Caraga Water Supply and Sanitation Databook and Regional Roadmap

Volume 2: Philippine Water Supply and Sanitation Master Plan



NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY



160°0.000'E

20°0,000'N

80<u>-0-</u>00/S

S

Table of Contents

	Introduction	
	Land Classification	6
	Economy	6
	Labor and Employment	6
	Family Income and Expenditure	9
	Demography a to the second sec	9
	Climate (7)	10
	Disaster Risk	10
	Climate Change and Hydrological Hazards	10
	WSS Sector Status	
	Access to Safe Water	15
	Drinking Water	15
	Access to Sanitation	17
	Water Resources	
	Surface Water	19
	Agusan River Basin	19
	Groundwater	21
	Water Use	21
	Water Availability, Water Stress and Water Scarcity	21
	Demand	
	Population Projection	22
	Water Supply and Demand	22
	Water Demand vs. Water Resources Potential	22
	WSS Infrastructure	
	Water Service Providers	25
	Water Districts	25
	LGU-Led Water Utilities	25
	BWSA	25
	RWSA	25
	Bulk Water Services	25
\sim	Sanitation	
	Open Defecation	26
	Wastewater and Domestic Biological Oxygen Demand	26
	Water Quality	31
	Waterborne diseases	31
	WSS Sector Gaps	
	Issues, Constraints and Challenges	32
	Regional Vision	34
	Strategic Framework	34
	Access Targets for Water and Sanitation	36
	Strategic Interventions	38
	Physical Interventions	39
	Nonphysical interventions	39
	Addressing the Gaps	
	Water Supply Investment Requirements	41

Physical Investments Nonphysical Investments Sanitation Investment Requirement Physical Investments Basic Sanitation Program Septage Management Program Sewerage Program Non-physical Investments Proposed Projects and Programs Identified Priority Projects (2019 - 2020) Appendix

Appendix A: Provincial and HUC Profiles

160°0.000'E

30°0.000'W

Page **List of Tables** 1 Population per Province, 2015 9 Table 2 Urban and Rural Population per Province, 20155 9 Table Table 3 Geological and Climatological Hazards 10 Seasonal Projections Under a Medium-Range Emission Scenario 10 Table 4 Table 5 Frequency of Extreme Events in 2020 and 2050 Under a Medium-Range Emission Scenario 10 Table National and Regional Access to Water Supply 15 6 7 Access to Water Supply per Province/HUC 15 Table 17 Table 8 National and Regional Access to Sanitation Table 9 Access to Sanitation Facilities per Province/HUC 17 10 Aquifer Classes Based on MGB Aquifer Types 21 Table 11 Water Availability per Province 21 Table 25 12 Water Service Providers per Province Table 13 Classification of the Tributaries of Agusan River Table 31 Table 14 Main Industries and Their Impacts on Water Quality of Agusan River 31 15 Hindering and Facilitating Factors 33 Table 16 Strategies in Achieving Increased Access to Potable Water Table 34 17 Proposed Strategic Interventions for Water Supply 38 Table 18 Proposed Strategic Interventions for Sanitation 38 Table Table 19 Capital Investments Required to Meet Water Supply Targets 39 Table 20 Institutional and Regulatory Reforms Required to Achieve Water Supply and Sanitation Goals 39 Table 21 Indirect Costs Employed 41 22 Total Investment Costs for Water Supply Sector 41 Table 23 Total Investment Costs for Sanitation Sector Table 43 **List of Figures** Page Figure 1 GRDP Contributions per Sector, 2016 6 2 Labor Force Participation and Employment Rates per Province, 2017 and 2018 6 Figure 9 Figure 3 Distribution of Family Expenditure, 2015 15 Figure 4 Main Sources of Water Supply, 2015 5 Provincial Access to Safe Water Figure 15 6 Percentage of Households with Access to Sanitation Facilities 17 Figure 7 Water Resources Potential and Annual Rainfall 19 Figure Figure 8 Water Use, 2017 21 9 Water Availability Map, 2015 Figure 21

Figure	11 Project	ed Water Demand	22
Figure	12 Biologi	cal Oxygen Demand, 2015	26
Figure	13 Catego	ries of Wastewater	26
Figure	14 Wastev	vater Produced, 2015	26
Figure	15 Waterle	ess Municipalities	31
Figure	16 Caraga	WSS Strategic Framework	35
Figure	17 Targete	d Households with Access to Safe Water	36
Figure	18 Targete	ed Households with Access to Sanitation	36
Figure	19 Distribu	tion of Investment Requirement per Province	39



10 Projected Population per Province

Figure

22

Acronyms

8

AIP AM Assistance to Municipalities AMWS ARMM BCWD **Butuan City Water District** BOD **Biological Oxygen Demand BWSA** CBO CDP CENRO CHO City Health Office CLTS DENR DILG DJF DPWH DOH Department of Health DTI FA **Financial Assistance** FHSIS FIES GRDP Household ΗH HUC **Highly Urbanized City** IP **Indigenous People** JICA JJA June, July and August JMP Joint Monitoring Program LCE Local Chief Executive LFPR LWUA LGU Local Government Unit MAM March, April and May MDG MSME M&E Monitoring and Evaluation NCR National Capital Region NDHS NEDA NGO NRW Nonrevenue Water NSSMP **NWRB** PAGASA PDP Philippine National Standards for Drinking Water PNS PPP Public-Private Partnership PSA **Philippine Statistics Authority** Philippine Water Supply and Sanitation Master Plan PWSSMP **River Basin Control Office** RBCO RDC **Regional Development Council Regional Project Monitoring Evaluation System** RPME Rural Waterworks and Sanitation Association RWSA Sustainable Development Goals SDG **SMERA** Small and Medium Enterprise Roving Academy September, October and November SON SSF **Shared Service Facilities** STP Septage Treatment Plant TC **Tropical Cyclone**

Annual Investment Plan Agusan Marsh Wildlife Sanctuary Autonomous Region in Muslim Mindanao Barangay Water and Sanitation Association **Community-Based Organization Comprehensive Development Plan** City Environment and Natural Resources Office Community-Led Total Sanitation Department of Environment and Natural Resources Department of the Interior and Local Government December, January and February Department of Public Works and Highways Department of Trade and Industry Field Health Service Information System Family Income and Expenditure Survey **Gross Regional Domestic Product** Japan International Cooperation Agency Labor Force Participation Rate Local Water Utilities Administration Millennium Development Goals Micro, Small, and Medium Enterprise National Demographic and Health Survey National Economic and Development Authority Nongovernment Organization National Sewerage and Septage Management System National Water Resources Board Philippine Atmospheric, Geophysical and Astronomical Services Administration Philippine Development Plan



30°0.000'W

+

UN	United Nations
UNICEF	United Nations Children's Fund
WD	Water District
WFR	Watershed Forest Reserve
WHO	World Health Organization
WRR	Water Resources Region
WSP	Water Service Provider
WSS	Water Supply and Sanitation
ZOD	Zero Open Defecation

Units

%	percent
°C	degree Celsius
ha	hectare
m	meter
m ²	square meter
m ³	cubic meter
mm	millimeter
km ²	square kilometer
lpcd	liters per capita per day
MCM	million cubic meters
PhP	Philippine peso

+



/000'0-0



+



40°0.000'W

120°0.000'W

Region XIII - Caraga

Caraga Region

Introduction

The Caraga Region, situated in the northeast section of Mindanao.

It is bounded on the north by the Bohol Sea, on the south by Davao del Norte, Compostela Valley, and Davao Oriental, on the west by Bukidnon and Misamis Oriental, and on the east by the Philippine Sea and the Pacific Ocean.

Designated as Region XIII, the Caraga Region (or Caraga Administrative Region) comprises five provinces: Agusan del Norte, Agusan del Sur, Dinagat Islands, Surigao del Norte, and Surigao del Sur. The region's name derives from the "Kalagan" people who are native to the Davao provinces.

Butuan City, a highly urbanized city (HUC) in Agusan del Norte, is the region's commercial, industrial, and administrative center.

Caraga is endowed with rich natural resources and large tracts of land available for agricultural and real estate development.

The region is noted for its wood-based economy, its extensive water resources and its rich mineral deposits, such as iron, gold, silver, nickel, chromite, manganese and copper. Rice, bananas, coconuts, calamansi, and rubber are among its major crops.

It has excellent tourism potential because of its unspoiled and beautiful beaches, abundant marine resources, ancient and historical landmarks, hot and cold springs, evergreen forests, and balmy weather.

Land Classification

The region has a total land area of 19,138 square kilometers (km²) representing around 6% of the country's total land area and 18% of that of Mindanao. Approximately 70% of the land area is forestland, and 30% is alienable and disposable land.

Agricultural land covers around 30%, timberland 52%, and land used for mineral production 9%. Approximately 71% of its forestland is used for timber production.





Agusan del Sur posted the most significant contribution to the region's output at 30%, while Dinagat Islands registered the lowest output at 4%.

Agusan del Norte led the provinces with a 37.98% growth increase in 2015. Surigao del Sur followed at 22.85%. Thanks to government aid (i.e., Department of Trade and Industry's [DTI] Small and Medium Enterprise Roving Academy [SMERA] and Shared Service Facilities [SSF]), the growth of micro, small, and medium enterprises (MSMEs) has contributed to the rise in domestic sales.¹

Labor and Employment

The current total labor force participation rate (LFPR) in the region was estimated at 67.1% of the total regional population — equivalent to a population of nearly 1.9 million, as of January 2018. This meant an increase of 4.8% from the October 2017 LFPR. Agusan del Sur had the highest LFPR (69.4%) among the five provinces.³

The employment rate was considerably high at 96% (from 96.3% in 2017). Among the provinces, Agusan del Sur registered the highest employment rate at 96.6%.

The quality of employment, however, has not been given the attention it deserves: the underemployment rate is estimated at 24.7% (from 22.7% in 2016) primarily because of seasonal job opportunities and a mismatch of occupations and skills.

20°0.000'

,000'0-0

6

 ¹ National Economic and Development Authority, Region XIII, Caraga Regional Economic Situationer, 2015
 ² Philippine Statistics Authority, CountryStat Philippines, 2016
 ³ Philippine Statistics Authority, Labor Force Survey, 2017 and 2018

Economy

The service sector made up the lion's share of the region's Gross Regional Domestic Product (GRDP), followed by the industry sector, and the agriculture, fishery, and forestry sector, as of 2016.

The region's domestic sales were estimated at PhP708 million in 2015.



Figure 2: Labor Force Participation and Employment Rates per Province

40°0.000'W









Figure 3: Distribution of Family Expenditure, 2015⁴

Family Income and Expenditure

Caraga Region has approximately 579,000 households (HHs), with an estimated annual average income of PhP198,000 and an annual average expenditure of PhP159,000.

Regarding income class, the total average expenditure for the PhP40,000-59,999 category is greater than its average income, while households in other categories earn incomes greater than expenditures. With family size as an indicator, a family of five has the largest incomeexpenditure difference, while a single-person household has the least income-expenditure difference — indicating that a family of five has more savings as compared to other family sizes.

With respect to the disbursement patterns of the families in the region and across income levels, the Family Income and Expenditure Survey (FIES) conducted in 2015 revealed that food expenditures were the highest among the major expenditure groups at 45.3%. Housing expenses followed at 9.6%, and expenses for water, electricity, gas and other fuels at 7.3%. Figure 3 graphs the expenditure distribution showing that most families spend more for their basic needs.

Table 1: Population per Province/HUC, 2015

Region/Province/ City	Population	Land Area (km²)	Population Density (person/ km ²)
Caraga Region	2,596,709	22,296	116
Agusan Del Norte (excluding Butuan City)	354,503	3,547	100
Agusan Del Sur	700,653	9,990	70
Surigao Del Norte	485,088	1,973	246

Demography

The region had a population of 2,596,709, accounting for 2.6% of the Philippine population in 2015. Agusan del Sur had the largest population among the five provinces, and Dinagat Islands had the smallest population. The region's population growth from 2000 to 2015 was recorded at 1.42%, which was lower than the national average of 1.84%.

The population density of the region averaged 116 persons per square kilometer in 2015. A large percentage of its population is concentrated in the cities as well as along the coastal areas (as shown on the map on the left).

The region is predominantly (73%) rural. Household size in the region averages 4.5 persons. (see Table 2)

Table 2: Urban and Rural Population per Province, 2015⁵

Region/Province	Urban Population	Rural Population		
Caraga Region	27%	73%		
Agusan Del Norte (excluding Butuan City)	15%	85%		
Agusan Del Sur	28%	72%		
Surigao Del Norte	22%	78%		
Surigao Del Sur	25%	75%		
Dinagat Islands	6%	94%		

58%

Surigao Del Sur	592,250	4,933	120
Dinagat Islands	127,152	1,036	123
Butuan City	337,063	817	412

Butuan City	/
-------------	---

42%

 ⁴ Philippine Statistics Authority, Family Income and Expenditure Survey, 2015
 ⁵ Philippine Statistics Authority, Philippine Standard Geographic Code, 2015

9

80°0.000'W

160°0.000'W

Climate

Caraga has two types of climate — Type II and IV. There are no definite dry and wet seasons and rainfall is evenly distributed throughout the year.

The region recorded an average annual temperature of 27.24°C from 1971 to 2000 based on the PAGASA's observed seasonal temperature data. The highest average temperature was registered in June, July, and August with 27.28°C. The lowest average temperature was recorded in December, January, and February.

Disaster Risk

The region is prone to geological and climatological hazards. It is one of the areas in the country most vulnerable to climate-related hazards. Four of its five provinces are included in the country's top 20 provinces most vulnerable to climate change. These provinces are Agusan del Sur, Surigao del Norte, Surigao del Sur, and Dinagat Islands. Although not included in the top 20, Agusan Del Norte is comparatively "less vulnerable" to these hazards.

Table 3: Geological and Climatological Hazards

Category	Specific Hazards					
Geological	earthquake, liquefaction, earthquake- induced landslide and tsunami					
Climatological	tropical cyclones (TCs), flooding, drought, rain-induced landslide, sea level rise, storm surges					

The main earthquake generators in the region are the Philippine Fault Zone, which traverses Luzon, Visayas, and Mindanao, and the Philippine Trench situated approximately 100 kilometers from the mainland of the eastern seaboard towards the Pacific Ocean.⁶

Climate Change and Hydrological Hazards

The Philippines is at great risk of climate-related hazards, such as TCs, floods, droughts and sea level rise. The effects of observed changes in extreme events and severe climate anomalies include increased occurrence of extreme rains causing: (a) floods and landslides; (b) longer and more intense droughts which cause massive crop failures, water shortages and forest fires; and (c) increased occurrence of TCs.

Global climate models, which were used to run two possible scenarios (A1B and A2), were downscaled to calculate projected Philippine rainfall. Studies show a general increase in rainfall for 2020, 2050 and beyond. The models, however, show higher variability in rainfall with increased peak rainfall during the wet season and longer dry conditions during the dry season. (Rainfall variability means changes in water supply dynamics spatially and year-to-year.)

Water supply is highly vulnerable to changes in river flows and the rate of replenishment of groundwater resources. Lower river flows will result in water shortages. More intense rainfall events may not necessarily mean more groundwater recharge compared to rain that is more evenly spread throughout the year. Lower than average rainfall or longer pronounced dry days may affect soil porosity and vegetation, which could lead to reduced soil infiltration rates. This means less groundwater recharge. Given this scenario, more water stress will likely be experienced by 2020 and 2050.

The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events (temperatures higher than 35°C, days when rainfall is more than 300 mm, and rainy days that outnumber dry days) in Region XIII based on the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) downscaled climate projections are shown in Tables 4 and 5. Four seasons are provided: December, January and February (DJF); March, April and May (MAM); June, July and August (JJA); and September, October and November (SON). The projections were added to the observed values in the past 30-year baseline (1971-2000).

Table 4: Seasonal Projections Under a Medium-Range Emission Scenario

Table 4. Seasonal Projections		Medium	-ixange i	_111155101	I Ocenia							
Seasonal Temperature Increase	C	bserved) (1971-	Baseline 2000)	Э		Change in 2020 Change in 2020 (2006-2035) (2036-2065)				in 2050 2065)		
(11 0)	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Agusan Del Norte	26.2	27.6	27.8	27.4	1.0	1.2	1.3	1.1	1.9	2.3	2.5	2.2
Agusan Del Sur	25.9	27.1	27.2	26.9	0.9	1.1	1.1	1.1	1.9	2.2	2.4	2.1
Su <mark>rigao Del N</mark> orte	26.3	27.6	28.2	27.7	0.9	1.1	1.3	1.1	1.7	2.2	2.6	2.0
Suri <mark>gao Del</mark> Sur	26.4	27.4	27.9	27.4	0.9	1.0	1.1	1.1	1.7	2.0	2.3	2.0
Seasonal Rainfall Change	С	bserved) (1971-	Baseline 2000)	9		Change (2006-	in 2020 2035)			Change (2036-	in 2050 2065)	2050 065)
(111 70)	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Agusan Del Norte	875.7	<mark>441</mark> .9	460.0	628.9	-0.8	-24.4	-7.9	5.0	13.8	-36.5	-8.3	0.6
Agusan Del Sur	963.3	<u>586.4</u>	593.4	694.8	4.0	-13.1	0.0	-6.0	-2.9	-26.1	-3.4	-5.9
Surigao Del Norte	1412.0	<u>639.0</u>	448.0	837.3	2.1	-11.7	-3.3	4.2	3.2	-33.2	-8.7	9.6
Surigao Del Sur	1394.0	746.9	534.6	842.5	5.8	-11.7	-2.2	-4.8	4.0	-29.1	-7.9	-3.7

>	\leq	
5	2	
C	\supset	
ς,		
C)	
0		

⁶ National Economic and Development Authority, Caraga, Regional Development Plan, 2017-2022

10

20°	ſ	n	n	n	1	Λ	
70	U	U	U	U		1	ļ

Table 5: Frequency of Extreme Events in 2020 and 2050 Under a Medium-Range Emission Scenario

Province	Station	No. of Days w/ T_{max} > 35°C			_{ix} > 35 [°] C No. of Dry Days			N Rai	o. of Days v nfall > 300	w/ mm
		OBS	2020	2050	OBS	2020	2050	OBS	2020	2050
Agusan Del Norte	Butuan	324	2855	4767	4997	6300	6804	0	10	10
Agusan Del Sur	Surigao	86	225	1333	5286	6054	5975	1	2	14
Surigao Del Sur	Hinatuan	157	1635	1635	5667	2715	3080	1	1	6

2

WGS 1984 - UTM Zone 51 N

Legend

S <

Type II - no dry season with a very pronounced maximum rain period from December to February. There is not a single dry month. Minimum monthly rainfall occurs during the period from March to May.
 Type IV - rainfall is more or less evenly distributed throughout the year. This type resembles Type 2 since it has no dry season.

+

WSS Sector Status

Access to Safe Water

Approximately 85% of Caraga's population had access to safe water sources in 2015.⁷

This figure translates to approximately 490,000 HHs. About 43.1% of the population has Level III service connection at home while 16.8% has Level II service which the households share with the community. More than 25% of the population has access to Level I service.

Safe sources of water under this category include tubed and/or piped deep/shallow wells (which users themselves own or share with the community), and protected springs, rivers, streams, etc.

The region's access to safe water is on a par with the national average of about 88%, with a discrepancy of only about 3%. In terms of access per level of service, Caraga's figures do not differ significantly from the national percentages with variances not greater than 10%. Level III access, in particular, is higher at 43.1% as compared to the national percentage of 4.1%.

Table 6: National and Regional Access to Water Supply⁸

Level of Service	National	Caraga
Level III	44.1%	43.1%
Level II	11.2%	16.8%
Level I (Safe Sources)	32.4%	25.1%
Subtotal (Safe Sources)	87.7%	85.0%
Level I (Unsafe Sources)	12.3%	15.0%
Total	100.0%	100.0%

Figure 4 shows the percentage distribution of the region's various water sources.

Table 7 shows safe water access in 2015 at the provincial level.

Table 7: Access to Water Supply per Province/HUC⁹

Region/Province/City	Access to Safe Water Supply
Caraga Region	91.7%
Agusan Del Norte	100.0%
Agusan Del Sur	78.0%
Surigao Del Norte	100.0%
Surigao Del Sur	90.0%
Dinagat Islands	99.0%
Butuan City	100.0%

Figure 5: Provincial Access to Safe Water

Drinking Water

In terms of access to safe drinking water, the Philippine Statistics Authority (PSA) has released data up to the municipal level based on the latest 2015 Census. The classification of sources for drinking water is the same as that for sources of safe water with the addition of bottled water.

Figure 4: Main Sources of Water Supply, 2015

As of 2015, 88% of the region's population drank water from sources considered "improved" and "safe". Approximately 21% of the regional population drinks bottled water.

Comparatively, Agusan del Sur has lower access to safe drinking water — 41%-61%. This can be attributed to its low population density (i.e., 70 persons/km²).

The map on the left shows the extent of access to safe drinking water at the municipal level.

 ⁷ Philippine Statistics Authority, Family Income and Expenditure Survey, 2015
 ⁸ Ibid.

⁹ Based on Caraga provinces' firsthand data on access to safe water, as gathered during the regional planning and consultation workshop

15

80°0.000'W

160°0.000′W

20-0-00/N

80<u>°0,00</u>0'S

0<u>°0°00</u>0

160°0.000'E

16

Access to Sanitation

Caraga Regional Planning and Consu

80°0.000'E

Veruela

Talacogon

San Luis

La Paz

+

Tagbina

Trento

Santa Josefa

slig City

80°0.000'W

160°0.000'W

Access to Sanitation

The continued growth of the region has, as a matter of course, contributed to the increase in demand for sanitation services.

Approximately 77% of the region's population has access to improved sanitation.

The 2015 FIES has reported that Region XIII was slightly above the national average with regard to improved sanitation coverage. The region slightly trails behind in basic sanitation and is almost on a par in regard to open defecation. (The open defecation rate is a proxy indicator for the lack of access to toilet facilities.)

Table 8: National and Regional Access to Sanitation¹⁰

Sanitation Coverage	National	Caraga
Improved Sanitation	73.77%	77%
Basic Sanitation	19.96%	16.69%
Unimproved Sanitation	2.04%	1.68%
Open Defecation	4.23%	4.63%
Total	100.0%	100.0%

Butuan City, the only HUC in the region, registers the highest access to basic sanitation at 90.53% and represents 12.98% of the region's total population. The provinces with the highest population base in the region, Agusan del Sur and Surigao del Sur, have the second highest access to basic sanitation at 84.99% and 82.23%, respectively.

Table 9: Access to Sanitation Facilities per Province/HUC¹¹

Region/Province/ City	HHs with Sanitary Toilets (2015)	HHs with Complete Basic Sanitation Facilities (2015)
Caraga Region	85.55%	58.76%
Agusan del Norte	88.31%	78.22%
Agusan del Sur	84.99%	48.79%
Surigao del Norte	83.70%	58.07%
Surigao del Sur	82.23%	31.38%
Dinagat Islands	84.64%	55.93%
Butuan City	90.53%	89.72%

The minor discrepancy between Tables 8 and 9 regarding totals and averages highlights the difficulty of reconciling the definition of sanitation coverage under the Millenium Development Goals (MDG) with a more stratified and specific definition under the Sustainable Development Goals (SDG). Table 8 reflects the specifics per the SDG's definition. Table 9, on the other hand, reflects the rates of access as defined under the MDG, wherein the percentage of households with complete basic sanitation facilities is a subset of those with sanitary toilets.

Categorization of the facilities as per SDG definitions is

Figure 6: Percentage of Households with Access to Sanitation Facilities

Figure 6 shows the percentage of households per type of sanitation facilities. It represents the initial stages of the sanitation ladder in the region.

While one of the main objectives of the Philippine Development Plan (PDP) is to achieve universal access to sustainable sanitation by 2030, SDG 6.2 highlights the need to broaden the definition of sanitation access, that is, to include safely managed and improved sanitation through the treatment of wastewater or fecal sludge on-site or off-site.

Data on access to sanitation at the provincial level in Caraga were gathered during the regional consultation and planning workshop. The map on the left shows the extent of access to sanitation of the provinces in the region.

On the other hand, there are no septage treatment plants (STPs) in the region.

as follows:

Improved Sanitation	 Water-sealed sewer septic tank (exclusive use)
Basic Sanitation	 Water-sealed sewer septic tank (shared) Water-sealed other depository (exclusive use) Water-sealed other depository (shared) Closed Pit
Unimproved Sanitatio	n • Open Pit
Open Defecation	Other MeansNone
	+

 ¹⁰ Philippine Statistics Authority, Family Income and Expenditure Survey, 2015
 ¹¹ Department of Health, FHSIS Annual Report CY 2015 (caraga.doh.gov.ph)

0°0.000′

Tagoloan River Basin

ver Basino

160°0.000'E

18

Caraga Rivers and Tributaries

DENR, NWRB, NAMRIA

Tagum-Libuganon River Basin

80°0.000'E

Agusan River Basin

ーオト

Water Resources

Caraga has the most water resource potential among all administrative regions.

The region's water resources potential is estimated at 18,214 million cubic meters (MCM)/year, accounting for 12.5% of the country's total.

The water resources potential of an area is divided into groundwater and surface water. Groundwater is estimated at 1,509 MCM/year while surface water is estimated at 16,705 MCM/year. Annual rainfall averages 2,846 mm/year.

These figures are based on the estimation of the potential of the country's water resources regions (WRR) (see National Databook). The WRRs do not necessarily coincide with the boundaries of the administrative regions. These hydrological boundaries are defined by their physiographic features and homogeneity in climate.

Caraga straddles two WRRs. Agusan del Norte, Agusan del Sur, Surigao del Norte, and Dinagat Islands are part of WRR 10. Surigao del Sur is part of WRR 11 which it shares with the provinces of Region XI (Davao Region).

Surface Water

Caraga is endowed with abundant water resources, among them, bodies of freshwater. The region is home to the Agusan River Basin, one of the 18 major river basins in the country.

Agusan River Basin

ear)

The Agusan River Basin (ARB) is the third largest river basin in the Philippines with a drainage area of 11,936 km². It is located in the northeastern part of Mindanao. It flows mainly through three provinces and one city: Compostela Valley in Region XI, and Agusan del Sur, Agusan del Norte, and Butuan City in Region XIII.

The 350-km Agusan River is reported to originate from the confluence area of Lanipao Creek of Barangay Araibo and Tabon Creek from Barangay Las Arenas, both in Pantukan, Compostela Valley. It traverses northward through five municipalities in Compostela Valley, nine municipalities in Agusan del Sur (including the Agusan Marsh), two municipalities in Agusan del Norte, and Butuan City, before draining into the Butuan Bay. The Agusan River is fed by 15 major tributaries: Adgaon, Bugabos, Gibong, Haoan/Ihaoan, Kasilan, Kayonan/ Umayam, Libang, Logom-Baobo, Manat, Maosam, Ojot, Simulao, Solibao, Taguibo and Wawa- Andanon.

There are five protected areas in the ARB: (1) the Agusan Marsh Wildlife Sanctuary, (2) Taguibo River Watershed Forest Reserve, (3) Andanan Watershed Forest Reserve, (4) Mainit Hot Spring Protected Landscape, Mainit Hot Spring Buffer Zone (National Park), and (5) Cabadbaran Watershed Reserve.

The Agusan Marsh Wildlife Sanctuary (AMWS) is one of the country's ecologically significant wetland ecosystems covering about 40,940 hectares. The AMWS areas consist of an extensive floodplain dissected by numerous watercourses, with 59 small shallow lakes and ponds. It acts as the catch basin of Agusan-Davao plain of eastern Mindanao.

The sanctuary is a very important source of freshwater as it stores about 15% of the country's freshwater resource in the form of a swamp forest.

20°0.000'N

Figure 7: Water Resources Potential and Annual Rainfall¹²

000'0-0

¹²JICA Master Plan on Water Resources Management in the Philippines, 1998; NWRB; PAGASA Rainfall Data; FAO

19

80°0.000'W

160°0.000′W

160°0.000'E

0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

20°0.000′N

10

Legend Extensive and Highly Productive Aquifers Fairly Extensive and Productive Aquifers Fairly Extensive and Productive, Aquifers with High Potential Recharge Fairly to Less Extensive and Productive Aquifers with Low to Moderate, Potential Recharge Local and Less Productive Aquifers Rocks with Limited Potential, Low to Moderate Permeability Rocks with Limited Potential, Low to Moderated Permeability Rocks without Any Known Significant, Groundwater Obtainable through Drilled Wells

Lake

80°0.000'S

R

Mainit Tubod

Mainit Lake

Magalla

AGUSAN DEL NORTE

Las Nieves

Nasipi

Buenavista

Mainit L

San Franci

Q

Libjo

DINAGAT ISLAND

SURIGAO DEL NORTE

Clave

2mg

Cantilar

Madrid

Carmer

Lanuza

San Miguel

Tandag City

Cagwait

SURIGAO DEL SUR

San Agusti

Marihatag

Carrasca

Alegria Gigaquit

Jabonga

Butuan City

Esperanza

Kitcharad

Santiag

Cabadbaran City

Bayugan City

+

+

Table 10: Aquifer Classes Based on MGB Aquifer Types

Aquifer Class	MGB Aquifer Type	Estimated Yields (boreholes unless stated)
Major Aquifer	Intergranular: extensive and highly	Mostly 50-100 lps
(Hignly permeable)	productive Fractured: fairly extensive and productive (aquifers	3-50 lps, spring yields up to 1000 lps
	with high potential recharge)	
Minor Aquifer	Intergranular: fairly extensive and productive	About 20 lps
(Variably permeable)	Intergranular: local and less productive	Mostly 2-20 lps
	Fractured: less extensive and productive	Well yields up to 3 lps
Non-aquifer	Rocks with limited groundwater potential	Yields mostly less than 1 lps
(Negligibly permeable)	Rocks without any significant known groundwater	Yields mostly less than 1 lps

Groundwater

Groundwater conditions are controlled by geology, ______ topography, and the structure of the groundwater basin. The structure of the groundwater basin consists of distribution and hydrogeological conditions such as the aquifer structure and aquicludes, the physical characteristics of the formations as per transmissibility and storage coefficient and chemical characteristics of groundwater. These factors need to be defined in relation to the possible development depth and overall development potential.

The extent of groundwater availability in any given area also depends on its surface area and the amount of precipitation it receives. Furthermore, it is tied to groundwater storage based on the type and class of aquifer present in a study area (see Table 10).

Apart from some parts of Surigao del Sur and Agusan del Sur that are underlain by the major aquifer class, mainland Caraga is predominantly underlain by the minor aquifer class (specifically the local and less productive kind). Its northern part (along with the region's island provinces) is underlain by non-aquifer areas that have limited groundwater potential.

Water Use

Water use in the region was estimated at 6,476 MCM annually based on awarded water permits as of 2017. Approximately 40% (2,617 MCM) is allocated for power generation and categorized under nonconsumptive use. The remaining volume (3,859 MCM) is allocated for consumptive use (see Figure 8).

The irrigation sector consumes the largest volume of water among all sectors with an 84% allocation. The industrial sector consumes 14% while the domestic sector consumes only 3%.

Water Availability, Water Stress, and Water Scarcity

Hydrologists typically assess scarcity by looking at the population-water equation. An area is experiencing water stress when annual water supplies drop below 1,700 m³ per person. When annual water supplies drop below 1,000 m³ per person, the population faces water scarcity, and below 500 m³ 'absolute scarcity.''' (UN Water, n.d.)¹⁴

Water availability per capita was computed by comparing the region and provinces' potential against the 2015 population (as shown in Table 11).

Table 11: Water Availability per Province

Region/Province	Water Availability (m ³ /capita/year)
Agusan del Norte	4,853
Agusan del Sur	13,492
Surigao del Norte	3,849
Surigao del Sur	4,317
Dinagat Islands	7,715
Caraga Region	7,014

Caraga's per capita water availability was above the threshold — around 7,000 m^3 /year.

Figure 9: Water Availability Map, 2015

 ¹³ National Water Resources Board. List of Water Permit Grantees, 2017
 ¹⁴ Managing Water Report under Uncertainty and Risk, UN World Water Development Report 4 (Volume 1)

21

80°0.000'W

Demand

Population Projection

Population projection is important in estimating the future water and sanitation demand of a study area. It is a study of a recorded pattern of past population growth to establish future trends.

Employing PSA's 2010-based population projections which were adjusted to conform with the actual 2015 population, the region's population is projected to reach 3,680,471 by 2045.

Water Supply and Demand

Water demand projection is fundamental to water supply feasibility studies and preliminary engineering design. It is also an important tool in the preparation of master plans, considering the future needs of a growing population. Water demand projections are developed based on the estimated projected population.

In general, the total water demand is equal to the sum of the domestic, commercial, industrial, institutional, and unaccounted-for water. Computation for water demand at the household level, in particular, is primarily based on the degree of urbanization of a barangay.

In projecting water demand, the units of consumption used are 120 liters per capita per day (lpcd) for urban populations, and 60 lpcd for rural populations. In the NCR and other HUCs, 150 lpcd and 80 lpcd are used for urban and rural populations, respectively.

By 2022, 2030, and 2040, the total water demand of the region would have reached 123.4 MCM/year, 140.5 MCM/year, and 161.8 MCM/year, respectively.

Water Demand vs. Water Resources Potential

The water demand of the industrial, business and domestic sectors in Caraga is expected to significantly increase in the near future. The efficient use and management of available water resources, therefore, must be ensured to promote universal access to stable and steady water supply.

Comparing the projected water demand (161.8 MCM/ year) to the water resources potential of the region (18,214 MCM/year), it is observed that the availability of water far exceeds the projected water demand of the region up to 2045.

It must be noted, however, that the projected water demand of the region does not include that of its agricultural sector, which consumes the largest volume of water among all industry sectors. What appears to be abundant may be less once the agriculture sector uses its "share". It is estimated that agriculture takes up about 75% to 80% of the total consumptive use of water in the country.

Though there is no foreseeable water shortage in the region in the coming years, it is necessary to efficiently manage and use its water resources to control possible demand shifts.

To fully make use of its groundwater and surface water potential, however, the issue regarding mining activities in the region has to be immediately addressed.

Figure 10: Projected Population

Figure 11: Projected Water Demand

22

0°0.000′

160°0.000'E

0°0.000′

0°0.000′

80°0.000'E N R 10 0 10 20 30 40 km WGS 1984 - UTM Zone 51 N DINAGAT ISLAND Ser and 20°0.000′N +Legend San Francisc Non - Operational WDs **Operational WDs** • 5 Barangays with Existing SURIGAO DEL NORTE Level 3 Water Service Tubod Mainit Lake Alegria Gigaqu Clave Kitcharad Mainit Carr Can Lanuza Cabadbaran City 80°0.000'S Tandag City AGUSAN DEL NORTE +2 Tago San Miguel Na Butuan City SURIGAO DEL SUR Bayugan City Marihatag Las Nieves San Agusti Prosperidad Esperanza Liang San Luis San Francisco

000.000

Water Districts and Areas Covered with Level III Service

Loreto

La Paz

LWUA, PAWD, NWRB Listahang Tubig, 2017 Data

•

Santa Josefa

Bunawan

Tagbina

Bielig City

160°0.000'E

24

•

Talacogon AGUSAN DEL SUR

+

WSS Infrastructure

Water service providers (WSPs) of various management types serve around 55% of Caraga.¹⁵

These management types depend on the service areas (urban and rural), the number of potential water connections, and the level of service given.

For small urban towns and rural areas, community-based organizations (CBOs) – which include rural waterworks and sanitation associations (RWSA), barangay water and sanitation associations (BWSA), and water cooperatives – operate supply systems offering services at Level II (and in some cases, Level I). As the area grows and becomes more urbanized or more densely populated, water service providers mostly comprise water districts (WDs) and LGU-run utilities providing Level III service.

Areas that do not have access to any formal level of service rely on point sources, such as shallow and deep wells.

Water Service Providers

The percentage of the population having access to or being served by these WSPs is not in accord with the figures in PSA's 2015 FIES mainly because the former came from various sources¹⁶, with the bulk of the data coming from the National Water Resources Board's (NWRB) Listahang Tubig. Furthermore, it cannot be ascertained that all WSPs in the region have already registered under Listahang Tubig or are continually updating their operations data.

Nevertheless, these data help economic experts and engineers gain insights into the region's situation in relation to its existing water utilities.

Water Districts

As of 2015, of the 32 WDs serving Caraga, 23 were operational and 9 non-functional. These covered about 1.3 million or roughly 51% of the total population. Of the number, only 749,184 users (or 57%) receive water service.

LGU-Led Water Utilities

The region has 278 LGU-run water utilities covering 36 areas and 342,148 users or 13% of the total population of Caraga.

BWSA

The region has 234 BWSA utilities in 32 areas covering about 7% of its total population.

RWSA

The region has 48 RWSA utilities covering14 areas and supplying water service to 40,882 users.

The map on the left shows the location of operational and nonoperational WDs in the region as well as barangays provided with Level III water service by various WSPs (except WDs).

Table 12: Water Service Providers per Province

Design (Drey in ea			-	Comise Area	Population S	Served
Region/Province	NO. OF LGUS	Type & NO. OF WSP	s	Service Area	Total	%
		WDs	3	440,634	334,844	75.99%
		LGU-led	35	Population Service Area Total 440,634 334,844 56,727 45,755 45,755 6,270 52,935 691,566 496,531 335,968 335,968 88,522 11,345 2,325 1 5,030 700,653 107,223 0 0 24,160 46,389 1,230 475	8.20%	
Agusan del Norte	12	BWSA	38		6.62%	
		RWSA	11		6,270	0.91%
		Private/Others	143		52,935	7.65%
		Subtotal	230	691,566	496,531	71.80%
		WDs	5	335,968	88,522	26.35%
		LGU-led	4		11,345	1.62%
Agusan del Sur	14	BWSA	1		2,325	0.33%
		RWSA	0		1	0.00%
		Private/Others	8		5,030	0.72%
		Subtotal	18	700,653	107,223	15.30%
		WDs	1	0	0	0.00%
Province of Dinaget		LGU-led 18			24,160	19.00%
Flovince of Dinayat	7	BWSA	70		46,389	36.48%
15101105		RWSA	2		1,230	0.97%
		Private/Others	2		475	0.37%
		Subtotal	93	127,152	72,254	56.82%
		WDs	6	236,423	165,484	69.99%
		LGU-led	180		198,415	40.90%
Surigao del Norte	22	BWSA	40		37,779	7.79%
		RWSA	13		10,756	2.22%
		Private/Others	27		22,017	4.54%
		Subtotal	266	485,088	434,451	89.56%
		WDs	8	305,782	160,334	52.4%
		LGU-led	41		51,501	8.70%
Surigao del Sur	19	BWSA	85		57,935	9.78%
		RWSA	22		22,625	3.82%
		Private/Others	48		30,161	5.09%
		Subtotal	204	592,250	322,556	54.46%
		WDs	23	1,318,807	749,184	56.81%
		LGU-led	278		342,148	13.18%
Caraga Region	74	BWSA	234		190,183	7.32%
		RWSA	48		40,882	1.57%
		Private/Others	228		110,618	4.26%
		Grand Total	811	2,596,709	1,433,015	55.19%

20°0.000'N

 ¹⁵ Based on registered WSPs in Listahang Tubig (as of 2017)
 ¹⁶ Local Water Utilities Administration (LWUA), PAWD, NWRB Listahang Tubig 000.000

160°0.000′W

1

Sanitation

Sanitation is the provision of facilities and services for the safe management and disposal of human waste. Without sanitation, water quality degrades, health is compromised and the environment is adversely affected.

This section discusses the link between growing water demand and its detrimental effects on water quality and public health.

Open Defecation

As defined by the Joint Monitoring Program (JMP) for Water Supply, Sanitation and Hygiene of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), open defecation is the practice whereby people go out into the fields, bushes, forests, open bodies of water, or other open spaces rather than use the toilet to defecate. This can pollute the environment and cause various health-related problems.

Among all regions, Caraga has the 7th highest open defecation rate at 4.6%. Approximately 12,022 people were reported practicing open defecation in 2015. This has been attributed to the many informal settlers along the coastlines and waterless areas which do not have access to sanitation facilities.

The map on the right shows the areas in the region where open defecation is most prevalent.

Wastewater and Domestic Biological Oxygen Demand

A measure of the organic strength of wastes in water is biological oxygen demand (BOD), which is the rate at which organisms use the oxygen in water or wastewater while stabilizing decomposable organic matter under aerobic conditions. The greater the BOD, the greater the degree of organic pollution.

The map below shows the current BOD in Caraga.

Industrial wastewater generated is computed by industry type and depends on the present and future annual volume of production output per type. Agricultural wastewater generation and BOD estimation, on the other hand, are based on the present and future annual number of heads of livestock and poultry produced.

Figure 13: Categories of Wastewater

In the absence of other data, only domestic BOD can be estimated. A BOD factor of 37 grams per person per day (unit pollution load) is assumed; for highly urbanized areas, 53 grams¹⁷ per person per day is used.

The wastewater¹⁸ produced by each province is directly proportional to its water demand as well as its population. It is assumed that wastewater generated is 80% of the total water demand. The current wastewater in the region is shown in Figure 14.

BOD and wastewater projections until 2040 are shown in the succeeding pages

¹⁷ Philippine Environment Monitor (PEM),
 2003
 ¹⁸ Ibid.

26

40°0.000'W

Figure 12: Biological Oxygen Demand, 2015

Figure 14: Wastewater Produced, 2015

120°0.000'W

160°

20°0.000'N

80°0.000'S

000'0-00

80°0.000'S

000.0°0

0°0.000′

La Paz La Paz AGUSAN DEL SUR La Paz Areas with Water Quality Monitori Water Districts' Water Quality Monitori

30

160°0.000'E

80°0.000'E

0°0.000′

+

Tagbina

Trento

slig City

Bunawan

Water Quality

Water quality measures how good water is in terms of its beneficial use and environmental value. It is water relative to its use and measured in terms of its physical, chemical, biological and radiological characteristics. It is most frequently used in reference to a set of standards against which compliance can be assessed.

As discussed earlier in "Water Resources", Caraga draws much of its water supply from the tributary rivers of Agusan River. Table 13 lists these rivers with their corresponding classifications.

According to the Environmental Management Bureau (EMB), Agusan River is classified under Class C. This type of river is used in fishery, noncontact activities such as boating, and industries.

Table	13.	Classification	of the	Tributaries	of	Δαιιsan	River
IUNIC		olussilloution		111Duturic3	U 1	Agusun	

R	iver	Classification
	Bugabos	С
A	Magallanes/Baug	C/D
Agusan der None	Taguibo	A/C/D
	Ojot	А
	Gibong	А
Anungan dal Qua	Agdaon	А
	Simulao	А
	Umayam	D
	Inaoan	D
Agusan der Sul	Wawa/Andaon	A/C
	Solibao	А
	Libang	D
	Maasam	D
	Kasilan	D

Wastewater projection maps (as shown in the preceding pages) indicate that most cities and growing municipalities have higher water demand compared to the other areas in the region. These areas are more exposed to problems related to water quality and health, among them waterborne diseases.

The map on the left shows the areas whose water sources have exhibited signs of poor water quality. The data are based on the water quality reports submitted by WDs to the Local Water Utilities Administration (LWUA). Data on water supply sources that are not covered or owned by WDs are not reflected on this map.

Waterborne Diseases

Waterborne diseases are generally transmitted through water in which pathogenic microorganisms live. These diseases can be spread while bathing, washing, or drinking water, or by eating food exposed to contaminated water.¹⁹

Approximately 6,579 cases of acute watery diarrhea, 1,144 cases of schistosomiasis, and 84 cases of typhoid and paratyphoid were reported in Caraga in 2015, according to a 2015 Field Health Service Information System (FHSIS) report.

These numbers indicate that many people in the region still have no access to safe drinking water and sanitation facilities.

As of 2017, Department of the Interior and Local Government (DILG) reported 11 waterless²⁰ municipalities in Caraga (see Figure 15).

Residents in these areas have limited access to safe (drinking) water, and thus, are forced to resort to unsafe sources of water. Doing so increases their exposure to a host of waterborne diseases.

Figure 15: Waterless Municipalities

Table 14: Main Industries and their Impacts on Water Quality of Agusan River

Source/Cause of Decline in Water Quality	1	Impact/Potential Waste Generated				
Industrial						
Gold rush area in Diwalwal mine sites in the eastern h	nills of Ma-	Processing of gold by small-scale and artisanal miners that increase				
co, Pantukan, and New Bataan COSTMA		mercury and cyanide levels				
Vegetable oil mills in Trento and Rosario and near But	nen	Filtrates and other by-products of oil refining resulting in increased				
	dan	BOD, and oils and grease				
Sawmills in the upstream part of Butuan		Generation of organic wastes and chemical effluents				
Wood processing plants in Talacogon plywood and ma ries in Magallanes	atch facto-	Burning of wastes causing ash to disperse and polluting the river				
¥	Agri	icultural				
Fertilizer runoff		Increased nitrate and phosphate levels from non-point sources				
Pesticide runoff		Increased pesticide levels from non-point sources				
	Aqu	aculture				
Chemicals that kill predator species by deoxygenating		Decreased dissolved oxygen (DO)				
Nitrate-based feed and fish waste causing algal bloom	1	Increased nitrate				
	Domestic	c Wastewater				
Absence of a domestic wastewater collection system		Increased BOD				
Absence of septic tanks		Increased total coliform and fecal coliform				
Open defecation		Increased incidence of waterborne diseases				
	Solid wa	ste pollution				
		Limited capacity and improper management of controlled				
Open and controlled dumpsites		dumpsite forcing households and industries to dump wastes into				
		rivers				
	Sedim	nentation				
Riverbank erosion/siltation with high velocity rainfall ru	noff	Increased total suspended solids (TSS)				

¹⁹ World Health Organization
 ²⁰ Municipalities with less than 50% service coverage, National Anti-Poverty
 Commission, 2010

80°0.000'E

WSS Sector Gaps

In assessing the current state of the WSS sector in Caraga, areas that require upgraded facilities, improved WSS systems as well as regular and extensive monitoring protocols were brainstormed and identified at the regional consultation and planning workshop.

Issues, Constraints and Challenges

The workshop on WSS in Region XIII produced a clear picture of realities on the ground, based on personal experiences, local knowledge and insights shared by key stakeholders and resource persons from the academe, nongovernment organizations (NGOs) and other concerned institutions

The planning workshop attended by provincial officials in Region XIII and representatives of regional line agencies identified certain "hindering and facilitating factors" and classified specific issues, constraints, and challenges confronting the WSS sector in three areas of concern: (a) Planning and Development, (b) Service Provision, and (c) Regulation.

Planning and Development

The non-existence of a master plan for the development of the water supply and sanitation sector in Region XIII lays bare everything that is wrong in the management and regulation of a major and critical public health challenge in that part of the country. It reveals poor governance, budgetary deficiency and limited financing options, dysfunctional institutions, faulty priority setting as well as manpower shortage made worse by technical incompetence at various levels of governance.

As revealed in the course of the regional workshop, the following facts on the ground persist because there is no authoritative document to guide the development of the WSS sector: water and land use zoning ordinances are not properly implemented; extraction of groundwater is unregulated causing groundwater depletion and creating bitter water rights conflict; unabated encroachment of small-scale miners in the watersheds; lack of focus in fund sourcing and budget enhancement; inadequate incentives to attract private sector investments; lack of interest to address human resources issues; failure to strengthen and institutionalize local monitoring and regulatory offices; and inability to tap the support of concerned national government line agencies, donor organizations, academic institutions and nongovernment organizations.

Overcoming the sector's various challenges is difficult but doable. The success of the Province of Surigao to produce an Ecological Watershed Forest Reserve Master Plan and Forest Land Use Plan should convince other provinces that they too can do it. Apart from being inspirational, Surigao's effort to protect and preserve potential sources of water in declared watershed areas wanting, a problem compounded by a shortage of laboratory facilities for water quality testing. Water distribution facilities are outmoded, need constant repair and are overdue for rehabilitation. The encroachment of small-scale miners in the watersheds raises concern about water contamination and pollution. Open defecation persists, especially in poor communities, exacerbating the twin problems of disease exposure and high expenditure on medical treatment.

In addition, sanitation facilities remain on the drawing board because of budget insufficiency. Capitalists are hesitant to invest in waste water treatment and septage facilities because of high tariffs imposed on sanitation projects.

Further complications come in the form of the region's unattractiveness to private sector investors due to high development cost of water distribution and sanitation facilities, prevailing low water rates and consumers' unwillingness to pay water tariffs.

Recommended remedial measures include: serious pursuit of options for financial and technical assistance from concerned line government agencies like LWUA, DOH, DENR-NWRB and especially DPWH for funding support for septage, sewerage and sanitary landfill projects; pursuit of partnership with NGOs, water service providers, donor agencies and academic institutions; and sustained efforts by LGUs and their NGO partners in conducting on-site Information, Education and Communication (IEC) activities in sanitation-challenged communities with special focus on IP settlements.

Regulation

3

Many of the problems that ail the WSS sector in Region XIII can be ascribed to failure of governance, especially in the sphere of regulation. This can be traced to the absence of a single national government agency to regulate the various components of water supply and sanitation service delivery, resulting in a number of maladies. These include: non-enforcement of laws governing the appropriation, utilization, exploitation, development, conservation and protection of water resources; inability to implement the various provisions of the country's Code on Sanitation; failure to regulate and penalize violations of existing rules and regulations, especially excessive extraction of groundwater; weakness in the mitigation of water rights conflict; absence of wastewater treatment facilities; failure to implement septage/sewerage projects; and various complications arising from institutional ineptitude to discourage mining companies from laying claim over water sources.

The corrective measures could be interpreted as a collective call for immediate government action. These include: the establishment in Caraga of a nationally mandated regulator with a regional and provincial presence; the strict enforcement of water and sanitation rules and regulations; improvement of capacity to arrest and penalize violators of the country's water and sanitation codes; establishment of more water treatment facilities, activation of water quality testing laboratories and monitoring units, and construction of waste management facilities.

should be considered as an initial building block towards the generation of a more comprehensive WSS sector development plan for Region XIII.

Service Provision

The serious gaps and deficiencies in the delivery of water supply and sanitation services in Region XIII inflict longterm damage on the health and general well-being of the residents. Less than 1/3 of the region's 67 municipalities and four cities are being served by WDs which means a great majority of Caraga's households are not connected to a piped distribution network. Sadly, even those being serviced by concessionaires are not assured of access to safe drinking water because water treatment facilities are Table 15 summarizes the hindering and facilitating factors impacting the WSS sector in Caraga.

Table 15: Hindering and Facilitating Factors

Areas	Hindering Factors	Facilitating Factors		
	Wat	er Supply		
	Manipulation by vested interest groups	Strong political will/LGU support		
	Political interference	Efficient water source management Check and balance mechanism to		
	Financial constraints	Strong participation and support of the community		
	Lack of interest/awareness	Setting up of water districts		
	Water rights conflicts	Capacity building		
Service	Conversion of forestland into agricultural land	I echnical support from LWUA		
Provision		wite the m		
		Municipal LCL curport of Community Led Total Sonitation (CLTS)		
		program		
	Lack of technical capacity among LGUs	DOH's support of the PHO Capacity building		
	Absence of a comprehensive water and sanitation master plan	Intensified toilet bowl program of LGUs		
	Lack of funds for sanitation facilities			
	Stakeholders' lack of awareness of the importance of good sanitation	_		
	Wat	er Supply		
	Water sources located beneath mining tenements	Creation of a functional governing board		
	Lack of financial resources and personnel to intensify efforts in water	Implementation of LCU projects		
	_ quality monitoring Overlapping of regulatory functions	Establishment of functional TRWQMA-GB		
	Improper implementation of Land Use Zoning Ordinance	Water quality monitoring of classified water bodies		
	Political interference (LGU level)			
Regulation	Lack of human resources	-		
rtogulation	Lack of personnel from NWRB	_		
	Long processing time re: approval of water rights/permit applications	_		
	Unregulated extraction of groundwater	_		
	Sa	anitation		
	Absence of wastewater treatment facilities			
	Absence of a single national government agency to regulate/oversee	-		
	the WSS sector General			
	Monitoring not included in the master plan	Formulation of development agenda of LCEs		
	Project delays resulting from different agenda from the executive/	Establishing linkages with foreign/national financing institutions/donor		
	legislative department Absence of harmonized templates/indicators	agencies re: funding support Intensive IEC campaigns to be conducted by the City Health Office (CHO)		
		or the City Environment and Natural Resources Office (CENRO)		
	Data inconsistencies at the local, regional, and national level			
	Political interference re: funding	_		
	Absence of a master plan for each province	_		
	Presence of insurgents in affected areas	_		
	Absence of a centralized system	-		
		Water		
	Lack of water treatment facilities in urban areas	Protection of water sources		
Planning and	Very limited water sources in barangays	Building strong partnerships with water service providers		
Development	Lack of a hudget resundrade of existing facilities (Level II - Level III)	Formulation of an Ecological Surigao Watershed Forest Reserve Master		
		Plan		
	Presence of coliform in water sources	Crafting of a forest land use plan Put an end to open defecation		
	Small-scale mining operations encroaching watersheds	Mining ban in watersheds		
	Illegal small-scale mining	Development of existing and potential water sources		
	Limited number of laboratories for water testing	_		
	Nonregulation of existing water sources			
	Mining companies laying claim over water sources	_		
	vvater rights in conflict areas			
	Sa			
		Funding support from DPVPH re: septage and sewerage		
	No septage/sewerage project implemented	Construction of sanitary facilities and landfills		
	Congested areas with no sanitation facilities	Continued IEC program on proper sanitation in IP areas		

80°0.000′W

160°0.000'W

Regional Vision

"Safe and Sustainable Water for Empowered Caraganons."

The Caraga WSS vision was crafted by the visioning group with the goal of achieving universal access to safe and sustainable water all throughout the region by 2030.

In essence, safe water encompasses sanitation, rationalizing the necessity of improved water and sanitation projects that will sustain adequate water supply, ensure its good quality and affordability, and upgrade sanitation infrastructure.

In keeping with this vision, key strategies and corresponding success indicators contributing towards the achievement of the overall sector vision were adopted, and key projects and programs were identified, including WSS targets which will adhere to the national WSS targets that are in accord with the PDP and SDGs.

Strategic Framework

The creation of the strategic framework begins with the determination of the issues, constraints and challenges of the WSS sector. The diagram on the right shows specific highlights and contrasts, pertaining to areas displaying best practices and those needing improvement.

The figure shows strategic priorities for Caraga highlighting the provinces' individual plans. Priority areas include health and research, water exploration, septage management, alliance building, capacity building, project development and politics. These priorities have been observed to be the major areas of concern in relation to the provincial plans (as discussed in "Issues, Constraints and Challenges").

Corresponding strategies were formulated to translate the regional vision into specific approaches to get the best results and achieve the region's WSS targets. These are the region's general approaches applicable to urban and rural contexts of ensuring access to safe water and sanitation.

A more detailed discussion with respect to achieving increased access to potable water considering the various segments comprising the water utilities (categorized as undeveloped/underdeveloped, developing and developed) is shown in Table 16.

Table 16: Strategies in Achieving Increased Access to Potable Water

Segment	Target	Strategic Statement
Undeveloped/Underdeve	eloped	
Level I	 Zero waterless barangays Reduction to 5% of unsafe sources of water supply (2022) and universal access to safe water (2030) 	 Government investment in the development of water supply systems (WSS) to upgrade unsafe sources to safe sources Promoting water harvesting in far-flung areas
Level II	Upgrade of Level II systems to Level III	 Establishing WDs or LGU-led water utilities that can operate commercially Upgrading Level II systems to Level III Creation of a body that provides technical and financial assistance to barangay water associations and rural waterworks to upgrade their level of service
Developing	The last	+
Water Districts (Categories C and D)	Zero nonoperational WDs	 Prioritizing conversion of nonoperational to operational WDs Assisting low performing WDs in rehabilitation and expansion works Providing a window for low cost funds that can be accessed by low performing WDs to expand coverage
Non-WDs (financially struggling water utilities)	 Organizing water utilities and allowing them to operate commercially 100% recovery of O&M cost 	 Allowing the commercialization of water utility operations; encouraging LGUs to establish WDs or similar local gov- ernment corporations or economic enterprises
Developed	5	
Level III	 100% coverage of franchise area Ensuring the sustainability of operations of Level III systems 	 Increasing private sector participation Ensuring a robust regulatory framework to balance the interest of consumers and operators/WSPs

 Encouraging business establishments and residential communities to embark on rainwater harvesting programs

34

160°0.000'E

W`000.0°0

160°0.000'W

+

Community-based researches Watershed development, expansion and protection Solid waste management Zero open defecation campaigns and advocacies Human resource development Partnership and linkages development Resource mobilization Infrastructure and facility establishment and provision Advancement of technologies Disaster response management Policy review, development and enforcement Strengthening of leadership and governance PROGRAMS AND PROJECTS 0% % 1 ACCESS TO SAFE ACCESS TO IMPROVED

20°0.000′

Figure 16: Caraga WSS Strategic Framework

WATER

SANITATION

80°0.000′W

160°0.000'W

Access Targets for Water Supply and Sanitation

As experts knowledgeable in and thoroughly familiar with the social and environmental conditions in their respective provinces, the workshop participants were given free rein in setting targets concerning water supply and sanitation access (even as they were guided by the prescribed goals).

Their targets were based on current and baseline data (i.e., population growth rates, water resources availability, topographical and geographical setting, etc.), the status quo (funding constraints, political and cultural challenges, etc.), and the realistic attainability of set targets. Caraga strives to achieve 96.5% access to safe water by 2022 and 100% access by 2030. Universal access by 2030 means more than 700,000 households will benefit.

Improved access to sanitation is set at 74% by 2022.

Figures 17 and 18 graph the WSS targets in terms of households for 2022 and 2030.

0000.0

36

160°0.000'E

+

+

Water Supply Targets

	AGUSAN D	EL NORTE	
Category	2022	2030	2040
Level III	80.0%	95.0%	100.0%
Level II	15.0%	5.0%	0.0%
Level I	5.0%	0.0%	0.0%
Safe Access	100.0%	100.0%	100.0%
No Access	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%
	AGUSAN	DEL SUR	
Category	2022	2030	2040
Level III	20.0%	25.0%	70.0%
Level II	35.0%	40.0%	30.0%
Level I	40.0%	35.0%	0.0%
Safe Access	95.0%	100.0%	100.0%
No Access	5.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%
	SURIGAO D	EL NORTE	
Category	2022	2030	2040
Level III	80.0%	95.0%	100.0%
Level II	10.0%	5.0%	0.0%
Level I	5.0%	0.0%	0.0%
Safe Access	95.0%	100.0%	100.0%
No Access	5.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%
	SURIGAO		
Category	2022	2030	2040
Level III	75.0%	85.0%	100.0%
l evel II	10.0%	15.0%	0.0%
	10.0%	0.0%	0.0%
Safe Access	95.0%	100.0%	100.0%
No Access	5.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%
PRO	OVINCE OF DI	NAGAT ISLAN	IDS
Category	2022	2030	2040
Level III	43.0%	55.0%	80.0%
Level II	50.0%	42.0%	20.0%
Level I	6.0%	3.0%	0.0%
Safe Access	99.0%	100.0%	100.0%
No Access	1.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%
	BUTUAN		
Category	2022	2030	2040
Level III	64.0%	70.0%	90.0%
Level II	36.0%	30.0%	10.0%
Level I	0.0%	0.0%	0.0%
Safe Access	100.0%	100.0%	100.0%
No Access	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%
	CARAGA	REGION	
Category	2022	2030	2040
	59.0%	69.1%	89.8%
		04.404	10.2%
Level II	22.6%	21.4%	
Level II Level I	22.6% 14.9%	9.5%	0.0%
Level II Level I Safe Access	22.6% 14.9% 96.5%	21.4% 9.5% 100.0%	0.0%
Level II Level I Safe Access No Access	22.6% 14.9% 96.5% 3.5%	21.4% 9.5% 100.0% 0.0%	0.0% 100.0% 0.0%
Level II Level I Safe Access No Access Total	22.6% 14.9% 96.5% 3.5% 100.0%	21.4% 9.5% 100.0% 0.0% 100.0%	0.0% 100.0% 0.0% 100.0%

Sanitation Targets

AC	GUSAN DEL N	IORTE	
Category	2022	2030	2040
mproved	97.0%	100.0%	100.0%
asic	2.0%	0.0%	0.0%
hared/Communal/ imited	1.0%	0.0%	0.0%
Open Defecation	0.0%	0.0%	0.0%
otal	100.0%	100.0%	100.0%
Δ	GUSAN DEI	SUR	
ategory	2022	2030	2040
nproved	97.0%	100.0%	100.0%
asic	3.0%	0.0%	0.0%
hared/Communal/ imited	0.0%	0.0%	0.0%
pen Defecation	0.0%	0.0%	0.0%
otal	100.0%	100.0%	100.0%
SU	RIGAO DEL N	NORTE	
ategory	2022	2030	2040
nproved	97.0%	100.0%	100.0%
asic	1.0%	0.0%	0.0%
hared/Communal/ imited	1.0%	0.0%	0.0%
pen Defecation	1.0%	0.0%	0.0%
otal	100.0%	100.0%	100.0%
		0.U.D	
S .	URIGAO DEL	SUR	
ategory	2022	2030	2040
iproved	97.0%	100.0%	100.0%
	3.0%	0.0%	0.0%
nared/Communal/ mited	0.0%	0.0%	0.0%
pen Defecation	0.0%	0.0%	0.0%
otal	100.0%	100.0%	100.0%
PROVING	CE OF DINAG	AT ISLANDS	
ategory	2022	2030	2040
nproved	97.0%	100.0%	100.0%
asic	3.0%	0.0%	0.0%
hared/Communal/ mited	0.0%	0.0%	0.0%
pen Defecation	0.0%	0.0%	0.0%
otal	100.0%	100.0%	100.0%
	BUTUAN CI	TY	
ategory	BUTUAN CI 2022	TY 2030	2040
ategory nproved	BUTUAN CI 2022 97.0%	TY 2030 100.0%	2040 100.0%
ategory nproved asic	BUTUAN CI 2022 97.0% 3.0%	TY 2030 100.0% 0.0%	2040 100.0% 0.0%
ategory nproved asic hared/Communal/ mited	BUTUAN CI 2022 97.0% 3.0% 0.0%	TY 2030 100.0% 0.0% 0.0%	2040 100.0% 0.0%
ategory nproved asic hared/Communal/ mited pen Defecation	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0%	TY 2030 100.0% 0.0% 0.0% 0.0%	2040 100.0% 0.0% 0.0% 0.0%
ategory proved asic nared/Communal/ mited pen Defecation	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0% 100.0%	TY 2030 100.0% 0.0% 0.0% 0.0% 100.0%	2040 100.0% 0.0% 0.0% 0.0% 100.0%
ategory nproved asic nared/Communal/ mited pen Defecation otal	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0% 100.0% CARAGA REG	TY 2030 100.0% 0.0% 0.0% 0.0% 100.0%	2040 100.0% 0.0% 0.0% 100.0%
ategory nproved asic hared/Communal/ imited pen Defecation otal otal	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0% 100.0% CARAGA REG 2022	TY 2030 100.0% 0.0% 0.0% 0.0% 100.0% 5ION 2030	2040 100.0% 0.0% 0.0% 100.0% 2040
ategory nproved asic hared/Communal/ mited pen Defecation otal otal (ategory nproved	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0% 100.0% CARAGA REG 2022 73.8%	TY 2030 100.0% 0.0% 0.0% 100.0% SION 2030 100.0%	2040 100.0% 0.0% 0.0% 100.0% 2040 100.0%
ategory nproved asic hared/Communal/ imited pen Defecation otal otal ategory nproved asic	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0% 0.0% 100.0% CARAGA REC 2022 73.8% 11.1%	TY 2030 100.0% 0.0% 0.0% 100.0% SION 2030 100.0% 0.0%	2040 100.0% 0.0% 0.0% 100.0% 2040 100.0% 0.0%
Category mproved Basic Shared/Communal/ imited Open Defecation Total Cotal Category mproved Basic Shared/Communal/ imited	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0% 100.0% CARAGA REG 2022 73.8% 11.1% 15.1%	TY 2030 100.0% 0.0% 0.0% 100.0% 500N 2030 100.0% 0.0%	2040 100.0% 0.0% 0.0% 100.0% 2040 100.0% 0.0%
ategory nproved asic hared/Communal/ imited pen Defecation otal ctal ctal ategory nproved asic hared/Communal/ imited pen Defecation	BUTUAN CI 2022 97.0% 3.0% 0.0% 0.0% 0.0% 100.0% CARAGA REC 2022 73.8% 11.1% 15.1% 0.0%	TY 2030 100.0% 0.0% 0.0% 100.0% 5ION 2030 100.0% 0.0% 0.0% 0.0%	2040 100.0% 0.0% 0.0% 100.0% 2040 100.0% 0.0%

80°0.000′W

Strategic Interventions

After the regional planning and consultation workshop, a working document detailing specific strategic interventions to improve water supply and sanitation access in Region XIII was formulated. The participants deliberated on these proposed interventions to make them adaptable to actual local conditions. (These are discussed more thoroughly in the National Master Plan and may be adopted accordingly at the local level.)

Tables 17 and 18 show the specific strategic interventions for water supply and sanitation, respectively.

Access to Safe Water	Planning and Development	Service Provision	Regulation	Promotion
95% Access to Safe Water in 2022 Universal Access in 2030	 Planning, program or project design Establishing labs and water quality testing centers Lobbying for the Regional WSS Masterplan 	 M&E expansion Rehabilitation/Non-revenue water (NRW) reduction maintained at 20% of total production Integration/ Amalgamation Automation Residuals management Mitigation Water potability maintained at all times Providing 24/7 water supply service Achieving 100% coverage Residuals management 	 Water resources protection Arbitration Environmental and social safeguards Compliance with PNSDW 2017 Close monitoring of Joint Agreement Compliance training from DOH Resource studies 	 Willingness to connect and pay Demand creation

Table 18: Proposed Strategic Interventions for Sanitation

222

Access to Improved Sanitation	Planning & Development Planning Program or Project Design Institution Building Training Financing Climate/Disaster Resiliency Policy	Service Provision Operations M&E Expansion Amalgamation Automation	<u>Regulation</u> Tariff/Pricing Resource Arbitration Registration, Permits, Rights	Promotions Social Preparation Advocacy Demand Creation Behavior Change
High Access Areas with 60% to 100% Improved Sanitation Coverage	 Local Sustainable Sanitation Plan (LSSP) should be incorporated into the WSS Sector Plan, local development plan (LDP), annual investment program (AIP), and local health plan. A sewerage system program should be developed to provide service in the urban core coordinating with those in charge of the septage management program; project urban sprawl A National Sewerage and Septage Management Program (NSSMP) subsidy grant for sewerage and septage management programs (SMP) should be 	 Sanitation programs should focus on implementing sewerage systems and completing septage management programs. Expansion of urbanized and urbanizing barangays should be pursued. M&E system should conform to PSA/ Census (covered by sewerage system, households desludged, and on- site systems). 	 Tariff should be computed using full cost recovery with infusion of capex subsidy for sewerage projects. LGU implementers have undergone compliance training given by DOH and DENR (particularly in sewerage systems), and the Dept. of Agriculture (DA) with respect to regulations/guidelines governing disposal of by-products. Penalties should be strictly imposed on those not complying 	 Promotions should focus on enjoining the public to connect to the sewerage system when made available stressing the importance of compliance and the benefits therefrom. Promotional efforts regarding water demand management should be supported to minimize wastage and unnecessary use of water. Building buy-in for paying for sanitation services should be promoted.

in place.

- Capacity development in regard to sewerage systems should be planned and integrated with other infrastructure.
- A sanitation ordinance covering sewerage system and septage management services should be passed, possibly integrating it into the environment code and Water Quality Management Areas (WQMA) action plan.

with certain requirements, including LGUs/WDs by filing cases with the environmental ombudsman.

160°0.000'E

Physical Interventions

To meet the targets for access and coverage as well as the normative content of water (service standards), capital investments are necessary. The details of these investments in 2022 and 2030 are listed in Table 19.

Table 19: Capital Investments Required to Meet Water Supply Targets

Service Level	2022	2030
Level III	 Water source assessment and development Construction of water treatment facilities Distribution network expansion Provision of service connections NRW reduction program Watershed and water resources protection, management and development Development of a Water Safety Program Adoption of a rainwater harvesting program Establishment of adequately equipped laboratory testing centers in strategic areas to serve all service levels clientele 	 Water source assessment and development Construction of water treatment facilities Distribution network expansion Provision of service connections NRW reduction program Watershed and water resources protection, management and development Development of a Water Safety Program Adoption of a rain water harvesting program Automation of operations and major services
Level II	 Rehabilitation of existing water supply system to upgrade it to Level III 	 Rehabilitation of water supply system to upgrade it to Level III
Level I	 Upgrading to "safe level" those water sources found "unsafe" 	 Adoption of a rain water harvesting program in areas not reached by Levels II and III services

Capital investments for the sanitation targets will include basic sanitation programs, septage management programs, and sewerage management programs.

Targets for 2022 will mainly focus on basic sanitation. The septage and sewerage management programs are to be undertaken to achieve 2030 targets, although these programs may be implemented as early as 2022.

Nonphysical Interventions

To support the CapEx programs and ensure the efficient operation of the newly constructed facilities, institutional and regulatory reforms are to be undertaken (as shown in Table 20).

 Table 20: Institutional and Regulatory Reforms Required to Achieve Water Supply and Sanitation Goals

Items	Undeveloped/Underdeveloped	Developing	Developed	
Water Service Provision	 LGUs will organize/establish water utilities as commercial enterprises in their jurisdictions or form a WD. LGUs will create offices to handle Level II and Level I services. 	 WDs and LGU-run utilities will be motivated to improve their performance by offering them incentives/rewards. 	 A system for independent evaluation and due diligence regarding public-private partnership projects will be set up. 	
Planning and Development	 An agency will be created to spearhead efforts to improve the WSS sector at the provincial level. The provincial office shall coordinate development plans for water and sanitation of all municipalities in each province, pursue efforts (in coordination with the DENR) in watershed rehabilitation, and provide training programs to LGUs in water supply development and management. 			
	 Service standards for water supply and sanitation will be defined. 			
Regulation	 An independent group will be form other than the WDs, within each p group could later be made part of 	ned to monitor the performance of was province. WDs will continue to be regu a regulatory body.	ter and sanitation service providers, ilated by the LWUA. The monitoring	

+

160°0.000′W

0°0.000′

+

+

+

0°0.000′

160°0.000'W

Addressing the Gaps

Water Supply Investment Requirements

Physical Investments

To address WSS infrastructure gaps and fulfill specific targets and commitments for 2022 and 2030, the cost of infrastructure investments was derived based on anticipated demand. Such demand was based on projected population, economic growth, as well as factored-in investments to ensure the continuous delivery of WSS services provided by existing systems. The _____ computation included the anticipated need to upgrade existing service levels (i.e., from Level II to Level III, Level I to Level III).

Caraga requires capital investments for infrastructure development of about PhP8.3 billion and PhP6.0 billion to achieve 2022 and 2030 targets, respectively. Unit development costs employed to arrive at these sums are estimated at PhP37,500 per HH for Level III, PhP18,700 for Level II, and PhP9,900 for Level I.

These rates are direct costs and cover water source development, water treatment facilities, storage requirements, transmission and distribution lines, and pumping requirements, and provision of service connections.

Furthermore, these unit costs (determined to suit local conditions in Caraga) were derived by applying regional cost factors (with respect to labor, material, and equipment costs) to the computed development base costs for NCR. NCR values are pegged at PhP31,800 per HH for Level III, PhP18,700 for Level II, and PhP8,400 for Level I.

The cost deviations (from the NCR base rates) were taken into account considering the region's distinct geographical, economical, and accessibility characteristics, and labor, material, and equipment costs, which are bound to affect the implementation costs of any project. The regionalization of costs ensures that computed regional investment requirements for the Master Plan and the Regional Roadmaps are as realistic as possible befitting each locale.

Aside from the direct costs, indirect costs were considered in estimating the total investment requirements. These items include project preparation activities (which may affect budget considerations) before actual construction work begins. Items considered and percentage values used in relation to the total direct costs computed are shown in Table 21. Total expenses for establishing water quality testing laboratories have also been taken into account. It is assumed that one laboratory per province will be constructed.

Table 22 shows a summary of the total investment requirements of the region. (The detailed methodology of how the regional costs for Caraga were derived is referenced in Annex D of the main volume of the Philippine WSS Master Plan.)

Nonphysical Investments

Institutional and regulatory reforms have to be pursued to complement infrastructure development and ensure that water supply systems constructed will operate efficiently. Costs of reform implementation have not been estimated at the regional level and are projected to be not substantial compared to the infrastructure investments.

LGUs, WDs, and other stakeholders are obligated to influence decision makers to pursue relevant reforms in the water sector. These reforms serve as noninfrastructure investments and typically include organization/institutional development, regulatory strengthening, capacity building, and project management.

Proposed interventions include the following:

- The model of existing water utilities should be identified in areas where there are no water districts. The establishment of WDs should be proposed in municipalities with a population of at least 20,000, subject to an agreement with the local chief executives. If LGUs are not amenable to forming a WD, water utilities that can operate commercially (e.g., a similar local government water corporation or economic enterprise) should be set up.
- Priority should be given to operationalizing nonfunctional WDs, particularly those in municipalities categorized as 3rd class and higher.
- The target expansion of service coverage shall be conducted at the municipal level. Municipalities with lower than 50% coverage will be given priority in the investment program.

The map on the left shows four Caraga municipalities where priority WD projects have been approved and those pending approval for LWUA's financial assistance (FA). The WD in Prosperidad has secured LWUA's FA. The requests for FA of the three other WDs — i.e., in Carmen, San Francisco, and Bislig City — are pending approval, as of this writing.

Table 21: Indirect Costs Employed²¹

Water Supply			
	Water Sup	piy	
Contingency	10.0%	Percentage of Total Direct Cost	
Feasibility Study	3.0%	Percentage of Total Direct Cost	
Detailed Engineering Design	6.0%	Percentage of Total Direct Cost	
Construction Supervision	5.0%	Percentage of Total Direct Cost	
ROW/Land Acquisition	3.0%	Percentage of Total Direct Cost	
Organizational Cost/Permits	2.0%	Percentage of Total Direct Cost	
Capacity Development*	33,350	1 Staff Employee per 100 HH (LWUA)	

Table 22: Total Investment Costs for Water Supply Sector

Province/City	Total Investment Cost (in PhP Million) 2022	Total Investment Cost (in PhP Million) 2030
Agusan del Norte	2,205	1,277
Butuan City	703	623
Agusan del Sur	1,085	1,049
Dinagat Islands	85	171
Surigao del Norte	2,003	1,489
Surigao del Sur	2,210	1,376
Total	8,291	5,985

²¹ Based on Industry Standards

000.000

160°0.000′W

80°0.000'W

0°0.000′

Sanitation Investment Requirements

Physical Investments

Basic Sanitation Program. The DOH plans to prescribe a national basic sanitation program for the entire country – looking into a combination of microfinance and behavior change communication. A Department Administrative Order on standard septic tank use and design will also be released by the DOH soon after planned consultation activities have been rolled out in the country's three major island groups (Luzon, Visayas and Mindanao).

Caraga will need about PhP9.7 billion for basic sanitation from 2016 to 2022 to reach a target of 97%.

This was derived by multiplying the unserved population by the unit development costs with regard to establishing specific on-site sanitation facilities. (An annex to this report and the National Master Plan explains the unit costs and derived costs for specific sanitation interventions.)

Septage Management Program. A clustering approach will be recommended to reduce capital costs and attain economies of scale. The proposed clustering per province is shown on the map on the left.

The region will need about PhP1,533 billion and PhP157.87 million for 2022 and 2030, respectively, for its septage management program.

Sewerage System Program. Only Butuan City will be required to plan and implement a sewerage system for its urban core. However, rapidly urbanizing cities (i.e., candidate HUCs) should also consider planning for sewerage services in the interim.

The indicative cost for sewerage was computed based on the 50% coverage of the HUCs' urban population only. The unit cost was derived per the procedure applied to septage management, wherein the unit cost was based on the National Septage and Sewerage Master Plan (NSSMP) estimations and later adjusted considering other factors.

For sewerage services, Butuan City will require PhP1.46 billion by 2022 and an additional PhP187 million by 2030. The computational template provided for a 25% coverage of sewerage services by 2022 and an additional 25% coverage by 2030. This includes the city's incremental population from 2015 to 2022 and from 2023 to 2030.

Candidate HUCs (e.g., Bayugan in Agusan del Sur and Surigao City in Surigao del Norte) may be closely examined initially as urbanization may set in more rapidly in these places than in other capital cities or towns like Bislig City in Surigao del Sur.

Table 23: Total Investment Costs for Sanitation Sector

Province/City	Total Investment Cost (in PhP Million) 2022	Total Investment Cost (in PhP Million) 2030
Agusan del Norte	955	518

Nonphysical Investments

Caraga, like other regions in the country, will require substantial assistance from the national government, or where technical and financial assistance can be funneled. This will include an inventory or survey and assessment of existing sanitation facilities, capacity development for implementing local agencies (local health office, environment and natural resources office, office of the building official, and general services office), institutional, policy and regulatory environment development (which would require the involvement of capacitance support offices like the budget and treasurer's office, bids and awards committee, commission on audit office, engineering office, office of legal services/affairs, barangay affairs office, office of the local chief executive, and the local legislative council).

Other nonstructural interventions that may require a budget include developing a monitoring and evaluation (M&E) system to monitor progress, support planning, and guide development training programs, promotional campaigns and other legislative advocacies, and initiate hygiene promotion programs.

			+
Total		14,418	2,668
Surigao del Sur		3,534	418
Surigao del Norte		3,977	483
Dinagat Islands		705	5
Agusan del Sur		2,974	650
Butuan City		2,274	595

80°0.000'W

160°0.000′W

Proposed Projects and Programs

A list of projects and investment programs has been developed during the regional planning workshop to assess the current state of the WSS sector and propose projects to increase access to and upgrade water supply and sanitation facilities at the provincial or regional level.

The DILG, DENR River Basin Control Office (RBCO) and LWUA have proposed projects in the WSS sector in addition to those discussed and agreed on at the regional workshop.

This list of projects does not cover only infrastructure projects, but also nonphysical investment requirements, such as capacity development programs, information dissemination campaigns, and watershed management plans. These projects run the gamut from conception, proposal, prefeasibility and feasibility study stages, detailed engineering design, to pre-procurement and procurement. Figure 19 shows the distribution of the investment requirement per province and HUC. Based on the proposed projects and programs, the region needs PhP12,369 billion to boost its WSS sector.

Figure 19: Distribution of Investment Requirement per Province

		0	02 70-						
			Agusa	n de	el Norte (including Butuan City)				
	Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiari es (2022)
1	Construction of water supply systems in various barangays in Butuan City	Medium	43.00	71	Butuan City Septage Management Program	Long Term	120.00		
2	Cabadbaran City centralized water supply system	Long Term	2,099.41	2	Butuan City sewerage system	Long Term	2,500.00		
3	Seminars/training/ workshops/consultation/IEC involving potential partners	Short Term	a lie .	3	Conducting a study to determine if decline in water quality is linked to cancer-related illnesses	Short Term	-		
4	Formulation of a Sustainable Water Resource Management Plan for Agusan del Norte	Short Term	R.	4	Hiring of more sanitary inspectors	Short Term	-		
5	Training, workshops and seminars on research and development	Short Term	1	5	Capacity development of treatment facility operators	Short Term	-		
6	Upgrade of existing facilities of WSPs; expansion of coverage areas and improvement of water quality	Short Term	5. 1. 1.5	6	Monitoring the performance of desludgers	Short Term	-	4,762	89,258
7	Installation of RAM pumps	Short Term	and Just-	7	Feasibility study on the establishment of treatment facilities for every cluster	Short Term	-		
8	Reforestation projects and watershed protection initiatives	Short Term		8	Establishment of a septage treatment facility (3 clusters)	Long Term	-		
9	Identification and development of alternative sources of water	Long Term	All and P	9	Provision of water treatment reagents	Short Term	-		
			26.66	10	Provision of toilet bowls and construction materials	Short Term	-		
		Total	2,142.41		Mie-4	Total	2,620.00		

		1			Agusan del Sur				
	Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiari es (2022)
1	Upgrade of provincial water laboratory	Long Term	1.00	1	Feasibility study re: proposed septage treatment plants	Long Term	3.00		
2	Exploration/Assessment of new water sources	Long Term	2.00	2	Construction of septage treatment plants in 5 Clusters	Long Term	230.00		
3	Development of springs as water sources	Long Term	0.03	T-S	Esperanza, San Luis and Talacogon				
4	Installation of rain collectors or harvesters	Long Term	22.50	No.	Bayugan and Sibagat	2 all		-	
5	Construction/rehabilitation/upgrade of biosand filter facilities (Level 2)	Long Term	100.00		San Francisco and Prosperidad				
6	Expansion of coverage and upgrade of WDs/BWSA facilities	Long Term	720.00		Loreto, La Paz, Sta. Josefa and Veruela	2			
7	Patin-ay Water System Project	Long Term	7.35		Rosario, Bunawan, and Trento	1			
8	Feasibility studies on proposed infra facilities	Short Term	0.75	3	Installation of improved sanitary toilets	Medium	570.00		
9	Creation of a Local Drinking Water Monitoring Committee	Short Term	1 () (¹	3		Total 5	803.00	1,698	168,605
		Total	853.63	12	I had the and the second and the				
	Water Supply and Sanitation	Period	Budget Requirement (PhP Million)			Som?			
1	Formulation of a Provincial Water Supply and Sanitation Master Plan	Short Term	2.00		· · · · · · · · · · · · · · · · · · ·	5			
2	Formulation of a City/Municipal Water Supply and Sanitation Master Plan	Short Term	21.00		Server Server				
3	Review and amendment (if necessary) of the Water and Sanitation Code	Short Term	0.50						
4	Organizing and strengthening the capability of water	Medium	18.00			~			

4

and sanitation units

				Surigao del Sur				
Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiari es (2022)
1 Installation of rainwater collectors	Long Term	13.00	1	Septage management project	Long Term	- 149.00		
2 Construction of water laboratories for Districts 1 and 2	Long Term	50.00	2	Provision of toilets and installation of septic tanks	Short Term	902.22		
Construction of water supply network/system at 3 Enchanted River covering San Juan, Tiwi, Dugmanon, Talisay, and Cambatong	Long Term	79.70	3	Seminars, training and workshops - CEPA	Short Term	8.00		
4 Construction of water supply facilities (infiltration galleries and treatment facilities)	Long Term	530.00			Total	1,059.22		
5 Proposal Lake 77 for the Bislig City Water System	Long Term	750.87	-	The state of the s	1.59		5,232	139,843
6 Reforestation near watersheds	Long Term	200.00		8	a the series	C.R.		
7 Spring Development Project Level II	Long Term	302.44		and the second second for	1. 8. 4. 9	2		
8 Spring Development Project Level III	Long Term	2,183.17			1-4492			
9 Spring Development Project Level I	Short Term	63.77	22		1111111111	and and a second		
	Total	4,172.95				Job.		

18.00

41.50

Term

Total

			Prov	vinc	e of Dinagat Islands				
	Water Supply	Period	Budget Requirement (Php Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiaries (2022)
1	Creation of a task force to oversee watershed inventory, assessment, and survey	Short Term	2.00	1	Construction of sanitary facilities in identified tourism sites	Long Term	5.00		
2	IEC program	Medium term	0.10	2	Construction of STPs (2 clusters)	Long Term	150.00		
3	Research study on water utilization of Del Pilar Dam and other major water sources	Short Term	0.15	3	Procurement of desludging equipment	Short Term	15.00		
4	A study on the development of springs as water sources	Short Term	0.15	4	Crafting and implementation of an ordinance on water-sealed septic tanks	Short Term	-		
5	Determination of volume and capacity	Short Term	-	5	Organizational management re: STP operation	Medium Term	0.25		
6	Research on and exploration of potential sources of water supply (surface water and groundwater) in every province	Long Term	1.00	6	IEC campaign on the importance of sanitation	Medium Term	-		
7	Installation of rainwater collection facilities in island and coastal barangays	Long Term	15.00	7	Community-LED Total Sanitation program	Medium Term	0.10	200	28,743
8	Expansion and improvement of existing water system facilities in 7 municipalities	Long Term	1.00	8	Assistance in the construction of toilet facilities	Medium Term	0.01		
9	Enforcement of watershed management policies	Medium Term	5.00	9	Conduct of training re: toilet bowl fabrication	Short Term	0.15		
10	Monitoring compliance with regulatory requirements re: water system management	Medium Term	0.15						
11	Capacity development training programs on proposal preparation, management of water system	Short Term	5.00						
12	Enhancing the capability of LGUs in managing water systems	Short Term	0.15						
13	Sourcing of funds from private and public institutions	Medium Term	-						
		Total	29.70			Total	170.51		

				Sı	urigao del Norte				
	Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiaries (2022)
1	Construction of satellite reservoirs	Long Term	30.00	1	Feasibility study re: Surigao City septage treatment facility	Medium Term	0.30		
2	Deep well projects in Surigao City: 10 units	Long Term	60.00	2	Site development and construction of septage treatment facilities	Long Term	80.00		
3	Installation of rainwater harvesting facilities	Long Term	5.00	3	Strict enforcement of sanitation laws and regulations	Short Term	-		
4	Feasibility study re: bulk water supply [target volume: 10,000 cubic meters per day]	Short Term	0.30	4	Formulation of contingency plans (re: sanitation)	Short Term	-		
5	Installation of water treatment facilities, chlorination systems in Bacuag, Claver, Gigaquit	Long Term	2.00	5	Provision of Portalets during disasters	Short Term	6.00		
6	New source intake with pipeline in Brgy. Jubgan, San Francisco	Long Term	100.00	6	Training/ Benchmarking of technical personnel including sanitary inspectors	Short Term	-		
7	New source intake with pipeline in Siargao Island	Long Term	15.00	7	Provision of sanitary toilets to 13,440 HHs	Short Term	24.00		
8	New source intake with pipeline in Brgy. Mabini, Surigao City	Long Term	6.20			Total	110.30		
9	Pipe laying and deep well development source for Arellano District	Long Term	10.00						
10	Purchase of laboratory equipment for water monitoring	Short Term	1.00						
11	Rehabilitation of water systems in Bacuag, Alegria, Gigaquit, Claver	Long Term	15.00						
12	Site development and construction of 20 MLD CLARIFIER systems with online analyzer at Don Julio Ouano Ceniza Reservoir, Surigao City	Long Term	35.00				T	476	122,195
13	Site development and construction of water treatment plant for iron and manganese removal	Long Term	50.00				+		
14	General checkup, inspection and maintenance of all generator sets and pumps; calibration of all equipment, flow meters, laboratory equipment, etc.; inventory of all assets of the district	Annually	0.30						
15	Skills training on the use of EPANET, GIS and SCADA for water systems	Annually	0.35						
16	Acquisition of water trucks, water drums and containers, and disaster response equipment	Short Term	11.50						
17	Site development and construction of a building for disaster response	Short Term	5.00						
18	Establishment of TESDA-accredited testing centers for plumbing	Short Term	0.25						
19	Orientation/seminars on PD1067(Water Code of the Philippines) for municipalities	Short Term	0.95						
20	Information and education campaigns involving IPs and socio-civic organizations	Short Term	0.50						

22 Upgrading of water systems from Level II to Level III in rural areas (Arellano districts and island barangays)	Medium Term	15.00
	Total	365.35

Annually

2.00

21 Reforestation/slope protection in watershed areas

80°0.000′W

+

0°0.000′

Identified Priority Projects (2019-2020)

The table below show the priority projects identified by LWUA and DILG for 2019-2020. The map on the left shows the various barangays and municipalities to be covered by DILG's Assistance to Municipalities (AM) and Salintubig Projects in 2019.

	Assistance To Municipalities (2019)							
Province	Municipality	Project Type	Project Title	Amount (PhP)				
Agusan Del Sur	Agusan Del Sur Sta. Josefa Potable water supply system		Expansion Of Level III Water System	10,337,000				
Surigao Del Norte	Alegria	Potable water supply system	Expansion Of Level III Water System	6,098,000				
Surigao Del Norte	Mainit	Potable water supply system	Rehabilitation/Improvement Of Level III Water System	3,100,000				
Surigao Del Norte	San Isidro	Potable water supply system	Expansion Of Water System	9,858,000				
Surigao Del Norte	Sta. Monica	Potable water supply system	Expansion Of Level III Water System	2,918,000				
Surigao Del Sur San Agustin Potable water supply system		Rehabilitation/Improvement Of Level III Water System	9,760,000					
			Total	42,071,000				

		SALINTUBIG (2019)		
Province	Municipality	Project Title	Barangay	Amount (PhP)
Agusan Del Norte	Santiago	Construction Of Santiago Water System, Santiago ADN	San Isidro, Jagupit, Curva And Poblacion 2	20,000,000
Agusan Del Sur	Loreto	Construction Of Potable Water System (Municipality- Wide)	Johnson	2,000,000
Agusan Del Sur	Loreto	Construction Of Rainwater Catchment System In Pan- labuhan Village	Sabud	2,000,000
Agusan Del Sur	Loreto	Installation Of Water Purification System In Panlabuhan Village	San Isidro	2,000,000
Agusan Del Sur	Loreto	Installation Of Water Purification System In Panlabuhan Village	San Mariano	2,000,000
Dinagat Islands	Cagdianao	Construction Of Upper Laguna Water System	Upper Laguna, La- guna	1,500,000
Dinagat Islands	Cagdianao	Construction Of Barangay Tigbao Water System	Tigbao	5,000,000
Surigao Del Norte	Dapa	Potable Water System Level II	Buenavista	1,000,000
Surigao Del Norte	Dapa	Potable Water System Level II	Corregidor	1,000,000
Surigao Del Norte	Dapa	Potable Water System Level II	Dagohoy	1,000,000
Surigao Del Norte	Dapa	Potable Water System Level II	San Carlos	1,000,000
Surigao Del Norte	Dapa	Potable Water System Level II	Sta. Felomena	1,000,000
Surigao Del Norte	Dapa	Potable Water System Level II	Union	1,000,000
Surigao Del Norte	Malimono	Improvement/Rehabilitation Of Level II WWS	Can-Aga	2,000,000
Surigao Del Norte	Malimono	Improvement/Rehabilitation Of Level II WWS	Villariza	2,000,000
Surigao Del Norte	Malimono	Improvement/Rehabilitation Of Level II WWS	Karihatag	2,000,000
Surigao Del Norte	Malimono	Improvement/Rehabilitation Of Level II WWS	Cansayong	2,000,000
Surigao Del Norte	Malimono	Improvement/Rehabilitation Of Level II WWS	Cantapoy	3,000,000
Surigao Del Norte	Malimono	Improvement/Rehabilitation Of Level II WWS	Masgad	3,000,000
			Total	54,500,000
		LWUA (2017-2018)		

		LWUA (2017-2018)		
Province	Municipality/WD	Project Type	Status	Amount (PhP)
Agusan Del Sur	San Francisco	Septage treatment	Pending approval	60,000,000
Agusan Del Sur	Prosperidad	Water system improvement	Approved	5,000,000
Surigao Del Sur	Bislig City	Construction/Rehabilitation	Pending approval	210,000,000
Surigao Del Sur	Carmen	Expansion/Improvement	Pending approval	50,000,000
			Тс	otal 325,000,000

80°0.000′W

+

160°0.000′W

+

20°0.000'N

80<u>00.0</u>0'S

Appendix A: Provincial and HUC Profiles

	2	
	10 municipalities	Buenavista, Carmen, Jabonga, Kitcharao, Las Nieves, Magallanes, Nasipit, Romualdo T. Romualdez, Santiago, Tubay
	one (1) component city	Cabadbaran City
OFFICIAL SEAL	one (1) highly urbanized city	Butuan City
AGUSAN DEL NORTE	253 barangays (excluding Butuan City)	48 urban, 205 rural
Land Area	3,546.9 square kilometers	
Demographics (2015)	Population (2015) – 354,503 Population Growth Rate (2000 to 2015 Population Density – 130 per sq. km	5) – 1.43
Economy	 Major industries - agriculture, fisher Major products - livestock such as lumber Major crops - rice, corn, coconut, b 	ry, forestry, mining and quarrying chicken and goat; saw log/veneer, pulp wood, anana, mango
Poverty Incidence (2015)	On Families – 28.1% On Population – 34.9%	2
WIND W AGUS AND AGUS	13 municipalities	Bunawan, Esperanza, La Paz, Loreto, Prosperidad, Rosario, San Francisco, San Luis, Santa Josefa, Sibagat, Talacogon, Trento, Veruela
* SAGISAC *	one (1) component city	Bayugan City
AGUSAN DEL SUR	314 barangays	31 urban, 283 rural
Land Area	9,989.5 square kilometers	
Demographics (2015)	Population (2015) – 700,653 Population Growth Rate (2000 to 2015 Population Density – 70 per sq. km	5) - 1.49
Economy	 Major industries - agriculture, fores Major products - palm oil, handicra Major crops - rice, corn, fruits Agusan del Sur is known as the "La rich natural resources – agricultura marshland. 	try, tourism fts and of Golden Opportunities" because of its I land, forests, waterfalls, mountains,
Poverty Incidence (2015)	On Families – 37% On Population – 47.3%	S. S.

7 municipalities

Basilisa, Cagdianao, Dinagat, Libjo, Loreto, San Jose, and Tubajon

DINAGAT ISLANDS	100 barangays 3 urban, 97 rurah
Land Area	1,036.3 square kilometers
Demographics (2015)	Population (2015) – 127,152 Population Growth Rate (2000 to 2015) – 1.14 Population Density – 123 per sq. km
Economy	 Major industries - agriculture, mining, aquaculture Major products - minerals such as chromite, gold, aluminous and neckeliferrous laterite; seafood Major crops - coconut, rice, root crops, fruits, vegetables, corn The province of Dinagat Islands is dubbed as the "Mystical Island Province of Love" as most of its natural wonders are unexplored and unspoiled.

48

160°0.000'E

W`000.0°0

L60°0.000'W

+

+

OF SURIGAD OF NORTH	20 municipalities	Alegria, Bacuag, Burgos, Claver, Dapa, Del Carmen, General Luna, Gigaquit, Mainit, Malimono, Pilar, Placer, San Benito, San Francisco (Anao-Aon), San Isidro, Santa Monica (Sapao), Sison, Socorro, Tagana- an, and Tubod
SURIGAO DEL	one (1) component city	Surigao City
NORTE	335 barangays	12 urban, 323 rural
Land Area	1,972.9 square kilometers	
Demographics (2015)	Population (2015) – 485,088 Population Growth Rate (2000 to 2015 Population Density – 246 per sq. km	i) — 1.71
Economy	 Major industries - agriculture, fisher Major products - handicrafts, ceram local delicacies such as <i>sayong-say</i> Major crops - rice, banana, coconut Surigao del Norte hosts the popula country's surfing capital. 	ry, mining, tourism nics, minerals such as chromite and copper; <i>yong</i> and <i>Gigaquit</i> rhum t r Siargao Island, often known to be the
Poverty Incidence (2015)	On Families – 26.7% On Population – 33.7%	
CL OL JURICAD DR. JURICAD	17 municipalities	Barobo, Bayabas, Cagwait, Cantilan, Carmen, Carrascal, Cortes, Hinatuan, Lanuza, Lianga, Lingig, Madrid, Marihatag, San Agustin, San Miguel, Tagbina, and Tago
SUBIGAO DEL	two (2) component cities	Bislig City Tandag City
SUR	309 barangays	19 urban, 290 rural
Land Area	4,932.7 square kilometers	
Demographics (2015)	Population (2015) – 592,250 Population Growth Rate (2000 to 2015 Population Density – 120 per sq. km) – 1.09
Economy	 Major industries - agriculture, minin Major products - minerals such as a sea by-products Major crops - rice, banana, tropical The Hinatuan Enchanted River, als Surigao del Sur. 	g, aquaculture copper, gold and silver; seafood and other fruits o called Hinatuan Sacred River, is found in
Poverty Incidence (2015)	On Families – 32% On Population – 40.1%	

BUTUAN CITY	Butuan City is the commercial, industrial, and administrative center of Caraga.
	86 barangays 27 urban, 59 rural
Land Area	816.6 square kilometers
Demographics (2015)	Population (2015) – 337,063 Population Growth Rate (2000 to 2015) – 1.53 Population Density – 413 per sq. km
Economy	 Major industries - agriculture, forestry, fishery, banking Major products - seafood such as shrimp and milkfish; poultry, local delicacies such as <i>palagsing</i> Major crops - rice, banana, coconut

20°0.000'N

80°0.000/S

160°0.000′W

NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY

12 St. Josemaria Escriva Drive, Ortigas Center, Pasig City Trunkline: (+632) 86310945 to 56 Email: info@neda.gov.ph

www.neda.gov.ph
fy NEDAhq

