

Appendix 5 Socio-Economic Study

1. Economy of the Study Area

1.1 Primary Industries

The study area, although becoming urbanized, basically depends upon primary industries such as agriculture, forestry, fishery and livestock raising. (See Table 1 and 2)

Of the total land uses in Legaspi City, 48.6% is classified as croplands, 20.5% as pasture lands and 17.5% as forest lands. Nearby 27% of the labor force is engaged in agriculture, forestry and fisheries. The leading crops of Legaspi City are rice, coconut, corn, camote and cassava. Located in the seashore, fishing is also an industry in which a small portion of the Legaspi labor force is engaged. Annual catch is around 4,000 mt. In Daraga, 58.9% of the total land area is built-up area and 41.1% is croplands. The percentage of workers engaged in agriculture, forestry and fishing is 35.0. Daraga's leading crops are rice, coconut, corn and vegetables. Livestock and poultry follow rice and other agricultural products in value and quantity. They are lucrative and are contributing to augmentation of farm income in Daraga. (See Tables 1, 3, 4, 5 and 6)

1.2 Manufacturing

The percentage of the labor force engaged in manufacturing is 20.2 for Legaspi City and 28.6 for Daraga. The manufacturing establishments in the study area is mostly small-scaled, with the exception only of the Legaspi Oil Company and the Isarog Pulp and Paper Mill. There are 32 NACIDA* registered cottage industries in the study area with a total capitalization of P46,722,601. Two thirds (22) of them are located in Daraga and one third (10) in Legaspi City. The leading types of manufacturing are handicraft and furniture. (See Table 7)

Note: *National Cottage Industries Development Authority

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1.3 Commerce and Services

The percentage of the total labor force engaged in trade and commerce, transportation and service amounts to 44.0 for Legaspi City and 27.7 for Daraga. Legaspi City and Daraga are becoming the hub of trade and commerce in the Bicol Region. Legaspi City and Daraga are complementing each other in trade and commerce as they serve their combine population as well as residents of surrounding areas. The leading types of the business establishments in the study area are sari-sari stores, dry goods stores, fresh fish dealers and general merchandise. (See Table 8)

1.4 Income Distribution

The surveys conducted by Legaspi lity (in 1979) and Daraga (in 1976) show that more than half of the total households earn less than P400 monthly in Legaspi City and less than P300 monthly in Daraga. The percentage of the total households earning more than P1,000 amount to 11.9 in Legaspi City and 7.0 in Daraga. It is to be noted in this connection that food is identified as the leading area of expense by household in the study area and 80% of the urban household and 75% of the rural households produce nearly one-fourth of the food that they consume. (See Table 8)

1.5 Employment

Of the population 10 years and over in 1975, those in the labor force, as revealed by the 1978 Updated Settlement Profile, amounted to 51.9% in Legaspi City and 58.7% in Daraga. The unemployment rate was 5.9% in Legaspi City and 4.1% in Daraga. (See Table 9)

Table 1 Existing Land Uses
(Source of Data: Settlement Profile, 1978)

Uses	LEGASPI CITY		DARAGA	
	Has.	% of Total	Has.	% of Total
1) Built-up Area:	2,194.0	6.2	7,079.5	58.9
Poblacion	569.3	1.6	2,500.0	20.8
Barangays	1,624.7	4.6	4,570.5	38.1
2) Croplands:	17,254.6	48.6	4,929.5	41.1
Permanent Crops	9,343.1	26.3	3,121.6	26.0
Annual Crops	4,658.0	13.1	1,807.9	15.1
3) Pasture Lands:	7,265.5	20.5	None	0.0
4) Forest Lands:	6,229.2	17.5	None	0.0
5) Inland Fisheries and Other Uses:	896.0	2.5		
Total Land Area	35,526.1	100.0	12,000	100.0

Table 2 Total Employment Size, Albay Province
(Source of Data: 1975 Population Census)

Type of Industry	Percentage
1) Agriculture, Forestry and Fisheries	54.5%
2) Mining and Quarrying	0.2
3) Manufacturing	18.7
4) Electricity, Gas and Water	0.2
5) Construction	3.1
6) Commerce	6.1
7) Transportation, Communication and Storage	3.2
8) Services	14.0
Total	100.0%

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Table 3 Percent of Workers by Major Industry
(Source of Data: City Planning & Development Staff of Legaspi, and Municipal Planning & Development Staff of Daraga)

	<u>Legaspi City</u> (1979)	<u>Daraga</u> (1980)
1) Agriculture, Forestry and Fishing	26.7%	35.01%
2) Mining and Quarrying	0.10	0.55
3) Manufacturing	20.24	28.57
4) Construction	6.25	4.54
5) Trade and Commerce	13.14	7.53
6) Transportation	6.23	3.05
7) Services	24.62	17.08
8) Electricity	0.49	-
9) Others	2.24	3.67

Table 4 Leading Crops
(Source of Data: Settlement Profile, 1978)

<u>Name of Crop</u>	<u>LEGASPI CITY</u>		<u>DARAGA</u>	
	<u>Area</u> (Has.)	<u>Annual</u> <u>Production (m. t.)</u>	<u>Area</u> (Has.)	<u>Annual</u> <u>Production (m. t.)</u>
1) Rice	1,367.3	5,370.0	2,415.8	6,700.0
2) Corn	250.0	237.5	234.5	303.0
3) Camote	190.2	634.4	-	-
4) Coconut	3,047.0	3,205.6	20,026.1	14,443.7
5) Cassava	117.9	347.4	-	-
6) Vegetable & Rootcrops	-	-	1,270.6	1,897.7
7) Abaca	74.7	17.1	7	

Table 5 Livestock and Poultry (Heads and Birds)
 (Source of Data: City Planning and Development Staff,
 Legaspi, and Municipal Planning and
 Development Staff, Daraga)

	<u>Legaspi City</u> <u>(1971)</u>	<u>Daraga</u> <u>(1976)</u>
1) Pig	842	7,414
2) Goat	-	256
3) Rabbit	-	824
4) Chicken	120	32,157
5) Cattle	50	1,622

Table 6 Fishing (1976)
 (Source of Data: Project Compassion Baseline Survey, 1977)

	<u>Legaspi City</u>	<u>Daraga</u>
1) Fishpond/Fishpen Operation		
a. Total area (has.)	8.1	0.1
b. Annual production	4.0	0.1
2) Offshore/Coastal Fishing		
a. Total tonnage (fishing vessel)	46.2	-
b. Annual fish catch	4,178.8	-
3) Inland Fishing		
a. Total number (fishing boats)	-	-
b. Annual fish catch (m.t.)	-	-

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Table 7 Manufacturing
 - Cottage Industries Registered with NACIDA as of 1980 -
 (Source of Data: NACIDA, Legaspi)

	<u>Legaspi City</u>	<u>Daraga</u>
No. of Operators classified by type of industry:		
a. Handicraft	7	21
b. Furniture	2	
c. Ceramics Ind.	1	
d. Metal craft		1
Total No.	<u>10</u>	<u>22</u>
Employment (No. of Workers)	<u>375</u>	<u>1,589</u>
Capitalization	<u>P2,237,262</u>	<u>P4,487,339</u>

Table 8 Household Income Distribution
 (Source of Data: City Planning & Development Staff of
 Legaspi and Municipal Planning &
 Development Staff of Daraga)

	<u>Legaspi (1979)</u>	<u>Daraga (1976)</u>
	%	%
Below P200	15.17	48.14
P200 - 299	17.43	21.89
P300	18.89	10.48
P400	12.88	4.08
P500	8.43	3.62
P600	5.54	2.32
P700	3.86	0.65
P800	3.28	1.21
P900 - 999	2.63	0.65
P1,000 - 1,499	6.96	2.88
P1,500 and over	4.93	4.08

Table 9 Labor Force and Employment (%)
 (Source of Data: Settlement Profile, 1978)

	<u>Legaspi City</u>		<u>Daraga</u>	
1) Population 10 years old and over	100.0		100.0	
2) In the Labor Force:	51.9 ^{a/}	100.0	58.7 ^{a/}	100.0
Employed	48.8	94.1 ^{b/}	56.4	95.9 ^{b/}
Unemployed	3.1	5.9 ^{c/}	2.3	4.1 ^{c/}
3) Not in the Labor Force:	48.0		41.3	

Note: a/ - Labor force ratio
b/ - Employment ratio
c/ - Unemployment ratio

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2. Social Background

2.1 Ethnical and Cultural Characteristics

The original inhabitants of the study area were predominantly Malays. As shown in Table 10, Bicol is spoken by 97.4% of Legaspi residents and 98.1% of Daraga residents. (See Table 10) People in the study area are predominantly Roman Catholic. The Population Census conducted in 1970 shows that 96.5% of the population in Legaspi City and 99.3% of that in Daraga are Roman Catholic. (See Table 11)

2.2 Population Structure

As shown in Table 12, Legaspi City has slightly more males than females and Daraga slightly more females than males. More than half of the population in the study area are under 20 years old. (See Tables 12 and 13)

2.3 Educational Attainment Level

The educational attainment level of Legaspi City and Daraga is among the highest not only in the Province of Albay but also compared with surrounding Provinces. This reflects that these areas form a center of education, having Bicol University, Divine World College and other high level schools. Academic degree holders total 3,175 in Legaspi City and 1,712 in Daraga. (See Table 14)

2.4 Dwelling

Table 15 shows that the household-dwelling unit ratio is 1.0 to 1.1 in Legaspi City and 0.99 to 1.00 in Daraga. As the percentage distri-

bution of Dwelling Units by type of dwelling shows, single dwelling units prevail both in Legaspi City and Daraga. Classified by roofing materials, nipa prevails in a high percentage. (76.4% in Legaspi City and 72.4% in Daraga). Aluminum follows with a percentage of about 20% (19.7% in Legaspi City and 21.6% in Daraga).

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Table 10 Population by Mother Tongue Ethnic Origin, 1975
(Source of Data: 1975 Population Census)

<u>Classification</u>	<u>Legaspi City</u>	<u>Daraga</u>
1) Bicol	86,064	62,078
2) Tagalog	1,348	873
3) Hiligaynon, Ilongo	180	76
4) Cebuano	177	59
5) Chinese, Mandarin	130	-
6) Others	659	179
Total	88,379	63,265

Table 11 Population Classified by Religion, 1970
(Source of Data: 1970 Census of Population and Housing)

<u>Classification</u>	<u>Legaspi City</u>	<u>Daraga</u>
1) Roman Catholic	81,982	57,904
2) Protestant	692	277
3) Iglesia ni Cristo	723	-
4) Aglipayan	-	-
5) Islam	-	-
6) Buddhism	-	27
7) Others	621	127
8) None	72	-
Total	84,090	58,335

Table 12 Population By Sex, 1980
(Source of Data: 1980 Population Census)

	<u>Legaspi City</u>	<u>Daraga</u>
Both Sexes	98,683	73,224
Male	49,367	36,247
Female	48,685	36,966

Table 13 Population by Age Group, 1975
 (Source of Data: 1975 Population Census)

	Legaspi City			Daraga		
	Both Sexes	Male	Female	Both Sexes	Male	Female
All Ages	88,378	44,435	43,539	63,265	31,573	31,692
Under 1	2,356	1,245	1,111	1,502	762	740
1 - 4	10,789	5,520	5,268	7,746	3,974	3,772
5 - 9	13,789	6,915	6,406	9,740	4,992	4,748
10 - 14	12,271	6,331	5,940	8,631	4,426	4,205
15 - 20	10,636	5,221	5,415	7,708	7,747	3,961
21 - 24	7,701	3,736	3,965	5,599	2,593	3,006
25 - 29	6,026	2,965	3,057	4,443	2,161	2,282
30 - 34	4,856	2,320	2,436	3,368	1,672	1,696
35 - 39	4,625	1,812	2,305	3,083	1,551	1,532
40 - 44	3,668	1,617	1,856	2,553	1,261	1,292
45 - 49	3,342	1,686	1,656	2,365	1,158	1,207
50 - 54	2,435	1,175	1,260	1,824	889	935
55 - 59	2,019	988	1,031	1,505	783	722
60 - 64	1,678	845	837	1,235	628	607
65 - 69	1,045	531	514	791	412	379
70 - 74	825	408	417	588	284	304
75 - 79	296	145	157	241	111	130
80 - 84	163	66	97	143	73	70
85 and Over	231	102	129	200	96	104

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Table 14 Population 6 Years Old and Over by Highest Grade Complete, 1975
(Source of Data: 1975 Population Census)

	<u>Legaspi City</u>	<u>Daraga</u>
Total	72,565	51,960
No. Grade Completed	8,086	6,090
Elementary		
1st - 3rd Grade	13,234	8,467
4th Grade	7,594	6,513
5th Grade	6,131	4,694
6th Grade	15,775	11,885
High School		
1st - 3rd Year	8,535	5,810
4th Year	4,636	2,896
College (No Degree)		
1st - 3rd Year	3,711	2,281
4th or Higher	581	803
Academic Degree Holder	3,175	1,712
Not Stated	1,107	605

Table 15 Dwelling Conditions
(Source of Data: 1980 Population Census)

	<u>Legaspi City</u>	<u>Daraga</u>
1) Number of Households (1980)	17,329	12,961
2) Household-to-Dwelling Unit Ratio	1.10 to 1	0.99 to 1
3) Percentage Distribution of Dwelling Units by Type of Dwelling		
a. Single	92.2	93.5
b. Duplex	2.7	2.7
c. Barong-Barong	2.5	2.0
d. Other Types	2.6	1.8
Total	100.0	100.0
4) Percentage Distribution of Dwelling Units by Type of Roofing Materials		
a. Aluminum	19.7	21.6
b. Asbestos	0.1	0.2
c. Tile/Concrete	0.5	0.4
d. Cogon	1.5	4.3
e. Nipa	76.4	72.4
f. Others	1.9	1.1
Total	100.0	100.0

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3. Infrastructures

3.1 Land Transportation

The transportation system for the study area, the City of Legaspi and the Municipality of Daraga, includes one airport, one seaport and one railway line. The airport connects the city and the municipality with Manila by a daily flight, with Cebu by three flights a week and with Virac by two flights a week. More than 30 buses run to Manila. Inter-province bus service is available with at least one hour interval. In the City and the Municipality, spot-to-spot transportation is available by jeeps/jEEPneys and motor-tricycles, which number more than 1,000 (see Table 16).

3.2 Roads

The road network of the study area, i.e., Legaspi and Daraga, totals 345 kilometers of which about 40% is paved either with concrete or asphalt. This pavement ratio is considerably high compared with other municipalities. (See Table 17)

3.3 Irrigation Systems

There is no irrigation systems maintained by the National Irrigation Administration. As shown in Table 18, there have been proposed 18 communal irrigation systems, but so far only one project is on-going.

3.4 Waterworks and sewerage System

The study area is being served by a provincial water supply systems, though its service is not so satisfactory, as delineated in PART ONE. The area has no sewerage system.

3.5 Power

The study area is presently served with electric power by the Albay Electric Cooperative, a semi-government entity, which buys its electric power from National Power Corporation (NAPOCOR). As shown in Table 19, the residential consumers in the study as of May 1981 total 11,546, 38.12% of the total households there. Monthly residential consumption in the area amount to 726,152 KWH while commercial one records 785,478 KWH.

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Table 16 Transportation Resources in the Study Area, 1980
(Source of Data: Bureau of Land Transportation)

<u>Kind of Motor Vehicles</u>	<u>Number</u>
1) Cars	1,021
2) Jeeps/jeepneys	1,635
3) Trucks	541
4) Buses	99
5) Trailers	87
6) Motor-cycles	626
7) Motor-tricycles	639
Total	4,598

Table 17 Road Length and Surface Conditions (Km)
(Source of Data: Office of the City Engineers, Legaspi
Office of the Highway District Engineer,
Albay)

<u>Legaspi</u>	<u>Total Length</u> km	<u>Surface Conditions</u>		
		<u>Gravel & Other</u>	<u>Asphalt</u>	<u>Concrete</u>
1) National Road	56.803	26.19	13.835	16.778
2) Provincial Road	5.1	2.3	21.0	27.8
3) City Road	29.67	11.34	15.86	2.47
4) Barangay Road	80.33	80.33	-	-
Total	217.903	120.16	50.695	47.048
<u>Daraga</u>				
1) National Road	22.629	-	-	22.629
2) Provincial Road	28.57	22.95	5.02	0.6
3) Municipal Road	11.7	1.6	9.4	0.7
4) Barangay Road	64.1	64.1	-	-
Total	126.999	88.65	14.42	23.929
Grand Total	344.902	272.91	65.115	70.977

Table 18 List of Communal Irrigation Projects/Systems at Legaspi City and Daraga
(Source of Data: National Irrigation Administration, Albay Office)

<u>Name of Project</u>	<u>Location</u>	<u>Area (Has.)</u>	<u>Status of Proj.</u>	<u>Source</u>	<u>Status of Water Right Permits</u>
1) Arimbay CIP	Legaspi City	150	Deferred	Buyuan River	Temporary water permit from NWRRC
2) Pawa Rawis CIP	Legaspi City	122	Deferred	Pawa River	None
3) Maslog CIS	Legaspi City	18	Proposed	Maslog Creek	None
4) Taysan CIS	Legaspi City	25	Proposed	Taysan Creek	None
5) Bagacay CIS	Legaspi City	13	Proposed	Bagacay Creek	None
6) Cullat CIS	Daraga, Albay	86	On-going	Yawa River	Under Preparation by NIA
7) De la Paz CIS	Daraga, Albay	11	Proposed	Dinoronan Creek	None
8) Malabog CIS	Daraga, Albay	180	Proposed	Malabog Creek	None
9) Maroroy-Bagtang CIS	Daraga, Albay	18	Proposed	Maroroy-Bagtang Creek	None
10) Pandan CIS	Daraga, Albay	50	Proposed	Pandan Creek	None
11) Budiao-Quilicao CIS	Daraga, Albay	200	Proposed	Quilicao River	None
12) Bongalon CIS	Daraga, Albay	60	Proposed	Bongalon River	None
13) Anislag CIS	Daraga, Albay	20	Proposed	Anislag Creek	None
14) Bascaran CIS	Daraga, Albay	50	Proposed	Bascaran Creek	None
15) Inarado CIS	Daraga, Albay	150	Proposed	Dinoronan Creek	None
16) Mayon CIS	Daraga, Albay	25	Proposed	Mayon Creek	None
17) Namantao CIS	Daraga, Albay	15	Proposed	Namantao Creek	None
18) Tabon-Tabon CIS	Daraga, Albay	150	Proposed	Tabon-Tabon Creek	None

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Table 19 Electricity Consumers and Consumption
 (Source of Data: Albay Electric Cooperative, Inc.)

	<u>Legaspi City (Incl. Albay)</u>	<u>Daraga</u>
1) No. of Residential Consumers	7,721	3,825
2) No. of Minimum Consumers (Res.)	2,755	652
3) No. of Commercial Consumers	1,040	494
4) No. of Minimum Consumers	293	26
5) Kilowatthour Consumption		
a. Residential	505,565	220,587
b. Commercial	680,530	104,948

Rate Schedule as of May 1981

<u>Type of Consumer</u>	<u>Rate</u>
<u>Residential/Public Building</u> Minimum Bill	P 6.95
Excess	.58/kwh
<u>Commercial</u> Minimum	12.00
Excess	.60/kwh

4. Public Health

4.1 Causes of Morbidity and Mortality

The health picture of the Albay Province in the past five years, 1976 to 1980, showed that Gastro-Enteritis, water-borne disease, was top in the causes of morbidity and was the fifth among the leading causes of mortality.

In Legaspi City, Gastro-Enteritis ranked 7th in the causes of morbidity and mortality. In Daraga, it ranked also 7th in the causes of mortality but 10th in the causes of morbidity. The environmental and sanitary conditions in Legaspi and Daraga which are considered comparatively better than other municipalities but are yet to be improved further. Both of them have in common a public water supply system whose service area is however limited. (See Tables 21 and 22)

4.2 Health Facilities

The City of Legaspi and the Municipality of Daraga can be considered as one district, viewed from the availability of hospital services. Eleven hospitals out of the total 12 in the study area are private hospitals. The total bed capacity of these 12 hospitals amounts to 861. Other health facilities in Legaspi and Daraga, as listed in Table 23, number 36.

4.3 Sanitary Toilets

The ratio of the households with flush-type and water-sealed type toilets amounts to 50.18% in the City of Legaspi and 40.95% in the Municipality of Daraga. Inadequate water supply is considered a major cause hindering the further sanitization of toilets in these districts. (See Table 24)

Table 20 1976 to 1980 Ten Leading Causes of Morbidity and Mortality,
(5-Year Average)
 (Source of Data: The Provincial Health Center of Albay)

ALBAY PROVINCE

<u>Causes of Morbidity</u>	<u>Rate</u> <u>(Per 10,000 Population)</u>
1) Gastro-Enteritis	198.54
2) Pneumonia	196.17
3) Pulmonary T.B.	187.16
4) Influenza	114.63
5) Bronchitis	113.01
6) Heart Disease	75.63
7) Prematurity	24.37
8) Hypertension	22.16
9) Malnutrition	18.02
10) Accident	17.28

<u>Causes of Mortality</u>	<u>Rate</u> <u>(Per 10,000 Population)</u>
1) Pneumonia	142.25
2) Pulmonary T.B.	84.79
3) Heart Disease	75.63
4) Bronchitis	56.73
5) Gastro-Enteritis	38.85
6) Prematurity	24.16
7) Hypertension	22.16
8) Malnutrition	18.02
9) Accident	17.28
10) Malignancy	11.23

Table 21 1976 to 1980 Ten Leading Causes of Morbidity and Mortality,
(5-Year Average)
 (Source of Data: The City Health Department of Legaspi)

LEGASPI CITY

<u>Causes of Morbidity</u>	<u>Rate</u> <u>(Per 100,000 Population)</u>
1) Bronchitis	3,558.36
2) Upper Respiratory Tract Infection	2,485.66
3) Intestinal Parasitism	1,275.16
4) Anemia	1,149.02
5) Influenza	1,080.12
6) Malnutrition	1,039.84
7) Gastro-Enteritis	941.26
8) Skin Disease	642.35
9) Infected Wound	374.17
10) P.T.B.	374.17

<u>Causes of Mortality</u>	<u>Rate</u> <u>(Per 100,000 Population)</u>
1) Bronchopneumonia	221.53
2) CVA	133.55
3) PTB	83.73
4) Bronchitis	79.49
5) Malignancy	19.07
6) Myocardial Infraction	24.37
7) Gastro-Enteritis	24.37
8) Coronary Thrombosis	23.31
9) Prematurity	18.01
10) Malnutrition	14.83

Table 22 1976 to 1980 Ten Leading Causes of Morbidity and Mortality,
(5-Year Average)
 (Source of Data: The Municipal Health Center of Daraga)

DARAGA

<u>Causes of Morbidity</u>	<u>Rate</u> <u>(Per 1,000 Population)</u>
1) Upper Respiratory Tract Infection	5.4
2) Viral Infection	2.1
3) Infection Wound	1.4
4) Anemia	1.3
5) Hypertension	1.2
6) Bronchitis	1
7) Parasitism	.93
8) Urinary Tract Infection	.68
9) Non-Infectious Diarrhea	.63
10) Acute Gastro-Enteritis	.61

<u>Causes of Mortality</u>	<u>Rate</u> <u>(Per 1,000 Population)</u>
1) Carde-Respiratory Failure	1.8
2) Bronchopneumonia	1.3
3) Cerebro-Vascular Accident	.72
4) Kech's Pubmenary	.57
5) Stillbirth	.43
6) Coronary Thrombosis	.32
7) Gastro-Enteritis	.29
8) Bronchitis	.29
9) Congestive Heart Failure	.26
10) Malnutrition	.16

Table 23 Health Facilities

(Source of Data: The City Health Department of Legaspi and the Provincial Health Center of Albay)

<u>The City of Legaspi</u>	<u>Number</u>
1) Hospital	9
2) Other	21
<u>The Municipality of Daraga</u>	
1) Hospital	3
2) Other	15

Table 24 Number of Households and Percent of Households with Sanitary Toilets

(Source of Data: The City Health Department of Legaspi and the Provincial Health Center of Albay)

<u>The City of Legaspi</u>	<u>Number</u>	<u>Percent</u>
Total Households	17,329	
1) Households with flush & water-sealed type toilets		50.81
2) Households with open pit toilets		42.25
3) Others		6.94
<u>The Municipality of Daraga</u>		
Total Households	12,961	
1) Households with flush & water-sealed type toilets		40.95
2) Households with open pit toilets		44.18
3) Others		14.87

Appendix 6 Design Criteria for Planning

To prepare the master plan and the preliminary design of feasibility study on a standardized basis, the following design criteria are worked out. In preparing these criteria, due consideration has been given to the design criteria that were made by LWUA and compiled in the Technical Standard Manual. And to make the present criteria more realistic and workable, the local conditions including that of the existing water supply facilities, in particular are taken into account.

1. (Per capita Consumption) For planning of the district water supply system, average daily per capita consumptions for each study area are projected based on records of different WDs. In this study the values tabulated in Table A.7.4 and Table A.7.5 shall be used as a basis for unit consumption figures.
2. (Peak Factor) Since no data on maximum day and peak hour demands in each study area are available the following demand factors shall be used.

Average day demand	1.00
Maximum day demand	1.20 x average day demand
Peak hour demand	1.50 x average day demand

3. (Capacity of the Facilities) The capacity of the water source and transmission facilities shall be determined based on Maximum day demand.

The distribution facilities shall be designed based on Peak hour demand.

4. (Water Pressure) Maximum static pressure on a pipeline shall not exceed 7 kg/sq cm. In case unavoidable, special device shall be installed to keep the water pressure within the said limit.

Minimum water pressure at pipe ends of the distribution system shall not be less than 7 m in head, as far as practicable.

5. (C Value) C value to be used for hydraulic calculation of new pipe shall be:

<u>Pipe Size (mm)</u>	<u>C Value</u>
600 and over	130
500 - 250	120
200 - 100	110
75	100
All sizes of PVC	140

C value for old pipe shall be determined according to the conditions of pipe.

6. (Pipe Material) Pipe materials shall be selected from the following: ACP, CIP, DCIP, Steel Pipe, PVC.

In selecting pipe materials, the following shall be taken into consideration:

- 1) Maximum static pressure and water hammer impact which the pipeline is to be subjected to.
 - 2) Conditions of the road under which the pipeline is to be laid.
 - 3) Corrosiveness of the soil in which the pipeline is to be buried.
7. (Fire Hydrants) Standard spacing of fire hydrants shall be 150 m. Size of pipe on which the fire hydrant to be installed shall be 150 mm and above. In case of fire hydrant is considered indispensable due to the conditions of the locality, 100 mm pipe may be utilized for installation of the fire hydrant.

8. (Valves, Air Valves, and Drain Pipe) Valves shall be installed at the following points:

Transmission pipelines: strategic operating points at about 2 km intervals.

Distribution mains : all main crosses and branches and at about 300 m intervals.

Air valves shall be installed at the top of vertical curves of pipelines.

Drain pipes shall be installed at the bottom of vertical curves of pipelines, where draining from the pipeline is possible.

9. (Storage Capacity) The capacity of a distribution reservoir shall be equivalent to 8 hours quantity of maximum day demand including water for fire fighting and water for emergency.

The said capacity can be split into plural numbers of reservoir in accordance with the needs of the locality.

10. (Meters) All production of the water source facilities and distribution shall be metered. For this purpose, bulk meters shall be provided at appropriate and convenient places to measure.

House meters shall be installed at all service connections.

Appendix 7 Procedure of Projections of Population
and Water Demand ^{1/}

A. Population Projection

General

To estimate the study area population which is one of the basic factors of water requirement, the past census made by the National Census and Statistics Office (NCSO) is used as the most reliable demographic data.

The total study area population is projected on the basis of separate projections for the city core or poblacion and for the rural barangays within the study area. The method of past trend extrapolation is applied for population projection of such "micro-economic" areas of barangays in this study.

To determine future growth rates for each barangay the following factors are considered:

1. Existing and proposed land use plans. (residential, commercial, industrial, institutional and agricultural zones)
2. Physical limits (barriers) to the geographical development of the area.
3. Population density. (persons per ha)
4. Housing patterns.
5. Existing and proposed transportation and communication facilities. (road network, etc)
6. Possible migrations within the municipality and the region
7. Family planning program of the Government.

Remarks: ^{1/} In the course of the work of preparing the master plan for water supply of the four WDs in the three provincial areas (Ilocos Norte WD in Ilocos Norte Province, Legaspi City WD and Daraga WD in Albay Province, and Tagbilaran WD in Bohol Province), this procedure of projections of population and water demand is established as a general concept to be applied to the four WDs.

Total Municipal Population

In projecting the municipal population, the following steps are observed:

1. Using available past census data, a trend analysis on past growth rates and the factors which might have influenced them is performed. Past population trend of the municipality is shown in Table 1.2.2 thru Table 1.2.6. (See 2.2 Population, Part One: General)
2. Future growth rates up to the design year are projected based on the field conditions and future development as well as data obtained in step 1 above.
3. The population for each design year is obtained using the projected average annual growth rates in step 2 above. The population in each design year is tabulated as shown in Table 2.3.1. The past and future trends are graphically shown in Fig. 2.3.1. (See 3.1 Population Projection, Part Two: Master Plan)

Barangay Population

1. Using the same method outlined for municipal population projections, the population for each barangay covered by the municipality is projected.
2. Since the total annual population of all the barangays should equal to the total annual municipal population, barangay population is revised where applicable and necessary. Population projection for each barangay is shown in Table 2.3.2 thru Table 2.3.6. (See 3.1 Population Projection, Part Two: Master Plan)
3. Population density of each barangay is checked.

As an example of the high growth of population in the study area, the high series of NEDA-POPCOM projection is introduced herein, which is considered to be a useful data for a sensitivity analysis of the population projection. While the low growth of population in the study area is projected with an assumption that the average growth rates from one design year to another design year may differ by 10 to 20 per cent from the medium growth of projection made in this study. The high and low growth of populations are shown in Table 2.3.7 and Table 2.3.8. (See 3.1 Population Projection, Part Two: Master Plan)

Served Population

At present, the served area of the city/municipality is mostly concentrated on the poblacion or the central urban area, where the middle-high income groups are usually found.

A percentage of population served is estimated in each design year based on the present population served, data gathered in the field, cost and availability of the water from sources. The served population as well as the served area ^{1/} for Phase I (1987) is decided based on a concept that the purpose of this Phase project is to satisfy the present water requirement which has not been met in recent years due to deterioration of the water supply facilities, by rehabilitation, improvement and some additional works, within as short a period as possible. It is the goal of this study, however, to be able to extend improved water services (Level III system services to no less than 70 percent and 80 percent of the population in the served area by Phase II (1993) and the master plan period (2010) respectively.

Remarks: ^{1/} Served area for this study is discussed in 2.2 Served Area, Part Two: Master Plan.

B. Water Demand Projection

General

Future water demand is projected by category of water use and area of water demand. The categories adopted are 1) domestic, 2) commercial and industrial and 3) institutional water demands. Unaccounted-for-water is also estimated and totalled to the above demands. The water demand areas adopted for projection are poblacion or urban area and rural barangays. The urban area includes the neighboring barangays of the poblacion where applicable.

Historical consumption data are not available because the current supply does not cover all the consumers with service connections and no records of meter reading are obtained. Therefore, potential/theoretical demand for the study area is considered as for the present consumption.

The potential demand as an average per capita demand for the study area is estimated based on the similar WDs records ^{1/}of consumption and the classification of WDs stipulated in the Design Manual of LWUA. The result of classification of WDs for the present study is shown in Table A.7.3. The average per capita water demands for the urban and rural areas are estimated respectively and shown in Table A.7.4 and Table A.7.5.

Domestic Demand

The projected demands for domestic water are based on the average per capita consumption and the projected served population in the study area. As mentioned in the preceding paragraph, data on present average domestic unit consumption for the study area are not available, then the consumption records of different WDs are referred

Remarks: ^{1/} Ref. Table A.7.1 Per Capita Consumption in Existing Water District (1978) and Table A.7.2 Average Unit Consumption by WD classification in 1978.

so that present unit consumption in the similar city/municipality is to be applied for the potential unit consumption for the study area. The future unit consumption which will represent an average consumption in the urban area are projected based on the said potential consumption as shown below:

<u>City/Municipality</u>	<u>1978</u> (lpcd)	<u>1987</u> (lpcd)	<u>1993</u> (lpcd)	<u>2010</u> (lpcd)
Ilocos Norte				
Laoag	128	128	135	155
Pasuquin	100	105	115	140
Bacarra	100	105	115	140
Vintar	100	105	115	140
Paoay	100	105	115	140
Legaspi	135	135	148	175
Daraga	135	135	148	175
Tagbilaran	128	128	135	155

Domestic consumption projections for the rural area are projected using the same method for the urban area projections, however, only a single series unit domestic consumption is estimated to adopt for all the study areas. The domestic unit consumptions are projected as follows:

	<u>1980</u> (lpcd)	<u>1987</u> (lpcd)	<u>1993</u> (lpcd)	<u>2010</u> (lpcd)
All rural area	60	69	78	100

The potential unit consumption in 1980 is estimated based on the experiences in the rural water supply programs in the Southeast Asian countries. Future unit consumptions are projected on the basis that the unit consumptions will increase at a growth rate of 2.0% per annum in the period 1980-1993 and 1.5% per annum in the period 1993-2010, respectively.

Commercial and Industrial Demand

Reliable data on present commercial and industrial water consumption of the study area are not available. Therefore, the following assumptions are employed for the future demand projections. According to the experience in the Philippines, there is a relation between the level of commercial and industrial activities and the service area population. These ratios vary from a minimum level of 0.3 commercial and industrial connections per 100 inhabitants to a maximum level of 1.2 connections per 100 inhabitants.

To estimate future commercial and industrial demands in the study area the following connection densities and unit consumptions are assumed:

Connection Density Ratio

	<u>Group II</u>	<u>Group III</u>	<u>Group IV</u>
(a) 1980 Density Ratio	-	-	-
(b) Density Increase			
Coefficient for year			
1987	1.4	1.2	1.0
1993	1.6	1.4	1.0
2010	2.5	2.0	1.2

Group II : Legaspi and Daraga

Group III : Laoag and Tagbilaran

Group IV : Bacarra, Pasuquin, Vintar and Paoay

Unit Consumption per Connection

<u>Years</u>	<u>Unit Water Consumption (m³/day)</u>
1987	1.2
1993	1.5
2010	2.0

Based on the above assumptions, unit commercial and industrial consumptions as per capita consumptions for the future design years are obtained and shown below:

Commercial and Industrial Consumptions (lpcd)

<u>Years</u>	<u>Group II</u>	<u>Group III</u>	<u>Group IV</u>
1987	17 (13)	14 (11)	12 (11)
1993	24 (16)	21 (16)	14 (12)
2010	50 (29)	41 (26)	24 (17)

() Percentage to the per capita domestic consumption

Institutional Water Demand

Institutional water consumers include schools, churches, public administration buildings and hospitals. It can be assumed that all institutional establishments within the future service area will be connected. Based on this consideration and referring to the socio-economic data, one institutional connection per 2000 inhabitants is employed to be served in the study area. Unit consumption for the institutional connection will be as follows:

<u>Year</u>	<u>1987</u>	<u>1993</u>	<u>2010</u>
Unit Institutional consumption (m ³ /day)	4.0	6.0	8.0
Converted to per capita consumption (lpcd)	2.0	3.0	4.0

Unaccounted-for-Water

Unaccounted-for-water including wastage, leakage and water losses are estimated as follows. During the field investigation the unaccounted-for-water measurement in the study area was not able to undertake because the supply capacity had not fully met with the requirement and no water condition in the distribution network was chronically observed.

Based on the experience, the following values for unaccounted-for-water (percentage of the total water production) may be assumed for the future design years:

<u>Year</u>	<u>1987</u>	<u>1993</u>	<u>2010</u>
System with old and new pipelines in 1987	34	25	20
System with new pipelines in 1987	22	20	20

Total Water Demand

The projected unit consumption figures for domestic, commercial and industrial, institutional, and unaccounted-for-water have been presented in the preceding sections. The compiled projected unit consumption and supply requirements are listed in Table A.7.4 and Table A.7.5.

The average day demand and supply requirements for the study area are projected based on the above unit consumption and supply requirements and the projected served population. The consolidated projection of average day water demands for the study area are shown in 3.2 Water Demand, Part Two: Master Plan.

Table A.7.1 Per Capita Consumption in Existing Water District (1978)

Water District	Total Population (1978)	Served Population (1978)	Number of Service Connection	Average Consumer per Connection	Average Metered Use per Connection (m ³ /month)	Per Capita Consumption (lpcd)	Water District Group
1. Bacolod	222,740	47,410	4,375	10.8	46.8	144	I
2. Bayao	482,230	33,672	5,466	6.2	37.6	202	I
3. Zamboanga	261,980	37,846	9,818	3.9	50.0	427	II
4. Cebu	625,350	85,358	12,496	6.8	42.9	210	I
5. Lipa	105,940	9,066	1,273	7.1	30.1	141	II
6. Tarlac	158,340	5,615	942	6.0	26.7	148	II
7. Cabanatuan	113,810	21,327	2,848	7.5	42.2	188	II
8. Gapan	53,840	4,750	589	8.0	13.5	56	IV
9. Bislig	56,840	4,284	865	5.0	23.3	155	III
10. Urdaneta	64,880	3,203	441	7.3	25.1	115	III
11. Silay	104,550	6,142	984	6.2	39.8	214	III
12. Calamba	96,310	6,174	1,135	5.4	26.3	162	II
13. Cotabato	66,756	14,586	1,900	7.7	28.4	123	III
14. Roxas	71,049	8,240	1,028	8.0	32.8	134	III
15. Baybay	66,596	5,138	1,153	4.5	16.2	120	III
16. San Fernando	97,800	10,632	1,445	7.4	26.4	119	II
17. Olongapo	143,279	43,806	6,375	6.9	42.2	204	I
Average				6.7	32.4	168.4	

Legaspi

Table A.7.2 Average Unit Consumption by WD Classification in 1978

<u>WD Group</u> ^{1/}	<u>Accounted- for-water</u> ^{2/} (lpcd)	<u>Unaccounted- for-water</u> ^{3/} (lpcd)	<u>Total</u> (lpcd)
I	190	127	317
II	152	101	253
III	144	96	240
IV	112 ^{4/}	75	187

1/ Refer to Design Manual of LWUA

2/ Based on records of different WDS

3/ 40% of the total is applied

4/ No data but estimated

Table A.7.3 Classification of Water Districts According to Future Requirements

City/Municipality	1975 Urban Income	Urban Households with Refrigerators	Urban Households with Flush Toilets	1975 Business Index	1980 Cost of Water Supply	1980 Served Population	Total Points	Group
Ilocos Norte								
Laos	10	8	6	11	14	8	57	III
Pasquin	6	7	6	4	20	5	48	IV
Bacarra	8	7	6	4	17	5	47	IV
Vintar	6	6	5	4	14	5	40	IV
Paoay	6	6	5	2	11	5	35	V
Legaspi	10	8	6	16	20	9	69	II
Darage	6	8	6	16	20	8	64	II
Tabilاران	10	8	6	16	11	8	59	III

Note: The grouping of WDs, based on the range of total points under the 5 criteria, is as follows:

Group	Total Points
I	70 and above
II	60 - 69
III	50 - 59
IV	40 - 49
V	39 and below

Legaspi

Table A.7.4 Legazpi, Daraga (Group II)
Average Unit Consumption and Supply Requirements

<u>Category/Year</u>	<u>1978</u>	<u>1987</u>	<u>1993</u>	<u>2010</u>
Domestic, lpcd	135	135	148	175
Commercial/Industrial, lpcd	15	17	24	50
(% of domestic)	(11)	(13)	(16)	(29)
Institutional, lpcd	2	2	3	4
Accounted-for- water, lpcd	152 ^{1/}	154	175	229
Unaccounted-for- water, lpcd	101	79	58	57
(% of production)	(40)	(34)	(25)	(20)
Total unit demand requirement, lpcd	253 ^{2/}	233	233	286

^{1/}Based on records of different WDs.

^{2/}Estimated as potential/theoretical requirement.

Table A.7.5 Rural Barangays
Average Unit Consumption and Supply Requirement

<u>Category/Year</u>	<u>1980</u>	<u>1987</u>	<u>1993</u>	<u>2010</u>
Domestic, lpcd	60 ^{1/}	69	78	100
Institutional, lpcd	2	2	3	4
Accounted-for-water, lpcd	62	71	81	104
Unaccounted-for-water, lpcd	21	20	20	26
% of Production	(25)	(22)	(20)	(20)
Total unit demand requirement, lpcd	83	91	101	130

1/ Potential/theoretical requirement

Appendix 8 Basic Cost Data

This appendix 4 presents basic cost data which are applied to costs estimates of the present feasibility study. Basically the unit costs are taken from the Methodology Manual of LWUA, as far as applicable. However, unit costs not included in the Manual are taken from prevailing prices in the Philippines as of July 1981. Further, some of breakdown ratios presented in the Manual have been modified so as to fit the present case.

Table 1 shows the prevailing land prices in each location of the present projects. Table 2 Labor Costs and Table 3 Unit Prices for Civil Works are quoted from the Manual for reference. Table 4 shows percentages of Foreign and Local components of various work items which are used in the present feasibility study. These percentages are obtained adjusting the percentages of corresponding work items in the Manual.

Table 1 Land Prices of Study Area

<u>Location</u>	<u>Prices</u> (pesos/sq m)
Mountainous area	20
Unirrigated rice field	25 - 30
Irrigated rice field	35
Poblacion	100 - 200

Table 2 Labor Costs

<u>Items</u>	<u>Unit</u>	<u>Rates</u> (Pesos)
Unskilled*	per day	20 - 25
Skilled **	do	40 - 45

* Mason, Pipe fitter, Pipe layer, Excavator, etc.

** Carpenter, Tinsmith, Supervisor of labors, etc.

Table 3 Unit Prices for Civil Works

<u>Items</u>	<u>Unit</u>	<u>Rate</u> (Pesos)
Earth Work		
Common excavation	cu m	40
Hardpan excavation	do	65
Trench excavation	do	55
Rock excavation	do	95
Backfill dumped	do	15
Backfill compacted	do	70
Disposal material	do	12
Gravel blanket	do	80
Concrete Work		
Concrete 4,000 psi	cu m	880
Concrete 3,000 psi	do	740
Formwork vertical	sq m	60
Formwork horizontal	do	100
Reinforcement bars	kg	10

Table 4 Components of Breakdown Used in Cost Estimates

<u>Item</u>	<u>F/C</u>	<u>L/C</u>
Deep well	29%	71%
Deep well pumping station	56	44
Transmission/distribution pumping station	60	40
Transmission/distribution pipeline	67	33
Valve	73	27
Service connection	77	23
Fire hydrant	66	34
Reservoir, chamber, etc.	25	75
Bulk meter	80	20
Chlorinator	90	10
Vehicle	50	50

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