Davao Region Water Supply and Sanitation Databook and Regional Roadmap

Volume 2: Philippine Water Supply and Sanitation Master Plan



NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY



Table of Contents

Introduction

80°0.000'E +

| IIIU | oddetion | |
|------|---|----|
| | Land Classification | 7 |
| | Economy | 7 |
| | Labor and Employment | 7 |
| | Family Income and Expenditure | 9 |
| | Demography | 9 |
| | Climate | 11 |
| | Disaster Risk | 11 |
| | Climate Change and Hydrological Hazards | 11 |
| WS | S Sector Status | |
| | Access to Safe Water | 15 |
| | Drinking Water | 15 |
| | Access to Sanitation | 17 |
| Wat | ter Resources | |
| | Surface Water | 19 |
| - | Groundwater | 21 |
| | Water Use | 21 |
| | Water Availability, Water Stress and Water Scarcity | 21 |
| Der | nand | |
| > | Population Projection | 22 |
| | Water Supply and Demand | 22 |
| | Water Demand vs. Water Resources Potential | 22 |
| WS | S Infrastructure | |
| | Water Service Providers | 25 |
| | Water Districts | 25 |
| | LGU-Run Water Utilities | 25 |
| Z | BWSA | 25 |
| ~ | RWSA | 25 |
| | Bulk Water Services | 25 |
| Sar | litation | |
| | Open Defecation | 26 |
| | Wastewater and Domestic Biological Oxygen Demand | 26 |
| | Water Quality | 31 |
| 521 | Waterborne Diseases | 31 |
| ws | S Sector Gaps | |
| > | Issues, Constraints and Challenges | 32 |
| 0 | Regional Vision | 34 |
| (| Strategic Framework | 34 |
| | Access Targets for Water and Sanitation | 36 |
| | Strategic Interventions | 38 |
| 1 | Physical Interventions | 39 |
| 5 | Nonphysical Interventions | 39 |
| | | |

Addressing the Gaps

Mato

| vvater Supply investment Requirements | 41 |
|--|--------|
| Physical Investments | 41 |
| Nonphysical Investments | 41 |
| Sanitation Investment Requirement | 41 |
| Physical Investments | 41 |
| Basic Sanitation Program | 43 |
| Septage Management Program | 43 |
| Sewerage Program | 43 |
| Nonphysical Investments | 43 |
| Proposed Projects and Programs | 44 |
| لdentified Priority Projects (2019-2020) | 47 |
| Appendix | |
| Appendix A: Provincial and HUC Profiles | 48 |
| | |

80°0.000'E

0°0.000′

+

80°0.000'N

| | | List of Tables | Page |
|-------|----|---|------|
| Table | 1 | Population per Province/HUC, 2015 | 9 |
| Table | 2 | Urban and Rural Population per Province/HUC, 2015 | 9 |
| Table | 3 | Seasonal Projections Under a Medium-Range Emission Scenario | 11 |
| Table | 4 | Frequency of Extreme Events in 2020 and 2050 Under a Medium-Range Emission Scenario | 11 |
| Table | 5 | National and Regional Access to Water Supply | 15 |
| Table | 6 | Access to Water Supply per Province/HUC | 15 |
| Table | 7 | National and Regional Access to Sanitation | 17 |
| Table | 8 | Access to Sanitation Facilities per Province/HUC | 17 |
| Table | 9 | Aquifer Classes Based on MGB Aquifer Types | 21 |
| Table | 10 | Water Availability per Province | 21 |
| Table | 11 | Water Service Providers per Province | 25 |
| Table | 12 | Classification of Tributary Rivers in Region XI | 31 |
| Table | 13 | Main Industries and Their Impacts on Water Quality of the River Basins | 31 |
| Table | 14 | Hindering and Facilitating Factors | 33 |
| Table | 15 | Strategies in Achieving Increased Access to Potable Water | 34 |
| Table | 16 | Proposed Strategic Interventions for Water Supply | 38 |
| Table | 17 | Proposed Strategic Interventions for Sanitation | 38 |
| Table | 18 | Capital Investments Required to Meet Water Supply Targets | 39 |
| Table | 19 | Institutional and Regulatory Reforms to Achieve Water Supply and Sanitation Goals | 39 |
| Table | 20 | Indirect Costs Employed | 41 |
| Table | 21 | Total Investment Costs for Water Supply Sector | 41 |
| Table | 22 | Total Investment Costs for Sanitation Sector | 43 |

List of Figures

7 Figure 1 GRDP Contributions per Sector, 2016 2 Labor Force Participation and Employment Rates per Province, 2017 and 2018 Figure 7 3 Distribution of Family Expenditure, 2015 9 Figure Figure 4 Main Sources of Water Supply, 2015 15 5 Provincial Access to Safe Water Figure 15 17 Figure 6 Percentage of Households with Access to Sanitation Facilities Figure 17 7 Existing Septage Treatment Plant 8 Water Resources Potential and Annual Rainfall of Region XI Provinces Figure 19 Figure 9 Water Use, 2017 21 10 Water Availability Map, 2015 21 Figure 11 Projected Population per Province 22 Figure

| rigule | ri rijected ropulation per riovince | 22 |
|--------|--|----|
| Figure | 12 Projected Water Demand | 22 |
| Figure | 13 Biological Oxygen Demand, 2015 | 26 |
| Figure | 14 Categories of Wastewater | 26 |
| Figure | 15 Wastewater Produced, 2015 | 26 |
| Figure | 16 Waterless Municipalities | 31 |
| Figure | 17 Davao Region WSS Strategic Framework | 35 |
| Figure | 18 Targeted Households with Access to Safe Water | 36 |
| Figure | 19 Targeted Households with Access to Sanitation | 36 |
| Figure | 20 Distribution of Investment Requirement per Province/HUC | 44 |
| | | |



Page

Acronyms

AM ARMM BOD **BWSA** CBO CDP DENR DILG DJF DOH FA FHSIS FIES GRDR HH HUC JJA JMP LCE LFPR LWUA LGU MAM MCWD MDG M&E NCR NDHS NEDA NGO NRW NSSMP **NWRB** PAGASA PDP PNSDW PPP PSA PWSSMP RBCO RDC RPME RWSA SDG

AIP

Annual Investment Plan Assistance to Municipalities Autonomous Region in Muslim Mindanao **Biological Oxygen Demand** Barangay Water and Sanitation Association **Community-Based Organization Comprehensive Development Plan** Department of Environment and Natural Resources Department of the Interior and Local Government December, January and February Department of Health **Financial Assistance** Field Health Service Information System Family Income and Expenditure Survey Gross Regional Domestic Product Household Highly Urbanized City June, July and August Joint Monitoring Program Local Chief Executive Labor Force Participation Rate Local Water Utilities Administration Local Government Unit March, April and May Metropolitan Cebu Water District Millennium Development Goals Monitoring and Evaluation National Capital Region National Demographic and Health Survey National Economic and Development Authority Nongovernment Organization Nonrevenue Water National Sewerage and Septage Management System National Water Resources Board Philippine Atmospheric, Geophysical and Astronomical Services Administration Philippine Development Plan Philippine National Standards for Drinking Water Public-Private Partnership Philippine Statistics Authority Philippine Water Supply and Sanitation Master Plan **River Basin Control Office Regional Development Council** Regional Project Monitoring Evaluation System





Rural Waterworks and Sanitation Association Sustainable Development Goals September, October and November Septage Treatment Plant Tropical Cyclone United Nations United Nations United Nations Children's Fund Water District World Health Organization Water Resources Region Water Service Provider Water Supply and Sanitation Zero Open Defecation

80°0.000'E

0°0.000′

80°0.000′W +

+

+

+

| percent |
|---------------------------|
| degree Celsius |
| hectare |
| meter |
| square meter |
| cubic meter |
| millimeter |
| square kilometer |
| liters per capita per day |
| million cubic meters |
| Philippine peso |
| |

80°0.000'N

60°0.000'N



+

+

+



0°0.000′

0

10

0



+

0°0.000′

N

10

20

30

40 km

Region XI - Davao

Introduction Davao Region

Davao Region is situated in the southeast section of Mindanao.

It is bounded on the north by the provinces of Surigao Del Sur, Agusan Del Sur, and Bukidnon, on the east by the Philippine Sea, and on the west by the Central Mindanao provinces.

The region comprises five provinces: Compostela Valley, Davao del Norte, Davao Oriental, Davao del Sur, and Davao Occidental (carved out from the southern part of Davao del Sur and created in 2013).

Davao City is classified as a highly urbanized city (HUC) and is independent of any province in the Davao Region. It is considered the region's commercial, industrial, and administrative center.

Davao Region is endowed with rich natural resources and vast tracts of land available for agricultural and real estate development.

Its economy is predominantly agricultural but Davao Region has flourished as an agro-industrial, trade and tourism hub.

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

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

Land Classification

The region has a total land area of 20,357.42 square kilometers (km²) representing around 6.6% of the country's total land area and 19.3% of that of Mindanao.

Approximately 60% of its land area is forestland, and



Figure 1: GRDP Contributions per Sector, 2016²

Labor and Employment

As of January 2018, the current total labor force participation rate (LFPR) was estimated at 62.2% of the total regional population — equivalent to nearly 3.8 million Davaoeños. This figure shows a decrease of 3.1% from the October 2017 LFPR.

Davao Oriental had the highest LFPR (65%) among the four provinces, although there was no significant difference in the LFPR among these provinces.³

The employment rate decreased to 95.3% from 96% in 2017. The quality of employment has always been a major social issue: the underemployment rate was recorded at 17.8% (from 21.2% in 2017) primarily because of seasonal job opportunities and mismatch of occupations and skills. Among the provinces, Davao Oriental had the highest employment rate at 96.6%.



12

80°0.000'N

40% is alienable and disposable land.

Economy

The service sector contributes the largest Gross Regional Domestic Product (GRDP), followed by the industry sector, and the agriculture, hunting, forestry and fishing (AHFF) sector.

The region's domestic sales reached around PhP1.44 billion in 2015. Thanks to government aid, the growth of micro, small, and medium enterprises (MSME) has immensely contributed to the rise in domestic sales.²

Labor Force Participation Rate, 2016 Employment Rate, 2016

Figure 2: Labor Force Participation and Employment Rates per Province, 2016

> ¹ Davao Regional Physical Framework Plan, 2015-2045 ² Davao Regional Development Plan, 2017-2022 ³ Philippine Statistics Authority, Labor Force Survey, 2017 and 2018

7





8

80°0.000'E

0°0.000′

0°0.000′



Family Income and Expenditure

Davao Region has approximately 1,156,000 households (HHs), with an estimated annual average income of PhP285,560 and an annual average expenditure of PhP219,680.

In terms of income class, all households earn income greater than their expenditures. Considering family size as an indicator, a family of five has the largest incomeexpenditure difference, while a single-person household has the least income-expenditure difference. This indicates that a family of five has more savings compared to other family sizes.

With respect to the disbursement patterns of the families in the region and across income levels, the Family Income and Expenditure Survey (FIES) conducted in 2015 revealed that food expenditure registered the highest among the major expenditure groups at 43.3%. Housing expenses followed at 10.7%, and expenses for water, electricity, gas and other fuels are estimated at 7.2%. Figure 3 graphs the expenditure distribution and shows that most families spend more for their basic needs.

Table 1: Population per Province/HUC, 2015

| Region/Province/ City | 2015 Population | Land Area (km²) | Population Density (persons/km²) |
|--|--------------------|--------------------|--|
| Davao Region | 4,893,318 | 20,357.42 | 240 |
| Compostela Valley | 736,107 | 4,479.77 | 160 |
| Davao Del Norte | 1,016,332 | 3,426.97 | 297 |
| Davao Del Sur (excluding Davao City) | 632,588 | 2,163.98 | 290 |
| Davao Oriental | 558,958 | 5,679.64 | 98 |

Demography

The region had a population of 4,893,318 accounting for 4.31% of the country's population in 2015. Davao Del Sur had the largest population among the five provinces, while Davao Occidental had the smallest population. The region's population growth from 2000 to 2015 was recorded at 1.81%, which was lower than the national average of 1.84%.

The population density of the region averaged 240 persons per square kilometer in 2015. The map on the left shows that a large percentage of the region's population is concentrated in the cities as well as along the coastal areas.

Among local government units (LGUs), Davao City had the highest density at 670 persons/km², about three times larger than that of the entire region.

The region is predominantly (52%) rural. The average household size in the region is 4.2 persons. (see Table 2)

Table 2: Urban and Rural Population per Province/HUC, 2015⁵

| Region/Province/City | Urban Population | Rural Population |
|---|------------------|------------------|
| Davao Region | 48% | 52% |
| Compostela Valley | 42% | 58% |
| Davao Del Norte | 63% | 37% |
| Davao Del Sur (excluding Davao City) | 40% | 60% |
| Davao Oriental | 35% | 65% |
| Davao Occidental | 20% | 80% |
| Davao City | 86% | 14% |

| Davao Occidental | 316,342 | 2,163.45 | 146 |
|------------------|-----------|----------|-----|
| Davao City | 1,632,991 | 2,443.61 | 670 |

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

9

80°0.000'W

160°0.000'W

}-___

80°0.000'E

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. 0 10 20 30 40 km WGS 1984 - UTM Zone 51 N

10

0°0.000′

Climate PAGASA. 2015 Data

10

60°0,000/N



Type II - no dry season with a very pronounced maximum rain period from December to February. There is not a single dry month. Minimum monthly rainfall occurs during the period from March to May.
Type III - no very pronounced maximum rain period with a dry season lasting only from one to three months, either during the period from March to May. 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.

0°0.000′

000.000

Climate

Davao Region has a Type IV climate — it has no definite dry and wet seasons, and rainfall is evenly distributed throughout the year.

The highest average temperature (29°C) is usually experienced in April. Generally, January is the month with the lowest average temperature.

Disaster Risk

The region is prone to geological and climatological hazards. Davao del Norte and Davao del Sur, in particular, are among the country's 20 provinces considered most vulnerable to climate-related hazards.

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

Climate Change and Hydrological Hazards

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

Global climate models, which were used to run two possible scenarios (A1B and A2), were downscaled to calculate projected Philippine rainfall. Studies show a general increase in rainfall for 2020, 2050 and beyond. The models, however, show higher variability in rainfall with increased peak rainfall during the wet season and longer dry conditions during the dry season. (Rainfall variability means changes in water supply dynamics spatially and year-to-year.) Water supply is highly vulnerable to changes in river flows and the rate of replenishment of groundwater resources. Lower river flows will result in water shortages. More intense rainfall events may not necessarily mean more groundwater recharge compared to rain that is more evenly spread throughout the year. Lower than average rainfall or longer pronounced dry days may affect soil porosity and vegetation, which could lead to reduced soil infiltration rates. This means less groundwater recharge. Given this scenario, more water stress will likely be experienced by 2020 and 2050.

The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events (temperatures higher than 35°C, days when rainfall is more than 300 mm, and rainy days that outnumber dry days) in Region XI based on the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) downscaled climate projections are shown in Tables 3 and 4. Four seasons are provided: December, January and February (DJF); March, April and May (MAM); June, July and August (JJA); and September, October and November (SON). The projections were added to the observed values in the past 30-year baseline (1971-2000).

| Seasonal Temperature Increase | (| Observed (1971- | Baseline 2000) | e | Change in 2020 (2006-2035) | | | | | Change in 2050 (2036-2065) | | | |
|----------------------------------|-------|---------------------|-------------------|-------|-------------------------------|-------|------|------|-------------------------------|-------------------------------|-------|------|--|
| (in °C) | DJF | MAM | JJA | SON | DJF | MAM | JJA | SON | DJF | MAM | JJA | SON | |
| Compostela Valley | 26.7 | 27.8 | 27.6 | 27.6 | 0.9 | 1.1 | 1.2 | 1.1 | 1.9 | 2.3 | 2.4 | 2.1 | |
| Davao Del Norte | 26.7 | 27.8 | 27.4 | 27.4 | 0.9 | 1.1 | 1.2 | 1.1 | 1.9 | 2.3 | 2.5 | 2.1 | |
| Davao Del Sur | 26.9 | 27.8 | 26.9 | 27.1 | 0.9 | 1.1 | 1.1 | 1.0 | 1.9 | 2.2 | 2.3 | 2.0 | |
| Davao Oriental | 26.8 | 27.8 | 27.5 | 27.6 | 0.9 | 1.0 | 1.1 | 1.0 | 1.8 | 2.0 | 2.4 | 2.0 | |
| Seasonal Rainfall Change | C | Dbserved) (1971- | Baseline 2000) | ; | Change in 2020 (2006-2035) | | | | Change in 2050 (2036-2065) | | | | |
| (111 70) | DJF | MAM | JJA | SON | DJF | MAM | JJA | SON | DJF | MAM | JJA | SON | |
| Compostela Valley | 748.1 | 559.0 | 546.7 | 586.6 | 10.2 | -11.3 | -2.7 | 0.3 | 6.6 | -21.9 | -21.9 | 0.0 | |
| Davao Del Norte | 637.0 | 496.5 | 535.6 | 556.2 | 9.2 | -12.5 | -3.6 | -1.5 | 1.1 | -22.2 | -7.9 | -2.2 | |
| Davao Del Sur | 288.1 | 347.1 | 494.1 | 442.3 | 18.1 | -9.8 | -7.8 | -2.4 | 15.2 | -12.0 | -12.6 | -4.5 | |
| | | | | | | | | | | | | | |

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

| Province | Station | No. of [| Days w/ T _{max} | _x > 35 [°] C | > 35°C No. of Dry Days No. of Days w/ Rainfall > 300 mm | | | | | |
|---------------|---------|----------|--------------------------|----------------------------------|--|------|------|-----|------|------|
| | | OBS | 2020 | 2050 | OBS | 2020 | 2050 | OBS | 2020 | 2050 |
| Davao Del Sur | Davao | 109 | 2981 | 5373 | 7930 | 4789 | 5368 | 0 | 0 | 0 |

⁶ National Irrigation Administration

80°0.000′W

160°0.000'W



80°0.000′E









Access to Safe Drinking Water

PSA, 2015 Census

0°0.000′

57

+

WSS Sector Status

Access to Safe Water

Approximately 91.44% of Davao Region's population had access to safe water sources in 2015.⁷

This figure translates to approximately 1,057,000. Approximately 40% of the population has Level III service connection at home, and 15% has Level II connection which the households share with the community. Access to Level I service comprises 37%.

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

The region's access to safe water is above the national average of about 88%, with a discrepancy of about 3.7%. In terms of access per level of service, Davao Region's numbers do not differ significantly from the national percentage, having variances not greater than 10%. Level III access, in particular, is lower as compared to the national figure of 44.1%.

Table 5: National and Regional Access to Water Supply⁸

| Level of Service | National | Davao Region |
|--------------------------|----------|--------------|
| Level III | 44.1% | 39.9% |
| Level II | 11.2% | 14.6% |
| Level I (Safe Sources) | 32.4% | 36.9% |
| Subtotal (Safe Sources) | 87.7% | 91.4% |
| Level I (Unsafe Sources) | 12.3% | 8.6% |
| Total | 100.0% | 100.0% |

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



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

Table 6: Access to Water Supply per Province/HUC⁹

| Region/Province/City | Access to Safe Water Supply |
|----------------------|-----------------------------|
| Davao Region | 86.1% |
| Compostela Valley | 92.0% |
| Davao Del Norte | 56.5% |
| Davao Del Sur | 94.0% |
| Davao Oriental | 93.0% |
| Davao Occidental | 69.1% |
| Davao City | 99.8% |



Drinking Water

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

Approximately 91.44% of Davao Region's population drank water from sources considered "improved" and "safe". About 10.24% of the regional population drank bottled water.

Among the provinces, Davao Occidental had low access to safe drinking water at around 80% owing to its low population density.

In contrast, households in coastal areas have more access to safe drinking water than those living inland.

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

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

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

15

Figure 4: Main Sources of Water Supply, 2015

80°0.000'W



16

80°0.000'E

0°0.000′

40 km

Access to Sanitation

The fast-paced growth of Davao Region, as a matter of course, contributed to the increase in demand for sanitation services.

Approximately 70% of the region's population has access to improved sanitation.

The 2015 FIES has reported that Region XI posted figures slightly above the national average in terms of improved sanitation. The region slightly trails behind in regard to basic sanitation and is almost on a par in terms of open defecation. (The open defecation rate is a proxy indicator for the lack of access to toilet facilities.) (see Table 7).

Table 7: National and Regional Access to Sanitation¹⁰

| Sanitation Coverage | National | Davao Region |
|-----------------------|----------|--------------|
| Improved Sanitation | 73.77% | 69.93% |
| Basic Sanitation | 19.96% | 26.94% |
| Unimproved Sanitation | 2.04% | 1.80% |
| Open Defecation | 4.23% | 1.33% |
| Total | 100.00% | 100.00% |

Davao del Norte registers the highest access to basic sanitation at 91.11% and represents 20.77% of the region's total population. Davao del Sur and Compostela Valley (both with the largest populations) had the lowest access at 81.54% and 77.28%, respectively.

Table 8: Access to Sanitation Facilities per Province/HUC¹¹

| Region/Province/ City | HHs with Sanitary Toilets | HHs with Complete Basic Sanitation Facilities |
|--------------------------|------------------------------|---|
| Davao Region | 85.90% | 65.07% |
| Compostela Valley | 81.54% | 43.26% |
| Davao Del Norte | 91.11% | 67.10% |
| Davao Del Sur | 77.28% | 30.91% |
| Davao Oriental | 84.88% | 71.04% |
| Davao Occidental | * | * |
| Davao City | 88.93% | 88.18% |

*No data





Figure 6: Percentage of HHs with Access to Sanitation Facilities

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

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

Data on access to sanitation at the provincial level in Davao 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, on the other hand, shows the location of the only septage treatment plant (STP) in the region



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

Figure 7: Existing Septage Treatment Plant

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

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





sin

Water Resources

Davao Region ranks 6th among all the administrative regions with the most water resources potential.

The region's water resources potential is estimated at 11,118 million cubic meters (MCM)/year, accounting for 7.6% of the country's total.

The water resources potential of an area is divided into groundwater and surface water. Groundwater in the region is estimated at 1,931 MCM/year while surface water is estimated at 9,187 MCM/year. Annual rainfall in the region averages 1,882 mm/year.

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

Davao Region straddles only WRR 11.

Surface Water

Davao Region is endowed with abundant water resources, particularly freshwater bodies. The region is home to the Davao River Basin and Tagum-Libuganon River Basin, two of the 18 major river basins in the country. Some rivers covered by the Buayan-Malungon River Basin and Agusan River Basin also traverse some parts of Davao Region.

The region draws much of its cities' water supply from surface water. The Davao City Water District (WD) and Tagum WD tap Tamugan River and Hijo River, respectively, for their bulk water supply projects.

Davao River Basin

Davao River is the third largest river in Mindanao (next to Mindanao River and Agusan River). It is 86 kilometers long and drains an area of about 175,960 hectares.

The Davao River Basin (DRB) is <u>shar</u>ed by Bukidnon (San Fernando, Quezon and Kitaotao), Davao del Norte (Talaingod) and Davao City (as shown on the map on the left). Davao City makes up 67% of the total area of DRB.

50 of DRB's 78 sub-watersheds are also found in the region.

In view of its enormity, DRB has been eyed as a potential resource to ensure Davao City's adequate water supply. It is included among the 18 major river basins in the country that have been prioritized for master planning.

Tagum-Libuganon River Basin

Tagum-Libuganon River Basin (TLRB) is the third largest river basin in Mindanao with an estimated catchment area of 319,500 hectares situated in the northern part of Davao Region.

TLRB covers three provinces namely, Agusan del Sur in Region XIII, Compostela Valley, and Davao del Norte (and a portion of Davao City).

Buayan-Malungon River Basin

The Buayan-Malungon River Basin (BMRB) is considered an allied subbasin. It is located in the southern and central parts of Mindanao and has an area of approximately 150,509.79 hectares.

Buayan River and Malungon River are its main tributaries. The former, which originates from Mt. Matutum on the western side, is the river basin's main water body.

Agusan River Basin

The Agusan River Basin (ARB) is the third largest river basin in the Philippines with a drainage area of 11,936 km². It is located in the northeastern part of Mindanao.

The Agusan River flows mainly through three provinces and one city: Compostela Valley, Agusan del Sur, Agusan del Norte; and Butuan City (in Region XIII).



¹² JICA Master Plan on Water Resources Management in the Philippines, 1998; NWRB; PA-GASA rainfall data; FAO

60°0,000/N

20



Groundwater Availability MGB +

Jose Abad

Aquifers with High Potential Recharge Fairly to Less Extensive and Productive Aquifers with Low to Moderate, Potential Recharge Local and Less Productive Aquifers

Rocks with Limited Potential, Low to Moderate Permeability

Rocks with Limited Potential, Low to Moderated Permeability

Rocks without Any Known Significant, Groundwater Obtainable through Drilled Wells

Lake





80°0.000'E

0°0.000′

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

Groundwater

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

The extent of groundwater availability in any given area also depends on its surface area and the amount of precipitation it receives. Furthermore, it is tied to groundwater storage based on the type and class of aquifer present in a study area (see Table 9).

Aside from some parts of Compostela Valley and Davao Oriental that are underlain by the non-aquifer class, the mainland of Davao Region is predominantly underlain by the minor aquifer class (specifically the local and less productive kind). On the other hand, the region's island provinces are underlain by fairly extensive and productive aquifer areas.

Water Use

Water use in the region was estimated at 6,137.66 MCM annually based on awarded water permits as of 2017. Approximately 59.20% (or 2,290.78 MCM) is allocated for power generation and categorized under nonconsumptive use. The remaining volume (3,846.88 MCM) is allocated for consumptive use (see Figure 9).

The irrigation sector consumes the largest volume of water among all sectors with a 86.2% allocation. The domestic sector consumes 6.7% while the industrial sector consumes only 6.1%.



Water Availability, Water Stress, and Water Scarcity

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

Water availability per capita was computed by comparing the region and provinces' potential against the 2015 population (as shown in Table 10).

Table 10: Water Availability per Province

| Region/Province | Water Availability (m ³ /capita/year), 2015 |
|-------------------|---|
| Compostela Valley | 3,154.59 |
| Davao Del Norte | 1,747.84 |
| Davao Del Sur | 1,549.19 |
| Davao Occidental | 3,545.01 |
| Davao Oriental | 4,272.89 |
| Davao Region | 2,853.90 |

Davao Region has a per capita water availability of around 2,853.90 m³/year.

Figure 10 presents the computed figures to highlight the provinces' level of water availability.



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

Demand

Population Projection

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

Employing PSA's 2010-based population projections which were adjusted to conform with the actual 2015 population, the region's population is projected to reach more than 7,690,000 by 2045.

Water Supply and Demand

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

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

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

By 2022, 2030, and 2040, the total water demand of the region would have reached 309.69 MCM/year, 361.26 MCM/year, and 433.96 MCM/year, respectively.

Water Demand vs. Water Resources Potential

The water demand of the industrial, business and domestic sectors in Davao 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 (433.96 MCM/ year) to the water resources potential of the region (11,118 MCM/year), the availability of water far exceeds the projected water demand of the region up to 2045.

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

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

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





Figure 12: Projected Water Demand







80°0.000'E





0°0.000′

5

0°0.000′

WSS Infrastructure

Water service providers (WSPs) of various management types serve around 34% of Davao Region.¹⁵

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

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

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

Water Service Providers

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

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

Water Districts

Of the 25 WDs serving Davao Region, 19 were operational and 6 nonoperational as of 2015. The total population covered by these WDs is about 3.27 million or roughly 66.78% of the region's population. Of this, only 44% receive water service.

Davao Del Sur has the highest coverage at 57.8%. Davao Occidental is not covered by any WD.

LGU-Run Water Utilities

The region has 138 LGU-run water utilities covering 13 areas with 133,945 users or 2.74% of the total population.

BWSA

The region has 18 BWSA utilities covering 4 areas with about 20,470 users or 0.42% of the total population.

RWSA

The region has 4 RWSA utilities covering only one service area and supplying water to around 3,355 users.

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

Table 11: Water Service Providers per Province

| Defien/Drewinee | No. of I Cillo | | | Sonvice Area | Population Served | |
|-------------------|----------------|----------------|-----|----------------|-------------------|--------|
| Relion/Province | NO. OI LGUS | | 22 | Service Area - | Total | % |
| | | WDs | 6 | 169,708 | 13,010 | 7.67% |
| | | LGU-led | 27 | | 45,295 | 6.15% |
| Compostela Valley | 11 | BWSA | 10 | | 16,030 | 2.18% |
| | | RWSA | 0 | | 0 | 0.00% |
| | 1 | Private/Others | 0 | | 0 | 0.00% |
| | | Subtotal | 43 | 736,107 | 74,335 | 10.10% |
| | | WDs | 8 | 843,449 | 239,186 | 28.36% |
| | | LGU-led | 1 | | 10,000 | 0.98% |
| Davao del Norte | 11 | BWSA | 0 | | 0 | 0.00% |
| | | RWSA | 0 | | 0 | 0.00% |
| | | Private/Others | 0 | | 0 | 0.00% |
| | | Subtotal | 9 | 1,016,332 | 249,186 | 24.52% |
| | | WDs | 6 | 1965030 | 1136060 | 57.81% |
| | | LGU-led | 18 | | 18,635 | 0.82% |
| Davao del Sur | 11 | BWSA | 8 | | 4,440 | 0.20% |
| | | RWSA | 0 | | 0 | 0.00% |
| | | Private/Others | 0 | | 0 | 0.00% |
| | | Subtotal | 32 | 2,265,579 | 1,159,135 | 51.16% |
| | | WDs | 1 | 0 | 0 | 0.00% |
| | 5 | LGU-led | 92 | | 60,015 | 18.97% |
| Davao Occidental | | BWSA | 0 | | 0 | 0.00% |
| | | RWSA | 0 | | 0 | 0.00% |
| | | Private/Others | 0 | | 0 | 0.00% |
| | | Subtotal | 93 | 316,342 | 60,015 | 18.97% |
| | | WDs | 4 | 289,392 | 55,672 | 19.24% |
| | 11 | LGU-led | 0 | | 0 | 0.00% |
| Davao Oriental | | BWSA | 0 | | 0 | 0.00% |
| | | RWSA | 4 | | 3,355 | 0.60% |
| | | Private/Others | 140 | | 55,525 | 9.93% |
| | | Subtotal | 148 | 558,958 | 114,552 | 20.49% |
| | | WDs | 25 | 3,267,579 | 1,443,928 | 44.19% |
| Davao Region | 49 | LGU-led | 138 | | 133,945 | 2.74% |
| | | BWSA | 18 | | 20,470 | 0.42% |
| | | RWSA | 4 | | 3,355 | 0.07% |
| | | Private/Others | 140 | | 55,525 | 1 13% |
| | | Grand Total | 325 | 4,893,318 | 1,657,223 | 33.87% |

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

25

Sanitation

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

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

Open Defecation

40°0.000'W

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

Davao Region is almost a third of the national rate in terms of open defecation. Approximately 65,081 people were reported practicing open defecation in 2015. This figure is attributed to the large number of informal settlers along the coastlines and waterless areas which do not have access to sanitation facilities.

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

Wastewater and Domestic **Biological Oxygen Demand**

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

The map below shows the current BOD in Davao Region.



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

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



Figure 14: Categories of Wastewater

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

The wastewater¹⁸ produced by each province is directly proportional to its water demand as well as its population. It is assumed that wastewater generated is 80% of the total water demand. The current wastewater in the region is shown in Figure 15.

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



60°0.000'N

26







Figure 13: Biological Oxygen Demand, 2015

Figure 15: Wastewater Produced, 2015

40°0.000'W

120°0.000'W





160°0.000'E

~0.000.0°

20

0°0.000′









160°0.000'E



With Water Quality Problem

Areas with Water Quality Proplems

Water Districts' Water Quality Monitoring Data, LWUA, 2015

+

Jose Aba

.

0°0.000′

+

30

80°0.000′W

+

Water Quality

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

As discussed earlier in "Water Resources", Davao Region has four major river basins. Table 12 shows a list of tributary rivers of the river basins with their corresponding classifications.

Table 12: Classification of Tributary Rivers in Region XI

| River | | Classification |
|-------------------|-----------------|----------------|
| Davas Divar Basin | Tamugan | А |
| | Davao | A/B |
| | Libuganon | С |
| Tagum-Libuganon | Saug | В |
| | Tagum | С |
| Buva-Malungon | Buayan | В |
| Buya-Malungon | Maribulan | С |
| | Bugabos | С |
| | Gibong | A |
| | Adgaon | А |
| | Simulao | А |
| | Umayam | D |
| | Ihaoan | D |
| | Magallanes/Baug | C/D |
| Agusan | Taguibo | A/C/D |
| | Ojot | А |
| | Wawa/ Andanon | A/C |
| | Solibao | А |
| | Libang | D |
| | Maasam | D |
| | Kasilan | D |
| | Naboc | С |

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

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

 Table 13: Main Industries and their Impacts on Water Quality of the River Basins

| Source/Cause of Decline in Water Quality | Impact/Potential Waste Generated | | | |
|---|--|--|--|--|
| Industrial | | | | |
| Gold rush area in Diwalwal mining areas in the eastern hills of | Increased mercury and cyanide levels resulting from the processin | | | |
| Maco, Pantukan, and New Bataan COSTMA | of gold by small-scale and artisanal miners | | | |
| Vegetable oil mills in Trento and Rosario near Butuan | Increased BOD/oil and grease caused by filtrates and byproducts of | | | |
| | oil refining | | | |
| Sawmills in the upstream part of Butuan | Generation of organic wastes and chemical effluents | | | |
| Wood processing plants in Talacogon Plywood and match fac- | Dispersal of ash and water pollution caused by the burning of | | | |
| tories in Magallanes | wastes | | | |
| Agı | icultural | | | |
| Fertilizer runoff | Increase in nitrate and phosphate levels from non-point sources | | | |
| Pesticide runoff | Increase in pesticide levels from non-point sources | | | |
| Aqu | laculture | | | |
| Chemicals that deoxygenate/kill predator species | Decreased dissolved oxygen (DO) | | | |
| Nitrate-based feed and fish waste causing algal bloom | Increased nitrate | | | |
| Domesti | Domestic Wastewater | | | |
| Absence of a domestic wastewater collection system | Increased BOD | | | |
| Absence of septic tanks | Increased total coliform and fecal coliform | | | |
| Open defecation | Increased incidence of waterborne diseases | | | |
| Solid wa | aste pollution | | | |
| | Limited capacity and improper management of controlled | | | |
| Open/controlled dumpsite | dumpsite forcing households/business establishments to dump | | | |
| | their waste into rivers | | | |
| Sedimentation | | | | |
| River bank erosion/siltation with high velocity rainfall runoff | Increased total suspended solids (TSS) | | | |
| | | | | |

Waterborne Diseases

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

Approximately 125 cases of schistosomiasis, and 184 cases of typhoid and paratyphoid were reported in Davao Region in 2015, according to a Field Health Services Information System (FHSIS) report in 2015.

As of 2017, the Department of the Interior and Local Government (DILG) reported 9 waterless²⁰ municipalities in Davao Region (see Figure 16).

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



80°0.000'N

000.000

¹⁹ World Health Organization
 ²⁰ Municipalities with less than 50% service

coverage, National Anti-Poverty Commission, 2010

31

WSS Sector Gaps

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

Issues, Constraints and Challenges

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

The planning workshop attended by provincial officials in Region XI and representatives of regional line agencies identified certain "hindering and facilitating factors" and classified specific issues, constraints, and challenges confronting the WSS sector in five areas of concern: (a) leadership and politics, (b) capacity building, (c) policy and institutional development, (d) funding, and (e) matters concerning cultural traditions, behaviors and attitudes.

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."

Among the many obstacles hampering the development of the water supply and sanitation sector in Region 11, the most problematic is the lack of private sector interest to come to the rescue. Serious money from serious investors are slow in coming because the paths to profit generation are severely limited.

Except for Davao City and a small number of first class cities and municipalities, the rest of the region's 43 municipalities can hardly meet the profitability yardsticks of investors. Among many other things, potential financiers need a welcoming environment, businessfriendly governance system and policies and, most of all, a sufficient number of households willing and able to pay fair and reasonable water tariffs.

LGUs determined to change the unbearable status quo must thus address these concerns and other well-thought -out goals in the form of a WSS sector master development plan.

Considering what is at stake, LCEs are encouraged to entrust the responsibility of crafting said development plan to technically capable people who are bound by a shared belief that their deliverable should have what it takes to attract investors, spur economic growth and rationalize institutional arrangements. The all-embracing objective is to help build communities with sustainable access to water and sanitation services.

Service Provision

In majority of Region XI's municipalities, access to WSS services (a basic human necessity) remains somewhat of a luxury. An unhealthy mix of budgetary constraints, technical incapacity, weak political will and lack of collaboration on cross-boundary issues inevitably result in intermittent and unreliable water and sanitation service delivery. And it does not help that a great majority of local households resist new ideas and development projects that require payment for services rendered.

If open defecation remains a widespread reality, it is because LGUs do not have the means to distribute toilet bowls to poor families. If water treatment facilities are scarce and septage facilities are almost nonexistent, it is because LGUs cannot afford them. If private investors are hesitant to secure contracts for water concessions, it is because the region's experience in the management and operation of small-scale water distribution system, especially those initiated by LGUs, had very little to show in terms of sustainability.

Facilitating measures include securing loans from financial institutions and tapping grants from donor agencies like JICA and AusAid.

Regulation

The failure of concerned government agencies to enforce existing water and sanitation laws and other pertinent regulations is another prominent issue. The criticisms ranged from loose, fragmented and inefficient organizational structure to the glaring absence of a regulatory and monitoring body, from limited budget and shorthanded enforcement units to misplaced budgetsetting priorities.

While it is true that a modicum of compliance with monitoring and evaluation standards exists in Davao City and other urbanized communities, the same cannot be said in less developed areas where long-standing challenges in the enforcement of existing regulations persist due to chronic budgetary deficiency, limited technical capacity, policy differences and disorganized implementation mechanisms.

Table 14 summarizes the hindering and facilitating factors impacting the WSS sector in Davao Region.

The final document should contain clearly defined, highlevel commitment to support private sector initiatives in the form of enabling policies, ordinances and counterpart government efforts aimed at protecting water resources from climate change and from indiscriminate man-made practices such as deforestation, pollution, groundwater overextraction, and harmful agricultural methods.



30°0.000'E



+

+

Table 14: Hindering and Facilitating Factors

| Areas | Hindering Factors | Facilitating Factors | |
|---|--|--|--|
| | Lack of political will among LCEs to implement policies | Supportive and committed leadership | |
| | Lack of sectoral collaboration | Participative approach | |
| Leadership and | Lack of funds among small-scale water service providers | Strong commitment to enforcing policies | |
| Politics | Misallocation of budget | Prioritization of water supply and sanitation | |
| _ | Lack of cooperation among leaders | | |
| | Lack of knowledge of various sanitation approaches among stakeholders; lack of technical expertise | Strong support and guidance from government agencies | |
| | Limited capacity building | Capacity development re: operational research | |
| - | | Training programs and workshops | |
| Capacity Building | Outmoded facilities in need of immediate upgrade/ rehabilitation; skills training of workers | Support from barangays, LGUs and stakeholders | |
| | + | Competent and qualified personnel | |
| | Not responsive in existing organization structure | Amendment of plans/policies re: environment protection, climate change adaptation/mitigation | |
| | Absence of a regulatory and monitoring agency for water and sanitation | Strict enforcement of environmental regulations and policies | |
| Policy and | Exclusion of national policies from the local code | Institutional fund support | |
| Development | | Establishing linkages with funding/donor agencies such as JICA, AusAID, etc. | |
| | Setting of a socially exclusive water policy re: upland ecosystem providers | Institutionalized LGU and NGA partnership | |
| | | Strict compliance with rules and regulations | |
| Planning and Development | Limited budget allocation for water supply and sanitation projects | Establishing linkages with financing institutions re: loan grants | |
| Matters Concerning Cultural Traditions, – Behaviors and Attitudes | Cultural groups' resistance to new ideas | Engagement of community members re: local affairs concerning WSS | |
| | | Respect for indigenous people's culture | |



80°0.000′W

+

+

.60°0.000′W

+

+

"An environmentally conscious and resilient Davao Region with universal and equitable access to safe, affordable and sustainable water supply and sanitation services that achieves balance between the environment, sound economics and socio-cultural development and contributes to the realization of AmBisyon Natin 2040 for a 'matatag, maginhawa at panatag na buhay'."

The Davao Region WSS vision was crafted by the visioning group with the goal of achieving universal and equitable access to safe and affordable water supply and sanitation by 2030.

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

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

Table 15: Strategies in Achieving Increased Access to Potable Water

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

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

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

A more detailed discussion with respect to achieving increased access to potable water considering the various segments comprising the water utilities (categorized as undeveloped/underdeveloped, developing and developed) is shown in Table 15..

| Segment | Target | Strategic Statement |
|---|--|---|
| Undeveloped/Underdev | eloped | 10 |
| 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 oper- ate commercially |
| 5-27 | | Upgrading Level II systems to Level III |
| | | Creation of a body that provides technical and financial assistance to barangay water associations and rural water-works 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 expan- sion works |
| $\langle \rangle$ | | 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 allow- ing them to operate commercially | Allowing the commercialization of water utility operations; encouraging LGUs to establish WDs or similar local gov- ernment corporations or economic enterprises. |
| (BOATAGE) | 100% recovery of O&M cost | entitient corporations of economic enterprises |

Developed

- 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







Watershed Management Plan Support economic activities of Indigenous Peoples Formulate a comprehensive water resource development plan Develop sustainable water supply system Construction of Water Supply Infrastructures Capacity Development Accreditation of water quality laboratories

Sustainability of water supply. Constitution of the Provincial Water Resources Board (PWRB) Formulate Local Water Supply and Sanitation Plan (LWSSP)

Pursue convergence initiative with NGAs

Conduct BAWASA inventory;

Financial Allocation

Implement advance/modern facilities;

PROGRAMS AND PROJECTS



Figure 17: Davao Region WSS Strategic Framework



80°0.000′W

160°0.000'W

Access Targets for Water Supply and Sanitation

80°0.000'E

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

Their targets were based on current and baseline data (i.e., population growth rates, water resources availability, topographical and geographical setting, etc.), the status quo (funding constraints, political and cultural challenges, etc.), and the realistic attainability of set targets.

Davao Region strives to achieve 97.7% access to safe water by 2022 and universal access by 99.4%. Universal access by 2030 means more than 1,506,570 HHs will benefit.

In addition, improved access to sanitation is set at 87.1% by 2022 and universal access by 2030.

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





457

72 124

173

239

1000

800

600

400

355

57

110

132

Figure 19: Targeted Households with Access to Sanitation

93

158

205

276

101

175

231

294







Davao Oriental

Davao del Norte

Compostela Valley

Davao del Sur (excluding Davao City)

+

+

Water Supply Targets

| | COMPOSTI | ELA VALLEY | |
|-------------|----------|------------|---------|
| Category | 2022 | 2030 | 2040 |
| Level III | 35.00% | 45.00% | 100.00% |
| Level II | 30.00% | 50.00% | 0.00% |
| Level I | 35.00% | 5.00% | 0.00% |
| Safe Access | 100.00% | 100.00% | 100.00% |
| No Access | 0.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO D | EL NORTE | |
| Category | 2022 | 2030 | 2040 |
| Level III | 50.00% | 60.00% | 100.00% |
| Level II | 25.00% | 28.00% | 0.00% |
| Level I | 20.00% | 10.00% | 0.00% |
| Safe Access | 95.00% | 98.00% | 100.00% |
| No Access | 5.00% | 2.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO | DEL SUR | |
| Category | 2022 | 2030 | 2040 |
| Level III | 60.00% | 80.00% | 100.00% |
| Level II | 19.00% | 15.00% | 0.00% |
| Level I | 17.00% | 5.00% | 0.00% |
| Safe Access | 96.00% | 100.00% | 100.00% |
| No Access | 4.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO OC | CIDENTAL | |
| Category | 2022 | 2030 | 2040 |
| Level III | 30.00% | 50.00% | 100.00% |
| Level II | 50.00% | 40.00% | 0.00% |
| Level I | 15.00% | 10.00% | 0.00% |
| Safe Access | 95.00% | 100.00% | 100.00% |
| No Access | 5.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO C | RIENTAL | |
| Category | 2022 | 2030 | 2040 |
| Level III | 36.00% | 50.00% | 100.00% |
| Level II | 30.00% | 32.00% | 0.00% |
| Level I | 30.00% | 16.00% | 0.00% |
| Safe Access | 96.00% | 98.00% | 100.00% |
| No Access | 4.00% | 2.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVA | O CITY | |
| Category | 2022 | 2030 | 2040 |
| Level III | 69.00% | 74.00% | 100.00% |
| Level II | 23.00% | 20.00% | 0.00% |
| Level I | 8.00% | 6.00% | 0.00% |
| Safe Access | 100.00% | 100.00% | 100.00% |
| No Access | 0.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO | REGION | |
| Category | 2022 | 2030 | 2040 |
| Level III | 52.90% | 64.00% | 100.00% |
| Level II | 26.40% | 27.60% | 0.00% |
| Level I | 18.40% | 7.80% | 0.00% |
| Safe Access | 97.70% | 99.40% | 100.00% |
| No Access | 2.30% | 0.60% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |

Sanitation Targets

| CO | MPOSTELA | VALLEY | |
|-----------------------------|------------|---------|---------|
| Category | 2022 | 2030 | 2040 |
| Improved | 97.00% | 100.00% | 100.00% |
| Basic | 3.00% | 0.00% | 0.00% |
| Shared/Communal/ Limited | 0.00% | 0.00% | 0.00% |
| Open Defecation | 0.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| D | AVAO DEL N | IORTE | |
| Category | 2022 | 2030 | 2040 |
| Improved | 97.00% | 100.00% | 100.00% |
| Basic | 0.00% | 0.00% | 0.00% |
| Shared/Communal/ Limited | 1.00% | 0.00% | 0.00% |
| Open Defecation | 2.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO DEL | SUR | |
| Category | 2022 | 2030 | 2040 |
| Improved | 97.00% | 100.00% | 100.00% |
| Basic | 1.00% | 0.00% | 0.00% |
| Shared/Communal/ Limited | 2.00% | 0.00% | 0.00% |
| Open Defecation | 0.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| DA | VAO OCCID | ENTAL | |
| Category | 2022 | 2030 | 2040 |
| Improved | 97.00% | 100.00% | 100.00% |
| Basic | 3.00% | 0.00% | 0.00% |
| Shared/Communal/ Limited | 0.00% | 0.00% | 0.00% |
| Open Defecation | 0.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| Γ | DAVAO ORIE | NTAL | |
| Category | 2022 | 2030 | 2040 |
| Improved | 97.00% | 100.00% | 100.00% |
| Basic | 0.00% | 0.00% | 0.00% |
| Shared/Communal/ Limited | 2.00% | 0.00% | 0.00% |
| Open Defecation | 1.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO CI | TY | |
| Category | 2022 | 2030 | 2040 |
| Improved | 97.00% | 100.00% | 100.00% |
| Basic | 3.00% | 0.00% | 0.00% |
| Shared/Communal/ Limited | 0.00% | 0.00% | 0.00% |
| Open Defecation | 0.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |
| | DAVAO REG | SION | |
| Category | 2022 | 2030 | 2040 |
| Improved | 87.10% | 100.00% | 100.00% |
| Basic | 5.70% | 0.00% | 0.00% |
| Shared/Communal/ Limited | 7.20% | 0.00% | 0.00% |
| Open Defecation | 0.00% | 0.00% | 0.00% |
| Total | 100.00% | 100.00% | 100.00% |

37



+



+

Strategic Interventions

After the regional planning and consultation workshop, a working document detailing specific strategic interventions to improve water supply and sanitation access in Region XI was formulated. The participants deliberated on these proposed interventions to make

them adaptable to actual local conditions. (These are discussed more thoroughly in the National Master Plan and may be adopted accordingly at the local level.)

Tables 16 and 17 show the specific strategic interventions for water supply and sanitation, respectively.

| Access to Safe Water | Planning and Development | Service Provision | Regulation | Promotion |
|---|--|--|---|---|
| 95% Access to Safe Water in 2022 Universal Access in 2030 | Planning, program or project design Establishing labs and water quality testing centers Lobbying for the Regional WSS Masterplan | M&E expansion Rehabilitation/Non-revenue water (NRW) reduction maintained at 20% of total production Integration/ Amalgamation Automation Residuals management Mitigation Water potability maintained at all times Providing 24/7 water supply service Achieving 100% coverage Residuals management | Water resources protection Arbitration Environmental and social safeguards Compliance with PNSDW 2017 Close monitoring of Joint Agreement Compliance training from DOH Resource studies | Willingness to connect and pay Demand creation |
| able 17: Proposed | Strategic interventions to | r Sanitation | 5 | |

| L. | 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 | <u>Promotions</u> Social Preparation Advocacy Demand Creation Behavior Change |
|----|--|--|---|---|---|
| | High Access Areas with 60% to 100% Improved Sanitation Coverage | Local Sustainable Sanitation Plan (LSSP) should be incorporated into the WSS Sector Plan, local development plan (LDP), annual investment program (AIP), and local health plan. A sewerage system program should be developed to provide service in the urban core coordinating with those in charge of the septage management program; project urban sprawl A National Sewerage and Septage Management Program (NSSMP) subsidy grant for sewerage and septage management programs (SMP) should be in place. | 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 | 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. |



- 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.

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

Physical Interventions

To meet the targets for access and coverage as well as the normative content of water (service standards), capital investments are necessary. The details of these investments in 2022 and 2030 are listed in Table 18.

Table 18: Capital Investments Required to Meet Water Supply Targets

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

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

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

Nonphysical Interventions

To support the CapEx programs and ensure the efficient operation of the newly constructed facilities, institutional and regulatory reforms are to be undertaken (as shown in Table 19).

Table 19: Institutional and Regulatory Reforms Required to Achieve Water Supply and Sanitation Goals

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



80°0.000'W

L60°0.000'W







Pending Projects

40

80°0.000'E

0°0.000′

40 km



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).

Davao Region requires capital investments for infrastructure development of about PhP12.7 billion and PhP12.8 billion to achieve 2022 and 2030 targets, respectively. Unit development costs employed to arrive at these sums are estimated at PhP32,500 per HH for Level III, PhP19,100 for Level II, and PhP8,600 for Level I.

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

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

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

Aside from the direct costs, indirect costs were considered in estimating the total investment requirements. These items include project preparation activities (which may affect budget considerations) before actual construction work begins. Items considered and percentage values used in relation to the total direct costs computed are shown in Table 20. 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 21 shows a summary of the total investment requirements of the region. (The detailed methodology of how the regional costs for Davao Region were derived is referenced in Annex D of the main volume of the Philippine WSS Master Plan.)

Nonphysical Investments

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

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

Proposed interventions include the following:

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

The map on the left shows the two Davao Region ^I municipalities where priority WD projects have been approved and those pending approval for LWUA's financial assistance (FA). A project of Samal WD in the Island Garden City has been approved, while another WD project in Carmen is pending approval, as of this writing.

80°0.000'N

Table 20: Indirect Costs Employed²¹

| 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 21: Total Investment Costs for Water Supply Sector

| Province/City | Total Investment Cost (in PhP Million) 2022 | Total Investment Cost (in PhP Million) 2030 | | |
|-------------------|---|---|--|--|
| Compostela Valley | 1,144 | 2,172 | | |
| Davao Del Norte | 3,559 | 1,912 | | |
| Davao Del Sur | 1,363 | 2,329 | | |
| Davao Occidental | 1,127 | 882 | | |
| Davao Oriental | 1,321 | 1,359 | | |
| Davao City | 4,216 | 4,209 | | |
| Total | 12,729 | 12,863 | | |
| | 8090 000/\// | | | |

²¹ Based on industry standards

160°0.000'W

41

20°0,000'S

N,000'0-08

,000°0₀0



80°0.000'E

42

80°0.000'E

0°0.000′

0°0.000′

Physical Interventions

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

Davao Region will need about PhP2.2 billion for basic sanitation from 2016 to 2022 to reach a target of 97%.

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

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

The region will need about PhP376 million and PhP493 million for 2022 and 2030, respectively, for its septage management program.

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

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

For sewerage services, Davao City will require PhP10.41 billion by 2022 and an additional PhP2.1 billion by 2030. The computational template provided for a 25% coverage of sewerage services by 2022 and an additional 25% coverage by 2030. This includes the city's incremental population from 2015 to 2022 and from 2023 to 2030.

Candidate HUCs may be closely examined initially as urbanization may set in more rapidly in these places than in other

Table 22: Total Investment Costs for Sanitation Sector

| Province/City | Total Investment Cost (in PhP Million) 2022 | Total Investment Cost (in PhP Million) 2030 |
|-------------------|---|---|
| Compostela Valley | 1,367 | 456 |
| Davao Del Norte | 2,102 | 597 |
| Davao Del Sur | 1,784 | 654 |

Nonphysical Interventions

Davao 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.

| Total | 22,931 | 7,190 |
|------------------|--------|-------|
| Davao City | 14,719 | 4,801 |
| Davao Oriental | 1,107 | 461 |
| Davao Occidental | 1,853 | 221 |



160°0.000'W

Proposed Projects and Programs

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

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

This list of projects does not cover only infrastructure projects, but also nonphysical investment requirements, such as capacity development programs, information dissemination campaigns, and watershed management plans. These projects run the gamut from conception, proposal, prefeasibility and feasibility study stages, detailed engineering design, to pre-procurement and procurement. Figure 20 shows the distribution of the investment requirement per province and HUC. Based on the proposed projects and programs, the region needs PhP12,369 billion to boost its WSS sector.



Figure 20: Distribution of Investment Requirement per Province/HUC

| | | | | Compostela Valley | | | | |
|---|-------------|--------------------------------|--------------------|--|-------------|--|--|--------------------------------|
| Water Supply | Period | Budge Requirem (PhP Mill | et nent ion) | Sanitation | Period | Budget Requirement (PhP Million) | Total Budget Requirement (PhP Million) | HH Beneficiarie s (2022) |
| 1 Assessment and mapping of water sources | Short Term | 2 | 20.00 | 1_Survey of sanitation facilities and practices | | States 5- | | |
| 2 Potable Water System projects in various municipalities: | Medium Term | 4 | 14.82 | 2 Intensive IEC campaigns | Short Term | 5.00 | | |
| 3 Construction of rain water ponds | Short Term | ~~··· | 11.00 | 3 Training programs in sanitation management and best practices | (Formany) | the second | 7 | |
| 4 Establishment of Water Quality Testing Laboratory | Short Term | { | - | 4 Inspection and monitoring activities | Little- | 5 | | |
| 5 Expansion of PWS Level 2 Municipality of Laak | Short Term | 1 | 0.50 | 5 Basic sanitation program | Short Term | 987.400 | | |
| 6 Greening projects/ Reforestation | Short Term | | 20.00 | 6 Construction of STPs in 7 identified clusters | Short Term | 239.01 | | |
| Inventory and assessment of capacities of all WSPs in 7 the province (Water Districts, Waters Service Coops/ Associations, LGU-run) | Short Term | | 5.00 | 7 Development of a sanitary landfill | Medium Term | 10.00 | | |
| 8 Livelihood Projects for the IPs (relevant to watershed/ forest protection and management) | Short Term | | 20.00 | 8 Relocation of barangay cemetery | Short Term | 10.00 | | |
| 9 Monitoring of water quality and compliance to applicable laws | Short Term | 0 | 5.00 | 9 Municipal public cemetery development | Medium Term | 15.00 | | |
| 10 Provision of funds for Repair of Water System Level 1,2,3 at Municipality of Mabini | Short Term | \bigcirc | 3.00 | 10 Establishment of a sanitary landfill | Short Term | 1.38 | | |
| Rain Water Harvesting in HHs, schools, government facilities | Short Term | 2 | 20.00 | 11 Provision of sanitary toilet bowls to11 barangays | Short Term | 3.300 | | |
| 12 Training for WSPs, LGUs and other stakeholders | Short Term | | 22.00 | 12 Construction of drainage canal | Long Term | 48.50 | | |
| 13 Provision of water infrastructures | Short Term | 78 | 81.54 | 13 Concreting of drainage line canal | Short Term | 2.73 | | |
| 14 Construction of Water System | Short Term | | 9.00 | 14 Construction of school toilet facilities | Medium Term | 33.25 | | |
| 15 Construction of Water System Level 2 | Medium Term | 7 | 73.00 | 15 Construction of health center toilet facilities | Medium Term | 4.73 | 3,130.29 | 185,301 |
| 16 Construction of Taglake PWS | Short Term | | 1.50 | 16 Construction of public market toilet facilities | Medium Term | 1.11 | | |
| 17 Construction of PWS Level 2 | Short Term | | 3.13 | 17 Construction of public cemetery toilet facilities | Medium Term | 6.67 | | |
| 18 Construction of Potable Water System Level 2 | Medium Term | , | 19.25 | 18 Construction of day-care center toilet facilities | Medium Term | 12.23 | | |
| 19 Construction of Level 3 Water System | Medium Term | 13 | 33.29 | 19 Construction of toilet facilities in public playgrounds/parks | Medium Term | 9.45 | | |
| 20 Rehabilitation of Various Water System | Short Term | | 10.00 | 20 Construction of slaughterhouse treatment facility | Medium Term | 1.60 | | |
| 21 Rehabilitation of PWS | Short Term | | 8.70 | 21 Construction of public market treatment facility | Medium Term | 1.60 | | |
| 22 Rehabilitation of PWS Level 2 | Short Term | | 0.50 | No. And | Total | 1,392.61 | T | |
| 23 Improvement of Water System | Long Term | | 39.50 | | | | | |
| 24 Improvement of PWS Level 2 | Short Term | 2 | 5.50 | \vee | | | | |
| 25 Improvement of PWS Level 2 | Medium Term | | 16.00 | | | | | |
| 26 Improvement of Water System Level 3 | Medium Term | | 90.00 | | | | | |
| 27 Upgrading of PWS Level 2 | Short Term | | 0.40 | | | | | |
| 28 Upgrading of Water System | Medium Term | 1997 | 3.50 | | | | | |
| 29 Completion of PWS Level 2 | Short Term | 12-12-1 | 1.55 | | | | | |
| | Total | 1,73 | 37.68 | | | | | |
| | THE ARE | | | | | | | |

Davao Del Norte

Budget Total Budget ΗH

| | Water Supply | Period | Budget Requirement (PhP Million) | | Sanitation | Period | Budget Requirement (PhP Million) | Total Budget Requirement (PhP Million) | HH Beneficiarie s (2022) |
|---|---|------------|--|---|---|------------|--|--|--------------------------------|
| 1 | Additional Bulk Water Supplies, Installation of Transmission and Distribution Pipelines, Water Storage Facilities | Short Term | 400.00 | 1 | Trainings on community-led total sanitation (e.g. M&E) | Long Term | 0.20 | | |
| 2 | Upland Reforestration, Project Riverbank Rehabilitation Project, Greening Project, Cave Management Project, Mangrove Rehabilitation | Short Term | 70.00 | 2 | Establishment of Septage Treatment Plants in identified clusters | Short Term | 322.00 | | |
| 3 | Potable Water System projects in various municipalities | Short Term | 1,309.38 | 3 | Establishment of Sewerage Facilities | Short Term | 3,360.00 | | |
| 4 | Formulation of Provincial Comprehenive Water Resource Development Plan | Short Term | 6.52 | 4 | Septage Management Program | Short Term | 50.00 | 6,048.20 | 255,831 |
| 5 | Trainings | Short Term | 10.00 | 5 | Sewerage Management Program | Short Term | 50.00 | | |
| 6 | Water Development Ordinance | Short Term | 40.00 | 6 | FS Preparation | Short Term | 50.00 | | |
| 7 | Establishment of Local Water Resources Monitoring Committee Training on Community Led Total Sanitation | Short Term | 20.00 | 7 | Tri-Media and Social Media | Short Term | 0.10 | | |
| | | Total | 2,215.90 | 8 | | Total | 3,832.30 | | |

+

+

Total

+

127.00

1,347.00

84,965

| | | | | | Davao Del Sur | | | | |
|---|--|------------|--|---|--|-------------|--|--|---------------------------------|
| | Water Supply | Period | Budget Requirement (PhP Million) | | Sanitation | Period | Budget Requirement (PhP I Million) | Total Budget Requirement (PhF Million) | HH P Beneficiaries (2022) |
| 1 | Installation of 11,000 shallow wells | | 60.00 | 1 | Construction of an STP in every cluster (6 clusters) | | 3.30 | | |
| 2 | Construction of water tanks | | 500.00 | 2 | Construction of a sewerage system in Digos City | | 100.00 | | |
| 3 | Purchase of drilling machines for Level 2 | | 500.00 | 3 | Training programs, seminars, workshops | | 3.00 | | |
| 4 | Creation of local water districts | | 2,000.00 | 4 | Technical training on sanitation design, seminars, workshops | | | 3.197.30 | 181.218 |
| 5 | Training programs, seminars, workshops | | 10.00 | 5 | SP/Committee meetings, public hearings (Creation of a Provincial Environmental Code) | | 0.50 | -, | - , - |
| 6 | Reforestation of watershed areas | | 20.00 | 6 | SP/Committee meetings, public hearings (Creation of a Provincial Sanitation Code) | | 0.50 | | |
| | | Total | 3,090.00 | | | Total | 107.30 | | |
| | | | | D | avao Occidental | | | | |
| | Water Supply | Period | Budget Requirement (PhP Million) | | Sanitation | Period | Budget Requirement (PhP Million) | Total Budget Requirement (PhP Million) | HH Beneficiaries (2022) |
| 1 | Establishment of a Local Water Resources Monitoring Committee | | | 1 | Community survey | Medium Term | 4.00 | | |
| 2 | Training on community-led total sanitation | Short Term | 20.00 | 2 | Information and education campaign | Medium Term | 3.00 | | |
| 3 | Reforestation and rehabilitation via environmental projects | | | 3 | Pilot project re: workable sanitation | Short Term | 20.00 | | |
| 4 | IEC campaigns, radio plugs | | 200.00 | 4 | Construction of 5 clustered STPs in each | Medium Term | 100.00 | | |

| 5 | Construction of water laboratory testing center | | |
|---|--|-------|----------|
| 6 | Patrolling by IP's and Forest Protection Officers of local and national government agencies | | |
| 7 | Construction of Level II safe water source in 5 municipalities | | 200.00 |
| 3 | Construction of Level III safe water source in 5 municipalities | | 300.00 |
| 9 | Construction of a water treatment facility in 5 municipalities | | 500.00 |
| | | Total | 1,220.00 |

| | | | | Davao Oriental | | | | |
|---|------------|--|---|--|------------|--|--|---------------------------------|
| Water Supply | Period | Budget Requirement (Php Million) | | Sanitation | Period | Budget Requirement (PhP Million) | Total Budget Requirement (PhF Million) | HH P Beneficiaries (2022) |
| 1 Construction of Level 1 PWS | Short Term | 318.23 | 1 | Construction of sanitary toilets | Short Term | 244.73 | 3 | |
| 2 Construction of Level 2 PWS | Short Term | 318.23 | 2 | Construction of septic tanks | Short Term | 395.53 | 3 | |
| 3 Construction of Level 3 PWS | Short Term | 381.88 | 3 | Development of a clustered septage and sewerage system | Short Term | 186.80 |) | |
| 4 Provision of water quality monitoring equipment | Short Term | 381.88 | 4 | Establishment of engineered wetlands | Short Term | 2.09 |) | |
| | Total | 1,400.23 | | | Total | 829.15 | 5 | |
| Water Supply and Sanitation | Period | Budget Requirement (PhP Million) | | | | | 2,250.17 | 142,665 |
| 1 Establishment of a Project Development and Management and Resource Generation Center | Short Term | 8.50 | | | | | | |
| 2 Formulation of a project feasibility study | Short Term | 0.94 | | | | | | |
| 3 WatSan capacity enhancement project | Short Term | 11.34 | | | | | | |
| | | | | | | | | |

| | | | | Davao City | | | | |
|---|--------|--|---|--|-----------|--|--|---------------------------------|
| Water Supply | Period | Budget Requirement (Php Million) | | Sanitation | Period | Budget Requirement (PhP Million) | Total Budget Requirement (PhF Million) | HH P Beneficiaries (2022) |
| Organizing and training of BAWASA officers and maintenance personnel | | | 1 | Enactment of a water development and management ordinance for Davao City | | 4.00 |) | |
| 2 Implementation and commissioning of Tamugan Surface Water Development Project | | | 2 | Addressing environmental sanitation concerns | | 4.00 |) | |
| 3 Geo-resistivity survey of water sources | | | 3 | Training/intervention programs and capacity building initiatives for employees | | 4.00 |) | |
| 4 Periodic monitoring and treatment of water systems | | | 4 | Hiring of additional workforce | | 4.00 |) | |
| 5 Commissioning of nano-filtration treatment services | | | 5 | Construction of a septage treatment facility in Davao City | Long Term | 0.35 | 5 | |
| 6 Requiring projects/activities that pose danger to the city's water resources to have their wastewater treated | | | | | Total | 16.35 | 416.35 | 485,676 |
| 7 Addressing environmental sanitation concerns | | | | | | | | |

8 Training/intervention programs for employees

| 9 Hiring of additional workforce | | |
|---|-------|--------|
| 10 Formulation and passing of a water development ordinance | | 400.00 |
| | Total | 400.00 |



80°0.000′W

+

160°0.000'W

+



AM, Salintubig Pipeline WSS Projects

10 0 10 20 30 40 km WGS 1984 - UTM Zone 51 N

0°0.000′

46

+

Identified Priority Projects (2019-2020)

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

| | Assistance To Municipalities (2019) | | | | | |
|------------------|-------------------------------------|-----------------------------|--|--------------|--|--|
| Province | Municipality | Project Type | Project Title | Amount (PhP) | | |
| Davao Del Norte | Carmen | Potable water supply system | Expansion of Level II Water System | 1,000,000 | | |
| Davao Del Sur | Magsaysay | Potable water supply system | New Construction of Level II Potable Water Supply System in Sitio Upper Mabini, Mabini (Purok 3 & 4) | 2,250,000 | | |
| Davao Del Sur | Magsaysay | Potable water supply system | New Construction of Level II Potable Water Supply System in Sitio Ma- ligang, Blocon | 2,000,000 | | |
| Davao Del Sur | Magsaysay | Potable water supply system | New Construction of Level II Potable Water Supply System in Sitio Si- mon, San Isidro and Purok 3, New Ilocos | 3,000,000 | | |
| Davao Del Sur | Magsaysay | Potable water supply system | Rehabilitation/Improvement of Level II Potable Water Supply System | 2,500,000 | | |
| Davao Del Sur | Magsaysay | Health and sanitation | Rehabilitation/Improvement/Upgrading of Existing Sanitary Toilet and Hygiene Facilities for Public Places | 1,072,000 | | |
| Davao Del Sur | Sta. Cruz | Potable water supply system | Rehabilitation and Improvement of Potable Water System Level II | 4,000,000 | | |
| Davao Occidental | Malita | Potable water supply system | Construction of Level II Potable Water Supply System in Barangay Kinangan | 4,000,000 | | |
| Davao Occidental | Malita | Potable water supply system | Construction of Level II Potable Water Supply System in Barangay Lais | 3,037,000 | | |
| Davao Occidental | Sta. Maria | Potable water supply system | Construction of Level II Potable Water Supply System | 2,710,000 | | |
| Davao Oriental | Cateel | Potable water supply system | Expansion of Level II Water System | 4,000,000 | | |
| Davao Oriental | Cateel | Potable water supply system | Rehabilitation/Improvement of Potable Water System Level II | 1,859,000 | | |

Total 31,428,000

| | | SALINTUBIG (2019) | | | |
|-------------------|---------------------------|--|--------------------------------|-----------------|--------------|
| Province | Municipality | Name Of Project | Ba | rangay | Amount (PhP) |
| Compostela Valley | New Bataan | Spring Development P-4 To P-5 & P5A | San Isidro, Jag Poblacion 2 | upit, Curva And | 4,500,000 |
| Davao Del Sur | Santa Cruz | Construction Of Potable Water System In Waterless S Barangays | Sitios/ Astorga | | 2,000,000 |
| Davao Del Sur | Santa Cruz | Construction Of Potable Water System In Waterless S Barangays | Sitios/ Jose Rizal | | 2,000,000 |
| Davao Del Sur | Santa Cruz | New Construction Of Level II Potable Water Supply Sy | ystem Sinoron | | 2,000,000 |
| | | | | Total | 10,500,00 |
| | | LWUA (2017-2018) | | | |
| Province | Municipality | / Project Type | Status | Amc | ount (PhP) |
| Davao Del Norte | Carmen | Expansion/Improvement | Pending approval | 1 | 502,200,000 |
| Davao Del Norte | Island Garden City mal | of Sa- Expansion/Improvement | Approved May 23, 2018 | | 48,000,000 |
| | | | | Total | 982,200,000 |

47



+

160°0.000'W

+

80°0.000′E -

0°0.000′

Appendix A: Provincial and HUC Profiles

| | ST COMPOSITE | 11 municipalities | Compostela, Laak, Mabini, Maco, Maragusan, Mawab, Monkayo, Montevista, Nabunturan, New Bataan, Pantukan |
|--|-----------------------------|---|---|
| | COMPOSTELA VALLEY | 237 barangays | 36 urban, 201 rural |
| | Land Area | 4,479.77 square kilometers | |
| | Demographics (2015) | Population (2015) – 736,107 Population Growth Rate (2000 to 2015 Population Density – 160 per sq. km |) – 1.57 |
| | Economy | Major industries - agriculture, minin Major products - seafood such as ti Major crops - rice, coconut, cacao, Compostela Valley was the second in 2017 according to the 2017 annu | g, fishery lapia and milkfish; gold coffee, papaya, fruits richest province in the country in terms of assets al financial report of the Commission on Audit. |
| | Poverty Incidence (2015) | On Families – 22.0% On Population – 28.1% | |
| | 220 | | Silver of |
| 5 | ANNORA LEVEL | 8 municipalities | Asuncion, Braulio E. Dujali, Carmen, Kapalong, New Corella, San Isidro, Santo Tomas, Talaingod |
| | OFFICIAL SEAL | three (3) component cities | |
| | DAVAO DEL NORTE | 223 barangays | 63 urban, 160 rural |
| | Land Area | 3,426.97 square kilometers | |
| 2 | Demographics (2015) | Population (2015) – 1,016,332 Population Growth Rate (2000 to 2015 Population Density – 300 per sq. km | 5) – 2.07 |
| | Economy | Major industries - agriculture, minir Major products - seafood such as a minerals such as gold, silica, silver Major crops - rice, maize, banana, Davao del Norte is hailed as the Ba plantations run by various multination | ng, forestry, fishery prackish water milkfish, tilapia, shrimp and crab; , copper and elemental sulfur coconut, abaca, ramie, coffee anana Capital of Philippines, with the many onal and local producers. |
| ~ | Poverty Incidence (2015) | On Families – 26.1% On Population – 33.2% | |
| 10 | | | |
| 2 | SCH OF DAVACO | 9 municipalities | Bansalan, Hagonoy, Kiblawan, Magsaysay, Malalag, Matanao, Padada, Santa Cruz, Sulop |
| | | one (1) component city | Digos City |
| | OFFICIAL SEAL | one (1) Independent city | Davao City |
| DAVAO DEL SUR 232 barangays (excluding Davao 85 City) | | | 85 urban, 147 rural |

N/000'0-08

| | Land Area | 2,163.98 square kilometers | | | | |
|---|-----------------------------|---|--|--|--|--|
| | Demographics (2015) | Population (2015) – 632,588 Population Growth Rate (2000 to 2015) – 1.50 Population Density – 290 per sq. km | | | | |
| | Economy | Major industries - agriculture, forestry, fishery, handicraft Major crops - coconut, rice, corn, sugarcane, cacao, coffee Davao del Sur has been regarded as Mindanao's top rice-yielding province because of Hagonoy's high yield performance averaging more than six tons per hectare. The province hosts the country's highest peak, Mt. Apo. | | | | |
| Ļ | Poverty Incidence (2015) | On Families – 12.0% On Population – 15.6% | | | | |
| | } + | | | | | |



0°0.000′W

5 municipalities

105 barangays

٠

•

•

2,163.45 square kilometers

Population (2015) - 316,342

Pepper Committee.

Population Density – 150 per sq. km

Population Growth Rate (2000 to 2015) - 1.44

Major industries - agriculture, aquaculture, tourism

Major crops - black pepper, banana, coconut

F DAVAO

DAVAO OCCIDENTAL

Land Area

(2015)

Economy

Economy

Demographics

160°0.000′V

Don Marcelino, Jose Abad Santos, Malita,

Santa Maria, Sarangani

45 urban, 60 rural

Davao Occidental's black pepper has been rated 'five star' by the International

| A COLOR OF DAVIS | 10 municipalities one (1) component city | Baganga, Banaybanay, Boston, Caraga, Cateel, Governor Generoso, Lupon, Manay, San Isidro, Tarragona Mati City 20 urban, 163 rural | | | |
|-----------------------------|--|---|--|--|--|
| DAVAO ORIENTAL | | | | | |
| Land Area | 5,679.64 square kilometers | | | | |
| Demographics (2015) | Population (2015) – 558,958 Population Growth Rate (2000 to 2015) – 1.49 Population Density – 98 per sq. km | | | | |
| Economy | Major industries - agriculture, fishery, tourism Major products - crude oil, copra pellets, crocodile ice cream, crocodile letchon and crocodile hamburger Major crops - coconut, copra, abaca, rice, banana Davao Oriental hosts the Davao Crocodile Park which showcases a 'state-of-the-art' crocodile farming system equipped with the most recent modern facilities. | | | | |
| Poverty Incidence (2015) | On Families – 21.3% On Population – 29.9% | | | | |

 Davao City is the regional center of Davao Region.

 Davao City is the regional center of Davao Region.

 182 barangays

 47 urban, 135 rural

 Land Area

 2,443.61 square kilometers

 Population (2015) – 1,632,991

 Population Growth Rate (2000 to 2015) – 2.34

 Population Density – 670 per sq. km

.

20°0.000'S

- Major industries agriculture, fishery, trade and commerce
- Major products chocolate, seafood such as yellow fin tuna, milkfish, mudfish and shrimp; food products made from durian
- Major crops durian, banana, pineapple, coffee, coconut, mangoes, cacao, pomeloes
- Davao City is name the Durian Capital of the Philippines.





NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY

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

www.neda.gov.ph
fy NEDAhq

