NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY

Volume 2: Philippine Water Supply and Sanitation Master Plan

Northern Mindanao Water Supply and Sanitation Databook and Regional Roadmap

Table of Contents

List of Tables

List of Figures

Acronyms

AHFF	Agriculture, Hunting, Forestry and Fishing
AIP	Annual Investment Plan
AM	Assistance to Municipalities
BOD	Biological Oxygen Demand
BWSA	Barangay Water and Sanitation Association
CapEx	Capital Expenditure
CBO	Community-Based Organization
DA	Department of Agriculture
DAO	Department Administrative Order
DENR	Department of Environment and Natural Resources
DILG	Department of the Interior and Local Government
DJF	December, January and February
DOH	Department of Health
DPWH	Department of Public Works and Highways
DTI	Department of Trade and Industry
ECC	Environmental Compliance Certificate
EMB	Environmental Management Bureau
FA	Financial Assistance
FAO	Food and Agriculture Organization
FHSIS	Field Health Services Information System
FIES	Family Income and Expenditure Survey
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
GVA	Gross Value Added
HH	Household
HUC	Highly Urbanized City
IEC	Information, Education and Communication
IP	Indigenous People
IPRA	Indigenous Peoples' Rights Act
IWRM	Integrated Water Resource Management
JICA	Japan International Cooperation Agency
JJA	June, July and August
LCE	Local Chief Executive
LDP	Local Development Plan
LFPR	Labor Force Participation Rate
LGU	Local Government Unit
LSSP	Local Sustainable Sanitation Plan
LWSSP	Local Water Supply and Sanitation Plan
LWUA	Local Water Utilities Administration
M&E	Monitoring and Evaluation
MAM	March, April and May
MDG	Millenium Development Goals
MGB	Mines and Geosciences Bureau
NAMRIA	National Mapping and Resource Information Authority
NCR	National Capital Region
NDRRMC	National Disaster Risk Reduction Management Council
NEDA	National Economic and Development Authority
NGO	Nongovernment Organization
NRW	Nonrevenue Water
NSSMP	National Septage and Sewerage Master Plan
NWRB	National Water Resources Board
O&M	Operation and Management
OBS	Observed Baseline

OCD	Office of Civil Defense
OD	Open Defecation
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAWD	Philippine Association of Water Districts
PDP	Philippine Development Plan
PEM	Philippine Environment Monitor
PNSDW	Philippine National Standards for Drinking Water
PSA	Philippine Statistics Authority
PSGC	Philippine Standard Geographic Code
PWSSMP	Philippine Water Supply and Sanitation Master Plan
RBCO	River Basin Control Office
RDC	Regional Development Council
RDP	Regional Development Plan
ROW	Right-of-Way
RWSA	Rural Waterworks and Sanitation Association
RWS	Rural Water System
SALINTUBIG	Sagana at Ligtas na Tubig
SDG	Sustainable Development Goals
SON	September, October and November
STP	Septage Treatment Plant
SWTP	Surface Water Treatment Plant
TC	Tropical Cyclone
TSS	Total Suspended Solids
UN	United Nations
UNICEF	United Nations Children's Fund
UTM	Universal Transverse Mercator
WASH	Water, Sanitation and Hygiene
WD	Water District
WHO	World Health Organization
WQMA	Water Quality Management Area
WRR	Water Resources Region
WSP	Water Service Provider
WSS	Water Supply and Sanitation
WSSPMO	Water Supply and Sanitation Program Management Office
ZOD	Zero Open Defecation

Units

%	percent
°C	degree Celsius
CY	Calendar Year
km²	square kilometer
km	kilometer
lpcd	liters per capita per day
lps	liters per second
m³	cubic meter
MCM	million cubic meters
mm	millimeter
mg/L	milligrams per liter
PhP	Philippine peso

120°0.000'W

160°0.000'E

20°0.000'S

80°0.000'S

0°0.000'

80°0.000'N

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Region X
Northern Mindanao

11

Introduction

Northern Mindanao Region

The Northern Mindanao Region is situated in the northcentral section of Mindanao Island.

It is bounded on the north by the Mindanao Sea, on the south by Regions XI (Southern Mindanao) and XII (SOCCSKSARGEN), on the west by Western Mindanao, and on the east by Region XIII (Caraga Region).

The region comprises five provinces namely, Bukidnon, Camiguin, Lanao del Norte, Misamis Occidental and Misamis Oriental. It has two highly urbanized cities (HUCs): Cagayan de Oro City and Iligan City.

With its strategic location, Northern Mindanao has a competitively major advantage compared to all the other regions in Mindanao. It is practically typhoon-free and physically linked to the other regions in the island through a network of roads.

Moreover, it is the best jump-off point for trade with both Luzon and the Visayas, and the international market as well because of its deep-water harbor.

The region also hosts notably improved port facilities such as the Mindanao Container Terminal (MCT), the only containerized port in Mindanao. It also boasts the Laguindingan Airport, the first international airport in the region, making it a major gateway to southern Philippines.

The region also has enormous agriculture potential because of its vast tracts of agricultural land highly suited for growing many crops, especially in Bukidnon and Lanao del Norte.[1]

Land Classification

The region has a total land area of 20,496 square kilometers (km^2) representing around 7% of the country's total land area and 21% of Mindanao. Approximately 53% of its land area is forestland, and 47% is alienable and disposable land.

About 46% of the land is allocated for crop production, while the remaining 1% is classified as built-up areas and settlements.[2]

Economy

The economy of Northern Mindanao is predominantly services-based, contributing 42.9% to the region's gross regional domestic product (GRDP). The industry, and agriculture, hunting, forestry and fishing (AHFF) sectors are its other major economic drivers. (see Figure 1)

The region's domestic sales reached around PhP283 million in 2015. In terms of its share in the country's economy, it had the seventh biggest regional economy in 2015.[3]

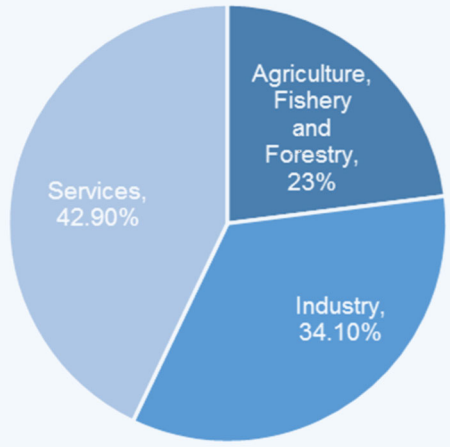


Figure 1: GRDP Contributions per Sector, 2016

Labor and Employment

Region X maintains an impressive employment rate of 95.9%. About 63.6% of those employed are in the service or industry sector while 36.4% work in the agriculture sector.[4]

As of 2016, the labor force participation rate (LFPR) was recorded at 67.2%. The slow increase in the labor force can be attributed to the low labor market participation of women, unemployment of children and youths, inadequate skills and competencies of the labor force, low labor productivity and the lack of employment opportunities.[5]

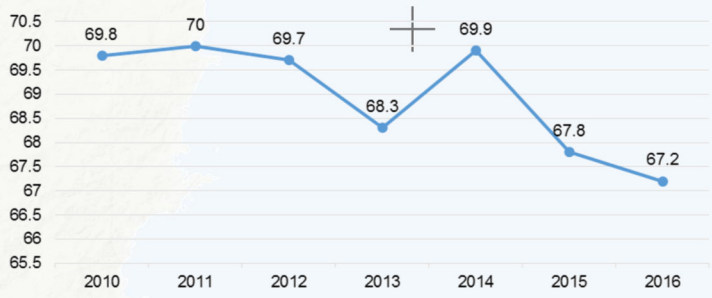


Figure 2: Labor Force Participation Rate

[1] *National Economic and Development Authority, Region X, Regional Development Plan, 2017-2022*
[2] *Ibid.*
[3] *Philippine Statistics Authority, CountryStat Philippines, 2016*
[4] *Ibid.*
[5] *National Economic and Development Authority, Region X, Regional Development Plan, 2017-2022*

20°0.000'

120°0.000'W

160°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

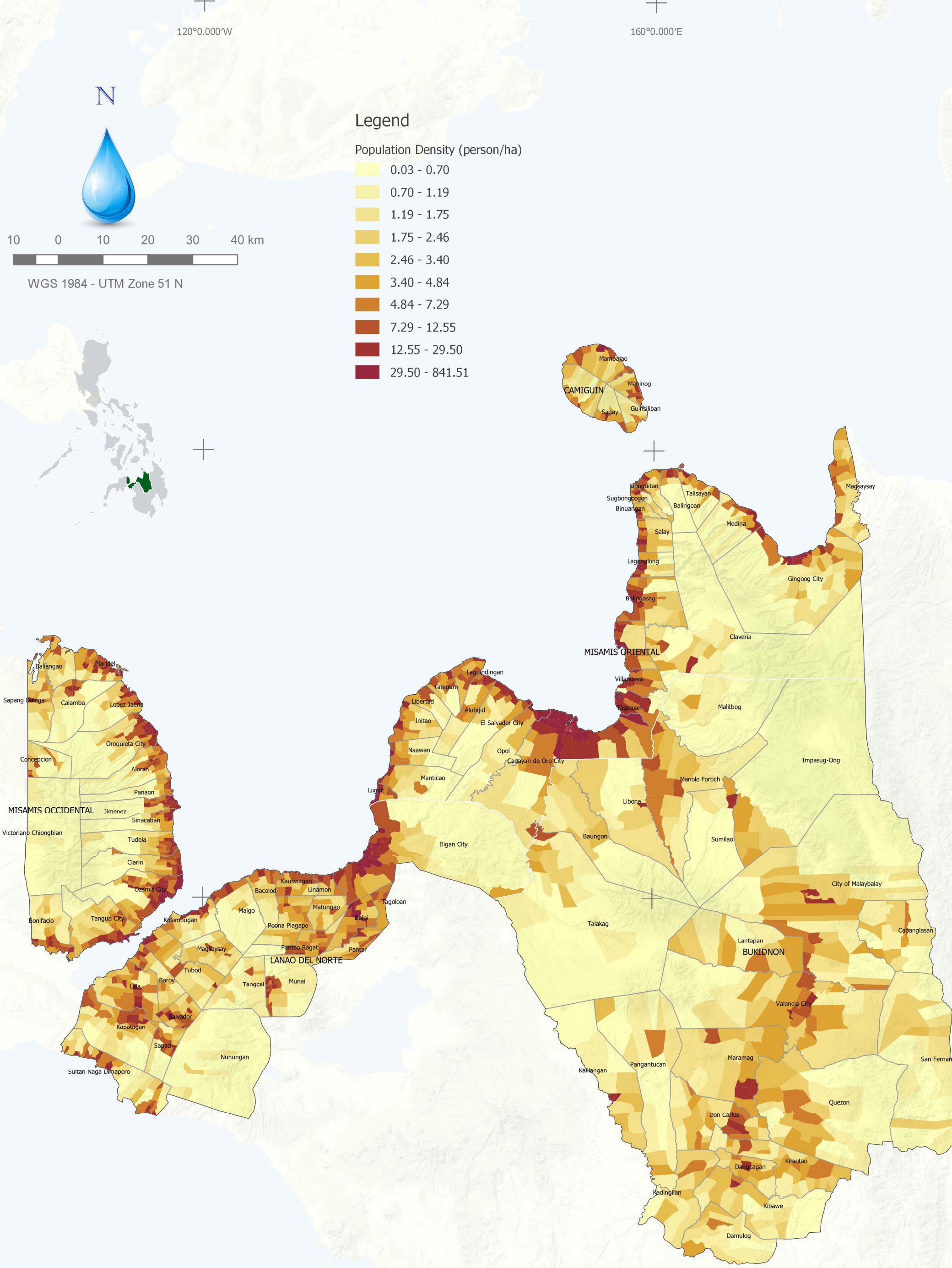
Population Density (person/ha)

- 0.03 - 0.70
- 0.70 - 1.19
- 1.19 - 1.75
- 1.75 - 2.46
- 2.46 - 3.40
- 3.40 - 4.84
- 4.84 - 7.29
- 7.29 - 12.55
- 12.55 - 29.50
- 29.50 - 841.51

80°0.000'S

0°0.000'

80°0.000'N



Population Density

PSA, 2015 Census

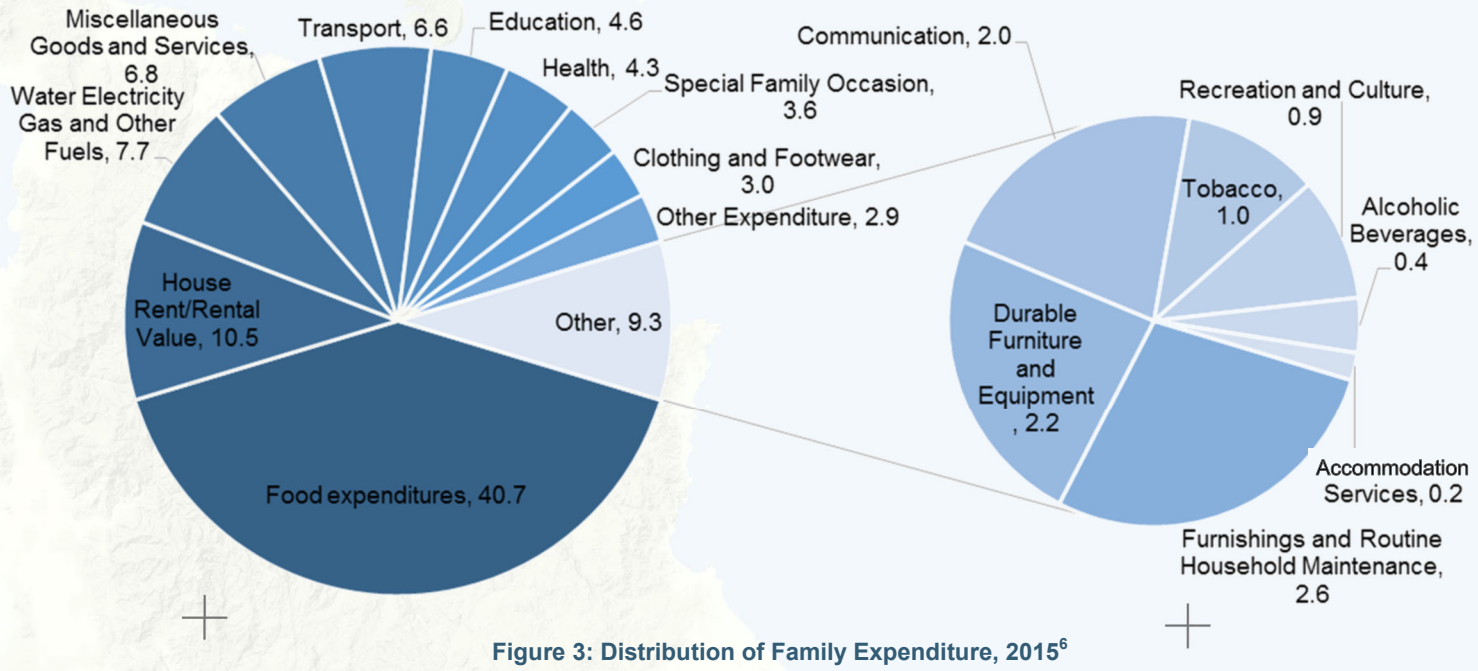


Figure 3: Distribution of Family Expenditure, 2015[6]

Family Income and Expenditure

Northern Mindanao has approximately 1.03 million households (HHs), with an estimated annual average income of PhP221,000 and an annual average expenditure of PhP161,000.

All income classes in the region have average expenditures lower than their average income. With family size as an indicator, a family of five has the largest income-expenditure difference, while a single-person household has the least income-expenditure difference. This shows that the former has more savings 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 expenditure registered the highest among the major expenditure groups at 40.7%. Housing expenses followed at 10.5%, and expenses for water, electricity, gas and other fuels were registered at 7.7%. Figure 3 graphs the expenditure distribution showing that most families spend more for their basic needs.

Demography

The region had a population of 4,677,259, which accounted for 4.6% of the Philippine population in 2015. Bukidnon had the largest population among the five provinces, and Camiguin had the smallest population.

The region's population growth from 2000 to 2015 was recorded at 1.92% — higher than the national average of 1.84%.

The population density of the region averaged 230 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). Among local government units (LGUs), Cagayan de Oro City had the highest density at 1,600 persons/km^2, about eight times larger than the regional figure.

The average household size in the region is 4.5 persons.

The region is predominantly (59%) rural. But the HUCs of Cagayan de Oro and Iligan have an urban population of 93% and 83%, respectively.

Table 1: Population per Province/HUC, 2015

Region/Province/City	2015 Population	Land Area (km^2)	Population Density (Persons/ km^2)
Northern Mindanao	**4,677,259**	**20,496**	**230**
Bukidnon	1,415,226	10,499	130
Camiguin	88,478	238	370
Lanao del Norte	676,395	3,347	200
Misamis Occidental	590,083	2,055	290
Misamis Oriental	888,509	3,132	280
Cagayan de Oro City	675,950	413	1,600
Iligan City	342,618	813	420

Table 2: Urban and Rural Population per Province/HUC, 2015[7]

Region/Province/City	Urban Population	Rural Population
Northern Mindanao	**41%**	**59%**
Bukidnon	42%	58%
Camiguin	17%	83%
Lanao del Norte	11%	89%
Misamis Occidental	15%	85%
Misamis Oriental	27%	73%
Cagayan de Oro City	93%	7%
Iligan City	83%	17%

[6] Philippine Statistics Authority, Family Income and Expenditure Survey, 2015
[7] Philippine Statistics Authority, Philippine Standard Geographic Code, 2015

120°0.000'W

160°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

- Type I - two pronounced season, dry from November to April and wet during the rest of the year. Maximum rain period is from June to September.
- 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 III - no very pronounced maximum rain period with a dry season lasting only from one to three months, either during the period from March to May. This type resembles Type I since it has a short dry season.
- Type IV - rainfall is more or less evenly distributed throughout the year. This type resembles Type 2 since it has no dry season.

20°0.000'N

80°0.000'S

0°0.000'

80°0.000'N

Climate

PAGASA, 2015 Data

Climate

Northern Mindanao has two types of climate: Type III and Type IV. There are no definite dry and wet seasons, and rainfall is evenly distributed throughout the year.

Disaster Risk

According to the Regional Development Plan of Region X, the geographical location, tectonic cut and combination of volcanic features expose Northern Mindanao to geological hazards.

These hazards include volcanic eruption, earthquake, and mass movement. Other local hazards include flooding, tsunami, landslides, erosion, subsidence and salt intrusion.

The region's poor flood control and drainage systems, and heavy siltation in rivers and creeks increase flood hazards, thus further making it vulnerable to various disasters. These were based on preliminary hazard assessments conducted throughout the region from 2004 -2009 in 1,818 barangays (i.e., 90% of the region's 2,022 barangays).

According to data released by the Office of Civil Defense and the National Disaster Risk Reduction and Management Council (NDRRMC), a total of 132 disaster incidents affected a total of 1,100 families between 2010 and 2015. (No one, however, was affected by tropical cyclones [TCs] in 2016.)

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 X based on the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) downscaled climate projections are shown in Tables 3 and 4. 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 3: Seasonal Projections Under a Medium-Range Emission Scenario

Seasonal Temperature Increase (in °C)	Observed Baseline (1971-2000)				Change in 2020 (2006-2035)				Change in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Bukidnon	25.1	26.5	25.8	25.7	1	1.2	1.2	1	1.9	2.3	2.4	2.1
Lanao del Norte	24.4	25.5	25.4	25.2	1	1.1	1	1	1.9	2.2	2.1	1.9
Misamis Occidental	25.6	26.7	26.6	26.4	1	1.1	1.1	1	1.9	2.2	2.2	1.9
Misamis Oriental	25.4	26.8	26.9	26.9	1	1.2	1.2	1	1.9	2	2.4	2
Seasonal Rainfall Change (in %)	**Observed Baseline (1971-2000)**				**Change in 2020 (2006-2035)**				**Change in 2050 (2036-2065)**			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Bukidnon	329.7	335.6	653.8	559.5	2.9	-10.3	-4.4	-0.3	-5.1	-13	-9.7	-5.8
Lanao del Norte	337.5	350.3	662.5	621.1	9.6	-0.6	-2.2	6.9	2.5	-1.9	1.4	7.1
Misamis Occidental	392.1	323.4	633.1	728.3	9.1	1.4	-6.1	6.1	5.2	0.3	-5.1	4.6
Misamis Oriental	442.5	269	615.7	581.1	4.6	-10.4	-3.7	2.9	1.8	-17.8	-5.2	-0.1

Table 4: Frequency of Extreme Events in 2020 and 2050 Under a Medium-Range Emission Scenario

Province	Station	No. of Days w/ T_{max} > 35°C			No. of Dry Days			No. of Days w/ Rainfall > 300 mm		
		OBS	2020	2050	OBS	2020	2050	OBS	2020	2050
Bukidnon	Malaybalay	26	477	1441	6537	3977	4461	0	1	1
Lanao del Norte	Dipolog	217	2155	4004	7481	5384	5470	0	5	2
Misamis Oriental	Cagayan de Oro	383	4539	6180	8251	6413	7060	0	2	0
Misamis Oriental	Lumbia	106	2012	3759	6495	6290	6580	0	4	1

120°0.000'W

160°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

CAMIGUIN

MISAMIS ORIENTAL

MISAMIS OCCIDENTAL

LANAO DEL NORTE

BUKIDNON

Contour Map

NAMRIA

12

120°0.000'W

160°0.000'E

120°0.000'W

160°0.000'E

20°0.000'N

80°0.000'S

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Average Rainfall

PAGASA, 2015 Data

Legend

Annual Rainfall 2015

Camiguin
Mambajao
Mahinog
Catarman
Sagay
Guinsiliban

Misamis Oriental
Kinoguitan
Talisayan
Magsaysay
Balingoan
Medina
Salay
Lagonglong
Gingoog City
Balingasag
Claveria
Laguindingan
Gitagum
Libertad
Initao
Alubijid
El Salvador City
Villanueva
Tagoloan
Malitbog
Opol
Naawan
Manticao
Cagayan de Oro City
Impasug-Ong
Manolo Fortich
Libona
Baungon
Sumilao
Iligan City
City of Malaybalay
Talakag
Bukidnon
Cabanglasan
Valencia City
Maramag
San Fernando
Pangantucan
Quezon
Don Carlos
Kitaotao
Kadingilan
Kibawe
Damulog

Lanao del Norte
Bacolod
Linamon
Ozamis City
Tangub City
Bonifacio
Maigo
Baloi
Tagoloan
Magsaysay
Pantao Ragat
Baroy
Tubod
Lala
Tangcal
Munai
Kapatagan
Salvador
Sapad
Nunungan
Sultan Naga Dimaporo

Occidental
Sinacaban
Tudela
Clarin
Panaon
Oroquieta City
Lopez Jaena
Calamba
Plaridel
Baliangao

1500
1000
500
2000

120°0.000'W

160°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

80°0.000'N

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

Safe Drinking Water (%)

- 1-77
- 78-89
- 90-95
- 96-98
- 98-100

Mambajao
Mahinog
CAMIGUIN
Guinsiliban
Sagay

Kinoguitan
Sugbongcogon
Binuangan
Talisayan
Balingoan
Magsaysay
Medina
Salay
Lagonglong
Gingoog City
Balingasag
Claveria
MISAMIS ORIENTAL
Villanueva
Tagoloan
Malitbog
Impasug-Ong
Manolo Fortich
Libona
Baungon
Sumilao
City of Malaybalay
Talakag
Lantapan
BUKIDNON
Cabanglasan
Valencia City
Maramag
San Fernando
Kalilangan
Pangantucan
Quezon
Don Carlos
Kitaotao
Dangcagan
Kadingilan
Kibawe
Damulog

Laguindingan
Gitagum
Libertad
Alubijid
Initao
El Salvador City
Naawan
Opol
Cagayan de Oro City
Manticao
Lugait
Iligan City

Baliangao
Plaridel
Sapang Dalaga
Calamba
Lopez Jaena
Oroquieta City
Concepcion
Aloran
Panaon
MISAMIS OCCIDENTAL
Jimenez
Sinacaban
Don Victoriano Chiongbian
Tudela
Clarin
Ozamis City
Bonifacio
Tangub City
Kolambugan
Kauswagan
Bacolod
Linamon
Maigo
Matungao
Poona Piagapo
Baloi
Tagoloan
Magsaysay
Pantao Ragat
Pantar
LANAO DEL NORTE
Tubod
Baroy
Lala
Tangcal
Munai
Salvador
Kapatagan
Sapad
Nunungan
Sultan Naga Dimaporo

Access to Safe Drinking Water

PSA, 2015 Census

WSS Sector Status

Access to Safe Water

Approximately 90% of Northern Mindanao's population had access to safe water sources 2015.[8]

This figure translates to approximately 923,000 HHs. Approximately 47% of the population has Level III service connection at home, and 18% has Level II connection which the households share with the community. More than 24% of the population has access to Level I service (safe sources).

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 2%. Regarding access per level of service, Region X's numbers do not differ significantly with the national figures, having variances of around 2%-6%. Level III access, in particular, is higher at 47.5% than the national percentage (44.1%).

Table 5: National and Regional Access to Water Supply[9]

Level of Service	National	Region X
Level III	44.1%	47.5%
Level II	11.2%	17.8%
Level I (Safe Sources)	32.4%	24.3%
Subtotal (Safe Sources)	*87.7%*	*89.6%*
Level I (Unsafe Sources)	12.3%	10.4%
Total	100.0%	100.0%

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

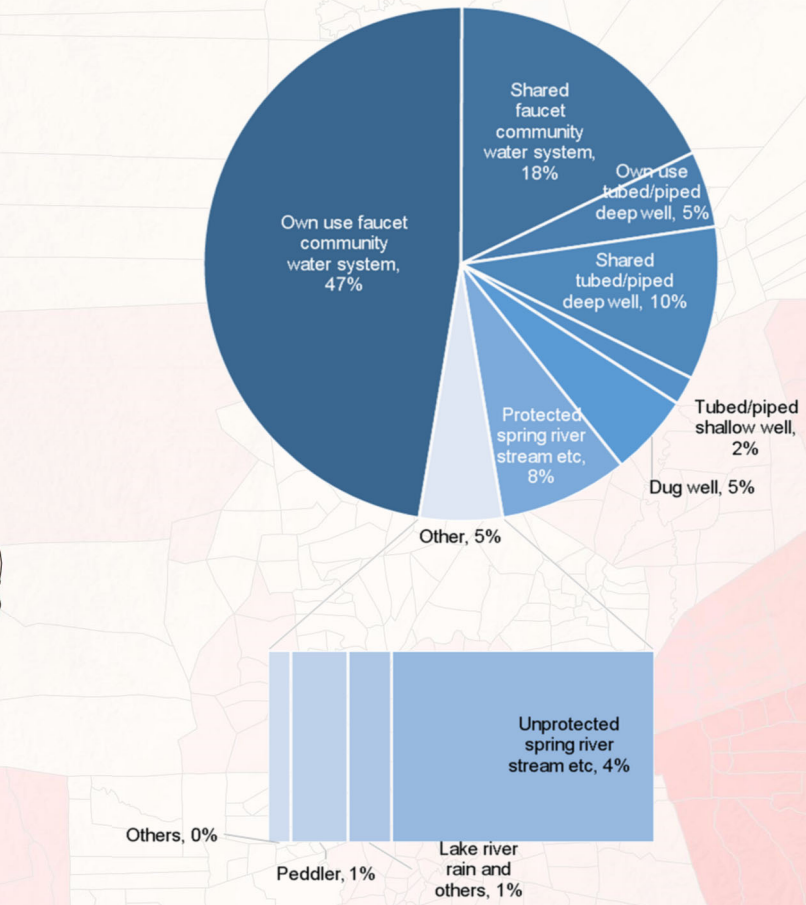


Figure 4: Main Sources of Water Supply, 2015

Table 6 shows safe water access in 2015 at the provincial level.

Table 6: Access to Water Supply per Province/HUC

Region/Province/City	Access to Safe Water Supply
Northern Mindanao	**94.45%**
Bukidnon	99.9%
Camiguin	100.0%
Lanao del Norte	48.1%
Misamis Occidental	98.0%
Misamis Oriental	96.0%
Cagayan de Oro City	100.0%
Iligan City	57.6%

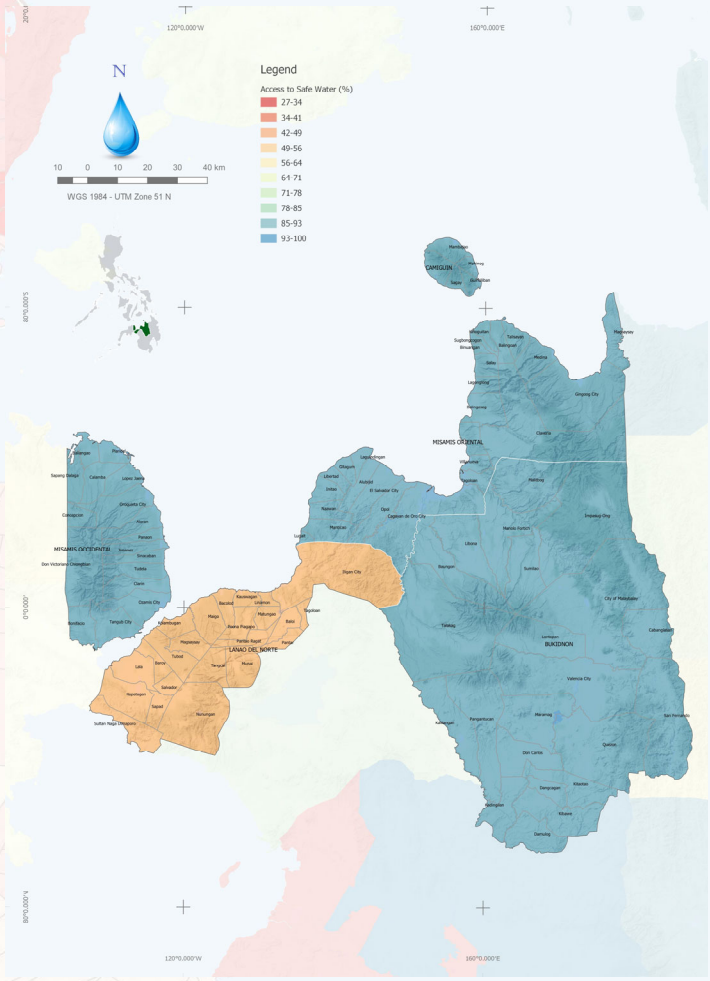


Figure 5: Provincial Access to Safe Water

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.

As of 2015, approximately 91% of Region X drank water from sources considered "improved" and "safe". About 15% drank bottled water — half the percentage of HHs (31%) drinking from their own faucets.

Lanao del Norte has the lowest access to safe drinking water at 85%, followed by Bukidnon at 89%. In contrast, Camiguin's households have the highest access to safe drinking water: 100%.

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

[8] Philippine Statistics Authority, Family Income and Expenditure Survey, 2015
[9] Ibid.
[10] Based on Region X provinces' firsthand data on access to safe water as gathered during the regional planning and consultation workshop

120°0.000'W

160°0.000'E

20°0.000'S

80°0.000'S

0°0.000'

80°0.000'N

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

Sanitation Access (%)

- 16-25
- 25-33
- 33-41
- 41-50
- 50-58
- 58-67
- 67-75
- 75-83
- 83-92
- 92-100

Mambajao
CAMIGUIN
Mahinog
Sagay
Guinsiliban

Kinoguitan
Sugbongcogon
Binuangan
Talisayan
Balingoan
Medina
Salay
Lagonglong
Magsaysay
Gingoog City
Balingasag
Claveria
MISAMIS ORIENTAL
Villanueva
Tagoloan
Malitbog
Impasug-Ong
Manolo Fortich
Libona
Baungon
Sumilao
City of Malaybalay
Talakag
Cabanglasan
Lantapan
BUKIDNON
Valencia City
Maramag
San Fernando
Kalilangan
Pangantucan
Quezon
Don Carlos
Dangcagan
Kitaotao
Kadingilan
Kibawe
Damulog

Laguindingan
Gitagum
Libertad
Alubijid
Initao
El Salvador City
Naawan
Opol
Cagayan de Oro City
Manticao
Lugait
Iligan City

Baliangao
Plaridel
Sapang Dalaga
Calamba
Lopez Jaena
Oroquieta City
Concepcion
Aloran
Panaon
MISAMIS OCCIDENTAL
Jimenez
Sinacaban
Don Victoriano Chiongbian
Tudela
Clarin
Ozamis City
Bonifacio
Tangub City

Kauswagan
Bacolod
Linamon
Maigo
Matungao
Tagoloan
Kolambugan
Poona Piagapo
Baloi
Magsaysay
Pantao Ragat
Pantar
LANAO DEL NORTE
Tubod
Baroy
Lala
Tangcal
Munai
Salvador
Kapatagan
Sapad
Nunungan
Sultan Naga Dimaporo

Access to Sanitation

Northern Mindanao Regional Planning and Consultation Workshop, 2017 Data

Access to Sanitation

The growth of Northern Mindanao's economy was principally driven by the flourishing business enterprises in the cities of Cagayan de Oro and Iligan. This, in turn as a matter of course, increased the demand for sanitation services.

Approximately 80% of the region's population has access to improved sanitation.

The 2015 FIES has reported that Northern Mindanao posted figures higher than the national average in terms of improved sanitation and lower figures with regard to basic sanitation. (see Table 7)

At 1.52%, the region's open defecation rate is slightly more than a third of the national average. (The open defecation rate is a proxy indicator for the lack of access to toilet facilities.)

Table 7: National and Regional Access to Sanitation[11]

Sanitation Coverage	National	Region X
Improved Sanitation	73.77%	80.08%
Basic Sanitation	19.96%	15.09%
Unimproved Sanitation	2.04%	3.31%
Open Defecation	4.23%	1.52%
Total	**100.0%**	**100.0%**

According to the 2015 Annual Report of the Field Health Services Information System (FHSIS) of the Department of Health (DOH), Camiguin registers the highest access to basic sanitation at 89.33% but which represents only 1.89% of the regional population. Bukidnon, which has the highest population base in the region, has the second to the lowest access to basic sanitation at 72.28%.

Table 8: Access to Sanitation Facilities per Province/HUC[12]

Region/Province/City	HHs with Sanitary Toilets	HHs with Complete Basic Sanitation Facilities
Northern Mindanao	**80.75%**	**61.85%**
Bukidnon	72.28%	42.57%
Camiguin	89.33%	27.41%
Lanao del Norte	66.39%	51.76%
Misamis Occidental	83.75%	69.49%
Misamis Oriental	87.72%	67.63%
Cagayan de Oro City	93.65%	88.00%
Iligan City	75.23%	49.67%

The minor discrepancy between Tables 7 and 8 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 7 reflects the specifics per the SDG's definition. Table 8, 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 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 Sanitation	▪ Open Pit
Open Defecation	▪ Other Means ▪ None

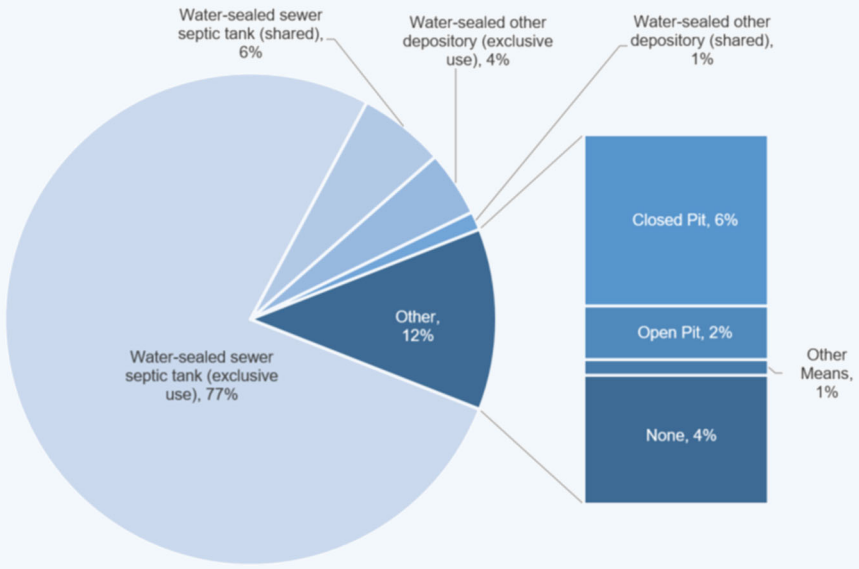


Figure 6: Percentage of Households with Access to Sanitation Facilities

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 Northern Mindanao 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.

Figure 7 shows the location of the only existing septage treatment plant (STP) in Region X.

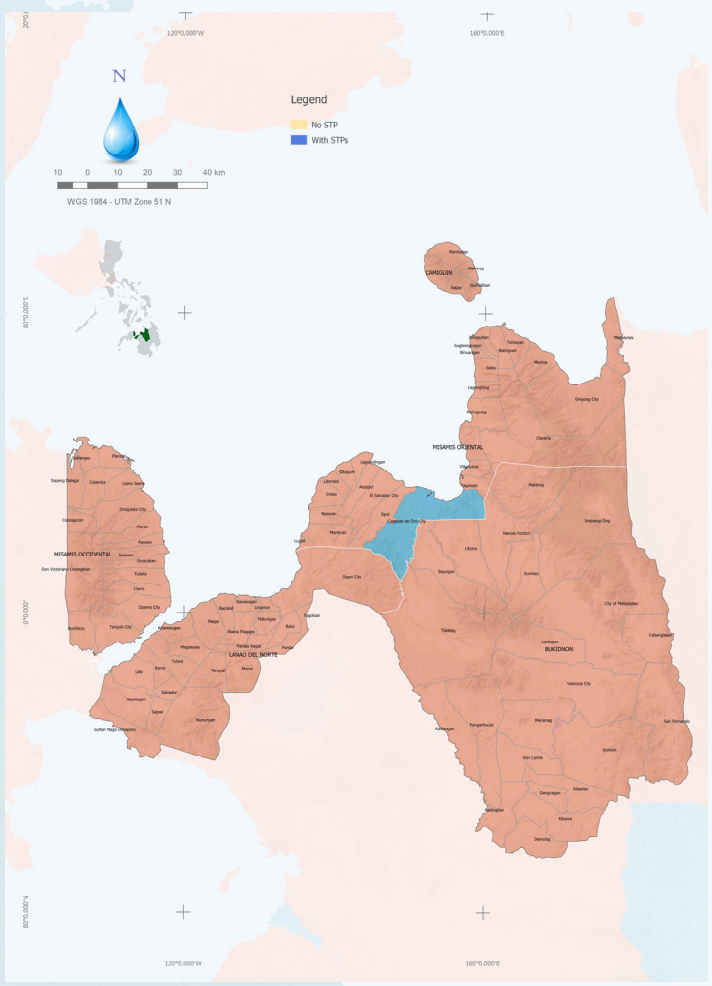


Figure 7: Existing Septage Treatment Facility

[11] Philippine Statistics Authority, Family Income and Expenditure Survey, 2015
[12] Department of Health, FHSIS Annual Report CY 2015 (Region X.doh.gov.ph)

20°0.000'N

120°0.000'W

160°0.000'E

N

Legend

Water Bodies

Major River Basin

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

80°0.000'S

Tagoloan River Basin

Cagayan de Oro River Basin

Agus River Basin

Mindanao River Basin

Davao Rive

0°0.000'

80°0.000'N

Northern Mindanao Rivers and Tributaries

DENR, NWRB, NAMRIA

18

120°0.000'W

160°0.000'E

Water Resources

Northern Mindanao ranks 2nd among all the administrative regions with the most water resources potential.

The region's water resources potential is estimated at 16,859 million cubic meters (MCM)/year, accounting for 11.55% of the country's total.

The water resources potential of an area is divided into groundwater and surface water. Groundwater in the region is estimated at 1,172 MCM/year while surface water is estimated at 15,687 MCM/year. Annual rainfall in the region averages 1,882 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.

Region X straddles two WRRs. Bukidnon, Camiguin, Misamis Occidental and Misamis Oriental are part of WRR 10. Lanao del Norte is covered by WRR 12. (Four other provinces in the Caraga Region form part of WRR 10 namely, Agusan del Norte, Agusan del Sur, Dinagat Islands and Surigao del Norte.)

Surface Water

Northern Mindanao has three major river basins namely: the Cagayan de Oro River Basin, Tagoloan River Basin and Ranao River Basin. Table 9 shows a description and the scope of each river basin.

Table 9: River Basins in Northern Mindanao

Cagayan de Oro River Basin[14]	
Area	1,379 km^2
River Classification	Class A
Scope	
Bukidnon	Region X
Misamis Oriental	Region X
Lanao del Norte	Region X
Iligan City	Region X
Cagayan de Oro City	Region X
Uses	domestic, agricultural, industrial, recreation, artisanal fishery, tourism and energy
Tagoloan River Basin[15]	
Area	1,577 km^2
River Classification	Class A
Scope	
Bukidnon	Region X
Misamis Oriental	Region X
Uses	agricultural and industrial
Ranao (Agus) River Basin[16]	
Area	1,987 km^2
River Classification	Class C
Scope	
Lanao del Norte	Region X
Lanao del Sur	ARMM
Cotabato City	Region XII
Uses	domestic, municipal, agricultural, aquaculture, energy, industrial, recreation, transportation and others

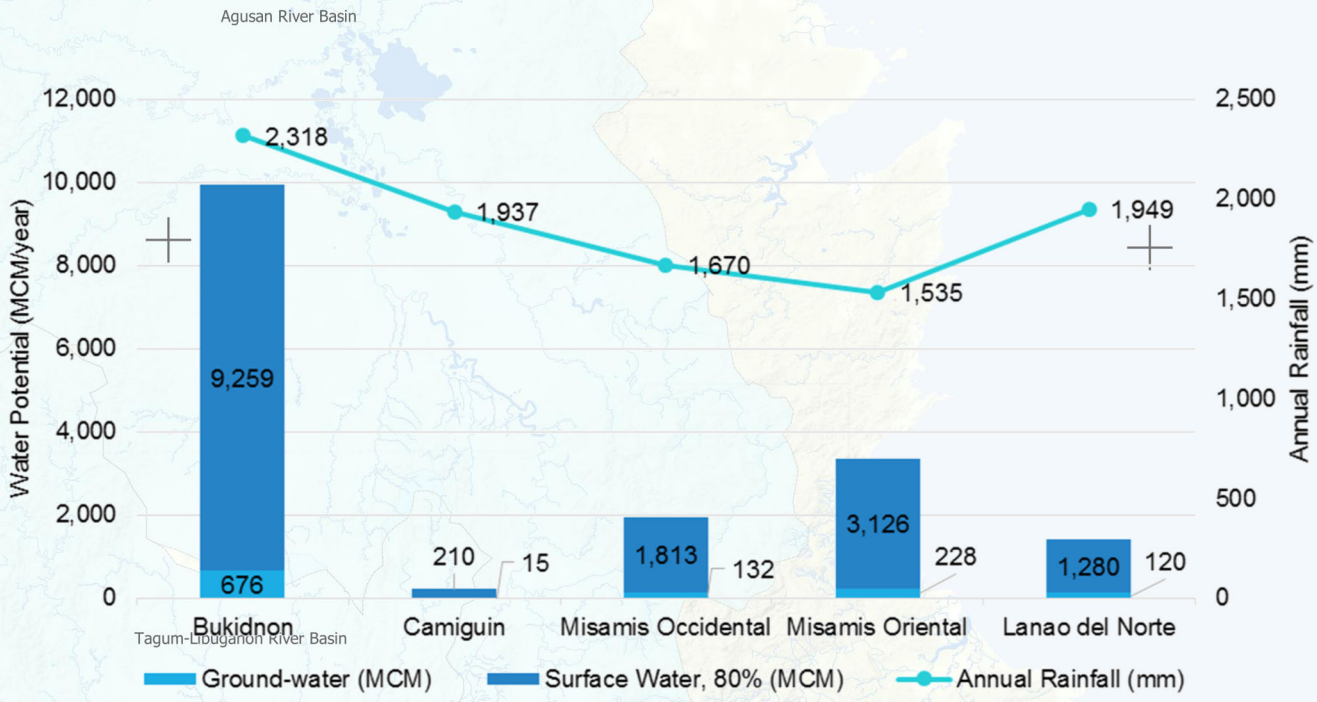


Figure 8: Water Resources Potential and Annual Rainfall[13]

[13] *JICA Master Plan on Water Resources Management in the Philippines, 1998; NWRB; PAGASA Rainfall Data; FAO*
[14] *River Basin Control Office, Cagayan de Oro River Basin Master Plan, 2014*
[15] *River Basin Control Office, Tagoloan River Basin Master Plan, 2014*
[16] *River Basin Control Office, Ranao (Agus) River Basin Master Plan, 2014*

120°0.000'W

160°0.000'E

20°0.000'S

80°0.000'S

0°0.000'

80°0.000'N

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

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

Mambajao
Mahinog
CAMIGUIN
Sagay
Guinsiliban

Kinoguitan
Talisayan
Sugbongcogon
Balingoan
Binuangan
Medina
Salay
Lagonglong
Gingoog City
Balingasag
Claveria
Magsaysay
MISAMIS ORIENTAL
Villanueva
Tagoloan
Malitbog
Impasug-Ong
Manolo Fortich
Libona
Baungon
Sumilao
City of Malaybalay
Talakag
Lantapan
BUKIDNON
Cabanglasan
Valencia City
Pangantucan
Maramag
San Fernando
Kalilangan
Quezon
Don Carlos
Kitaotao
Dangcagan
Kadingilan
Kibawe
Damulog

Laguindingan
Gitagum
Libertad
Alubijid
Initao
El Salvador City
Naawan
Opol
Cagayan de Oro City
Manticao
Lugait
Iligan City

Baliangao
Plaridel
Sapang Dalaga
Calamba
Lopez Jaena
Oroquieta City
Concepcion
Aloran
Panaon
MISAMIS OCCIDENTAL
Jimenez
Sinacaban
Don Victoriano Chiongbian
Tudela
Clarin
Ozamis City
Bonifacio
Tangub City

Kauswagan
Bacolod
Linamon
Tagoloan
Maigo
Matungao
Kolambugan
Poona Piagapo
Baloi
Magsaysay
Pantao Ragat
Pantar
LANAO DEL NORTE
Tubod
Baroy
Lala
Tangcal
Munai
Salvador
Kapatagan
Sapad
Nunungan
Sultan Naga Dimaporo

Groundwater Availability

MGB

20

Table 10: Aquifer Classes Based on MGB Aquifer Types

Aquifer Class	MGB Aquifer Type	Estimated Yields (boreholes unless stated)
Major Aquifer (Highly permeable)	Intergranular: extensive and highly productive	Mostly 50-100 lps
	Fractured: fairly extensive and productive (aquifers with high potential recharge)	3-50 lps, spring yields up to 1000 lps
Minor Aquifer (Variably permeable)	Intergranular: fairly extensive and productive	About 20 lps
	Intergranular: local and less productive	Mostly 2-20 lps
	Fractured: less extensive and productive	Well yields up to 3 lps
Non-aquifer (Negligibly permeable)	Rocks with limited groundwater potential	Yields mostly less than 1 lps
	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).

Most parts of the region, especially Lanao del Norte, are underlain by the major aquifer class. Its central part is predominantly underlain by the minor aquifer class (specifically the local and less productive kind). Its southeastern part, on the other hand, is underlain by non-aquiferous class that have limited groundwater potential.

Water Use

Water use in the region was estimated at 37,154 MCM annually based on awarded water permits as of 2017. Approximately 87% (or 32,355.38 MCM) is allocated for power generation and is categorized under nonconsumptive use. The remaining volume (i.e., 4,798.94 MCM) is allocated for consumptive use (see Figure 9).

The irrigation sector consumes the largest volume of water among all sectors with a 65% allocation. The industrial sector consumes 26% while the domestic sector consumes only 5.7%.

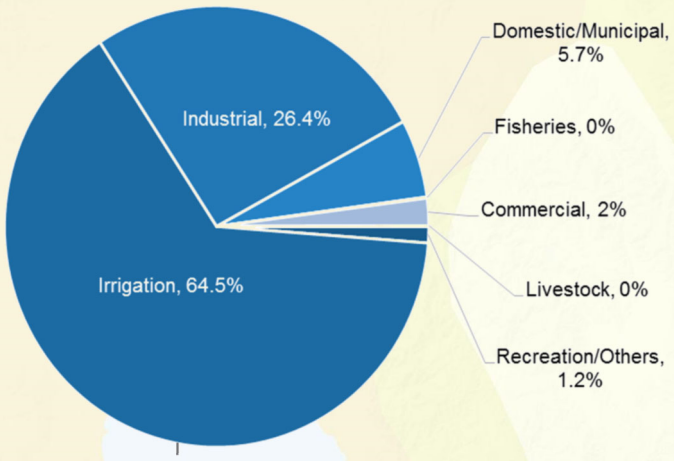


Figure 9: Consumptive Water Use, 2017[17]

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 m^3 per person. When annual water supplies drop below 1,000 m^3 per person, the population faces water scarcity, and below 500 m^3 'absolute scarcity.'" (UN Water, n.d.)[18]

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

Northern Mindanao's per capita water availability is above the threshold, i.e., more than 3,000 m^3/year.

Table 11: Water Availability per Province

Region/Province	Water Availability (m^3/capita/year)
Bukidnon	7,020
Camiguin	2,545
Lanao del Norte	1,374
Misamis Occidental	3,230
Misamis Oriental	2,144
Northern Mindanao	**3,263**

Figure 10 presents the computed figures to highlight the provinces' level of water availability, stress, and scarcity.

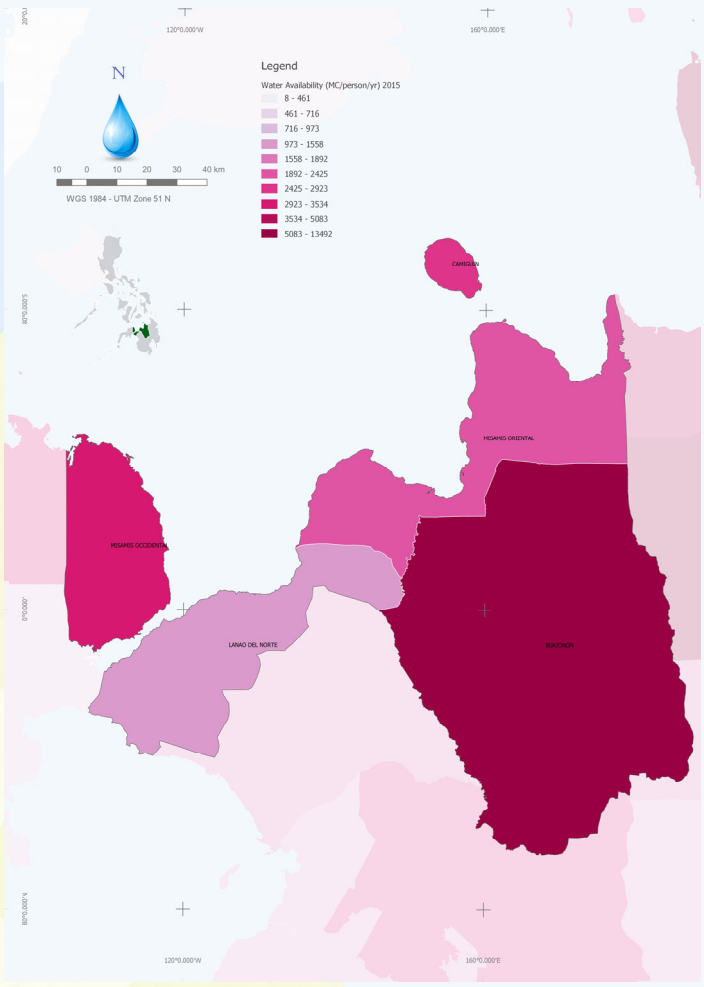


Figure 10: Water Availability Map, 2015

[17] National Water Resources Board's list of water permit grantees, 2017
[18] Managing Water Report under Uncertainty and Risk, UN World Water Development Report 4 (Volume 1)

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 6,803,320 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 258 MCM/year, 299 MCM/year, and 349 MCM/year, respectively.

Water Demand vs. Water Resources Potential

The water demand of the industrial, business and domestic sectors in Northern Mindanao 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 (349 MCM/year) to the water resources potential of the region (16,859 MCM/year), 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.

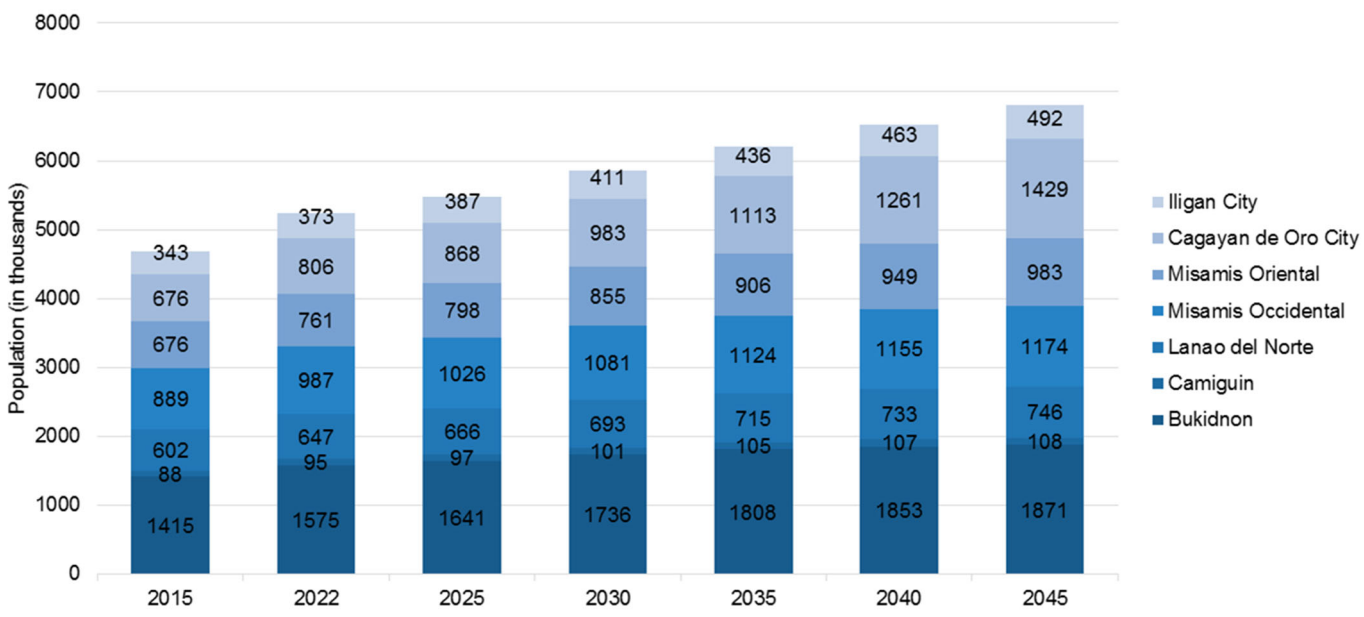


Figure 11: Projected Population

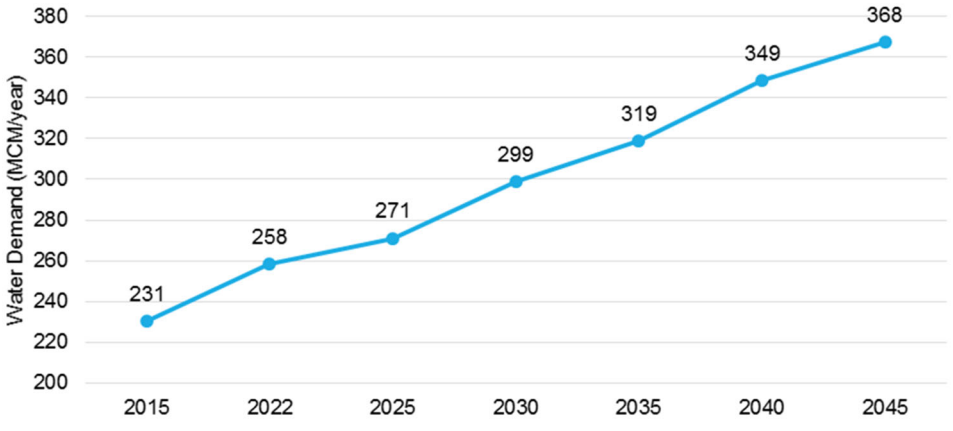
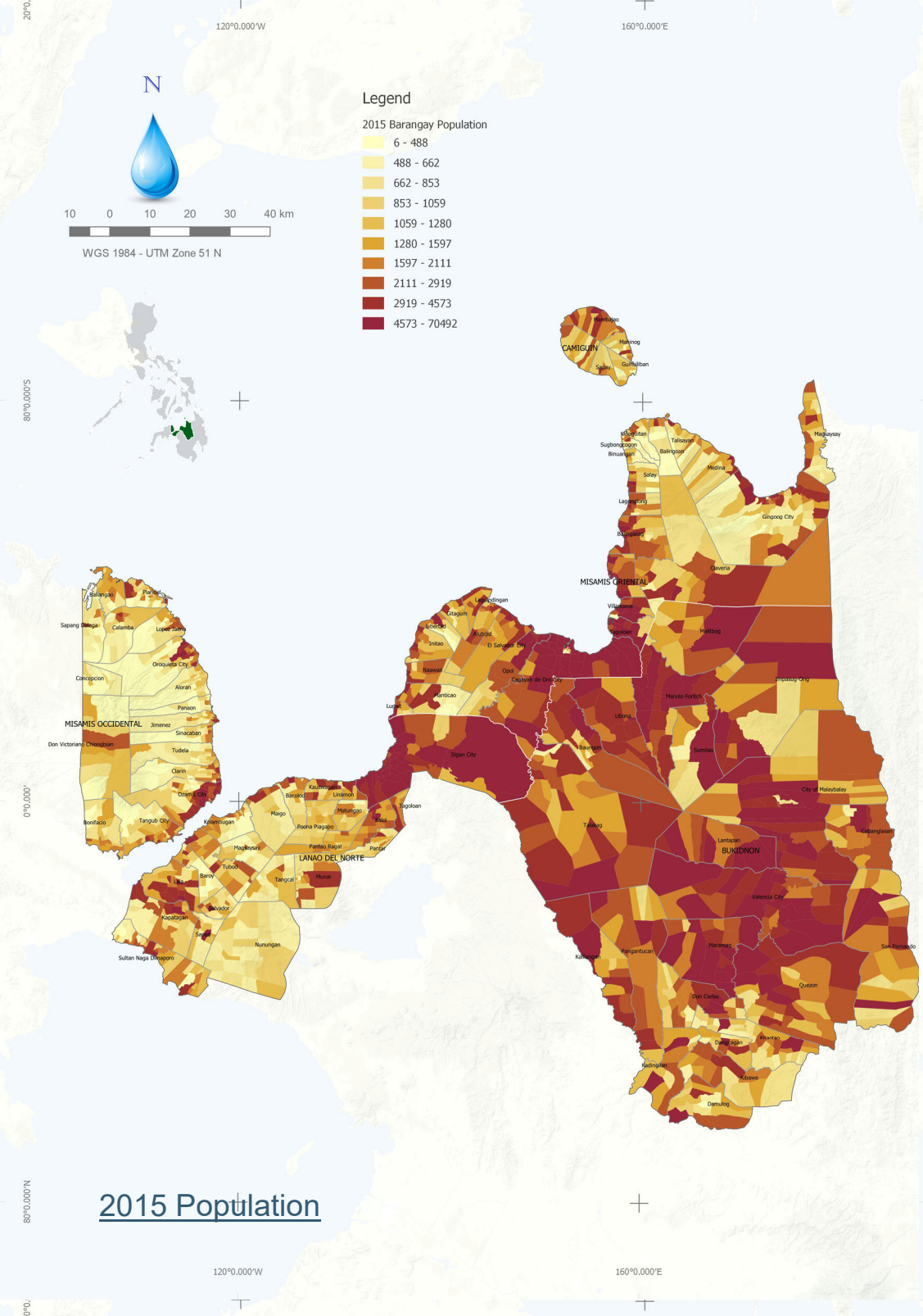
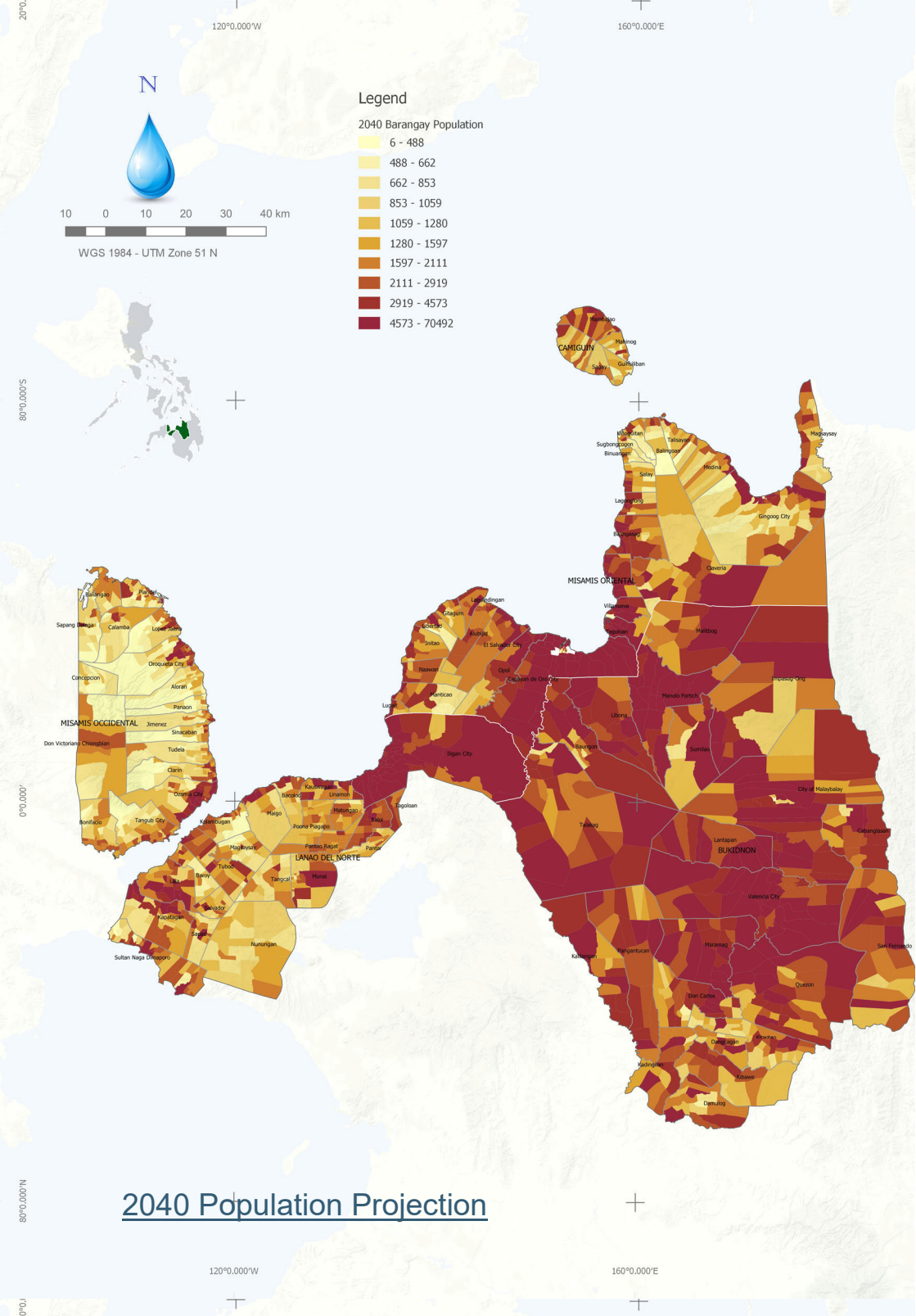


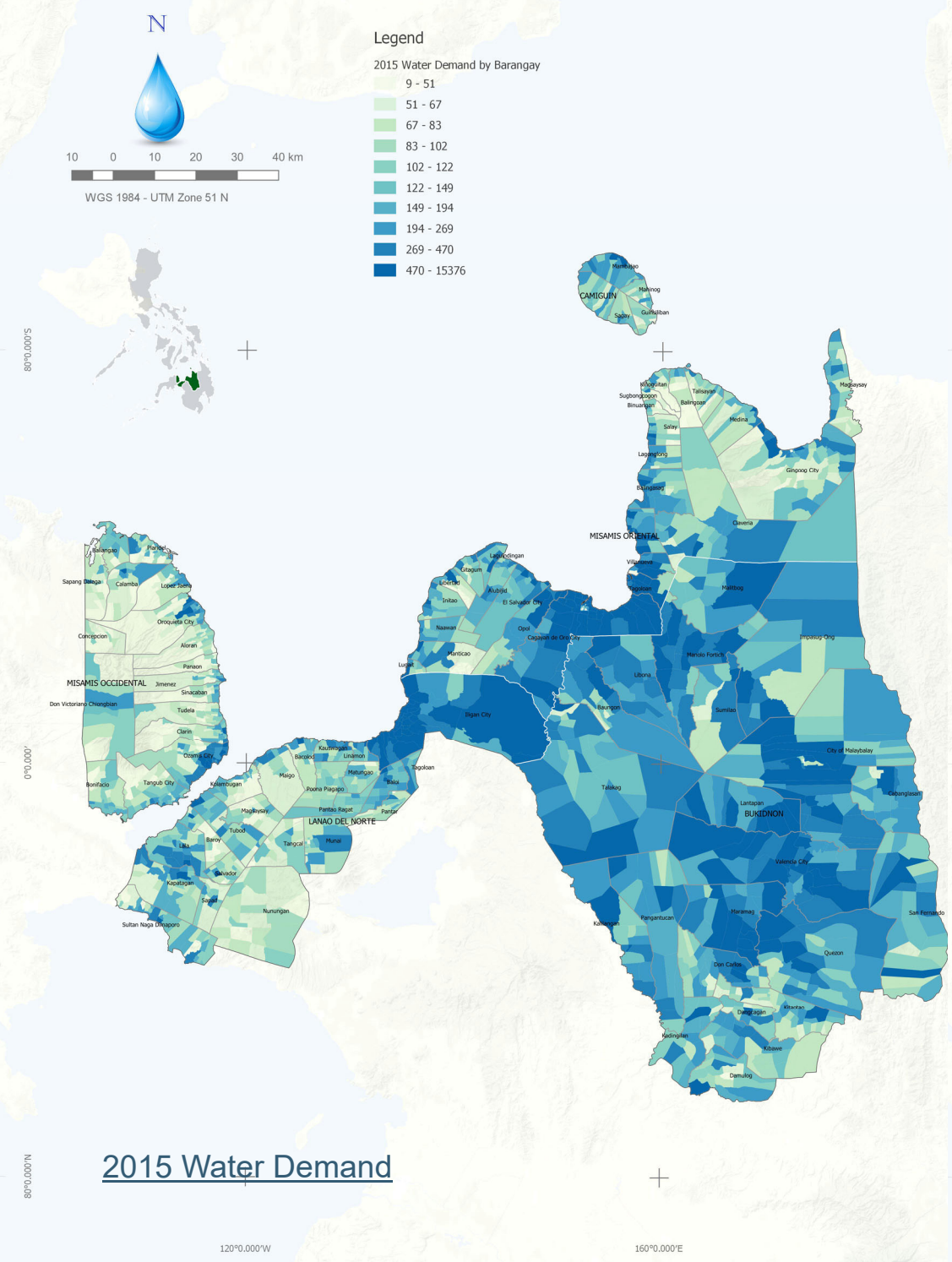
Figure 12: Projected Water Demand



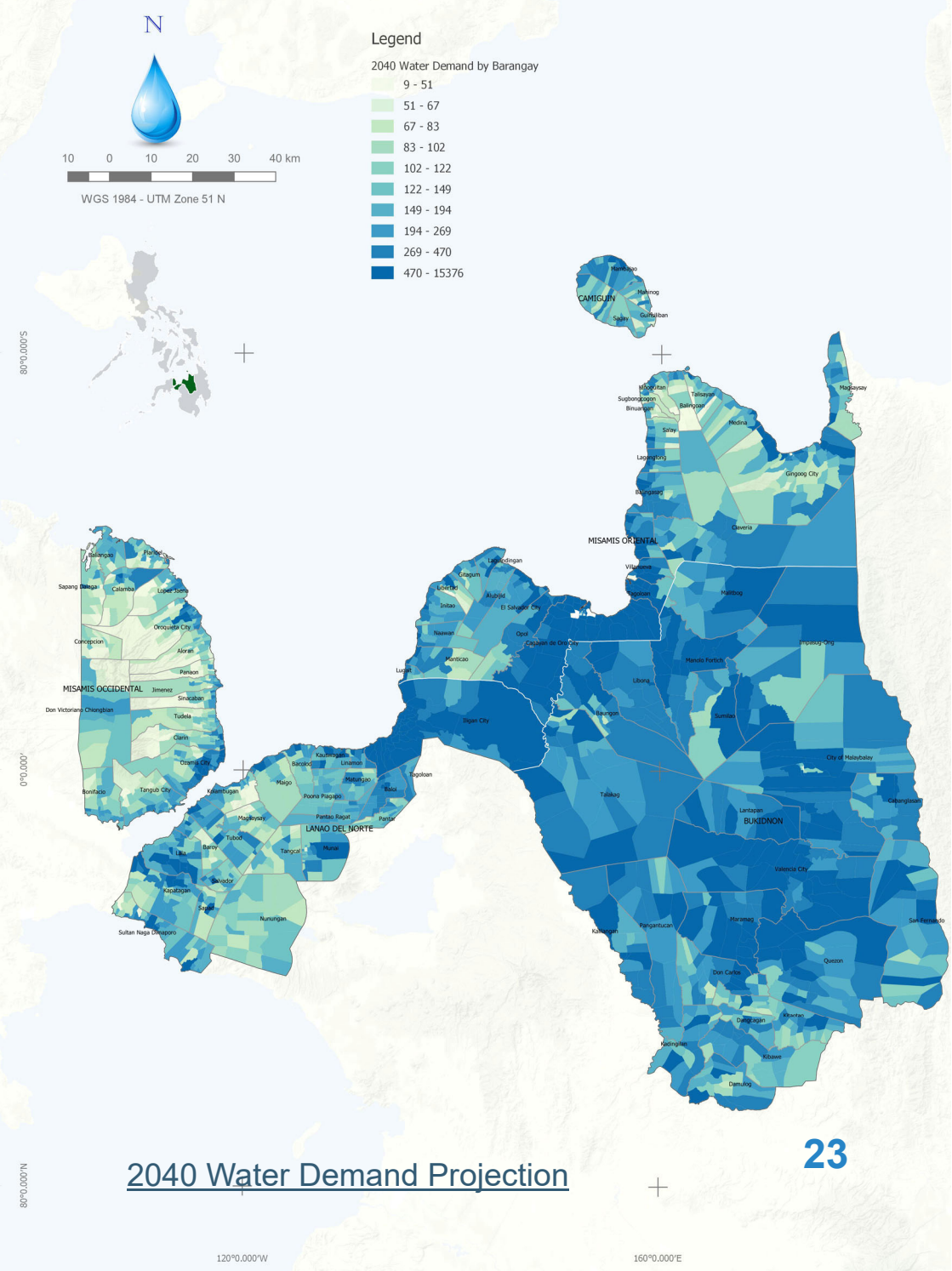
2015 Population



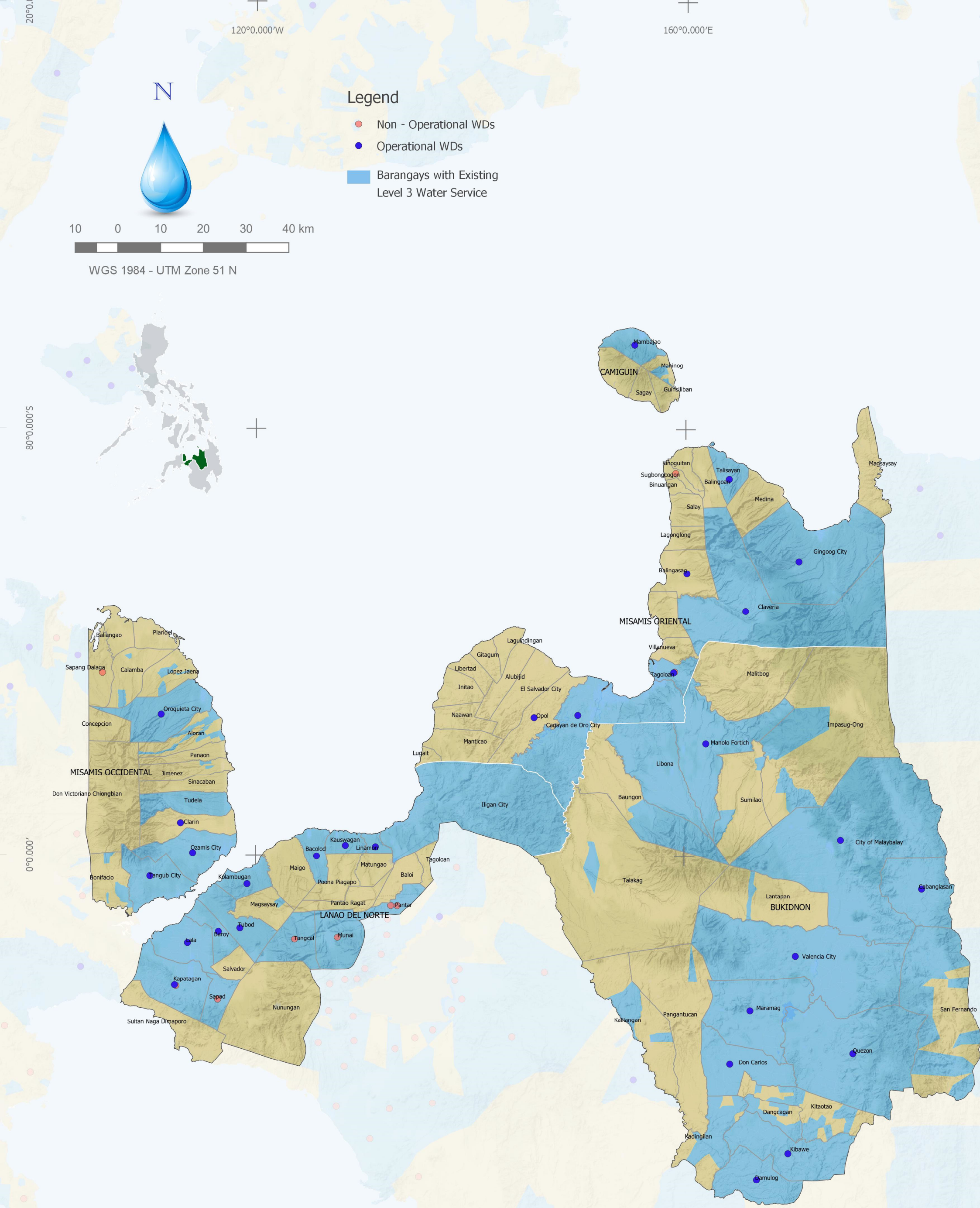
2040 Population Projection



2015 Water Demand



2040 Water Demand Projection



Water Districts and Areas Covered with Level III Service

LWUA, PAWD, NWRB Listahang Tubig, 2017 Data

WSS Infrastructure

Water service providers (WSPs) of various management types serve around 47% of Northern Mindanao.[19]

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 sources[20], 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

There are 32 WDs in Northern Mindanao, 22 of which are operational and 10 nonoperational. The total population covered by these WDs is estimated at 2.06 million or roughly 43.9% of the total population. Of this, only 1.27 million (or 61.72% of the service area) are covered.

Misamis Oriental has the largest population served by these WDs — 721,258 users (69.44%). Camiguin has the least number of users, i.e., 17,215 (44.44%).

LGU-Led Water Utilities

There are 155 LGU-led water utilities in Northern Mindanao covering only 34 LGUs — equivalent to 417,528 users or 8.90% of the population served.

Lanao del Norte has the highest population served, i.e., 144,925 users despite the fact that only 5 LGUs are included in these utilities' service coverage.

BWSA

There are 332 BWSA utilities in Northern Mindanao serving only 42 LGUs (with about 262,095 users) or 5.59% of the population served.

RWSA

A total of 111 RWSA utilities in Northern Mindanao serve 13 LGUs, i.e., 103,180 users or 2.20% of the total population. Camiguin is not covered by any RWSA utility.

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

Region/Province	No. of LGUs	Type & No. of WSPs		Service Area	Population Served	
					Total	%
Misamis Occidental	17	WD	4	114,203	143,296	125.47%
		LGU-led	35		95,093	15.79%
		BWSA	85		55,605	9.23%
		RWSA	46		25,925	4.31%
		Others (coop/private/etc.)	219		60,745	10.09%
		Subtotal	**389**	**602,126**	**380,664**	**63.22%**
Bukidnon	22	WD	9	676,488	316,492	46.78%
		LGU-led	74		136,055	9.61%
		BWSA	187		177,635	12.55%
		RWSA	35		41,515	2.93%
		Others (coop/private/etc.)	46		37,390	2.64%
		Subtotal	**351**	**1,415,226**	**709,087**	**50.10%**
Lanao del Norte	23	WD	10	191,785	73,038	38.08%
		LGU-led	14		144,925	14.22%
		BWSA	51		22,260	2.18%
		RWSA	0		0	0.00%
		Others (coop/private/etc.)	123		36,050	3.54%
		Subtotal	**198**	**1,019,013**	**276,273**	**27.11%**
Misamis Oriental	26	WD	8	1,038,623	721,258	69.44%
		LGU-led	25		30,580	1.95%
		BWSA	6		4,185	0.27%
		RWSA	30		35,740	2.28%
		Others (coop/private/etc.)	6		6,244	0.40%
		Subtotal	**75**	**1,564,459**	**798,007**	**51.00%**
Camiguin	5	WD	1	38,735	17,215	44.44%
		LGU-led	7		10,875	12.29%
		BWSA	3		2,410	2.72%
		RWSA	0		0	0.00%
		Others (coop/private/etc.)	4		25,090	28.36%
		Subtotal	**15**	**88,478**	**55,590**	**62.83%**
Northern Mindanao	93	WD	32	2,059,834	1,271,299	61.72%
		LGU-led	155		417,528	8.90%
		BWSA	332		262,095	5.59%
		RWSA	111		103,180	2.20%
		Others (coop/private/etc.)	398		165,519	3.53%
		Grand Total	**1,028**	**4,689,302**	**2,219,621**	**47.33%**

[19] *Based on registered WSPs in Listahang Tubig (as of 2017)*
[20] *Local Water Utilities Administration (LWUA), PAWD, NWRB Listahang Tubig*

120°0.000'W

160°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Camiguin

Mambajao

Mahinog

Catarman

Sagay

Guinsiliban

Misamis Oriental

Kinoguitan

Talisayan

Magsaysay

Binuangan

Medina

Salay

Lagonglong

Gingoog City

Balingasag

Claveria

Laguindingan

Villanueva

Gitagum

Libertad

Initao

Tagoloan

Malitbog

Alubijid

El Salvador City

Opol

Naawan

Cagayan de Oro City

Impasug-Ong

Manticao

Manolo Fortich

Libona

Baungon

Sumilao

Iligan City

City of Malaybalay

Baliangao

Plaridel

Sapang Dalaga

Lopez Jaena

Calamba

Oroquieta City

Concepcion

Aloran

Panaon

Jimenez

Sinacaban

Tudela

Clarin

Ozamis City

Bacolod

Linamon

Tagoloan

Bonifacio

Tangub City

Maigo

Baloi

Magsaysay

Pantao Ragat

Lanao del Norte

Baroy

Tubod

Lala

Tangcal

Munai

Kapatagan

Salvador

Sapad

Nunungan

Sultan Naga Dimaporo

Talakag

Lantapan

Bukidnon

Valencia City

Kalilangan

Pangantucan

Maramag

Quezon

Don Carlos

Kitaotao

Kadingilan

Kibawe

Damulog

Legend

% Open Defecation

0.000 - 0.073

0.073 - 0.146

0.146 - 0.220

0.220 - 0.293

0.293 - 0.366

0.366 - 0.439

0.439 - 0.512

0.512 - 0.586

0.586 - 0.659

0.659 - 0.732

Open Defecation

PSA, 2015 Data

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.

Northern Mindanao has the sixth lowest open defecation rate among all regions. Approximately 71,277 people were reported practicing open defecation as of 2015. This figure is attributed to the large number of informal settlers along the coastlines and waterless areas which do not have access to sanitation facilities.

The map on the left 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 Northern Mindanao.

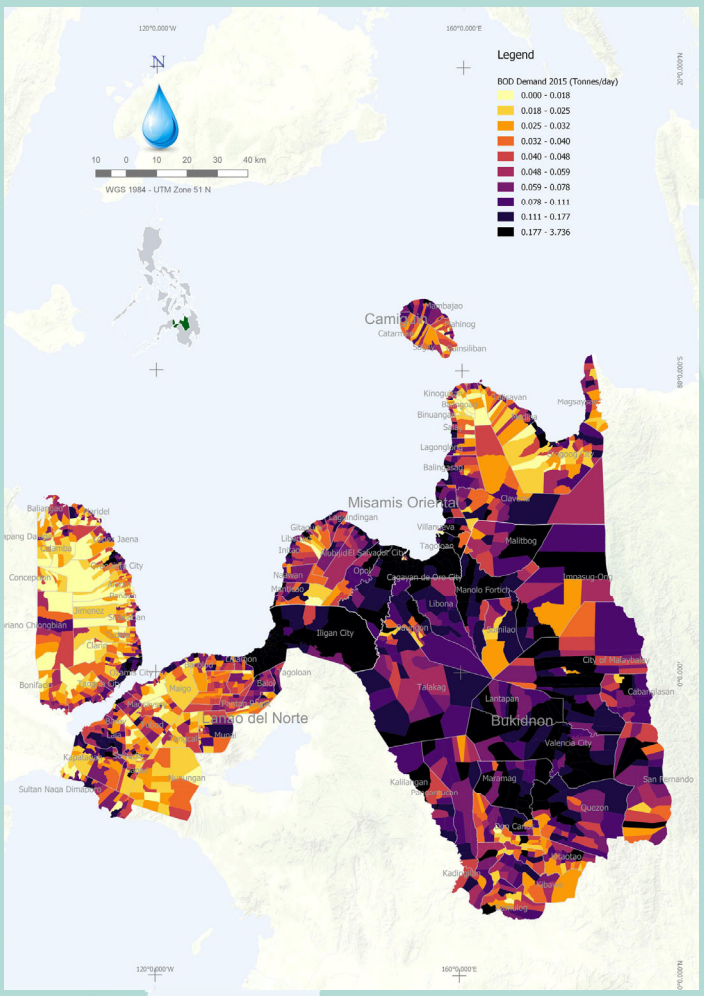


Figure 13: Biological Oxygen Demand, 2015

Industrial and agricultural wastewater generation may be estimated using guidelines provided by the WHO Rapid Assessment of Sources of Air, Water, and Land Pollution. Estimations, however, heavily depend on sectoral data not currently available to the Consulting Team.

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.

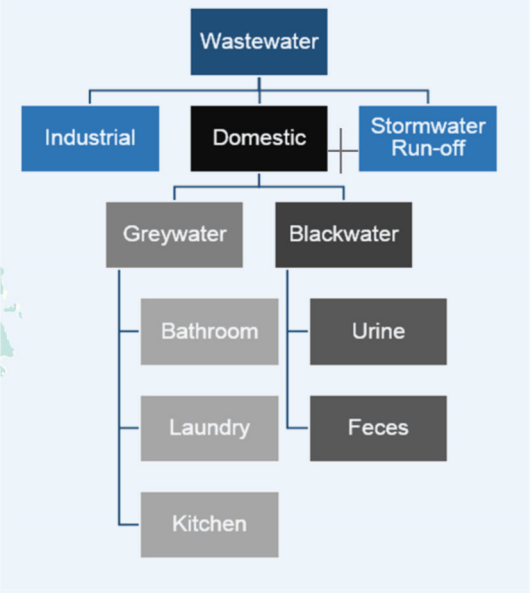


Figure 14: Categories of Wastewater

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 grams[21] per person per day is used.

The wastewater[22] 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 15.

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

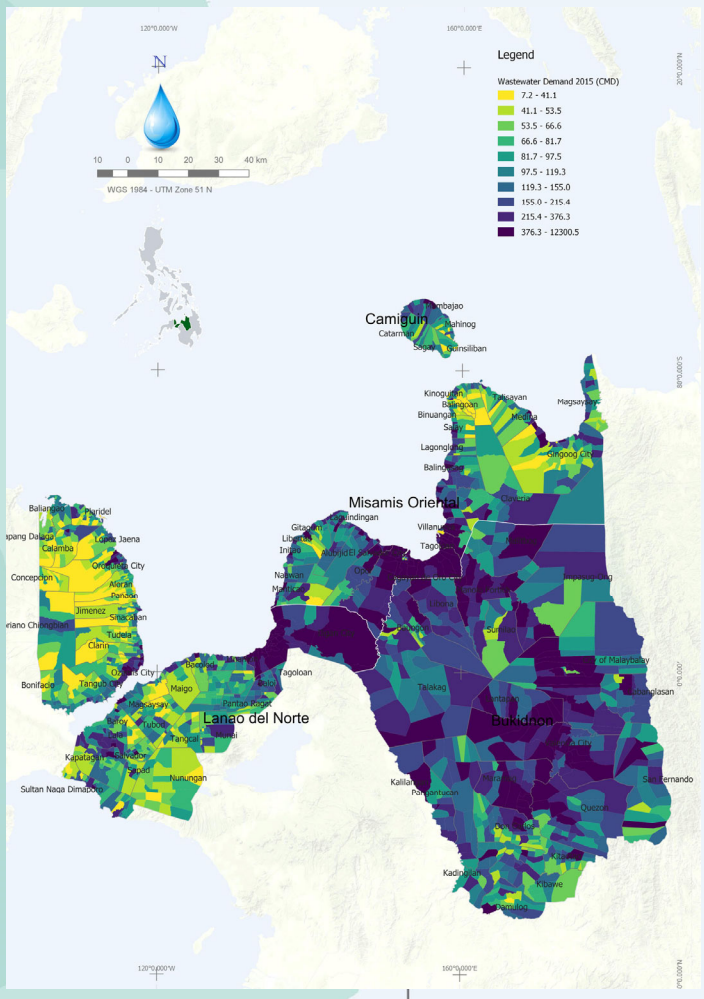
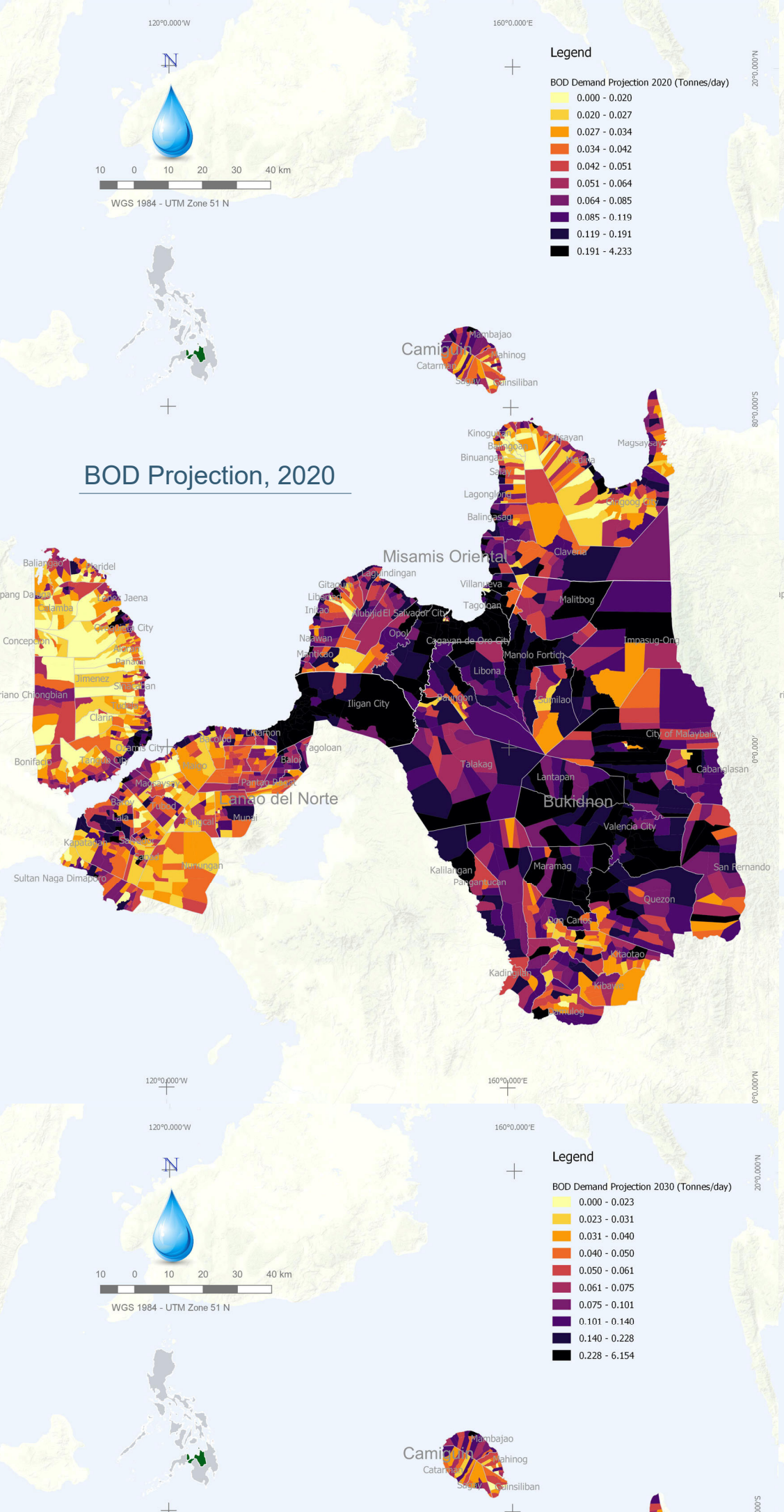


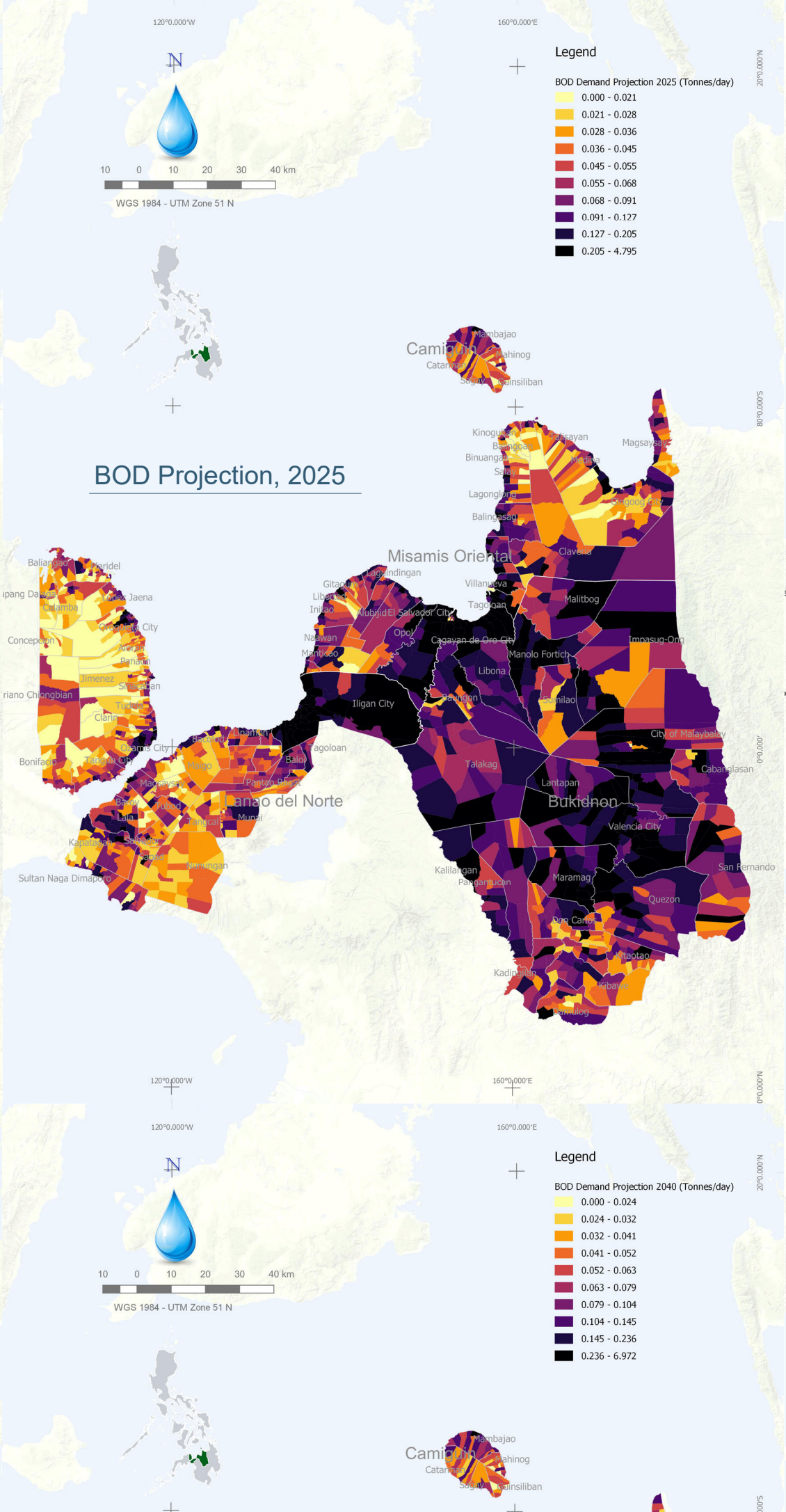
Figure 15: Wastewater Produced, 2015

[21] *Philippine Environment Monitor (PEM), 2003*
[22] *Ibid.*

BOD Projection, 2020

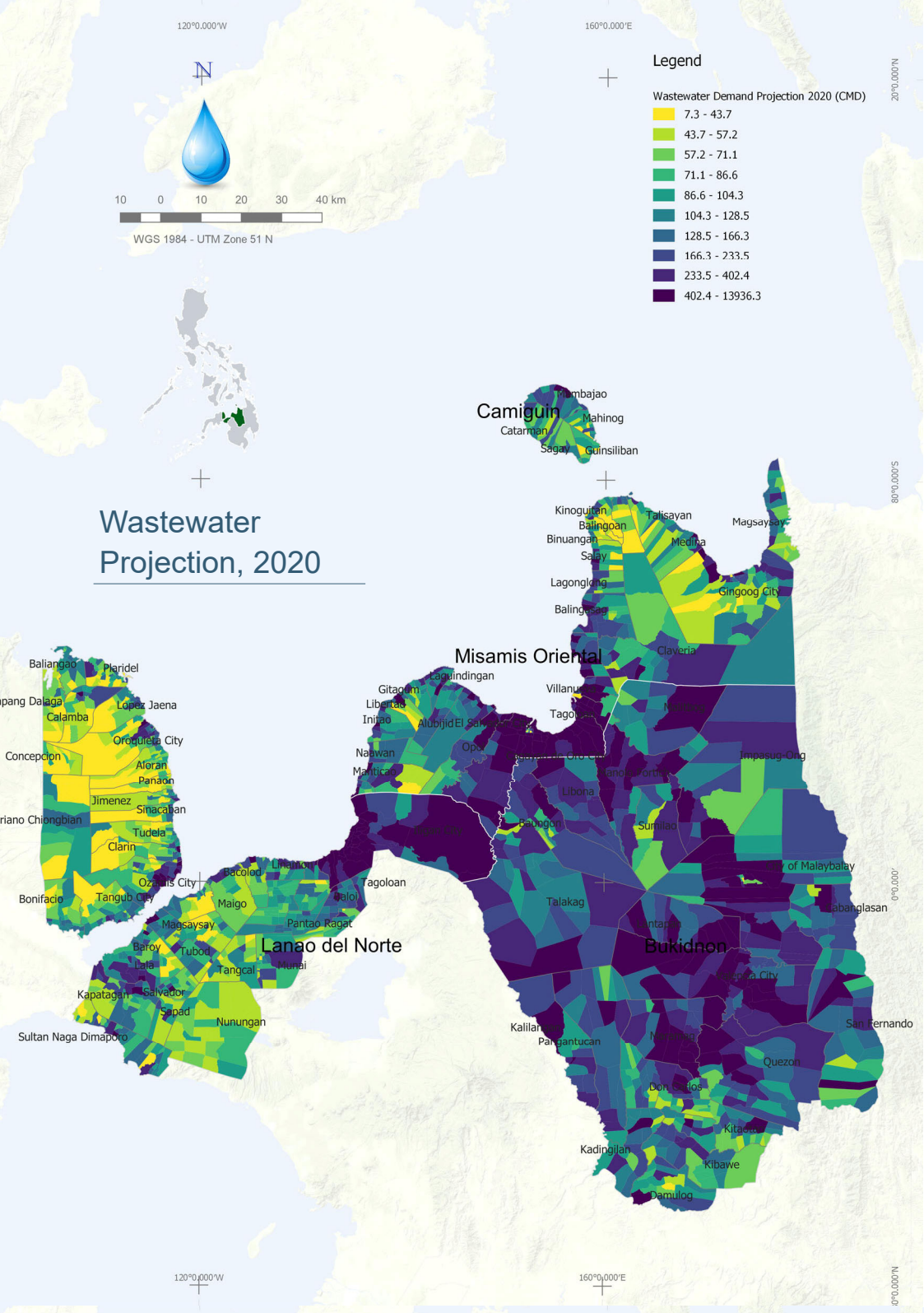


BOD Projection, 2025

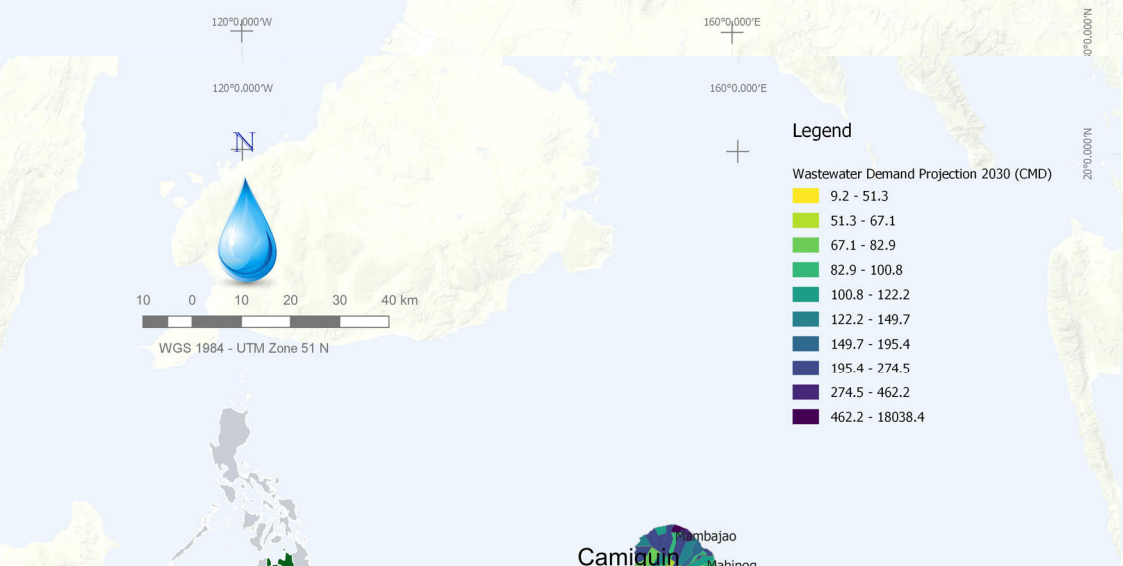


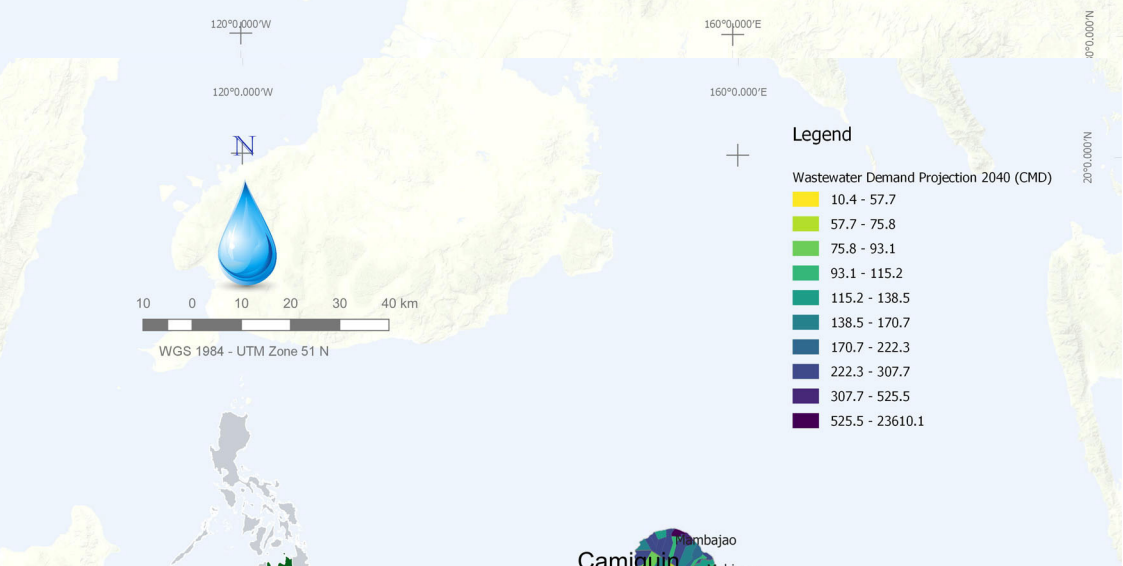
BOD Projection, 2030

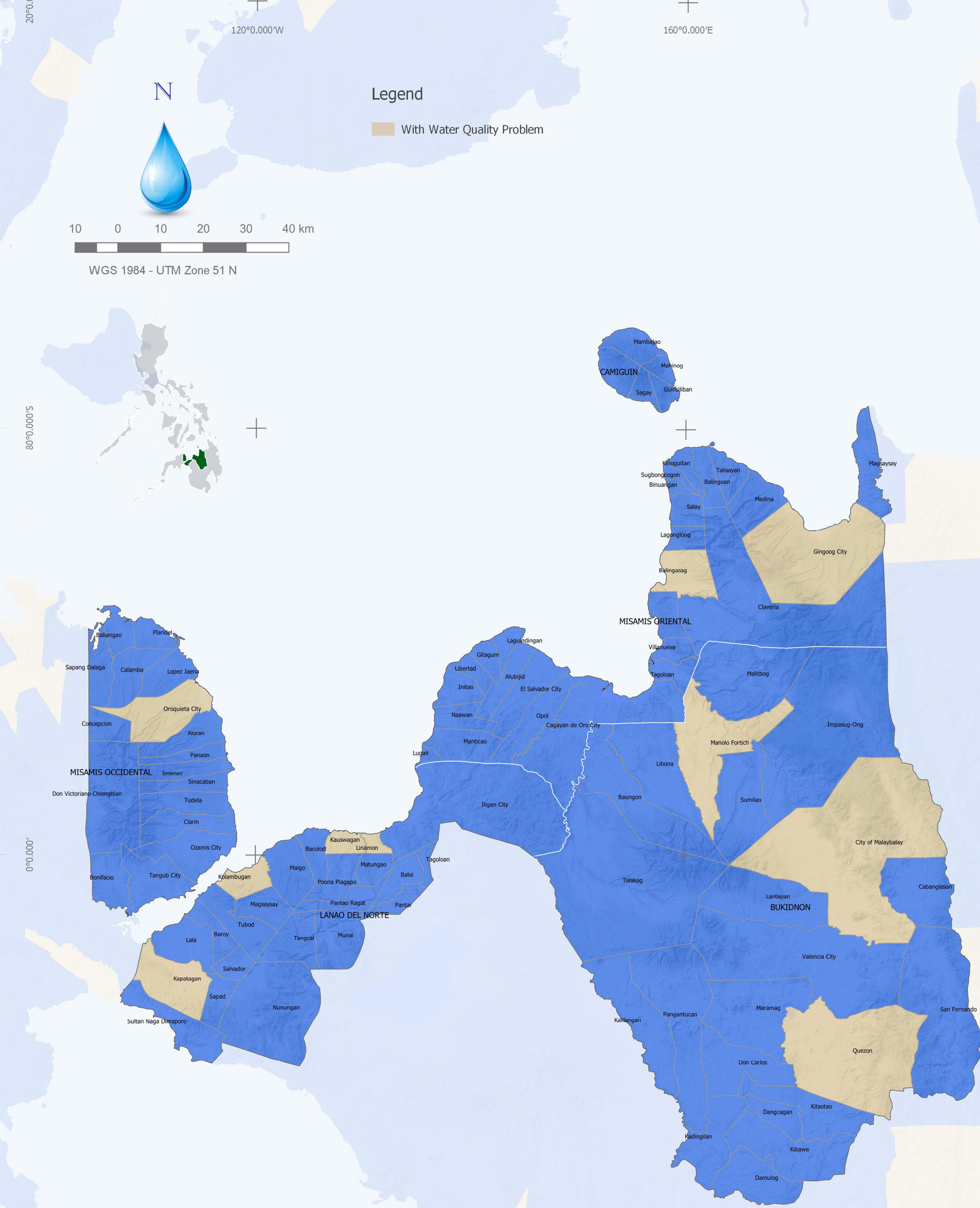
BOD Projection, 2040


Wastewater Projection, 2020
Legend
Wastewater Demand Projection 2020 (CMD)
7.3 - 43.7
43.7 - 57.2
57.2 - 71.1
71.1 - 86.6
86.6 - 104.3
104.3 - 128.5
128.5 - 166.3
166.3 - 233.5
233.5 - 402.4
402.4 - 13936.3
WGS 1984 - UTM Zone 51 N
10 0 10 20 30 40 km
Camiguin
Misamis Oriental
Lanao del Norte
Bukidnon
Sultan Naga Dimaporo
Kadingilan
Damulog
Kibawe
Kitaotao
Quezon
San Fernando
Talakag
Libona
Impasug-Ong
Gingoog City
Claveria
Tagoloan
Jasaan
Oroquieta City
Ozamis City
Tangub City
Tubod
Iligan City
Malaybalay
Valencia City

Wastewater Projection, 2025
Legend
Wastewater Demand Projection 2025 (CMD)
7.4 - 46.1
46.1 - 60.6
60.6 - 75.5
75.5 - 91.8
91.8 - 111.3
111.3 - 136.8
136.8 - 178.4
178.4 - 250.6
250.6 - 425.9
425.9 - 15787.3
WGS 1984 - UTM Zone 51 N
10 0 10 20 30 40 km
Camiguin
Misamis Oriental
Lanao del Norte
Bukidnon
Sultan Naga Dimaporo
Kadingilan
Damulog
Kibawe
Kitaotao
Quezon
San Fernando
Talakag
Libona
Impasug-Ong
Gingoog City
Claveria
Tagoloan
Jasaan
Oroquieta City
Ozamis City
Tangub City
Tubod
Iligan City
Malaybalay
Valencia City


Wastewater Projection, 2030
Legend
Wastewater Demand Projection 2030 (CMD)
9.2 - 51.3
51.3 - 67.1
67.1 - 82.9
82.9 - 100.8
100.8 - 122.2
122.2 - 149.7
149.7 - 195.4
195.4 - 274.5
274.5 - 462.2
462.2 - 18038.4
WGS 1984 - UTM Zone 51 N
10 0 10 20 30 40 km
Camiguin
Misamis Oriental
Lanao del Norte
Bukidnon
Sultan Naga Dimaporo
Kadingilan
Damulog
Kibawe
Kitaotao
Quezon
San Fernando
Talakag
Libona
Impasug-Ong
Gingoog City
Claveria
Tagoloan
Jasaan
Oroquieta City
Ozamis City
Tangub City
Tubod
Iligan City
Malaybalay
Valencia City


Wastewater Projection, 2040
Legend
Wastewater Demand Projection 2040 (CMD)
10.4 - 57.7
57.7 - 75.8
75.8 - 93.1
93.1 - 115.2
115.2 - 138.5
138.5 - 170.7
170.7 - 222.3
222.3 - 307.7
307.7 - 525.5
525.5 - 23610.1
WGS 1984 - UTM Zone 51 N
10 0 10 20 30 40 km
Camiguin
Misamis Oriental
Lanao del Norte
Bukidnon
Sultan Naga Dimaporo
Kadingilan
Damulog
Kibawe
Kitaotao
Quezon
San Fernando
Talakag
Libona
Impasug-Ong
Gingoog City
Claveria
Tagoloan
Jasaan
Oroquieta City
Ozamis City
Tangub City
Tubod
Iligan City
Malaybalay
Valencia City



Areas with Water Quality Problems

Water Districts' Water Quality Monitoring Data, LWUA, 2015

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”, Region X has three major river basins. Table 13 below shows the list of tributary rivers of the river basins with their corresponding classifications.

Table 13: Classification of Tributary Rivers

	River	Class
Cagayan de Oro River Basin	Longobon Falls	A
	Kalawaig	A
	Bubunaoan	A
	Tumalaong	A
	Cagayan	A
Tagoloan River Basin	Dila	-
	Alulum	-
	Mangima	-
	Amusig	-
	Siloo	-
	Malitbog	A
	Titian	-
Ranao (Agus) River Basin	Lake Lanao	A
	Ramain	-
	Taraka	-
	Gata	-
	Malaig	-

The rapid increase in population, urbanization and industrialization has significantly degraded the river basins in Region X. The sources of pollutants discharged into these bodies of water are listed in Table 14.

Open defecation, improper solid waste management, indiscriminate farming practices (such as *kaingin*), and small-scale mining have contributed to the decline of the quality of water of the region’s river basins and their tributaries from which water is drawn to meet its water demand.

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[23].

The lack of safe drinking water and sanitation facilities that compels grassroots communities to content themselves with poor hygiene contributes significantly to waterborne diseases.

Approximately 2,818 cases of acute watery diarrhea, 277 cases of schistosomiasis, and 323 cases of typhoid and paratyphoid were reported in Region X in 2015, according to the 2015 FHSIS.

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

As of 2017, the Department of the Interior and Local Government (DILG) reported 11 waterless[24] municipalities in Northern Mindanao (see Figure 16). 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.

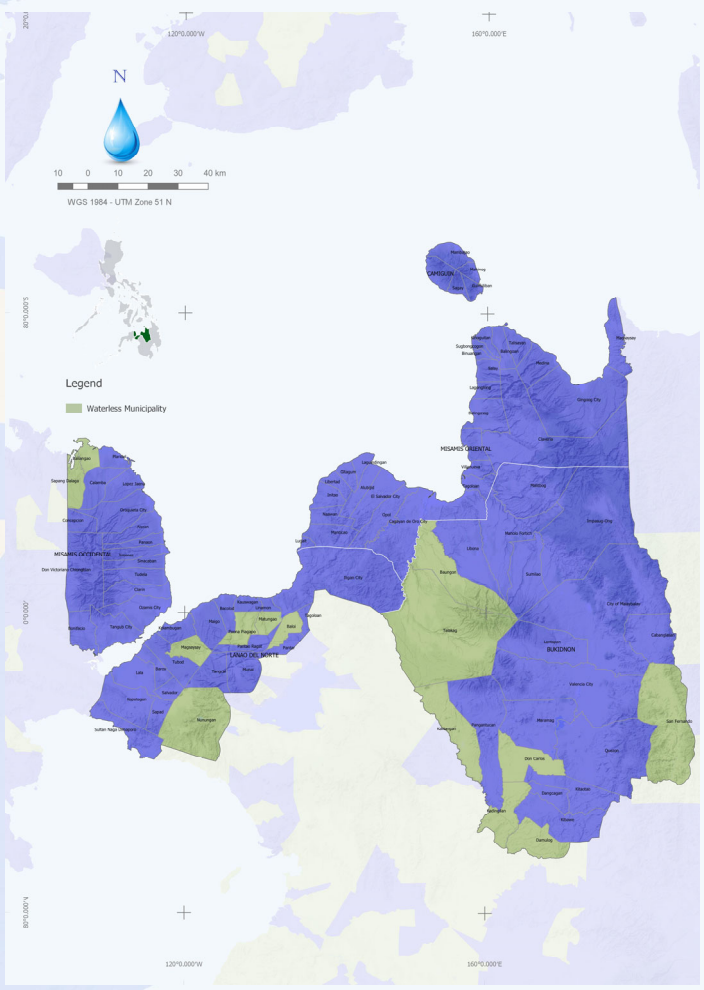


Figure 16: Waterless Municipalities

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

Source/Cause of Decline in Water Quality	Impact/Potential Waste Generated
Industrial	
Unregulated small-scale mining activities	Increase in heavy metals in water, poor water quality
Quarrying activities	Sedimentation and landslides
Agricultural	
Intense mono-cropping and illegal expansion of pineapple and banana plantations	Increased nitrate and phosphate levels from non-point sources
Logging of timber for fuel; slash-and-burn farming	Increased Total Suspended Solids (TSS) and dwindling forest cover
Domestic 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

[23] World Health Organization
[24] Municipalities with less than 50% service coverage, National Anti-Poverty Commission, 2010

WSS Sector Gaps

In assessing the current state of the WSS sector in Northern Mindanao, 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 X 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 X 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.

The workshop also discussed cross-cutting areas such as policy and institutional development, leadership, matters pertaining to cultural traditions/behaviors/ attitudes, and capacity building.

Planning and Development

Planning is commonly defined as “a strategic process to achieve developmental objectives.” In a broad sense, it is a fundamental management undertaking that requires “logical thinking, rational decision-making and total dependence on reliable data and factual information.”

The development of the WSS sector in Northern Mindanao is being bogged down by the concerned LGUs’ inability to come up with comprehensive, fact-based and results-oriented plans with clear implementation strategies and well-defined goals.

This weakness, in a collective view, stems from the failure of LGUs to activate a robust, fully functioning mechanism for efficient data collection, processing, archiving and information-sharing. Making things worse is the dearth of technical expertise and resources badly needed to drive the gathering of scientific data, compilation of useful background materials and intelligent analysis of applicable concepts and ideas.

It is little wonder, then, that LCEs do not regard the preparation of development plans a priority — a fact made more pronounced by the failure of some LGUs to come up with even the most basic and rudimentary water safety and sanitation plans. Other poor governance issues include lack of political will, red tape, and self-serving political intervention.

Remedial measures include: enhancement of LGU planning capability through investment in computerized data collection, analysis, storage and retrieval; in-house technical capacity upgrade through training and other skills improvement programs; hiring of WSS consultants; and partnership with academic institutions, scientific communities, donor agencies and non-government organizations.

In the immediate term, the following issues that must be on the front burner of LGUs’ planning development calendar include: disaster risk reduction and management (especially in the light of climate change challenges); water resources conservation through reforestation (with the National Greening Program as a guide; putting up of rainwater catchments in the uplands to minimize downstream flooding; development of water safety and sanitation plans; and the creation of a local water board.

Service Provision

The delivery of WSS services in Region X is flawed in a number of ways. Existing water and sanitation facilities are not only inadequate — they are also antiquated and in need of constant repair. The list of inadequacies also include: a shortage of treatment plants; lack of water quality testing facilities in far-flung areas; limited waste disposal/desludging facilities; and lack of rural sanitary inspectors.

Apart from poor governance issues such as the failure to support the WSS sector with development funds, misplaced prioritization, lack of political will, among many other things, the real problems are rooted in economics, specifically the bottom line of the water service business.

In Region X, water concessionaires’ profitability has been adversely affected by existing low tariffs. The refusal of consumers to pay the “right” price for better service has been a perennial deal breaker. The situation is now so bad that consumers, unsure about the quality of water being provided by their respective WDs, have started sourcing their drinking water from water refilling stations.

On top of immediately addressing the issues that prevent water concessionaires from pouring additional investments in facilities upgrade and service area expansion, LCEs are urged to fill the void and connect the missing links in the chain of governance, leadership, quality of service, financial and human resource investments, networking and priority setting.

Regulation

Among the many factors blamed for the sorry state of water and sanitation in Region X, government’s failure to regulate the sector’s essential functions tops the list; and it is a failure that comes in many forms. Among the most glaring manifestations thereof include: failure to exercise effective supervision of the operation of water concessionaires; tolerance of a fragmented regulatory framework; negligence in requiring accredited desludgers to put up proper waste disposal facilities; and failure to enforce water and sanitation laws (e.g., non-imposition of penalties on owners of piggeries regarding the disposal of piggery waste into water resources).

In the case of Uydungan River, a water resource, the high concentration of inorganic contaminants remains a serious public health threat. The same sewage problem afflicts Camiguin, a tourist destination, and Cagayan de Oro City, a HUC.

Facilitating measures recommended to improve the regulatory capability of the LGUs include: harmonization of fragmented regulatory frameworks; putting up more water testing laboratories; fast-tracking the establishment of waste treatment facilities; crafting of enabling ordinances; hiring of more sanitary inspectors; and strict compliance with existing municipal/city water supply, sanitation, sewerage sector plans (M/C W4SP).

Table 15 summarizes the hindering and facilitating factors impacting the WSS sector in Region X.

Table 15: Hindering and Facilitating Factors

Areas	Hindering Factors	Facilitating Factors
Planning and Development	Lack of IEC materials and other information on water and sanitation	Implementation of the Listahang Tubig Program
	Absence of a local water board	Establishing linkages with national lead agencies re: capacity building, tapping of resources
	No priority given to WSS in development plans by LCEs	Creation of a local water board
	Red tape governing the submission of WSS project proposals	Hiring of consultants
		Subsidy programs
	Absence of water safety plans in some LGUs	Establishing linkages with donor agencies re: capacity building, equipment
	Limited technical knowledge	Creation of a Water Quality Management Area
	Lack of awareness of the importance of a planning framework	Political will
	Limited funds for planning	
	Absence of WSS consultants	
Service Provision	Climate change and adverse weather conditions or calamities which affect water sources and facilities	Formulation of a functional water safety plan
	Inadequate funds for rehabilitation/expansion of water systems	Water supply assistance programs or grants from external organizations
	Lack of water treatment plants	Water quality monitoring (regular water treatment)
	Lack of water testing laboratories in far-flung areas	Water and sanitation programs aimed at improving the quality of water supplied by WDs
	Lack of priority given to sanitation by some LCEs resulting in the absence of a workable sanitation program	Setting up accredited laboratories for water quality monitoring
	Lack of rural sanitary inspectors who can monitor the water and sanitation situation	Promoting and expanding the coverage of the zero open defecation (ZOD) program
	Absence of proper disposal facilities among desludgers	Strong political will to implement ZOD
	Absence of personal protective equipment (PPE) such as masks, gloves, boots, etc.	Provision of toilet bowls from DOH and LGUs
		IEC campaigns on proper sanitation (ZOD, hygiene, hand washing)
Regulation	Willful prior informed consent (cultural observance) and lengthy procedures governing the issuance of Environmental Compliance Certificates (ECCs)	Monitoring and evaluation of compliance with sanitation standards
	Right-of-way processing delays	Review and approval of tariff proposals
	Giving political favors; political intervention	Strict implementation of laws and regulations and sanctions, and grant of incentives
	Lengthy due process of law	Strong support from LGUs thru public hearings and subsequent drafting and passing of local legislation
Policy and Institutional Development	Conflict between the mayor and the governor in the appointment of Board of Directors of WDs	Compliance with existing laws such as: RA 1378, RA 9275, PD 198 as amended and RA 9003
	Conflict between WDs and LGUs on WD management and operations	Strong WD organizations such PAWD and MAWD
	Problem in water rights application vis-a-vis IPRA of 1997	
	Circularization of COA rules and regulations re: uniform interpretation and implementation	
	Lack of coordination between WDs and concerned government agencies	
Leadership and Politics	WASH not prioritized by the NDRRMC	Executing water quality management mechanisms (e.g., WQMA, RBMC)
	Fragmented regulatory framework	Enforcing and showing LGU best practices on WSS
	Lack of national government commitment to adhere to SDG, MDG	Compliance with existing ordinances related to water and sanitation
	BWSA affected by political maneuvers	Strict compliance with existing municipal/city water supply, sanitation, sewerage sector plans (M/C W4SP)
	Absence of a single body/agency addressing water and sanitation issues/ concerns	Enforcement of national laws, regulations and guidelines
	Water conservation and sanitation not a priority among LGUs	Technical assistance in the formulation of the 10-year Solid Waste Management Plan and financial assistance in the construction of material recovery facilities
	Lack of political will of the LGU managers in implementing the water service code	DPWH NSSMP grant
	Lack of political will to improve sanitation	Availability of funding support for watershed management (e.g., DOE ER 1-94)
	No allocation given to the maintenance of Level I (point source) water systems	
	Lack of a synchronized information and monitoring system re: actual access and coverage of WSS services	
	Lack of close/strict monitoring of compliance with the existing building and green building code	
	Population increase and migration brought about by urbanization	
	Possible change in leadership in LGUs every 3 years	
Matters Concerning Cultural Practices, Behaviors and Attitudes	Appointment of unqualified personnel	Employee validation through a system of rewards and incentives
	Lack of political support to improve the management of water utilities	Appointing only qualified and competent managers
	Political intervention in systems operation	Formulation of a water safety plan re: water pricing
	Political and local leaders who act out of self-interest	Electing committed, honest, and transparent leaders in spite of lack of support
	Very low employee morale	Commitment of qualified, competent employees
		Adherence to policies despite political intervention
		Continuing professional education from concerned government agencies
		Private-public partnerships (PPP) re: systems upgrade
Capacity Building	Lack of sustainability pertaining to capacity building programs	Various capacity building activities for LGUs related to water management
	Lack of personnel training in water management/conservation and sanitation	Operation and management of WS facilities managed by LGUs or BWSA
	Lack of IEC activities on the importance of sanitation and on raising the awareness level of sanitation management in rural communities	Water safety plan
	Improper water conservation in households	MW4SP (Ps preparation, DED preparation, project supervision, fund management)
	Different interpretations of definitions of terms during the workshop and in training sessions	Skilled WQMA monitoring personnel
	Reshuffling/reassignment of trained technical personnel	Technical and financial assistance from ODA
	Sanitation component not emphasized in WSS projects	Hiring of qualified personnel and efficient management of WDs
	BWSA affected by political maneuvers	Adequate budget allocated for CapDev (ODA, GAA, academe)
	Lack of political will of the LGU managers in enforcing the water service code	Training programs from EMB on: NSSMP, 10-year water quality management plan
		Training on WSS given by academic institutions, e.g., state universities and colleges (SUCs)

Regional Vision

"By 2040, Region X is a happy, healthy, safe and progressive community through sustained watershed management, adequate and affordable supply of potable water and efficient sanitation management system."

The Northern Mindanao WSS vision was crafted by the visioning group with the goal of achieving universal and equitable access to safe and affordable water supply and sanitation by 2040. In essence, it articulated the outcomes and targets the sector wants to achieve without losing sight of the challenges that lie ahead, especially those related to sufficiency, accessibility, affordability, governance and sustainability.

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 water supply and sanitation 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 Northern Mindanao 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/Underdeveloped		
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		
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 government corporations or economic enterprises
Developed		
Level III	▪ 100% coverage of franchise area ▪ Ensuring the sustainability of operations of Level III systems ▪ Continuing expansion programs to ensure 100% coverage	▪ 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

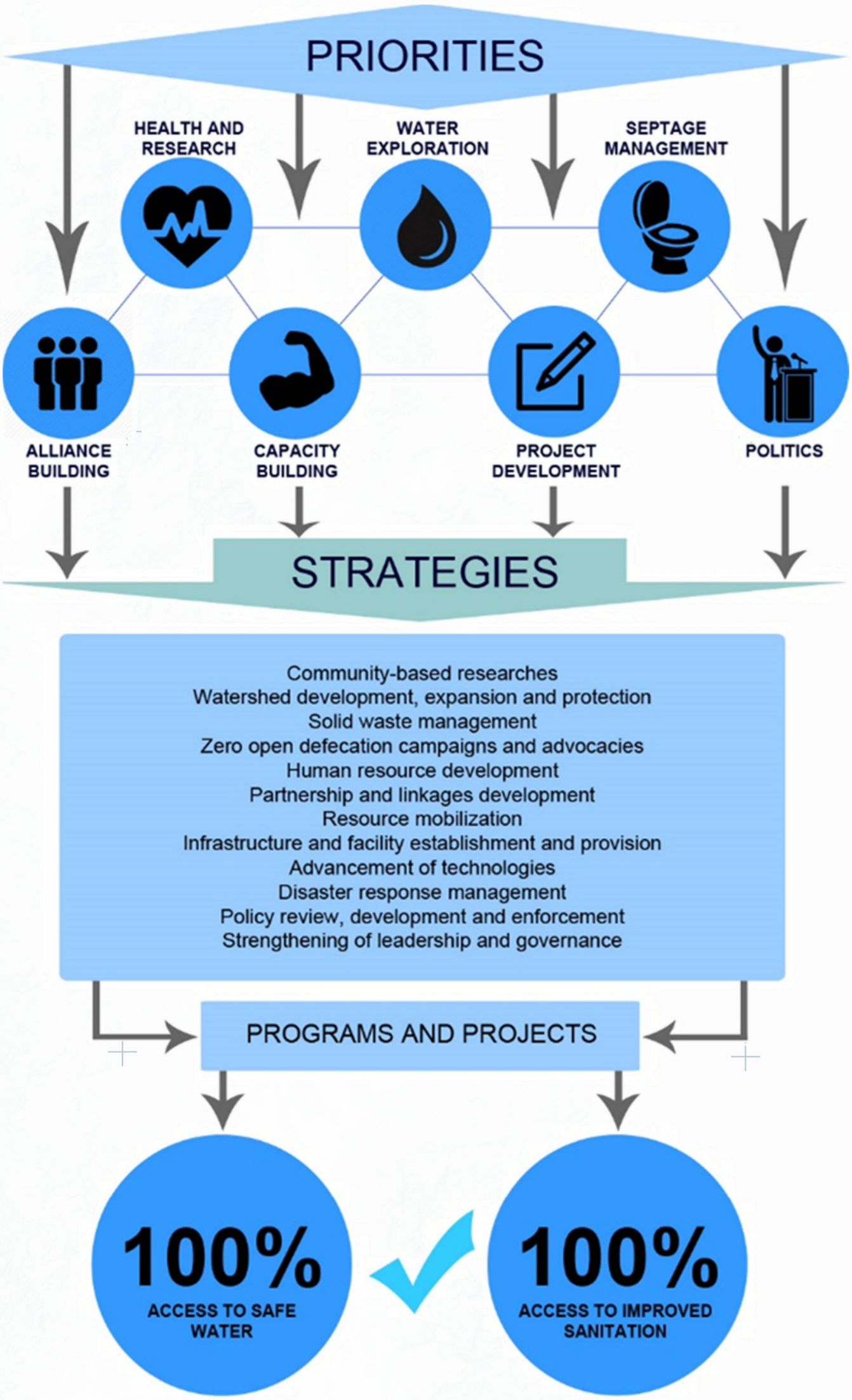


Figure 17: Northern Mindanao WSS Strategic Framework

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.

Northern Mindanao strives to achieve 95.3% access to safe water by 2022 and 100% access by 2030. The latter means more than 1.4 million HHs will have access to safe water. In addition, improved access to sanitation is set at 90.3% by 2022 and universal access by 2030.

Figures 18 and 19 graph the WSS targets in terms of households for 2022, 2030 and 2040.

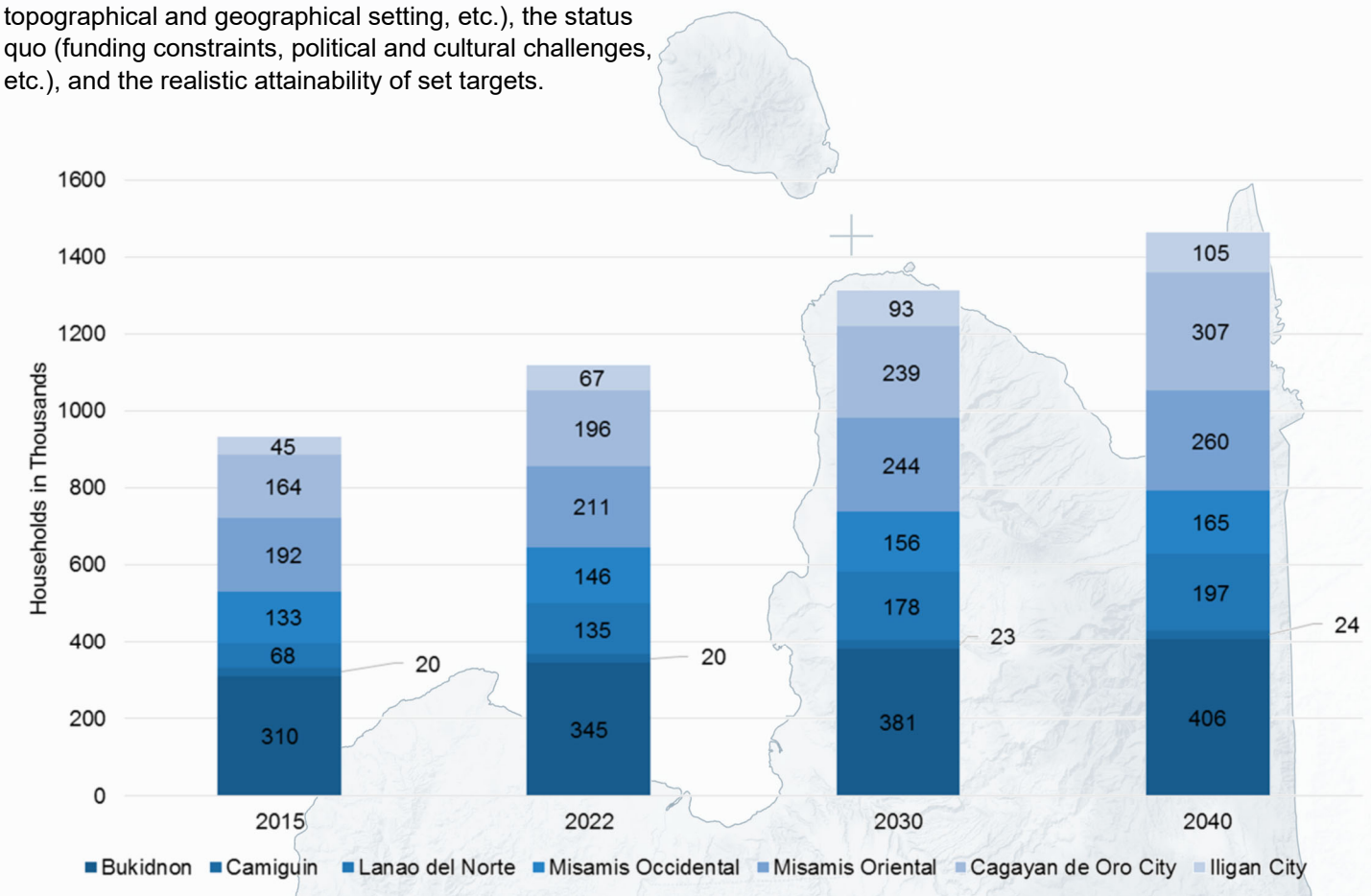


Figure 18: Targeted Households with Access to Safe Water

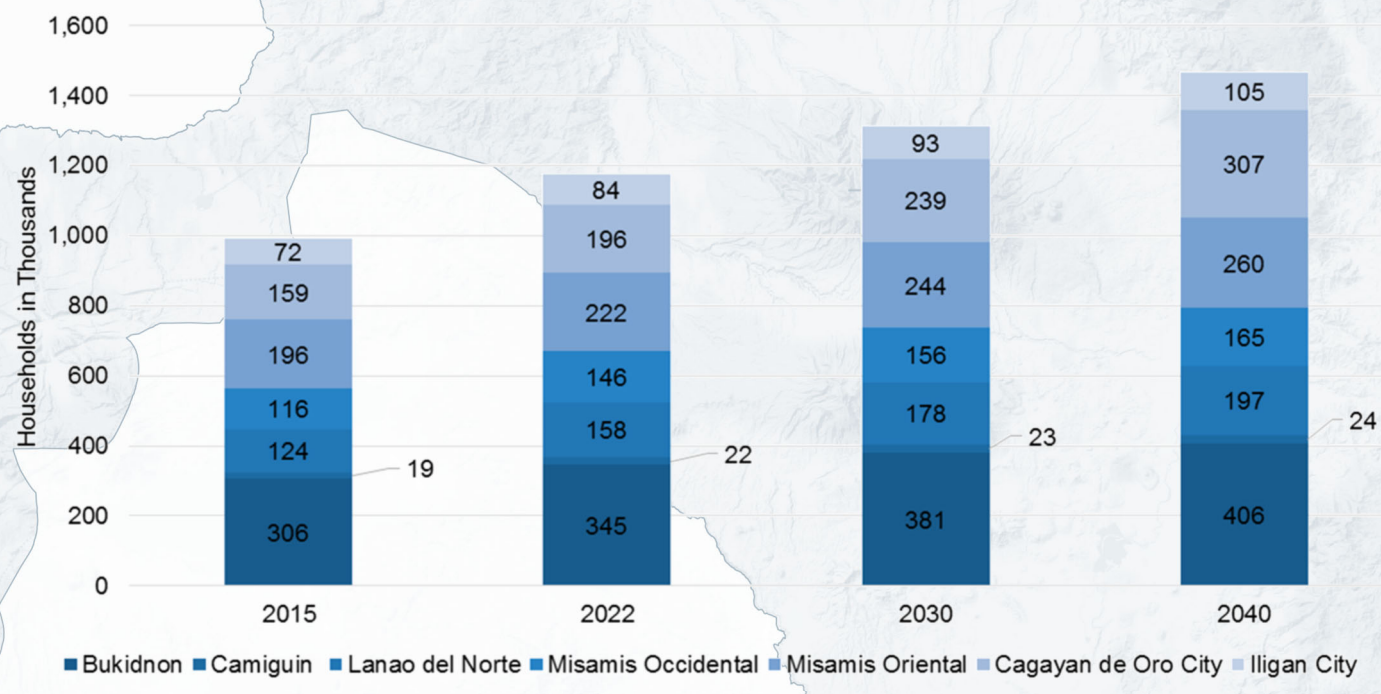


Figure 19: Targeted Households with Access to Sanitation

Water Supply Targets

BUKIDNON			
Category	2022	2030	2040
Level III	49.2%	54.0%	100.0%
Level II	32.9%	38.0%	0.0%
Level I	17.7%	8.0%	0.0%
With Access	99.8%	100.0%	100.0%
No Access	0.2%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

CAMIGUIN			
Category	2022	2030	2040
Level III	95.0%	100.0%	100.0%
Level II	0.0%	0.0%	0.0%
Level I	0.0%	0.0%	0.0%
With Access	95.0%	100.0%	100.0%
No Access	5.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

LANAO DEL NORTE			
Category	2022	2030	2040
Level III	45.0%	80.0%	100.0%
Level II	25.0%	20.0%	0.0%
Level I	15.0%	0.0%	0.0%
With Access	85.0%	100.0%	100.0%
No Access	15.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

MISAMIS OCCIDENTAL			
Category	2022	2030	2040
Level III	68.0%	75.0%	100.0%
Level II	17.0%	22.0%	0.0%
Level I	15.0%	3.0%	0.0%
With Access	100.0%	100.0%	100.0%
No Access	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

MISAMIS ORIENTAL			
Category	2022	2030	2040
Level III	60.0%	75.0%	100.0%
Level II	25.0%	20.0%	0.0%
Level I	10.0%	5.0%	0.0%
With Access	95.0%	100.0%	100.0%
No Access	5.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

CAGAYAN DE ORO CITY			
Category	2022	2030	2040
Level III	95.2%	98.0%	100.0%
Level II	4.6%	1.9%	0.0%
Level I	0.2%	0.1%	0.0%
With Access	100.0%	100.0%	100.0%
No Access	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

ILIGAN CITY			
Category	2022	2030	2040
Level III	65.0%	80.0%	100.0%
Level II	10.0%	14.0%	0.0%
Level I	4.0%	6.0%	0.0%
With Access	79.0%	100.0%	100.0%
No Access	21.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

NORTHERN MINDANAO			
Category	2022	2030	2040
Level III	62.0%	74.1%	100.0%
Level II	21.7%	21.8%	0.0%
Level I	11.6%	4.1%	0.0%
With Access	95.3%	100.0%	100.0%
No Access	4.7%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

Sanitation Targets

BUKIDNON			
Category	2022	2030	2040
Improved	97.0%	100.0%	100.0%
Basic	2.0%	0.0%	0.0%
Shared/Communal/Limited	1.0%	0.0%	0.0%
With Access	100.0%	100.0%	100.0%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

CAMIGUIN			
Category	2022	2030	2040
Improved	97.0%	100.0%	100.0%
Basic	0.0%	0.0%	0.0%
Shared/Communal/Limited	1.0%	0.0%	0.0%
With Access	98.0%	100.0%	100.0%
Open Defecation	2.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

LANAO DEL NORTE			
Category	2022	2030	2040
Improved	97.0%	100.0%	100.0%
Basic	1.0%	0.0%	0.0%
Shared/Communal/Limited	0.0%	0.0%	0.0%
With Access	98.0%	100.0%	100.0%
Open Defecation	2.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

MISAMIS OCCIDENTAL			
Category	2022	2030	2040
Improved	97.0%	100.0%	100.0%
Basic	1.0%	0.0%	0.0%
Shared/Communal/Limited	2.0%	0.0%	0.0%
With Access	100.0%	100.0%	100.0%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

MISAMIS ORIENTAL			
Category	2022	2030	2040
Improved	97.0%	100.0%	100.0%
Basic	3.0%	0.0%	0.0%
Shared/Communal/Limited	0.0%	0.0%	0.0%
With Access	100.0%	100.0%	100.0%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

CAGAYAN DE ORO CITY			
Category	2022	2030	2040
Improved	97.0%	100.0%	100.0%
Basic	2.0%	0.0%	0.0%
Shared/Communal/Limited	0.0%	0.0%	0.0%
With Access	99.0%	100.0%	100.0%
Open Defecation	1.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

ILIGAN CITY			
Category	2022	2030	2040
Improved	97.0%	100.0%	100.0%
Basic	3.0%	0.0%	0.0%
Shared/Communal/Limited	0.0%	0.0%	0.0%
With Access	100.0%	100.0%	100.0%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

NORTHERN MINDANAO			
Category	2022	2030	2040
Improved	90.3%	100.0%	100.0%
Basic	5.0%	0.0%	0.0%
Shared/Communal/Limited	4.7%	0.0%	0.0%
With Access	100.0%	100.0%	100.0%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

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 X 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.

Table 17: Proposed Strategic Interventions for Water Supply

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

Access to Improved Sanitation	<u>Planning & Development</u> *Planning* *Program or Project Design* *Institution Building* *Training* *Financing* *Climate/Disaster Resiliency* *Policy*	<u>Service Provision</u> *Operations* *M&E* *Expansion* *Amalgamation* *Automation*	<u>Regulation</u> *Tariff/Pricing* *Resource* *Arbitration* *Registration, Permits, Rights*	<u>Promotions</u> *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 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.	▪ 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 Department of Environment and Natural Resources (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 with certain requirements, including LGUs/WDs by filing cases with the environmental ombudsman.	▪ 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.

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.		
Regulation	▪ Service standards for water supply and sanitation will be defined. ▪ An independent group will be formed to monitor the performance of water and sanitation service providers, other than the WDs, within each province. WDs will continue to be regulated by the LWUA. The monitoring group could later be made part of a regulatory body.		

20°0.000'N

120°0.000'W

160°0.000'E

N

Legend

Approved Projects

Pending Projects

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

80°0.000'S

0°0.000'

80°0.000'N

Mambajao
CAMIGUIN
Mahinog
Guinsiliban
Sagay

Kinoguitan
Sugbongcogon
Binuangan
Talisayan
Balingoan
Medina
Salay
Lagonglong
Balingasag
Gingoog City
Claveria
Magsaysay
MISAMIS ORIENTAL
Villanueva
Tagoloan
Malitbog
Impasug-Ong
Manolo Fortich
Libona
Baungon
Sumilao
City of Malaybalay
Talakag
Lantapan
Cabanglasan
BUKIDNON
Valencia City
Maramag
San Fernando
Pangantucan
Kalilangan
Quezon
Don Carlos
Dangcagan
Kitaotao
Kadingilan
Kibawe
Damulog

Laguindingan
Gitagum
Libertad
Alubijid
Initao
El Salvador City
Naawan
Opol
Cagayan de Oro City
Manticao
Lugait
Iligan City

Baliangao
Plaridel
Sapang Dalaga
Calamba
Lopez Jaena
Oroquieta City
Concepcion
Aloran
Panaon
MISAMIS OCCIDENTAL
Jimenez
Sinacaban
Don Victoriano Chiongbian
Tudela
Clarin
Ozamis City
Bonifacio
Tangub City
Kolambugan
Kauswagan
Bacolod
Linamon
Maigo
Matungao
Tagoloan
Poona Piagapo
Baloi
Magsaysay
Pantao Ragat
Pantar
LANAO DEL NORTE
Tubod
Baroy
Lala
Tangcal
Munai
Salvador
Kapatagan
Sapad
Nunungan
Sultan Naga Dimaporo

LWUA Priority Projects

LWUA, 2015 Data

40

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 II or Level III).

Northern Mindanao requires capital investments for infrastructure development of about PhP11.51 billion and PhP13.37 billion to achieve the 2022 and 2030 targets, respectively. Unit development costs employed to arrive at these sums are estimated at PhP35,200 per HH for Level III, PhP20,700 for Level II, and PhP9,300 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 Northern Mindanao) 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 household 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.

Table 21: Indirect Costs Employed[25]

Water Supply		
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
Bukidnon	2,155.15	2,453.79
Camiguin	119.49	117.25
Lanao del Norte	2,812.70	3,246.62
Misamis Occidental	1,717.47	2,089.07
Misamis Oriental	2,315.64	2,256.65
Cagayan de Oro City	1,453.84	2,174.74
Iligan City	931.61	1,035.86
Total	**11,505.91**	**13,373.99**

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 Northern Mindanao 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.

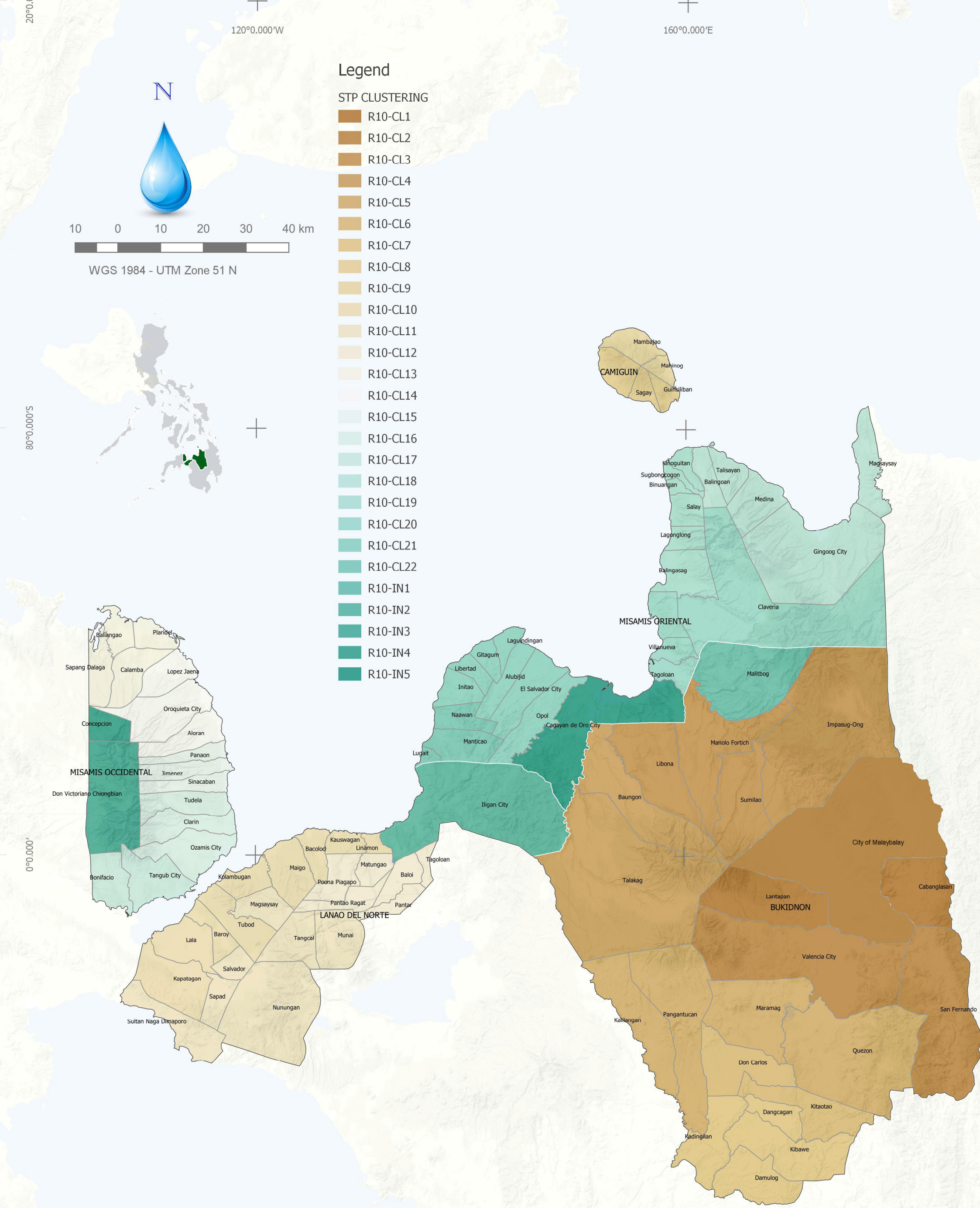
LGUs, WDs, and other stakeholders are obligated to influence decision makers to pursue relevant reforms in the water sector. These reforms serve as non-infrastructure investments and typically include organization/institutional development, regulatory strengthening, capacity building, and project management.

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 the nine Northern Mindanao LGUs where priority WD projects have been approved and those pending approval for LWUA's financial assistance (FA).

[25] *Based on industry standards*



Septage Treatment Plant Clustering

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).

Northern Mindanao will need about PhP1.5 billion for basic sanitation from 2016 to 2022 to reach a target of 100%.

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 PhP2.7 billion and PhP316 million for 2022 and 2030, respectively, for its septage management program.

Sewerage System Program. Only Cagayan de Oro City and Iligan 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, Cagayan de Oro City and Iligan City will require PhP6.93 billion by 2022 and an additional PhP1.29 billion 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 may be closely examined initially (e.g., Gingoog City in Misamis Oriental, and Malaybalay City and City of Valencia in Bukidnon) as urbanization may set in more rapidly in these places than in other towns such as Ozamis City in Misamis Occidental, and tourism sites like Manolo Fortich in Bukidnon.

Table 23: Total Investment Costs for Sanitation Sector

Province/City	Total Investment Cost (in PhP Million) 2022	Total Investment Cost (in PhP Million) 2030
Bukidnon	4,116.91	1,239.61
Camiguin	139.57	51.33
Lanao del Norte	3,799.95	722.39
Misamis Occidental	2,074.35	352.95
Misamis Oriental	5,573.44	734.14
Cagayan de Oro City	10,425.38	2,465.38
Iligan City	2,683.64	485.89
Total	**28,813.24**	**6,051.69**

Nonphysical Investments

Northern Mindanao, 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.

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, pre-feasibility and feasibility study stages, detailed engineering design, to pre-procurement and procurement. Figure 20 shows the distribution of the investment requirement per province and HUC. Based on the proposed projects and programs, the region needs PhP487 billion to boost its WSS sector.

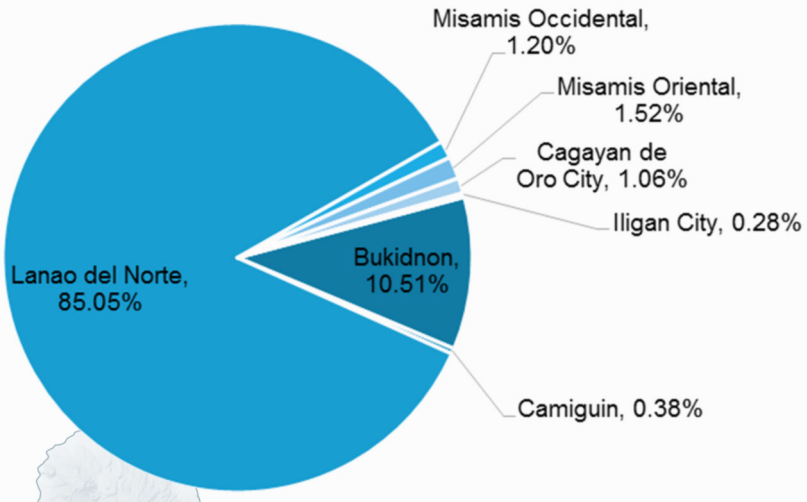


Figure 20: Distribution of Investment Requirement per Province/City

Bukidnon									
Water Supply		Period	Budget Requirement (in PhP Million)	Sanitation		Period	Budget Requirement (in PhP Million)	Total Budget Requirement (Php)	HH Beneficiaries (2022)
1	Upgrade of water meters installed 5 or more years ago (Phase 1)	Short Term	160.00	1	Creation of a Provincial Water Supply and Sanitation Board	-	-		
2	Upgrade of water meters installed 5 or more years ago (Phase 2)	Medium Tern	525.00	2	Establishment of a Local Water Sources Monitoring Committee	-	-		
3	Rehabilitation of dilapidated pipelines (Phase 1)	Short Term	113.00	3	Passage of the “Municipal Septage Management Ordinance” calling for the creation of a Septage Management Program	-	-		
4	Rehabilitation of dilapidated pipelines (Phase 2)	Medium Tern	132.00	4	Formulation and implementation of the local water safety and sanitation plan (Phase 1)	Short Term	5.00		
5	Calibration of all water meters	Short Term	3,000.00	5	Formulation and implementation of the local water safety and sanitation plan (Phase 2)	Medium Term	5.00		
6	Establishment of rainwater harvesting facilities in every household (Phase 1)	Short Term	4.00	6	Forming strategic alliances of multi-sectoral and multi-level stakeholders re: the construction of a septage treatment plant (Phase 1)	Short Term	1,863.28		
7	Establishment of rainwater harvesting facilities in every household (Phase 2)	Medium Tern	3.60	7	Forming strategic alliances of multi-sectoral and multi-level stakeholders re: the construction of a septage treatment plant (Phase 2)	Medium Term	192.80		
8	Construction of water treatment plant (Phase 1)	Short Term	20,500.00	8	Provision of water sealed toilet bowls to indigent families (Phase 1)	Short Term	500.00		
9	Construction of water treatment plant (Phase 2)	Medium Tern	23,000.00	9	Provision of water sealed toilet bowls to indigent families (Phase 2)	Medium Term	200.00		
10	Reforestation of watershed Areas (Phase 1)	Short Term	30.00	10	Regular collection of household waste	Short Term	457.00		
11	Reforestation of watershed Areas (Phase 2)	Medium Tern	30.00	11	Imposition of penalties on households or individuals caught throwing or dumping household waste into bodies of water	-	-	**51,260.68**	**345,481**
12	Payment of environmental services (Livelihood Projects) (Phase 1)	Short Term	110.00	12	Strict imposition of penalties on noncompliant industrial firms	-	-		
13	Payment of environmental services (Livelihood Projects) (Phase 2)	Medium Tern	300.00	13	Training on community-led total sanitation (Phase 1)	Short Term	25.00		
				14	Training on community-led total sanitation (Phase 2)	Medium Term	25.00		
				15	Seminars for/capacity building of health and identified community volunteers on community-based sanitation (Phase 1)	Short Term	10.00		
				16	Seminars for/capacity building of health and identified community volunteers on community-based sanitation (Phase 2)	Medium Term	10.00		
				17	Involvement of barangay health workers in environmental and sanitation programs	-	-		
				18	LGUs’ coordination with schools, church groups and other organizations or agencies re: information campaigns	-	-		
				19	Conduct of IEC campaigns in schools & barangays (Phase 1)	Short Term	10.00		
				20	Conduct of IEC campaigns in schools & barangays (Phase 2)	Medium Term	20.00		
				21	Tri-media campaign (radio, TV, and print media) (Phase 1)	Short Term	10.00		
				22	Tri-media campaign (radio, TV, and print media) (Phase 2)	Medium Term	20.00		
		Total	**47,907.60**			**Total**	**3,353.08**		

Camiguin										
	Water Supply	Period	Budget Requirement (in PhP Million)		Sanitation	Period	Budget Requirement (in PhP Million)	Total Budget Requirement (PhP)	HH Beneficiaries (2022)
1	Upgrading/improvement of main pipelines and reservoirs from Katugupan source, Mainit to Barangay Bonbon Catarman	-	-	1	Information dissemination on environmental protection and proper hygiene in every municipality of Camiguin	Long Term	2.00		
2	Upgrading/improvement of main pipelines and reservoirs from Katugupan source, Mainit to Barangay Bonbon Catarman	-	-	2	Information dissemination on environmental protection and proper hygiene in every municipality of Camiguin	-	3.00		
3	Construction of 2,000 cu.m. RC reservoir distribution mains and other appurtenances in the municipality of Mahinog at Brgy. Cabuan, Guinsiliban	-	-	3	Providing toilet bowls with septic tanks to 1,888 households with no toilets or sanitary facilities in critical barangays in five municipalities in Camiguin;	Short Term	1,776.00		
4	Construction of 2,000 cu.m. RC reservoir distribution mains and other appurtenances in the municipality of Mahinog at Brgy. Cabuan, Guinsiliban	-	-	4	Providing toilet bowls with septic tanks to 1,888 households with no toilets or sanitary facilities in critical barangays in five municipalities in Camiguin	-	2.00		
5	Installation of chlorinating equipment in the 2 new utility lines (Katugupan, Mainitit to Barangay Bonbon, and reservoir in Brgy. Cabuan)	-	-	5	Provision of other sanitation facilities (septage treatment plant/sewerage system)	Medium Term	5.00		
6	Installation of chlorinating equipment in the 2 new utility lines (Katugupan, Mainitit to Barangay Bonbon, and reservoir in Brgy. Cabuan)	-	-	6	Provision of other sanitation facilities (septage treatment plant/sewerage system)	-	-		
7	Water source development of Cabantian Spring including raw water mains, Sto. Nino, Catarman, Camiguin	-	-	7	Symposia aimed at crafting policies and procedures governing the adoption of various programs on sanitation (processing/issuing permits, record keeping, monitoring guidelines, regulation, etc.)	-	1.00		
8	Water Water source development of Cabantian Spring including raw water mains, Sto. Nino, Catarman, Camiguin	-	-	8	Symposia aimed at crafting policies and procedures governing the adoption of various programs on sanitation (processing/issuing permits, record keeping, monitoring guidelines, regulation, etc.)	-	15.00		
9	Other water supply infrastructure projects in Mambajao and Mahinog, Camiguin (projects still to be determined since the participants were unable to **attend) [attend what?]**	-	-	9	Provision of water-sealed toilet bowls to indigent families	Short Term	7.00		
10	Other water supply infrastructure projects in Mambajao and Mahinog, Camiguin (projects still to be determined since the participants were unable to **attend) [?]**	-	-						
11	Water supply infrastructure projects in Mambajao and Mahinog, Camiguin	Long Term	22.00						
12	Construction of a water treatment plant	Long Term	4.00						
13	Establishment of rainwater harvesting facilities in every household	Short Term	1.00						
14	Reforestation of watershed areas	Medium Term	6.00					**1,854.00**	**21,535**
		Total	**33.00**			**Total**	**1,811.00**		

	Water Supply and Sanitation	Period	Budget Requirement (in PhP Million)		Water Supply and Sanitation	Period	Budget Requirement (in PhP Million)
1	Putting up of signages and information banners in protected areas in Camiguin (Phase 1)	Short Term	5.00	10	Investment fora aimed at increasing capitalization and attracting investors, donors, and institutions providing loan grants; turnover of resources in 5 municipalities in Camiguin (financial capacity) (Phase 2)	-	-
2	Putting up of signages and information banners in protected areas in Camiguin (Phase 2)	Short Term	5.00	11	Memorandum of Understanding with key institutions (both public and private) for technical and financial support (feasibility, evaluation of existing water systems) re: water supply and sanitation management (Phase 1)	-	-
3	Information drive via the local media and schools informing the public and stakeholders of the current environmental state of Camiguin (Phase 1)	-		12	Memorandum of Understanding with key institutions (both public and private) for technical and financial support (feasibility, evaluation of existing water systems) re: water supply and sanitation management. (Phase 2)	-	-
4	Information drive via the local media and schools informing the public and stakeholders of the current environmental state of Camiguin (Phase 2)	-		13	Feasibility studies and evaluation of existing water and sanitation systems for Camiguin (Phase 1)	-	-
5	Training/seminars and arranging site visits of key LGUs, WSPS and NGA re: sustainability of the water supply and sanitation sector (Phase 1)	-		14	Feasibility studies and evaluation of existing water and sanitation systems for Camiguin (Phase 2)	-	-
6	Training/seminars and arranging site visits of key LGUs, WSPS and NGA re: sustainability of the water supply and sanitation sector (Phase 2)	-		15	Building alliances and goodwill with DPWH, DILG, and other government agencies, and actively participating in national water supply and sanitation programs	-	-
7	Human resources development and hiring of additional personnel to handle water supply and sanitation management (Phase 1)	-		16	Monitoring and evaluation of water supply and sanitation projects (Phase 1)	-	-
8	Human resources development and hiring of additional personnel to handle water supply and sanitation management (Phase 2)	-		17	Monitoring and evaluation project of water supply and sanitation projects (Phase 2)	-	-
9	Investment fora aimed at increasing capitalization and attracting investors, donors, and institutions providing loan grants; turnover of resources in 5 municipalities in Camiguin (financial capacity) (Phase 1)	-		18	Symposia aimed at crafting policies and procedures governing the adoption of various programs on sanitation (processing/issuing permits, record keeping, monitoring guidelines, regulation, etc.)	Short Term	-
		-				**Total**	**10.00**

Misamis Oriental									
	Water Supply	Period	Budget Requirement (in PhP Million)		Sanitation	Period	Budget Requirement (in PhP Million)	Total Budget Requirement (PhP)	HH Beneficiaries (2022)
1	Proposed geophysical assessment of the 26 major watersheds in Misamis Oriental	Short Term	858.00	1	Proposed study/data generation on sanitation per sector/industry	-	-		
2	Proposed geophysical assessment of the 26 major watersheds in Misamis Oriental	Medium Term	15.00	2	Fora for stakeholders re: IEC campaigns on water and sanitation best practices	-	-		
3	Proposed assessment of water availability and demand in Misamis Oriental	-	-	3	Learning exchange programs through visits re: best practices in water resources and septage management	-	-		
4	Proposed studies on water quality and use based on the geographic information system (GIS)	-	-	4	Proposed training in septage management, design and treatment including monitoring and evaluation	-	-		
5	Proposed survey of water sources and utilization in Misamis Oriental	-	-	5	Proposed implementation of sanitation laws and ordinances	-	-		
6	Proposed IEC programs in schools, barangays re: stakeholders' role in watershed management	-	-	6	Integration of sustainable sanitation development into the planning framework (PDPFP and CDP)	-	-		
7	Training programs for Misamis Oriental clusters on the 3-dimensional framework of IWRM	-	-	7	Proposed design and construction of sanitary septage facilities at the barangay level (i.e., remote communities) as well as on-site designs including collection and treatment	-	-		
8	Proposed creation of the Provincial Water Resources Management Board (LCEs) and Technical Working Group (MPDOs/PPDCs)	Short Term	58.00	8	Proposed design and construction of communal sanitary septage facilities for each of the 7 area clusters (MANLUNA, GALILEO, AGILA, CLAJAVITA, MISORET, GBA, Laguindingan Airport Development Project Impact Zone)	-	-		
9	Proposed establishment of financing programs in water resources and supply management	Medium Term	1.00	9	Implementation of plans and programs re: septage management and treatment plants	Short Term	-		
10	Proposed local ordinances and resolutions to resolve conflicts in water allocation	-	-	10	Implementation of plans and programs re: septage management and treatment plants	Medium Term	-		
11	DRRM/CCA enhanced planning and design of water resources infrastructure per cluster in Misamis Oriental	Short Term	1,143.00	11	Proposed construction of sanitary landfill per clustered LGUs (7 clusters)	Short Term	-		
12	DRRM/CCA enhanced planning and design of water resources infrastructure per cluster in Misamis Oriental	Medium Term	200.00	12	Proposed construction of sanitary landfill per clustered LGUs (7 clusters)	Medium Term	-		
13	Establishing an integrated information management system (IIMS) re: water resources and sanitation	-	-	13	Clustered septage management, collection and treatment facilities	Long Term	1,572.00		
14	Proposed design and construction of water supply distribution systems	-	-						
15	Proposed design and construction of a water filtration system for each cluster/municipality	-	-						
		Total	**2,275.00**			**Total**	**1,572.00**		

	Water Supply and Sanitation	Period	Budget Requirement (in PhP Million)					
1	Proposed geotagging of water and sanitation infrastructure in Misamis Oriental	-	-	7	Provincial Infrastructure Development:			**7,421.00 222,187**
2	Proposed capacity development to establish self-regulation (voluntary actions)	Short Term	58.00		a. DRRM/CCA enhanced planning and design of water resources infrastructure per cluster in Misamis Oriental			
3	Proposed capacity development to establish self-regulation (voluntary actions)	Medium Term	1,000.00		b. Integration of sustainable sanitation development into the planning framework (PDPFP and CDP)			
4	Proposed local laws and ordinances to establish regulations and guidelines	-	-		c. Establishing an integrated information management system (IIMS) re: water supply and sanitation			
5	Provincial Baseline Studies and Research:				d. Proposed design and construction of water supply distribution systems	Long Term	3,143.00	
	a. Geophysical assessment of the 26 major watersheds in Misamis Oriental				e. Proposed design and construction of a water filtration system for each cluster/municipality			
	b. Assessment of water availability and demand in Misamis Oriental				f. Proposed design and construction of sanitary septage facilities at the barangay level (remote communities) as well as on-site design including collection and treatment			
	c. GIS-based studies on water quality and use	Long Term	2,358.00		g. Proposed design and construction of communal sanitary septage facilities for each of the 7 area clusters (MANLUNA, GALILEO, AGILA, CLAJAVITA, MISORET, GBA, Laguindingan Airport Development Project Impact Zone)			
	d. Geotagging of water and sanitation infrastructure in Misamis Oriental			8	Provincial Institutional Mechanisms:			
	e. Survey of water sources and utilization in Misamis Oriental				1. Proposed creation of a Provincial Water Resources Management Board (LCEs) and Technical Working Group (MPDOs/PPDCs)			
	f. Study/data generation on sanitation per sector/ industry				2. Proposed local laws and ordinances to establish regulations and guidelines	Long Term	158.00	
6	Education and Training/IEC:				3. Proposed establishment of financing programs in water resources and supply management			
	a. Capacity development to establish self-regulation (voluntary actions)				4. Proposed local ordinances and resolutions to resolve conflicts in water allocation			
	b. IEC programs in schools and barangays re: stakeholders' role in watershed management				5. Proposed implementation of sanitation laws and ordinances			
	c. Training programs for Misamis Oriental clusters on the 3-dimensional framework of IWRM	Long Term	158.00			**Total**	**3,574.00**	
	d. Forum encouraging stakeholders to take part in IEC campaigns on water and sanitation best practices							
	e. Learning exchange programs through visits re: best practices in water resources and septage management							
	f. Training re: septage management, design and treatment including monitoring and evaluation							

Misamis Occidental									
	Water Supply	Period	Budget Requirement (in PhP Million)		Sanitation	Period	Budget Requirement (in PhP Million)	Total Budget Requirement (Php)	HH Beneficiaries (2022)
1	Reforestation of watershed areas	Short Term	12.50	1	Training on community-led total sanitation	Short Term	2.00		
2	Reforestation of watershed areas	Medium Term	26.30	2	Training on community-led total sanitation	Medium Term	5.00		
3	Establishment of Local Water Resources Monitoring Committee	Short Term	0.80	3	Construction of communal septic tanks for coastal areas	Short Term	78.30		
4	Establishment of Local Water Resources Monitoring Committee	Medium Term	1.10	4	Construction of a septage treatment plant (STP)	Short Term	150.00		
5	Upgrading of water supply distribution system from Level I or Level II to Level III	Short Term	1,110.00	5	Construction of an STP	Medium Term	300.00		
6	Upgrading of water supply distribution system from Level I or Level II to Level III	Medium Term	2,400.00	6	Establishment of STP Management and Monitoring Committee	Short Term	5.00		
7	Development of new water sources	Short Term	111.00	7	Establishment of STP Management and Monitoring Committee	Medium Term	15.00		
8	Development of new water sources	Medium Term	240.00	8	Charging of a socialized environmental fee for septage	Short Term	2.50		
9	Construction of water storage facilities	Short Term	166.50	9	Charging of a socialized environmental fee for septage	Medium Term	5.00		
10	Construction of water storage facilities	Medium Term	360.00	10	Formulation of a Provincial Sewerage Management Plan	Short Term	4.50		
11	Rehabilitation & improvement of water supply system facilities	Short Term	133.20	11	Formulation of a Provincial Sewerage Management Plan	Medium Term	6.50		
12	Rehabilitation & improvement of water supply system facilities	Medium Term	288.00	12	Technical and institutional training programs on sewerage management	Short Term	3.50		
13	Administration improvements such as: office and building improvements, purchasing of vehicles, office equipment, tools and implements, furniture and fixtures (Phase 1)	Short Term	8.00	13	Technical and institutional training programs on sewerage management	Medium Term	7.00		
14	Administration improvements such as: office and building improvements, purchasing of vehicles, office equipment, tools and implements, furniture and fixtures (Phase 2)	Short Term	8.30						
15	Development of water sources including geo-resistivity study and land acquisition; acquisition of pumps and motors, generators, electro-mechanical equipment; water treatment facilities and deep well accessories (Phase 1)	Short Term	16.50					**5,869.30**	**165,052**
16	Development of water sources including a geo-resistivity study and land acquisition; acquisition of pumps and motors, generators, electro-mechanical equipment; water treatment facilities and deep well accessories (Phase 2)	Short Term	12.50						
17	Expansion of service coverage areas (Phase 1)	Short Term	93.50						
18	Expansion of service coverage areas (Phase 2)	Short Term	93.90						
19	Service renewal (Phase 1)	Short Term	57.70						
20	Service renewal (Phase 2)	Short Term	69.90						
21	NRW Maintenance and Management Programs (Phase 1)	Short Term	44.40						
22	NRW Maintenance and Management Programs (Phase 2)	Short Term	27.00						
		Total	**5,281.10**			**Total**	**584.30**		

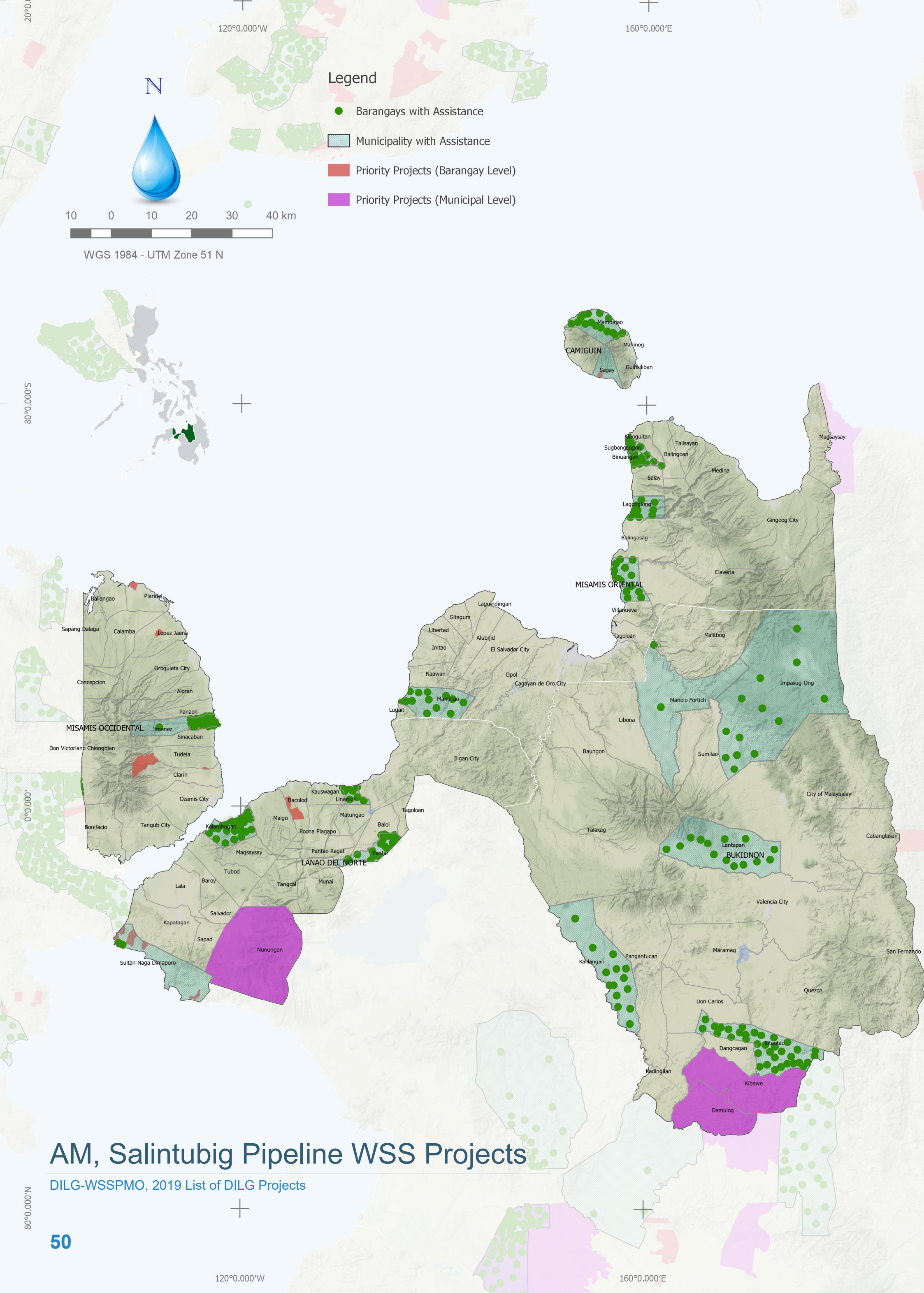
	Water Supply and Sanitation	Period	Budget Requirement (in PhP Million)
1	Technical, financial and institutional training programs on water supply and sanitation management	Short Term	1.40
2	Technical, financial and institutional training programs on water supply and sanitation management	Medium Term	2.50
		Total	**3.90**

Lanao Del Norte								
Water Supply	Period	Budget Requirement (in PhP Million)	Sanitation	Period	Budget Requirement (in PhP Million)	Total Budget Requirement (PhP)	HH Beneficiaries (2022)
1 Watershed profiling	Short Term	4.00	1 Improved sanitation projects	Short Term	28,296.00		
2 Watershed profiling	Medium Term	5.00	2 Improved sanitation projects	Medium Term	306,124.00		
3 Establishment of buffer zones	Short Term	5.00	3 Registration of septage service providers	-	-		
4 Reforestation project	Short Term	15.00	4 Identification of possible sites for septage treatment facility	-	-		
5 Reforestation project	Medium Term	15.00	5 Establishment/construction of septage treatment plant in cluster municipalities	Short Term	184.00		
6 Creation and operation of a local water and sanitation board	Short Term	6.00	6 Establishment/construction of septage treatment plant in cluster municipalities	Medium Term	3,634.00		
7 Construction of water supply facilities (Levels I, II & III)	Short Term	1,953.00	7 Separate sewerage system	Short Term	31,066.00		
8 Construction of water supply facilities (Levels I, II & III)	Medium Term	2,493.00	8 Separate sewerage system	Medium Term	41,106.00		
9 Improvement/redevelop- ment of water supply facilities	Short Term	9.00	9 Establishment of aerated lagoon system		-		
10 Improvement/redevelopment of water supply facilities	Short Term	3.00	10 Training on community-led total sanitation	Short Term	6.00		
11 Identification and profiling of alternative sources of water		-	11 Training on community-led total sanitation	Medium Term	6.00	415,002.00	158,258
12 Preparation of project proposal/feasibility study	Short Term	1.00	12 Training/Workshop on the formulation of a water safety plan	Short Term	5.00		
13 Preparation of project proposal/feasibility study	Medium Term	1.00	13 Training/Workshop on the formulation of a water safety plan	Medium Term	5.00		
14 Development of untapped springs/deep wells	Short Term	35.00	14 Training on sewerage & septage operation & management	Short Term	-		
15 Development of untapped springs/deep wells	Medium Term	5.00	15 Training on sewerage & septage operation & management	Medium Term	-		
16 Water quality control and development		-	16 Training on gender sensitivity	Short Term	5.00		
17 Human resources development and training		-	17 Training on gender sensitivity	Medium Term	5.00		
			18 Training on community development and management	Short Term	5.00		
			19 Training on community development and management	Medium Term	5.00		
			20 Project implementation arrangements	-	-		
			21 Community development and management	-	-		
	Total	**4,550.00**		**Total**	**410,452.00**		

Iligan City							
Water Supply	Period	Budget Requirement (in PhP Million)	Sanitation	Period	Budget Requirement (in PhP Million)	Total Budget Requirement (PhP)	HH Beneficiaries (2022)
1 JV proposal for Iligan City water supply improvement and expansion project	Short Term	612.83	1 Enforcement of existing environmental laws	-	-		
2 JV proposal for Iligan City water supply improvement and expansion project	Medium Term	658.18	2 Continuing information & education campaign on Segregation@ Source	-	-		
3 Public consultations re: proposed tariff	-	-	3 Improvement of existing facilities	-	-		
4 Creation of a monitoring team to draft the water safety plan and monitor implementation	Short Term	1.00	4 Amending existing sanitation laws which should include new trends and techniques	-	-		
5 Creation of a monitoring team to draft the water safety plan and monitor implementation	Medium Term	1.00	5 Tree & mangrove planting & growing	-	-	1,373.01	84,185
6 Reforestation of watershed areas	Short Term	20.00	6 Training on community-led total sanitation	-	-		
7 Reforestation of watershed areas	Medium Term	50.00	7 Training on community-led total sanitation	-	-		
8 Public consultations & preparation of IEC materials	Short Term	15.00	8 Construction of a sewerage & septage system	-	-		
9 Public consultations & preparation of IEC materials	Medium Term	15.00	9 Construction of a sewerage & septage system	-	-		
	Total	**1,373.01**		**Total**	-		

Cagayan de Oro City									
	Water Supply	Period	Budget Requirement (in PhP Million)		Sanitation	Period	Budget Requirement (in PhP Million)	Total Budget Requirement (PhP)	HH Beneficiaries (2022)
1	Procurement or development of additional water sources (surface & groundwater) (Phase 1)	Short Term	80.00	1	Implementation of CDOBAR WQMA PLAN	-	-		
2	Procurement or development of additional water sources (surface & groundwater) (Phase 2)	Medium Term	1,400.00	2	Construction of STP	Short Term	128.00		
3	Development of new water supply systems in waterless barangays	Short Term	316.00	3	Solid waste management plan	-	-		
4	Pipeline extension projects in waterless areas and in areas with poor water supply (Phase 1)	Short Term	59.00	4	Creation of sewerage system	Medium Term	2,000.00		
5	Pipeline extension projects in waterless areas and in areas with poor water supply (Phase 2)	Medium Term	600.00	5	Construction of treatment and disposal facilities	Short Term	1.00		
6	Continuing tree-growing projects in partnership with private organizations	Short Term	50.00	6	Cagayan de Oro City sewerage system	Long Term	65.00		
7	Employment of a leak detection system; activities in water pressure management	Short Term	9.70	7	Formulation of a septage management plan and construction of STPs	Long Term	128.00		
8	Establishment of a rainwater harvesting facility	Short Term	50.00						
9	Training on water demand management	Short Term	50.00						
10	Construction of additional water storage facilities/ water reservoirs	Short Term	36.00					**5,175.70**	**196,226**
11	Construction of flood walls or flood protection structures around water supply facilities; elevation of existing generator sets at sources & booster stations	Short Term	15.00						
12	Cagayan de Oro WD expansion (new river source)	Short Term	3.00						
13	Development of additional water sources (surface & groundwater)	Long Term	148.00						
14	Development of new water supply systems in waterless barangays	Long Term	32.00						
		Total	**2,848.70**			**Total**	**2,322.00**		

	Water Supply and Sanitation	Period	Budget Requirement (in PhP Million)	Water Supply and Sanitation	Period	Budget Requirement (in PhP Million)
1	Continuing tree-growing projects in partnership with private organizations	Short Term	5.00			
		Total	**5.00**			



AM, Salintubig Pipeline WSS Projects

DILG-WSSPMO, 2019 List of DILG Projects

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
Bukidnon	Impasug-Ong	Potable Water Supply System	Construction Of Water System	6,007,000
Bukidnon	Kalilangan	Potable Water Supply System	Rehabilitation Of Level III Potable Water System	6,628,000
Bukidnon	Kitaotao	Potable Water Supply System	Construction Of Water System	5,639,000
Bukidnon	Lantapan	Potable Water Supply System	Construction Of Level II Water System	7,052,000
Bukidnon	Manolo Fortich	Potable Water Supply System	Rehabilitation/Improvement Of Water System In Brgy. Minsuro	3,000,000
Bukidnon	Manolo Fortich	Potable Water Supply System	Expansion Of Water System In Brgy. Dicklum	4,842,000
Camiguin	Mambajao(Capital)	Potable Water Supply System	Rehab/Improvement Of Level II Water System	2,500,000
Camiguin	Mambajao (Capital)	Health And Sanitation	Construction Of Sanitary Toilet And Hygiene Facility	2,068,000
Camiguin	Sagay	Potable Water Supply System	Construction Of Level II Water System In Sudlon, Bacnit	8,000,000
Camiguin	Sagay	Potable Water Supply System	Rehabilitation/Improvement Of Water System In Poblacion	1,550,000
Lanao Del Norte	Kolambugan	Health And Sanitation		5,000,000
Lanao Del Norte	Kolambugan	Health And Sanitation	Construction Of Sanitary Toilets With Hygiene Facilities For Public Places	1,847,000
Lanao Del Norte	Kolambugan	Potable Water Supply System	Construction Of Water Supply System	3,000,000
Lanao Del Norte	Linamon	Potable Water Supply System	Rehab/Improvement Of Level II Water System	6,187,000
Lanao Del Norte	Pantar	Potable Water Supply System	Construction Of Water Supply System	2,000,000
Lanao Del Norte	Sultan Naga Dimaporo (Karomatan)	Potable Water Supply System	New Construction Of Level II Potable Water Supply System In Brgy. Kauswagan	2,774,000
Lanao Del Norte	Sultan Naga Dimaporo (Karomatan)	Potable Water Supply System	New Construction Of Level II Potable Water Supply System In Brgy. Tagulo	3,000,000
Misamis Occidental	Jimenez	Potable Water Supply System	Rehabilitation/Improvement Of Level III Waterworks System	11,529,000
Misamis Oriental	Binuangan	Potable Water Supply System	Rehabilitation/Improvement Of Level III Waterworks System	2,362,000
Misamis Oriental	Jasaan	Potable Water Supply System	Expansion Of Water System	11,584,000
Misamis Oriental	Lagonglong	Potable Water Supply System	Construction Of Water Supply System	5,047,000
Misamis Oriental	Manticao	Potable Water Supply System	Expansion Of Water System	9,877,000
Misamis Oriental	Sugbongcogon	Potable Water Supply System	Expansion Of Water System	7,631,000
			Total	**119,124,000**

SALINTUBIG (2019)				
Province	Municipality	Name Of Project	Barangay	Amount
Camiguin	Sagay	Rehab And Improvement Of Mayana Water System	Mayana	3,000,000
Lanao Del Norte	Bacolod	Potable Water Supply	Babalaya and Kahayag	6,000,000
Lanao Del Norte	Sultan Naga Dimaporo	Potable Water Supply	Kirapan, Mahayahay, Lantawan, Calibao, Mabuhay and Bagco	9,000,000
Misamis Occidental	Jimenez	Potable Water Supply	Seti,Sinara Alto and Sinara Bajo	9,000,000
Misamis Occidental	Lopez Jaena	Potable Water Supply	Macalibre Alto	3,000,000
Misamis Occidental	Plaridel	Potable Water Supply	Danao	3,000,000
Misamis Oriental	Sugbongcogon	Potable Water Supply	Alicomohan and Kiraging	6,000,000
Misamis Occidental	Tudela	Potable Water Supply	Gala and Yahong	6,000,000
Bukidnon	Damulog	Potable Water Supply	-	10,000,000
Bukidnon	Kibawe	Potable Water Supply	-	15,000,000
Lanao Del Norte	Nunungan	Potable Water Supply	-	10,000,000
			Total	**80,000,000**

LWUA (2017-2018)				
Province	Water District	Project Type	Status	Amount
Bukidnon	Manolo Fortich WD	Development of Surface Water	Pending approval	135,000,000.00
Bukidnon	Quezon WD	Admin Building	Pending approval	10,000,000.00
Bukidnon	Valencia City WD	NRW Reduction	Pending approval	250,000,000.00
Misamis Oriental	Balingasag WD	Water System Improvement	Pending approval	7,200,000.00
Misamis Oriental	Cagayan De Oro	Pipeline Extension	Pending approval	66,580,000.00
Bukidnon	Manolo Fortich WD	Expansion	Pending approval	150,000,000.00
Bukidnon	Valencia City	Expansion	Pending approval	160,000,000.00
Misamis Oriental	Province of Misamis Oriental	Expansion	Pending approval	500,000,000.00
Misamis Oriental	Cagayan De Oro	Expansion	Pending approval	500,000,000.00
			Total	**1,778,780,000.00**

Appendix A: Provincial and HUC Profiles

BUKIDNON	22 municipalities	Baungon, Cabanglasan, Damulog, Dangcagan, Don Carlos, Impasugong, Kadingilan, Kalilangan, Kibawe, Kitaotao, Lantapan, Libona, Malitbog, Manolo Fortich, Maramag, Pangantucan, Quezon, San Fernando, Sumilao, Talakag
	two (2) component cities	Valencia City, Malaybalay City
	464 barangays	18 urban, 446 rural
Land Area	10,498.59 square kilometers	
Demographics (2015)	Population (2015) – 1,415,226 Population Growth Rate (2000 to 2015) – 1.91 Population Density – 130 per sq. km	
Economy	• Major industries - agriculture, livestock, manufacturing, handicraft • Major products - flowers, handicrafts • Major crops - rice, corn, sugar, coffee, pineapply, tomato, cassava, fruits, vegetables • Bukidnon hosts one of the largest pineapple plantations in the world. Owned by Del Monte Philippines, Inc., the plantation covers an area of 23,000 hectares.	
Poverty Incidence (2015)	On Families – 47.0 On Population – 53.6	
CAMIGUIN	5 municipalities	Catarman, Guinsiliban, Mahinog, Mambajao, Sagay
	58 barangays	3 urban, 55 rural
Land Area	237.95 square kilometers	
Demographics (2015)	Population (2015) – 88,478 Population Growth Rate (2000 to 2015) – 1.16 Population Density – 370 per sq. km	
Economy	• Major industries - agriculture, fishery, tourism, handicraft • Major products - crafts made from abaca fiber • Major crops - copra, *lanzones*, rice, cassava, coffee, fruits • Camiguin is the second smallest province in the Philippines. • With *lanzones* as the prime produce, the province serves as the venue of the *Lanzones* Festival every October.	
Poverty Incidence (2015)	On Families – 29.9 On Population – 34.0	
LANAO DEL NORTE	22 municipalities	Bacolod, Baloi, Baroy, Kapatagan, Kauswagan, Kolambugan, Lala, Linamon, Magsaysay, Maigo, Matungao, Munai, Nunungan, Pantao Ragat, Pantar, Poona Piagapo, Salvador, Sapad, Sultan Naga Dimaporo, Tagoloan, Tangcal, Tubod
	one (1) independent city	Iligan City
	462 barangays (excluding Iligan City)	27 urban, 435 rural
Land Area	3,346.57 square kilometers	
Demographics (2015)	Population (2015) – 676,395 Population Growth Rate (2000 to 2015) – 2.37 Population Density – 200 per sq. km	
Economy	• Major industries - agriculture, fishery, tourism • Major products - aquaculture products • Major crops - coconut, copra, rice, corn, fruits • Lano del Norte is home to the Agus Power Plants 4, 6 and 7 that stretches from Baloi to Iligan City, which generate 80% of the Mindanao power grid.	
Poverty Incidence (2015)	On Families – 36.3 On Population – 44.3	

MISAMIS OCCIDENTAL	14 municipalities	Aloran, Baliangao, Bonifacio, Calamba, Clarin, Concepcion, Don Victoriano Chiongbian, Jimenez, Lopez Jaena, Panaon, Plaridel, Sapang Dalaga, Sinacaban, Tudela
	three (3) component cities	Oroquieta City, Ozamiz City, Tangub City
	490 barangays	20 urban, 470 rural
Land Area	2,055.22 square kilometers	
Demographics (2015)	Population (2015) – 602,126 Population Growth Rate (2000 to 2015) – 1.40 Population Density – 290 per sq. km	
Economy	• Major industries - agriculture, fishery • Major products - coconut oil, rubber, furniture and handicrafts made of wood, bamboo and rattan • Major crops - rice, coconut, corn, abaca, cacao • Misamis Occidental is endowed with rich fishing grounds, the biggest brackish water fishponds in the region.	
Poverty Incidence (2015)	On Families – 30.1 On Population – 36.9	

MISAMIS ORIENTAL	23 municipalities	Alubijid, Balingasag, Balingoan, Binuangan, Claveria, Gitagum, Initao, Jasaan, Kinoguitan, Lagonglong, Laguindingan, Libertad, Lugait, Magsaysay, Manticao, Medina, Naawan, Opol, Salay, Sugbongcogon, Tagoloan, Talisayan, Villanueva
	one (1) independent city	Cagayan de Oro City
	two (2) component cities	El Salvador City, Gingog City
	424 barangays (excluding Cagayan de Oro City)	13 urban, 411 rural
Land Area	3,131.52 square kilometers	
Demographics (2015)	Population (2015) – 888,509 Population Growth Rate (2000 to 2015) – 1.92 Population Density – 280 per sq. km	
Economy	• Major industries - agriculture, forestry, mining, services • Major products - steel, metal, processed food, rubber, wood • Major crops - coconut, pineapple, rice, banana, papaya, cassava, vegetables	
Poverty Incidence (2015)	On Families – 14.9 On Population – 19.3	

Appendix A: Provincial and HUC Profiles

CAGAYAN DE ORO CITY	Cagayan de Oro City serves as the regional center of Northern Mindanao. 80 barangays — 80 urban, 0 rural
Land Area	412.80 square kilometers
Demographics (2015)	Population (2015) – 675,950 Population Growth Rate (2000 to 2015) – 2.53 Population Density – 1,600 per sq. km
Economy	• Major industries - agriculture, livestock, trade and commerce, services, tourism • Major products - hog, goat, cattle and carabao meat • Major crops - coconut, abaca, cacao, coffee, root crops, fruits • Cagayan de Oro City is known for its white water rafting or kayaking adventures.

ILIGAN CITY	Iligan City is known as the industrial center of southern Philippines with its industry-based economy. 44 barangays — 11 urban, 33 rural
Land Area	813.37 square kilometers
Demographics (2015)	Population (2015) – 342,618 Population Growth Rate (2000 to 2015) – 1.21 Population Density – 420 per sq. km
Economy	• Major industries - agriculture, banking, trade and commerce, tourism • Major products - pinakurat, packed peanuts with various flavors • Major crops - coconut, corn, banana, coffee, peanuts • Iligan City is known as the “City of Majestic Waterfalls” because of its numerous waterfalls, the most well-known of which is the Maria Cristina Falls.

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
NEDAhq