B.3.8 Relevant Studies and Projects

Data and information regarding studies and projects realized in Chinandega, which are related to this Study, were obtained from the counterpart. Table B-62 lists those studies and projects.

Table B-62: Relevant Projects in the City of Chinandega

Classification of project	Name (or Outline) of project	Date of project	Organization	Project location	Study, design or construction	Cost of the project
Potable Water	Water supply project	Sep/96	PRODEL- ASDI	Chi./Rafaela Herrera	Construction of net	C$ 71,216
Potable Water	Water supply project	Jan/96	PRODEL- ASDI	Chi./Gerard Aguilera	Construction of net	C$ 233,661
Potable Water	Water supply project	March/95	Municipality-PRODEL	Chi./Repto. Monserrat	Construction of net	C$ 88,050
Potable Water	Water supply project	----------	PRODEL	Chi./Repto. Progreso # 2	Construction of net	C$ 67,975
Potable Water	Water supply net Improvement	1994 (6 months)	ACDI	Chinandega.	Improvement of net (8,762 m)	C$ 1,208,910
Potable Water	Construction of storage tank	1995	ACDI	Chinandega.	Construction of tank (700,000 gal)	C$ 2,500,000
Potable Water	Hydraulic test	1995	ACDI	Chinandega.	Inspection of net	US$ 20,000
Potable Water	Water supply net installation	1989-92 1994-96	Leverkusen city (casa de los 3 mundo).	Chinandega.	Construction	US$ 320,000
Potable Water	Water supply project	1996/97	Japanese volunteer	Chinandega (rural area)	Construction	US$ 43,000
Wastewater	Sewer installation	March/96	PRODEL	Chi./Dávila Bolaños	Construction	C$ 153,194
Wastewater	Sewer installation	Jun/95	Municipality-PRODEL	Chi./Repto. Monserrat	Construction	C$ 285,368
Wastewater	Sewer installation	Feb/95	PRODEL	Chi./Julio C. Tinoco	Construction	C$ 170,190
Wastewater	Sewer installation	Oct/94	PRODEL	Chi./Miriam Tinoco	Construction	C$ 82,011
Wastewater	Sewer installation	Nov/94	PRODEL	Chi./Gerardo Lindo	Construction	C$ 84,895
Wastewater	Rehabilitation of oxidation lagoon and pump	1995	BID	Chinandega	Construction	C$ 10,000
Wastewater	Sewer installation	1996	BID	Chi./Roberto González	Construction (18 km pipes)	US$ 400,000
Wastewater	Study and design of sewer	----------	FISE	Chinandega	Study and design	C$ 2,799,999
SWM	SWM in 41 municipality	Oct/95	JICA	Chinandega	Study	*
SWM	Hospital SWM	1995/1996	Japanese volunteers	Hospitals in Chinandega	Training	only volunteers
SWM	Hygiene in market	1995 (4 months)	Japanese volunteers	Markets in Chinandega	Local training.	Only volunteers
SWM	Cleaning Competence	1996	Saskia-bodelier (sistercity Eindhoven-Chinandega)	Chinandega	Promotion of cleaning works	----------
Sanitation	Construction of latrine	Sep/95	PRODEL	Chi./Carlos Fonseca	Construction and maintenance	C$ 142,866
Sanitation	Construction of 150 latrines	Jan/95	MINSA-FISE	Chinandega	Construction	C$ 327,386

Classification of project	Name (or Outline) of project	Date of project	Organization	Project location	Study, design or construction	Cost of the project
Sanitation	Construction of 140 latrines	Jan/95	MINSA-FISE	Chinandega	Construction	C$ 305,624
Sanitation	Construction of 100 latrines	Jan/95	MINSA-FISE	Chinandega	Construction	C$ 218,098
Public health	Environment education and sanitation	Oct/96	Embassy of Holland	Chinandega Municipality	Training and technical assistance	US$ 27,000
Environment	Fruit planting and reforestation	1993/96	Leverkusen city and Molins de Reis city	Schools in Chinandega	Training	US$ 10,000
Multiple	Sanitation improvement (potable water and bio-gas plant)	----------	Embassy of Japan, JOCV-JICA	Chinandega Municipality	Construction	US$ 71,000
Multiple	Potable water, latrine construction, and health education	1995/1998	(COSUDE, Switzerland)	Chinandega	Construction and health education	US$ 1,486,400

Note : * Total cost of study for 41 municipality is U$ 235,088.

B.4 Granada

B.4.1 Definition of the Study Area

At the meeting of the discussion on the inception report (IC/R) for the Study, the Nicaraguan side requested to expand the boundary of the Study Area from that shown in the IC/R. Although the boundary of the Study Area of the IC/R was defined as the present (1995) urban area (see Figure B-26) in the S/W (scope of work) for the Study, agreed upon between INIFOM and the JICA Preparatory Study Team in November 1995, the Team agreed that the expansion will be the urban limit in the target year 2010, on condition that the Nicaraguan side clarify and provide information necessary for projecting the improvement plan of USE, such as proposed boundary, projected population, etc. in the target year 2010.

Based on the above-mentioned discussion, counterparts from Granada Municipality presented a map showing the boundary of the urban area of Granada City in 2010. Consequently the Study Area for the city of Granada covering 14.30 km^2, was defined as the projected urban area in 2010 as shown in Figure B-27.

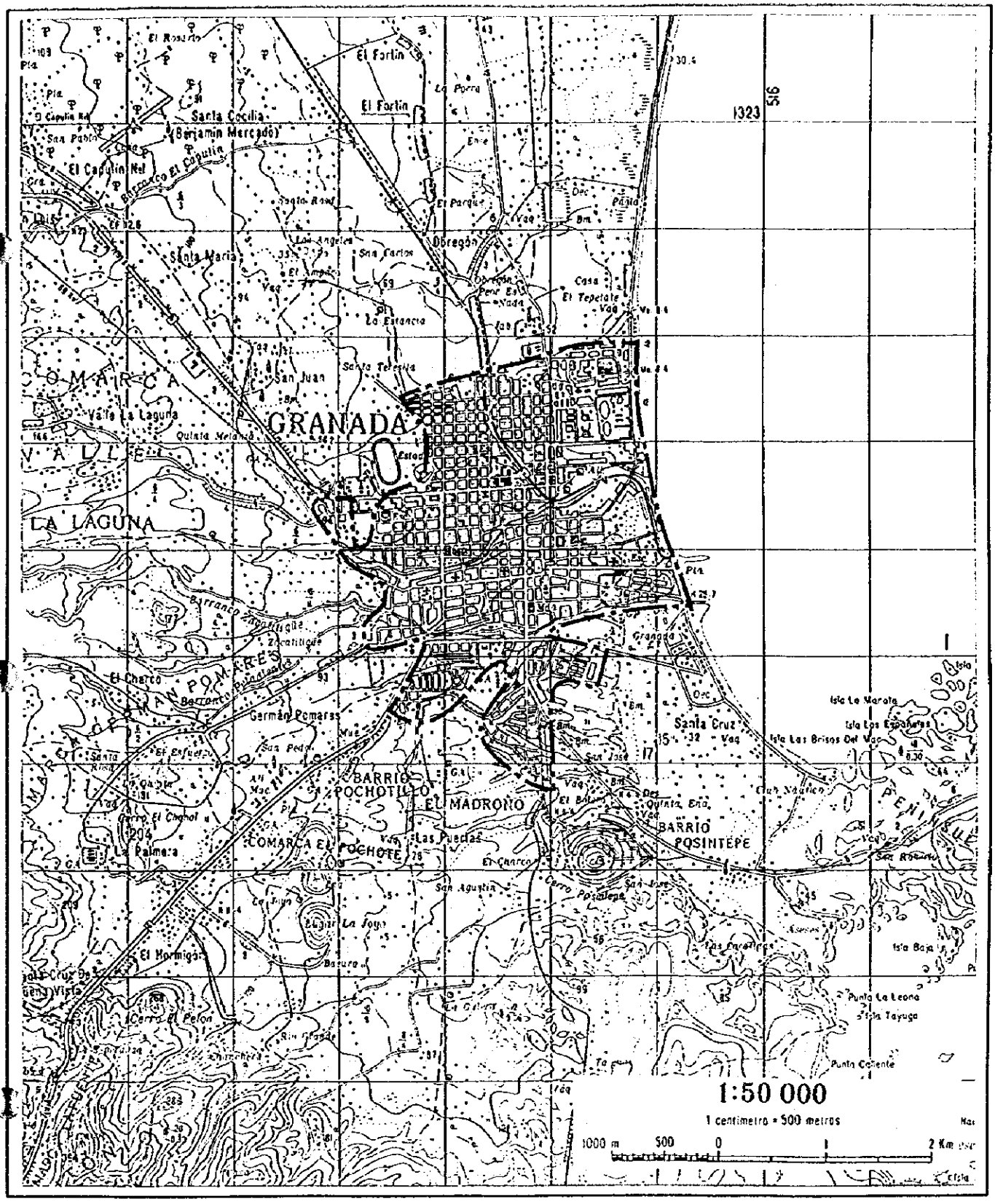

Figure B-26: Urban Area of Granada in 1995

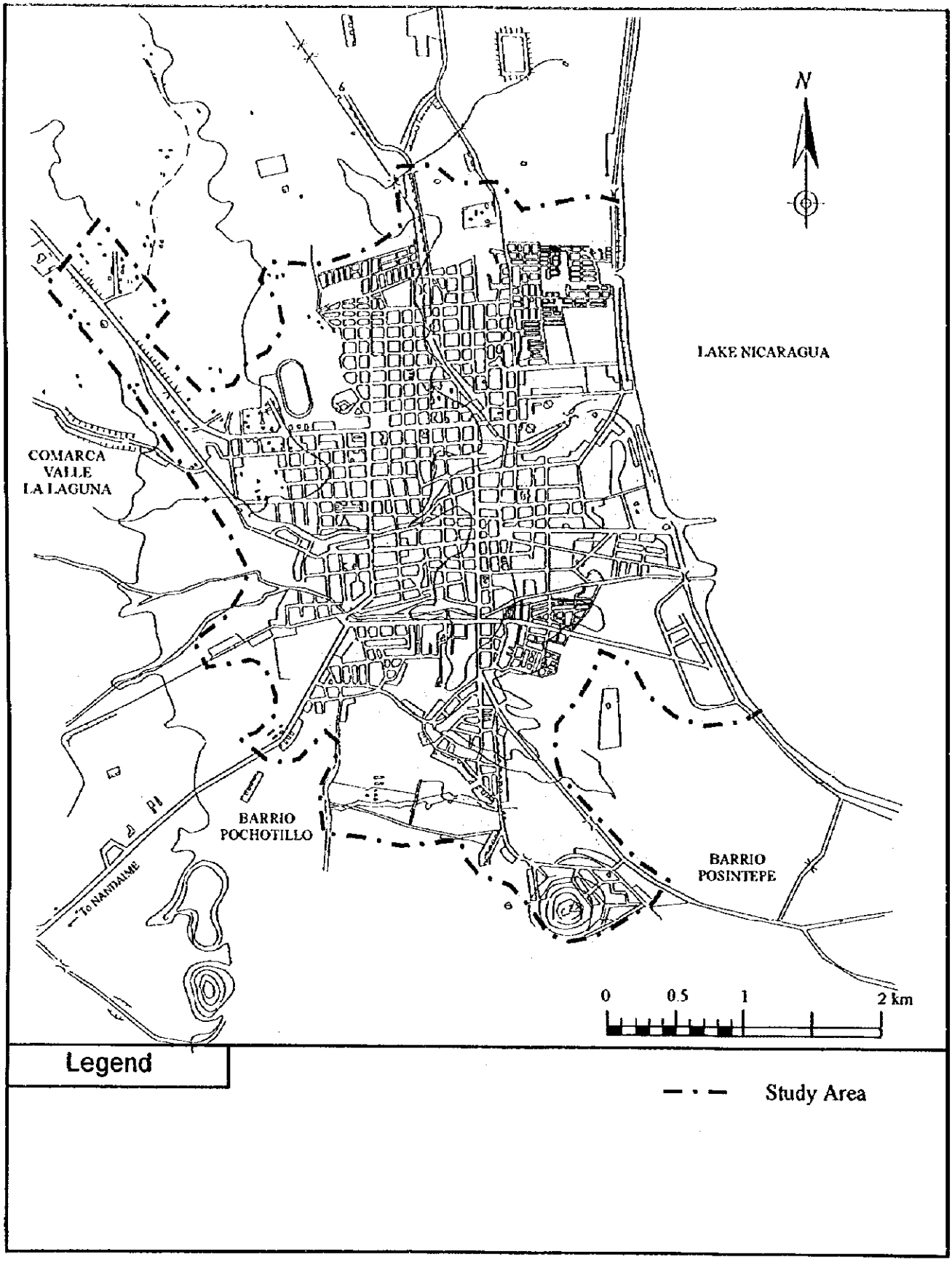

Figure B-27: Study Area in Granada

B.4.2 Natural Conditions

a. Location and Area

The city of Granada is located on the northeastern coast off Lake Nicaragua, which is the biggest lake in Central America having an area of 8,270 km^2 and a maximum depth of 70 m.

The city area lies between 11°54' to 11°57' latitude and 85°56' to 85°59' longitude, situated 15 km west-southwest of Masaya City and 40 km southwest of Managua. The elevation of the city of Granada ranges from 30.4 m, the level of Lake Nicaragua, to nearly 100 m in the west.

The uphill slope gradually becomes steep toward the plateau of Los Pueblos to the west. A huge crater or a small scale caldera of Lake Apoyo is 10 km west of Granada City and the Mombacho volcano is 20 km south of the city. There are some craters and cones to the south of the city which were formed by the volcanic activity that also created Apoyo and Mombacho.

The city area is more or less 1,000 ha as of 1993, expanding especially to the north where the alluvial plain is extended.

b. Climate and Hydrology

b.1 Precipitation

According to the 17 year precipitation record from 1969 to 1985 taken at Granada City, the average annual precipitation is 1,517 mm; the lowest recorded was 1,022 mm in 1979 and a maximum of 1,932 mm in 1972. Similar to the areas of the Pacific coastal plain, the rainy season begins in May and ends in the beginning of November. More than 90 % of the annual precipitation falls in the rainy season between May to October, and nearly 10 % in the remaining 6 months. The average monthly precipitation is the highest in September (309 mm) followed by October (276 mm) and June (236 mm). The maximum monthly rainfall in 17 years was recorded in May of 1982 at 587 mm. Annual precipitation varies considerably by year, as shown in Figure B-28. The average monthly rainfall is also presented in Figure B-29, accompanied by the minimum and maximum monthly precipitation between 1969 and 1986. Monthly precipitation for the same years is tabulated in Table B-63.

b.2 Temperature, Humidity and Evaporation

Since the data on various meteorological conditions are not available at the rain gauging station in Granada, the data taken at the nearest station - the Masaya station at an elevation of 210 m - was referred to for estimation of Granada's condition.

Table B-64 shows the meteorological data of Masaya in 1992. The mean monthly temperature averages 26.0 °C with a small monthly variation within a range of 24.8 - 28.3 °C. Mean maximum temperature becomes higher at the end of the dry season, from 32.8 °C in March to 34.2 °C in May. The highest temperature recorded in 1992 was 36.8 °C in May.

Mean minimum temperature is relatively low in the dry season, ranging from 20.8 °C in January to 21.8 °C in December. In May, the rainy season, it ranges from 21.8 °C to 23.6 °C. The minimum temperature recorded in 1992 was 18.0 °C in December. Since

the mean elevation of Granada is 140 - 150 m lower than that of Masaya, the temperature in Granada City is presumably a little higher than the figures given. The difference between the highest and lowest temperatures may be smaller than in Masaya, because Granada faces the huge waterfront of Lake Nicaragua.

Monthly relative humidity in Masaya is considerably high throughout the year, ranging from 64 % in April to 87 % in July. Humidity is relatively high, at more than 80 % , one month before the rainy season starts. Granada may have the same characteristics influenced by the vast water area. Regardless of the high humidity in Masaya, evaporation potential is quite high, ranging from 65.0 mm in July to 24.5 mm in April. In 1992, evaporation totaled 1,561 mm, twice as much as the precipitation of the same year. However, Granada's condition cannot be extrapolated from the data in Masaya.

b.3 Hydrology

There are no perennial rivers in the vicinity of Granada City. Most of the river flow originates from halfway down the slope of Los Pueblos plateau and moves westward. Since the stream gradient is steep and due to the high erodability of the surface soil, majority of the streams have become V-shaped valleys. When there is no rain, the rivers get depleted. In the north, where the foot of the mountain gently slopes into the alluvial plain, no river system exists, because rainwater immediately infiltrates the ground to become groundwater. Shallow groundwater flows down westward presumably emanating from or off the shore of the lake.

c. Geology and Hydrology

c.1 Geological Structure and Composition

Granada City and Lake Nicaragua are situated in the Nicaraguan Depression (Graben). Since Granada City is about 10 km away from the western edge of the depression, the hydrological basement rock in this area, the " Brito Formation", is at a depth of probably more than 1,000 m. During the depression, the Brito Formation was thickly overlain by the Coyol Formation, which is composed mainly of lava, tuff, tuffbrecia and ignimbrite. On the other hand, the Coyol Formation is extensively and thickly overlain by the Las Sierras Formation which is mainly of tuff, pumice-tuff, agglomerate and tuffaceous sandstone. This formation around the Granada area is presumably more than 300 m thick. Both the Coyol and Las Sierras Formations resulted from the period of active volcanism in the late Pliocene to the Pleistocene Period. Active volcanism in the Holocene period created lined volcanoes running from NW to SE in the Nicaraguan Depression. These volcanoes are the Maderas, Conception and El Cerro in Lake Nicaragua, Mombacho, Apoyo and Masaya near Granada, and Los Maribios mountains in the north.

In the Granada area, the eruption of the volcanoes of Masaya, Apoyo and Mombacho, especially of Apoyo and Mombacho, has widely overlain the Las Sierras Formation with volcanic falls, lavas and pyroclastic flows. Accumulation of these volcanic surface materials may be more or less than 100 m in thickness. The uppermost layer of these deposits is of pyroclastic materials originating from Mombacho Volcano. A schematic cross section is given in Figure B-30. The volcanism of Apoyo and Mombacho was accompanied by faulting running from N to S and fissure eruption along the faults. A straight cliff along the shore in the city area, and the existence of a cone in the southward

extension of the cliff are the evidence of the above mentioned activities. The three craters aligned from N to S at El Pochote area also suggest fissure eruption.

c.2 Hydrogeology

The highly permeable pyroclastic materials widely distributed in the area allow rapid penetration of rainwater into the ground, providing a convenient situation for groundwater recharge. On the other hand, however, such condition also facilitates contamination of groundwater by the rapid infiltration of polluted water like untreated effluents from factories, untreated DWW and leachate through the dumped solid wastes into the ground. Since the aquifers in the area of Granada and its surroundings are not overlain by an impermeable strata, so far as the shallower aquifers are concerned, the existence of the solid waste dumping site at the upper reach of the groundwater source of the water supply wells suggests the possibility of contamination.

According to the water quality analyses conducted by CIRA and INAA in 1996, the water source has not been affected by the polluted water from the dumping site. Sooner or later, however, the area of contamination may expand toward the west and northwest, and eventually reach the water source wells, as long as the piling of solid waste is continued at the La Joya site. INAA is currently planning the construction of additional wells, and one of the proposed sites is nearer to the La Joya site than the existing water source area. Therefore, the construction of a test well for water quality analysis is required before construction of the production wells. With regard to site selection for the additional wells, sites on or very close to the fault line should be avoided because drilling at such points presumably will hit hot springs or water of high concentration in hot spring components.

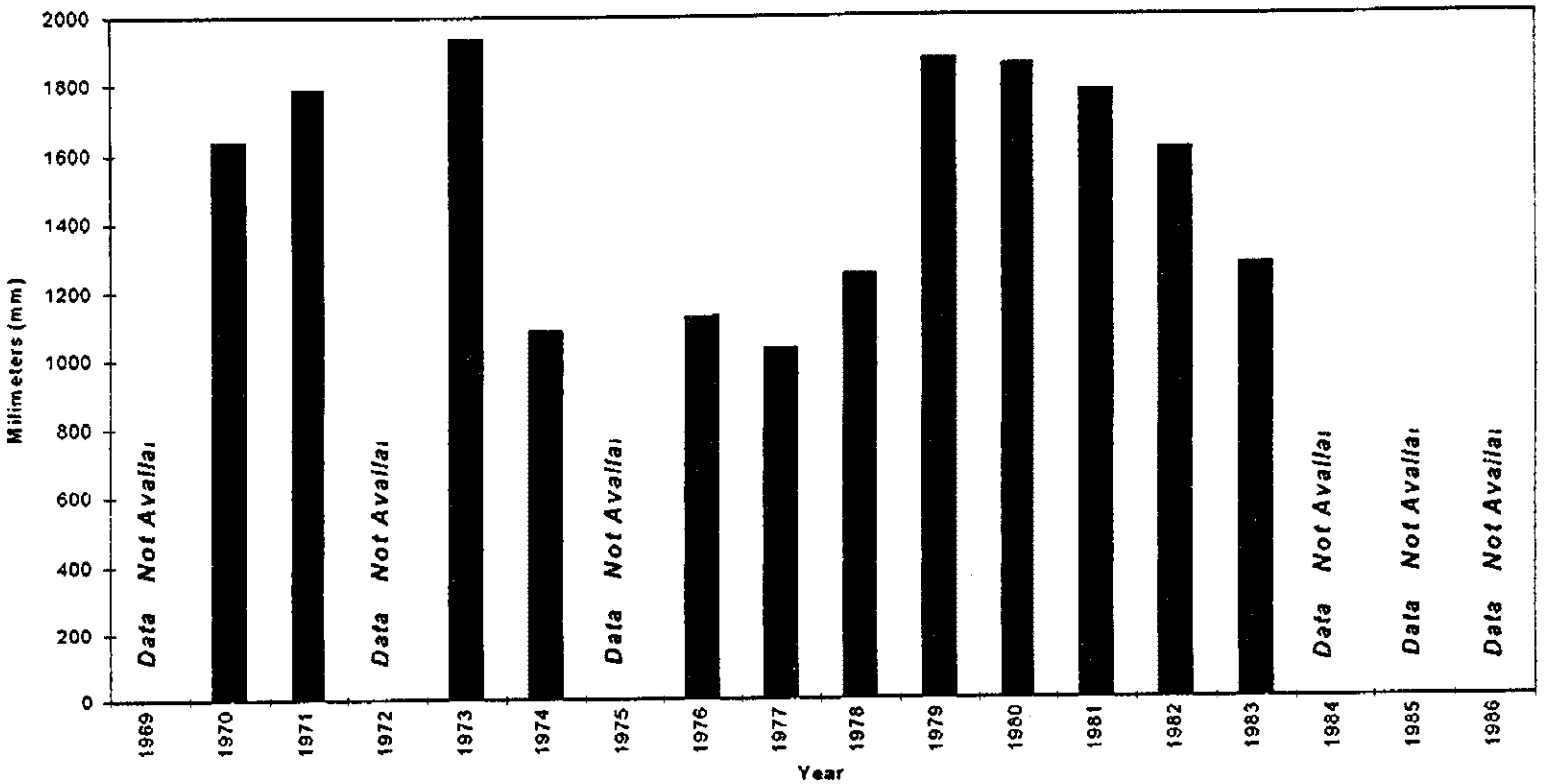

Figure B-28: Fluctuations in Annual Precipitation in Granada

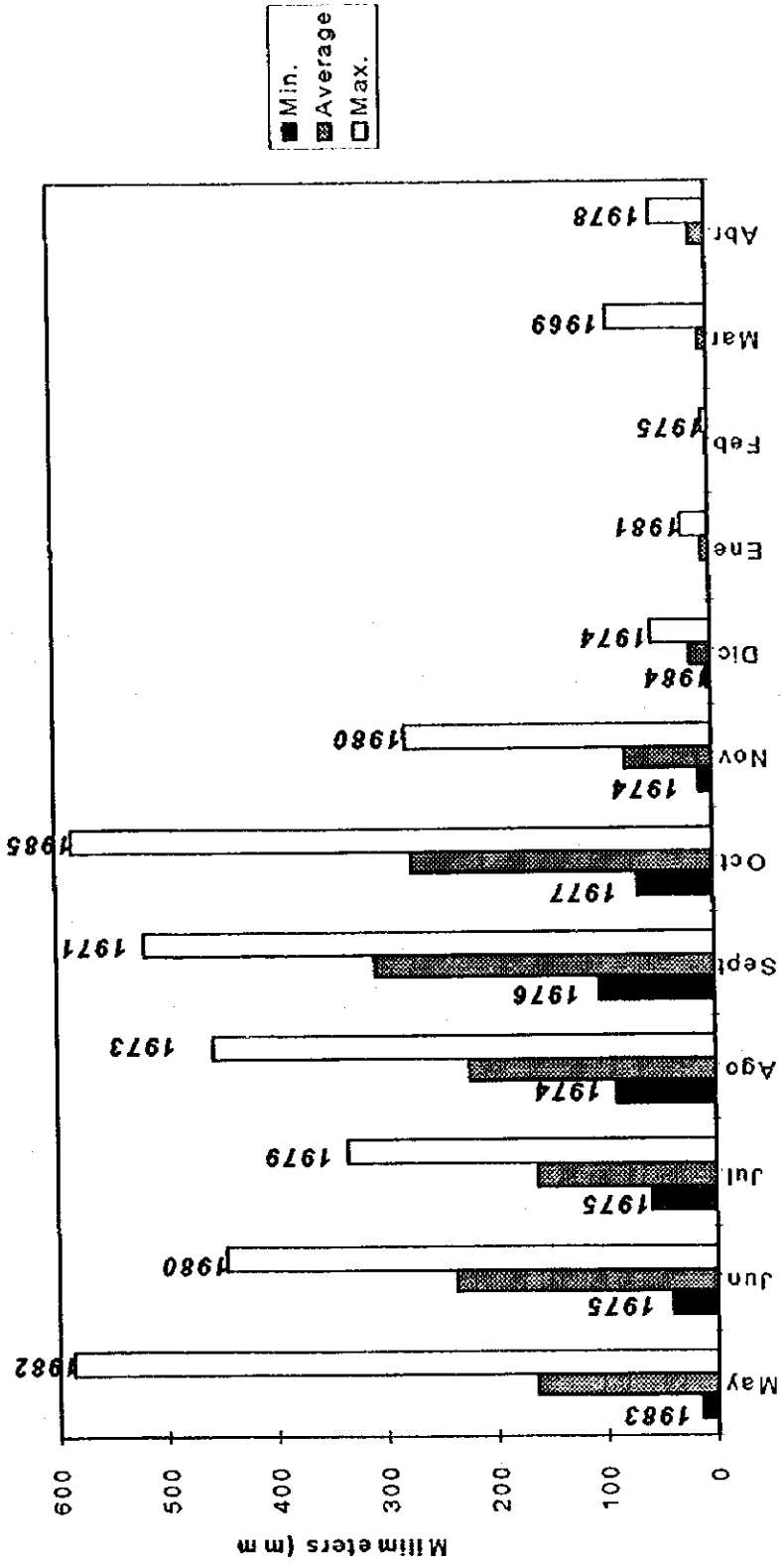

Figure B-29: Monthly Average Precipitation in Granada (17 Years from 1969 to 1986)

Table B-63: Monthly Precipitation in Granada (1969 - 1985)

Code	Station	Elevation	Latitude	Longitude	Type
69054	GRANADA	95	115600	855800	AG

Unit : mm

Year	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
1969	-1	363	97	274	287	196	96	25	-1	-1	92	46	
1970	144	165	215	358	420	187	106	20	14	1	0	4	1634
1971	187	248	158	224	519	277	106	44	19	2	0	0	1784
1972	194	-1	-1	-1	-1	-1	-1	-1	0	2	0	0	
1973	117	323	257	457	209	474	68	7	12	2	2	4	1932
1974	85	251	94	90	315	170	11	54	7	0	1	0	1078
1975	33	41	59	183	517	256	123	-1	0	5	4	25	
1976	127	377	69	132	104	280	14	16	0	0	0	1	1120
1977	223	172	65	146	243	70	73	7	2	0	0	21	1022
1978	118	116	167	137	337	257	56	5	0	0	0	51	1244
1979	126	307	334	304	262	429	80	26	4	0	0	0	1872
1980	169	446	153	156	341	273	281	5	1	0	17	15	1857
1981	249	295	203	346	268	301	21	23	26	3	1	43	1779
1982	587	242	158	141	242	168	43	9	1	0	2	17	1610
1983	16	176	204	190	270	357	33	17	3	1	0	3	1270
1984	85	203	245	246	456	142	100	3	3	3	1	-1	
1985	-1	57	124	199	150	584	61	19	-1	-1	-1	-1	
1986	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
Average	164	236	163	224	309	276	80	19	6	1	8	15	1517
Standard Deviation	134	114	78	101	120	132	64	15	8	2	23	18	345
Min.	16	41	59	90	104	70	11	3	0	0	0	0	1022
Max.	587	446	334	457	519	584	281	54	26	5	92	51	1932
75 % (*)	141	203	140	192	265	237	68	16	5	1	6	13	1288
95 % (*)	76	157	74	141	268	215	18	1	0	0	0	1	950

Source : INETER (*) Probability Distribution : (Normal and Weibull), elaborated by ITS-LOTTI/LAMSA -1 = No Data

Table B-64: Various Meteorological Data in 1992, Granada (Masaya Station)

INSTITUTO NICARAGUENSE DE ESTUDIOS TERRITORIALES (INETER)
METEOROLOGY DEPARTMENT
*** SUMMARY OF ANNUAL METEOROLOGICAL DATA ***

STATION : MASAYA
CODE : 069115
YEAR : 1992

LATITUDE : 11°58' N
LONGITUDE : 86°06' W
ELEVATION : 210 msnm
TYPE : HMO

		TEPERATURE				RELATIVE HUMIDITY	VAPOR TENSION	RECIPITATION.	EVAP.(ml)(mm)		FINE WEATHER	AVERAGE CLOUDY	WIND (m/dec.)			
MONTH	ABSOLUTE MIN.	ABSOLUTE MAX.	MIN.	MAX.	AVERAGE	(%)	(mm)	(mm)	RICHER	TANK	HOURS	1/8 OF SKY COVERED	MIN.	MAX.	AVERAGE	DIRECTION
JAN.	18.2	31.7	20.8	30.4	25.0	74	17.0	1.1	159.1			2.8	1.3	3.0	1.8	E
FEB.	18.4	33.3	21.4	31.7	25.8	71	17.3	0.0	174.3			3.2	1.6	2.8	1.8	E
MAR.	19.2	34.6	21.8	32.8	26.6	66	16.7	0.8	239.3			2.1	1.3	3.1	1.9	E
APR.	21.6	36.7	23.4	34.6	28.3.	64	18.0	2.3	244.9			2.0	1.4	2.9	1.7	E
MAY.	22.0	36.8	23.6	34.2	28.1	67	18.6	84.6	207.9			2.9	1.1	2.5	1.5	E
JUN.	22.0	34.8	23.5	32.4	26.8	81	21.1	251.6	95.8			3.6	1.2	2.3	1.2	E
JUL.	20.8	31.5	22.6	29.4	24.8	87	20.3		65.0			3.9	1.8	3.0	1.5	E
AUG.	21.0	32.2	22.4	30.5	25.2	85	20.2	49.7				3.5	1.8	3.1	1.7	E
SEP.	21.0	33.1	22.3	30.8	25.2	86	20.5	202.7	65.3			3.5	1.6	2.9	1.4	E
OCT.	20.3	32.6	21.8	30.5	25.6	83	20.2	134.3	84.8			2.9	1.7	3.0	1.7	E
NOV.	20.2	32.2	21.4	30.9	25.7	80	19.4	8.4	89.7			3.0	2.2	3.7	1.9	E
DEC.	18.0	31.4	21.8	30.1	25.1	76	17.8	15.2	135.0			3.8	2.3	4.8	2.8	E
TOTAL								750.7	1561.1			37				
ABSOLUTE	22.0	31.4														
AVERAGE	20.2	33.4	22.2	31.5	26.0	77	18.9	68.2	141.9			3	1.6	3.1	1.7	E

Source : INETER

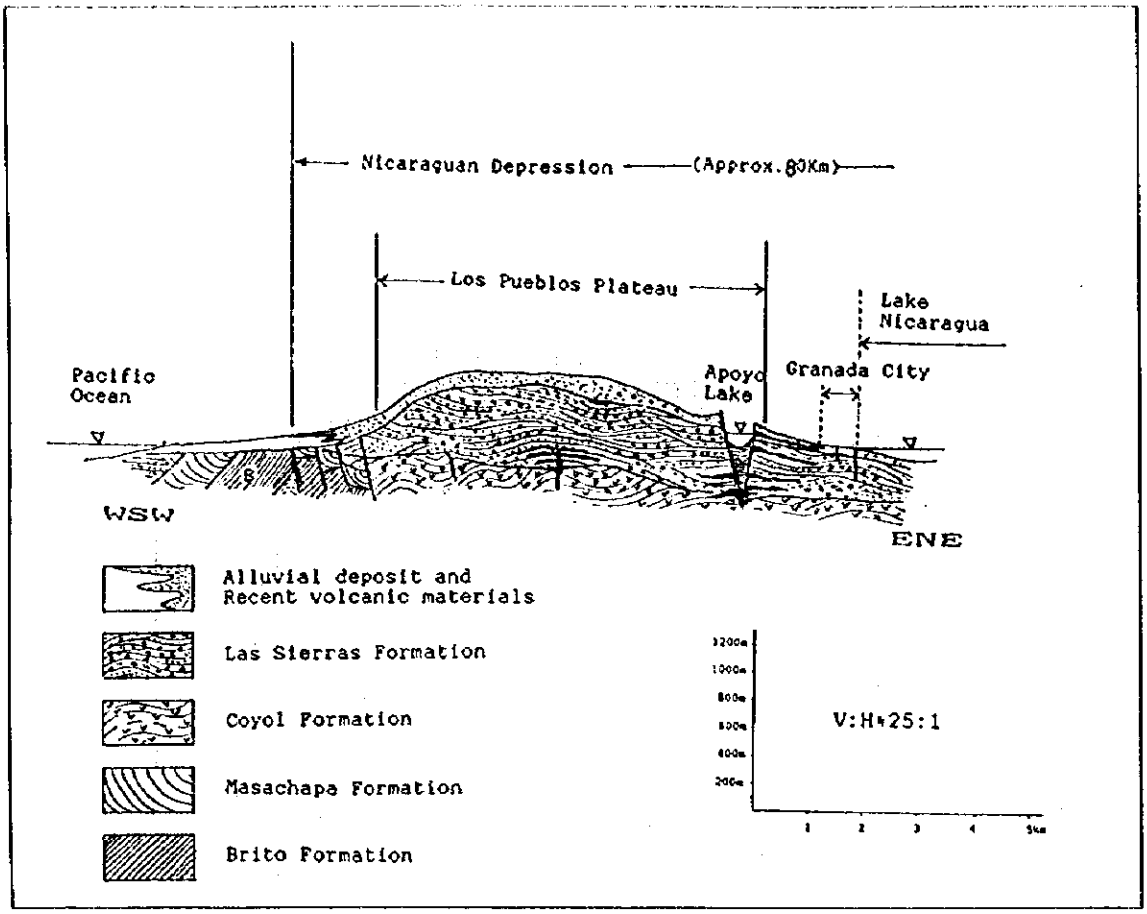

Figure B-30: Schematic Cross Section in Granada

B.4.3 Social Conditions

a. Administration

As established in Law No. 40 - 88, the municipal government is made up of the Municipal Council (ten councilors directly elected by the citizens) and the Executive Organ, under the Mayor, "Alcalde". The Mayor and his deputy, the Vice Mayor, are also councilors elected by the Council.

[The amended 1995 Constitution states that the Mayor and Vice Mayor have to be directly elected.]

a.1 Executive Structure and Some Relevant Procedures

The municipal government (MG) employs officials distributed in the four director level departments: Municipal Services, Research & Projects, Administration and Finance, Cadastre Office and a Central Registry Office, as well as two Citizens Advisory Teams for Tenants and Juridical questions, and Management of Temporary Projects: reforming the "Casa de los Tres Mundos" (with Spanish aid), and creating a university (Santo Tomas, in an old Franciscan convent). Various staff assist in higher administrative decisions (see flowchart).

- Municipal Services Department (MSD)

  The MSD is divided into three unstructured sections, employing a total of 117 staff. The sections are mainly involved in providing SW seminars, maintenance of streets and riverbeds, management of parks and cemeteries and manufacturing pavement blocks.

  SW services provided include household waste collection (28 workers, 1 supervisor and 4 drivers), street sweeping (28 workers and 3 supervisors), and disposal at the dumping site (1 supervisor); all 65 employees are under one section manager.

  The collection workers usually have a 6 hour shift and work overtime to get additional pay. The Union and MG have an agreement to collect 20 m^3/team during the normal shift and for every additional cubic meter the MG pays C$ 1.04 to workers and C$ 1.58 to the driver (from "Estudio de Manejo de los Derechos Sólidos de la Ciudad de Granada" - Proconsult Ingenieros SA - Feb. 1996).

  A section manager and 32 employees are employed to perform other services: 15 for street and river bed maintenance, 10 for parks, 2 for management of cemeteries and 5 skilled laborers for general maintenance.

  The other section employs 6 people to produce blocks to pave and maintain streets.

- Research and Projects Department (RPD)

  The RPD supplies and maintains vehicles and machinery, using its own small workshop, private workshops and fuel stations.

  The procedures to buy items or contract services are standardized nationally. The fuel station is paid weekly. At times, what the suppliers owe the municipality in taxes (debts) are deducted from the payment of services to the municipality.

- Administration - Finance Department (AFD)

  The administration and finance department is divided into five sections. Its services include purchase of materials and services as well as storage, and provision of transportation for all employees and officials of the municipality.

  Human Resources Section, including management of personnel, involved in provision of other services e.g., publication of magazines.

  The Tax Collectors Office manage door to door tax collectors. Taxes for SW services is stipulated by MSD and the collectors may verify the figures with the AFD. Only houses located in the central areas and some outer sections are charged. In total, 12,000 households are subject to taxation, of which only 850 pay. The main reason for non-payment is "inadequate services".

  The urban area is divided in to 9 zones, some of which is divided into sub-classes according to the condition of the rood surface i.e., paved or unpaved. Land values are set (C$/$m^2$) for each zone.

  The property value is calculated by adding the land and building values. The building is evaluated by tax collectors, but the owner can discuss the values. This latest fiscal value will be fixed for five years, and is the base for calculating the

Real Estate Tax. The Cadastre Office is responsible for establishing zones and for evaluation of property prices.

The Real Estate Tax was reduced greatly since February 1996, for residents who own their property, including if the owner uses up to 30% of the property for commercial purposes. It was a central government decision in consideration of people who are not well off.

- Cadastre Office (Director level)

The office started its operations in November 1995 and has 3,500 houses listed out of a total of 19,000 properties. It uses the nationally standardized system SISCAT (micro - station).

a.2 Support from Ministries and National Entities

The local SILAIS performs hygiene inspections at markets and abattoirs and vermin control including fumigation, with the aid of ACEM -Malaria Control and Eradication Area. MAG should also inspect the markets.

It is important to consider that municipalities have several responsibilities fixed by the Law of Municipalities. However, this does not include authorization to impose strong sanctions such as closure of an establishment. Thus they need support from national authorities, mainly MINSA that exercises the Sanitary Code, MARENA, the principal agency that manages environmental laws, and INAA, the agency that manages all water and wastewater systems. Sewer nets that are poorly maintained encourage illegal discharge into the stormwater drainage system (surface or pipes), and insufficient supervision by INAA and the municipality promotes the mixing of both stormwater and wastewater.

MCT sets standards for urban streets, and is responsible for street maintenance outside the urban area.

A large discussion on environmental problems aiming to establish an Environmental Plan for Granada under the grant of the Canadian Government was held by CIRA/UNAN during 1995/1996, with the participation of municipal, governmental and non-governmental organizations. The same grant includes studying and planning a SWMS as well as designing a sanitary landfill.

a.3 Relevant Aspects of the Municipal Project Budget (MB)

Some indices may be calculated from the MB, for a macro - analysis of budgets for 1995 and 1996:

TsI/MB=	0.88
HI/MB=	0.01
D/MB=	0.07
R/MB=	
MiT/TsI=	0.63
MT/TsI=	0.19
R/TsI=	

Other indices may be calculated for a specific analysis, taking Relevant Costs as:
= RC = PpE + (S.M.P):

WRC=	2755
MkRC=	556
ARC=	497
WT/WRC=	0.09
MkT/MkRC=	3.16
AT/ARC=	0.67

Some conclusions are as follows:

- Taxes correspond to 88% of the MB and 7% of foreign donations.
- In proportion to the total tax income (TsI), direct municipal taxes for services and usage (MT) correspond to only 19%, and imposed taxes (MiT) correspond to 63% (these taxes are transferred from national taxes).
- 56% of TsI correspond to the tax on sales and services.
- The waste & cleansing tax covers only 9% of the relevant costs (RC) of the services.
- Market and abattoir taxes cover 316% and 67% of the services respectively.

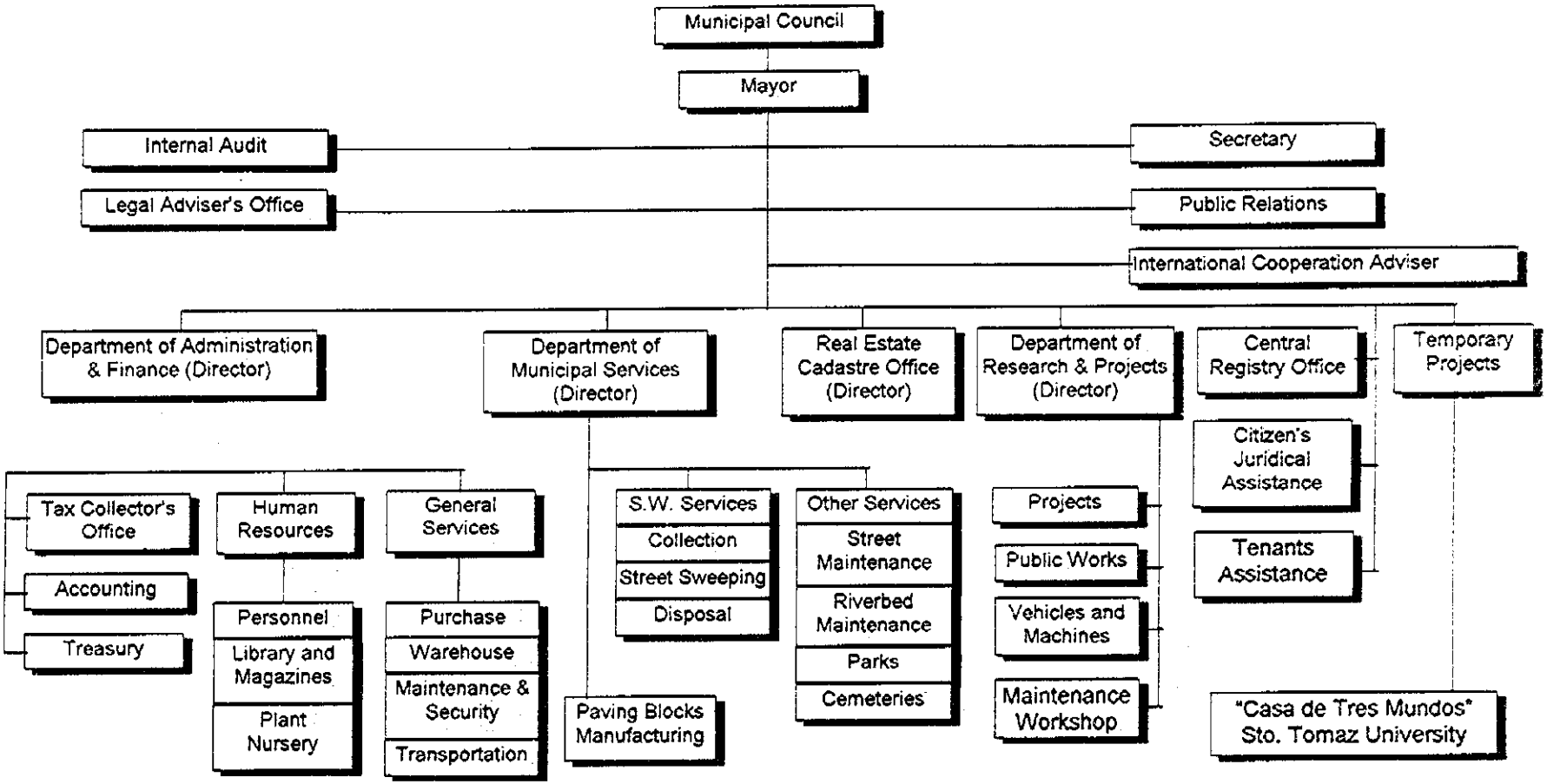

Figure B-31: Organization Chart of the Municipal Government of Granada

b. Community

Communities tend to be structured in levels, starting with individual premises at the bottom, then moving up to neighbors, districts, etc., and finally to the official administrative ward (e.g., barrio, reparto, etc.) level.

Communication and/or cooperation between authorities and a community are normally exchanged at this level of administrative ward (i.e., barrio, reparto, etc.). Community activities supported by authorities, such as community based education programs and health promotion, are normally extended by community volunteers (so called brigadas or brigadistas). Some of these volunteers' activities in relation to public health are mentioned in the following sections.

c. Public Health

At national level, it is reported that the following diseases and/or illnesses (morbidity and mortality, as indicated in the first column of the table below) affect the people most and thus need to be taken into consideration for the improvement of national public health conditions. The principal diseases (morbidity or mortality) in Granada Municipality recorded in 1993-1995 are shown in the table below.

Table B-65: Principal Diseases (Morbidity or Mortality)

	Morbidity or Mortality	1993	1994	1995
Acute Diarrhea	Morbidity	3,886	4,530	3,870
	Mortality	18	22	14
Acute Respiratory Infection	Morbidity	13,886	17,814	22,880
	Mortality	13	9	16
Cholera	Morbidity	61	401	224
	Mortality	0	11	3
Classic Dengue	Morbidity	62	157	224
	Mortality	0	0	0
Hemorrhagic Dengue	Morbidity	0	0	3
	Mortality	0	0	0
Malaria	Morbidity	209	75	520
	Mortality	0	0	0
Injury by animal bites	Morbidity	683	442	284
	Mortality	0	0	0
Maternal Death	Mortality	1	4	3
Neonatal Death	Mortality	26	23	21
Fetal Disease	Mortality	39	24	27

Source : MINSA

d. Current Status of the Health Sector in Granada

There are 2 public and 3 private hospitals, 11 health centers (centro de salud) and 55 health posts (puesto de salud) throughout the Granada Department (Departamento). Medical institutions in the Granada Municipality are shown in the table below in comparison to those in Granada Department.

	Unit	Granada Department	Granada Municipality
Public hospitals	No.	1	1
Private hospitals	No.	1	0
Health centers with bed facilities	No.	4	2
Health centers without beds	No.	1	1
Health posts attended by medical doctors	No.	6	6
Health posts attended only by nurses	No.	20	10

Health centers can be divided into 2 types: one is equipped with beds, the other is without bed facilities. Health posts also can be categorized into 2 types: one is visited by medical doctors, the other is only attended by nurses.

There were 57 medical doctors and 108 nurses and allied health professionals in the municipality in 1996.

e. Public Health Education in Granada

The health education in Granada is the responsibility of MINSA in cooperation with SILAIS, that program sanitary education workshops in different sectors of the city. The workshops are oriented towards the causes and effects of diseases (cholera, dengue, malaria) and how to prevent and combat them. A video and projector are used as teaching aids in the workshop.

Four (4) manuals on sanitary education for the residents have been prepared since the middle of October 1995; they specifically deal with:

- Control and/or disposal of DWW.
- Construction, use and maintenance of latrine.
- Adequate garbage disposal.
- Protection of drinking water.

The formulation of these educational materials is partly covered by the project financed by ACDI-INAA, which covers 6 cities, including Granada. In Granada, the project was executed in 2 barrios, namely Eddy Ruiz and El Rosario. Furthermore, sanitary education activities (training of 30 teachers, January 1996) are being coordinated with the MED. International assistance for projects in the area are as follows:

- IDB finances projects of great importance to the population. It also finances the teaching trainee volunteer teams (brigadistas). These projects are appropriated a total of approximately US$ 4,000 to 5,000 per month .
- WHO finances activities related to health, sanitation and training programs. These activities are appropriated a total of approximately US$ 10,000/month.
- The international NGO, World Vision (Visión Mundial), finances projects for street children.

f. Employment

"Statistics of socio-labor in Granada City" surveyed by MITRAB reported that the number of people in employment in Granada is 27,434 in 1994. From that data, the unemployment rate can be calculated as 9.2 percent (refer to Table B-66). The major

economic activity is "social, community services", with 8,352 people involved, followed by "commerce, restaurant and hotel", with 8,004. Employees of these two major activities occupied about 60 percent of the whole workforce. The rate of concentration to above two activities is the lowest in the study areas because the number of employees in the manufacturing sector was 7,540 (18.4 percent). Employees in the informal sector shared 65 percent, involving 17,748 people, therefore the EAP seems considerably low.

Table B-66: Number of Employees and Unemployment Rate in 1994

Unit : C$1,000

	EAP*	Employee	Unemployment Rate	Reference INSS
Total	30,218	27,434	9.2	6,907
Primary Sector	696	638	8.3	750
Agriculture	696	638	8.3	750
Secondary Sector	9,396	8,700	7.4	2,000
Manufacturing	7,946	7,540	5.1	1,813
Construction	1,392	1,102	20.8	187
Mining	58	58	0.0	0
Tertiary Sector	20,126	18,096	10.1	4,157
Commercial, restaurant & hotel	8,468	8,004	5.5	718
Transport & Communication	1,334	1,160	13.0	27
Electricity, gas & water supply	348	348	0.0	130
Finance, security, property &	232	232	0.0	128
Social, community services	9,048	8,352	7.7	3,145
Non-specific activities	696	0	100.0	9

Note : * "EAP" = economically active population
Source : Estadisticas Sociolaborales de la Ciudad de Granada
Anuario Estadistico 1994, INSSB

f. Income Level

It is difficult to compare the income level in Granada with other cities because of the absence of an income distribution table. The survey executed in August 1993 by FIDEG reported that the rate of households below the poverty line was 77.3 percent, higher than the 75.1 percent in Leon.

INSSBI reported that the average weekly salary was C$250.74, which is higher than that of Leon and is 75 percent of the average income in the whole country (C$336.50). Comparing average income by economic activity, the salary of unspecified activities and that of transport and communications is very low (refer to Table B-67).

Table B-67: Average Salary (Weekly)

Unit : C$

	1991	1993	1995	ratio to whole country (%)
Total	123.88	207.37	250.74	74.5
Primary Sector	52.14	110.2		
Agriculture	52.14	110.2	175.41	72.5
Secondary Sector	143.81	290.03		
Manufacturing	148.41	296.58	306.69	82.4
Construction	114.52	237.94	423.61	129.3
Mining				
Tertiary Sector	129.02	118.44		
Commercial, restaurant & hotel	157.83	276.53	294.33	70.2
Transport & Communication	91.45	219.81	181.68	35.4
Electricity, gas & water supply	104.33	198.46	271.77	49.4
Finance, security, property & service for enterprises	161.29	299.52	431.79	71.0
Social, community services	117.5	168.38	207.94	79.4
Non-specific activities	66.61	129.37	156.37	16.7
Total in Nicaragua	168.96	291.49	336.50	

Source : Anuario Estadistico 1991,1993,1995, INSSBI

B.4.4 Population of Granada

a. Demography

This section deals with the demographic characteristics in the urban area of Granada based on the 1995 Population and Housing Census of INEC. The variables examined here include: population size, household size and population distribution.

b. Nicaragua's Population and Growth Rate

Nicaragua covers an area of 130,668 km² (121,428 km² land and 9,240 km² water area). It has an estimated population of 4.4 million based on the 1995 figures of the National Institute of Statistics and Census (INEC).

The country has an annual growth rate of 3.37% and a population density of 36 persons/km². The urban population makes up 54% of Nicaragua's total population due to migration of rural residents to Managua and other important cities.

The country is ethnically diverse and the majority of the population is made up of mestizos of Indian and Spanish descent. Like other developing countries, Nicaragua has a high birth rate and a gradually declining mortality rate. Regardless of a high population growth rate, the population density (36 persons/km²) of the nation is lower than most Latin American countries.

The country is divided into 16 Departments. Table B-24 shows the population distribution by department based on the national census taken by INEC in 1971 and 1995. According to the table, the population of Nicaragua soared from 1.9 million in 1975 to 4.4 million in 1995, showing a 232% increase and a 3.37% average annual growth rate.

The greater part of the country's population, 57% (1995 estimate), is concentrated in the Pacific region, which is the most urbanized and economically developed region in the country. The central zone, which is reported to have the highest annual growth rate, makes up 31% of the national population, while the Atlantic zone only covers 12%.

Table B-68: Population of Nicaragua

Country / Department	Population		Growth Rate (%)
	1971	1995	95/71
Country	**1,877,952**	**4,357,099**	**3.37**
Chinandega	155,286	350,212	3.45
Leon	166,820	336,894	2.97
Managua	485,850	1,093,760	3.44
Masaya	92,152	241,354	4.09
Granada	71,102	155,683	3.32
Carazo	71,134	149,407	3.14
Rivas	74,129	140,432	2.70
Chontales	68,802	144,635	3.14
Boaco	69,187	136,949	2.89
Matagalpa	168,139	383,776	3.50
Jinotega	90,640	257,933	4.45
Esteli	79,164	174,894	3.36
Madriz	53,423	107,567	2.96
Nueva Segovia	65,784	148,492	3.45
Rio San Juan	20,832	70,143	5.19
Zelaya (1)	145,508	464,968	4.96
R.A.A.N.		192,716	
R.A.A.S.		272,252	

Note : 1971 and 1995 Census (INEC)

c. Population by Municipality in Granada Department

With a population of 155,683 persons (INEC 1995 preliminary census), the department of Granada represents 3.6% of the country's total population. Occupying a land area of 929 km^2, it has a population density of 168 persons/km^2. The department is made up of 4 municipalities: Granada, Diria, Diriomo and Nandaime.

Sixty two percent of the department's total population is concentrated in the municipality of Granada, which is inhabited by 96,996 people. The municipality of Granada is the most populated in the department; 74% of its population resides in the urban area of Granada Municipality. The population distribution and growth rates by municipality according to the 1971 and 1995 census are shown in Table B-69.

Table B-69: Population and Growth Rate by Municipality in Granada Department

	1971			1995			Growth Rates		
Municipality	Total	Urban	Rural	Total	Urban	Rural	71/95 (T)	71/95 (U)	71/95 (R)
1. Granada	44,453	35,422	9,031	96,996	71,783	25,213	3.30	2.99	4.37
2. Diria	3,200	1,939	1,261	6,075	3,246	2,829	2.71	2.17	3.42
3. Diriomo	8,910	3,621	5,289	20,102	7,076	13,024	3.45	2.83	3.83
4. Nandaime	14,539	5,677	8,862	32,510	14,594	17,916	3.41	4.01	2.98
Total	71,102	46,659	24,443	155,683	96,701	58,982	3.32	3.08	3.74

Source : Population Census Data of 1995 (INEC)

d. Population of the Urban Area of Granada Municipality

The urban area of Granada Municipality has a population of about 71.8 thousand (INEC data) and is made up of 101 "barrios" (municipal government data).

With 71,783 inhabitants in a land area of 14.30 km^2, the population density in the urban area of Granada Municipality is an estimated 5,020 persons/km^2. It is the least populated of the three principal cities in this study.

Table B-70: Urban and Rural Area Population of Granada Municipality

Granada	Area (km^2)	Population (1971)	Population (1995)	Population Density (p/km^2)	Growth Rate (1971/1995)
Urban Area	14.30	35,422	71,783	5,020	2.99
Rural Area	516.70	9,031	25,213	49	4.37
Total	531.00	44,453	96,996	183	3.30

Source : Population data (INEC); Growth rates estimated by the Study Team

The population in this municipality is concentrated in the urban area. The center of the city is found to be very densely populated with 100 persons/ha, as opposed to the rest of the city, e.g. the northern section, coastal area of Lake Cocibolca (Nicaragua).

d.1 Household

With an annual growth rate of 2.99%, the population of the urban area of Granada Municipality now amounts to 71,783. The urban area of Granada Municipality was estimated in 1995 to have 12,651 households and an average household size of 5.7 persons per household (refer to table below).

Table B-71: Urban Area of Granada: Population and Household

City	Area (km^2)	Urban Population	Number of Household	Person per Household
Urban Area	14.30	71,783	12,651	5.7

Source : 1995 Population Census Data (INEC)

d.2 Population Composition and Division by District

Districts categorized by income in the urban area of Granada are represented in Figure B-32. The urban area of Granada Municipality is made up of 108 "barrios" and "repartos. The majority of the population is concentrated in Sabaneta Eddy Ruiz, Reparto El Rosario and Campo de Aterrizaje. As stated in previous sections, INEC's statistical data for population and housing figures shall be considered official, therefore, population distribution and housing estimates represented in the table mentioned will be used as reference.

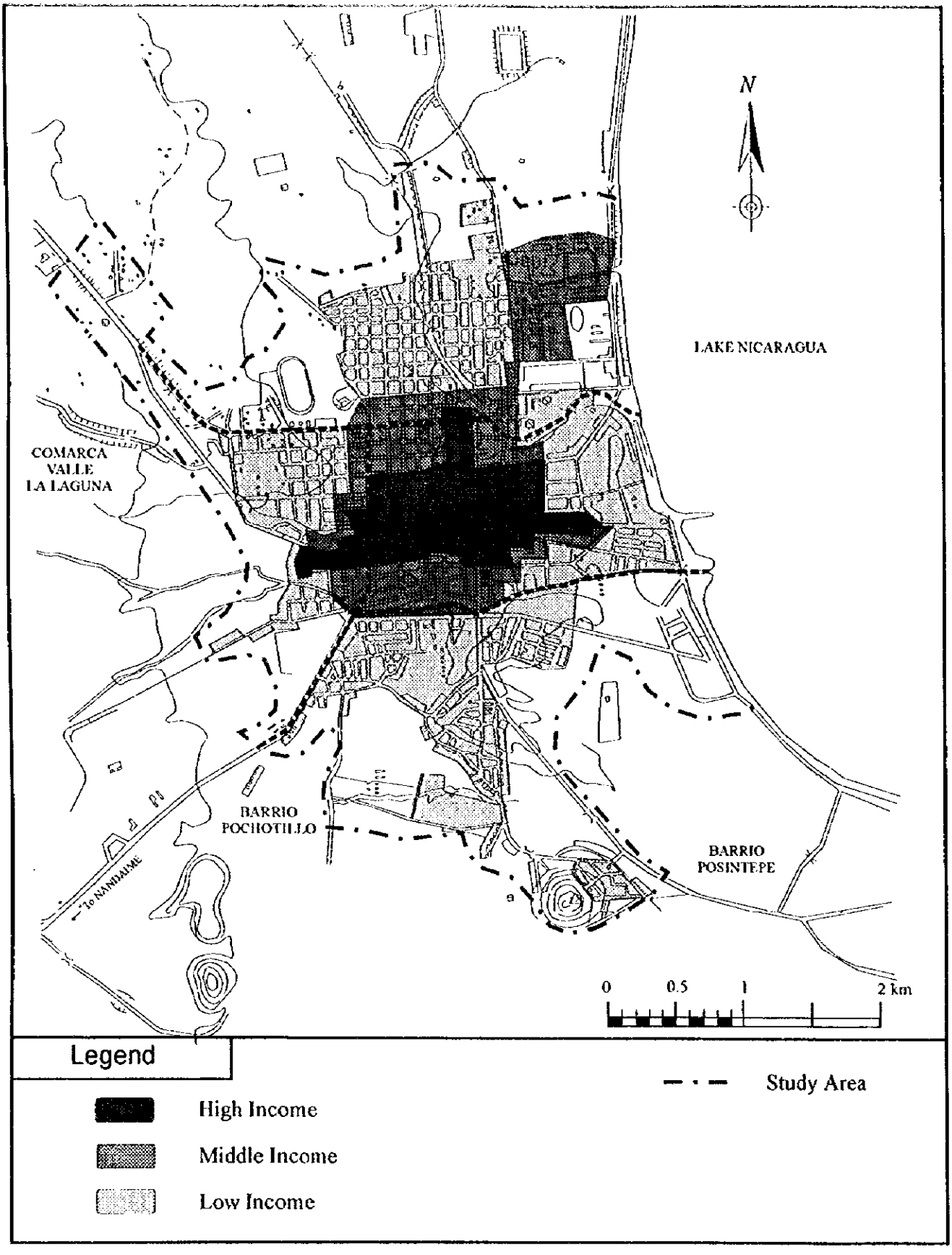

Figure B-32: Zones Categorized by Income in Granada

B.4.5 Housing Conditions in Granada

a. Housing Development

The Housing Bank of Nicaragua (BAVINIC) conducts housing development projects in the urban area of Granada in cooperation with some private construction companies.

The following are the housing projects supervised by BAVINIC:

i. On-going Projects

- Housing project (150 units) in the eastern section of Reparto Tepetate; US$7,500/unit.
- Housing project (150 units) in the northeastern section of Reparto San Antonio.
- Housing project (120 units) in the southern section of Reparto San Ignacio; US$3,000 to US$5,000/unit.
- Construction of the western side of Campo de Aterrizaje (180 units in the preliminary stage).

ii. Others

- Expansion of housing in the northern, western and southeastern sections of the city.
- Infrastructure improvement and installation: water distribution pipelines in 6 barrios, and drainage works in 3 barrios.

b. Living Conditions

Poverty and unemployment have become serious concerns of both the central and local governments. Government agencies are currently engaged in livelihood programs to counter-act impoverished conditions caused by lack of jobs.

The 1980's ended with Nicaragua facing critically impoverished conditions and a demographic structure and distribution that greatly affected the country's socioeconomic conditions. The civil war significantly influenced national economic growth as it impelled the rapid and accentuated decline in social indicators that led to the decay of productive and social infrastructure. Today, the standard of living in Nicaragua is still one of the worst in Latin America, a condition that is mainly attributed to unemployment or underemployment.

According to the magazine, "El Observador Economico" (The Economic Observer), published by the International Foundation for Global Economic Challenge (FIDEG), 53% of households in cities located in the Pacific region (including Leon, Managua and Granada) in 1995 were considered to be impoverished.

Poverty and other problems related to the living conditions of the people in the study areas are specifically identified below:

- Low income, unemployment or underemployment of the breadwinner.
- About 61% of households in the three cities headed by widows or single women are below the poverty line.

- Migration of breadwinners to other urban areas in search of better employment opportunities. However, the employment rate in these areas is worse than that of rural areas. The alarming rate of rural to urban migration further exacerbates housing conditions.
- Poor education or illiteracy.
- High percentage of school dropouts among extremely impoverished households.
- Insanitary conditions. Poverty has serious repercussions on public health, especially in children; various diseases were observed to have a high incidence rate in Leon in 1995.
- Apathy and dependence on outside assistance.

The Economic Observer also states Granada to have the highest ratio of impoverished households (57.4%), followed by Leon with 55.4%, and Managua with 47.1%.

In relation to housing, a vast number of Nicaraguans still reside in unacceptable and substandard housing conditions, such as those in spontaneous settlements and progressive urban settlements scattered around the peripheries and suburbs of the three cities in the study.

c. Housing

According to the 1995 census conducted by INEC, the number of housing units in the municipality in 1995 totaled 16,731, indicating an increase of 94% from the 1971 figure of 8,605. The number of housing units in the urban area (12,651) was also found to exceed the number in the rural area (4,080).

As previously mentioned, the bulk of Granada's population is concentrated in Sabaneta Eddy Ruiz, Reparto El Rosario and Campo de Aterrizaje (airfield area). Each area is populated with about 4,000 people and subdivided into 781, 423, 345 lots, respectively. The rest of the population make up the 105 barrios and repartos in the urban area.

According to the municipal government of Granada, 15% of households belong to the high income category, 35% to the middle income category, and 50% to the low income category.

The total housing distribution within the municipality in Granada Department is shown in table below.

Table B-72: Number of Housing Units in Granada Department

Municipality	1971			1995			Growth Rates		
	Total	Urban	Rural	Total	Urban	Rural	71/95 (T)	71/95 (U)	71/95 (R)
1. Granada	8,605	6,354	3,251	16,731	12,651	4,080	2.81	3.65	0.95
2. Diria	373	257	116	1,051	574	477	4.41	3.40	6.07
3. Diriomo	987	755	232	3,295	1,198	2,097	5.15	1.94	9.61
4. Nandaime	1,458	1,128	330	5,729	2,658	3,071	5.87	3.64	9.74
Total	11,423	7,494	3,929	26,806	17,081	9,725	3.62	3.49	3.85

Source : Population Census Data, 1995 (INEC)

B.4.6 Urban Structure

a. General Situation

Granada, located 45 km southeast of Managua, is 40 m above sea level on the shores of Lake Cocibolca, also known as Lake Nicaragua. The municipality has an average elevation of 60m as it rises up to 80 m above sea level.

Granada is one of the cities that has a good potential for tourism development. Its homogeneous and highly characteristic architecture, as well as its recreational zones along the shores of Lake Nicaragua, are major tourist attractions. Because of their importance, special protection measures should be implemented from the northern to the southern coastal areas.

Located on the shores of Lake Nicaragua, the country's largest water resource, Granada is an inland port, where it is possible to enjoy beach and other water activities.

Granada is originally divided into "barrios" (town), where activities are centered around a church. Barrios are usually located around civic institutions, such as the city hall, hospital, railway stations, etc. Those within the city area have grown considerably in recent years, but the ones within the urban area are not expected to have a high increase in population because 25% of the urbanized area is still vacant.

The following are the "barrios" that have developed around the center of the city: Reparto Adelita 2, Reparto San Carlos, Reparto Bilbao, Barrio Palmira, Barrio El Escudo, Barrio El Bolsón, Reparto Solorzano, Barrio El Hospital, Reparto San Alejandro, Barrio El Domingo, Villa Sandino and Barrio Ermita del Socorro.

b. Brief History of Granada City

The city of Granada was founded in 1524 by the conquistador Hernandez de Cordoba. It was established between the Aduana and Zacateligue *arroyos* (streams). In later years, the growth of the city was focused toward the northern and southwestern sectors. At present, the urban area covers approximately 14.30 km² and in the shape of a fan.

In 1954, the city grew to 309.4 hectares as it extended over streams. Developments in this period were seen in the northern and southwestern regions. Fourteen years later, in 1968, further expansion in the same regions continued, increasing the area of the city to 404.8 hectares. In 1977, the coverage doubled to 843 hectares, as developments were carried out towards the north and northeastern regions of the original location of the city.

The topographic conditions in the southeastern section of the city restricted expansion in this part of the area. This section is considerably undulated and is considered dangerous in the rainy season due to its many streams and water courses. Nevertheless many reside (e.g. spontaneous settlements) in this section. Because the area does not have adequate infrastructure, insanitary conditions prevail.

At present, growth is slow. Gradual development is, however, seen in Villa Tepetate Sur, in the northeastern section, through the project carried out by BAVINIC, and in Reparto San Ignacio in the southeastern section. At the same time, various construction projects are also carried out in and outside the city. The development projects carried out are mainly to conserve vacant lands, restore recreational areas, and reconstruct or repair historic buildings within the city.

Figure B-33 shows the evolution of the city of Granada from the 17th century to 1996.

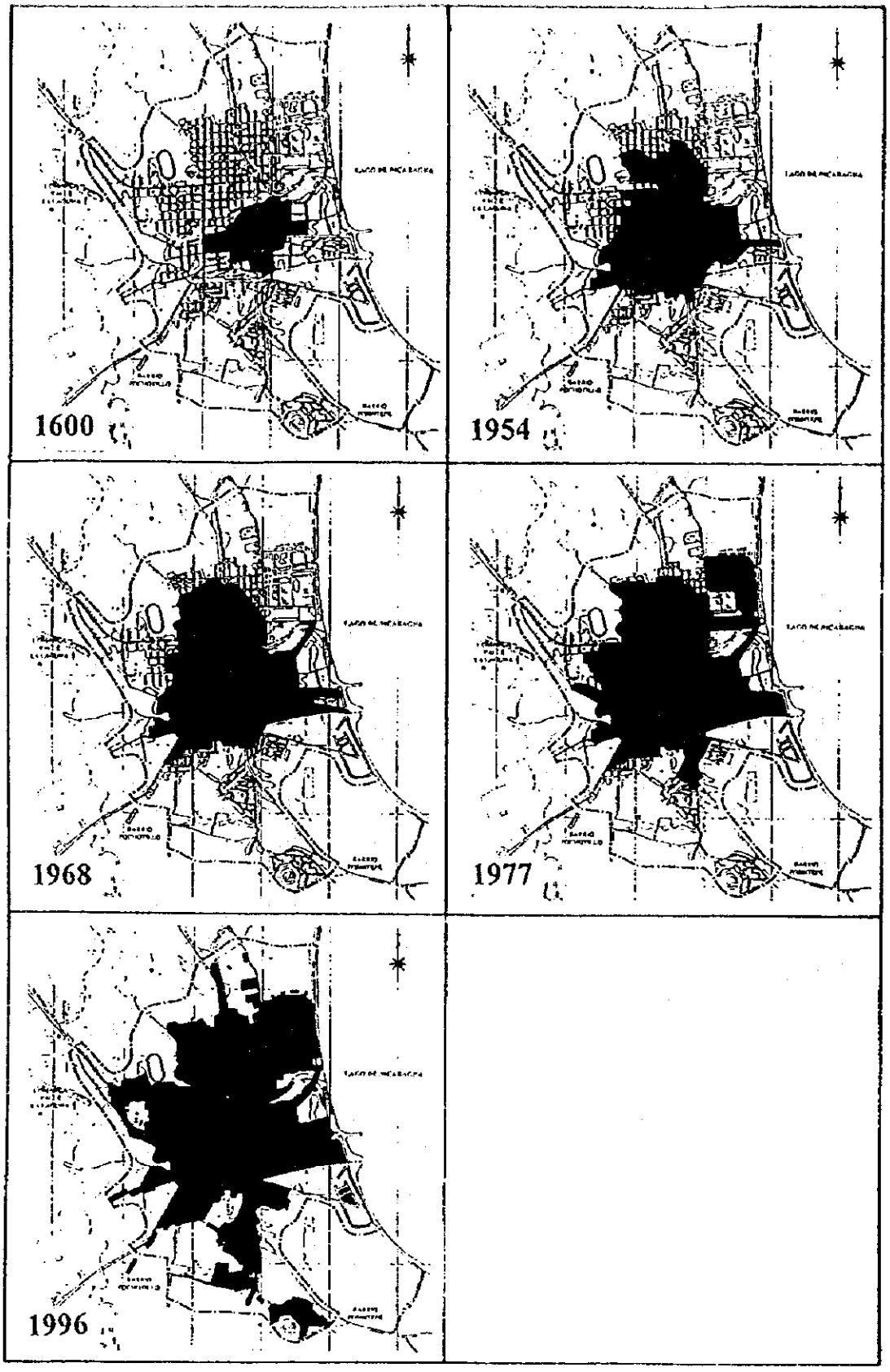

Figure B-33: Urbanization of Granada

c. City Development Plan

It is very important to conduct a study on the improvement of the urban sanitation environment to fully determine the policies and criteria necessary for the urbanization of the city, with due consideration of existing regulations and development plans. Only two reports were made in the study area: the "Urban Development of Granada" (1978) and the "Regulating Plan" of Granada (1982). Although these reports are dated, they were reviewed. Due to the political situation at the time these reports were made, they were never executed. However, they were used as bases for the formulation of the guidelines on urban regulations in October 1982.

The Regulation Plan contained the following general guidelines relevant to urban development:

- zoning regulation and land use
- regulation for urban development
- regulation for construction permits
- regulation for preservation of historic areas in Granada

Currently there are no city development plans. The municipal government does not have an Urban Planning Section although it has an office responsible for the preservation of historic sites and properties. This office is sponsored by the Spanish Cooperation Agency.

The realization of city development projects is difficult due to shortage of economic and human resources. Unfortunately, there are no guidelines and regulations to control urban growth, land use, etc., and development features are determined based on the general and natural development trends in some settlement areas.

d. Land Use

As previously mentioned, there are no land use maps. Therefore, a land use map was prepared based on information provided by the municipal government of Granada and the field survey carried out by the Study Team using the available cartographic map. This land use map is shown in Figure B-34.

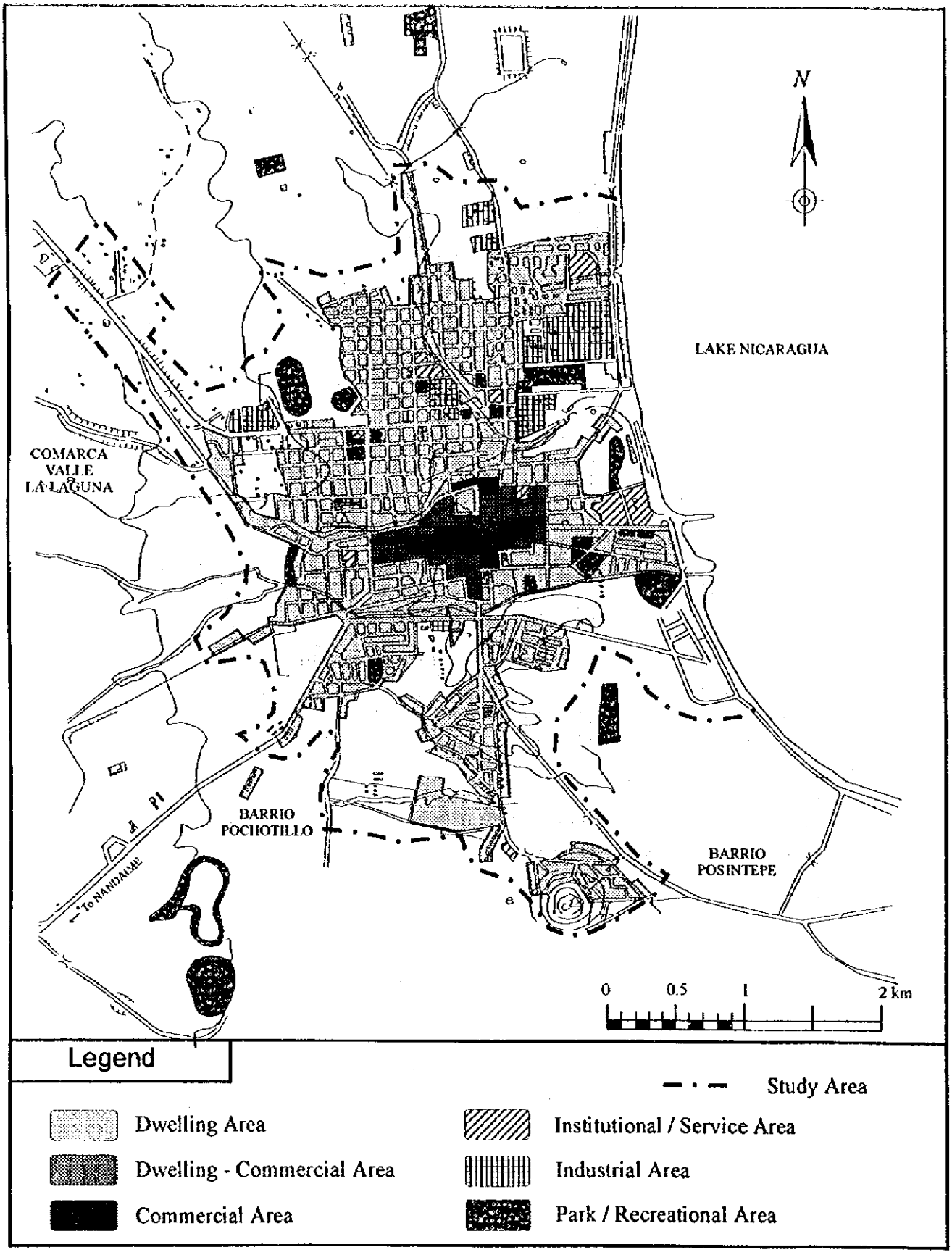

Figure B-34: Current Land Use in the Urban Area of Granada

e. Industry

The main economic activity in the municipality is agriculture, followed by manufacturing. However, the latter is more vital to regional and national economic development. The manufacturing industries in the area include soap factories and medium scale factories manufacturing textile, shoes, clothes, tobacco, vinegar, sauces, and ice cream. The important factories in the city are: PREGO (soap factory), E. CHAMORRO (soap factory), MONISA (food), IUCASA (paper), AGROTEX (cloth), TEXLASA (textile), CARTONSOL (cardboard factory). There are also 4 medium scale factories within the city area.

Soap factories are located along streams, a main environmental concern in the area. The factories indirectly contaminate Lake Nicaragua (the country's most important water resource) as they discharge their effluents (e.g. detergents, chemical substances) into the watercourses along the streams.

There are also about 92 commercial establishments which are mostly located in the center of the city.

f. Infrastructure

f.1 Road Transport

Road transportation is the main means of transportation in the city. Cars, motorcycles, buses, taxis, and trucks make up the city's transportation system.

f.2 Road Network in the City of Granada

As in Leon and Chinandega, the roads in the city are arranged in a grid formation extending from the central plaza area towards outlying districts. Expansion, however, is restricted in the eastern section by the presence of Lake Nicaragua.

The Pan American Highway is the main artery which crosses the department of Granada in a south-easterly direction. This highway connects the city of Granada to the cities of Masaya and Nandaime, as it extends toward Rivas until the border with Costa Rica.

The city of Granada has 122.8 km of roads, 42.4 km of which are paved either in asphalt or stone blocks. The rest are unpaved.

Because it contains many *arroyos* (streams) intersecting from east to west, Granada has 31 bridges (31). Eight of the main bridges are constructed over the Aduana stream, 6 over Zacateligue stream, and 17 over other major streams in the city.

The maintenance and construction of roads, bridges, sewerage, and other public utilities within the city area are supervised by the municipal government. The maintenance and construction of roads outside the city are supervised by MCT.

f.3 Power Supply and Telecommunication

The power supply of Nicaragua is provided by the state-owned Nicaraguan Institute of Energy (INE) and is distributed by the Nicaraguan Electric Company (ENEL). A substation is located within the city periphery, and the city has a total of 12,617 household connections.

Local, domestic, and international postal and telegraphic services are provided by ENITEL.

B.4.7 Economic Conditions

a. Regional Economy

a.1 General condition

There is no study on Gross Regional Domestic Product (GRDP) in Nicaragua. The basic data needed to estimate GRDP such as industrial production and commercial sales and services according to region are too dated to estimate the current GRDP.

INAA reported the socioeconomic profile of Granada in "Estudio de Prefactibilidad Sistema Regional Granada" as follows:

- Basic activity of Granada is agriculture, especially corn, rice and sorghum production.
- The second major activity is industrial manufacturing. Recently the number of small industrial manufacturers has increased.
- The economically active population (EAP) in 1994 was 45.3%, which is equivalent to about 38,135 persons.

On the other hand, INSSBI reported the amount of social security contributions and number of employers by regional economic activity, which are summarized in the following tables.

Table B-73: Number of Employers by Economic Activity

	1991		1993		1995	
		%		%		%
Total of Granada	347	100.0	294	100.0	243	100.0
Primary Sector	113	32.6	86	29.3	25	10.3
Agriculture	113	32.6	86	29.3	25	10.3
Secondary Sector	92	26.5	62	21.1	64	26.3
Manufacturing	81	23.3	57	19.4	59	24.3
Construction	11	3.2	5	1.7	5	2.1
Mining		0.0		0.0		0.0
Tertiary Sector	142	40.9	146	49.7	154	63.4
Commercial, restaurant & hotel	69	19.9	63	21.4	57	23.5
Transport & Communication	6	1.7	4	1.4	6	2.5
Electricity, gas & water supply	2	0.6	3	1.0	5	2.1
Finance, security, property & service for enterprises	10	2.9	9	3.1	9	3.7
Social, community services	53	15.3	63	21.4	76	31.3
Non-specific activities	2	0.6	4	1.4	1	0.4
Total in Nicaragua	8,132		7,759		7,733	
Percentage of Granada (%)	4.3		3.8		3.1	

Source : Anuario Estadistico 1991,1993,1995, INSSBI

Table B-74: Social Security Contribution by Economic Activity

	1991		1993		1995	
		%		%		%
Total	8,941	100.0	7,383	100.0	6,840	100.0
Primary Sector	1,374	15.4	818	11.1	704	10.3
Agriculture	1,374	15.4	818	11.1	704	10.3
Secondary Sector	3,362	37.6	2,058	27.9	2,003	29.3
Manufacturing	2,894	32.4	1,843	25.0	1,795	26.2
Construction	468	5.2	215	2.9	208	3.0
Mining	0	0.0	0	0.0	0	0.0
Tertiary Sector	4,205	47.0	4,507	61.0	4,133	60.4
Commercial, restaurant & hotel	836	9.4	696	9.4	647	9.5
Transport & Communication	38	0.4	31	0.4	39	0.6
Electricity, gas & water supply	19	0.2	28	0.4	104	1.5
Finance, security, property & service for enterprises	347	3.9	218	3.0	247	3.6
Social, community services	2,955	33.0	3,520	47.7	3,088	45.1
Non-specific activities	10	0.1	14	0.2	8	0.1
Total in Nicaragua	228,930		207,490		208,125	
Percentage of Granada(%)	3.9		3.6		3.3	

Source : Anuario Estadistico 1991,1993,1995, INSSBI

These tables point out the characteristics of Granada's economy as follows:

- Total number of employers has decreased and the figure in 1995 was 70 percent of 1991. In particular, the number of employers in the primary sector fell to 22 percent of the 1991 figure. The secondary sector in 1995 was also 70 percent of 1991, though it increased in 1993. The tertiary sector in 1995 increased to 1.08 times of 1991.
- Overall social security contributions also decreased, and in 1995 it was 77 percent of 1991.
- Both the number of employers and social security contribution in the fields of electricity, gas and water supply exceptionally increased.

a.2 Estimation of GRDP

The results of the calculation of GRDP, as with Leon, is shown in Table B-75.

Table B-75: GRDP in Granada Region in 1991 and 1995

Unit : C$ million in 1980

	1991		1995	
		%		%
Total	505.3	100.0	523.0	100.0
Primary Sector	77.4	15.3	154.2	29.5
Secondary Sector				
Manufacturing	238.6	47.2	190.1	36.3
Construction	17.1	3.4	34.9	6.7
Mining	0.0	0.0	0.0	0.0
Tertiary Sector				
Commerce	90.2	17.9	71.8	13.7
Government	54.3	10.7	44.3	8.5
Transport & Communication	1.5	0.3	1.3	0.3
Bank, Security & Others	10.1	2.0	4.2	0.8
Electric, Gas & Water Supply	0.6	0.1	15.2	2.9
Property & Dwelling	13.0	2.6	5.5	1.1
Other Services	2.4	0.5	1.4	0.3
Population			155.683	
GRDP/capita			3,359.1	

Source : Calculated by JICA Study Team based on;
Anuario Estadistico 1995, INSSBI
Informe Anual 1995, BCN
Compendio Estadistico 1987-1991, INEC

The GRDP in 1995 was 3.5 percent higher than in 1991, which is a unique characteristic to Granada region. A significant increase was recorded in agriculture, construction, electricity, gas and water supply. Manufacturing, the major industry, decreased to 80 percent of 1991. GRDP in current price was C$74 million, that is 78 percent of Leon region.

GRDP per capita in 1995 was C$3,359 in constant price (1980), which is 75 percent of the GDP per capita (C$4,481).

a.3 Fishery

In this study, it is assumed that the delivery amount to processing factories at fishing ports represents the catch of the region. The catch in the region by fishing port is shown in Table B-76.

Table B-76: Fish Catch in the Region

Unit : Libras

Fishing ports	1994	1995	1996*
Granada	200,142	331,727	147,387
Granada Total	200,142	331,727	147,387
Pacific Ocean Total	3,961,456	5,764,307	3,526,556
Share of Granada(%)	5.05	5.75	4.18

Note : * until September of 1996
Source : Boletin Estadistico Pesquero 1994, 1995, MEDE-Pesca

The table shows that the catch in 1996 decreased relatively, though it had increased in 1995. It is unclear whether this is caused by water pollution or due to seasonal variations.

a.4 Tourism

"Tourism Inquiry 1995" surveyed by Ministry of Tourism (MITUR) reported that the number of foreign tourists visiting Granada in 1994 was 237,652, equivalent to 23.7 percent of foreign tourists visiting Nicaragua (237,652).

The number of people who stayed in the two major hotels was 2,241 from abroad and 1,155 from Nicaragua. The major reasons for visiting were 81.6 percent for leisure, 12.7 percent for business, 4.2 percent for conference and 1.5 percent for other activities .

The number of customers staying in the largest hotel in 1995 has sharply increased to 3,560 from abroad and 1,359 from Nicaragua.

b. Tax System and Utilities Charging System

b.1 Local Tax System

The local tax system of Granada is the same as Leon.

b.2 Utilities Charging System

The utilities charging system of Granada is also the same as Leon.

The average fee collected in Granada is as follows:

Table B-77: Average Fee by Users

Unit : C$/$m^3$

	1995	1996
Residential house	1.79	2.05
Commerce	4.13	4.98
Industry	5.34	5.84
Government	6.85	7.60
Public utility	1.09	1.23
Multi-families	1.18	1.30

Source : INAA/General Accounting Department

c. Financial Conditions

The preliminary revenue estimates in 1994,1995 and 1996 and the actual revenue in 1994 and 1995 with some indicators are shown in Table B-78.

Concerning expenditure, the primary budget of the last three years and actual expenditure are shown in Table B-79.

Table B-78: Municipal Budget for the last Three Years (Revenue)

Unit : C$1,000

	1994		1995		1996
	Budget	Actual	Budget	Actual	Budget
Municipal Budget (MB)	11,959	10,537	10,730	13,071	14,826
Tax Incomes (TsI)	11,842	9,792	10,118	11,609	12,416
Municipal imposed taxes (MiT)	7,288	6,119	6,047	8,488	10,342
on sales & services (SsT)	6,333	5,436	5,363	7,481	7,346
other imposed taxes	955	683	684	1,007	2,996
Transfer from National taxes (TNT)	2,469	1,505	1,925	1,223	0
on vehicles	1,105	358	385	376	511
on real estate	1,364	1,147	1,540	847	1,596
Municipal taxes (MT)	2,085	2,138	2,146	1,877	2,074
for municipal services (MST)	2,015	2,053	2,043	1,797	2,011
waste & cleansing (WT)	102	98	98	106	139
municipal market (MkT)	978	951	982	815	774
municipal abattoirs (AT)	157	113	117	151	215
for other services	778	891	846	725	883
other municipal taxes	70	85	103	81	63
Heritage incomes (HI)	10	171	110	98	40
services	10	84		67	40
other heritage incomes	0	88	110	32	0
Donations (D)	0	304	25	945	1,850
Foreign (FD)	0	297		930	1,850
National		7		15	
undecided			25		
Recoveries (R)	16	16	12	4	6
Uncollected revenue(UC)					
Other recoveries	16	16	12	4	6
Other revenues	91	253	465	415	514
TsI/MB	0.99	0.93	0.94	0.89	0.84
HI/MB	0.00	0.02	0.01	0.01	0.00
FD/MB	0.00	0.03	0.00	0.07	0.12
R/MB	0.00	0.00	0.00	0.00	0.00
MiT/TsI	0.87	0.89	0.89	0.88	0.71
MT/TsI	0.29	0.35	0.35	0.22	0.20
R/TsI	0.00	0.00	0.00	0.00	0.00
SsT/TsI	0.87	0.89	0.89	0.88	0.71
WT/MT	0.05	0.05	0.05	0.06	0.07
MkT/MT	0.47	0.45	0.46	0.43	0.37

Source : Financial Department of Granada Municipality

Table B-79: Municipal Budget for the last Three Years (Expenditure)

Unit : C$1,000

	1994		1995		1996
	Budget	Actual	Budget	Actual	Budget
Municipal Budget (MB)	11,959	10,437	10,730	13,616	14,826
Personnel (PE)	6,159	6,510	6,134	7,220	7,113
full time employee (FtE)	3,587	3,956	3,816	5,125	5,281
for waste & cleansing (WE1)	572	629	547	888	1,117
for markets (MkE1)	144	156	180	227	194
for abattoirs (AE1)	21	29	200	139	125
for street maintenance	177	196	186	279	423
for other services	2,673	2,946	2,703	3,593	3,422
other personnel expenditure	2,572	2,554	2,318	2,095	1,832
Services, Materials, Products for Municipal Services (SMP)	1,346	851	1,336	1,145	1,077
waste & cleansing (WE2)	435	314	521	467	587
vehicles maintenance		27	165	122	97
combustible & lubricant		138	162	169	162
other expenditure	435	148	194	177	328
markets (MkE2)	385	41	145	50	37
slaughterhouses (AE2)	118	3	137	26	35
street maintenance		383		484	
for other services	408	110	533	118	418
Investments (Iv)	1,690	1,130	1,547	2,592	4,397
new works	445	481	1,349	1,220	2,875
public works	280	190	1,349	1,010	1,025
for pipes & drainage		0		15	25
for other public work	280	190	1,349	996	1,000
others	165	291	0	210	1,850
on going works and others	1,245	649	198	1,372	1,522
public works	550	319		1,140	
other going works	695	330	198	232	1,522
Other expenditure	2,764	1,945	1,713	2,659	2,239
WRC=WE1+WE2	1,007	943	1,068	1,355	1,704
MkRC=MkE1+MkE2	529	198	325	277	231
ARC=AE1+AE2	139	32	337	165	160
WT*	102	98	98	106	139
MkT*	978	951	982	815	774
AT*	157	113	117	151	215
PE/MB	0.52	0.62	0.57	0.53	0.48
SMP/MB	0.11	0.08	0.12	0.08	0.07
Iv/MB	0.14	0.11	0.14	0.19	0.30
WT/WRC	0.10	0.10	0.09	0.08	0.08
MkT/MkRC	1.85	4.82	3.02	2.94	3.35
AT/ARC	1.13	3.56	0.35	0.91	1.34

Note : * Municipal taxes shown in the previous table
Source : Financial Department of Granada Municipality

These tables summarize the characteristics of Granada as follows:

- The actual revenue in 1995 was larger than the primary budget, though revenue in 1994 was smaller than the predicted amount. The revenue from municipal imposed tax and foreign aids have increased in particular. The actual revenue in 1995 was C$13.1 million, only 3.5 percent of the estimated GRDP mentioned earlier.
- The main source of income is tax, which corresponded to 89 percent of the actual revenue in 1995 and 93 percent in 1994.
- Transfer from national taxes on vehicles is 98 percent of the primary budget because the target of the primary budget was set too low at 35 percent of 1994. The actual revenue transferred from national taxes on real estate in 1995 has decreased to 55 percent of the primary budget.
- The actual revenue of municipal taxes in 1995 was 88 percent of the primary budget, though it exceeded the figure in 1994. But the actual revenue of waste and cleansing tax shows an improvement, exceeding the primary budget in 1995.
- Personnel expenditure in 1994 and 1995 corresponded to 62 percent and 53 percent of the total, respectively. The total expenditure increased more sharply than that of personnel.
- Actual investment increased to 11 percent in 1994 and 19 percent in 1995. Foreign aids make it possible to invest in new projects.
- The waste and cleansing tax covers only 8 percent of the relevant costs of SWM in 1995. The coverage rate was worse than the figure in 1994, which was 10 percent.
- On the other hand the market tax covers 294 percent of the relevant costs of services.

d. SWM Costs and Fee Collection

The SWM costs in 1995 totaled C$1,355,000. SWM costs in June 1996 amounted to C$106,000, of which C$72,000 (62%) was for personnel costs, and C$18,000 (17%) for fuel and lubricant costs.

At present, SWM activities are not accounted separately, although they were in September 1994. At that time, collection costs totaled about C$62,000/month, while the cost for street sweeping was C$29,000/month.

The tariff of waste tax is set as follows:

- C$20/m3 for large companies
- C$12/m3 for restaurant, bars and public institutions
- C$5/month for residents of central & eastern areas
- C$2/month for residents of other waste collection areas

Measurement of volume is only done by visual estimates by collectors. The residents do not pay the waste and cleansing tax because they, including the workers, do not think the service is necessary. It is, therefore, necessary to educate these people on the importance of the service to establish a financial base.

B.4.8 Relevant Studies and Projects

Data and information regarding studies and projects realized in Granada, which are related to this Study, were obtained from the counterpart. Table B-80 lists those studies and projects.

Table B-80: Relevant Projects in the City of Granada

Classification of projects	Name (or Outline) of project	Date of project	Organization	Project location	Study, design or construction	Cost of the project
Potable Water	Extension of potable water	1996 (19 weeks).	Frankfurt (Germany) - INAA	Granada/ San Ignacio	Construction of net	C$ 635,064
Potable Water	Construction of storage tank	1996.	Frankfurt (Germany) - INAA	Granada	Construction of storage tank	US$ 44,448
Potable Water	Construction of storage tank	1996 (2 months).	ACDI (Canada)	Granada	Construction of tank (capacity of 700,000galon)	US$ 196,758
Potable Water	Net improvement	1996 (January)	ACDI	Granada	Construction	US$ 119,243
Potable Water	3 storage tank rehabilitation	during 1997.	ACDI.	Granada	Rehabilitation of 3 storage tanks	C$ 935,082
Potable Water	Construction of a new well	during 1997.	ACDI	Granada	Construction of a new water source	US$ 36,000
Potable Water	Construction of 3 wells.	---------- -	FISE	Granada	Construction	C$ 129,375
Potable Water	Study and design of potable water supply	---------- -	FISE	Granada	Study and design	C$ 2,000,000
Wastewater	Diagnosis and design of sewer	being carried out	BID, OPEP, NDF	Granada and other regions	Design	US$ 58,500
Wastewater	Rehabilitation of oxidation lagoons	1996 .	BID	Granada	Lagoon repair and sludge remove	C$ 4,500,000
Wastewater	Construction of sewer net	1996 (3 months)	Pobladores.	Granada /Rep. Julio Q	Construction	C$ 16,000
SWM	SWM for 41 municipality	Oct/1995	JICA	Granada	Study	*
Sanitation	Latrine construction (496 Nos.)	05 / 07 / 94.	MINSA - FISE	Granada	Construction of latrines	C$ 271,232
Sanitation	Construction of 134 latrines	7 /11 /94.	MINSA-FISE	Granada.	Construction of latrines.	C$ 827,069
Sanitation	Construction of latrines	15 / 11 /94.	MINSA-FISE	Granada.	Construction of latrines.	C$ 892,955

Note : * Total cost of study for 41 municipality is U$ 235,088.

ANNEX C

Public Opinion Survey

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C Public Opinion Survey (POS)

C.1 Objectives of the POS

The primary objective of the Public Opinion Survey (POS) with regard to the urban sanitation environment (USE) in the three cites (Leon, Chinandega, and Granada), was to identify areas such as:

- public awareness on USE
- opinion on present USE
- needs for improvement
- willingness to pay (WTP) and ability to pay (ATP) for improvements.

C.2 Method of the Survey

The POS was carried out in accordance with the survey flow described in Figure C-1. The survey was subcontracted to a local consultant, EGO, through a tender process.

The POS plays a considerably important role in:

- determining appropriate charges for the sanitation services,
- selecting a priority city among the 3 principal cities,
- selecting priority project(s), etc.

Therefore, the contents of the POS questionnaire were fully examined by the Team and the counterpart, and finalized.

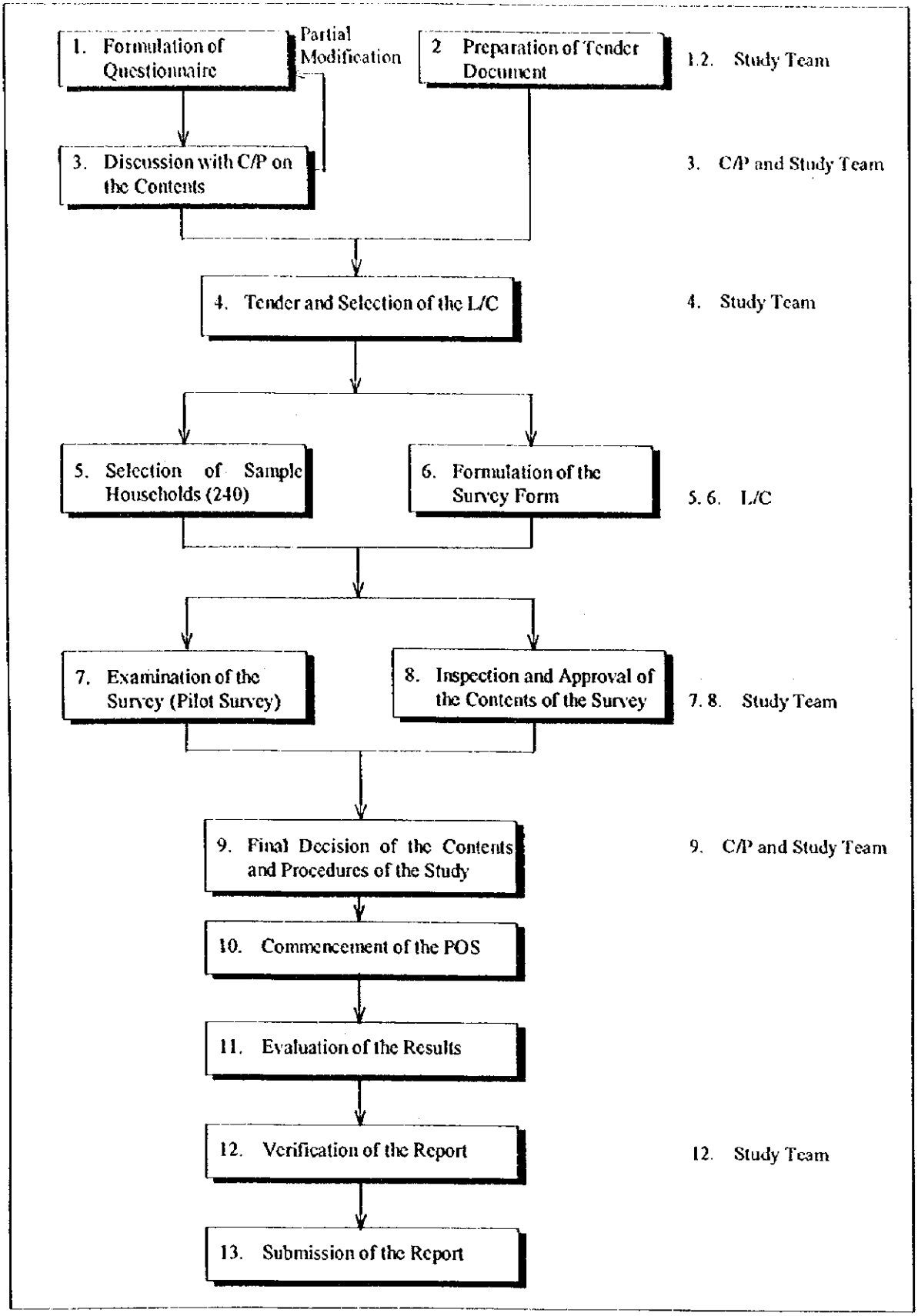

Figure C-1: Flow of POS

a. Sample Number and Survey Area

The team initially proposed a sample number, for each of the 3 cities, as follows:

- urbanized area: 30 samples
- semi-urban area: 30 samples
- commercial area: 20 samples

The discussion between the counterpart and the Team members was extended to determine the distribution of the sample numbers in proportion to the USE problems. Consequently, the counterpart proposed:

- urbanized area: 30 samples
- semi-urban area: 40 samples
- commercial area: 10 samples

The Team accepted the amended distribution of sample numbers.

The selection of the survey sampling area (i.e., urban, semi-urban, and commercial areas) was designed to counterpart members from respective municipalities due to their knowledge of intrinsic situations in each area of the city.

In general, the category of the sample area represented:

- **urban area:** the city center and/or traditionally established areas (sometimes including new residential areas) with fewer problems on urban infrastructure.
- **semi-urban area:** urban fringe area, and some barrios/repartos newly extended and/or isolated from the city center, with more problems related to urban infrastructure and sanitation.
- **commercial area:** the area where commercial activities are concentrated in each city.

Table C-1,Table C-2,Table C-3 list names of barrios/repartos and streets where samples were taken and the sample numbers.

b. Survey items

The survey items were, in general, categorized into:

- general awareness on USE
- present situation of public services related to USE
- community participation
- Diseases and USE
- needs and willingness to pay (WTP) for the improvement of USE.

Table C-1: Sample Area of Leon

AREA CATEGORY	NAME OF BARRIO/REPARTO	SAMPLES
URBAN	Subtiava	8
	San Sebastian	4
	Laborio	4
	San Juan	4
	San Jose	4
	El Coyolar	6
	URBAN-TOTAL	30
SEMI-URBAN	Todo Sera Mejor	5
	Santa Lucia	5
	Carlos Nuñez	5
	18 de Agosto	5
	Venceremos	5
	Brisas de Acosasco	5
	William Fonseca	4
	Ruben Dario	3
	Las cuchillas	3
	SEMI-URBAN TOTAL	40
COMMERCIAL	San Juan	4
	Terminal de Buses	2
	Mercado Central	4
	COMMERCIAL TOTAL	10
LEON TOTAL		80

Table C-2: Sample Area of Chinandega

AREA CATEGORY	NAME OF BARRIO/REPARTO	SAMPLES
URBAN	San Agustin	2
	El Rosario	2
	La Cruz	1
	Guadalupe	3
	Santa Ana	3
	El Calvario	4
	Los Arcos	4
	Moonserat	3
	San Luis	4
	Los Angeles	4
	URBAN-TOTAL	30
SEMI-URBAN	Carlos Fonseca	7
	Roberto Gonzalez	7
	La Florida	7
	Camilo Ortega	7
	Jiron	5
	Rugama	1
	12 de Septiembre	6
	SEMI-URBAN TOTAL	40
COMMERCIAL	Mercado Mayoreo	2
	Mercado Central	7
	Santa Ana	1
	COMMERCIAL TOTAL	10
CHINANDEGA TOTAL		80

Table C-3: Sample Area of Granada

AREA CATEGORY	NAME OF BARRIO/REPARTO	SAMPLES
URBAN	Santa Lucia	8
	Calle Sur Jalteva	6
	La Sabaneta	8
	Consulado	8
	URBAN-TOTAL	30
SEMI-URBAN	Eddy Ruiz	7
	El Bolson	6
	Pansacan	6
	Adelita	7
	Santa Isabel	7
	San Ignacio	7
	SEMI-URBAN TOTAL	40
COMMERCIAL	Calle Atravesada	3
	Calle Real Jalteva	3
	Avenida Arellano	2
	Inmaculada	2
	COMMERCIAL TOTAL	10
GRANADA TOTAL		80

Figure C-2, Figure C-3, Figure C-4 show sample area in 3 cities.

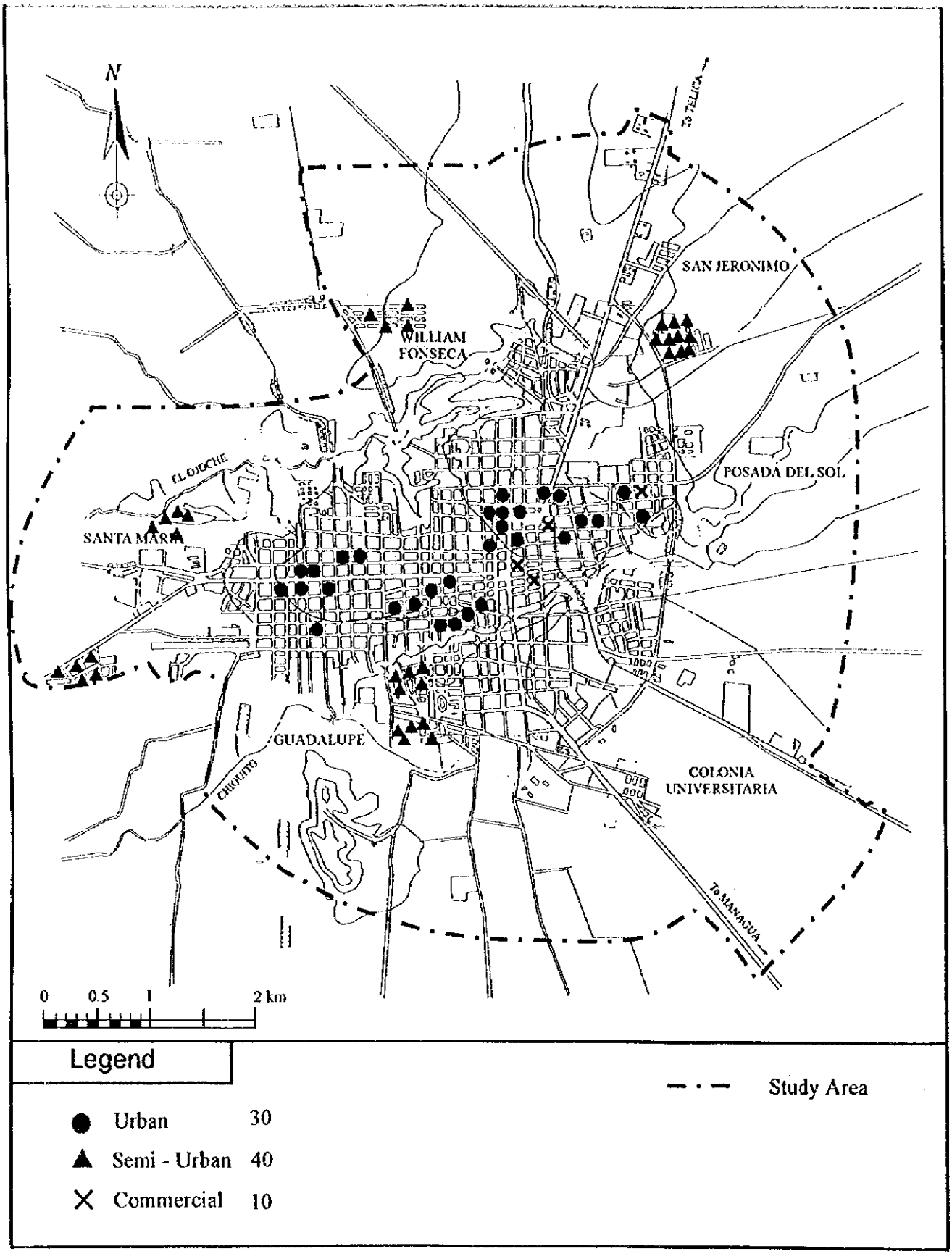

Figure C-2: Map of Sampling Area in Leon

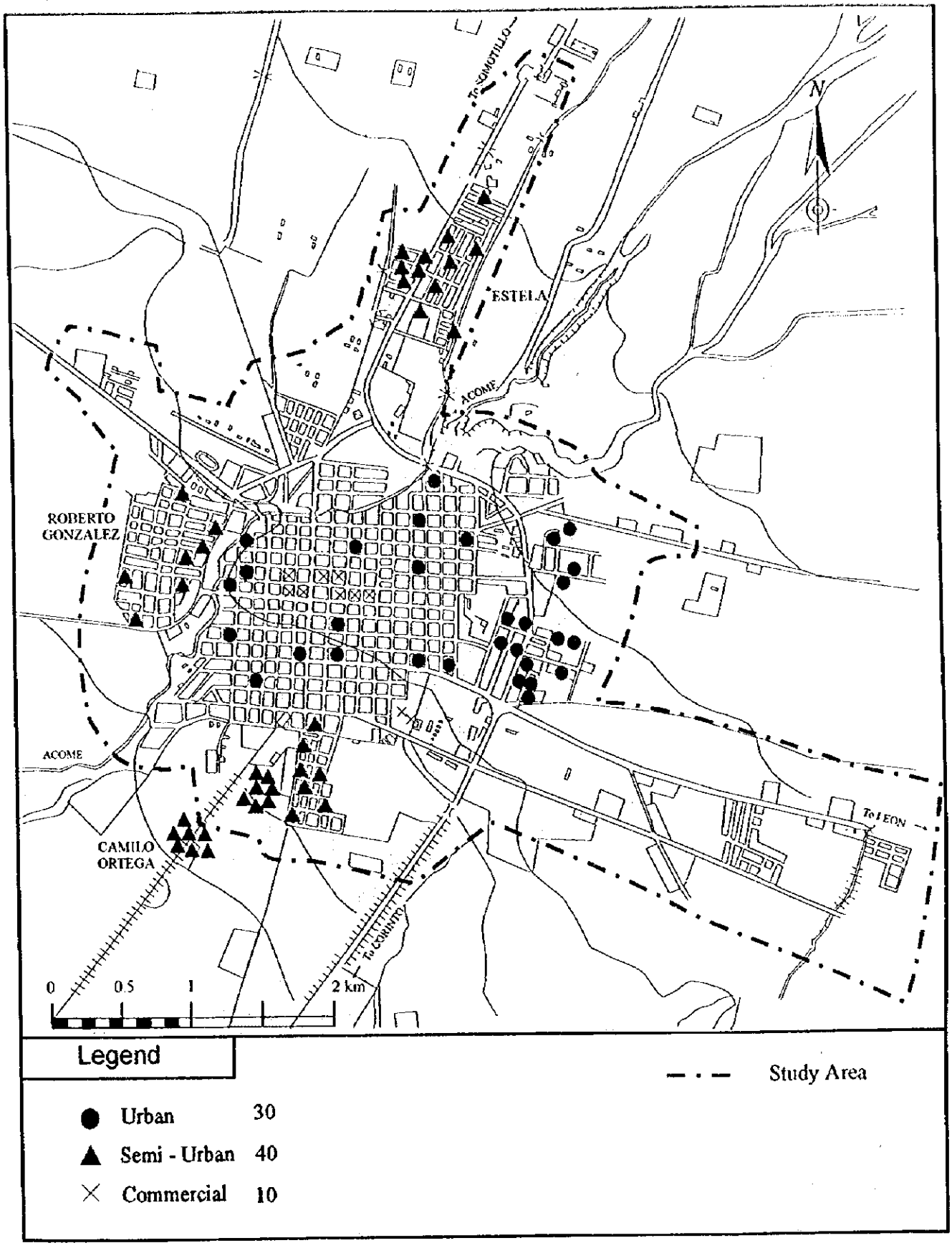

Figure C-3: Map of Sampling Area in Chinandega

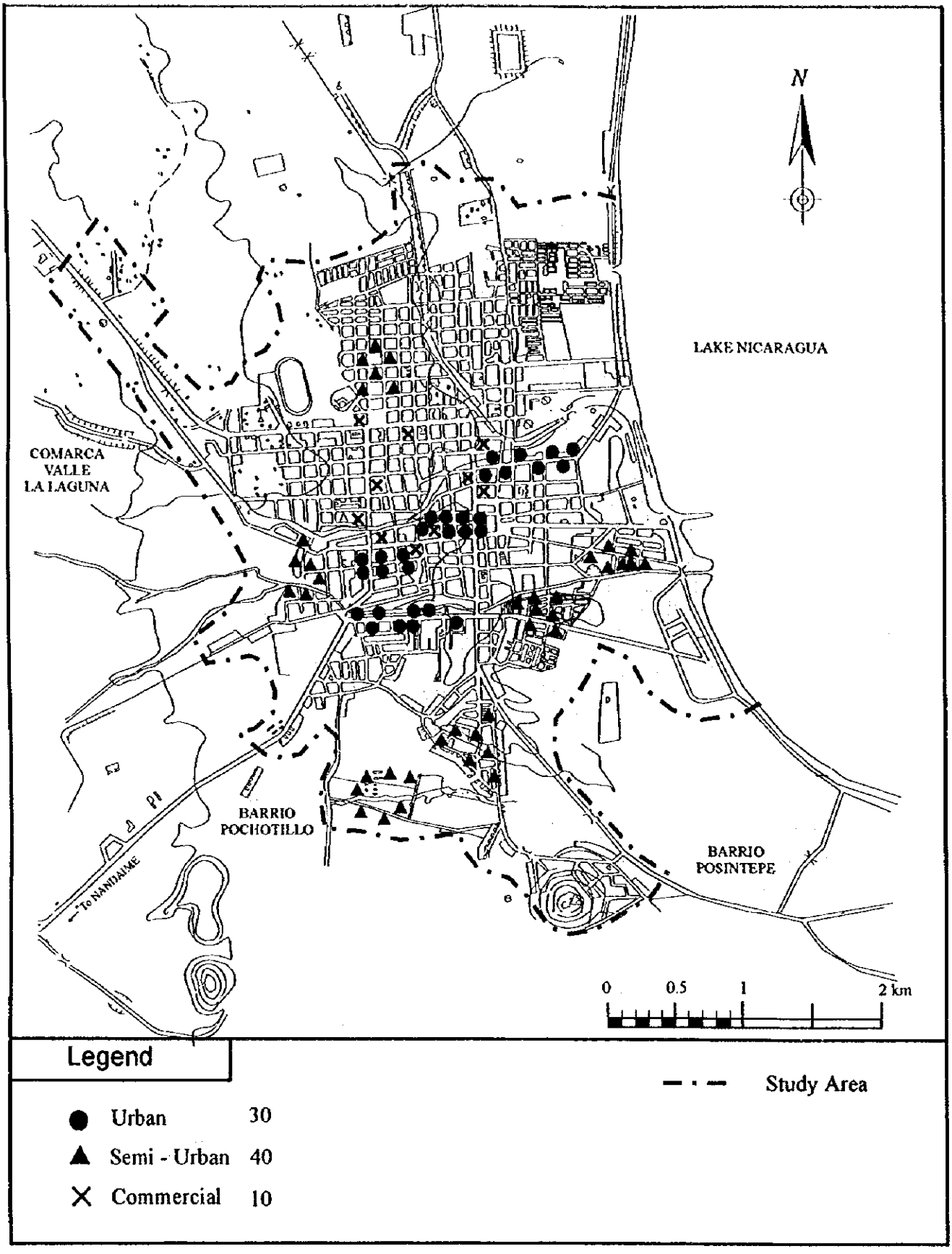

Figure C-4: Map of Sampling Area in Granada

C.3 Outcome of the POS

The outcome of the POS are presented below. The study results were analyzed in terms of either:

- overall sample (240 samples)
- comparison between the 3 cities (80 samples each)
- comparison between the sampling areas (urban area (90 samples), semi-urban area (120 samples), and commercial area (30 samples))
- comparison between the income levels (*low income (50 samples), middle income (157 samples), and high income (37 samples)).

*Note: As for the income level, out of the total 240 samples, 50 replied that their family income is less than 500 Cordoba/month, 157 answered 500 to 1,500 Cordoba/month and 33 as more than 1,501 Cordoba/month. Therefore, for income-level comparison in this POS analysis, 3 income classifications (low: -C$ 500/month, medium: C$ 500-1,500/month, high: C$ 1,501/month-) were employed.

a. General Awareness Consciousness on USE

a.1 Environmental Problems Perceived (1-Q-1, 1-Q-2)

In general, the majority (60.4%) of interviewees mentioned the presence of USE problems i.e., "there are problems (21.7%)" or "very problematic (38.8%)". (1-Q-1)

Meanwhile, the majority of interviewees specified their main USE problems as being related to **"Wastewater (67%)"** and "Solid Waste (51%)". Problems related to "Inundation (31%)" were also significant.

As for comparison between the 3 cities, problems mentioned regarding "wastewater" ranked almost the same in each city (i.e., Leon 69%, Chinandega 60%, Granada 70%), problems expressed regarding "inundation" were also similar among the 3 cities (Leon 33%, Chinandega 33% and Granada 29%). On the other hand, 64% in Leon, 56% in Chinandega and 31% in Granada problems expressed their concern regarding "solid waste".

Problems of USE regarding disease vectors (e.g., flies, mosquitoes, cockroaches and rats) were rated very high (82% to 72% for each vector). This could imply that people may be conscious about deterioration of the environment and health such as being exposed to water-related and excreta-related diseases (1-Q-2).

a.2 Responsibility of the Existing USE Problems (1-Q-3, 1-Q-4)

For each of the above USE problems (water, wastewater, solid waste, inundation etc.), interviewees were asked who is principally responsible for the problems.

The results showing (the two most responsible bodies for the problems) are as follows:

- Water: central government, municipality
- Wastewater: municipality, central government
- Solid waste: municipality, central government
- Inundation: municipality, central government

Primarily the responsibility of the central government and municipalities were emphasized. Meanwhile, only a few responded that it is: "the responsibility of citizen" (1-Q-3).

A further question was asked as to who should principally cope with and solve the problems. Actions by the central government and municipalities were ranked at the top, meanwhile, not many people responded that it is not many people responded that it is: "actions by citizens" or "actions by all" to this question (1-Q-4).

b. Present Situation of Public Services Related to USE

b.1 Water Supply (2-Q-1 to 2-Q-3)

A great majority (209/240) of homes have water supply and receive sufficient amount of water, enough to wash their clothes at home. A few (27/240) receive water from a communal taps, communal wells, and private wells, especially those in semi-urban areas (20 out of the 27 were from the semi-urban area) (2-Q-1, 2-Q-1a).

Only 15 out of 240 interviewees do not pay for water, mainly because their water source is a private well or public tap, etc., or their inability to pay. A great majority (66%) pay for the water on time, but some (25%) occasionally pay late.

For those that pay (225) the average monthly charges for water is **C$73.76/month**.

As for the comparison of the 3 cities, citizens in Leon on average pay a little more than the others (i.e., Leon: C$81.62/month, Chinandega: C$76/month, Granada: C$71.10/month). In comparing sampling areas, citizens in semi-urban areas pay much less than those in urban or commercial districts. (i.e., semi-urban: C$43.02/month, urban: C$ 97.18/month, commercial: C$121.79/month). Apparently, income level is reflected on the levels of water charges (2-Q-2).

The majority have an impression that potable water cost s are "expensive (55%)" and "a little bit expensive (12%)", and a considerable number of interviewees answered: "the water charge system is not fair (21%)". In other words, 88% expressed a dissatisfaction towards water charges (2-Q-3).

b.2 Wastewater (2-Q-4 to 2-Q-8)

About 36% (87/240) answered they have a flush type toilet and a great majority (59%, 141/240) answered they have a latrines. Majority of urban interviewees (58/90) have a flush type toilets, whereas a great majority of residents in semi-urban areas (107/120) use a pit latrines (2-Q-4).

In comparing the 3 cities, the provision of sewers in Granada was less than Leon and Chinandega (2-Q-5).

The majority (145/240) of interviewees pay nothing for wastewater as they are not connected to the sewer system (or other reasons) (2-Q-6).

Eighty three out of 240 are connected to the sewers of which only 39 pay for the services. Average monthly wastewater charges among those who pay (39) is C$24.49/month (2-Q-7).

Among those who pay for wastewater, the majority have an impression that wastewater charges are "expensive (19/39)" or "reasonable little bit expensive (6/39)". Meanwhile, several replied that "the wastewater charge is" (19 out of all the respondents) (2-Q-8).

b.3 Stormwater (2-Q-9)

A number (43/240) of interviewees mentioned they have leakage problems, although most replied that they have no inundation problems. From the POS results, no atypical stormwater problems were observed between the 3 cities (2-Q-9).

b.4 Solid Waste Collection (2-Q-10 to 2-Q-18a)

A great majority (78%, 187/240) replied that there are SW collection services in their areas, whereas 22% (or 52 out of 240) do not receive SW collection services. Most of those in urban and commercial areas (92%) receive collection services, whereas 63% of residents in semi-urban areas receive services. (2-Q-10)

Collection is mainly conducted by the municipality; none of the cities have privatized domestic waste collection services (2-Q-11).

Sixty nine percent of those who receive SW collection services replied that they are satisfied with the services. As for the 3 cities, Chinandega shows a higher rate of satisfaction than the other 2 cities (Chinandega 62%, Leon 53%, Granada 51%). In comparing the sampling areas, urban areas show the highest satisfaction (77%) and semi-urban areas the least (41%). According to income level respondents with high income show the highest satisfaction (64%) and those with low income least (50%) (2-Q-12).

The main reason for dissatisfaction with the services mentioned was: "low frequency"; the next common reason is "irregular collection time" (2-Q-13).

"Door to door collection" is prevalent, and the number who discharge waste "directly to a collection truck" is also significant (2-Q-14).

The frequency of SW collection per week were: once (13%), twice (30.0%), three times (24%), 4 times (3%) more than 5 times (7%). Where average collection frequency is 2.59 times/week, Granada shows a slightly higher average frequency than the other 2 cities (Granada 3.12times/week, Leon 2.48times/week, and Chinandega 2.18 times/week). Where urban and commercial areas receive services about collection 3 times/week on average, semi-urban areas receive collection 2 times/week (2-Q-15).

Ninety nine out of 240 do not pay for SW collection services. Average monthly charges for SW collection fees among those who pay (141) is C$16.60/month. As for the comparison of the 3 cities, average monthly charges vary immensely (i.e., Granada C$7.38, Chinandega C$17.60, Leon C$25.20). Complaints regarding charges for SW collection in Leon are significantly higher than the other 2 cities. Comparing income levels, average monthly charges vary immensely (i.e., high income C$31.70, middle income C$14.67 and low income C$6.83). However, those who thought SW charges were the "proper amount" amounts to 58%, 36% and 26% of high, middle and low income level interviewees respectively (2-Q-15).

Collection services performed at a fixed time amounts to 68% in Chinandega, meanwhile the figures fall to 53% in Granada and 38% in Leon. Fixed collection services in semi-

urban areas reached 43%, whereas the figure was 61% in urban and 67% in commercial areas (2-Q-16).

On SW charges, many have the impression the "the charge is reasonable (88/240)". Meanwhile 37/240 replied that it is "expensive or a little bit expensive", and 19/2240 "cheap or a little bit cheap". Ninety four out of 240 did not answer or answered "others" mainly because they were not receiving any services (2-Q-17).

Among those who do not receive SW collection services, the majority just dump their garbage somewhere, and others just simply burn their waste (2-Q-18).

b.5 Electricity Supply and Road Conditions (2-Q-18b to 2-Q-20)

Almost urban and commercial areas connected to electricity. About 24% of semi-urban areas do not receive electricity (2-Q-18b).

The majority (210/240) receive electricity from a national electric company, whereas only 1% (3 out of 240) rely on individual generators for electricity (2-Q-19).

When asked about the condition of the road outside their house, "Asphalt paved road" and "gravel/brick pavement", whereas most do not have a paved road. The majority of residents in semi-urban areas do not have a paved roads to their house (87%) (2-Q-20).

c. Participation

c.1 Community Participation (3-Q-1 to 3-Q-7)

A great majority (95%, 229/240) expressed their willingness to participate in community activities (3-Q-1).

One hundred and sixty out of 240 consider that community participation is "indispensable" or "very important" for the improvement of USE, and a further 77 out of 240 mentioned "it is important". In other words, 233 out of 240 consider USE improvement important (3-Q-2).

Most interviewees (231/240) expressed their willingness to participate. (3-Q-3)

As for manners of participation, a significant amount would provide labor for such activities (178/240) and secondly would pay for such activities and/or services (41/240) and thirdly donate some cash for activities (14/240) (3-Q-4).

As for the importance of public education and campaign, most interviewees (210/240) reckoned that it is "very important" or "important" and some (26/240) mentioned "it is absolutely essential". In other words, 236 out of 240 consider public education important (3-Q-5).

With regard to the question as to who should initiate public education and campaign, a great majority (more than 200 out of 240) expect, primarily, good functioning of the **central government** and **municipalities** to take on the responsibility. Some expect **schools, families and neighborhood organizations** to also play these roles; NGO's and churches are not expected by the majority of interviewees to play any roles (3-Q-6, 3-Q-7).

d. Diseases (3-Q-8 to 3-Q-10)

The interviews revealed that "flu and respiratory diseases", "gastroenteric diseases including diarrhea" and "malaria and dengue" are the top three common diseases afflicting the people. To follow these, "skin and eye infection" and "intestinal worm" also count for a significant amount.

As for "flu and respiratory diseases", no distinct implication is observed when comparing the 3 cities, sample areas or income level. Meanwhile, for "gastroenteric diseases and diarrhea" and "malaria and dengue", a certain correlation is observed between income level and disease incidence (i.e., higher incidence of "gastroenteric diseases, diarrhea" and "malaria, dengue" are mentioned by people on lower income).

As for the comparison of the 3 cities, Granada shows a slightly frequency of gastroenteric diseases and diarrhea" than the other 2 cities; Chinandega has a little higher incidence of "malaria and dengue" than the others (3-Q-8).

On the other hand, regarding the question "what diseases you are most afraid of", "AIDS", "gastroenteric disease including diarrhea", "malaria and dengue", "hepatitis", and "flu and respiratory diseases" are the top 5 diseases people are most afraid of.

"Flu and respiratory diseases" are the most common diseases, however people are generally not afraid of it. Meanwhile, the next common disease **"diarrhea"**, followed by **"malaria and dengue"** are strongly feared . "AIDS" calls most fears because it has no known care (3-Q-9).

As for counter measures for those diseases, people mention "preventive measures " as well as "curative measures" (3-Q-10).

e. Needs and WTP (willingness to pay) for the Improvement of USE

e.1 SWM (4-Q-1 to 4-Q-3)

With regard to the question "do you want to receive a SW collection service", the reply was yes in 94% (i.e., 49 out of 52 those who do not have the service today). In other words, a great majority of those who do not receive the service express their needs for it (4-Q-1).

In view of bearing the cost for the improvement of SW collection services, the majority suggested the cost should be firstly borne by the municipality (145/240), then the central government (68/240). Cost sharing by citizens through paying a increased fees (15/240) and through provision of labor (6/240) is not a popular suggestion (4-Q-2).

Average WTP (as the additional amount payable by those who pay for the service today : i.e., 141 samples) for the improvement of SW collection service is 5.27 C$/month. On the other hand, the average WTP among those who do not receive any service is 6.46C$/month. Among those who receive collection services but presently do not pay for the service show an average WTP of 3.35C$/month (4-Q-3).

e.2 Water Supply (4-Q-4 to 4-Q-7)

Since the majority (208/240) are aware that they have safe water, they are satisfied. A few (32/240) expressed their wish to improve the water supply services (4-Q-4).

In view of the cost bearing for improvement of water supply services, the majority suggested the responsibility lies firstly on the central government (99/240), and secondly the municipalities (40/240). Cost sharing by citizens through paying increased fees (1/240) and through provision of labor (1/240) was not a popular suggestion (4-Q-5).

Most people (105 out of 140) are already satisfied with the present water supply services (4-Q-6).

Average WTP, (as the additional amount payable by those who pay for the service today : i.e., 207 samples), for improved water supply services, is C$0.47/month. On the other hand, the average WTP among those who do not receive water supply services show their WTP as an average of C$14.90/month. Meanwhile, those who receive water supply services but presently do not pay are unwilling to pay for the services (4-Q-7).

e.3 Wastewater Services (4-Q-8 to 4-Q-11)

Since only 89 out of 240 are connected to the sewer system, the majority (133/240) expressed their desire of receiving an improved sanitation system (i.e., sewerage) (4-Q-8, 4-Q-10).

In view of cost bearing for the improvement of sewage sanitation, the majority suggested the costs should firstly be borne by the central government (120/240), then the municipalities (102/240). Cost sharing by citizens through paying increased fees (8/240) and through their cooperation (1/240) was not a popular opinion (4-Q-9).

Presently, 149 out of a total of 240 replied that they do not have an appropriate sewerage system. One hundred and thirty three out of the 149 wished to receive an improved sanitation system (i.e.; sewerage). The percentage of those who do not want to receive improved sewerage services was 14% and 12% in Chinandega and Granada respectively. Whereas the percentage in Leon was only 6% (4-Q-10).

Meanwhile, as for WTP for improved sanitation, 44 replied C$0.0/month as their WTP, possibly due to their inability to pay; 89 expressed their WTP ranging from C$2 to 100/month. Average WTP, (as the additional amount payable by those who pay for the service today: i.e., 39 samples), for the improvement of wastewater service is C$2.23/month. On the other hand, on average those who do not have a sewer connection show their WTP as 8.32C$/month. Those who receive sewer services but at present do not pay for the service show an average WTP of 1.36C$/month (4-Q-11).

f. Interviewees' Priority

Interviewees' **top priority** for improvement are ranked as follows:

1. sewer system (64/240: 26.7%),
2. electricity supply (38/240: 15.8%)
3. water supply (36/240: 15.0%)
4. solid waste collection (29/240: 12.1%)
5. access road improvement (28/240: 11.7%)

Interviewees' **next priority** for improvement are ranked as follows:

1. access road(40/240: 16.7%),
2. electricity supply (35/240: 14.6%)
3. sewer system (31/240: 12.9%)

4. solid waste collection (31/240: 12.9%)
5. stormwater drainage improvement (24/240 10.0%)

The top 4 priorities of interviewees for improvement mentioned are "wastewater treatment", "solid waste management", "electricity supply" and "access road improvement" (4-Q-12).

C.3.1 Findings

Findings of the survey with regard to USE are listed below.

a. Water

- **A great majority receive water supply services.** Where interviewees currently pay C$73.76/month on average for the service, WTP (as the additional amount payable by those who pay for the service today) for water supply improvement is very small (C$0.47/month). It could be concluded that **present water charges** are very close to people's **maximum affordable amount** for the service. Additional cost bearing of water charges by beneficiaries would be very difficult.

b. Wastewater

- The majority mention the top USE problems as being related to **"wastewater"**, followed by **"solid waste management"**.
- The majority (133 out of 149 who do not have an appropriate sewerage system) expressed that they are in need of a sewer service. Where only 39 out of 240 pay an average C$24.49/month for sewer charges, the **WTP** (as the additional amount payable by those who pay for the services today) for improvement is very small (C$2.23/month). It could be concluded that the **present sewer charges** also is close to the people's **maximum affordable amount** for the services.
- Another **WTP** expressed (as the amount payable by those who do not receive any services today) for the sewer improvement is C$8.32/month. The difference between the "present sewer charge" and this "low WTP (C$8.32/month)" suggest a compromise and/or reconciliation between **"improvement needs"** and **"affordable practices"** for domestic wastewater disposal.

c. Solid Waste Management

- The majority (187 out of 240) receive SW collection services. Where the average charge for SW collection service is C$16.60/month, the **WTP** (as the additional amount payable by those who pay for the service today) for the SW collection service improvement is C$5.27/month. It could suggest, in comparison with "water" and "wastewater" sectors, that it is still **able** to bear some additional costs for improving the "SW collection service".

d. Other Sectors

- Many also place a priority on improvement of electricity supply and access road improvement. These opinions must be based on the people's desire for life amenity and convenience, but not based on the perception of environmental health problems.

e. Community Participation

- Most people expressed their strong willingness to participate in community activities for USE improvement. However, in reality, community participation is not well substantiated. Efforts by both authorities and communities (i.e., beneficiaries of USE improvement) should be made in this area, in order to easily introduce the community activities into USE improvement.

f. Comparison 3 Cities

- Citizens of Leon show the highest financial ability to pay for the services, compared to the other 2 cities.
- Granada shows a higher incidence of "gastroenteric diseases and diarrhea" compared to the other 2 cities; Chinandega has a higher incidence of "malaria and dengue" than the other 2 cities.
- SW problems are expressed in Leon more than in the other 2 cities.

g. Sampling Area Comparison: "Urban, Semi-Urban, Commercial"

- In general, the "semi-urban areas" have more problems related to USE (e.g., smaller coverage of USE services) and a greater dissatisfaction for USE services.