

1. POPULATION

at 4 million people in 1997. Based on this of resident population at about 4.3 million in 2001 (see Section 1.2.4). This is not an official estimate of the population for 2001; it is derived solely for the purposes of this SOER. For example, this chapter uses this population estimate to derive the quantities of solid municipal waste and domestic wastewater generated annually.

1.1 Administrative Boundaries

Lebanon is divided into six administrative regions, called *Mohafazas*, which are further sub-divided into 25 districts, called *Cazas*, not including Beirut (see Table 1.1). Each Caza is made up of several cadastral zones, *manateq iikarieh*. In total, there are 1,492 cadastral zones. The Bekaa is the largest Mohafaza (4,161 km²), followed by the North (2,025 km²) and Mount Lebanon (1,968 km²). Appendix A provides the surface area and the number of cadastral zones for each Caza, as well as a map of Lebanon depicting all the administrative boundaries.

Table 1.1
Administrative Regions and Localities at Mohafaza Level

<i>Mohafaza</i>	<i>Number of Cazas</i>	<i>Number of Cadastral Zones</i>	<i>Surface Area (km²)</i>
Beirut	-	12	19.6
Mount Lebanon	6	495	1,968.3
North	7	387	2,024.8
South	3	227	929.6
Nabatiyeh	4	147	1,098.0
Bekaa	5	224	4,160.9
TOTAL	25	1,492	10,201.2

Source: Data on surface areas supplied to ECODIT by the National Center for Remote Sensing

1.2 Population

Since the last comprehensive population census dates back to 1932, there continues to be no agreement on the actual size of the Lebanese population today. The two latest government surveys have produced significant differences in their estimates, from 3.1 million (1996) to 4 million people (1996-97), as explained next, up from 793,000 in 1932 (see Figure 1.1).

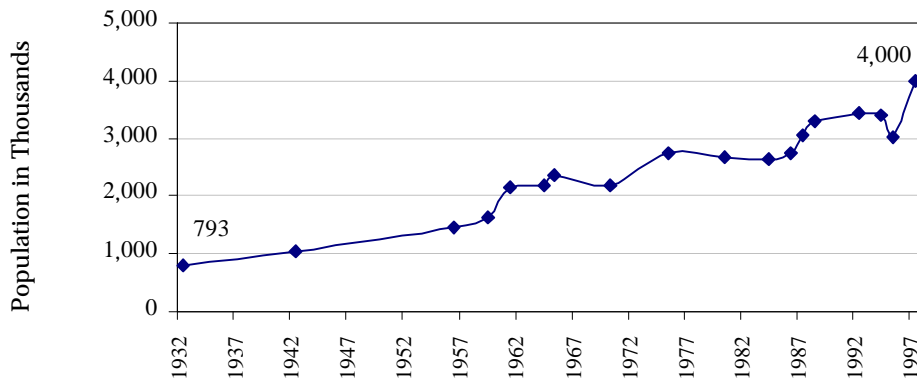
Population size is increasing at the rate of 1.65 percent yearly - about 66,000 net births in 1999 (CAS Bulletin/No.1, 2000). Average life expectancy is 71.3 years (MoSA, 1996); it is lowest in the North (68.5 years) and highest in Beirut (74.5 years).

1.2.1 Statistical Base

The statistical information base was seriously eroded in Lebanon during the war (1978-1991). The Directorate of Statistics was part of the Ministry of Planning until 1977, when the latter was dissolved and replaced with the Council for Development and Reconstruction (CDR). One year later, the Central Administration for Statistics (CAS) was established (law-decree 1793), with mission of collecting and publishing statistical

information on economic and social conditions. However, due to continued fighting and instability, the CAS did not start functioning until 1993. Since then, the CAS has been actively trying to recreate the statistical information base in Lebanon (MoMRA/ECODIT, 1998).

Figure 1. 1
Approximation of Demographic Trend between 1932 and 1997



Source: For years 1932 to 1995, population data are based on a compilation prepared by Faour, M. (1994) and republished in METAP/ERM, 1995. Population data for year 1997 is from CAS Study No.9/1998.

Between 1996 and 1997, the CAS conducted a **census** of all buildings and establishments in all six Mohafazas. This census differentiated residential from non-residential units, as well as between primary, secondary and empty units. Based on the results of this census and using the Mohafaza as a base for sampling and extrapolation, the CAS conducted a **survey** of living conditions between May and June 1997. The CAS surveyors visited a statistically representative sample of 16,800 dwellings and collected information on the number of people, living conditions, housing problems etc. The Living Conditions Survey provides the most recent and most solid basis for estimating the resident population and average household size in each Mohafaza.

The CAS estimate of resident population includes all inhabitants of a residence such as maids, resident non-nationals (e.g., Palestinians and Syrians), and Palestinian settlements. It does not include seasonal workers (such as construction and agriculture labor).

1.2.2 Distribution of population by Mohafaza according to CAS

Drawing on the CAS Census of buildings (CAS Studies, 1996-98) and Survey of Living Conditions (CAS Study No. 9/1998), CAS has estimated the population of Lebanon at around 4 million people in 1996-1997. CAS has also estimated population size at the Mohafaza level as per the breakdown in Table 1. 2 (CAS Study No. 9/1998).

About one third of the total population resides in Beirut and its suburbs.¹ While Beirut accounted for 22.3 percent of the population in 1970, with the expansion of the Beirut suburbs, this share has decreased to just 10 percent in 1997 (see section 4.1.2 for a

¹ Geographic extension of Beirut suburbs is described in Appendix B. It includes portions of the Cazes of Metn, Baabda, Chouf and Aaley.

discussion of the evolution of construction in time). Within the Beirut suburbs, the highest proportion of the population resides in the immediate extension of Beirut, namely Chiah, Furn El Chabak, Sin el Fil and Bourj Hammoud (CAS Study, No.9/1998). Table 1.2 presents the population distribution and population density in 1997.

Table 1. 2
Distribution of Population by Mohafaza (1997)

<i>Mohafaza</i>	<i>Population</i>	<i>Percent</i>	<i>Surface Area (km²)</i>	<i>Population Density</i>
Beirut	403,337	10%	20	20,167
Beirut Suburbs	899,792	22%	233	3,862
Rest of Mount Lebanon	607,767	15%	1,735	350
North	807,204	20%	2,025	399
Bekaa	539,448	13%	4,161	130
Nabatieh	275,372	7%	1,098	251
South	472,105	12%	930	508
Total	4,005,025	100.0	10,202	393

Source: CAS Study, No. 9/1998

1.2.3 Ministry of Social Affairs Survey

The Ministry of Social Affairs (MoSA), with funding from UNFPA, carried out a population and housing survey published in 1996 (MoSA/UNDP, 1996). This survey used the household as a base unit and estimated the population size and the average household size by Caza (see Table 1.3). The MoSA survey estimated the population of Lebanon at 3.1 million inhabitants and the average household size at 4.7 people per household, varying from 4.1 (Beirut) to 6.0 (Akkar). This estimate includes all inhabitants of a residence (maids and non-national residents) but does not include populations living inside Palestinian settlements. There are only partial explanations for the huge discrepancy between the population estimates provided by CAS and MoSA (see Box 1.1).

Box 1. 1 **Differences Between the MoSA and CAS Population Surveys**

The MoSA and CAS surveys estimated the population of Lebanon in 1996/1997 at 3.1 and 4 million people, respectively. Preliminary explanations of this discrepancy are:

1. The CAS survey included the Palestinians, estimated to be around 300,000;
2. The CAS survey was carried out on a later date than the MoSA survey. The natural net population increase for such a period of time would be around 120,000; and
3. The MoSA survey was based statistically on households (i.e., inhabitants of a residence) whereas the CAS survey was based on dwellings (primary and secondary residences).

Source: MoMRA/ECODIT, 1998

1.2.4 Population projection for 2001

According to CAS, its population estimates at the Mohafaza level have a margin of error of plus or minus five percent. CAS has advised that using its Census of Buildings and Living Conditions Survey to estimate resident population at the Caza level would produce estimates within a margin of error of at least 10-15 percent (MoMRA/ECODIT, 1998). Therefore, the 2001 SOER uses population estimates at the Mohafaza level but not at the Caza level. Furthermore, and for purposes of this report only, population size at the mohafaza level in 2001 is estimated by multiplying the CAS population estimates for 1997 by a factor of 1.068 to account for population growth at an estimated annual rate of 1.65 percent over a four-year period; hence the total population size estimate of about 4.3 million people in 2001 (see Table 1.4 on next page). While not officially sanctioned by the GoL, this estimate seems consistent with a recent World Bank report, which estimated

2

1.2.5 Distribution of population by gender and age

Information on gender and age distribution of Lebanese population is provided by CAS (1998) and was not updated for 2001. The population is roughly equally divided between males and females (see Table 1.3). This ratio varies slightly according to the age group. For example, in the age groups 0-19 and above 60, there are slightly more males than females, and there are more females across all other age groups (age 20-59). Moreover, a comparison of the population by age groups between 1970 and 1997 reveals that the population is becoming older (see Table 1.5). Compared to 1970, there are fewer young people (age group 0-19) and more elderly (age group above 60). In 1997, more than half of the population was in the 20-59 years age bracket.

Table 1.3
Population Breakdown by Age Group and Gender (1997)

<i>Age Group</i>	<i>Total (1997)</i>	<i>Male</i>	<i>Female</i>
0-19	1,558,083	51.5	48.5
20-39	1,342,447	49.5	50.5
40-59	703,977	48.6	51.4
Above 60	391,232	51.0	49.0
NID	9,286	35.5	64.5
Total	4,005,025	50.2	49.8

Source: CAS Study, No.9/1998

² World Bank Development Indicators, 2001. Data retrieved from <http://www.worldbank.org/data/wdi2001/people.htm>

Table 1. 4
Official Population Estimates (1996-97) and SOER Estimate (2001)

Mohafaza / Caza	MoSA Survey Estimates ^{a/}		CAS Population Estimates (1997) ^{b/}	SOER Population Estimate (2001) ^{c/}
	Population Estimate (1996)	Average Household Size (1996)		
Beirut	407,403	4.1	403,337	429,777
Mount Lebanon	670,610	4.4	1,507,559	1,606,383
Jbeil	62,407	4.7	-	-
Kesrouan	123,600	4.0	-	-
Metn	367,150	4.2	-	-
Baabda	371,882	4.7	-	-
Aaley	99,947	4.4	-	-
Chouf	120,473	4.6	-	-
North	670,610	5.3	807,204	860,118
Akkar	198,174	6.0	-	-
Tripoli	227,857	5.2	-	-
Minieh-Dinnieh	96,417	5.7	-	-
Zgharta	48,974	4.6	-	-
Bcharre	16,831	4.7	-	-
Koura	47,540	4.4	-	-
Batroun	34,817	4.6	-	-
Bekaa	399,891	5.0	539,448	574,810
Hermel	38,975	5.8	-	-
Baalbek	157,049	5.3	-	-
Zahle	124,336	4.6	-	-
West Bekaa	55,692	5.0	-	-
Rachaiya	23,839	5.0	-	-
South	283,057	4.9	472,105	503,053
Jezzine	14,626	3.5	-	-
Saida	138,348	4.9	-	-
Sour	130,083	5.1	-	-
Nabatiyeh	205,412	4.6	275,372	293,423
Hasbaya	19,460	4.3	-	-
Bint Jbeil	52,710	4.8	-	-
Marjayoun	40,879	4.5	-	-
Nabatiyeh	92,363	4.7	-	-
TOTAL	3,111,832	4.7	4,005,025	4,267,564

a/ MoSA/UNDP, 1996

b/ CAS Study/No.9, 1998

c/ Population estimate for 2001 are not official; they are estimates for purposes of this SOER only

Table 1. 5
Population Evolution by Age Group Between 1970 and 1997

Age Group	Percent of Total Population	
	1970	1997
0-19	53	39
20-39	25	34
40-59	14	18
Above 60	8	10
Total	100.0	100.0

Source: CAS Study, No.9/1998

1.3 Pressures

The 2001 SOER has produced best estimates of solid waste and wastewater effluent generation at the Mohafaza level in 2001 (see Section). Solid waste and wastewater management are discussed in Chapters 14 and 15, respectively.

1.3.1 Solid waste

This report estimates that, in 2001, Lebanon generated about 1.44 million tonnes of municipal solid waste (MSW), or about 3,940 tonnes per day. The report extrapolates this estimate based on the MSW quantities reported in the Greater Beirut Area and the Greater Tripoli Area and the population projection estimates for 2001. In the extended GBA area alone (population of about 2 million), the collection company SUKLEEN collected 713,000 tonnes of MSW (1,955 tonnes per day) between June 1, 2000 and May 31, 2001 (see Section 14.2.3), which suggests an average daily MSW generation rate of about 1 kg per capita in the extended GBA. In the North, the cities of Tripoli, El-Mina, Beddawi, and Kalamoun (second largest metropolitan area in Lebanon after GBA) generated about 103,000 tonnes of MSW in 2001,³ at an average daily rate of about 0.95 kg per capita per day.

Based on these quantities of MSW reported for Greater Beirut and Tripoli, and the population estimates by Mohafaza (see Table 1.3), the report assumes the following average per-capita SWM generation rates by Mohafaza:

- 1.1 kg per capita per day in Beirut City (highest due to high economic activity);
- 0.95 kg per capita per day in predominantly urban and semi-urban Mohafazas (Mount Lebanon, South Lebanon); and
- 0.85 kg per capita per day for Mohafazas with significant rural and semi-rural areas (North Lebanon, Bekaa, and Nabatiyeh).

Unlike previous estimates, MSW quantities for the Greater Beirut Area and Greater Tripoli are based on the actual weighing of all MSW trucks entering and leaving the solid waste facilities used by these two areas. These findings refute earlier assumptions about the per capita MSW generation rates; for -Term

(CDR/Libanconsult, 1995) projected per-capita generation rates of only 0.60 kg/day in rural areas and 0.70 kg/day in urban areas (including GBA) for 2001.

³ Data supplied to ECODIT by Tripoli Environment & Development Observatory, based on Libanconsult supervision reports of Batco SWM operations in Al Fayhaa region (Tripoli, Kalamoun and Beddawi), 2001

Using those average per-capita MSW generation rates, the report derives the estimate of 1.44 million tonnes of MSW generated annually in 2001, or an average of about 0.92 kg per person per day nationwide (see Table 1.6).

1.3.2 Wastewater effluent

Domestic wastewater flow is directly related to water supply. While the average water supply delivery rate is approximately 120 liters per capita per day (l/c/d),⁴ delivery rates may vary from 100 (e.g., Baalbeck and Qoubayat) to 200 l/c/d (Beirut and Kesrouane).⁵ A lot of water is additionally supplied from private water wells and ultimately ends up in the sewage flow.

Whereas the 1995 SOER calculated sewage flow using a mean sewage generation rate of 120 liters per capita per day, the 2001 SOER uses a mean generation rate of 160 l/c/d to reflect significant improvements that have been achieved in the water supply sector since 1995 (see Section 8.5.2 on government spending to improve the water supply and distribution networks). Based on the population projection estimate for 2001, the total wastewater flow is estimated at 249 Mm³ per year (0.68 Mm³ per day), up from 163 Mm³ in 1995 (0.44 Mm³ per day). Assuming a BOD load of 400 mg/l in raw sewage, yearly outflow results in a BOD load of 99,690 tonnes, up from 65,300 tonnes in 1995.

Table 1. 6
Estimates of Solid and Liquid Waste Generation at Mohafaza Level (2001)

<i>Mohafaza / Caza</i>	<i>Solid Waste Generation Rate (kg /capita/day)</i>	<i>Solid Waste Generation (Tonnes/day)</i>	<i>Wastewater Flow³/day)</i>	<i>Wastewater BOD Load (Tonnes per year)</i>
Beirut	1.1	473	68.8	10,040
Mount Lebanon	0.95	1,526	257.0	37,525
North	0.85	731	137.6	20,092
Bekaa	0.85	488	92.0	13,428
South	0.95	473	80.5	11,751
Nabatiyeh	0.85	249	47.0	6,854
TOTAL	0.92	3,940	683	99,690

Source: ECODIT estimates using available data and best professional judgment. Assumed the population projections for 2001 of Table 1-4, sewage generation rate of 160 liters per capita per day, and a BOD loading of 400 mg/l for raw sewage

⁴ *Pers comm* El Hassan Z, CDR/Water Supply Specialist, 2001

⁵ WB-METAP/ERM, 1995