NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY

Volume 2: Philippine Water Supply and Sanitation Master Plan

Ilocos Region Water Supply and Sanitation Databook and Regional Roadmap

Table of Contents

List of Tables

List of Figures

Acronyms

AHFF	Agriculture, Hunting, Fishery and Forestry
AIP	Annual Investment Plan
AM	Assistance to Municipalities
BOD	Biological Oxygen Demand
BWSA	Barangay Waterworks and Sanitation Association
CapEx	Capital Expenditure
CAR	Cordillera Administrative Region
CBO	Community-Based Organization
CNC	Certificate of Non-Coverage
DA	Department of Agriculture
DAO	DENR 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
EMB	Environmental Management Bureau
FA	Financial Assistance
FAO	Food and Agriculture Organization
FHSIS	Field Health Service 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
IWRM	Integrated Water Resources Management
JICA	Japan International Cooperation Agency
JJA	June, July and August
JMP	Joint Monitoring Programme
LCE	Local Chief Executive
LDP	Local Development Plan
LFPR	Labor Force Participation Rate
LGU	Local Government Unit
LHB	Local Housing Board
LSB	Local School Board
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	Millennium Development Goals
MGB	Mines and Geosciences Bureau
MSMEs	Micro, Small and Medium Enterprises
NAMRIA	National Mapping and Resource Information Authority
NAPC	National Anti-Poverty Commission
NCR	National Capital Region
NDRRMC	National Disaster Risk Reduction Management Council
NEDA	National Economic and Development Authority
NGO	Non-Government Organization
NRW	Non-Revenue 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
RHO	Regional Health Office
ROW	Right-of-Way
RWSA	Rural Waterworks and Sanitation Association
RWS	Rural Water System
SALINTUBIG	Sagana at Ligtas na Tubig
SDG	Sustainable Development Goals
SMC	Septage Management Committee
SMERA	Small and Medium Enterprise Roving Academy
SMP	Septage Management Program
SON	September, October and November
STP	Septage Treatment Plant
SSF	Shared Service Facilities
SWTP	Surface Water Treatment Plant
TC	Tropical Cyclones
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
WGS	World Geodetic System
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

160°0.000'W

120°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

20°0.000'N

80°0.000'S

0°0.000'

160°0.000'W

120°0.000'E

Region I - Ilocos

Introduction

1

Ilocos Region

The Ilocos Region (Region I) is located in the northwest section of Luzon.

It is bounded by the Cordillera Administrative Region (CAR) and Cagayan Valley Region. It is bordered by the Central Cordillera Mountain Range on the east and the West Philippine Sea on the west.

The region is composed of four provinces, namely: Ilocos Norte, Ilocos Sur, La Union, and Pangasinan.

It is predominantly mountainous, with a few hills and some lowland areas. The region can be reached via land, air, and water.

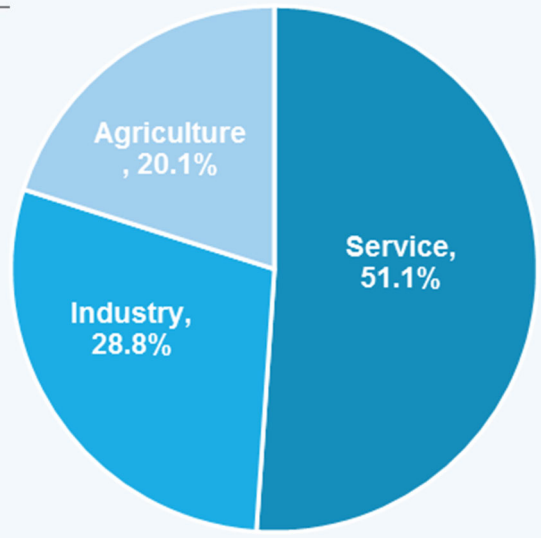


Figure 1: GRDP Contributions per Sector, 2016

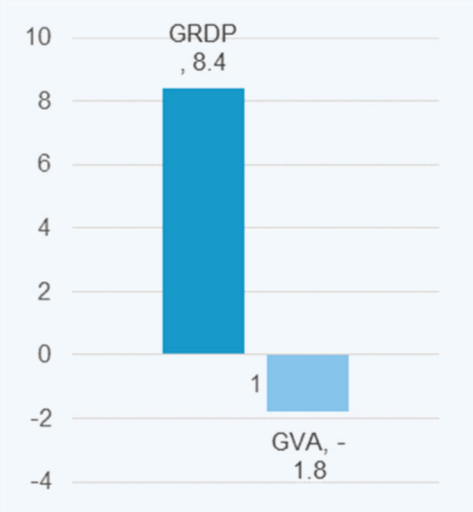


Figure 2: GRDP and GVA in Agriculture, Hunting, Forestry and Fishing, 2016

Land Classification

The region has a total land area of 12,840 square kilometers, representing around 4% of the country's total land area and 12% of the island of Luzon. Pangasinan (41.81%) has the biggest land area while the smallest province is La Union (11.63%).

About 37% of the region's total land area covers forestland and 63% alienable and disposable land.

About 17% of its vast forestland is used as forest reserves while 16% is used for timber production. The remainder of its land area includes national parks, and areas classified as military, naval and civil reservation and land for fishpond development.[1]

Economy

The 2016 CountryStat Philippines for Ilocos Region indicates that the service sector contributes the largest Gross Regional Domestic Product (GRDP) followed by the industrial sector and the agriculture, fishery, and forestry sector.[2]

Table 1: GRDP and GVA in Agriculture, Hunting, Forestry and Fishing, 2016

Item	At Current Prices	At Constant 2000 Prices
	In Million Pesos	
Gross Regional Domestic Product	450,667	257,208
Gross Value Added in Agriculture, Hunting, Forestry and Fishing	90,221	51,581

The low contribution of the agriculture, hunting, forestry and fishing (AHFF) sector is attributed to the large number of aging farmers, the conversion of productive farmlands into non-agricultural purposes, the effects of climate change, and unanticipated natural disasters. These factors all contribute to the vulnerability of the sector.[3]

Labor and Employment

As of October 2017, the current total labor force participation rate (LFPR) was estimated at 59.7% (nearly 2.076 million) of the region's total population. This shows a decrease of 1.5% from the 2016 LFPR.[4]

[1] *NEDA — Region I, Regional Development Plan, 2011-2016*
[2] *Philippine Statistics Authority, CountryStat Philippines 2016*
[3] *NEDA — Region I, Regional Development Plan, 2017-2022*
[4] *Philippine Statistics Authority, Labor Force Survey, 2017*

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

Population Density (person/ha)

- 0.0 - 1.3
- 1.3 - 2.5
- 2.5 - 3.5
- 3.5 - 4.9
- 4.9 - 6.6
- 6.6 - 9.0
- 9.0 - 12.7
- 12.7 - 19.2
- 19.2 - 34.3
- 34.3 - 8364.2

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Nagbukel
Narvacan
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
Banayoyo
San Emilio
Candon City
Galimuyod
Gregorio Del Pilar
Quirino
Salcedo
Santa Lucia
Santa Cruz
Sigay
Cervantes
Suyo
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Sugpon
Santol
Bacnotan
San Gabriel
San Juan
San Fernando City
LA UNION
Bagulin
Naguilian
Burgos
Bauang
Caba
Aringay
Agoo
Tubao
Pugo
Santo Tomas
Rosario
Bolinao
Anda
Bani
Sison
San Fabian
San Nicolas
Alaminos City
Pozzorubio
Agno
San Manuel
San Jacinto
Binalonan
Sual
Dagupan City
Manaoag
Natividad
Mapandan
Asingan
Tayug
Burgos
Lingayen
Binmaley
Calasiao
San Quintin
Mabini
Labrador
PANGASINAN
Santa Barbara
Urdaneta City
Santa Maria
Dasol
Villasis
Bugallon
San Carlos City
Malasiqui
Rosales
Balungao
Umingan
Basista
Alcala
Infanta
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem

Population Density

PSA, 2015 Census

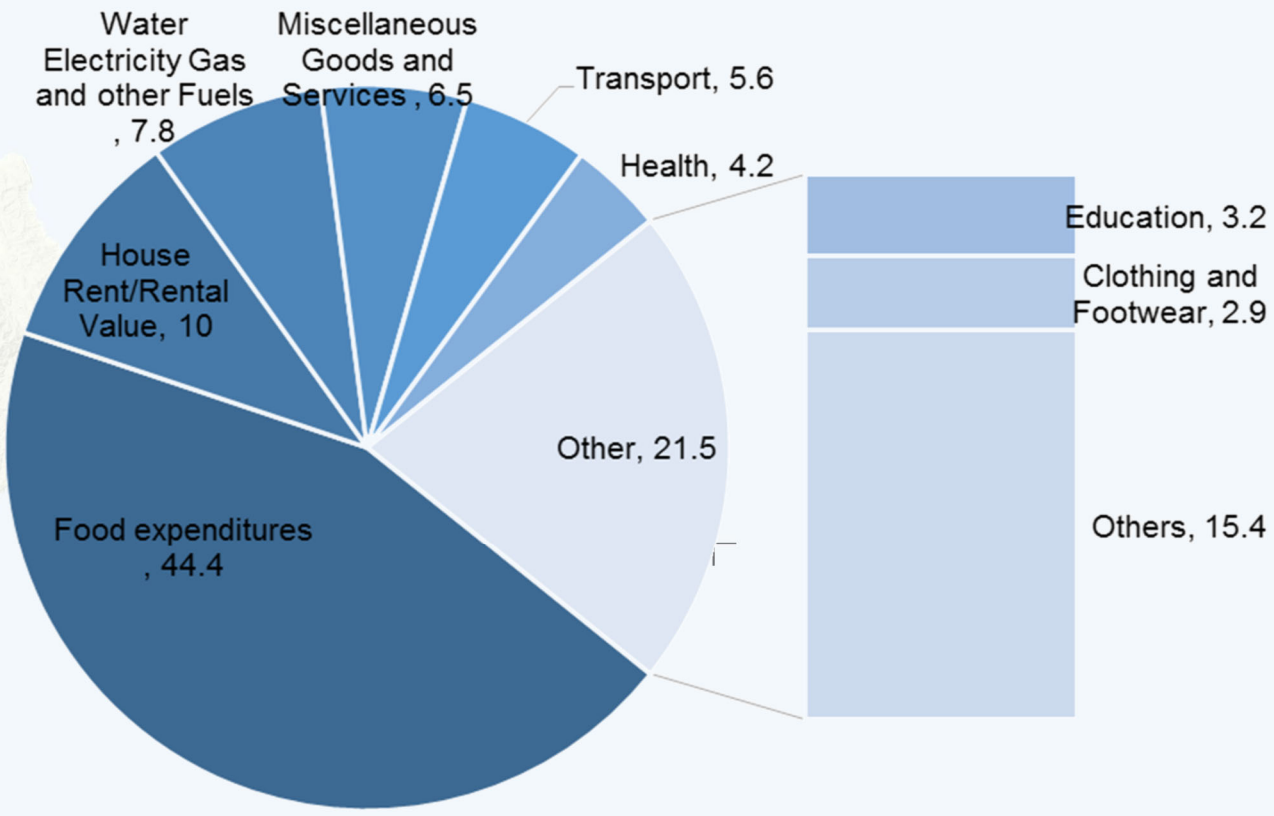


Figure 3: Distribution of Expenditure, 2015

Demography

The Ilocos Region's population reached 5,026,128 in the last census year (2015), accounting for 4.98% of the total Philippine population. There was an annual average increase of 1.09% for the period 2010 to 2015.

Of the four provinces in the region, Pangasinan has the biggest population with 2.96 million while Ilocos Norte has the smallest population with only 593,000. San Carlos City has a population of 189,000, the biggest among the nine cities in Region I while Vigan City has the smallest population, 54,000. Table 2 shows the distribution of the population and density per province.

The population density of the region in 2015 averaged 390 people per km². Pangasinan has the highest density at 540 people per km². The map on the left shows that the population of the region is concentrated in the cities as well as along the coastal areas.

The household size in the region averages 4.36 people.

The region is predominantly rural, that is, 88% of its population lives in rural areas. Currently, none of its nine cities has been classified as a highly urbanized city (HUC). Table 3 shows the percentage of urban and rural population of each province.

Family Income and Expenditure

There are about 1,170 families in the Ilocos Region, with an estimated total average income of PhP238,000 and a total average expenditure of PhP182,000. Across all the income classes in Region I, all exhibited having an average expenditure lower than the average income.

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 2015 Family Income and Expenditure Survey (FIES) reveals that food expenditure registered the highest among the major expenditure groups at 44.4%. Expenditure for house rental/rental value followed at 10.0% and that for water, electricity, gas and other fuels at 7.80%.

Figure 3 graphs the expenditure disseminations and shows that most families spend more on their basic needs[5].

Table 2: Population per Province, 2015

Region/Province	2015 Population	Land Area	Population Density
		km²	Person/km²
Ilocos Region	**5,026,128**	**12,840.19**	**390**
Ilocos Norte	593,081	3,399.34	170
Ilocos Sur	689,668	2,579.58	270
La Union	786,653	1,493.09	530
Pangasinan	2,956,726	5,368.18	540

Table 3: Urban and Rural Population per Province, 2015[6]

Region/Province	Urban Population	Rural Population	HH Size
Ilocos Region	**12%**	**88%**	**4.36**
Ilocos Norte	5%	95%	4.24
Ilocos Sur	2%	98%	4.38
La Union	12%	88%	4.34
Pangasinan	16%	84%	4.38

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

160°0.000'W

120°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

20°0.000'N

80°0.000'S

0°0.000'

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 of 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.

Climate

PAGASA, 2015 Data

160°0.000'W

120°0.000'E

Climate

Region I has a Type I climate with two pronounced seasons: a dry season that lasts from November to April and a rainy season that lasts from May to October. Cooler temperatures occur in December until February while the hottest months occur in April and May.

Disaster Risk

Because of its geographical location, Ilocos Region is highly susceptible to typhoons and flooding. From 2010 to 2016, several natural calamities battered the region, the most destructive of which included Typhoons Lando and Ineng in 2015 affecting about 1.336 million residents.

In 2010, 20 disaster incidents were recorded devastating 560,000 people in the region. In 2011, there were 32 disaster incidents affecting 620,000 people. In 2012, however, there was a decrease in the number of natural disasters affecting 210,000. In 2013, the number of disasters decreased, but the affected population increased to 500,000 on account of the disasters' intensity.

In 2014, 47 disasters struck the region with a total of 850,000 people affected. In 2016, there was a decrease by more than 60% in the number of people affected — from 1.336 million in 2015 to only 413,000 in 2016.[7]

Climate Change and Hydrological Hazards

The Philippines is a country at greatest risk of climate-related hazards, such as tropical cyclones (TCs), floods, droughts and sea level rise. The effects of observed changes in extreme events and severe climate anomalies include: (a) an increased occurrence of extreme rains causing 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. All the studies show a general increase in rainfall for 2020, 2050 and beyond. However, the models 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 extremely vulnerable to changes in river flows and the rate of replenishment of the 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. Less 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 > 35°C, days when rainfall > 300 mm and number of dry days) in Region I 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: DJF for December, January and February, MAM for March, April and May, JJA for June, July and August and SON for September, October and November. The findings of the projections were added to the observed values in the past 30-year baseline (1971-2000).

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

Seasonal Temperature Increases (in °C)	Observed Baseline (1971 - 2000)				Change in 2020 (2006-2035)				Change in 2050 (2036-2065)			
Provinces	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Ilocos Norte	25.3	28.1	28.3	27.4	0.8	1.0	0.8	0.9	2.1	2.2	1.7	1.8
Ilocos Sur	23.1	25.7	25.4	24.8	0.9	1.1	0.8	1.0	2.0	2.1	1.6	1.8
La Union	20.5	22.9	22.8	22.2	0.9	1.1	0.7	1.0	2.0	2.1	1.6	1.8
Pangasinan	25.0	27.4	26.9	26.4	0.9	1.1	0.9	1.0	2.2	2.1	1.8	2.0
Seasonal Rainfall Change (in %)	Observed Baseline (1971 - 2000)				Change in 2020 (2006-2035)				Change in 2050 (2036-2065)			
Provinces	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Ilocos Norte	49.8	185.5	1106.4	595.4	4.4	-3.1	18.0	5.8	-18.8	-31.3	20.9	4.7
Ilocos Sur	17.5	288.8	1575.4	672.9	-4.6	-2.0	3.3	23	-0.1	-27.6	58.1	33.3
La Union	14.7	395.6	1852.3	837.8	-0.4	4.5	43.1	30	-1.1	-24.6	72.5	39.0
Pangasinan	19.4	298	1608.9	707.8	54.3	-6	6.1	5.9	1.1	-11.2	22.9	11.9

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

Provinces	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
Ilocos Norte	Laoag	801	1677	3157	9015	7391	7425	4	19	10
Ilocos Sur	Vigan	110	130	627	8728	8105	7939	1	17	6
Pangasinan	Dagupan	1280	2265	3728	8303	6443	6419	2	13	20

[7] *Office of Civil Defense, National Disaster Risk Reduction Management Council*

160°0.000'W

120°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

ILOCOS NORTE

ILOCOS SUR

LA UNION

PANGASINAN

20°0.000'N

80°0.000'S

0°0.000'

Contour Map

NAMRIA

160°0.000'W

120°0.000'E

60°0.000'S
160°0.000'W
120°0.000'E
20°0.000'N
80°0.000'S
0°0.000'

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Pagudpud
Burgos
Bangui
Adams
Pasuquin
Vintar
Bacarra
Ilocos Norte
Laoag City
San Nicolas
Piddig
Sarrat
Paoay
Dingras
Solsona
Batac City
Marcos
Banna
Badoc
Pinili
Nueva Era
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Vicente
Bantay
Vigan City
Santa
Nagbukel
Narvacan
Santa Maria
Burgos
Santiago
Lidlidda
Ilocos Sur
Candon City
Gallmuyod
Gregorio Del Pilar
Quirino
Salcedo
Santa Cruz
Sigay
Cervantes
Tagudin
Suyo
Alilem
Sudipen
Luna
Balaoan
Sugpon
Bacnotan
Santol
San Juan
San Gabriel
San Fernando City
La Union
Bauang
Naguilian
Caba
Aringay
Tubao
Agoo
Pugo
Bolinao
Anda
Bani
Rosario
Sison
Alaminos City
San Nicolas
Agno
Pozzorubio
San Manuel
Natividad
Sual
Dagupan City
Burgos
Manaoag
Asingan
San Quintin
Mabini
Lingayen Binmaley
Labrador
Santa Barbara
Urdaneta City
Dasol
Bugallon
Malasiqui
Villasis
San Carlos City
Balungao
Umingan
Infanta
Agular
Urbiztondo
Alcala
Bayambang
Mangatarem

500
1000
1500
2000
2500
3000

Legend

Annual Rainfall 2015

Average Rainfall

PAGASA, 2015 Data

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

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

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Nagbukel
Narvacan
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
Banayoyo
San Emilio
Candon City
Galimuyod
Gregorio Del Pilar
Quirino
Salcedo
Santa Lucia
Santa Cruz
Sigay
Cervantes
Suyo
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Santol
Sugpon
Bacnotan
San Gabriel
San Juan
San Fernando City
LA UNION
Bagulin
Naguilian
Bauang
Burgos
Caba
Aringay
Tubao
Agoo
Pugo
Santo Tomas
Rosario
Bolinao
Anda
Bani
Sison
Alaminos City
San Fabian
Agno
Pozzorubio
San Nicolas
San Manuel
Sual
San Jacinto
Binalonan
Dagupan City
Manaoag
Natividad
Burgos
Mapandan
Asingan
Tayug
Mabini
Lingayen
Binmaley
Calasiao
San Quintin
Labrador
PANGASINAN
Santa Barbara
Urdaneta City
Santa Maria
Dasol
Villasis
Bugallon
San Carlos City
Malasiqui
Rosales
Balungao
Umingan
Basista
Alcala
Infanta
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem

Access to Safe Drinking Water

PSA, 2015 Census

WSS Sector Status

Access to Safe Water

About 92% of the population of the Ilocos Region had access to classified water sources as of 2015.[8]

This translates to around 1,078,782 households (HHs) out of the total 1,169,919 HHs. About 16% of the population has Level III service connections in their own homes while 6% is connected to Level II service and shares water supply with the community. Access to Level I service accounts for 78%.

Safe sources of water under this category include tubed and/or piped deep/shallow wells (which are either privately owned or shared with the community), protected springs, rivers, streams, and other water resources.

The region's access to safe water is higher than the national average of about 4.5%. In terms of access per level of service, the percentage of the population of the Ilocos Region with access to Level I sources is significantly higher than that with access to Level III sources.

Table 6: National and Regional Access to Water Supply[9]

Level of Service	National	Ilocos
Level III	44.1%	16.0%
Level II	11.2%	6.1%
Level I (Safe Sources)	32.4%	70.1%
Subtotal (Safe Sources)	*87.7%*	*92.2%*
Level I (Unsafe Sources)	12.3%	7.8%
Total	**100.0%**	**100.0%**

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

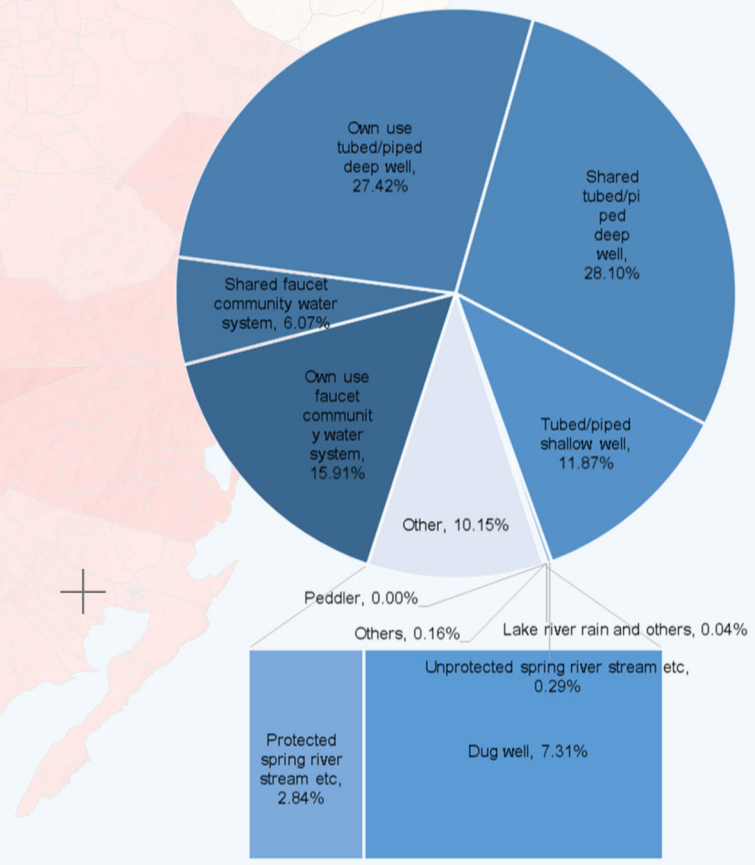


Figure 4: Main Sources of Water Supply, 2015

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

Table 7: Access to Water Supply per Province[10]

Region/Province	Access to Safe Water Supply
Ilocos Region	**95.8%**
Ilocos Norte	96.8%
Ilocos Sur	93.8%
La Union	92.9%
Pangasinan	96.9%

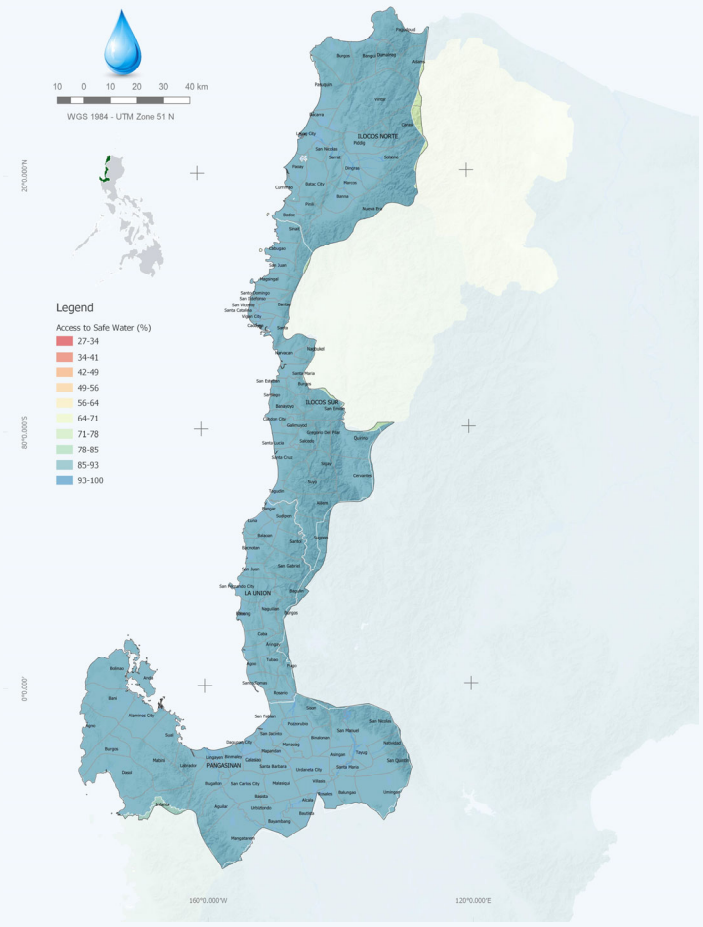


Figure 5: Provincial Access to Safe Water

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 of drinking water is mostly the same as that of the sources of safe water except for bottled water sources.

As of 2015, 95% of the population of Region I has access to drinking water from what are considered improved and safe water sources. Of the region's total population, 35% drinks bottled water.

At the provincial level, Ilocos Norte registered comparatively low access to safe drinking water at around 86%.

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 Ilocos Region Province's first hand data on access to safe water: gathered during the regional consultation and planning workshop

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

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

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Narvacan
Nagbukel
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
Banayoyo
San Emilio
Candon City
Galimuyod
Gregorio Del Pilar
Quirino
Santa Lucia
Salcedo
Santa Cruz
Sigay
Cervantes
Suyo
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Santol
Sugpon
Bacnotan
San Gabriel
San Juan
San Fernando City
LA UNION
Bagulin
Naguilian
Bauang
Burgos
Caba
Aringay
Agoo
Tubao
Pugo
Santo Tomas
Rosario
Bolinao
Anda
Bani
Alaminos City
Agno
Sual
Burgos
Mabini
Labrador
Dasol
Lingayen
Binmaley
PANGASINAN
Calasiao
Santa Barbara
Urdaneta City
Bugallon
San Carlos City
Malasiqui
Villasis
Basista
Rosales
Balungao
Umingan
Alcala
Infanta
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem
Sison
San Fabian
Pozzorubio
San Nicolas
San Manuel
San Jacinto
Binalonan
Dagupan City
Manaoag
Natividad
Mapandan
Asingan
Tayug
San Quintin
Santa Maria

Access to Sanitation

Ilocos Regional Consultation and Planning Workshop, 2017 Data

Access to Sanitation

Ilocos Region has significantly grown, reaping the benefits of an economic boom in Vigan City, Dagupan City, and surrounding municipalities. The fast-paced growth of the region has consequently led to an increase in demand for sanitation services.

About 72% of the region's population has access to improved sanitation.

PSA's 2015 FIES 2015 has reported that in terms of improved sanitation, the Ilocos Region is almost on a par with the national average. The regional percentage with regard to open defecation was lower than the national percentage (open defecation being a proxy indicator for the absence of toilet facilities).

Table 8: National and Regional Access to Sanitation[11]

Sanitation Coverage	National	Ilocos Region
Improved Sanitation	73.77%	71.62%
Basic Sanitation	19.96%	25.23%
Unimproved Sanitation	2.04%	1.59%
Open Defecation	4.23%	1.56%
Total	**100.0%**	**100.0%**

Table 9: Access to Sanitation Facilities per Province[12]

Year 2015	HHs with Sanitary Toilets	HHs with Complete Basic Sanitation Facilities
Ilocos Region	**93.17%**	**85.22%**
Ilocos Norte	93.69%	85.16%
Ilocos Sur	90.45%	84.39%
La Union	90.64%	75.54%
Pangasinan	94.49%	85.29%

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

Categorization of the facilities as per SDG definitions is as follows:

Improved Sanitation	▪ Water-sealed sewer septic tank (exclusive use) ▪ 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

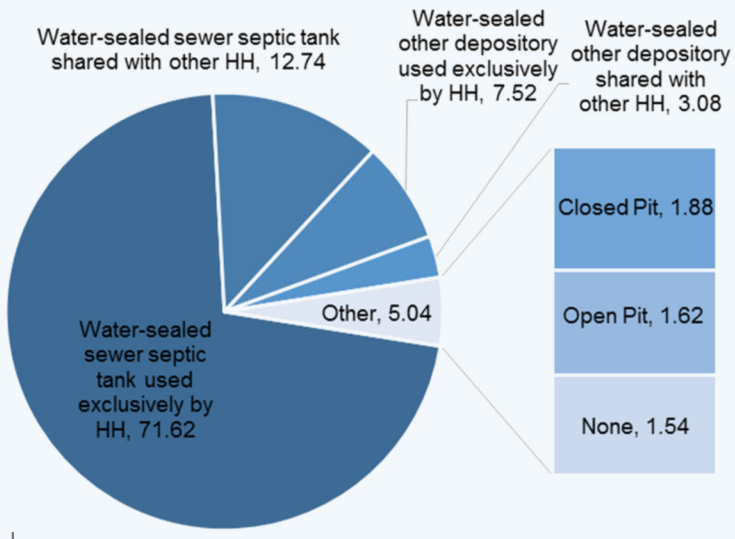


Figure 6: Percentage of HHs with Access to Sanitation Facilities

Figure 6 shows the percentage per type of sanitation facility Ilocos households have access to. Sanitation facilities (as shown in said figure) represent 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 the Ilocos Region 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 the region. Regarding The STP is located in San Fernando City, La Union. It was built through the joint effort of the local government of San Fernando and the Rotary Club (US) with technical assistance from USAID's Local Initiatives for Affordable Wastewater Treatment Project (LINAW). It showcases a hybrid model where the front-end receiving and screening processes are mechanized while the back-end is a purely natural process.

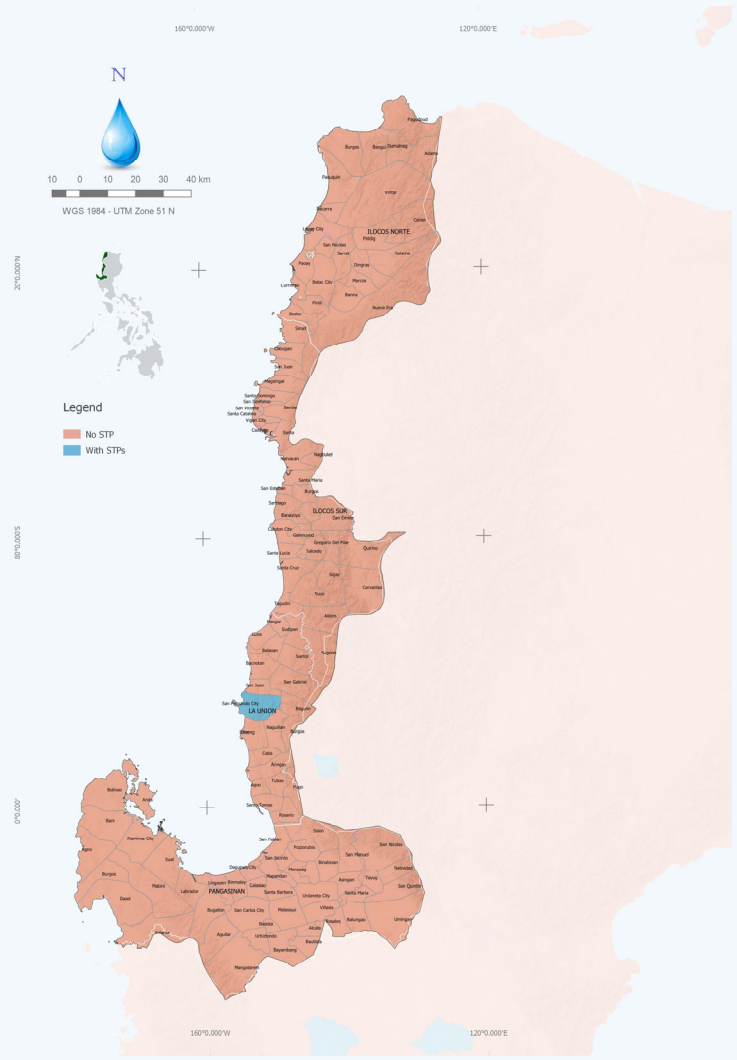


Figure 7: Location of Existing Septage Treatment Plant[13]

[11] *Philippine Statistics Authority, Family Income and Expenditure Survey, 2015*
[12] *Department of Health, FHSIS Annual Report CY 2015, 2015*
[13] *Based on Ilocos Region Province's first hand data on access to safe water: gathered during the regional consultation and planning workshop*

160°0.000'W

120°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

20°0.000'N

80°0.000'S

0°0.000'

Legend

Water Bodies

Major River Basin

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Narvacan
Nagbukel
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
San Emilio
Banayoyo
Candon City
Galimuyod
Salcedo
Quirino
Santa Lucia
Santa Cruz
Sigay
Suyo
Cervantes
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Santol
Sugpon
Bacnotan
San Gabriel
San Juan
San Fernando City
LA UNION
Bagulin
Naguilian
Baguang
Burgos
Caba
Aringay
Tubao
Agoo
Pugo
Santo Tomas
Rosario
Bolinao
Anda
Bani
Alaminos City
Agno
Sual
Burgos
Mabini
Labrador
Dasol
Infanta
Sison
San Fabian
San Nicolas
Pozzorubio
San Manuel
San Jacinto
Binalonan
Mangaldan
Dagupan City
Laoac
Natividad
Mapandan
Asingan
Tayug
San Quintin
Lingayen
Binmaley
Calasiao
PANGASINAN
Santa Barbara
Urdaneta City
Santa Maria
Agno River Basin
Bugallon
San Carlos City
Malasiqui
Villasis
Umingan
Basista
Rosales
Balungao
Alcala
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem

Abulug Watershed

Abra Watershed

Cagayan Watershed

Pampanga River Basin

Ilocos Region
Rivers and Tributaries

DENR, NWRB, NAMRIA

Water Resources

The Ilocos Region is ranked 5th among all administrative regions with the least water resources potential.

The region's water resources potential totals to 4,491 million cubic meters (MCM)/year, taking up only 3% of the country's total. Of this figure, 1,034 MCM/year is groundwater while 3,457 MCM/year is surface water. The Annual rainfall in the region averages 2,409 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.

The Ilocos Region straddles WRR 1 and WRR 3. The first cluster of Ilocos provinces is composed of Ilocos Norte, Ilocos Norte, and La Union. Pangasinan, on the other hand, is covered by WRR 3 along with the provinces of Region III (Central Luzon).

Surface Water

The Ilocos Region has two major river basins namely, Abra River Basin and the Agno River Basin. Tables 10 and 11 show a description and the scope of each river basin.

Table 10: Abra River Basin Characteristics

Abra River Basin[14]	
Area	5,125 km²
River Classification	Class A
Scope	
Abra	CAR
Ilocos Sur	Region I
Mountain Province	CAR
Benguet	CAR
Uses	Domestic, Municipal, Agricultural and Aquaculture

Table 11: Agno River Basin Characteristics

Agno River Basin[15]	
Area	6,219.66 km²
River Classification	Class A - upper portion Class C - lower portion
Scope	
Benguet	CAR
Ifugao	CAR
Mountain Province	CAR
Nueva Ecija	Region III
Nueva Vizcaya	Region II
Pangasinan	Region I
Tarlac	Region III
Zambales	Region III
Pampanga	Region III
Uses	Domestic, Municipal, Agricultural, Energy and Industrial

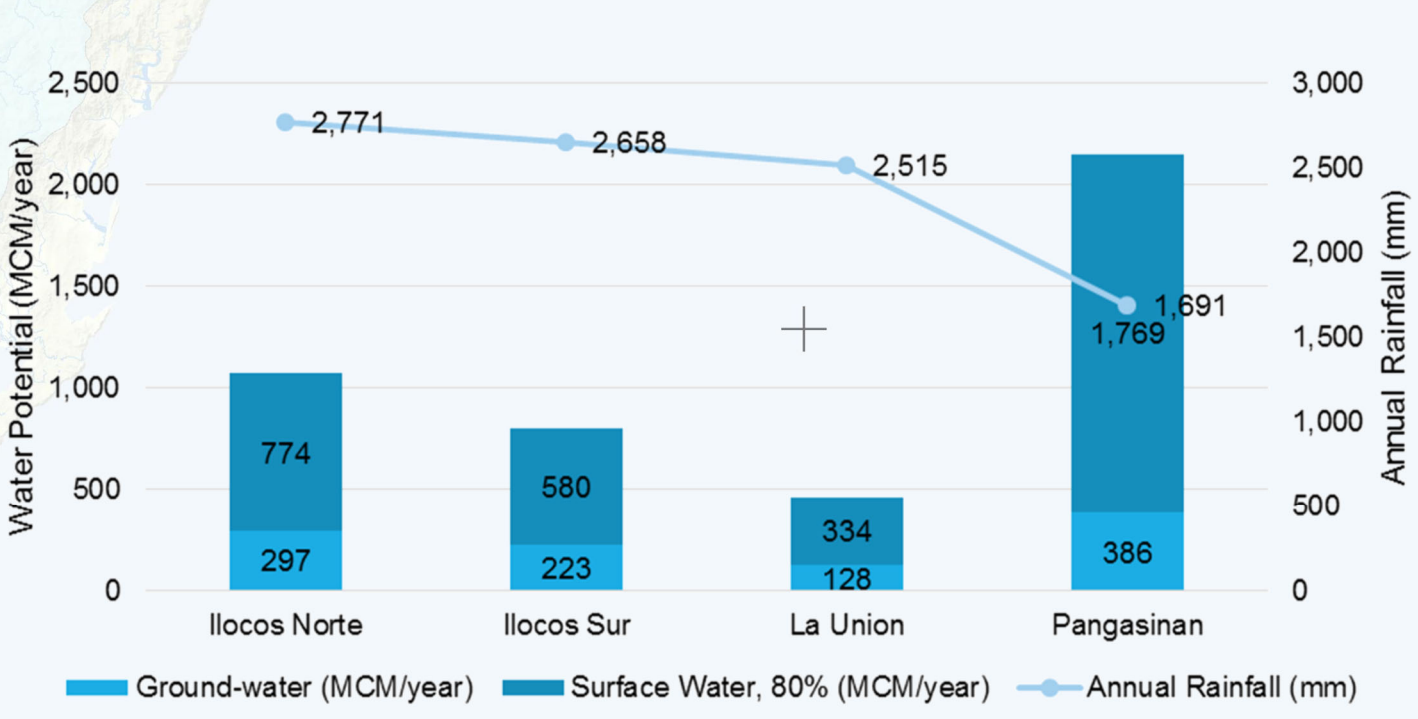


Figure 8: Water Resources Potential and Annual Rainfall[14]

[14] River Basin Control Office, Abra River Basin Master Plan, 2014
[15] River Basin Control Office, Agno River Basin Master Plan, 2016
[16] JICA Master Plan on Water Resources Management in the Philippines, 1998; NWRB; PAGASA Rainfall Data; FAO

160°0.000'W

120°0.000'E

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

20°0.000'N

80°0.000'S

0°0.000'

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

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Narvacan
Nagbukel
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
Banayoyo
San Emilio
Candon City
Galimuyod
Gregorio Del Pilar
Quirino
Santa Lucia
Salcedo
Santa Cruz
Sigay
Cervantes
Suyo
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Santol
Sugpon
Bacnotan
San Gabriel
San Juan
San Fernando City
LA UNION
Bagulin
Naguilian
Baluang
Burgos
Caba
Aringay
Agoo
Tubao
Pugo
Santo Tomas
Rosario
Bolinao
Anda
Bani
Sison
San Fabian
San Nicolas
Alaminos City
Pozzorubio
Agno
San Manuel
San Jacinto
Binalonan
Sual
Dagupan City
Manaoag
Natividad
Burgos
Mapandan
Asingan
Tayug
Mabini
Lingayen
Binmaley
Calasiao
San Quintin
Labrador
PANGASINAN
Santa Barbara
Urdaneta City
Santa Maria
Dasol
Villasis
Bugallon
San Carlos City
Malasiqui
Rosales
Balungao
Umingan
Basista
Alcala
Infanta
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem

Groundwater Availability

MGB

Ground Water

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 be defined in relation to the possible development depth and overall development potential.

In addition, 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 also tied to groundwater storage which is estimated based on the type and class of aquifer present in a study area (see Table 12).

Table 12: 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

Apart from some parts of Ilocos Norte and Pangasinan classified under the major aquifer class, mainland Ilocos Region is predominantly underlain by the minor aquifer class (specifically the local and less productive aquifers). Ilocos Sur, on the other hand, is underlain by non-aquifer areas that have limited groundwater potential.

Water Use

As of 2017, water use in the region (based on water permits granted) amounted to about 20,159.41 MCM annually. A large percentage of this volume, i.e., about 11,356.69 MCM or 56%, is allocated for power generation and is categorized as non-consumptive use. The remaining 8,802.72 MCM is reserved for consumptive use (Figure 9).

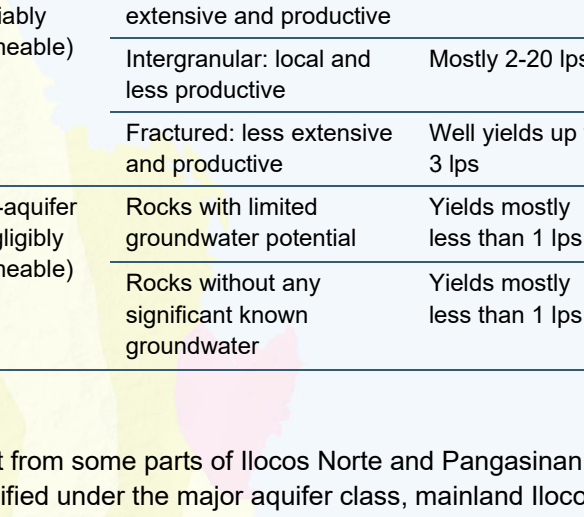


Figure 9: Consumptive Water Use, 2017[18]

The irrigation sector consumes the most water among all sectors with a 78.3% allocation. The industrial sector eats up 20.4% while the domestic sector consumes up to only 1.2%.

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.)[17]

Water availability per capita is computed by comparing the region and provinces' water potential against the 2015 population (see Table 13).

Table 13: Water Availability per Province

Province/Region	Water Availability (m^3/capita/yr), 2015
Ilocos Norte	1,807
Ilocos Sur	1,163
La Union	588
Pangasinan	729
Ilocos Region	**1,072**

The Ilocos Region has a per capita water availability of around 1072 m^3/year, which is slightly above the threshold. However, Pangasinan and La Union are below the threshold and may experience water scarcity.

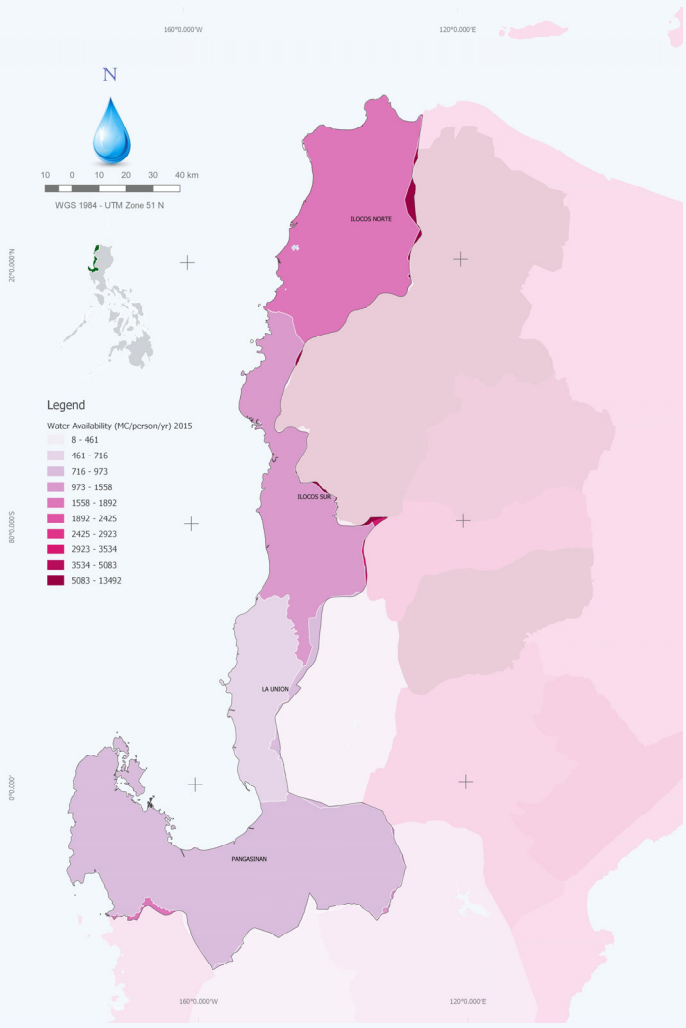


Figure 10: Water Availability Map, 2015

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

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 that seeks to establish future trends.

Employing PSA's 2010-based population projections which were adjusted to conform with the actual 2015 population, the future population of the region and its provinces has been projected. By 2045, the Ilocos Region's population would have grown to 4,385,800 or 1,020,187 HHs.

Water Supply Demand

Water demand projection is fundamental to water supply feasibility studies and preliminary engineering design. It also serves as an important tool in the preparation of master plans, considering the future needs of a growing population. In general, total water demand is equal to the sum of the domestic, commercial, industrial, institutional, and unaccounted-for water.

In projecting water demand, the unit consumption used was 120 liters per capita per day (lpcd) for an urban population, and 60 lpcd for a rural population. In the National Capital Region (NCR) and other HUCs, 150 lpcd and 80 lpcd were used for urban and rural populations, respectively.

Computation for water demand at the household level, in particular, was primarily based on the degree of urbanization of a barangay.

Water demand projections were conducted based on the estimated projected population. By 2022, 2030, and 2040, the total water demand of the region is projected to reach 19 MCM/year, 22 MCM/year, and 25 MCM/year, respectively.

Water Demand vs. Water Resources Potential

The water demand of the industrial, business and domestic sectors in the Ilocos Region 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 (25 MCM/year) to the water resources potential of the region (4,491 MCM/year), it is observed that the availability of water far exceeds the region's water demand projected 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.

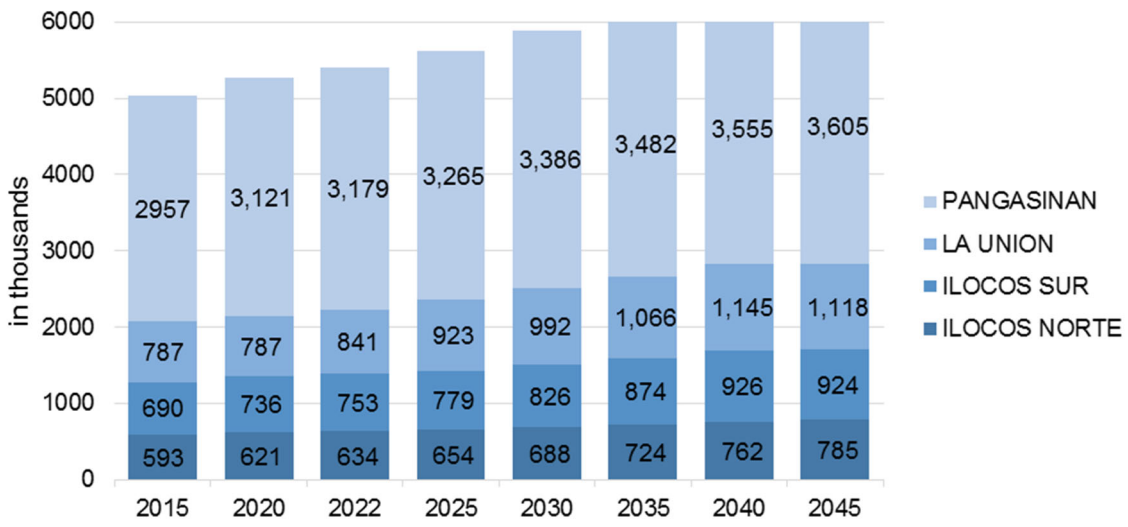


Figure 11: Projected Population

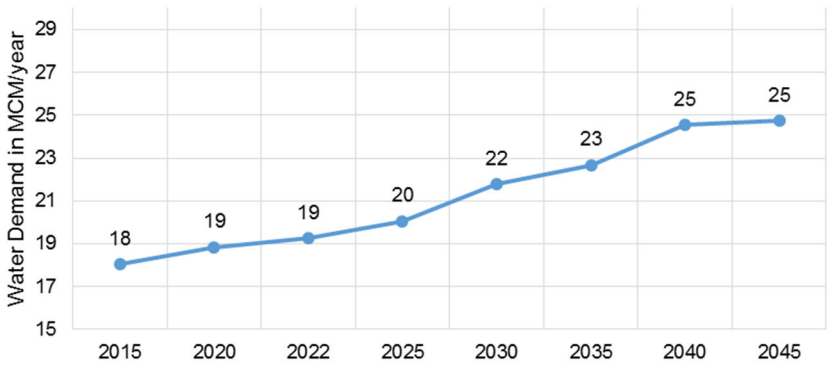
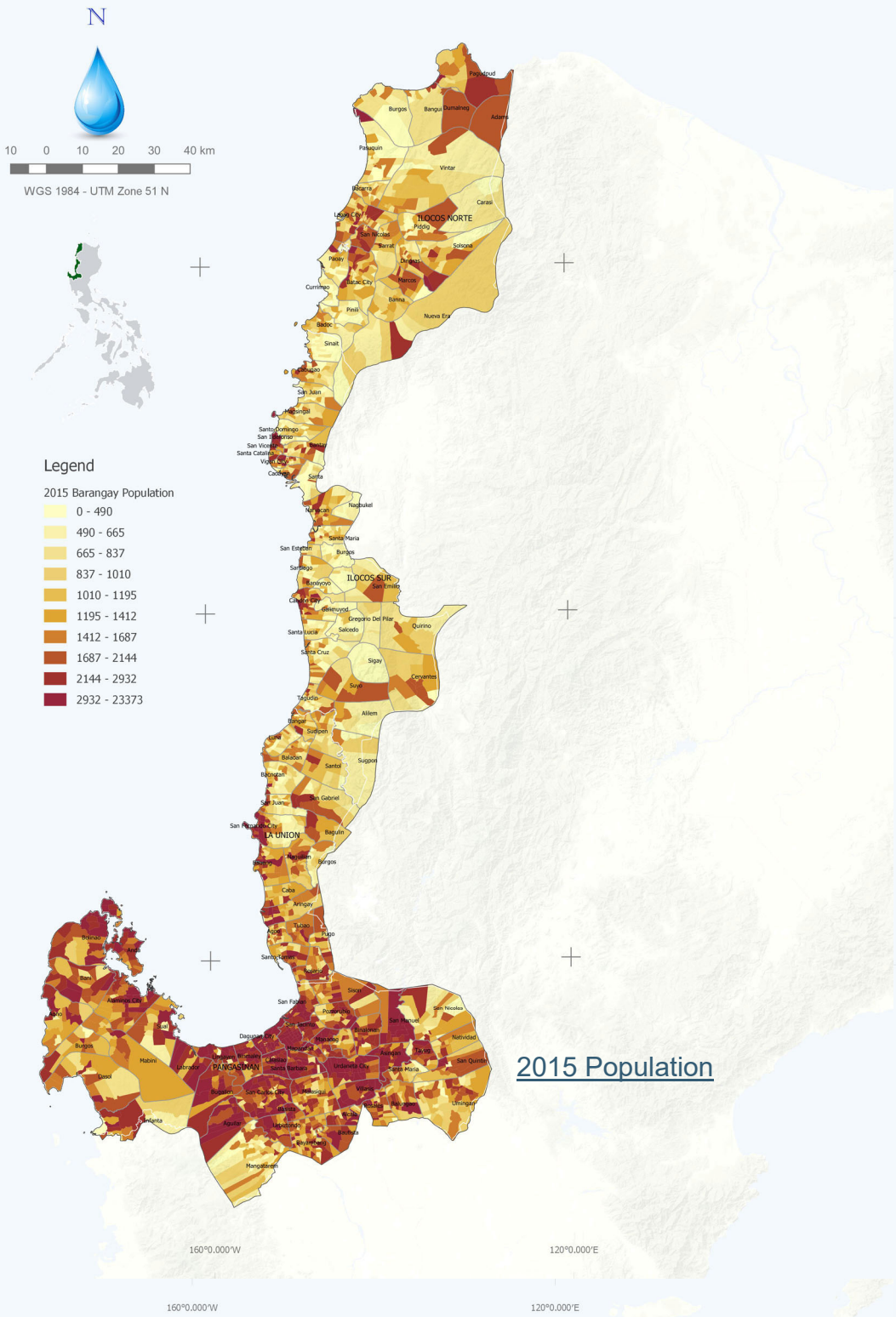
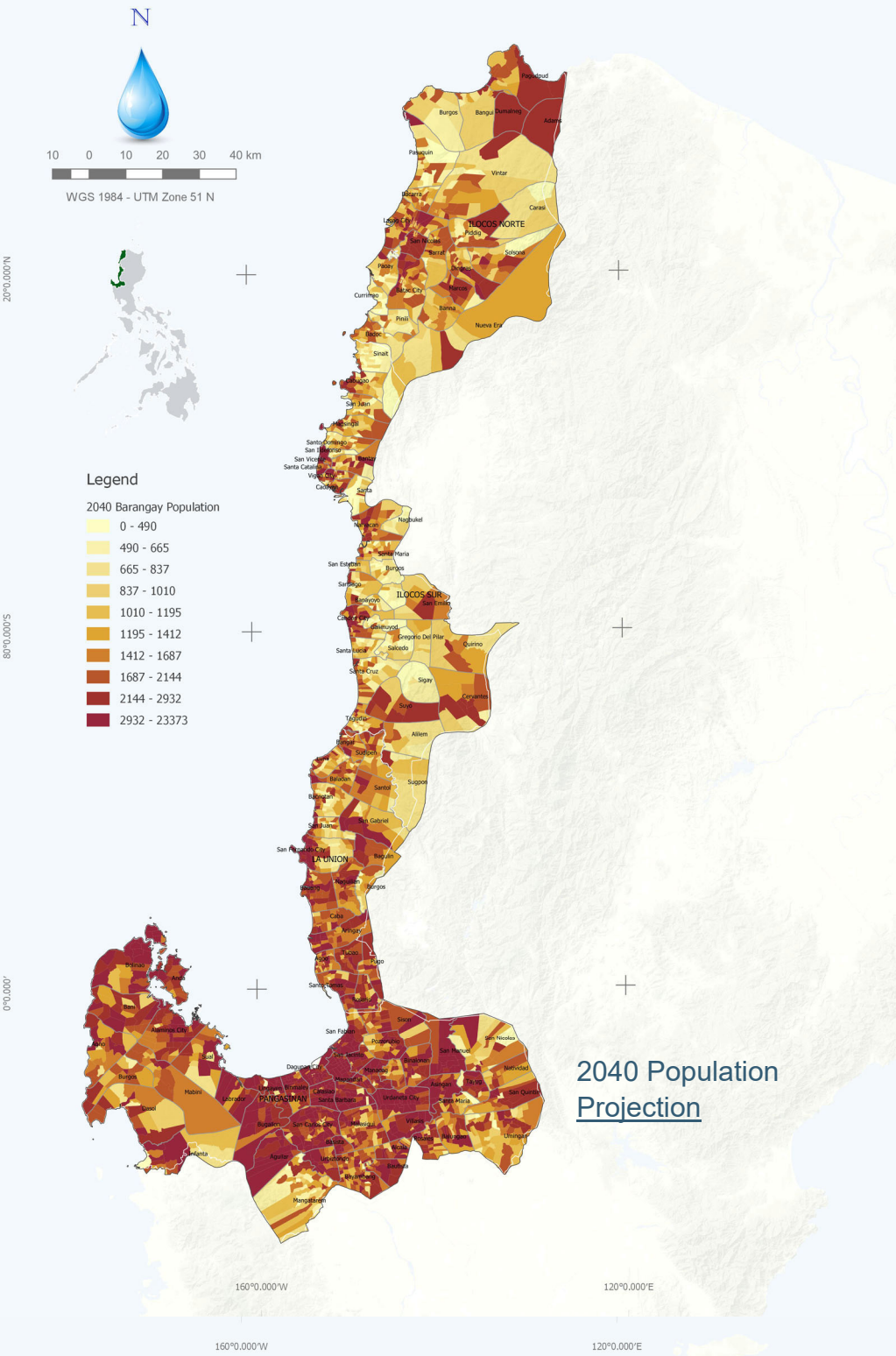


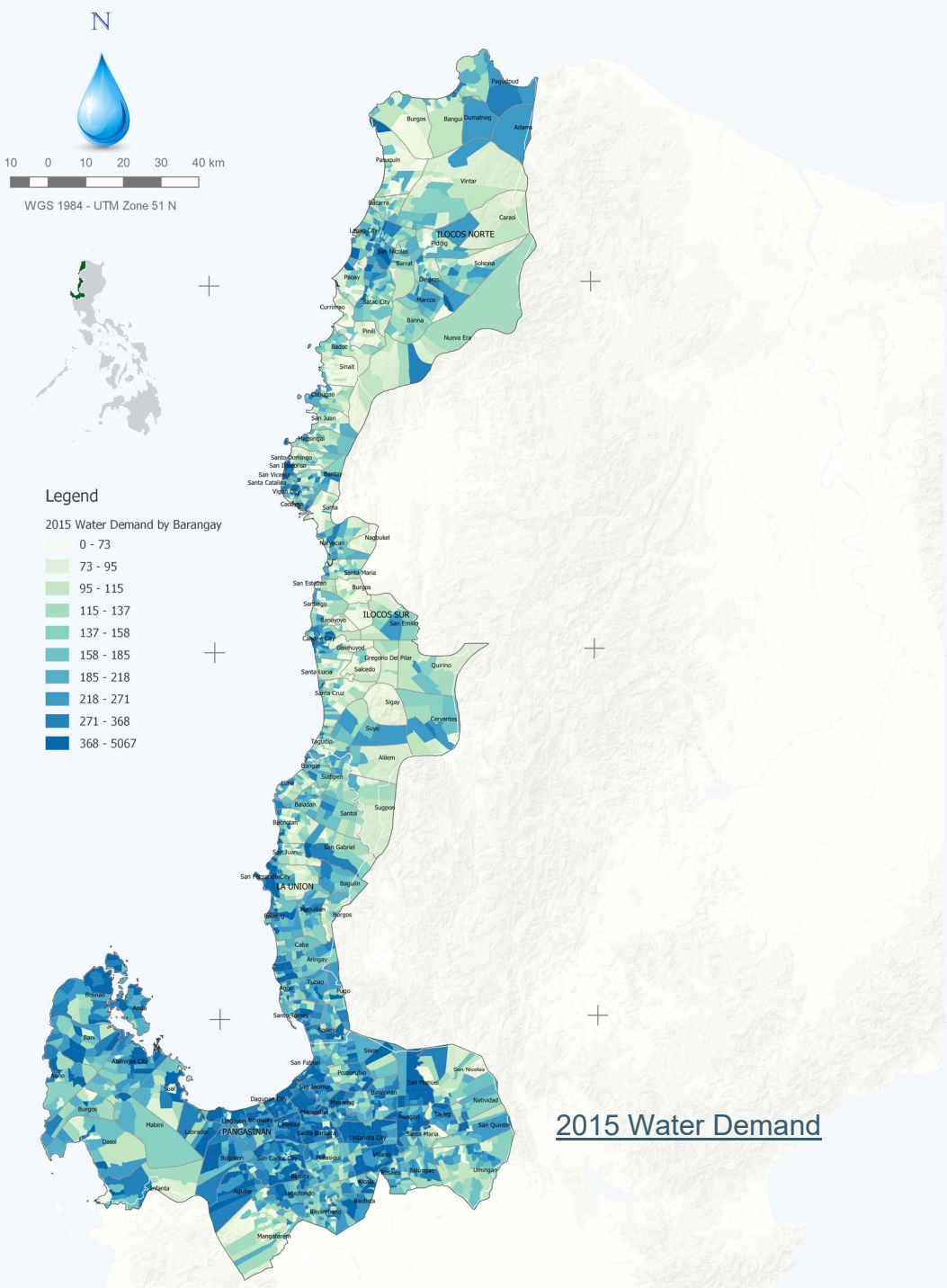
Figure 12: Projected Water Demand



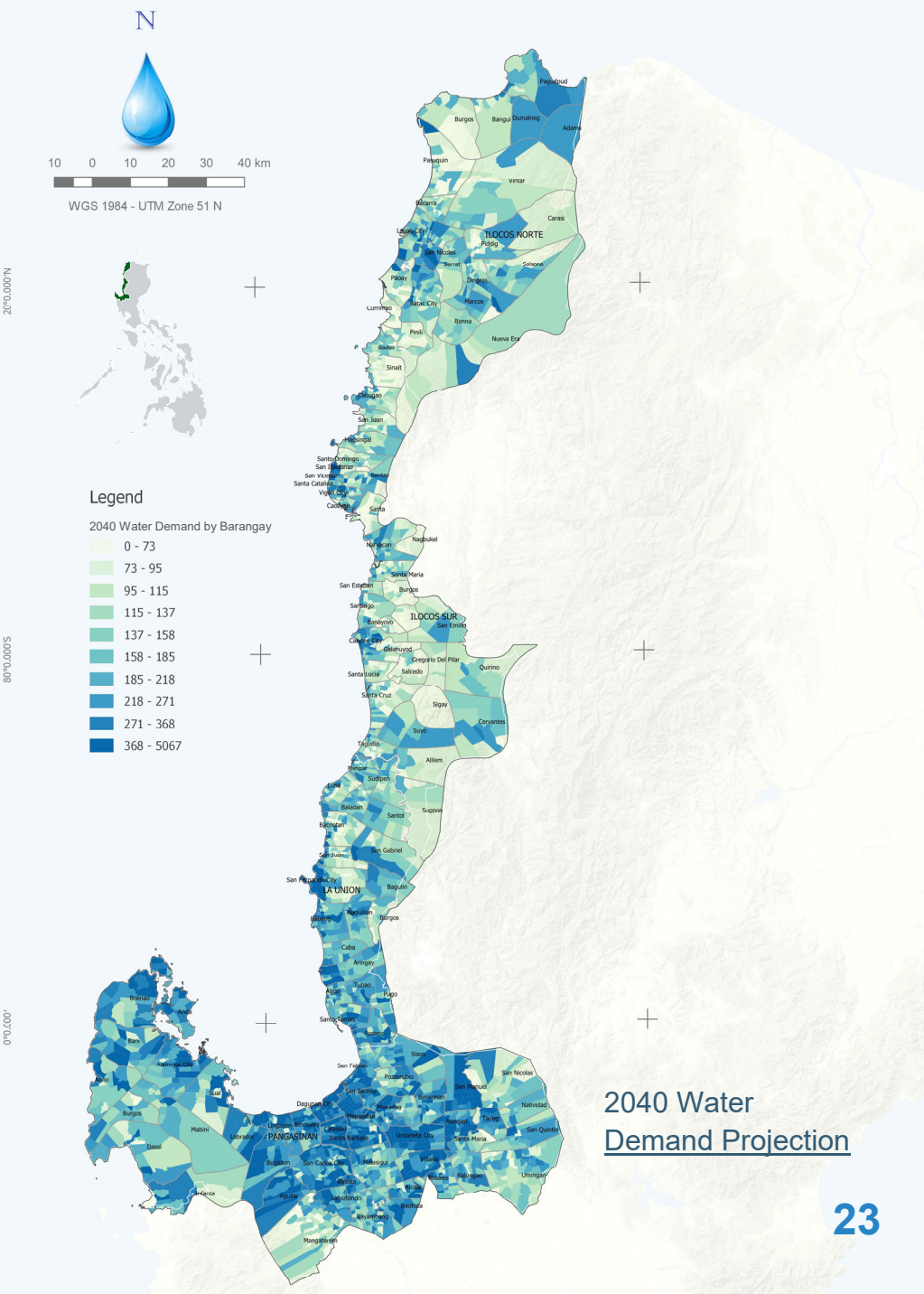
2015 Population



2040 Population Projection



2015 Water Demand



2040 Water Demand Projection

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

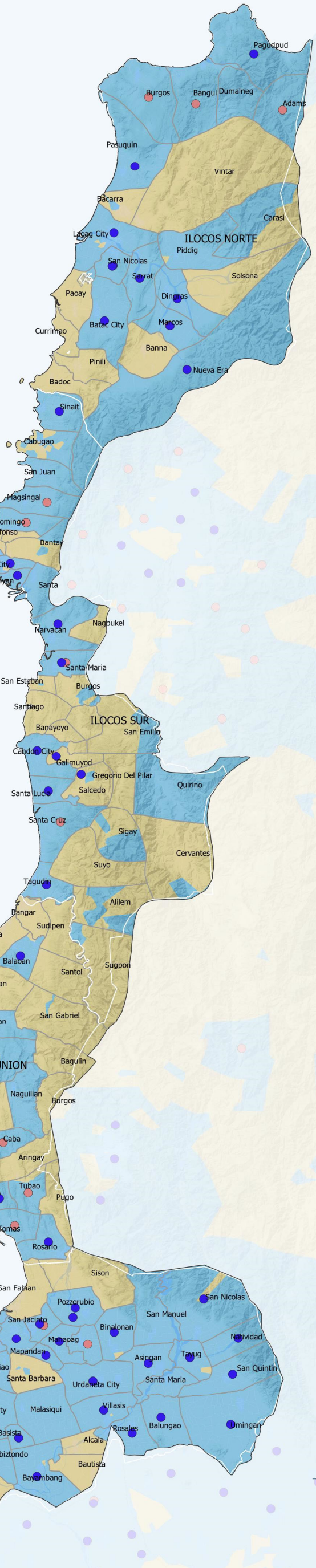
N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

- Non - Operational WDs
- Operational WDs
- Barangays with Existing Level 3 Water Service



Water Districts and Areas covered by Level III Services

LWUA, PAWD, NWRB Listahang Tubig, 2017 Data

WSS Infrastructure

Water service providers (WSPs) of various management types serve around 39% of the Ilocos Region[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 Supply Service Providers

The percentage of the population having access to or being served by these WSPs does not conform with the percentage in PSA's FIES 2015 mainly because the former came from various sources[20], with the bulk of the data coming from Listahang Tubig of the National Water Resources Board (NWRB).

Although such information gives an insight into the state of the region's water utilities, it cannot be ascertained if all WSPs in the region have already registered under Listahang Tubig or are continually updating their operations data.

Water Districts

As of 2015, of the 64 WDs serving the Ilocos Region, 41 were operational and 23 nonfunctional. The total population covered by these WDs is about 2.5 million or roughly 50% of the total population. Of this figure, only 41% of the population or 1.04 million are serviced by WDs. Pangasinan has the highest coverage of 44%, while Ilocos Sur has the lowest coverage with only 29.66% of the population covered.

LGU-led Water Utilities

There are 54 LGU-led water utilities within the region covering 30 areas and 66,525 or 1% of the total population of the Ilocos Region.

BWSA

There are 146 BWSA utilities within the region serving 29 areas or about 1% of the total population. La Union has the biggest number of BWSA utilities — 64. Pangasinan has the highest number of users of about 22,215.

RWSA

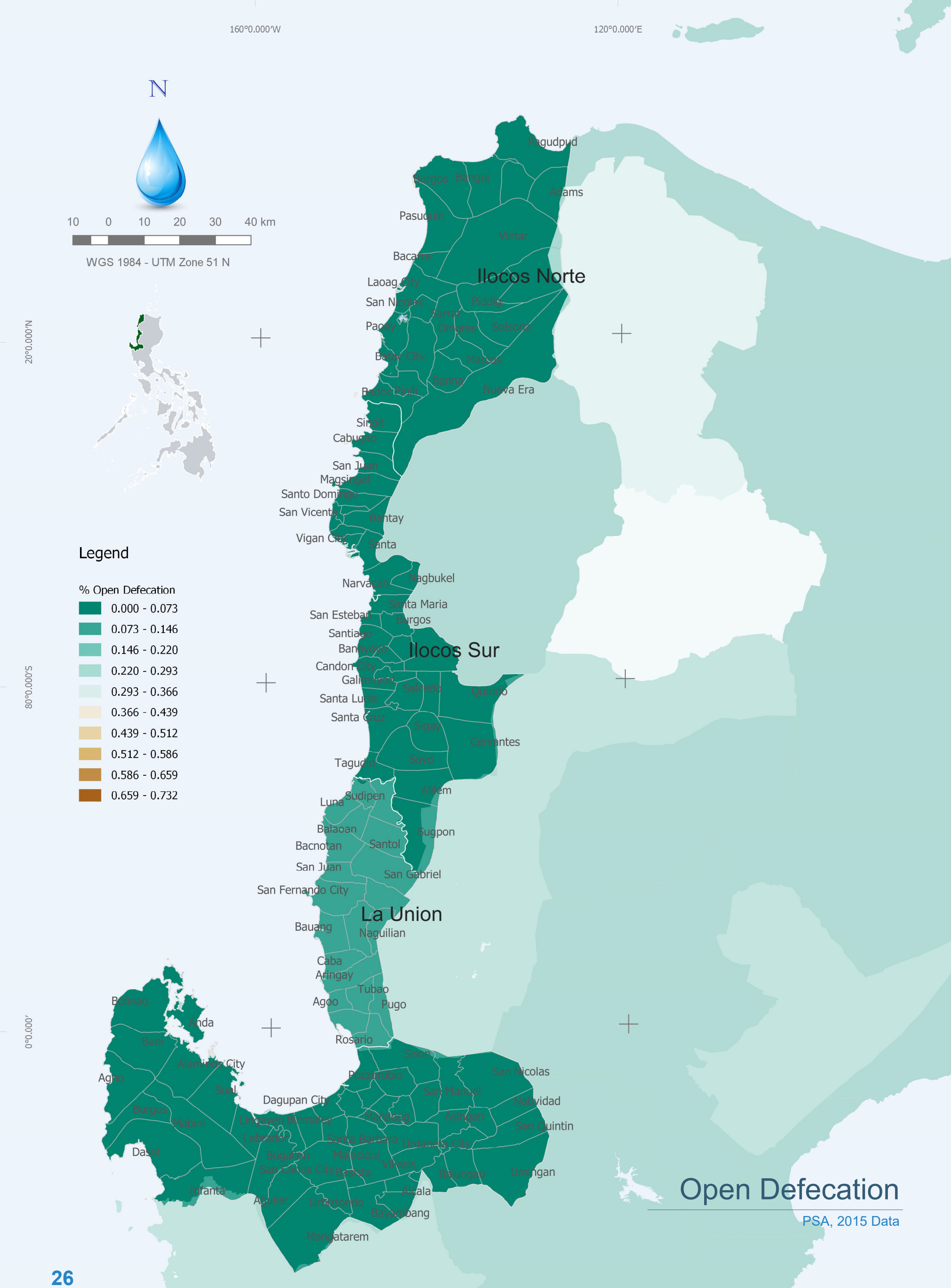
There are 101 RWSA utilities within the region, serving 51,530 users or about 1% of the region's total population. Ilocos Norte has the highest number of RWSAs and served consumers in the region.

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 14: Water Service Provider per Province

Province/Region	No. of LGUs	Type and No. of WSPs		Service Area Population	Population Served	
					Total	%
Ilocos Norte	23	WDs	10	100,510	37,834	37.64%
		LGU-led	17		5,280	0.89%
		BWSA	31		14,930	2.52%
		RWSA	67		30,110	5.08%
		Private/Others	428		78,695	13.27%
		Subtotal	**553**	**593,081**	**166,849**	**28.13%**
Ilocos Sur	34	WDs	12	254,167	75,382	29.66%
		LGU-led	12		34,305	4.97%
		BWSA	28		11,961	1.73%
		RWSA	10		7140	1.04%
		Private/Others	449		55,375	8.03%
		Subtotal	**511**	**689,668**	**184,163**	**26.70%**
La Union	20	WDs	7	334371	100792	30.14%
		LGU-led	18		15,810	2.01%
		BWSA	64		19,930	2.53%
		RWSA	9		3,780	0.48%
		Private/Others	342		77900	9.90%
		Subtotal	**440**	**786,653**	**218,212**	**27.74%**
Pangasinan	48	WDs	35	1,844,323	828,521	44.92%
		LGU-led	7		11,130	0.38%
		BWSA	23		22,215	0.75%
		RWSA	15		10,500	0.36%
		Private/Others	495		101,610	3.44%
		Subtotal	**575**	**2,956,726**	**973,976**	**33.00%**
Ilocos Region	125	WDs	64	2,533,371	1,042,529	41.15%
		LGU-led	54		66,525	1.32%
		BWSA	146		69,036	1.37%
		RWSA	101		51,530	1.03%
		Private/Others	1,714		313,580	6.24%
		Grand Total	**2,079**	**5,026,128**	**1,543,200**	**30.70%**

[19] Based on registered WSP's in Listahang Tubig (Data as of 2017)
[20] LWUA, PAWD, NWRB Listahang Tubig



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.

This section discusses the connection between growing water demand and its harmful 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 by which 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 a host of health problems.

Open defecation in the Ilocos Region rates at 3.1%. As of 2015, about 78,048 people were reported practicing open defecation because many areas are waterless and have no 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 the Ilocos Region.

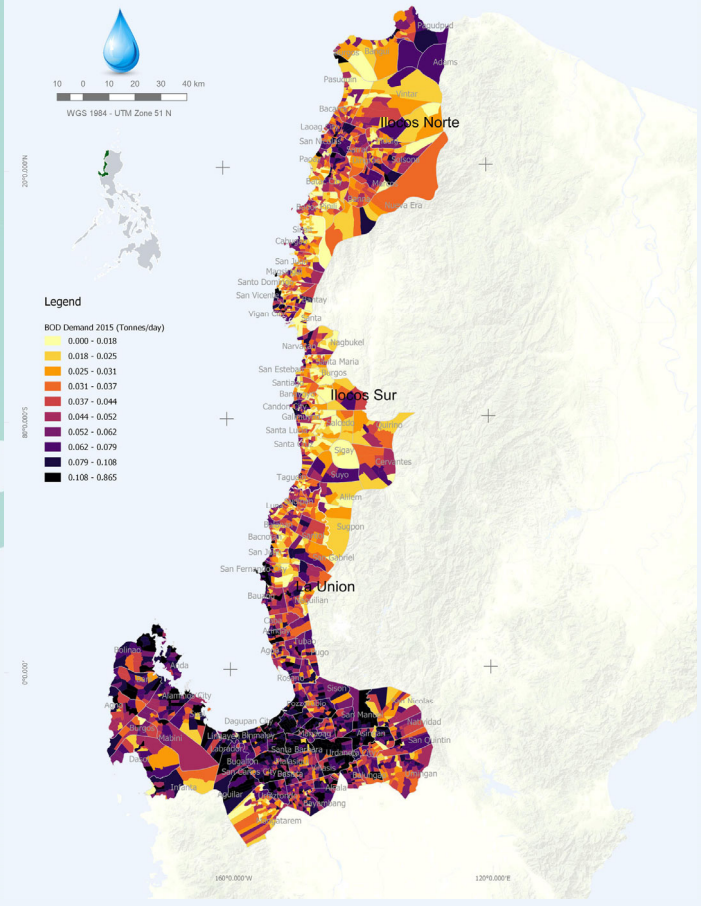


Figure 13: Biological Oxygen Demand, 2015

The industrial and agricultural wastewater generation may be estimated using the 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.

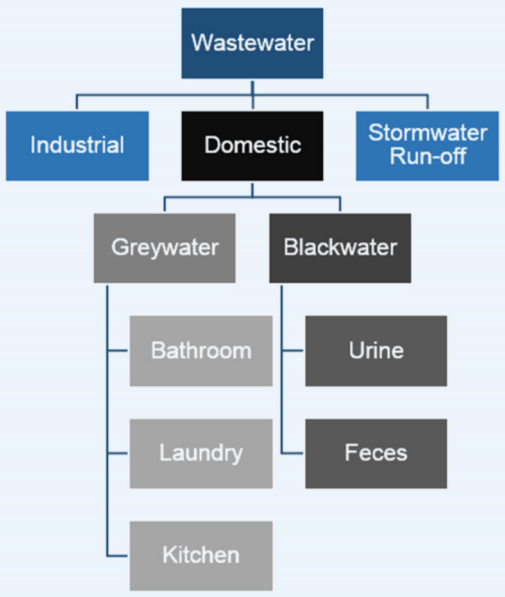


Figure 14: Categories of Wastewater

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.

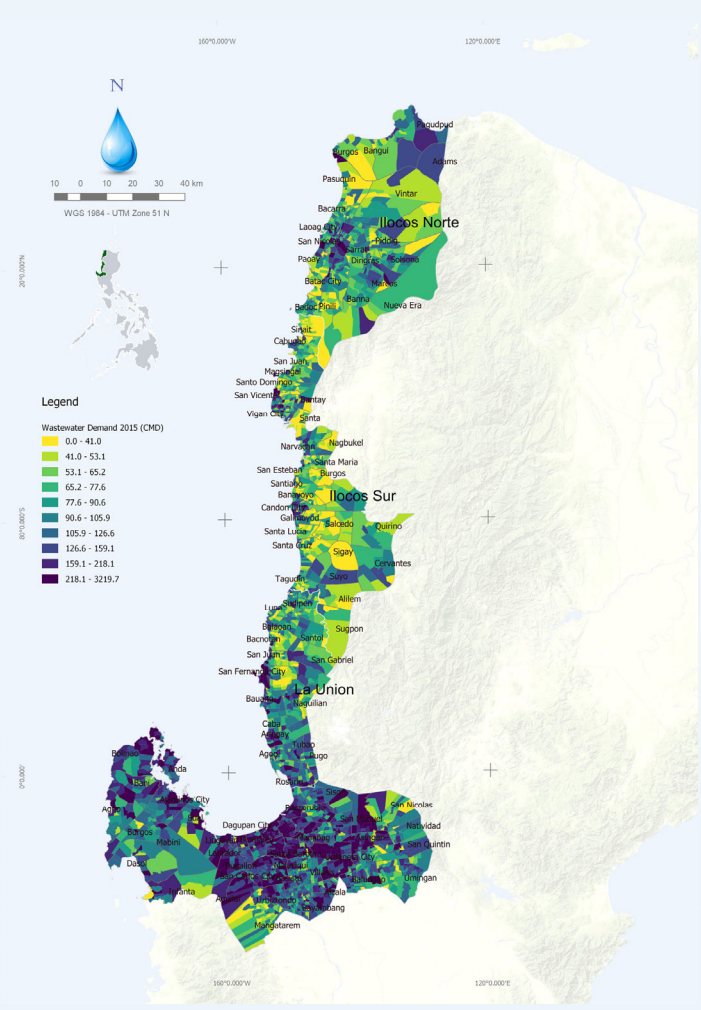
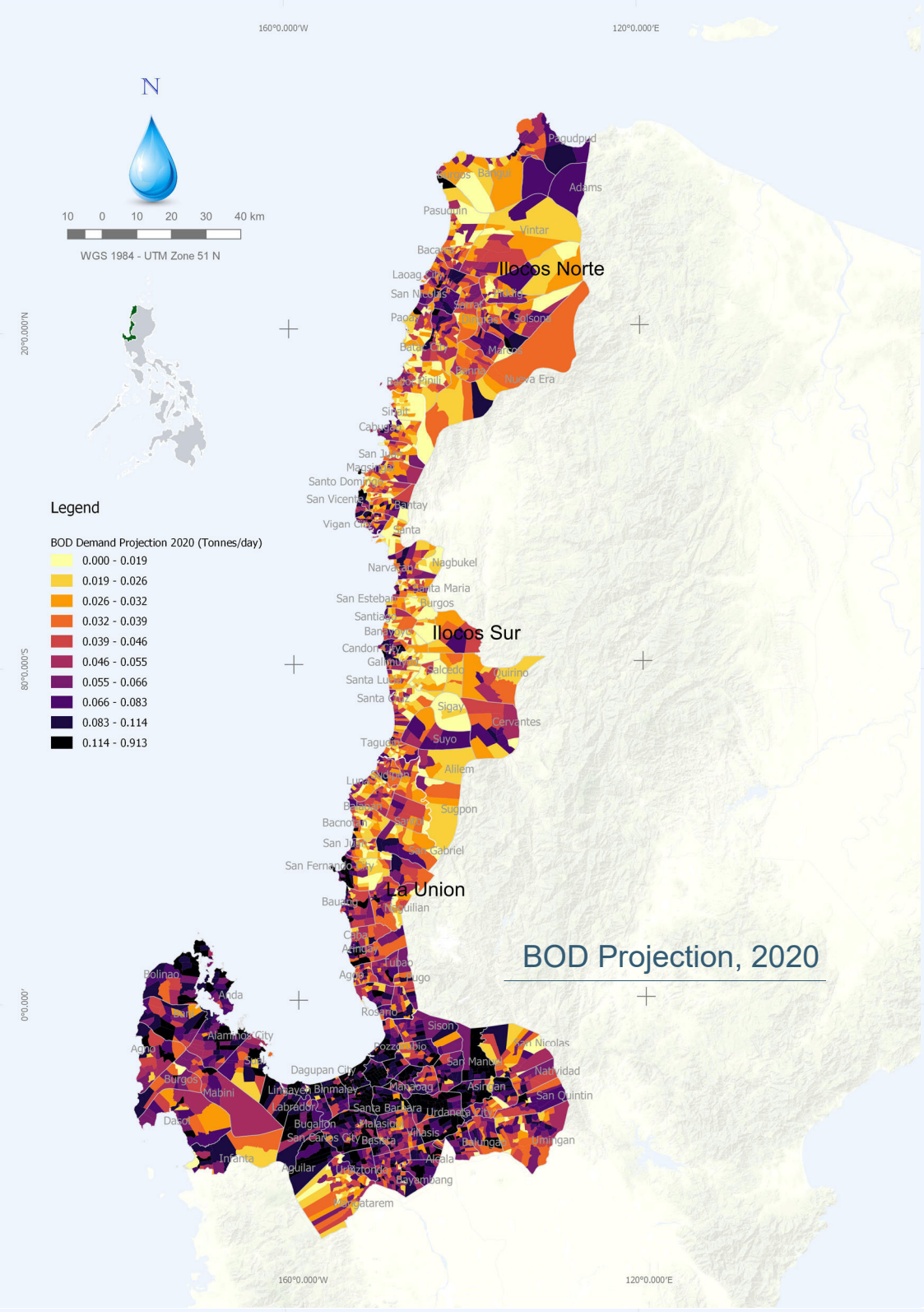
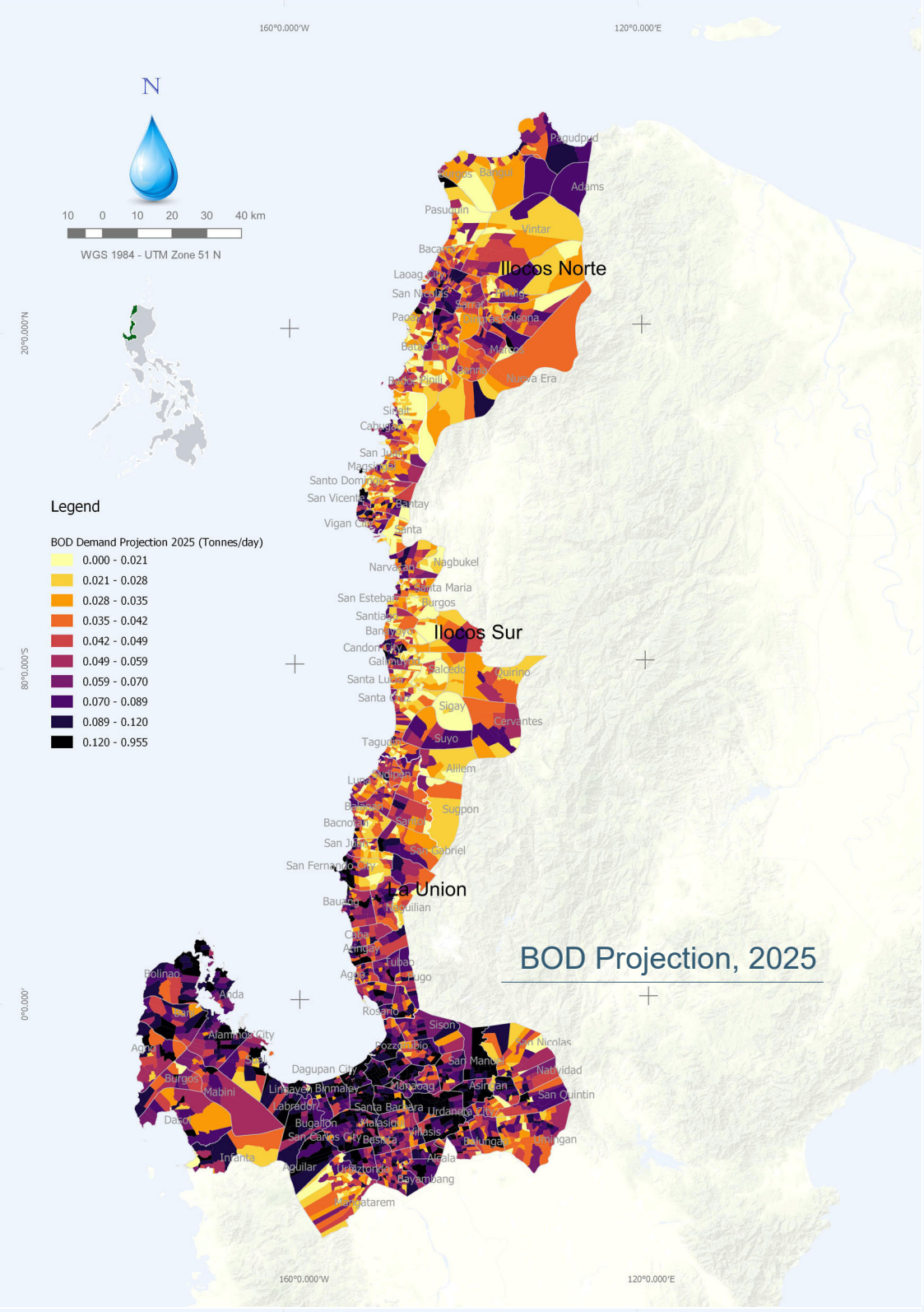
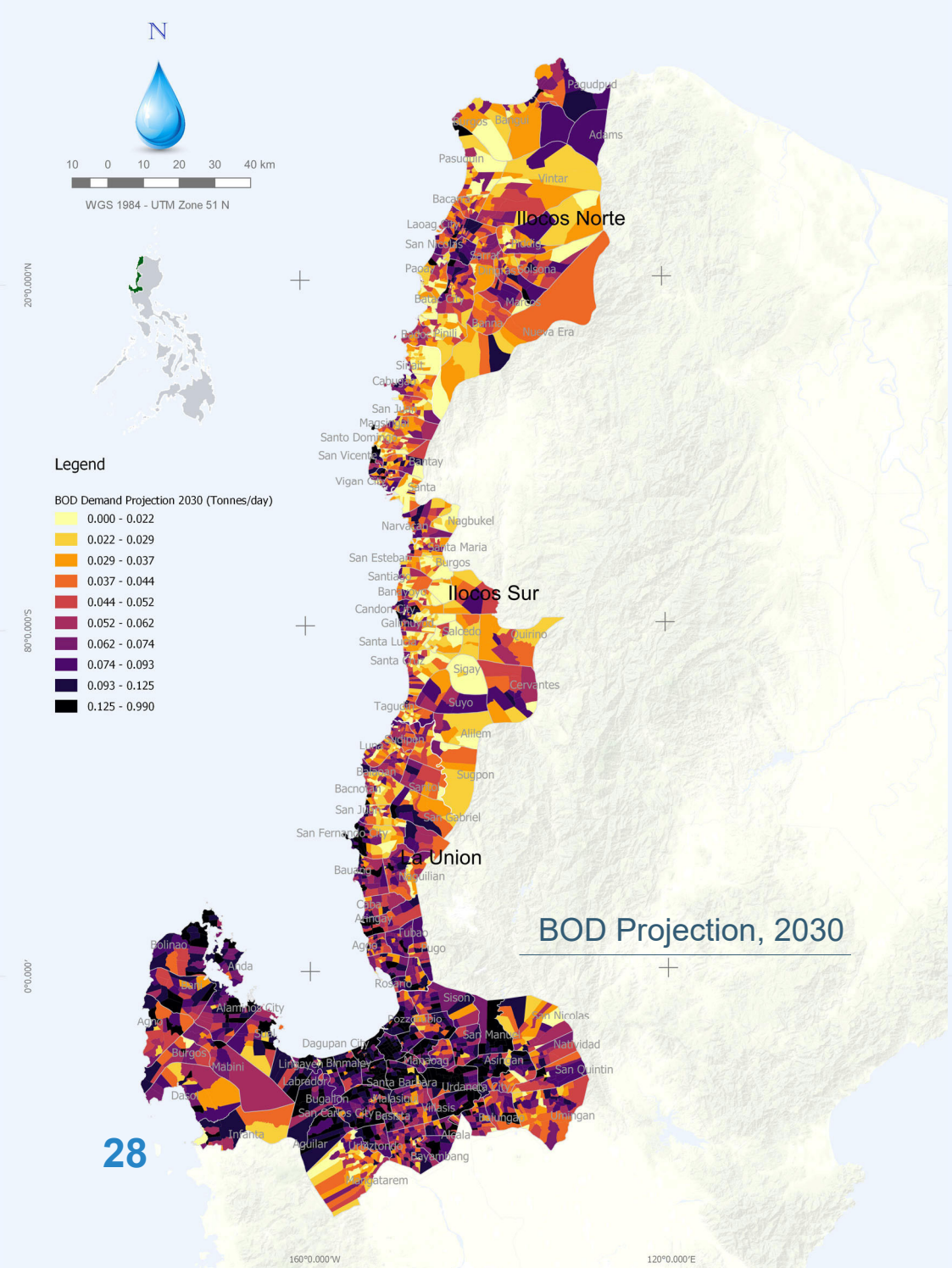


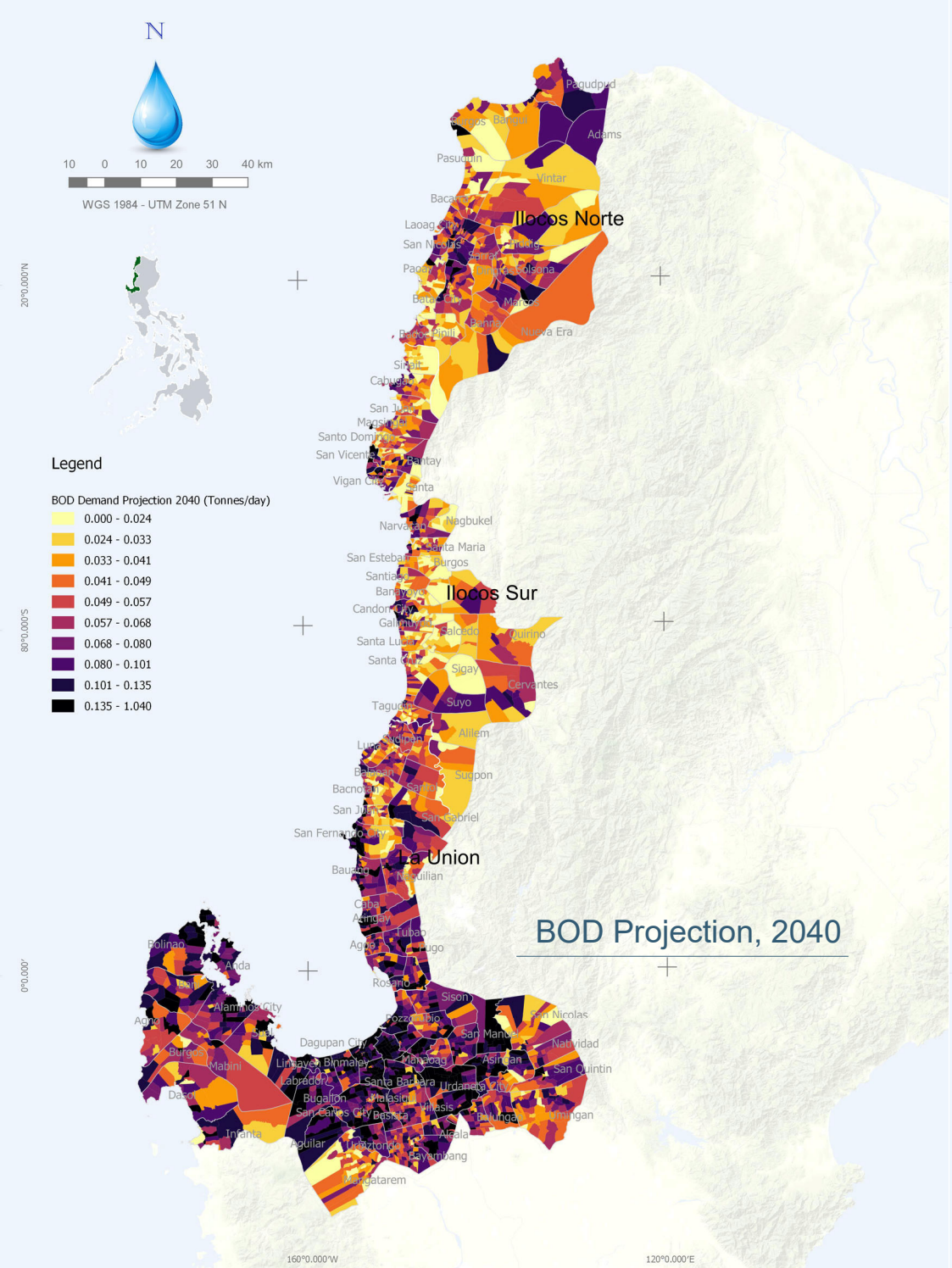
Figure 15: Wastewater Produced, 2015

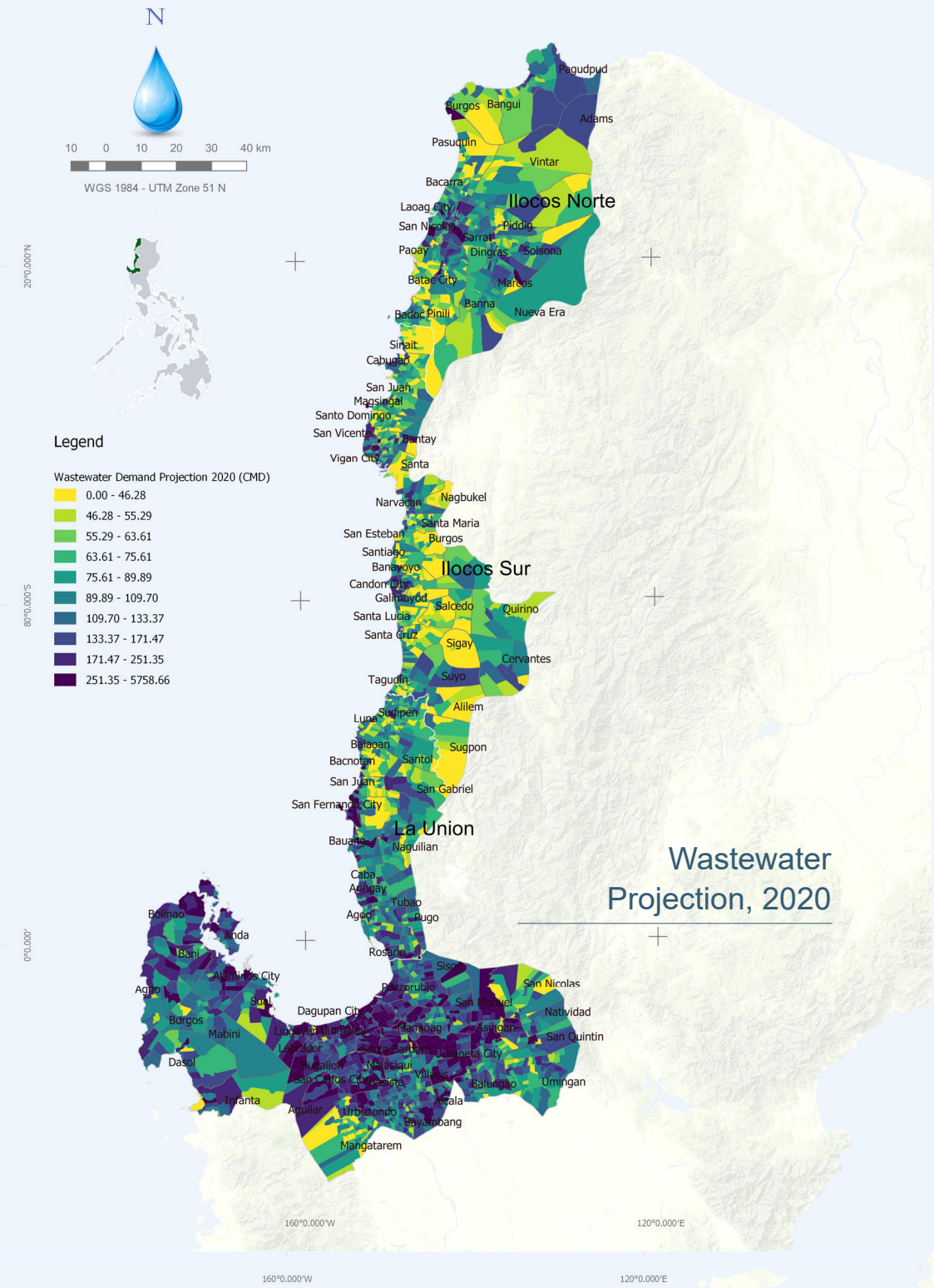
[21] *Philippine Environment Monitor (PEM), 2003*
[22] *Ibid.*

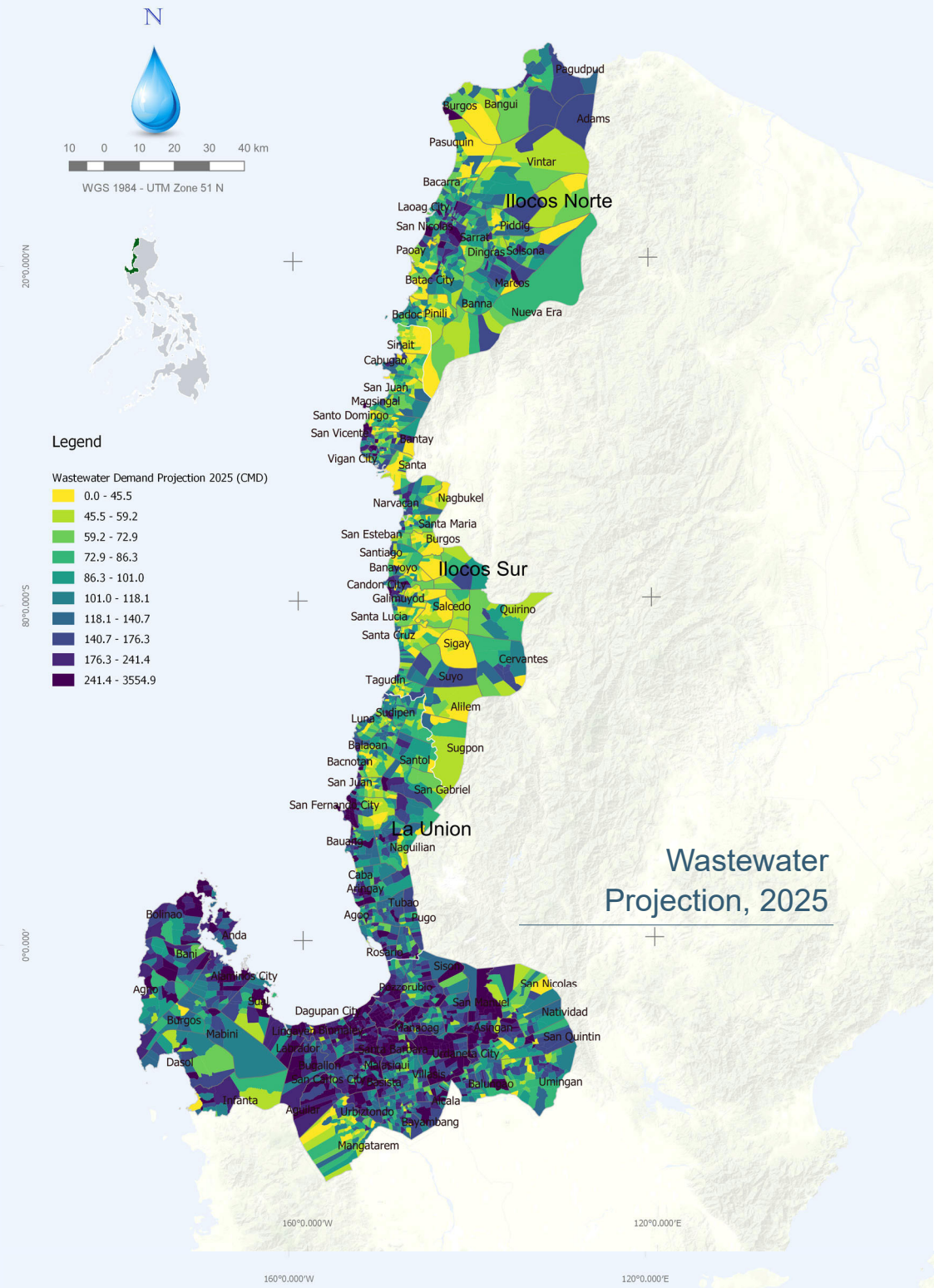

N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
BOD Demand Projection 2020 (Tonnes/day)
0.000 - 0.019
0.019 - 0.026
0.026 - 0.032
0.032 - 0.039
0.039 - 0.046
0.046 - 0.055
0.055 - 0.066
0.066 - 0.083
0.083 - 0.114
0.114 - 0.913
Ilocos Norte
Ilocos Sur
La Union
BOD Projection, 2020
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S

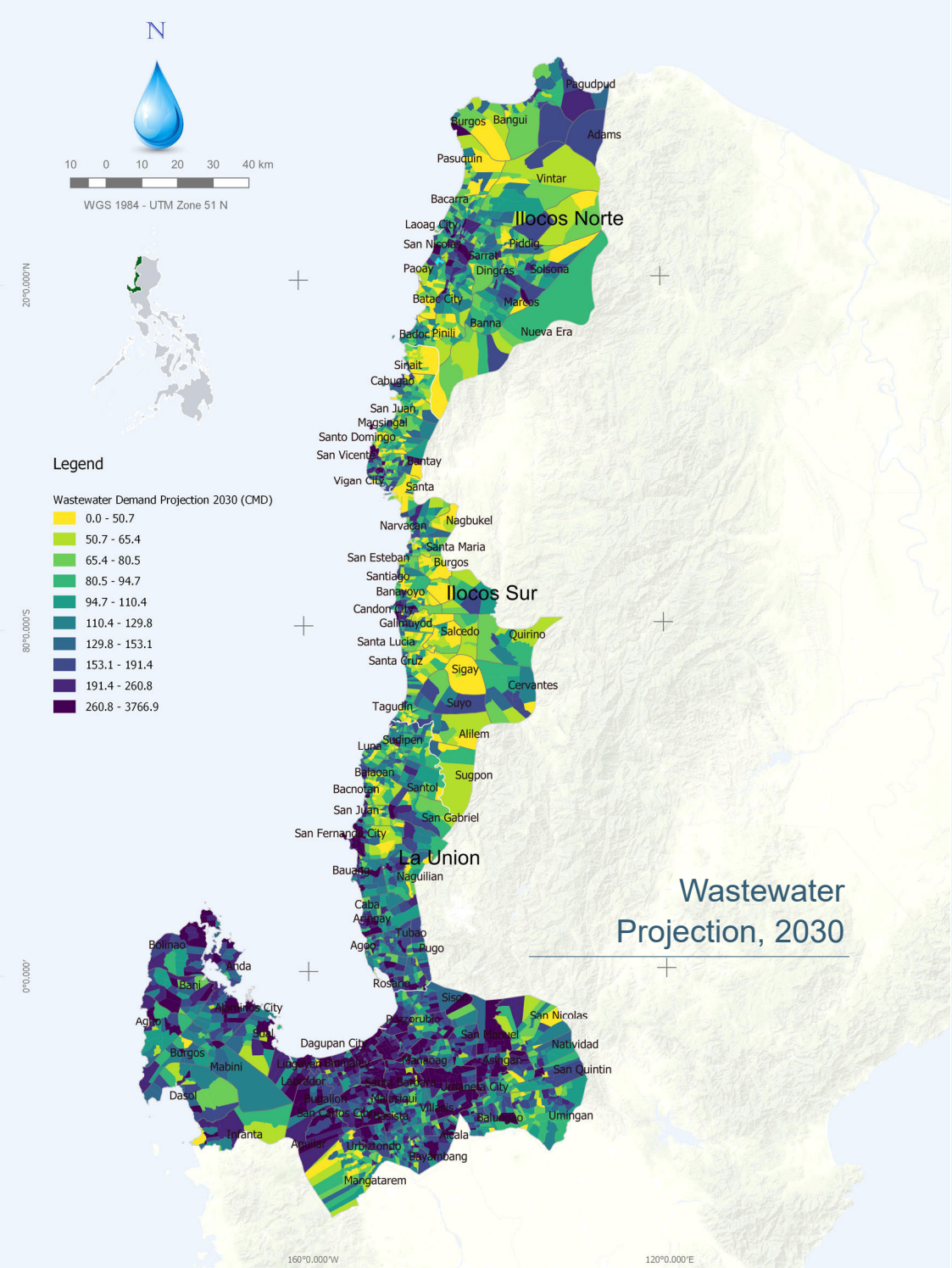

N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
BOD Demand Projection 2025 (Tonnes/day)
0.000 - 0.021
0.021 - 0.028
0.028 - 0.035
0.035 - 0.042
0.042 - 0.049
0.049 - 0.059
0.059 - 0.070
0.070 - 0.089
0.089 - 0.120
0.120 - 0.955
Ilocos Norte
Ilocos Sur
La Union
BOD Projection, 2025
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S

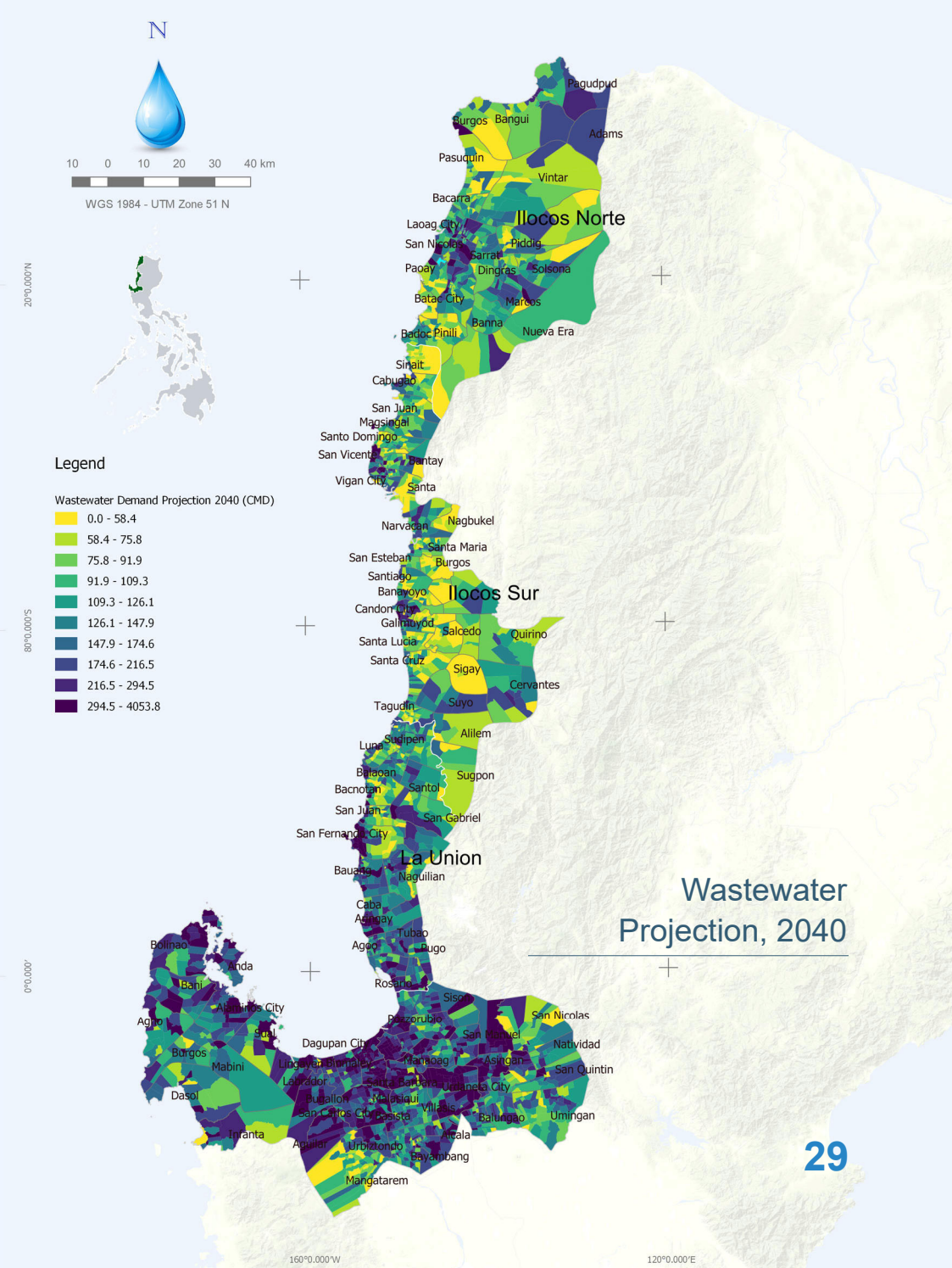

N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
BOD Demand Projection 2030 (Tonnes/day)
0.000 - 0.022
0.022 - 0.029
0.029 - 0.037
0.037 - 0.044
0.044 - 0.052
0.052 - 0.062
0.062 - 0.074
0.074 - 0.093
0.093 - 0.125
0.125 - 0.990
Ilocos Norte
Ilocos Sur
La Union
BOD Projection, 2030
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S


N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
BOD Demand Projection 2040 (Tonnes/day)
0.000 - 0.024
0.024 - 0.033
0.033 - 0.041
0.041 - 0.049
0.049 - 0.057
0.057 - 0.068
0.068 - 0.080
0.080 - 0.101
0.101 - 0.135
0.135 - 1.040
Ilocos Norte
Ilocos Sur
La Union
BOD Projection, 2040
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S


N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
Wastewater Demand Projection 2020 (CMD)
0.00 - 46.28
46.28 - 55.29
55.29 - 63.61
63.61 - 75.61
75.61 - 89.89
89.89 - 109.70
109.70 - 133.37
133.37 - 171.47
171.47 - 251.35
251.35 - 5758.66
Ilocos Norte
Ilocos Sur
La Union
Wastewater Projection, 2020
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S


N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
Wastewater Demand Projection 2025 (CMD)
0.0 - 45.5
45.5 - 59.2
59.2 - 72.9
72.9 - 86.3
86.3 - 101.0
101.0 - 118.1
118.1 - 140.7
140.7 - 176.3
176.3 - 241.4
241.4 - 3554.9
Ilocos Norte
Ilocos Sur
La Union
Wastewater Projection, 2025
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S


N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
Wastewater Demand Projection 2030 (CMD)
0.0 - 50.7
50.7 - 65.4
65.4 - 80.5
80.5 - 94.7
94.7 - 110.4
110.4 - 129.8
129.8 - 153.1
153.1 - 191.4
191.4 - 260.8
260.8 - 3766.9
Ilocos Norte
Ilocos Sur
La Union
Wastewater Projection, 2030
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S


N
10 0 10 20 30 40 km
WGS 1984 - UTM Zone 51 N
Legend
Wastewater Demand Projection 2040 (CMD)
0.0 - 58.4
58.4 - 75.8
75.8 - 91.9
91.9 - 109.3
109.3 - 126.1
126.1 - 147.9
147.9 - 174.6
174.6 - 216.5
216.5 - 294.5
294.5 - 4053.8
Ilocos Norte
Ilocos Sur
La Union
Wastewater Projection, 2040
160°0.000'W
120°0.000'E
20°0.000'N
0°0.000'
80°0.000'S

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

With Water Quality Problem

ILOCOS NORTE

Pagudpud, Burgos, Bangui, Dumalneg, Adams, Pasuquin, Vintar, Bacarra, Carasi, Laoag City, Piddig, San Nicolas, Sarrat, Solsona, Paoay, Dingras, Batac City, Marcos, Currimao, Banna, Pinili, Nueva Era, Badoc, Sinait, Cabugao, San Juan, Magsingal, Santo Domingo, San Ildefonso, San Vicente, Bantay, Santa Catalina, Vigan City, Caoayan, Santa, Narvacan, Nagbukel, Santa Maria, San Esteban, Burgos, Santiago

ILOCOS SUR

Banayoyo, San Emilio, Candon City, Galimuyod, Gregorio Del Pilar, Quirino, Salcedo, Santa Lucia, Santa Cruz, Sigay, Cervantes, Suyo, Tagudin, Alilem, Bangar, Sudipen, Luna, Balaoan, Santol, Sugpon, Bacnotan, San Gabriel, San Juan

LA UNION

San Fernando City, Bagulin, Naguilian, Burgos, Bauang, Caba, Aringay, Tubao, Agoo, Pugo, Santo Tomas, Rosario

PANGASINAN

Bolinao, Anda, Bani, Alaminos City, Agno, Sual, Burgos, Mabini, Labrador, Dasol, Infanta, Lingayen, Binmaley, Calasiao, Dagupan City, Mapandan, Santa Barbara, Bugallon, San Carlos City, Malasiqui, Aguilar, Urbiztondo, Bayambang, Mangatarem, Sison, San Fabian, Pozzorubio, San Jacinto, Manaoag, Binalonan, San Manuel, San Nicolas, Natividad, Asingan, Tayug, San Quintin, Urdaneta City, Santa Maria, Villasis, Rosales, Balungao, Umingan, Alcala, Bautista

Areas with Water Quality Problems

Water Districts' Water Quality Monitoring Data, LWUA, 2015 Data

Water Quality

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

As discussed in the water resources section of this report, Region I has two major river basins. Table 15 shows a list of tributary rivers of the river basins with their corresponding classifications.

Table 15: Classification of Tributary Rivers in Region I

River Basin	River	Class
Abra River Basin	Abra	A
Agno River Basin	Benguet	A
	Itogon	C
	Antamok	A
	Bokod	A
	Adunot	A
	Kabayan	A
	Alenod	A
	Ambulalacao Lake	AA
	Pangasinan	C

As has been mentioned, mining, indiscriminate agricultural and forestry practices (such as *kaingin)* and charcoal making contribute to the degradation of water bodies, particularly the quality of water thereof. Table 16 shows the impact of wastewater on the water quality of the river basins in Region I.

Based on the wastewater projection maps, most of the region's cities and growing municipalities have higher demand compared to that in other areas. These areas generate more wastewater and wastes that, if left untreated and unmanaged, would pollute existing and future water sources, and increase the incidence of 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 where pathogenic microorganisms live. These diseases can be spread while bathing, washing, or drinking water, or by eating food exposed to contaminated water.[23]

In 2015, there were 22,147 reported cases of acute watery diarrhea and 2,520 cases of typhoid and paratyphoid in Region I, according to the Field Health Services Information System (FHSIS).

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

As of 2017, DILG reported that there are 12 waterless[24] municipalities in the Ilocos Region (see figure below).

Population from these areas have limited access to safe (drinking) water, and thus are forced to resort to other doubtful sources of water. Doing so increases their exposure to the risks of acquiring various waterborne diseases.

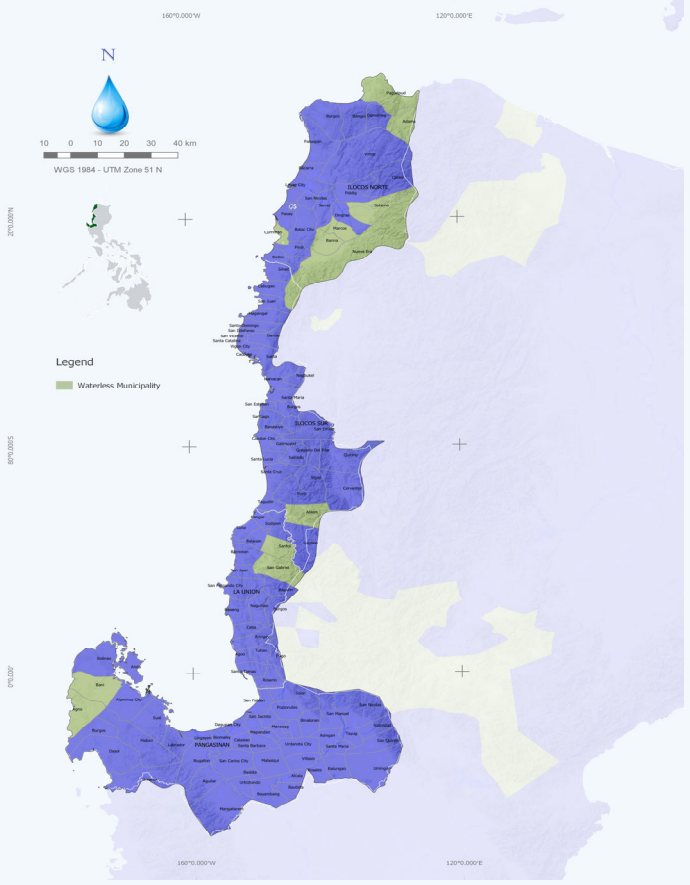


Figure 16: Waterless Municipalities, 2017

Table 16: Main Industries and their Impacts on Water Quality of the River Basins

Source	Impact/Potential Waste Generated
Industrial	
Improper disposal of mine tailings of mining companies	Increased levels of heavy metals
Agricultural	
Fertilizer runoff	Increased nitrate and phosphate levels from non-point sources
Pesticide runoff	Increased pesticide levels from non-point sources
Domestic Wastewater	
Absence of a domestic wastewater collection system	Increased BOD
Open defecation	Increased incidence of waterborne diseases
Solid waste	
Inefficient management of open and controlled dump sites	Limited capacity of controlled dump sites
Sedimentation	
Indiscriminate logging and slash-and-burn agriculture	Increased Total Suspended Solids (TSS)
River bank erosion/siltation with high velocity rainfall runoff	Increased TSS
Poor flood control and drainage facilities, lack of instruments for rainfall and flood measurements and siltation	Frequent flooding

[23] *World Health Organization*
[24] *Waterless municipalities are those with less than 50% service coverage, National Anti-Poverty Commission, 2010*

WSS Sector Gaps

In assessing the current state of the water supply and sanitation (WSS) sector in Region I, areas that require upgraded facilities, improved water supply and sanitation 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 I 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 participated in by concerned provincial officers from Region I and representatives from regional line agencies have produced a working document that identified the “hindering” issues, constraints, and challenges being encountered by the WSS sector in three areas of concern: (a) Planning and Development, (b) Service Provision, and (c) Regulation.

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.”

Those who participated in Region I’s consultation and planning workshop emphasized, in the course of input-sharing and discussion sessions, the weaknesses in the capability and competence of those responsible for the formulation of Region I’s WSS development plan.

One of the main takeaways stressed by the participants was the need to conduct Information, Education, and Communication campaigns throughout the region. The core message of these campaigns should highlight the strong partnership between the government and the private sector to enhance and upgrade the region’s WSS facilities. The whole undertaking should be viewed as a product of the stakeholders’ consensus rather than an “imposition” from policy makers and regulatory institutions.

Service Provision

The workshop participants conceded that resolving the various problems hindering the efficient delivery of water and sanitation service to Region I consumers was easier said than done. The complications are caused by external forces, lack of political will, financial constraints, dysfunctional regulatory mechanisms and consumer ambivalence.

A case in point is that WSPs and desludging facilities are lacking in the locality due to their non-affordability. Funds for the rehabilitation/construction of these facilities are not available.

In addition, facilities are underfunded or unfunded due to the lack of political will and misplaced priorities by the local leadership. The recommended facilitating measures include promotion of WSS projects; harnessing public opinion to prompt local officials to fill the gaps in legislation, funding and expertise; creation of an information bandwagon to change consumer attitude; and, demonstration of strong political will to resolve right-of-way issues.

Regulation

There is awareness among the LGUs that their efforts and initiatives to achieve water supply and sanitation efficiency are being hampered by the absence of a strong and dependable regulatory body. In their collective view, nothing less than a well-funded, fully staffed and professionally neutral regulatory regime would suffice to eliminate the drawbacks being created by competing vested interest groups.

Interested and committed non-government organizations (NGOs) to be allowed to play supporting roles through their relevant advocacies is also recommended.

Another significant consensus that emerged after a discussion of the strengths and weaknesses of the region’s WSS sector was the need for a coordinated and well-crafted vision statement which would serve as a guide for the stakeholders’ action planning and decision-making towards a common goal.

Table 17 summarizes the hindering and facilitating factors impacting the WSS sector in Ilocos Region.

Table 17: Facilitating and Hindering Factors

Areas	Facilitating Factors	Hindering Factors
Planning and Development	Availability of data	Inconsistencies/discrepancies in available data
	Investigation of available resources	Lack of potable water sources
	Competent planning office	Top-down planning (lack of heed assessment among beneficiaries)
	Supportive LCE, SP and barangay officials	Political differences
	Presence of technical experts	Lack of interest in WSS
	Presence of water agencies	No single agency to spearhead the provision and regulation of WSS services
	Proper water constituents	No determined recipients of proposed WSS projects
	Improvement of water system	Low acceptability of proposed WSS facilities among stakeholders
	Enforcement of the Clean Water Act	Lack of available and acceptable locations for facilities
	Presence of ordinances	No standard Terms of Reference
	Compliance with existing laws	
	Enough funding	
	Inclusion of WSS in AIP, ADP	
	Inclusion of sustainability plans	
Service Provision	LGU and BWSA to maintain/operate WSS projects	Inaccessibility of rural areas
	Newly rehabilitated facilities	Natural calamities
	Monthly water microbiological physical and chemical testing in accredited laboratories	Lack of WSPs in the locality
	24/7 water availability	Difficulty maintaining LGU staff employees processing accounts
	Regular monitoring of water resources (pump wells/ springs/creeks)	Lack of manpower to monitor water services
	Well-trained employees	Poor construction of distribution lines
	Immediate response to clients' complaints	Illegal connections
		Presence of E. coli in bodies of water
		Lack of knowledge in the proper mode of transport resulting in water contamination
		Affordability of desludging services
		Lack of coordination with regard to road widening projects
Regulation	Revised PNSDW of 2017	Reorientation of stakeholders on PNSDW of 2017
	Presence of policies, regulations and standards in the implementation of water and sanitation programs	Uncoordinated initiatives of government and non-government offices on wastewater treatment facilities
	Strict implementation/enforcement of laws	Political intervention
	Review and redirection of guidelines	Noncompliance with septic tank construction standards under the sanitation code
	Quarterly inspection of establishments (sanitation standard form)	Existing unlined/bottomless septic tanks and lack of septage treatment plants
	Collation and validation of reports by concerned line agencies	Lack of accredited water testing laboratories
	Presence of a monitoring system regarding access to safe water supply and sanitation through an indicator framework	Lack of manpower
	Presence of a water surveillance system	Lack of diligence among personnel with respect to their job functions
	Cash incentives given to LGUs with 100% ZOD by the RHO-1	Lack of implementation of water surveillance system
		No NGOs to monitor activities

Regional Vision

"By 2030, Region I is a clean and healthy place with safe, adequate and sustainable water and good sanitation for all."

The Ilocos Region WSS Vision was born from the combined efforts of the four provinces and cities, the regional line agencies, and the NEDA Region I Office.

The region's goal by 2030 is to have safe, clean, and sustainable water supply and sanitation using world-class facilities. Realizing these aspirations will help uplift the living standards in Region I, thus stimulating growth and promoting peace and order.

Sustainability encompasses not only the program, but also the environment from which Region I sources its water supply.

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 Region I highlighting the provinces' individual plans. Priority areas include watershed exploration, protection and expansion, watershed development, solid waste management, and zero open defecation (ZOD) campaigns and advocacies. Resource mobilization, research and development, facility establishment and provision, and advancement of technologies were given serious consideration. Human resource development, capacity building, policy review, development and enforcement, leadership and governance, and alliance building and partnership development comprise the strategies for organizational or institutional enhancement. 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 18.

Table 18: 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

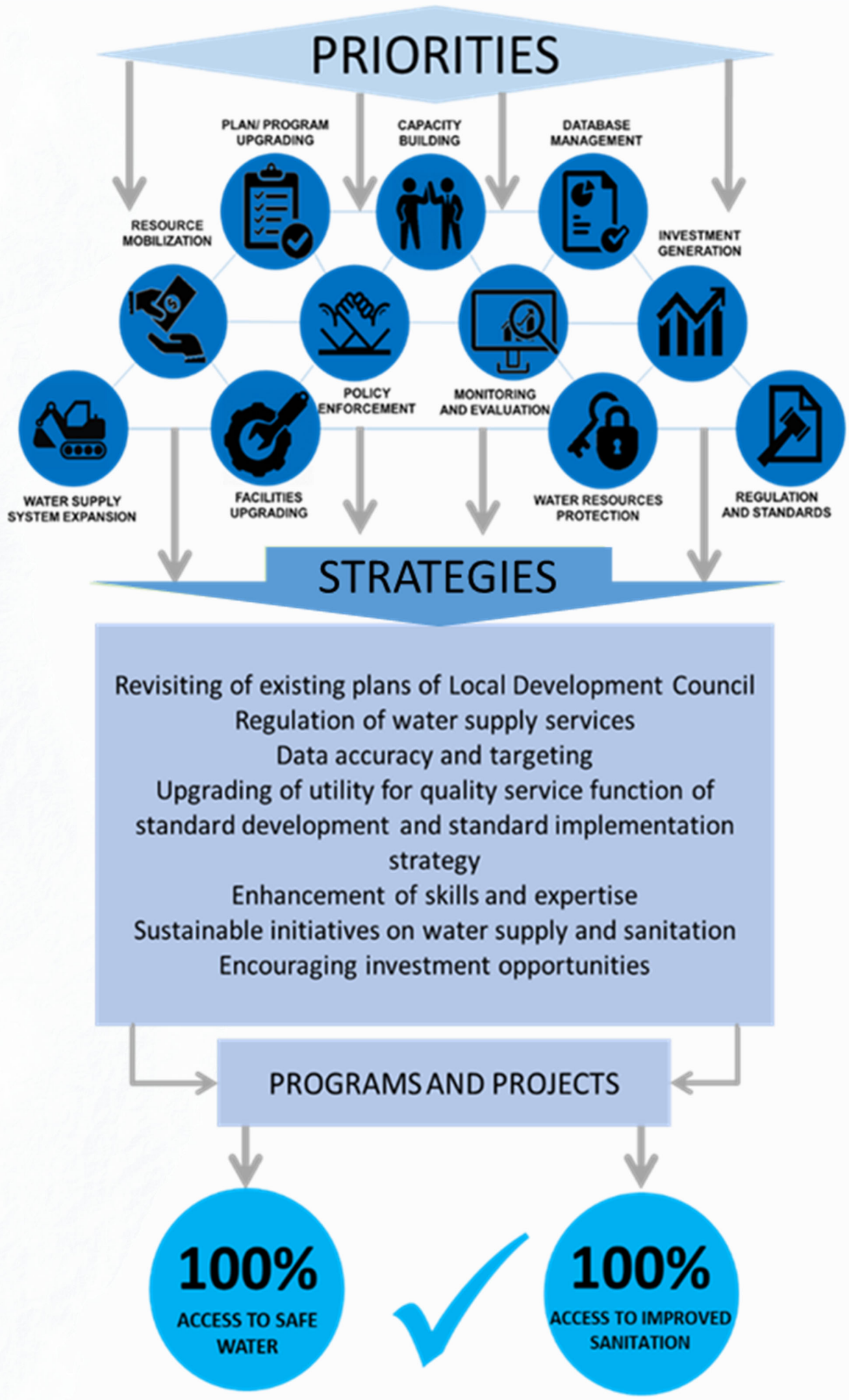


Figure 17: Ilocos Region WSS Strategic Framework

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 (but 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.

The Ilocos Region strives to achieve 98% access to safe water by 2022 and universal access by 2030. Universal access by 2040 is equivalent to more than 1 million HHs. Improved access to sanitation is set at 100% for 2022 and 2030.

Figures 18 and 19 graph the targets for water supply and sanitation for 2022 and 2030, respectively, in regard to the number of households.

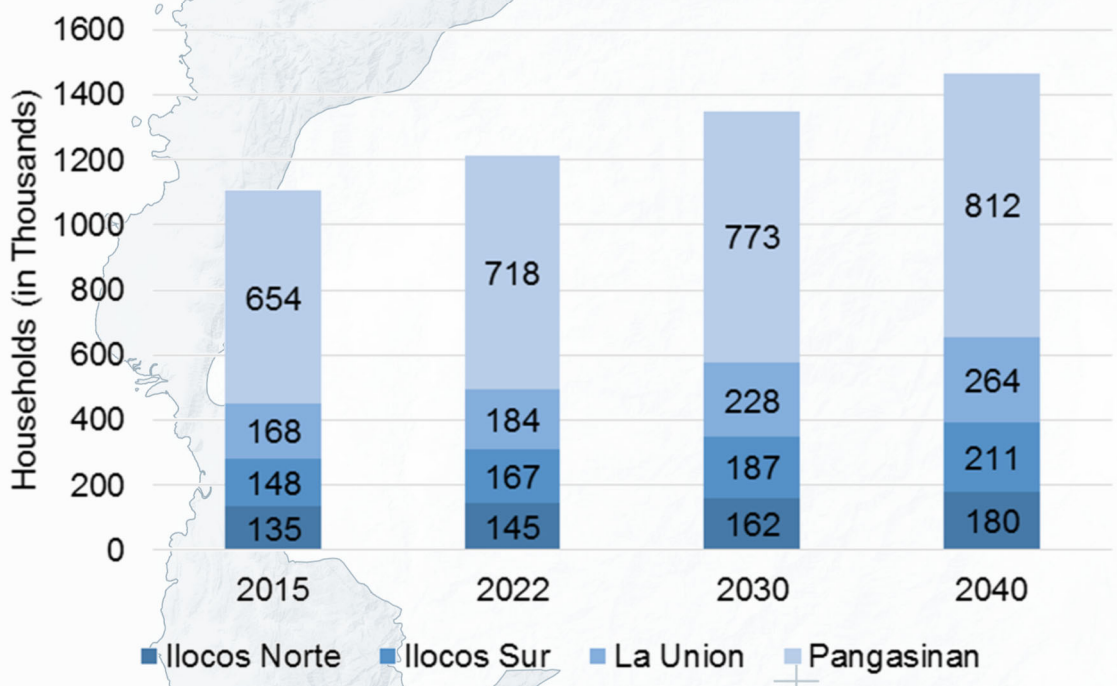


Figure 18: Targeted Households with Access to Safe Water

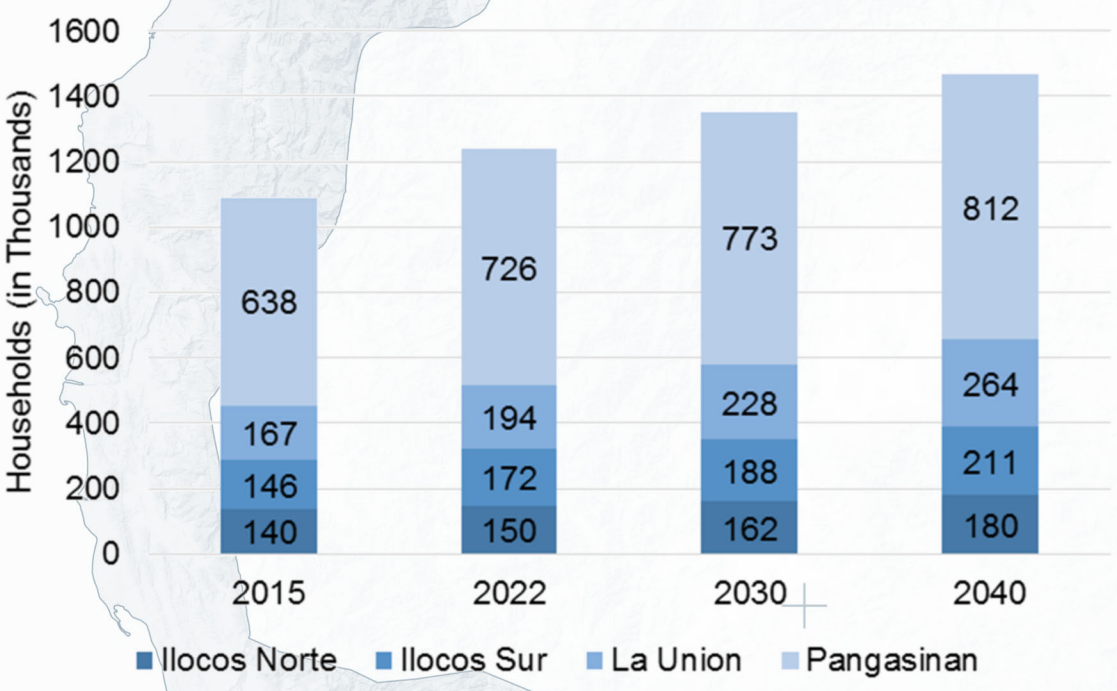


Figure 19: Targeted Households with Access to Sanitation

Water Supply Targets per Province

ILOCOS NORTE			
Category	2022	2030	2040
Level III	55.0%	65.0%	100.0%
Level II	11.0%	8.0%	0.0%
Level I	30.8%	27.0%	0.0%
With Access	96.8%	100.0%	100.0%
No Access	3.3%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

ILOCOS SUR			
Category	2022	2030	2040
Level III	33.0%	61.0%	100.0%
Level II	30.0%	38.0%	0.0%
Level I	34.0%	0.0%	0.0%
With Access	97.0%	99.0%	100.0%
No Access	3.0%	1.0%	0.0%
Total	100.0%	100.0%	100.0%

LA UNION			
Category	2022	2030	2040
Level III	18.0%	30.0%	100.0%
Level II	12.0%	20.0%	0.0%
Level I	65.0%	50.0%	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%

PANGASINAN			
Category	2022	2030	2040
Level III	52.0%	80.0%	100.0%
Level II	15.0%	20.0%	0.0%
Level I	32.0%	0.0%	0.0%
With Access	99.0%	100.0%	100.0%
No Access	1.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

REGION I			
Category	2022	2030	2040
Level III	44.4%	67.2%	100.0%
Level II	16.2%	21.1%	0.0%
Level I	37.3%	11.6%	0.0%
With Access	97.8%	99.9%	100.0%
No Access	2.2%	0.1%	0.0%
Total	100.0%	100.0%	100.0%

Sanitation Targets per Province

ILOCOS NORTE			
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%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

ILOCOS SUR			
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%
Open Defecation	1.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

LA UNION			
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%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

PANGASINAN			
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%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

REGION I			
Category	2022	2030	2040
Improved	93.8%	100.0%	100.0%
Basic	1.1%	0.0%	0.0%
Shared / Communal / Limited	5.0%	0.0%	0.0%
Open Defecation	0.0%	0.0%	0.0%
Total	100.0%	100.0%	100.0%

Strategic Interventions

After the planning and consultation workshops, a working document detailing specific strategic interventions to improve water supply and sanitation access in Region I was formulated. Based on their consensus during the workshops, these proposed interventions were deliberated on 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 19 and 20 show the specific strategic interventions for WSS, respectively.

Table 19: 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 20: Proposed Strategic Interventions for Sanitation

Access to Improved Sanitation	Planning & Development *Planning* *Program or Project Design* *Institution Building* *Training* *Financing* *Climate/Disaster Resiliency* *Policy*	Service Provision *Operations* *M&E* *Expansion* *Amalgamation* *Automation*	Regulation *Tariff/Pricing* *Resource* *Arbitration* *Registration, Permits, Rights*	Promotions *Social Preparation* *Advocacy* *Demand Creation* *Behavior Change*
High Access Areas with 60% to 100% Improved Sanitation Coverage	▪ Local Sustainable Sanitation Plan (LSSP) should be incorporated into the WSS Sector Plan, local development plan (LDP), annual investment program (AIP), and local health plan. ▪ A sewerage system program should be developed to provide service in the urban core coordinating with those in charge of the septage management program; project urban sprawl ▪ A National Sewerage and Septage Management Program (NSSMP) subsidy grant for sewerage and septage management programs (SMP) should be 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 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

In order to meet the targets for access and coverage as well as the normative content of water (service standards), the capital investments needed for 2022 and 2030 are listed in Table 21.

Table 21: Capital Investments Required for 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.

Non-physical 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 22).

Table 22: Institutional and Regulatory Reforms Required for 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 the 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 the province. WDs will continue to be regulated by the LWUA. The monitoring group could later be made part of a regulatory body.		

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

Approved Projects

Pending Projects

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Nagbukel
Narvacan
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
Banayoyo
San Emilio
Candon City
Galimuyod
Gregorio Del Pilar
Quirino
Santa Lucia
Salcedo
Santa Cruz
Sigay
Cervantes
Suyo
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Santol
Sugpon
Bacnotan
San Gabriel
San Juan
San Fernando City
LA UNION
Bagulin
Naguilian
Bauang
Burgos
Caba
Aringay
Agoo
Tubao
Pugo
Santo Tomas
Rosario
Bolinao
Anda
Bani
Alaminos City
Agno
Sual
Burgos
Mabini
Labrador
Dasol
PANGASINAN
Lingayen
Binmaley
Calasiao
Santa Barbara
Dagupan City
San Jacinto
Mapandan
Manaoag
Urdaneta City
Sison
San Fabian
Pozzorubio
Binalonan
San Manuel
San Nicolas
Natividad
Asingan
Tayug
San Quintin
Santa Maria
Villasis
Rosales
Balungao
Umingan
Bugallon
San Carlos City
Malasiqui
Basista
Alcala
Infanta
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem

LWUA Priority Projects

LWUA, 2018 Data

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).

For infrastructure development, the Ilocos Region requires capital investments of about PhP12.55 billion and PhP16.96 billion for 2022 and 2030, respectively. Unit development costs employed to arrive at these sums are estimated at PhP32,300 per HH for Level III, PhP18,800 for Level II, and PhP8,400 for Level I.

These rates are direct costs and cover items such as 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 Region I) 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 PhP 31,800/ HH, PhP 18,700/HH, and PhP 8,400/HH for Levels III, II, and I, respectively.

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 also 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 23.

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 24 shows a summary of the total investment requirements of the region. The detailed methodology on how the regional costs at Region I were derived is referenced in Annex D of the main volume of the Philippine WSS Master Plan.

Non-Physical 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 four municipalities and two cities with WDs included in LWUA's list of projects. Balungao WD has secured LWUA's financial assistance (FA) for its project. The other five (5) WDs in Candon City, Dagupan City, Binmaley, Dingras, and San Nicolas WDs have requested FA that are pending approval (as of this writing).

Table 23: 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 24: Total Investment Costs for Water Supply Sector

Province	Total Investment Cost (in PhP Million) 2022	Total Investment Cost (in PhP Million) 2030
Ilocos Norte	869	965
Ilocos Sur	1,681	2,909
La Union	459	1,945
Pangasinan	9,456	11,140
Total	**12,465**	**16,959**

[25] *Based on Industry Standards*

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

STP CLUSTERING

- R1-CL1
- R1-CL2
- R1-CL3
- R1-CL4
- R1-CL5
- R1-CL6
- R1-CL7
- R1-CL8
- R1-CL9
- R1-CL10
- R1-CL11
- R1-CL12
- R1-CL13
- R1-CL14
- R1-CL15
- R1-CL16
- R1-CL17
- R1-CL18
- R1-CL19
- R1-CL20
- R1-CL21
- R1-CL22
- R1-CL23
- R1-CL24
- R1-CL25
- R1-CL26
- R1-IN1
- R1-IN2
- R1-IN3
- R1-IN4
- R1-IN5

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Narvacan
Nagbukel
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
Banayoyo
San Emilio
Candon City
Galimuyod
Gregorio Del Pilar
Quirino
Santa Lucia
Salcedo
Santa Cruz
Sigay
Cervantes
Suyo
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Santol
Sugpon
Bacnotan
San Gabriel
San Juan
San Fernando City
LA UNION
Bagulin
Naguilian
Baguang
Burgos
Caba
Aringay
Agoo
Tubao
Pugo
Santo Tomas
Rosario
Bolinao
Anda
Bani
Alaminos City
Agno
Sual
Sison
San Fabian
Pozzorubio
San Nicolas
San Manuel
San Jacinto
Binalonan
Dagupan City
Manaoag
Natividad
Mapandan
Asingan
Tayug
San Quintin
Burgos
Mabini
Lingayen
Binmaley
Calasiao
PANGASINAN
Santa Barbara
Urdaneta City
Santa Maria
Labrador
Dasol
Villasis
Bugallon
San Carlos City
Malasiqui
Rosales
Balungao
Umingan
Basista
Alcala
Infanta
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem

Septage Treatment Plant Clustering

Sanitation Investment Requirements

Physical Investments

Basic Sanitation Program. The Department of Health (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).

The Ilocos Region will need about PhP1.55 billion for basic sanitation from 2016 to 2022 to reach its 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 PhP2.57 billion and PhP230 million for 2022 and 2030, respectively, for its septage management program.

Sewerage System Program. There are no sewerage systems required at this time in the Ilocos Region. However, rapidly urbanizing cities (i.e., candidate HUCs) should also consider planning for sewerage services in the interim. Candidate HUCs may be closely examined initially in Ilocos Norte (e.g., in Laoag City) and Pangasinan (e.g., in Bayambang, Dagupan City, Lingayen, Malasiqui, San Carlos City, and Urdaneta City) as urbanization may set in more rapidly in these places than in other capital towns of the other provinces, like San Fernando City in La Union.

Table 25: Total Investment Costs for Sanitation Sector

Province	Total Investment Cost (in PhP Million) 2022	Total Investment Cost (in PhP Million) 2030
Ilocos Norte	2,110	373
Ilocos Sur	936	501
La Union	3,083	1,043
Pangasinan	18,680	1,435
Total	**24,809**	**3,352**

Non-Physical Investments

The Ilocos Region, 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, Department of Environment and Natural Resources (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. Based on the proposed projects and programs, the region needs PhP76.2 billion to boost its WSS sector.

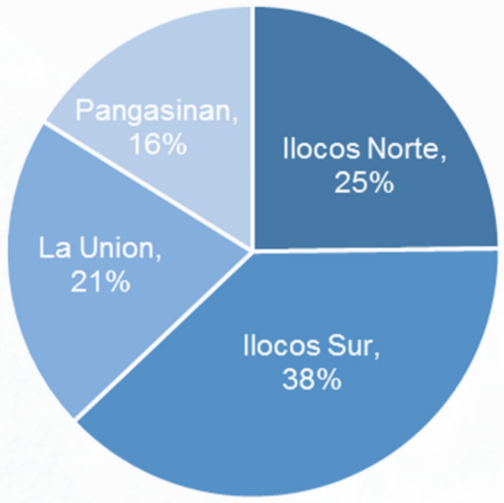


Figure 20: Distribution of Investment Requirement per Province

Ilocos Norte									
	Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiaries (2022)
1	Development of 1 Spring Source	Short Term	500.00	1	Construction of Basic Sanitation Facilities	Medium Term	48.02		
2	Province-wide Grey Wastewater Treatment (Capitol)	Long Term	250.00	2	Improvement of Sanitation Access and Construction of Septage Management Facilities	Medium Term	1,190.81		
3	Watershed and Woodlot Development	Short Term	62.50	3	Monthly Fecal and Semiannual Chemical Test	Long Term	-		
4	Establishment of Ilocos Norte PHO's Water Quality Analysis Laboratory	Medium Term	4.00						
5	Province-wide Water Harvesting Facility (Capitol)	Short Term	250.00						
6	Water Quality Surveillance and Treatment: Purchase of Chromogenic Substrate Machine	Short Term	5.75					**4,311.83**	**149,600**
7	Improvement of Water Supply Access; Water Source Development and Pipe Replacement	Medium Term	2,000.00						
8	Purchase of Chlorine and Chlorinator Facilities for Level II Water Systems	Short Term	0.75						
9	Continuous Propagation of Plants Endemic in the Area	All year round							
		TOTAL	**3,073.00**			**TOTAL**	**1,238.83**		

Ilocos Sur									
	Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiaries (2022)
1	DROPS (Develop, Restore and Operate Our Potable Water System) Project	Medium Term	500.00	1	STOOL (Sanitary Toilet Toward Zero Open Defecation at Local Level) Project	Long Term	5,000.00		
2	Establishment of Microbiology and Water Quality Analysis Laboratory	Short Term	12.50	2	Improvement of Sanitation Access; Construction of Proposed Septage Management Facilities	Short Term	100.00		
3	Installation of Additional Water Pumps and Overhead Tanks	Short Term	12.50					**6,625.00**	**193,795**
4	Water Source Development and Expansion	Short Term	1,000.00						
5	Training of personnel	Short Term	-						
		TOTAL	**1,525.00**			**TOTAL**	**5,100.00**		

La Union									
	Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiaries (2022)
1	Construction of a desalination plant	Medium Term	120.00	1	Construction of a wastewater treatment facility	Medium Term	1,500.00	3,644.72	193,795
2	Feasibility study for a Watershed Management Plan	Short Term	0.72						
3	Rainwater harvesting facilities	Short Term	24.00						
4	Rehabilitation of existing pipelines	Short Term	2,000.00						
5	Purchase of hardware/software	Medium Term	-						
6	Small water impounding stations	Short Term	-						
7	Establishment of small community water supply systems	Short Term	-						
		TOTAL	**2,144.72**			**TOTAL**	**1,500.00**		

Pangasinan									
	Water Supply	Period	Budget Requirement (PhP Million)		Sanitation	Period	Budget Requirement (PhP Million)	Total Budget Requirement (PhP Million)	HH Beneficiaries (2022)
1	Alaminos Water District projects			1	Setting up a WD in Alaminos and operation of septage management facility	Long Term	6.20	**2,804.48**	**725,695**
	Facilities with 5,000 CM water storage capacity	Short Term	9.02	2	Construction of a septage management and treatment system	Long Term	100.97		
	Construction of additional water sources	Short Term	3.39	3	Construction of a sewerage system	Long Term	818.16		
	NRW Reduction Program	Short Term	1.02	4	Septage management and treatment facilities	Long Term	86.73		
	Pipeline rehabilitation, upgrade, and expansion	Medium Term	13.60	5	Construction of wastewater treatment facility	Long Term	200.00		
	Purchase and modernization of pumping equipment, generator sets, plumbing tools and computer equipment and software	Medium Term	5.00	6	Construction of sanitation facilities	Short Term	-		
2	Expansion of water supply coverage and service (Dagupan and San Carlos City)	Short Term	155.93	7	Zero open defecation project	Short Term	-		
3	Expansion and increase of water supply coverage and access	Short Term	1,375.29	8	Septage management and treatment facilities for cities and municipalities	Short Term	-		
4	Upgrading, rehabilitation, repair, & improvement of water systems	Medium Term	20.00						
5	Water quality surveillance	Short Term	1.18						
6	Watershed rehabilitation and conservation	Medium Term	5.00						
7	Updating of CLIPS/PDPFP/ business plans	Short Term	-						
8	Dredging or desilting of major river systems	Short Term	-						
9	Mangrove reforestation	Short Term	-						
10	Construction of river bank protection structures	Short Term	-						
11	Construction of SWIPS	Short Term	-						
12	Construction of reservoir	Short Term	-						
		TOTAL	**1,589.43**			**TOTAL**	**1,212.06**		

	Water Supply & Sanitation	Period	Budget Requirement (PhP Million)
1	Capacity development of stakeholders	Short Term	3.00
2	Training in wastewater management	Short Term	-
		TOTAL	**3.00**

160°0.000'W

120°0.000'E

20°0.000'N

80°0.000'S

0°0.000'

N

10 0 10 20 30 40 km

WGS 1984 - UTM Zone 51 N

Legend

- Barangays with Assistance
- Municipality with Assistance
- Priority Projects (Barangay Level)
- Priority Projects (Municipal Level)

Pagudpud
Burgos
Bangui
Dumalneg
Adams
Pasuquin
Vintar
Bacarra
Carasi
Laoag City
ILOCOS NORTE
Piddig
San Nicolas
Sarrat
Solsona
Paoay
Dingras
Batac City
Marcos
Currimao
Banna
Pinili
Nueva Era
Badoc
Sinait
Cabugao
San Juan
Magsingal
Santo Domingo
San Ildefonso
San Vicente
Bantay
Santa Catalina
Vigan City
Caoayan
Santa
Nagbukel
Narvacan
Santa Maria
San Esteban
Burgos
Santiago
ILOCOS SUR
Banayoyo
San Emilio
Candon City
Galimuyod
Gregorio Del Pilar
Quirino
Santa Lucia
Salcedo
Santa Cruz
Sigay
Cervantes
Suyo
Tagudin
Alilem
Bangar
Sudipen
Luna
Balaoan
Santol
Sugpon
Bacnotan
San Gabriel
San Juan
San Fernando City
Bagulin
LA UNION
Naguilian
Pauang
Burgos
Caba
Aringay
Tubao
Agoo
Pugo
Bolinao
Anda
Santo Tomas
Rosario
Bani
Sison
Alaminos City
San Fabian
Pozzorubio
San Nicolas
Agno
San Manuel
San Jacinto
Binalonan
Sual
Dagupan City
Manaoag
Natividad
Burgos
Mapandan
Asingan
Tayug
Lingayen
Binmaley
Calasiao
San Quintin
Mabini
Labrador
PANGASINAN
Santa Barbara
Urdaneta City
Santa Maria
Dasol
Villasis
Bugallon
San Carlos City
Malasiqui
Rosales
Balungao
Umingan
Basista
Alcala
Infanta
Aguilar
Urbiztondo
Bautista
Bayambang
Mangatarem

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	Barangay	Project Type	Amount
La Union	Agoo	Balawarte	Potable water supply	2,000,000.00
La Union	Agoo	Capas	Potable water supply	2,000,000.00
La Union	Agoo	Purok	Potable water supply	2,000,000.00
La Union	Agoo	San Nicolas West	Potable water supply	2,000,000.00
La Union	Agoo	San Roque West	Potable water supply	2,000,000.00
La Union	Bauang	Pilar	Potable water supply	2,500,000.00
La Union	Bauang	Upper San Agustin	Potable water supply	2,500,000.00
La Union	Tubao	Leones West, Rizal And Pideg	Potable water supply	10,000,000.00
			Total	**25,000,000.00**

SALINTUBIG (2019)			
Province	Municipality	Project Name	Amount
Ilocos Norte	Banna (Espiritu)	Level III water system	20,000,000
Ilocos Norte	Burgos	Construction/upgrading of potable water system	15,000,000
Ilocos Norte	Pagudpud	Development of potable water systems in all barangays	12,000,000
La Union	Santol	Construction of Level II water supply in Brgys. Paagan, Ramot, and Tubaday	11,000,000
Pangasinan	Agno	Potable water supply	10,000,000
Pangasinan	Aguilar	Spring Development Project: Bocacliw Spring	15,000,000
Pangasinan	Bani	Provision of water systems in all barangays not covered by BWD	15,000,000
Pangasinan	Urbiztondo	Potable water supply	11,000,000
		Total	**109,000,000**

LWUA (2017-2018)				
Province	Municipality	Project Type	Status	Amount
Pangasinan	Balungao WD	Expansion	Approved	20,000,000
Ilocos Norte	Dingras WD	Expansion	Pending Approval	14,000,000
Ilocos Sur	Candon City WD	Expansion	Pending Approval	0
Pangasinan	Binmaley WD	Treatment Plants	Pending Approval	60,000,000
Pangasinan	Dagupan City WD	Expansion	Pending Approval	100,000,000
Pangasinan	San Nicolas WD	Expansion	Pending Approval	20,000,000
			Total	**214,000,000**

Appendix A: Provincial Profiles

ILOCOS NORTE	21 municipalities	Adams, Bacarra, Badoc, Bangui, Banna, Burgos, Carasi Currimao, Dingras, Dumalneg, Marcos, Nueva Era, Pagudpud, Paoay, Pasuquin, Piddig, Pinili, San Nicolas, Sarrat, Solsona, Vintar
	two (2) component cities	Batac City, Laoag City
	557 barangays	17 Urban, 540 Rural
Land Area	3,467.89 sq. km.	
Demographics (2015)	Population (2015) – 593,081 Population Growth Rate (2000 to 2015) – 0.98 Population Density – 170 per sq. km.	
Economy	• Major industries - agriculture, fishery, livestock, tourism • Major crops - rice, corn, garlic, tabacco, legumes, fruits • Ilocos Norte's position in the northwest corner of Luzon makes it a deal for wind power generation. The province now boasts its 25 megawatt wind farm.	
Poverty Incidence (2015)	On Families – 3.3% On Population – 5.3%	
ILOCOS SUR	32 municipalities	Alilem, Banayoyo, Bantay, Burgos, Cabugao, Caoayan, Cervantes, Galimuyod, Gregorio del Pilar, Lididda, Magsingal, Nagbukel, Narvacan, Quirino, Salcedo, San Emilio, San Esteban, San Ildefonso, San Juan, San Vicente, Santa, Santa Catalina, Santa Cruz, Santa Lucia, Santa Maria, Santiago, Santo Domingo, Sigay, Sinait, Sugpon, Suyo, Tagudin
	two (2) component cities	Candon City, Vigan City
	768 barangays	13 Urban, 755 Rural
Land Area	2,596 sq. km.	
Demographics (2015)	Population (2015) – 689,668 Population Growth Rate (2000 to 2015) – 0.94 Population Density – 270 per sq. km.	
Economy	• Major industries - agriculture, weaving • Major products - loom weaves, furniture, jewelry • Major crops - rice, corn, tabacco, fruit trees • Vigan City is unique for having preserved much of its Hispanic colonial character, thus gaining recognition from the UNESCO World Heritage Centre.	
Poverty Incidence (2015)	On Families – 9.5% On Population – 12.1%	

LA UNION	19 municipalities	Agoo, Aringay, Bacnotan, Bagulin, Balaoan, Bangar, Bauang, Burgos, Caba, Luna, Naguilian, Pugo, Rosario, San Gabriel, San Juan, Santo Tomas, Santol, Sudipen, Tubao
	One (1) component city	San Fernando City
	576 barangays	30 Urban, 546 Rural
Land Area	1,497.70 sq. km.	
Demographics (2015)	Population (2015) – 786,653 Population Growth Rate (2000 to 2015) – 1.18 Population Density – 530 per sq. km.	
Economy	• Major industries - agriculture, manufacturing, trading • Major products - hand-woven blankets, baskets, pottery, wood crafts • Major crops - rice, fruits and vegetables, fish, poultry • La Union is one of the most famous surfing destinations in the country.	
Poverty Incidence (2015)	On Families – 9.2% On Population – 12.2%	

PANGASINAN	44 municipalities	Agno, Aguilar, Alacala, Anda, Asingan, Balungao, Bani, Basista, Bautista, Bayambang, Binalonan, Binmaley, Bolinao, Bugallon, Burgos, Calasiao,Dasol, Infanta, Labrador, Laoac, Lingayen, Mabini, Malaiqui, Manaoag, Mangaldan, Mangatarem, Mapandan, Natividad, Pozorrubio, Rosales, San Fabian, San Jacinto, San Manuel, San Nicolas, San Quintin, Santa Babara, Santa Maria, Santo Tomas, Sison, Sual, Tayug, Umingan, Urbiztondo, Villasis
	Three (3) component cities	Alaminos City, San Carlos City, Urdaneta City
	One (1) independent city	Dagupan City
	1,364 barangays	86 Urban,1278 Rural
Land Area	5,451.01 sq. km.	
Demographics (2015)	Population (2015) – 2,956,726 Population Growth Rate (2000 to 2015) – 1.28 Population Density – 540 per sq. km.	
Economy	• Major industries - agriculture, fishery, livestock, forestry • Major crops - rice, root crops, vegetables, corn, mango, sugar cane • Pangasinan is the richest province in the Ilocos Region.	
Poverty Incidence (2015)	On Families – 11.2% On Population – 15.3%	

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