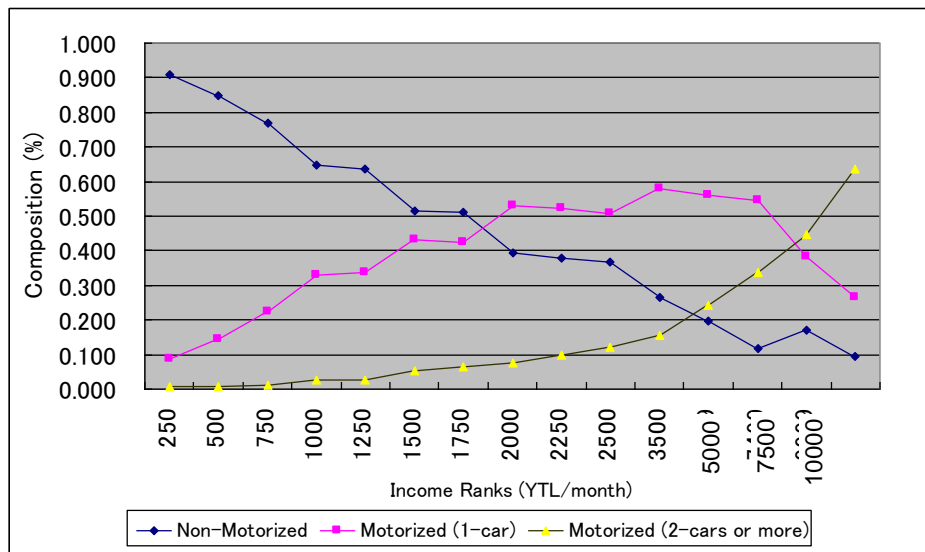
Vehicle Type	Total	Not Specified	Company	Private Household
Cars	1,282,672	472	123,501	1,158,698
Lorry	7,503	7,503		
Small Lorry	10,529	10,529		
Motorcycle	11,516	11,516		
Bus	1,353	1,353		
Minibus	9,696	9,696		
Others	11,362	11,362		
Total	1,334,630	52,430	123,501	1,158,698

Source : *ibid.*

2) Motorized Households by Income Rank

The percentage of car ownership categorized into non-car, single-car, and multiple car owning by monthly household income level is shown in Figure 2.2.24. As seen from the figure, the percentage rates of non-motorized household decreases, while motorized households increase with their increase in income levels.

The distribution of motorized households that have a single car has a crest between 3,500 to 8,000 YTL, while multi-car owning households increase straight according to the income level.



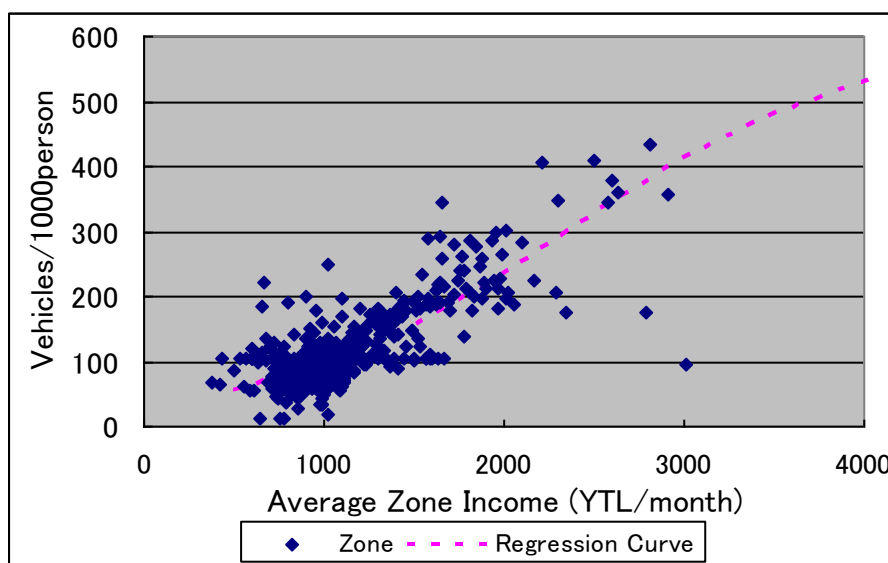
Source : *ibid.*

Figure 2.2.24 Ratio of Motorized Households by Income Level

3) Motorized Households and Vehicle Ownership by Zone

Both average income and car ownership by zone have close relation with each other in the analysis of the person trip survey data. Figure 2.2.25 shows this relationship, the red dotted line shows the value from model equation by regression analysis. High car owning rate is seen naturally in high income zones. For example, vehicle ownership in a zone with an average income of 1000 YTL is approximately 100 vehicles/1000person, in contrast to 400 vehicles/1000 person in a zone with a 3,000 YTL income.

This relationship is used to estimate the number of motorized households by zone in accordance with the future income growth.



Source : *ibid.*

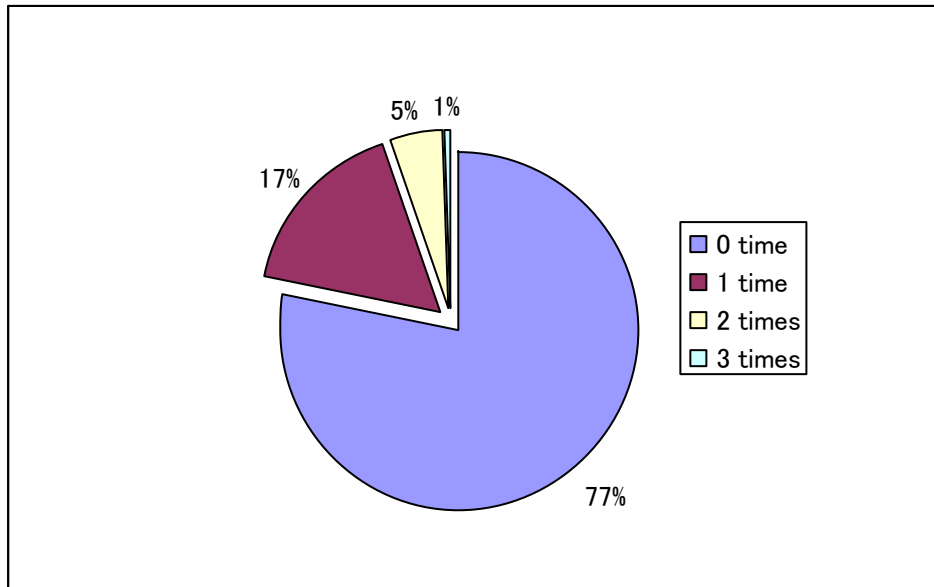
Figure 2.2.25 Relationship between Income Level and Car Ownership, 2006

2.2.8 Public Transport Passenger Characteristics

1) Number of Transfers

Public transport passengers arrive at their destination with or without transfers. Source : *ibid.*

Figure 2.2.26 shows the number of transfer times of public transport. This excludes transfers between public transport and other modes such as cars. As can be seen, the ratio of no-transfer passengers accounts for 77%, while one-time transfer shares 17%. Passengers making twice or more transfers have a low percentage at 6%. In Istanbul, most public transport passengers travel without transfers.



Source : *ibid.*

Figure 2.2.26 Number of Transfer Times of Public Transport

2) Transfer Modes

In this section, the distribution of transfers between modes is shown in Table 2.2.8 in a matrix format. The figures, in Table 2.2.8, are the ratios to the total of trips that made transfers. Note, however, that this table excludes the trips that made no transfers.

As can be seen, the transfer of public bus is numerous compared to others.

Table 2.2.8 Distribution of Transfers between Modes, 2006

(Unit: trip ratio to the total :%)

	Car	Public Bus	Metro	Tramway	Boat	Others	Total
Car	0.2	1.1	0.1	0.0	0.4	0.5	2.4
Public Bus	0.5	37.6	6.4	3.4	6.6	6.7	61.2
Metro	0.1	5.6	0.2	1.0	0.1	0.9	8.0
Tramway	0.0	2.7	0.9	0.2	1.2	0.6	5.7
Boat	0.2	5.8	0.2	1.7	0.0	1.9	9.6
Others	0.5	6.4	0.9	0.6	1.5	4.5	13.1
Total	1.6	59.2	8.7	7.0	9.9	15.2	100.0

Source : *ibid.*

2.3 Summary of Present Trip Characteristics

1) Trip Rate

Number of trips per person per day is 1.74 for all modes and 0.86 for motorized modes. Trip production rate for motorized and non-motorized household is 1.86 and 1.68, respectively. This relationship is taken into account in the trip production model.

2) Travel Time

Approximately 70% of total HBW trips have a travel time of less than 60 minutes and the percentage of travel time exceeding 90 minutes is approximately 6% of the total. Approximately 15% of the total trips depart from home during the morning peak hour: from 7:00 to 8:00 a.m. Car has approximately 40 minutes average travel time. Bus and Metro have somewhat longer travel time than car, with 70 minutes and 50 minutes, respectively.

3) Trip Distribution

Trip distribution in Istanbul is separated roughly into two parts; European side and Asian side. These movements are restricted by the Bosphorus crossing. Within the European side, there are large movements between the central commercial/business areas and their surrounding residential areas. Car and public transport trip distribution have a similar movement pattern.

4) Modal Share

Vehicle-owning households have high income. Motorized households increase in parallel to the increase in their income levels. Car owning households mainly use car, while transport of non-motorized household is supported by bus.

As for multi-car owning families, number of car trips per car decreases, while number of car trips per person increases, through the increase in the number of multi-car owning household.

5) Public Transport Passenger

The public transport passengers usually travel without transfers. The ratio of no-transfer passengers to the total reaches approximately 80%. Bus passengers usually transfer to buses of other routes, metro, tramway and boat. At present, it is bus that connects public transport routes with each other.