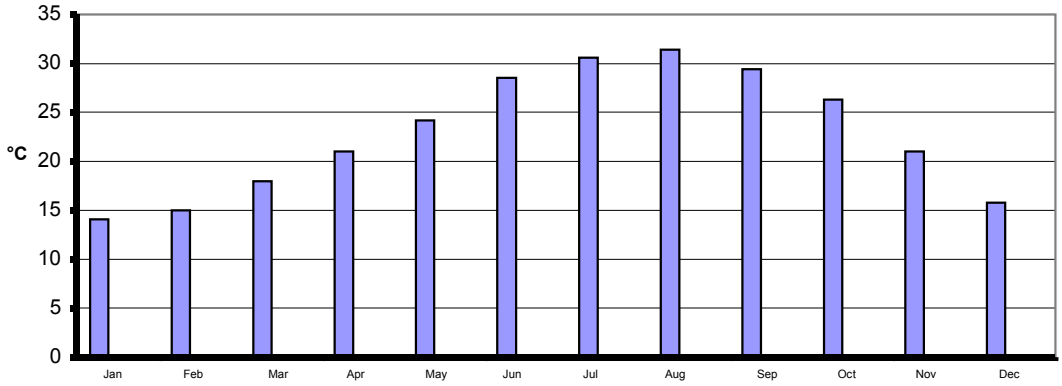

Figure 14-10: Monthly Maximum Mean Temperatures (State Meteorological Office, 1998)

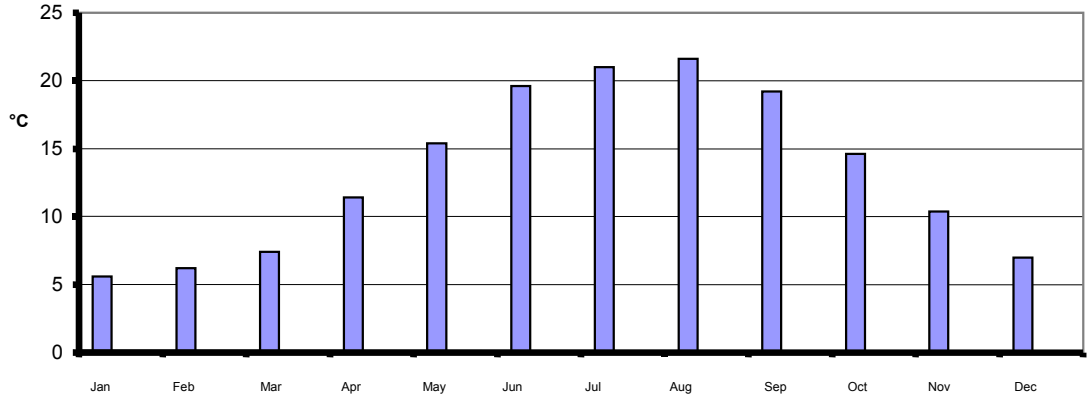

Figure 14-11: Monthly Minimum Mean Temperatures (SMO, 1998)

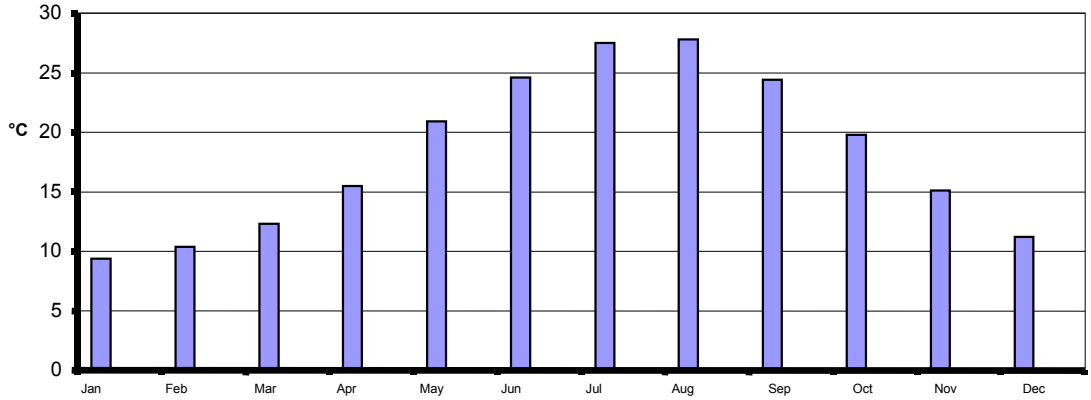

Figure 14-12: Monthly Mean Temperatures (SMO,1998)

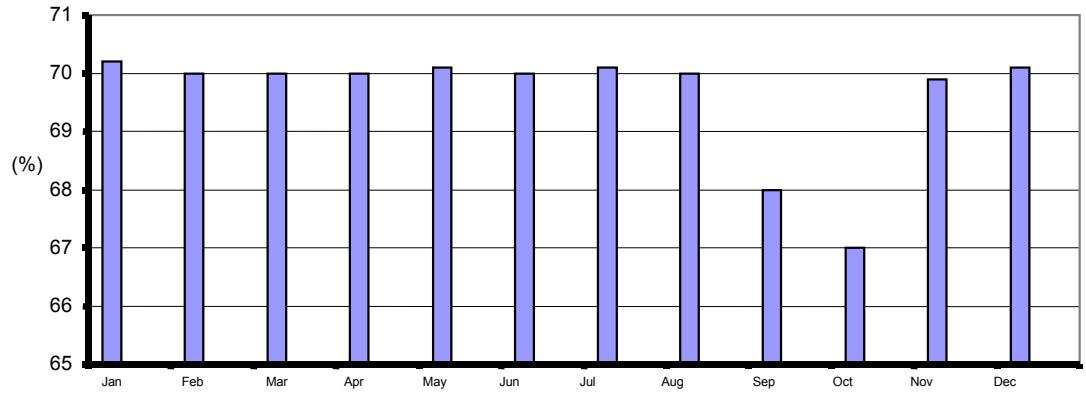

Figure 14-13: Monthly Relative Humidity (SMO,1998)

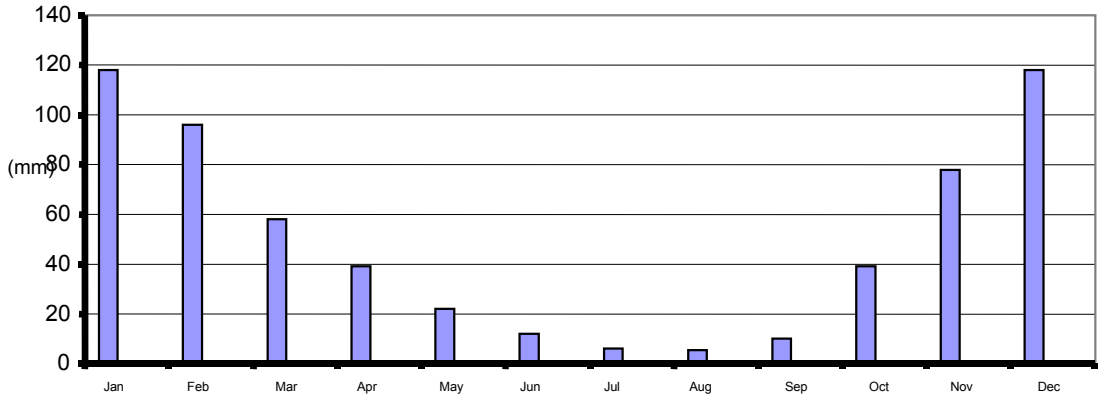

Figure 14-14: Monthly Mean Precipitation (S.M.O.1998)

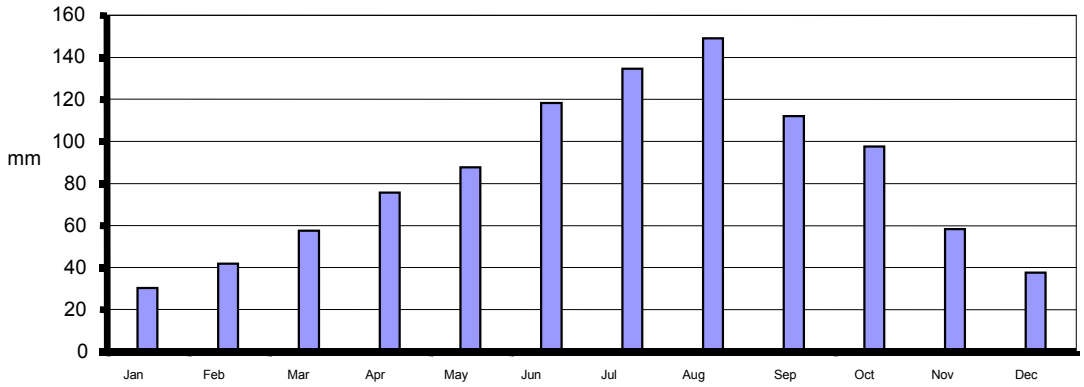

Figure 14-15: Monthly Mean Evaporation (S.M.O.1998)

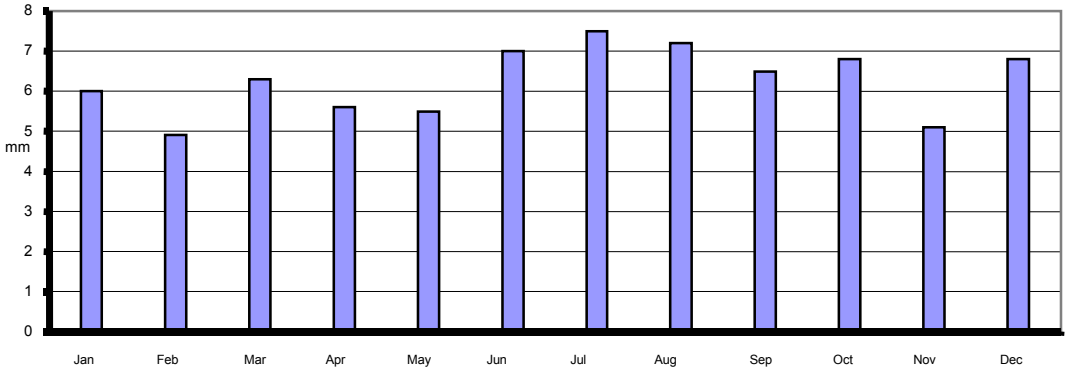

Figure 14-16: Maximum Daily Evaporation (S.M.O., 1998)

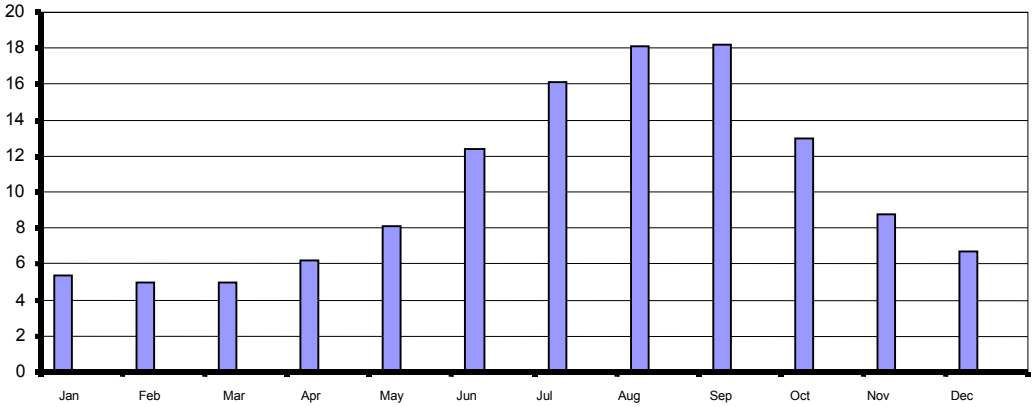

Figure 14-17: Monthly Clear Days (S.M.O., 1998)

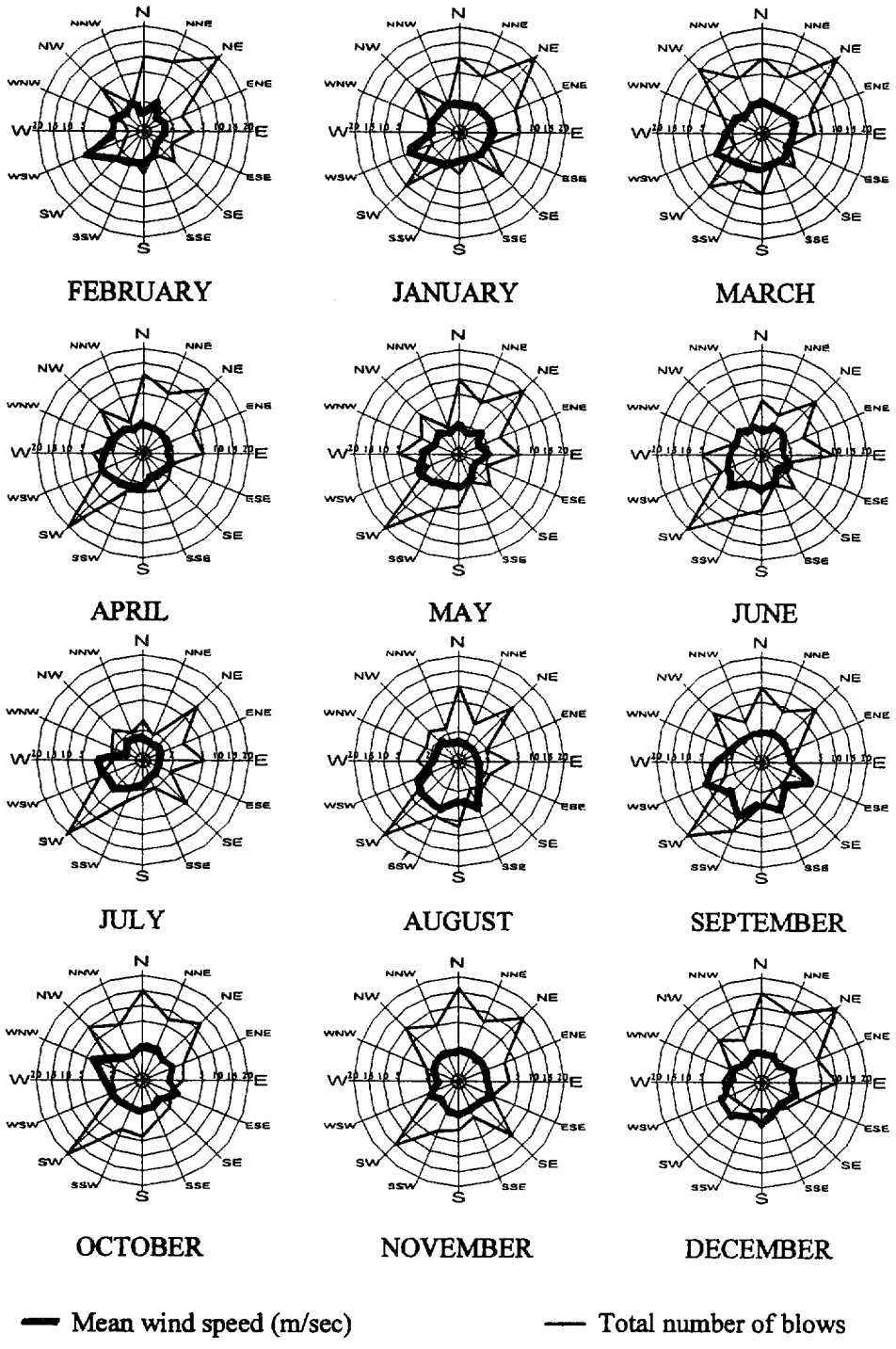

Figure 14-18: Wind Roses of Cimsa (S.M.I., 1998)

14.4.1.3 Selection of Items for Environmental Impact Assessment

According to the Environmental Impact Assessment Regulation of the Republic of Turkey, an Initial Environmental Assessment/Evaluation (IEE) should be carried out prior to the construction of a disposal site for general wastes to determine whether there is a need for environmental impact assessment. However, because this project involves infectious and hazardous medical wastes the direct implementation of environmental impact assessment is required. The items to be subject to the environmental impact assessment were selected by JICA Study Team based on the JICA guidelines for environmental considerations for the conduct of development studies as shown in Table 14-10. In consideration of the guidelines, the selected items pertain to the site topography, surrounding land use conditions, location of residential areas, and natural conditions.

The environmental impact assessment for this project will cover the following items:

- Economic activities
- Traffic and public facilities
- Public health
- Hazards/risks
- Groundwater
- Hydrological situation
- Fauna and flora
- Landscape/aesthetics
- Air pollution
- Water pollution
- Soil contamination
- Noise and vibration
- Offensive odour

Table 14-10: Scoping of Environmental Impacts for Proposed Site

No	Environmental Item	Description	Evaluation	Reason
Social Environment				
1	Resettlement	Resettlement due to land acquirement for project(s) (transfer of rights of land ownership/residence).	D	No houses/residents in area for proposed site.
2	Economic Activities	Loss of bases for economic activities (e.g., land) and effects on these activities.	C	Excavation works and associated activities in or near quarry will be affected; effect on recycling/scavenging activities; production and sale of compost.
3	Traffic and Public Facilities	Impacts on schools, hospitals, etc. and traffic conditions (e.g., increased traffic congestion/accidents).	C	Increased traffic congestion/accidents may occur on the access road.
4	Division of Community	Division of Community geographically due to project location, interruption of area traffic, etc.	D	No community in proposed area.
5	Cultural Property	Damage to or loss of value of churches, temples, archaeological remains or other cultural assets.	D	No cultural property in area around landfill site.
6	Water Rights/ Access Rights	Obstruction of fishing rights, water rights and rights of common access.	D	No water/fishing rights affected.
7	Public Health	Deterioration of public health and sanitary conditions due to refuse generation and increase in pathogens/vermin.	B	Impact will be significant near landfill site due to refuse disposal; deterioration in air and water quality will also affect public health.
8	Waste	Generation of construction wastes/debris.	D	Almost no construction wastes/debris.

No	Environmental Item	Description	Evaluation	Reason
9	Hazards/Risks	Increase in natural disasters (e.g., landslides) and man-made hazards (e.g., landfill gas explosions, refuse fires).	C	Possibility of natural disasters (landslides, flooding) is unlikely to increase; possibility of gas explosions.
		Natural Environment		
10	Topography and Geology	Changes of valuable topography and geology due to excavation, construction and/or filling works.	D	Topography has already been changed by quarry operation.
11	Soil Erosion	Topsoil erosion by rainfall after earthfilling and deforestation.	D	Topsoil has already been removed by quarry operation.
12	Groundwater	Changes in groundwater level due to leachate infiltration & run-off from disposal site.	C	Impact on groundwater level is likely to be small.
13	Hydrological Situation	Changes in river discharge and riverbed condition due to inflow of run-off and landfill.	C	Impact on surface water sources in vicinity of landfill is likely to be small.
14	Coastal Zone	Coastal erosion and changes in vegetation due to coastal reclamation and coastal changes.	D	Project will not impact on coastal zone.
15	Fauna and Flora	Obstruction of breeding and extinction of species due to changes in habitat conditions.	C	Increase in vermin may threaten flora and fauna.
16	Meteorology	Changes in temperature, rainfall, wind, etc. due to large scale land changes and building construction.	D	None; scale of landfill is too small to produce such changes.
17	Landscape/ Aesthetics	Changes in topography & vegetation due to earthworks; deterioration in environmental aesthetics.	C	Topography and vegetation has already been changed; affect landscape unless sanitary landfill is conducted.
		Pollution		
18	Air Pollution	Pollution caused by exhaust/toxic gases, dust, smoke, fumes, etc. from refuse collection vehicles and the landfill site.	C	Landfill gases (e.g., methane) will be generated; smoke/dust may be problematic especially during dry season; impact of fumes/exhaust gases from refuse collection and landfill vehicles should be small.
19	Water Pollution	Pollution caused by inflow of sand, silt, leachate and run-off from disposal site into rivers, groundwater and sea near river discharges.	A	Due primarily to leachate.
20	Soil Contamination	Contamination of soil by leakage and diffusion of ash, leachate, etc.	B	Due primarily to leachate & hazardous/toxic substances in medical waste.
21	Noise and Vibration	Noise and vibration generated by refuse collection vehicles and landfill site equipment.	B	Due to refuse collection vehicles and heavy landfill site equipment (e.g., bulldozers).
22	Land Subsidence	Deformation of land and land subsidence due to decrease in groundwater table.	D	None
23	Offensive Odour	Generation of offensive odours from landfill site, associated treatment facilities and during waste transportation.	B	Odours due to landfill gases, refuse smell and leachate will be generated at landfill site.

Note: Evaluation categories: A - serious impact expected; B - some impact expected; C - extent of impact unknown (examination needed; impacts may become clear as Study progresses); D - no impact expected; EIA not necessary

14.4.2 Characteristics of Socio-economic, Physical-biological Environment and Use of Natural Resources

14.4.2.1 Social Environment

a. Economic Activities

The aim of this study is to provide economic analysis for the Mersin waste management systems. More particularly, it is aimed to find economic value added, including employment, and beneficiaries and losers of the Project.

Data are taken from "Main Report". Price and quantity information were collected in October 1998. The price information is converted to June 1999 by the method developed below. The quantity data are used as given in the Report.

The first step was to convert prices to the US dollar values of October 1998 and June 1999. This provides a base for comparison of prices in October 1998 and June 1999. For simplicity, a calculated ratio, as "June 1999 US $/ October 1998 US $= 1.51" is used. October 1998 prices are multiplied by this ratio.

October 1998 prices were converted to June 1999 prices, using State Institute of Statistic's "private sector wholesale price index" as the second step. A ratio is calculated by "June 1999 Index/ October 1998 Index = 1.312". October 1998 prices are multiplied by this ratio.

The third step was a simple arithmetic average of step 1 and step 2.

There are mainly three stages in waste collection in Mersin. The first stage is performed by "street waste pickers". Their numbers are estimated as 90. Pickers use only their labourforce and simple push carts and sack, including some horses. The estimated amount of collection is 10 ton/day. Pickers sell waste to "middlemen". Their numbers are given 100. There is an association in Mersin. Middlemen sell waste to final users and to each other. The final waste dumping site is the last stage of waste collection. Scavengers recycle 1.50 ton/day. There exists a compost plant in Mersin which recycles 0.35 ton/day.

Street waste pickers' wage income and profit are considered together, while middlemen and final site scavengers enjoy from profit. It is assumed that none of these people pay any tax, rent, etc. to public authorities.

Price and income for street waste pickers and middlemen are calculated as given Table 14-11.

Table 14-11: Prices Calculated for Street Waste Pickers (as of June 1999, TL/Kg)

Material	Price
Metal	12,700
Tin can	12,700
Plastics	28,220
PET	28,220
Aluminium can	246,925
Bottle and glass	10,583
Paper	16,225

The next step is to estimate daily and annual income of street waste pickers.

Table 14-12: Estimated Income of Street Waste Pickers (TL/day)

Material	Income
Metal	20,320,000
Plastics	194,414,000
Paper	74,635,000
Total	199,369,000

The annual income is calculated for 350 days: 199,369,000 X 350= 69,779,150,000 TL/year. This is the total value added created by street waste pickers. It is estimated 90 pickers in Mersin, making average annual income per picker 775,532,000 TL, and daily income 2 million TL.

Middlemen buy waste from pickers, and occasionally, from households, and sell to final users. They enjoy from a profit margin, as calculated Table 14-13.

Table 14-13: Profit of Middlemen (as of June 1999, TL/Kg)

Material	Profit
Metal	7,055
Plastics	30,993
PET	10,583
Aluminium can	84,660
Bottle and glass	3,175
Paper	9,172
Cardboard	7,055

It is possible to calculate daily and annual total profit of middlemen (Table 14-14).

Table 14-14: Profit of Middlemen (as of June 1999, TL/day)

Material	Profit
Metal	35,275,000
Plastics	92,979,000
PET	10,583,000
Aluminium can	101,592,000
Bottle and glass	3,175,000
Paper	91,720,000
Total	335,324,000

The total annual profit of middlemen is calculated for 350 days as:

335,324,000. x 350= 117,363,400,000 TL.

The amount of recycled material is relatively small at Mersin Waste Site and Composting Plant. For example, the amount is 8 ton/day at the Sofulu Site, but 1.85 ton/day at the Mersin Waste Site and at the Composting Plant. Average annual figures of the last three years are only 135 ton/year and 555 ton/year at the Composting Plant and the Mersin Waste Site, respectively. It is not calculated a value added for these

rather low amounts. The total value added created by street waste pickers and middlemen are,

Street waste pickers	69.8 billion TL/year
Middlemen	117.4 billion TL/year
Total	187.2 billion TL/year.

10 permanent workers of the Composting Plant receive 3 million TL/day each, and work 6 days a week. They receive 3,000,000 x 10 x 313= 9,390,000,000 TL/year. There are 20 workers at the Mersin Waste Site, but they do not work on regular base. It is possible to make an "approximation" on the basis of 20 workers who earn as much as 10 workers of the Composting Plant, i.e., 9,390,000,000 TL/year. All together, the total wage created at the Mersin Waste Site and at the Composting Plant becomes 18 780,000,000 TL/year.

The total amount of waste collected in Adana would be calculated as shown at Table 14-15.

Table 14-15: Total Waste Collected in Mersin (Ton/year)

Material	Amount
Metal	1795
Aluminium can	438
Plastics	1110
PET	380
Glass and bottle	750
Paper and cardboard	3545
Total	8018

618 ton/year of the total is collected at the Mersin Waste Site and at the Composting Plant while the remaining part is from the city. It is calculated that street waste pickers collect 10 ton/day, middlemen collect 21.2 ton/day, and scavengers collect 618 ton/year at the Waste Site and at the Composting Plant. The total daily waste collection is approximately 23 ton and it makes 8038 ton/year. Since Table 14-15 gives very close conclusion, it could be accepted as equal.

The breakthrough of waste and Turkish average values are as follows.

Material	**Mersin**	**Turkey**
Metal	22%	9%
Plastics and PET	19%	20%
Bottle and glass	9%	16%
Paper and cardboard	44%	46%
Aluminium can	6%	N/A

b. Traffic and Public Facilities

There is heavy traffic along the road E-24 where there is access to the proposed site. Along the road, four different transportation companies are present. After the junction point of E 90, there is 20 meters wide entrance way which is later crossed by an 8 meter wide railway. The road is used for two-way traffic flow, but there is no

distinct traffic lanes separating the different directions of traffic flow. This asphalt road is 10-12m wide, but it is quite damaged, because of the heavy truck traffic. Main road is separated into two directions after about 1 km. One of the roads leads to Tekke village and the other one directs to the quarries. There is a pass to the excavation area through the Tekke village , but it is seldom used by 4 or 5 vehicles per day. The vehicle count is realised on 21 May 1999 Friday from 7:00 a.m. to 7:00 p.m. The kinds of vehicles counted are truck, car (automobile, taxi and pickup), bus, minibus, motorcycle and tractor. Pedestrians were also counted. Vehicles are recorded hourly. The survey results are given for the three points (point A , point B, point C at Figure 14-19) as can be seen by the following tables.

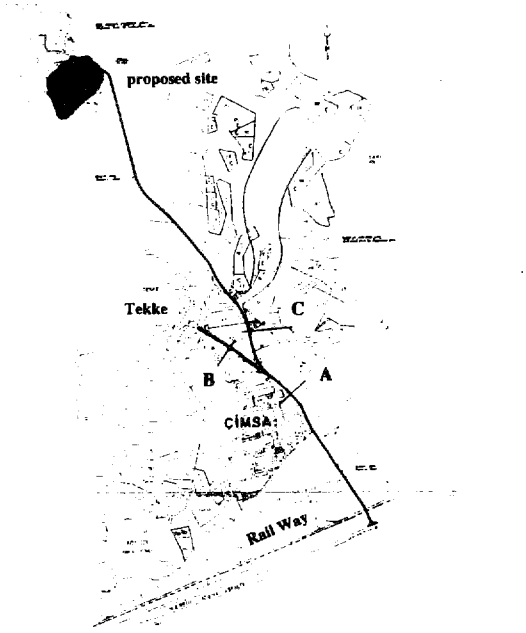

Figure 14-19: Location Map of Traffic Volume Survey

Table 14-16: Traffic Volume Survey at Point A (Glass Plant Entrance) (21 May 1999)

Time (hour)	Truck	Car	Bus	Minibus	Motorcycle	Tractor	Pedestrian	Special Notes
7.00-8.00	79	38	26	14	4	3	12	
8.00-9.00	71	34	14	6	6	2	8	
9.00-10.00	69	27	5	4	5	3	3	Train passed during the first 15 minutes
10.00-11.00	76	36	3	6	3	1	5	
11.00-12.00	81	39	4	9	4	4	6	
12.00-13.00	53	21	3	3	3	6	6	
13.00-14.00	61	29	3	11	3	3	7	
14.00-15.00	75	41	4	7	4	4	8	Sheep herd entered the zone
15.00-16.00	69	43	23	12	11	4	7	
16.00-17.00	68	29	6	11	2	2	9	
17.00-18.00	65	18	13	9	4	1	11	
18.00-19.00	45	17	4	6	4	2	10	
TOTAL	812	372	108	98	53	35	92	

The traffic volume at point A is greater than the total volume at point A and B because more than half of vehicles come to and from the glass company.

Table 14-17: Traffic Volume Survey at Point B (Tekke Village Entrance) (21May 1999)

Time (hour)	Truck	Private Car	Bus	Minibus	Motorcycle	Tractor	Pedestrian	Special Notes
7.00-8.00	4	5	1	3	3	2	7	
8.00-9.00	2	4	1	2	3	1	5	
9.00-10.00	3	4	-	1	2	-	-	
10.00-11.00	4	8	-	3	1	1	4	
11.00-12.00	1	6	-	2	3	2	5	One horse cart has passed
12.00-13.00	1	4	-	4	-	3	4	
13.00-14.00	-	6	-	2	1	2	5	
14.00-15.00	4	10	-	2	1	2	-	
15.00-16.00	1	5	1	-	-	-	1	One waste disposal truck passed
16.00-17.00	2	7	-	2	1	5	4	
17.00-18.00	1	7	1	3	4	-	2	
18.00-19.00	-	15	-	3	3	2	8	
TOTAL	23	82	4	27	22	20	45	

Table 14-18: Traffic Volume Survey at Point C (Proposed Site Entrance Road) (21May 1999)

Time (hour)	Truck	Private Car	Bus	Minibus	Motorcycle	Tractor	Pedestrian	Special Notes
7.00-8.00	35	2	-	-	-	-	1	
8.00-9.00	30	2	-	1	-	-	-	
9.00-10.00	20	2	-	-	-	-	-	
10.00-11.00	31	4	-	-	-	-	-	
11.00-12.00	26	6	-	-	1	-	2	
12.00-13.00	24	-	-	-	-	-	-	
13.00-14.00	26	1	-	-	-	-	1	
14.00-15.00	34	1	-	-	-	1	-	240 sheep uses the Santiye road to go to Aslankoy plateau
15.00-16.00	27	2	-	-	-	-	1	
16.00-17.00	39	4	-	3	-	-	-	
17.00-18.00	46	1	-	-	-	-	-	
18.00-19.00	22	2	-	1	-	-	-	
TOTAL	358	27	-	5	1	1	5	

c. Hazards/ Risks

Judging from the result of field survey, it is considered that topographic and geological condition is stable, and there is no probability of landslide in the proposed site because the topographical features are gentle.

The proposed site is located in the area for quarrying activities. As over 80% of the material for cement (rock) has been removed from the site, the landform is profoundly changed. There is no possibility of hazards and risks except outbreak of dust at present.