

## 6.2 Forecast of Future Waste Amount and Composition

### 6.2.1 Population Forecast

#### a. Future Population Applied to the Study

Population forecast from 1999 to 2010 shown in Table 6-7, which is arranged by the Study Team on the basis of “Proyección de la Población de El Salvador” and information from the municipalities, is applied to this Study.

The future population is forecast as follows:

- Total population is quoted from “Proyección de la Población de El Salvador.”
- Population growth rate in rural area for the whole country in “Proyección de la Población de El Salvador” is applied to the forecast (See Table 6-6).
- Population in urban area is obtained by subtracting the rural population from the total population.

Table 6-6: Population Growth Rate in Rural Area

Year	Growth rate (%)
1995-2000	1.3
2001-2005	1.2
2006-2010	0.9

Source: “Proyección de la Población de El Salvador”

Table 6-7: Population Forecast in AMSS (1999 – 2010)

Muni.		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SS	T	473,374	479,605	485,845	492,001	497,844	503,143	507,666	510,367	512,681	513,869	513,488	512,873
	U	473,374	479,605	485,845	492,001	497,844	503,143	507,666	510,367	512,681	513,869	513,488	512,873
	R	0	0	0	0	0	0	0	0	0	0	0	0
MJ	T	185,204	189,392	193,400	197,273	200,917	204,240	207,153	209,708	211,878	213,779	215,528	217,248
	U	185,204	189,392	193,400	197,273	200,917	204,240	207,153	209,708	211,878	213,779	215,528	217,248
	R	0	0	0	0	0	0	0	0	0	0	0	0
CD	T	149,394	153,350	157,094	160,684	164,069	167,196	170,014	172,570	174,825	176,873	178,808	180,727
	U	149,394	153,350	157,094	160,684	164,069	167,196	170,014	172,570	174,825	176,873	178,808	180,727
	R	0	0	0	0	0	0	0	0	0	0	0	0
CT	T	90,079	94,062	97,758	101,276	104,640	107,876	111,011	114,077	117,013	119,877	122,727	125,618
	U	90,079	94,062	97,758	101,276	104,640	107,876	111,011	114,077	117,013	119,877	122,727	125,618
	R	0	0	0	0	0	0	0	0	0	0	0	0
AY	T	38,158	39,953	41,616	43,201	44,720	46,189	47,622	49,034	50,395	51,731	53,068	54,427
	U	28,000	29,663	31,203	32,663	34,056	35,397	36,700	38,014	39,276	40,512	41,748	43,005
	R	10,158	10,290	10,413	10,538	10,664	10,792	10,922	11,020	11,119	11,219	11,320	11,422
SM	T	69,660	70,610	71,575	72,542	73,452	74,246	74,864	75,326	75,635	75,838	75,979	76,106
	U	69,660	70,610	71,575	72,542	73,452	74,246	74,864	75,326	75,635	75,838	75,979	76,106
	R	0	0	0	0	0	0	0	0	0	0	0	0
ST	T	152,723	158,207	163,793	169,515	175,286	181,023	186,636	192,131	197,568	202,935	208,225	213,431
	U	138,723	144,025	149,441	154,991	160,588	166,149	171,584	176,944	182,244	187,473	192,624	197,690
	R	14,000	14,182	14,352	14,524	14,698	14,874	15,052	15,187	15,324	15,462	15,601	15,741
AC	T	42,773	45,123	47,578	50,140	52,790	55,507	58,273	61,090	63,969	66,906	69,899	72,950
	U	42,773	45,123	47,578	50,140	52,790	55,507	58,273	61,090	63,969	66,906	69,899	72,950
	R	0	0	0	0	0	0	0	0	0	0	0	0
SY	T	283,598	285,286	287,034	288,694	290,412	292,333	294,604	297,183	299,275	301,885	305,729	309,772
	U	283,598	285,286	287,034	288,694	290,412	292,333	294,604	297,183	299,275	301,885	305,729	309,772
	R	0	0	0	0	0	0	0	0	0	0	0	0
IL	T	127,434	132,231	136,696	140,945	144,985	148,822	152,465	155,957	159,232	162,370	165,452	168,554
	U	127,434	132,231	136,696	140,945	144,985	148,822	152,465	155,957	159,232	162,370	165,452	168,554
	R	0	0	0	0	0	0	0	0	0	0	0	0
SMT	T	101,086	107,212	112,906	118,362	123,663	128,898	134,152	139,463	144,722	150,008	155,396	160,949
	U	73,000	78,761	84,114	89,224	94,175	99,056	103,952	108,991	113,976	118,985	124,094	129,365
	R	28,086	28,451	28,792	29,138	29,488	29,842	30,200	30,472	30,746	31,023	31,302	31,584
AP	T	163,974	171,833	179,122	186,064	192,728	199,180	205,488	211,715	217,733	223,652	229,580	235,614
	U	163,974	171,833	179,122	186,064	192,728	199,180	205,488	211,715	217,733	223,652	229,580	235,614
	R	0	0	0	0	0	0	0	0	0	0	0	0
NJ	T	31,466	32,172	32,849	33,504	34,119	34,680	35,171	35,601	35,966	36,285	36,578	36,866
	U	15,000	15,492	15,969	16,421	16,831	17,185	17,466	17,737	17,941	18,098	18,227	18,350
	R	16,466	16,680	16,880	17,083	17,288	17,495	17,705	17,864	18,025	18,187	18,351	18,516
TN	T	39,871	41,277	42,588	43,836	45,020	46,139	47,192	48,193	49,122	50,005	50,868	51,733
	U	29,000	30,265	31,444	32,558	33,607	34,589	35,503	36,399	37,222	37,998	38,753	39,509
	R	10,871	11,012	11,144	11,278	11,413	11,550	11,689	11,794	11,900	12,007	12,115	12,224
Total	T	1,948,794	2,000,313	2,049,854	2,098,037	2,144,645	2,189,472	2,232,311	2,272,415	2,310,014	2,346,013	2,381,325	2,416,868
	U	1,869,213	1,919,698	1,968,273	2,015,476	2,061,094	2,104,919	2,146,743	2,186,078	2,222,900	2,258,115	2,292,636	2,327,381
	R	79,581	80,615	81,581	82,561	83,551	84,553	85,568	86,337	87,114	87,898	88,689	89,487

Note: T: total, U: urban, and R: rural

Source: arranged by the Study Team on the basis of information from the municipalities and Dirección General de Estadística y Censos, Ministerio de Economía, 1995, "Proyección de la Población de El Salvador," El Salvador

## 6.2.2 Assumption for Waste Amount and Composition Forecast

### 6.2.2.1 Waste Amount

Assumptions for the waste amount forecast are as follows.

- Waste generation ratio (---g/day/capita) is constant from present to future.

- The increase in numbers of establishments (such as offices, market and restaurant), their employees and/or other related parameters was obtained by assuming that it is proportional to the population growth from 1999 to 2010, and used to estimate the future waste generation from those establishments.

### 6.2.2.2 Waste Composition

If the life-style including dietary habits does not change to a length, waste composition in general might not change considerably. It is difficult to forecast that the life-style in AMSS be altered substantially in 10 years. Therefore, it is assumed that the waste composition till the target year 2010 be same that of today.

### 6.2.3 Waste Composition

#### 6.2.3.1 Waste Composition (wet base)

Table 6-8 shows composition of residential waste and Table 6-9 shows of restaurant, other commercial, institutional, market and road sweeping wastes.

Table 6-8: Composition of Residential Waste

Composition	Unit: %		
	High income	Middle income	Low income
Combustible	95.5	94.4	93.4
Food waste	59.5	57.6	66.0
Papers	18.5	13.0	13.1
Textiles	1.2	1.1	2.5
Grass, wood, bamboo	2.7	16.8	4.0
Plastics	12.1	5.8	7.8
Rubber, leather	1.5	0.1	0.0
Incombustible	4.5	5.6	6.6
Metals	1.3	1.1	1.2
Bottles, glass	1.3	2.6	3.7
Ceramics and soil	0.2	0.7	0.6
Others	1.7	1.2	1.1
Total	100.0	100.0	100.0

Table 6-9: Composition of Commercial, Institutional, Market and Road Sweeping Wastes

Composition	Unit: %				
	Commercial		Institutional	Market	Road sweeping
restaurant	Other				
Combustible	95.1	97.5	89.3	96.8	88.3
Food waste	62.2	6.4	19.0	78.1	2.6
Papers	22.1	63.1	35.0	9.5	6.4
Textiles	0.0	5.2	1.1	0.3	0.4
Grass, wood, bamboo	0.3	11.8	12.3	1.4	75.3
Plastics	10.2	10.6	20.5	7.2	3.6
Rubber, leather	0.3	0.4	1.4	0.3	0.0
Incombustible	4.9	2.5	10.7	3.2	11.7
Metals	0.7	1.3	0.5	0.4	0.1
Bottles, glass	2.4	0.3	4.6	0.8	0.3
Ceramics and soil	0.0	0.0	1.6	0.7	9.8
Others	1.8	0.9	4.0	1.3	1.5
Total	100.0	100.0	100.0	100.0	100.0

### 6.2.3.2 Moisture Content

Table 6-10 shows moisture content of each category.

Table 6-10: Moisture Content

Category		Moisture content (%)
Residential	High income	51.45
	Middle income	46.97
	Low income	46.61
Commercial	Restaurant	58.83
	Other	12.79
Institutional		19.19
Market		64.85
Road sweeping		16.60

### 6.2.3.3 Carbon and Nitrogen Content

Table 6-11 shows carbon and nitrogen contents of residential (middle income), restaurant and market waste.

Table 6-11: Carbon and Nitrogen Content

Category	Content (%)		C/N ratio
	Carbon	Nitrogen	
Residential *	42.74	2.81	15.2
Restaurant	45.16	3.52	12.8
Market	44.55	3.28	13.6

Note: \* middle income

## 6.2.4 Waste Amount

Future waste generation amount is calculated based on the assumptions above.

### 6.2.4.1 Waste Generation Ratio

Waste generation ratio is show in Table 6-12.

Table 6-12: Waste Generation Ratio

Source		unit	Generation ratio
Household waste	High income	g/person/day	600
	Middle income		540
	Low income		420
Commercial waste	Restaurant	g/seat/day	466
	Others	g/employee/day	482
Institutional waste		g/employee/day	196
Market waste		g/stall/day	1,674
Street sweeping waste		g/m/day	198

### 6.2.4.2 Forecast Parameters

Parameters necessary for future waste amount forecast, except for street sweeping length, are set up assuming that they are on a proportional increase to the population growth. Forecast parameters in 2010 are listed in Table 6-13.

Table 6-13: Forecast Parameters in 2010

	Population				Commercial		Institutional waste	Market waste	Street sweeping waste
	Total	High income	Middle income	Low income	Restaurant Nos. of seat	Others Nos. of employee			
San Salvador	512,873	155,606	117,858	239,409	20,253	51,173	93,374	23,429	324,769
Mejicanos	217,248	6,713	71,670	138,865	10,389	22,644	43,366	1,698	29,060
Delgado	180,727	5,837	23,314	151,576	8,960	21,989	23,509	532	15,036
Cuscatancingo	125,618	0	14,773	110,845	8,693	12,466	15,195	0	8,970
Ayutuxtepeque	43,005	4,270	19,369	19,366	1,287	3,811	10,473	317	2,660
San Marcos	76,106	0	20,488	55,618	3,782	5,548	6,569	515	7,010
Nueva San Salvador	197,690	48,039	126,304	23,347	7,143	17,029	41,170	3,288	43,080
Antiguo Cuscatlan	72,950	41,107	26,065	5,778	2,455	7,469	23,301	704	51,630
Soyapango	309,772	0	51,949	257,823	24,097	27,772	45,385	3,693	12,618
Ilopango	168,554	0	38,312	130,242	8,363	12,137	17,206	553	1,760
San Martin	129,365	0	26,636	102,729	12,794	13,915	14,681	4,644	1,700
Apopa	235,614	0	11,616	223,998	19,895	18,481	16,371	6,771	5,615
Nejapa	18,350	0	9,175	9,175	1,598	2,637	1,872	108	668
Tonacatepeque	39,509	0	19,755	19,754	1,815	5,525	17,234	197	3,225
Total	2,327,381	261,572	577,284	1,488,525	131,524	222,596	369,706	46,449	507,801

### 6.2.4.3 Future Waste Generation Amount

Table 6-14 summarizes waste generation amount in 2010 calculated by incorporating the figures in Table 6-12 and Table 6-13.

Table 6-14: Waste Generation Amount in 2010

	Household	Restaurant	Other than restaurant	Institutional	Market	Road sweeping	Total
San Salvador	257.6	9.4	24.7	18.3	39.2	64.4	413.6
Mejicanos	101.0	4.8	10.9	8.5	2.8	5.8	133.8
Delgado	79.8	4.2	10.6	4.6	0.9	3.0	103.1
Cuscatancingo	54.6	4.1	6.0	3.0	0.0	1.8	69.5
Ayutuxtepeque	21.2	0.6	1.8	2.1	0.5	0.5	26.7
San Marcos	34.5	1.8	2.7	1.3	0.9	1.4	42.6
Nueva San Salvador	106.8	3.3	8.2	8.1	5.5	8.5	140.4
Antiguo Cuscatlan	41.2	1.1	3.6	4.6	1.2	10.2	61.9
Soyapango	136.4	11.2	13.4	8.9	6.2	2.5	178.6
Ilopango	75.4	3.9	5.9	3.4	0.9	0.3	89.8
San Martin	57.5	6.0	6.7	2.9	7.8	0.3	81.2
Apopa	100.4	9.3	8.9	3.2	11.3	1.1	134.2
Nejapa	8.9	0.7	1.3	0.4	0.2	0.1	11.6
Tonacatepeque	19.0	0.8	2.7	3.4	0.3	0.6	26.8
Total	1,094.3	61.2	107.4	72.7	77.7	100.5	1,513.8