

Republic of the Philippines
Province of Sorsogon
MUNICIPALITY OF GUBAT

**LOCAL CLIMATE CHANGE ACTION PLAN
2019 - 2028**



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I. BACKGROUND

A. Rational of the Plan

Considered to be one of the most serious problems faced today anywhere else in the globe, climate change remains to be on the top priorities of all countries. It affects everyone, however, it is the poor who are more critical to its drastic effects (World Bank). In the Philippines, scientific studies have shown that mean temperature has been increasing. In the last 59 years, observed mean temperature exhibited an increase of 0.64°C or an average of 0.01 °C per year from 1951 - 2010. In addition, the number of tropical cyclones passing the country shows a slight increase from 1971 to 2000 compared to previous years.

Philippines is the third most vulnerable to the impacts of climate change such as sea level rise, weather-related extreme events, and the increasing intensity and frequency of typhoons. (Worldbank, 2013) This poses a great risk to hazard-prone areas and coastal communities. Gubat as a coastal municipality with most of the households rely on agriculture and fishing as livelihood sources experiences firsthand the adverse impacts of climate change on food security and economic stability.

In response to the urgency to act on climate change, Climate Change Act was enacted in the Philippines in 2009, also known as Republic Act 9279. The law highlights the role of the LGUs as stated in Section 14 that “LGUs shall be the frontline agency in the formulation, planning and implementation of climate action plans in their respective areas...” It mandates mainstreaming of climate change in government policies, plans, and programs. Moreover, LGUs are also mandated to formulate, plan, and implement climate change action plans in their respective areas, consistent with the provisions of Republic Act 7160, the National Framework Strategy on Climate Change (NFSCC), and the National Climate Change Action Plan (NCCAP).

The Local Government of Gubat started formulation of its Local Climate Change Action Plan (LCCAP) in 2017. Results of focus group discussions, available local and national data, and results of the Climate and Disaster Risk Assessment (CDRA) were made an integral part in formulation of the plan. Vulnerable areas and groups were identified and adaptive capacity were rated. The plan aims to address future impacts of climate change on food security, water sufficiency, human security, ecological and environmental stability, climate-smart industries and services, sustainable energy, and knowledge and capacity development.

B. LGU PROFILE

Physical and Environmental Profile

Geographic Location and Land Area

The Municipality of Gubat is located in the East Coast of the Province of Sorsogon. It is the third largest municipality in Sorsogon Province bounded on the North by the Municipality of Prieto Diaz and Bacon District of Sorsogon City, on the South by the Municipality of Barcelona, on the West by Sorsogon City and the Municipality of Casiguran, and on the East by the vast Pacific Ocean.

It is nineteen (19) kilometers from the provincial capital Sorsogon City, eighty (80) kilometers from the regional center of Legazpi City, and six hundred twenty one (621) kilometers from Manila. The Municipality lies on the coordinates 12° 55' 15.63" North Latitude, and 124° 07' 28.66" East Longitude.

Gubat is comprised of forty-two (42) barangays, eight (8) of which are classified as urban and located in the poblacion, while the rest are classified as rural.

It has 11,421.17 hectares land area and a total of 19,078.02 hectares of municipal waters and coral reef.

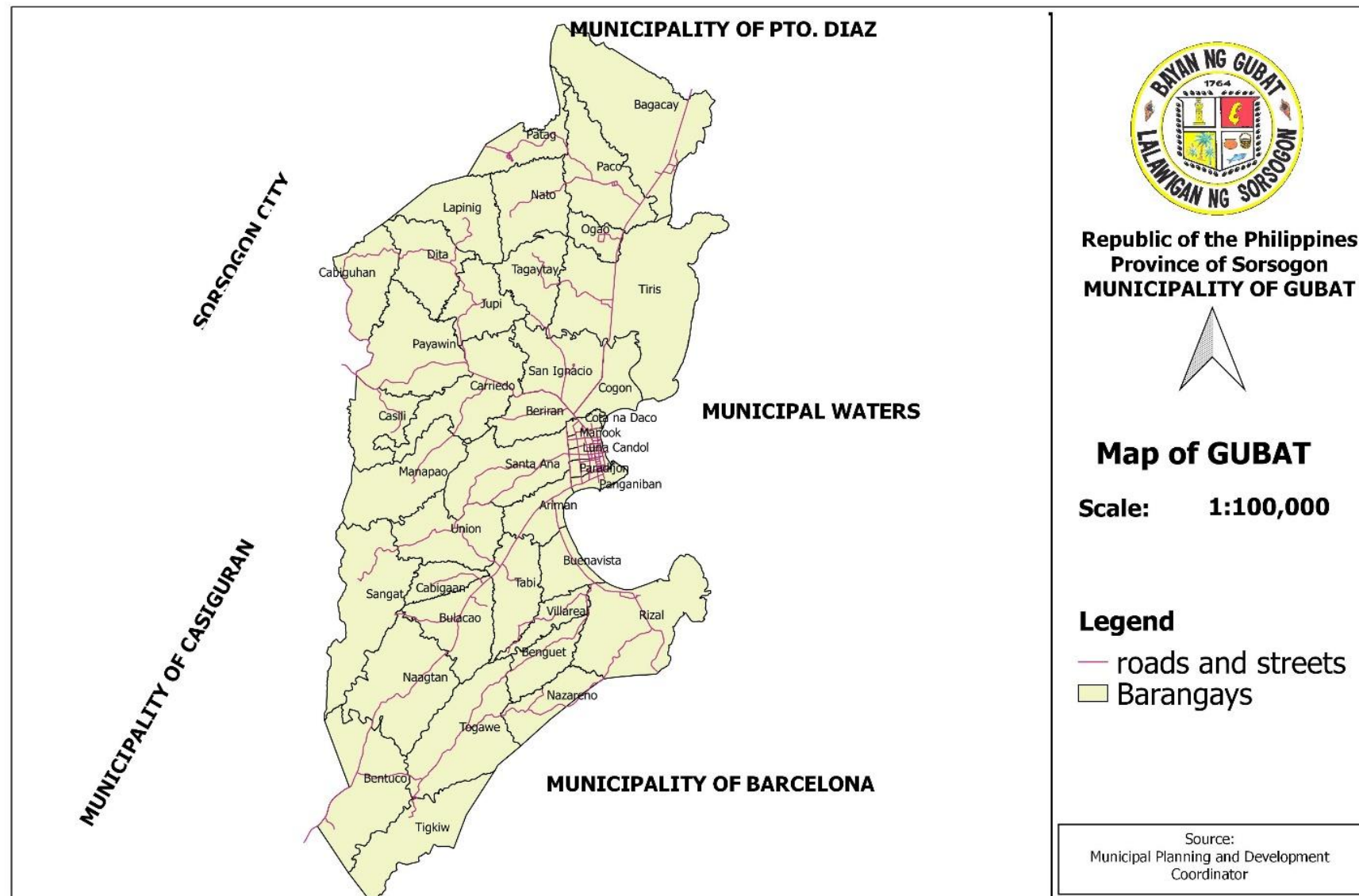


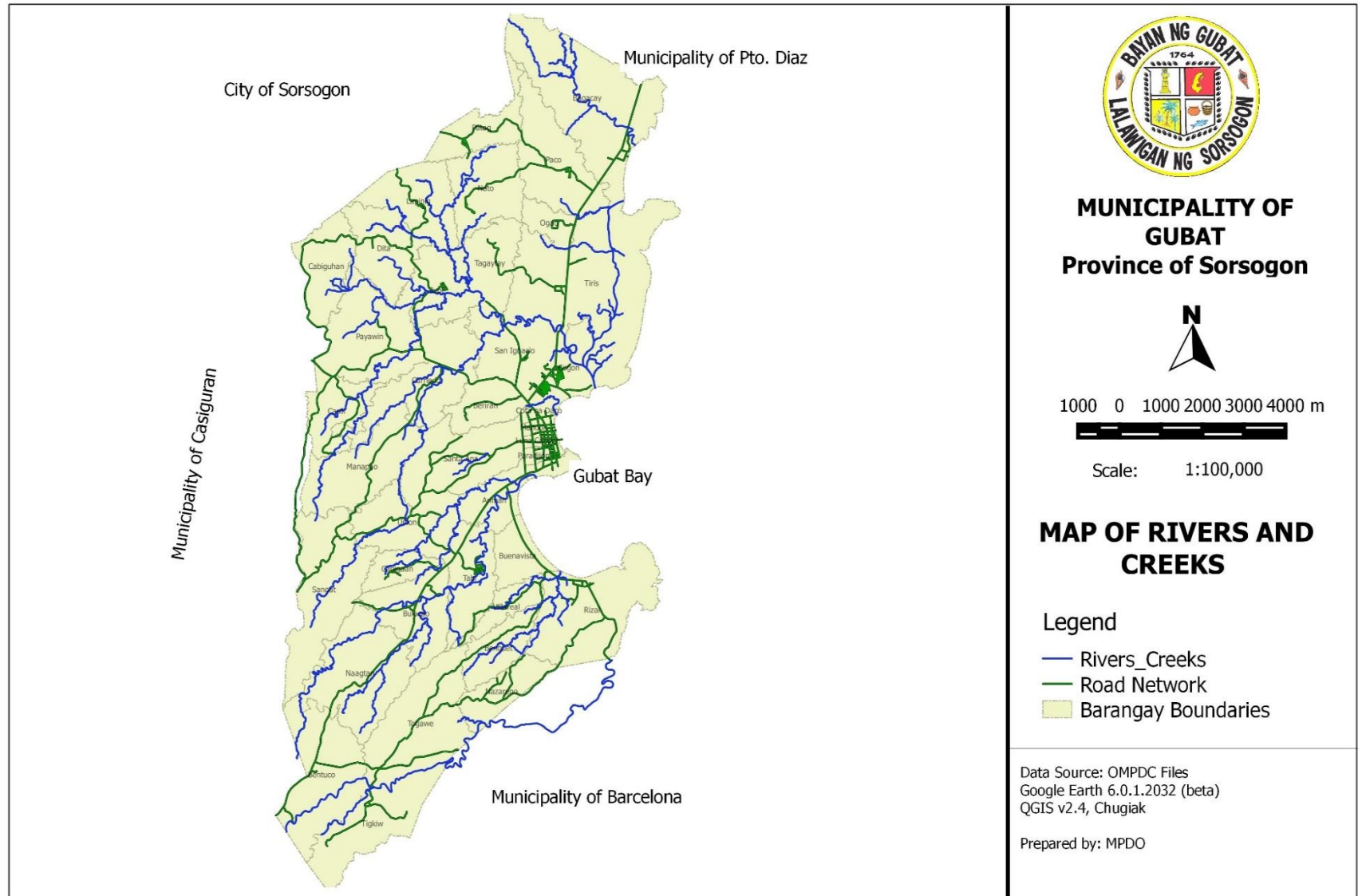
Figure 1. Map of Gubat.

Topography

The municipality is interspersed by creeks and rivulets that are mostly tributaries of the three main rivers called the *Bulacao*, *Basiao* and *Tingting*. The *Bulacao* River has two sources: one originates from Ariman in Barangay Bentuco flowing through Anibong, Malidlid and Calumpit, all sitios of Barangay Bulacao, to Barangay Tabi and Ariman where it meets the seashore. The other source originates from Liyang, Sitio Bentuco, to Lucha in Bulacao and merges at Calumpit. The *Basiao* River starts from the numerous springs in Barangay Cabigaan, to Pandan in Bulacao, to Arasiang in Barangay Union, to Tanke in Barangay Sta.Ana, to Aropag in Barangay Ariman and into the sea.

The *Tingting* River serves the northwestern part of the municipality. From a small brook in Manapao, it flows to Caragti in Barangay Carriedo, to Carriedo proper, then to Maroc-baroc and Tingting in Barangay San Ignacio, then to the southern part of Barangay Tiris and flows out to the sea. Another source originates from Barangay Casili, to Barangay Payawin, to Barangay Jupi and then merges at Tingting. From Tingting, rivulets and creeks traverse the outlying plains of the different sitios of Barangay Dita and barangays Lapinig and Patag. All rivers in the municipality empty at the Pacific Ocean.

The town is predominantly level to nearly level to very gently sloping (0-9%) spread over 7,350 hectares that represent 70.4% of the total land area. The gently sloping (9-18%) is 857 hectares or 8.3% of the total land area widely scattered over the whole municipal area. Moderately sloping or rolling to strongly sloping or strongly rolling has an area of 2,032 hectares contributing 19.6% of the total land area. This type is situated in the northern part of the municipality. The strongly hilly to mountainous portion of more than 30 % and located on the southwest side of the municipality has a total land area of 181 hectares and is 1.7% of the total land area. The highest point in Gubat is 166 meters above sea level at Tigkiw, at the southernmost part of the municipality.



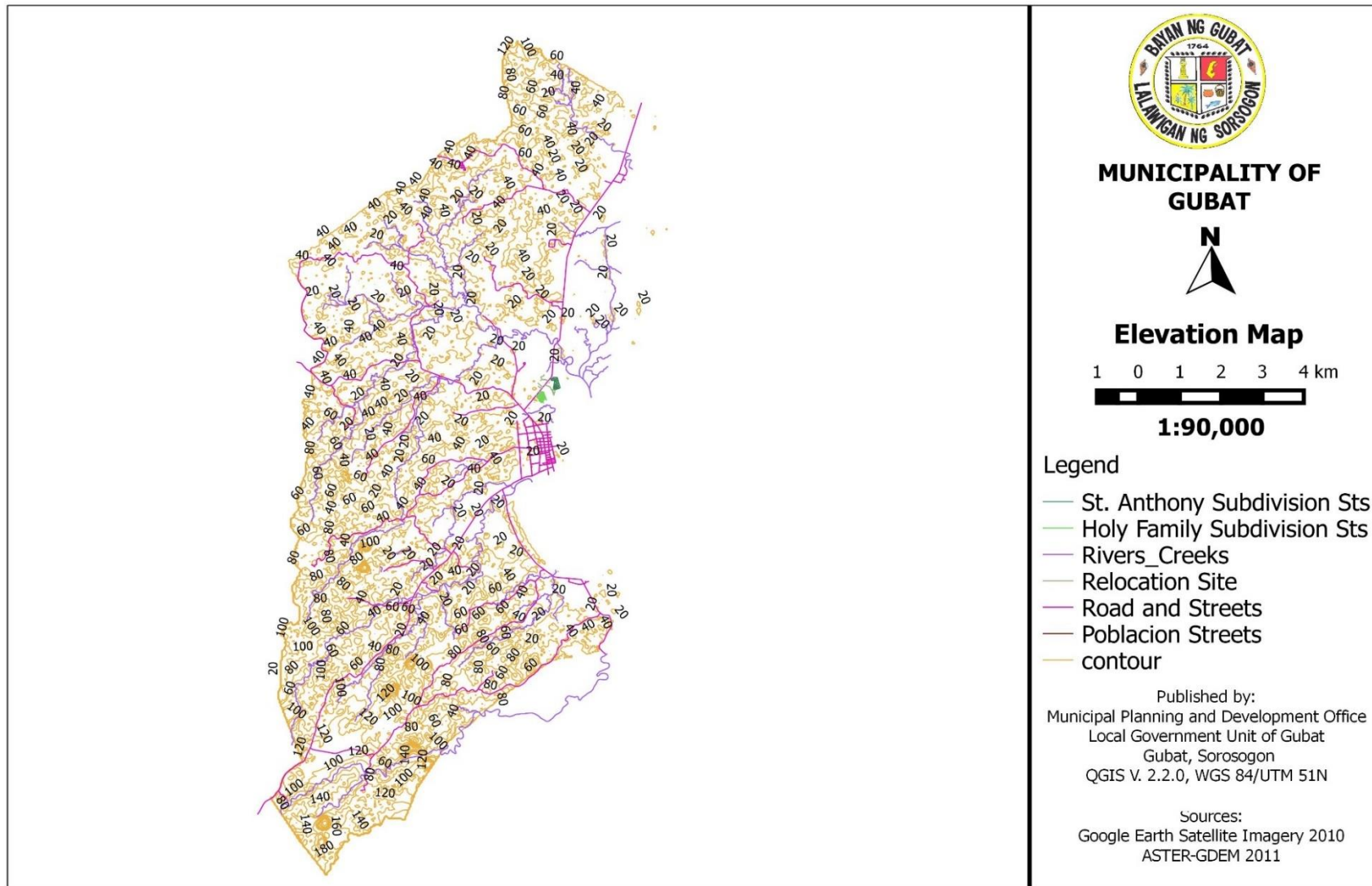


Figure 2. Elevation Map of Gubat.

Soil

Different soil types characterize the terrestrial territory of the Municipality of Gubat. These are Bascaran clay, comprised of 2,834 hectares; clay loam, 4,877 hectares; sandy loam, 240 hectares; hydrosol, 354 hectares; fine sandy loam, 406 hectares; and fine clay loam, 1,709 hectares. The coastal barangays are the hydrosol type or the beach type of soil.

The clay loam, fine clay loam and the Bascaran clay are the primary medium, of agriculture in the municipality. The clay loam, which has the biggest area coverage, is found in the low lands while the Bascaran clay is found exclusively in the highlands.

Soil Characteristics

Clay Loam

| <u>Depth</u> | <u>Characteristics</u> |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0-40 cm | Surface soil, clay loam, dark brown to brick reddish brown; coarse granular to blocky; highly plastic when wet, but becomes brittle upon drying. It has a fair organic matter content and is well penetrated by roots. Boundary to the subsoil is wavy and diffused. |
| 40-110 cm | Subsoil, clay, reddish brown, dark brown to brown; coarse granular to columnar. It is mottled black and gray, highly plastic and sticky when wet, and brittle and hard when dry. It is moderately compact. Boulders are present in some places in this layer. It has diffused and wavy boundary to the lower layer. |
| 110-170 | Lower subsoil, clay, dark brown to reddish brown; blocky to columnar. Presence of gray and bluish streaks and concretions. Boundary to the substratum is clear. |
| 170-200 | Substratum, clay, dark brown to reddish brown; moderately compact and columnar with plenty of concretions. Underneath is reddish orange and gray and highly weathered parent material. |

Bascaran Clay

| | |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0-40 | Surface soil, clay, brownish gray to grayish brown and light reddish brown; moderately compact; blocky structure; slightly plastic when wet; fair amount of organic matter. Gravel is present. |
| 40-65 | Subsoil, silty clay to clay, grayish brown to dark brown with abundant brick red streaks; plastic when wet and brittle when dry; coarse columnar. Weathered yellowish gravel is present in this layer. Boundary is diffused and smooth to the lower horizon. |
| 65-115 | Lower subsoil, clay, brownish gray splotched with red; columnar and contains yellowish orange gravel. Boundary is smooth and diffused. |
| 115-150 | Substratum, clay, yellowish brown, grayish brown to brownish gray, massive. Compact. |

Hydrosoil

The hydrosoil in the Municipality of Gubat comprises the areas of swamps and marshes. The areas are under water practically the whole year round, and are extensive along the Gubat coastline. The hydrosoil is generally characterized by a brackish aqueous horizon that is about 100 centimeters deep or more depending upon the rise and fall of the tide. Underneath the aqueous layer is the sub-aqueous horizon. It is slimy, brownish gray to grayish brown to light gray, fine to coarse sandy clay to silty clay with plenty of plant remains. The depth ranges from 35 to 80 centimeters. The basal horizon is also slimy, ashy gray sandy clay. The depth ranges from 80 to 150 centimeters or more from the sub-aqueous surface.

Fine Sandy Loam

- | | |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0-15 | Surface soil, fine sandy loam, black to grayish black; friable; fine granular; loose and mellow in all moisture conditions. Fair in organic content and no stones. boundary to the subsoil is smooth and clear. |
| 30-60 | Lower subsoil, silt loam, brown to grayish brown and mottled brown; structureless; very compact in dry and wet conditions. Boundary to substratum is smooth and diffused. |
| 60-150 | Substratum, sandy loam, light gray and compact. Below the substratum is a layer of dark gray clay. |

Clay Loam

- | | |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0-60 | Surface soil, clay loam; grayish black to reddish brown; coarse granular and moderately compact; slightly sticky and plastic when wet and very crumbly when dry. Contain good amount of organic matter and coarse skeleton is present on areas along rivers. Boundary to the subsoil is clear and weavy. |
| 60-80 | Subsoil, clay; reddish brown to strong brown; coarse granular to columnar; moderately compact; very sticky and plastic when wet. In some places, stones are present. Boundary to the lower layer is diffused and wavy. |
| 80-120 | Lower subsoil, clay; dark brown to reddish brown with bluish black mottling; coarse columnar. Free from stones. Boundary to the substratum is clear and smooth. |
| 120-below | Substratum, clay; arrange brown to reddish brown speckled yellow and black; coarse granular. This layer rests on highly weathered sandstone and tuff. |

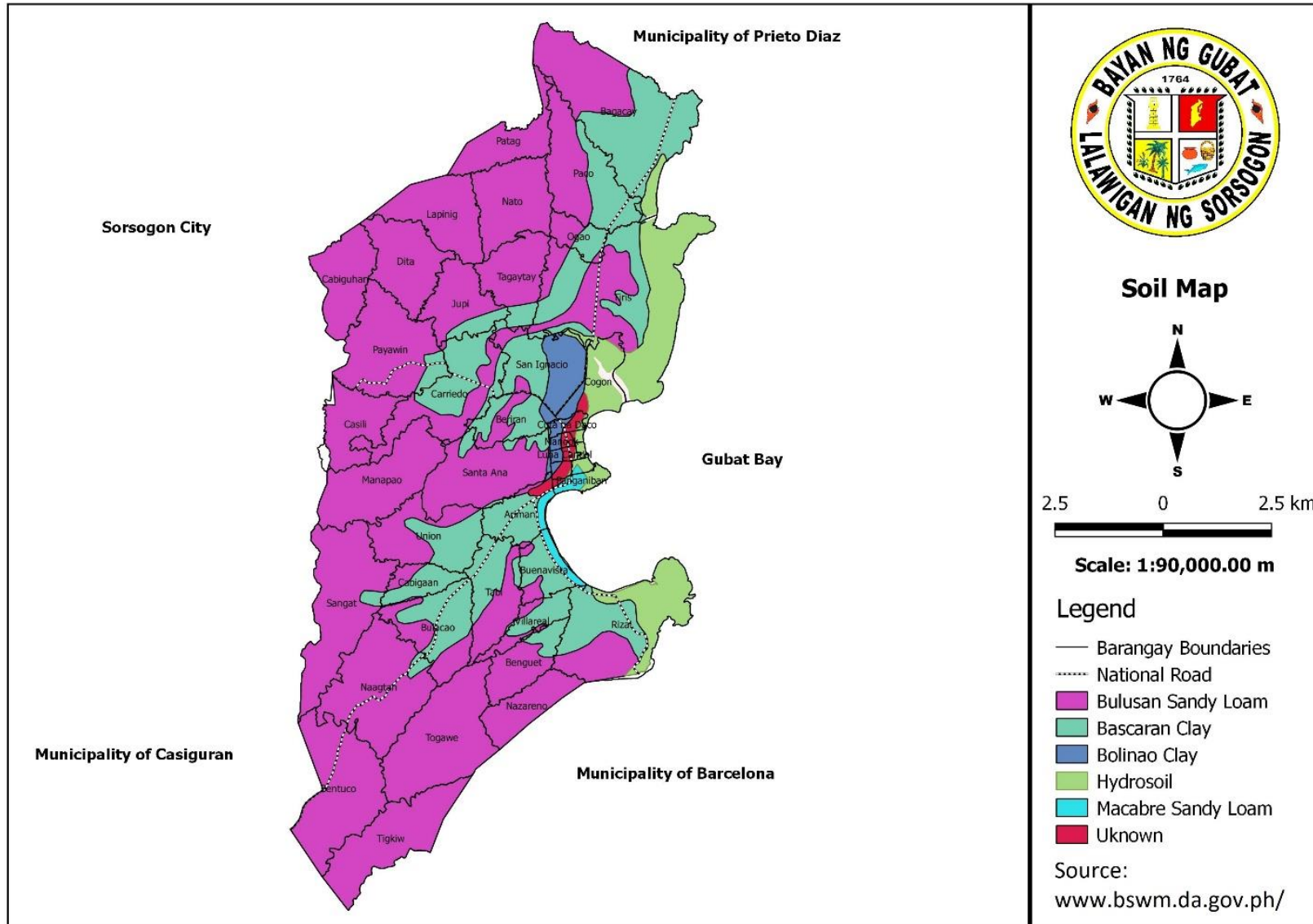


Figure 3. Soil Map of Gubat.

Climate

The municipality experiences a Type II climate characterized by a short dry season in the months of April to August, and a pronounced maximum rainfall from November to January. The average rainfall is 6.65 mm while the highest readings occur in the month of February at 14.3 mm and the lowest at .4 mm in the month of May. The mean temperature is 27.245 degree Celsius.

There are three kinds of wind systems passing the municipality at different times of the year. The Northeast Monsoon occurs during the months of October to February; the North Pacific Trades from March to April; and the Southwest Monsoon from May to September. Gubat is along the path of typhoons of the magnitude 11k from May to December. Normal track of typhoon may occur once a year.

Average humidity is reached at late dawn when the temperature is minimal. The coldest months are December, January, and February with the lowest air temperature of 20 degree Celsius, while the hottest month is April recording the highest temperature of 35 degree Celsius.

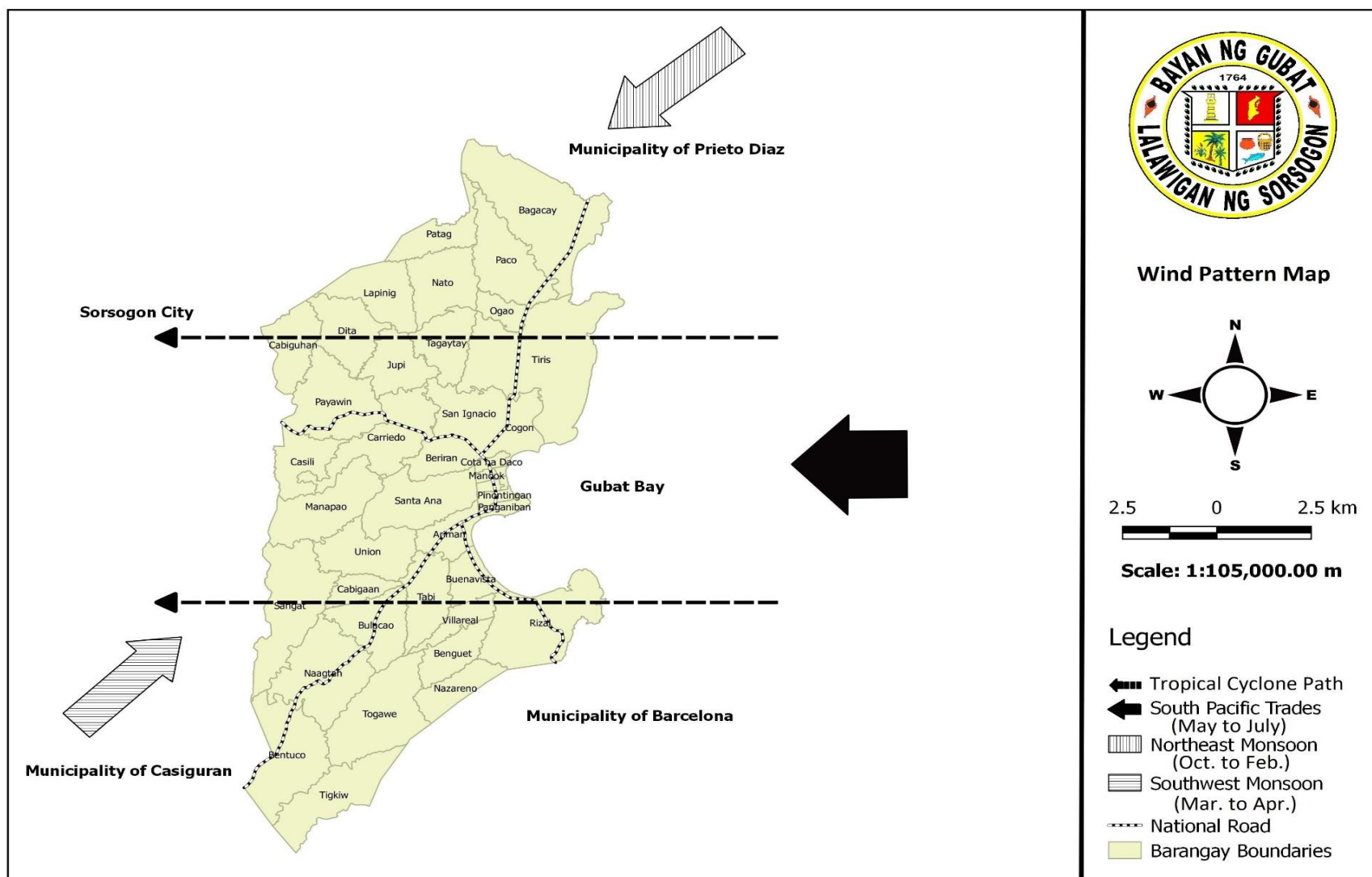


Figure 4. Wind Pattern Map of Gubat.

Population and Demographic Profile

Total Population

The result of the CY 2015 census revealed that the municipality has already reached 59,534 counts compared to the recorded population of 57,327 in 2010 (Table 2). The current population of the municipality accounts 7.51% of the total population of the Province of Sorsogon. This shows that the municipality has a lower growth rate of 0.72% compared to the 1.31% growth rate of the province. If this trend continues, the population of the municipality is expected to reach 67,927 by year 2029 (Table 3).

Table 1. Population Growth Rate from 1980 to 2018.

| Year | Population | Household |
|------|---------------|-----------|
| 1980 | 43,866 | |
| 1990 | 43,251 | |
| 1995 | 49,716 | |
| 2000 | 52,707 | |
| 2007 | 55,457 | |
| 2010 | 57,327 | 12,197 |
| 2011 | 57,946 | 12,287 |
| 2012 | 58,572 | 12,378 |
| 2013 | 59,205 | 12,470 |
| 2114 | 59,844 | 12,562 |
| 2015 | 59,534 | 13,474 |
| 2016 | 59,963 | 13,574 |
| 2017 | 60,394 | 13,774 |
| 2018 | 60,829 | 13,876 |

Annual Population Growth Rate: 0.72%
Household Growth Rate: 0.74%

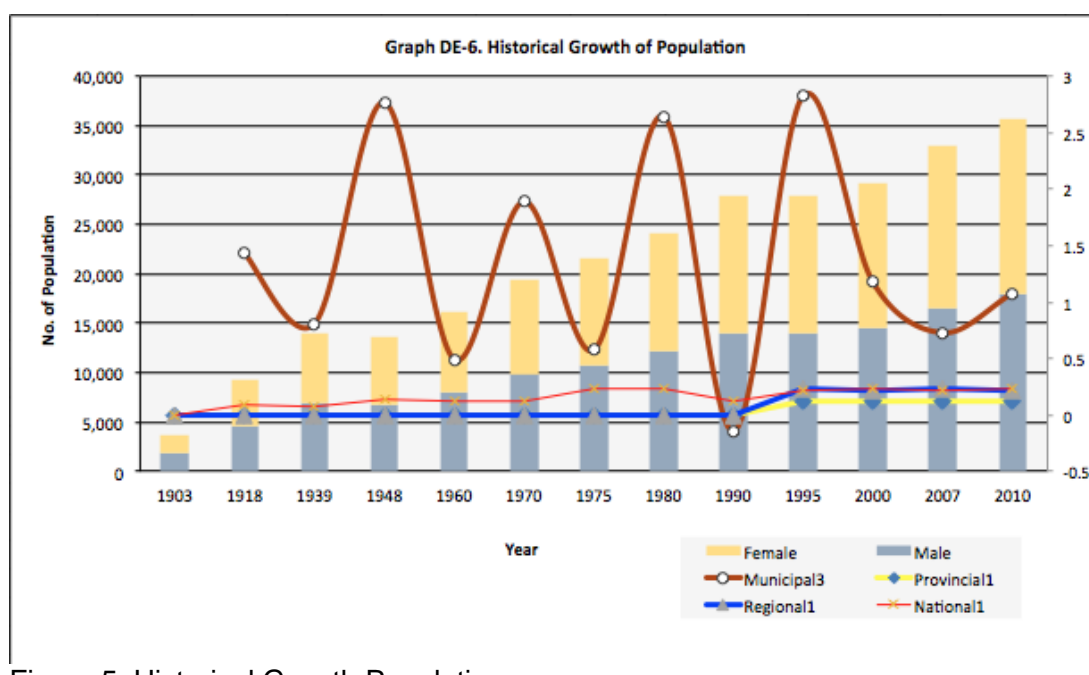


Figure 5. Historical Growth Population.

Table 2. Population Projection from 2019 to 2029.

| Year | Population |
|------|------------|
| 2019 | 61,267 |
| 2020 | 61,708 |
| 2021 | 62,153 |
| 2022 | 62,600 |
| 2023 | 63,051 |
| 2024 | 63,505 |
| 2025 | 63,962 |
| 2026 | 66,423 |
| 2027 | 64,886 |
| 2028 | 65,354 |
| 2029 | 65,824 |

Annual Population Growth Rate: 0.72%

Urban-Rural Population

As of CY 2015 census, 13,388 persons live in the poblacion. This number represents 22.49% of the total population of the town, while the rural population is 46,146 or 77.51% of the total population.

While previous records in the 2007 and 2010 census showed that the urbanity movement in the municipality is small, there was an increase of rural population or decreased in urbanity movement in the municipality in the year 2015. This could be attributed to the development of new subdivisions in Barangays Cogon and San Ignacio.

As per result of the census conducted in 2015, age groups 5-9 and 10-14 account for 10.70% and 11.54% of the total population respectively (Table 4). And while the male slightly outnumbered the females from 2010 to 2015, the urban-rural population ratio did not substantially change.

Table 3. Population Distribution from 2010 to 2015.

| Age Group | Censal Year 2 - 2015 | | | Censal Year 1- 2010 | | |
|-----------|----------------------|--------|-------|---------------------|--------|-------|
| | Male | Female | Total | Male | Female | Total |
| 0 - 4 | 3,024 | 2,839 | 5,863 | 3,070 | 2,806 | 5,876 |
| 5 - 9 | 3,359 | 3,012 | 6,371 | 3,512 | 3,302 | 6,814 |
| 10 - 14 | 3,524 | 3,349 | 6,873 | 3,719 | 3,462 | 7,181 |
| 15 - 19 | 3,410 | 3,041 | 6,451 | 3,416 | 2,984 | 6,400 |
| 20 - 24 | 2,574 | 2,297 | 4,871 | 2,205 | 1,859 | 4,064 |
| 25 - 29 | 1,932 | 1,788 | 3,720 | 1,724 | 1,627 | 3,351 |
| 30 - 34 | 1,722 | 1,649 | 3,371 | 1,725 | 1,608 | 3,333 |
| 35 - 39 | 1,793 | 1,692 | 3,485 | 1,673 | 1,628 | 3,301 |
| 40 - 44 | 1,612 | 1,563 | 3,175 | 1,749 | 1,724 | 3,473 |
| 45 - 49 | 1,725 | 1,709 | 3,434 | 1,511 | 1,461 | 2,972 |

| | | | | | | |
|--------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 50 - 54 | 1,451 | 1,397 | 2,848 | 1,291 | 1,213 | 2,504 |
| 55 - 59 | 1,220 | 1,249 | 2,469 | 1,036 | 1,105 | 2,141 |
| 60 - 64 | 915 | 1,074 | 1,989 | 866 | 937 | 1,803 |
| 65 and over | 1,907 | 2,707 | 4,614 | 1,704 | 2,354 | 4,058 |
| Total | 30,168 | 29,366 | 59,534 | 29,201 | 28,070 | 57,271 |

Rural population accounts about 78% of the total population of the municipality, which is opposite to the provincial level of urbanization. The level of urbanization percentage from 1995 to 2015 showed a decrease from an urban tempo of 26% in 1990 to 22.4% in 2015 (Table 5).

Table 4. Household Distribution by Barangay in 2015.

| Urban | | | |
|------------------|------------------|-------------------|-------------------------------|
| Barangay | Household | Population | Average Household Size |
| Balud del Norte | 444 | 1,961 | 4.38 |
| Balud del Sur | 270 | 1,192 | 4.39 |
| Cota na Daco | 386 | 1,707 | 4.39 |
| Luna Candol | 533 | 2,356 | 4.38 |
| Manook | 317 | 1,401 | 4.40 |
| Panganiban | 500 | 2,211 | 4.39 |
| Paradijon | 293 | 1,295 | 4.40 |
| Pinotingan | 286 | 1,265 | 4.40 |
| Sub-Total | 3,029 | 13,388 | 4.39 |
| Rural | | | |
| Ariman | 375 | 1,657 | 4.39 |
| Bagacay | 753 | 3,328 | 4.36 |
| Benguet | 123 | 543 | 4.41 |
| Bentuco | 379 | 1,676 | 4.39 |
| Beriran | 228 | 1,007 | 4.40 |
| Buenavista | 226 | 997 | 4.39 |
| Bulacao | 458 | 2,024 | 4.39 |
| Cabigaan | 253 | 1,116 | 4.39 |
| Cabiguhan | 174 | 771 | 4.42 |
| Carriedo | 508 | 2,244 | 4.38 |
| Casili | 249 | 1,101 | 4.40 |
| Cogon | 518 | 2,289 | 4.38 |
| Dita | 110 | 488 | 4.43 |
| Jupi | 248 | 1,095 | 4.40 |
| Lapinig | 110 | 485 | 4.40 |
| Manapao | 219 | 968 | 4.40 |
| Naagtan | 221 | 975 | 4.40 |
| Nato | 255 | 1,129 | 4.41 |
| Nazareno | 118 | 522 | 4.41 |
| Ogao | 300 | 1,327 | 4.40 |
| Paco | 351 | 1,552 | 4.40 |
| Patag | 134 | 593 | 4.42 |
| Payawin | 365 | 1,611 | 4.39 |
| Rizal | 609 | 2,690 | 4.37 |
| San Ignacio | 508 | 2,244 | 4.38 |
| Sangat | 188 | 832 | 4.41 |

| | | | |
|------------------------------|---------------|---------------|-------------|
| Sta. Ana | 456 | 2,015 | 4.39 |
| Tabi | 380 | 1,681 | 4.40 |
| Tagaytay | 233 | 1,031 | 4.41 |
| Tigkiw | 231 | 1,019 | 4.39 |
| Tiris | 465 | 2,053 | 4.38 |
| Togawe | 286 | 1,265 | 4.40 |
| Union | 270 | 1,193 | 4.40 |
| Villareal | 141 | 625 | 4.42 |
| Sub-Total | 10,442 | 46,146 | 4.39 |
| TOTAL (Urban + Rural) | 13,471 | 59,534 | 4.39 |

Population Density

As of 2015, the population density of the municipality stands at 426.2 per square kilometer, while urban or poblacion barangays remain to have the highest population density with barangay Balud del Norte posting the highest population density of 215.3 per hectare population density.

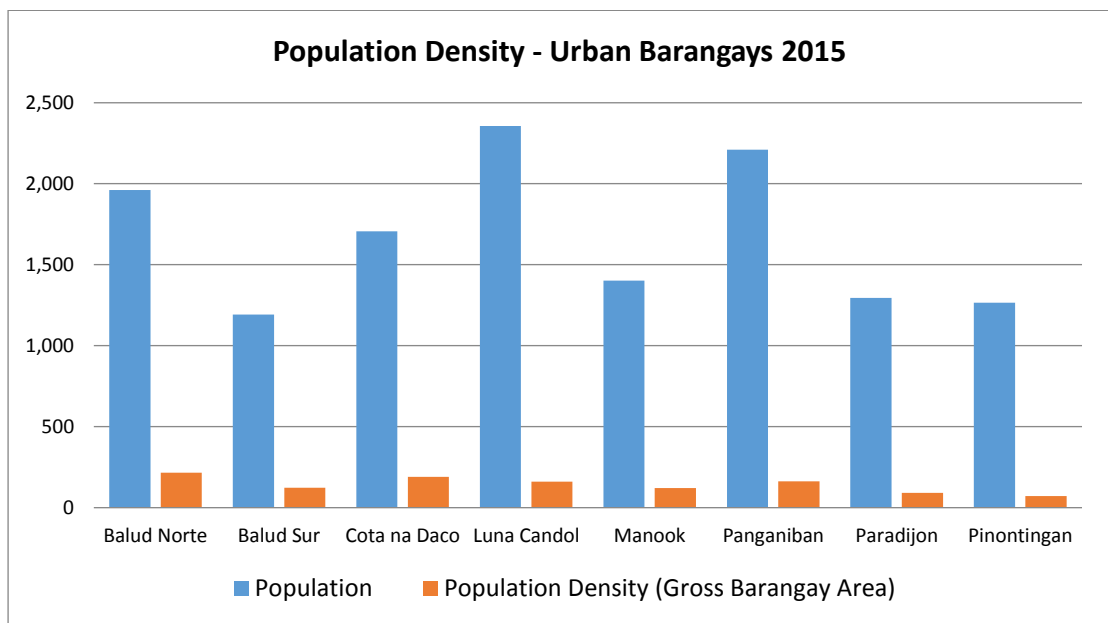


Figure 6. Population Density of Urban Barangays in 2015.

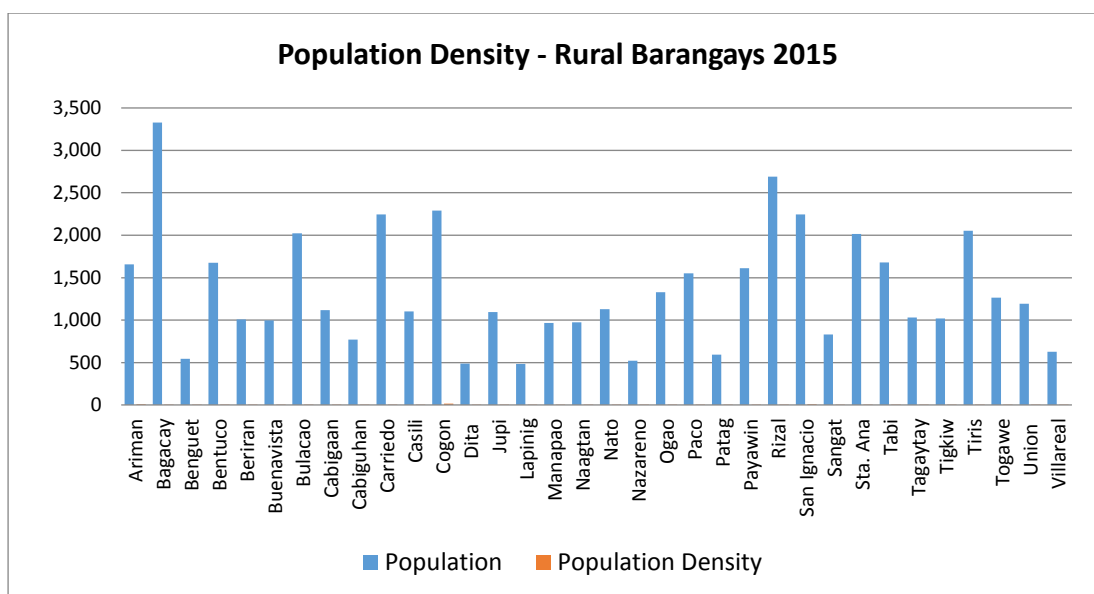


Figure 7. Population Density of Rural Barangays in 2015.

Poverty Incidence

Poverty Incidence*

Table 5. Comparison of Poverty Incidence in Gubat in 2003 and 2009.

| 2003 | | 2009 | |
|-------------------|--------------------------|-------------------|--------------------------|
| Poverty Incidence | Coefficient of Variation | Poverty Incidence | Coefficient of Variation |
| 41.3 | 5.9 | 33.62 | 7.2 |

Data Source: PSA

As per 2009 NSO (PSA) record, the poverty incidence of the municipality is at 33.62, which is significantly lower than the provincial rate of 41.30 and regional rate of 45.10, but higher than the national incidence of 26.50. Per RCBMS 2016 results, there are 7,979 households below the poverty threshold, nearly 59% of the total households; and 42% of households have income below food threshold. Total unemployment rate is at 12.09%.

Based on the June 2015 data from the Department of Social Welfare and Development (DSWD) Region V, there are 4,042 family beneficiaries of the 4Ps program in Gubat. Barangay Bagacay accounts for the greatest number with 243 families while barangay Paradijon with the least/lowest number of beneficiaries of 17 families. By 2018, 4Ps beneficiaries decreased to 3,874.

* In 2018, a Filipino family of five (5) needed P 7,337 average monthly income to buy their Minimum Basic Food Needs and P 10,481 monthly to include Other Minimum Basic Needs. In 2009, food threshold is at PHP 4,869 and poverty threshold is at PHP 7,017.

Table 6. Labor Force.

| | Population 15 Yrs and Over | Employed | % | Unemployed | % |
|------------|----------------------------|----------|------|------------|------|
| Male | 20,261 | 13,764 | 67.9 | 6,497 | 32.1 |
| Female | 20,166 | 4,615 | 22.9 | 15,551 | 77.1 |
| Both Sexes | 40,427 | 18,379 | 45.5 | 22,048 | 54.5 |

Commerce, Trade, and Industry

Major Economic Activities

Agriculture is the main economic resource of Gubat where most of the population is engaged into farming coconut and palay, and fishing. Based on the Rapid Community Based Monitoring System (RCBMS) in CY 2016, out of the 13,471 households, about 25% are engaged in agriculture.

Table 7. Number of Households Engaged in Agriculture.

| Barangay | Agriculture | Livestock and Poultry | Fishing | Forestry and Hunting |
|-----------------|-------------|-----------------------|---------|----------------------|
| Ariman | 69 | 7 | 4 | 0 |
| Bagacay | 107 | 37 | 14 | 1 |
| Balud Del Norte | 1 | 0 | 2 | 0 |
| Balud Del Sur | 8 | 1 | 3 | 0 |
| Benguet | 40 | 13 | 3 | 0 |
| Bentuco | 75 | 10 | 3 | 1 |
| Beriran | 45 | 10 | 3 | 0 |
| Buenavista | 53 | 12 | 9 | 0 |
| Bulacao | 82 | 48 | 0 | 1 |
| Cabigaan | 73 | 15 | 0 | 1 |
| Cabiguhan | 41 | 10 | 0 | 4 |
| Carriedo | 96 | 9 | 0 | 0 |
| Casili | 57 | 11 | 1 | 2 |
| Cogon | 17 | 7 | 11 | 2 |
| Cota Na Daco | 18 | 1 | 11 | 0 |
| Dita | 33 | 9 | 0 | 0 |
| Jupi | 86 | 19 | 0 | 1 |
| Lapinig | 18 | 11 | 0 | 0 |
| Luna-Candol | 72 | 9 | 1 | 0 |
| Manapao | 78 | 26 | 0 | 3 |
| Manook | 1 | 0 | 0 | 0 |
| Naagtán | 75 | 16 | 0 | 1 |
| Nato | 72 | 19 | 0 | 0 |
| Nazareno | 44 | 16 | 1 | 1 |
| Ogao | 50 | 22 | 5 | 0 |
| Paco | 61 | 21 | 14 | 5 |
| Panganiban | 38 | 2 | 1 | 0 |
| Paradijon | 17 | 0 | 0 | 0 |
| Patag | 42 | 16 | 0 | 0 |
| Payawin | 92 | 29 | 0 | 0 |
| Pinontingan | 23 | 1 | 5 | 0 |

| | | | | |
|--------------|-------------|------------|------------|-----------|
| Rizal | 155 | 38 | 8 | 0 |
| San Ignacio | 59 | 19 | 5 | 29 |
| Sangat | 91 | 11 | 0 | 6 |
| Santa Ana | 100 | 26 | 1 | 1 |
| Tabi | 82 | 9 | 4 | 1 |
| Tagaytay | 58 | 13 | 1 | 0 |
| Tigkiw | 68 | 15 | 0 | 2 |
| Tiris | 136 | 35 | 16 | 0 |
| Togawe | 85 | 31 | 1 | 4 |
| Union | 87 | 31 | 0 | 2 |
| Villareal | 45 | 14 | 0 | 0 |
| TOTAL | 2550 | 649 | 127 | 68 |

Data Source: RCBMS 2016

Table 8. Number of Households Engaged in Other Sources of Income.

| Barangay | Wholesale and Retail | Manufacturing | Community, Social, Recreational, and Personal Services | Transportation, Storage and Communication Service | Mining and Quarrying | Construction | Activities Not Elsewhere Classified | Wholesale/ Retail |
|-----------------|----------------------|---------------|--------------------------------------------------------|---------------------------------------------------|----------------------|--------------|-------------------------------------|-------------------|
| Ariman | 12 | 3 | 0 | 2 | 1 | 1 | 1 | 12 |
| Bagacay | 67 | 6 | 0 | 4 | 0 | 9 | 1 | 67 |
| Balud Del Norte | 9 | 0 | 4 | 1 | 0 | 2 | 3 | 9 |
| Balud Del Sur | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Benguet | 2 | 0 | 0 | 4 | 0 | 5 | 0 | 2 |
| Bentuco | 22 | 4 | 2 | 1 | 0 | 1 | 1 | 22 |
| Beriran | 8 | 0 | 1 | 5 | 1 | 6 | 0 | 8 |
| Buenavista | 21 | 7 | 0 | 7 | 0 | 5 | 1 | 21 |
| Bulacao | 1 | 0 | 0 | 2 | 0 | 2 | 0 | 1 |
| Cabigaan | 4 | 3 | 2 | 3 | 0 | 8 | 0 | 4 |
| Cabiguhan | 15 | 7 | 0 | 3 | 0 | 4 | 2 | 15 |
| Carriedo | 1 | 0 | 0 | 3 | 0 | 3 | 0 | 1 |
| Casili | 13 | 3 | 1 | 4 | 0 | 1 | 0 | 13 |
| Cogon | 14 | 0 | 8 | 6 | 0 | 4 | 2 | 14 |
| Cota Na Daco | 15 | 1 | 1 | 3 | 0 | 2 | 2 | 15 |
| Dita | 5 | 12 | 2 | 5 | 0 | 3 | 0 | 5 |
| Jupi | 8 | 5 | 1 | 4 | 0 | 5 | 1 | 8 |
| Lapinig | 4 | 1 | 3 | 1 | 0 | 1 | 0 | 4 |
| Luna-Candol | 39 | 3 | 0 | 3 | 0 | 3 | 2 | 39 |
| Manapao | 9 | 8 | 1 | 2 | 0 | 4 | 0 | 9 |
| Manook | 1 | 0 | 0 | 2 | 0 | 0 | 1 | 1 |
| Naagtán | 4 | 1 | 1 | 3 | 0 | 1 | 1 | 4 |
| Nato | 6 | 3 | 1 | 2 | 0 | 1 | 0 | 6 |
| Nazareno | 3 | 10 | 1 | 4 | 0 | 0 | 0 | 3 |
| Ogao | 15 | 2 | 1 | 6 | 0 | 5 | 0 | 15 |
| Paco | 25 | 2 | 2 | 3 | 1 | 7 | 4 | 25 |
| Panganiban | 5 | 0 | 1 | 2 | 0 | 1 | 1 | 5 |
| Paradijon | 10 | 1 | 1 | 8 | 0 | 3 | 2 | 10 |
| Patag | 3 | 7 | 2 | 1 | 0 | 4 | 0 | 3 |

| | | | | | | | | |
|-------------|----|----|---|----|---|----|---|----|
| Payawin | 15 | 3 | 2 | 2 | 0 | 9 | 0 | 15 |
| Pinontingan | 7 | 1 | 0 | 7 | 0 | 3 | 0 | 7 |
| Rizal | 9 | 2 | 1 | 6 | 1 | 11 | 1 | 9 |
| San Ignacio | 22 | 6 | 0 | 12 | 0 | 3 | 1 | 22 |
| Sangat | 4 | 3 | 0 | 4 | 0 | 0 | 1 | 4 |
| Santa Ana | 20 | 5 | 2 | 5 | 0 | 1 | 3 | 20 |
| Tabi | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Tagaytay | 11 | 16 | 1 | 2 | 1 | 4 | 0 | 11 |
| Tigkiw | 3 | 5 | 0 | 2 | 0 | 1 | 1 | 3 |
| Tiris | 26 | 1 | 0 | 1 | 0 | 2 | 2 | 26 |
| Togawe | 4 | 6 | 1 | 3 | 0 | 6 | 2 | 4 |
| Union | 13 | 2 | 0 | 1 | 0 | 1 | 0 | 13 |
| Villareal | 4 | 1 | 1 | 4 | 0 | 4 | 0 | 4 |

Meanwhile, as the commercial and trade center of the neighboring municipalities of Prieto Diaz, Barcelona, and Bulusan, the municipality shows an increasing pattern of business registrations, with a steady number of new registrants in the last three years. However, the data in 2018 represents only 70% of the total 1,078 business establishments in the municipality.

Table 9. Number of Establishments by Industry Sectors.

| Business/ Commercial Establishments | | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|------------------------------------------------------------|---------------|------|------|------|------|------|------|------|
| Total Number of Registered Business Establishments to date | | 500 | 529 | 553 | 469 | 499 | 753 | 761 |
| | With Plate | 370 | 342 | 369 | | 268 | | |
| | Without Plate | 130 | 187 | 184 | | 231 | | |
| Fish | Existing | | | | | 80 | 79 | 71 |
| | Registered | | | | | 9 | 35 | 34 |
| Meat | Existing | | | | | 23 | 23 | 15 |
| | Registered | | | | | 8 | 11 | 11 |
| Carenderia | Existing | | | | | 27 | 35 | 13 |
| | Registered | | | | | 16 | 29 | 8 |
| Vegetable | Existing | | | | | 30 | 45 | 54 |
| | Registered | | | | | 16 | 32 | 41 |
| Sarisari | Existing | | | | | 105 | 112 | 72 |
| | Registered | | | | | 83 | 88 | 64 |
| Grocery | Existing | | | | | 31 | 45 | 76 |
| | Registered | | | | | 26 | 33 | 63 |
| Vegetable | Existing | | | | | 17 | 16 | 15 |
| | Registered | | | | | 16 | 15 | 14 |
| Others | Registered | | | | | | 447 | 526 |

Data Source: BPLO

The results of the assessment of the LGU competitiveness and business-friendliness from the National Competitiveness Council and Philippine Chamber of Commerce and Industry's Business-friendly LGU Awards Program shows that in 2018, Gubat is at the bottom of overall ranking of all municipalities at 1,064 out of 1,368 entries.

Among 1st and 2nd class municipalities, it ranks at 430 among 490 entries, an improvement of fifty places from its ranking in 2016. The ranking gives us an idea of how the LGU stands in terms of having a business-friendly environment for its investors.

Table 10. Inventory of Commercial Establishment by Economic Activities.

| Economic Activities | 2017 | | 2018 | |
|-----------------------------------------------|----------------|------------|----------------|------------|
| | Establishments | Employment | Establishments | Employment |
| Wholesale and Retail Trade | 690 | 1125 | 727 | 1273 |
| Hotel and Restaurants, Transport, and Storage | 38 | 159 | 14 | 135 |
| Communication | 1 | 1 | 1 | 1 |
| Financial Intermediation | 19 | 31 | 12 | 136 |
| Real Estate Renting and Business Activities | 5 | 49 | 7 | 55 |

Data Source: BPLO

Table 11. Employment by Type/Classification/Type of Business and Trade in 2018.

| Type/ Classification/ Kind of Business and Trade | Number of Employment |
|--------------------------------------------------|----------------------|
| Wholesale Trade and Retail | 1169 |
| Banking and Finances | 176 |
| Real Estate/ Construction | |
| Services | 255 |
| Total | |

Data Source: BPLO

Table 12. Number of Business Establishments by Barangay.

| Barangay | With Mayor's Permit | With Barangay Permit | Without Barangay Permit | Total |
|-----------------|---------------------|----------------------|-------------------------|-------|
| Ariman | 10 | 34 | 11 | 45 |
| Bagacay | 14 | 40 | 23 | 63 |
| Balud Del Norte | 5 | 26 | 1 | 27 |
| Balud Del Sur | 10 | 20 | 9 | 29 |
| Benguet | 0 | 5 | 1 | 6 |
| Bentuco | 3 | 12 | 2 | 14 |
| Beriran | 3 | 10 | 1 | 11 |
| Buenavista | 8 | 17 | 16 | 33 |
| Bulacao | 5 | 16 | 4 | 20 |
| Cabigaan | 0 | 5 | 11 | 16 |
| Cabiguhan | 1 | 3 | 8 | 11 |
| Carriedo | 9 | 32 | 17 | 49 |
| Casili | 2 | 12 | 5 | 17 |
| Cogon | 23 | 45 | 4 | 49 |
| Cota Na Daco | 16 | 39 | 6 | 45 |
| Dita | 0 | 5 | 1 | 6 |
| Jupi | 0 | 4 | 1 | 5 |
| Lapinig | 0 | 3 | 4 | 7 |
| Luna-Candol | 20 | 37 | 20 | 57 |
| Manapao | 0 | 18 | 2 | 20 |
| Manook | 46 | 65 | 5 | 70 |
| Naagtan | 1 | 5 | 5 | 10 |
| Nato | 4 | 25 | 2 | 27 |
| Nazareno | 1 | 6 | 4 | 10 |

| | | | | |
|--------------|------------|------------|------------|-------------|
| Ogao | 2 | 10 | 0 | 10 |
| Paco | 7 | 19 | 7 | 26 |
| Panganiban | 15 | 31 | 5 | 36 |
| Paradijon | 34 | 40 | 5 | 45 |
| Patag | 0 | 7 | 6 | 13 |
| Payawin | 2 | 24 | 8 | 32 |
| Pinontingan | 47 | 67 | 0 | 67 |
| Rizal | 9 | 48 | 9 | 57 |
| San Ignacio | 3 | 6 | 0 | 6 |
| Sangat | 1 | 15 | 0 | 15 |
| Santa Ana | 2 | 27 | 1 | 28 |
| Tabi | 4 | 13 | 8 | 21 |
| Tagaytay | 1 | 12 | 4 | 16 |
| Tigkiw | 1 | 2 | 5 | 7 |
| Tiris | 9 | 19 | 3 | 22 |
| Togawe | 1 | 8 | 2 | 10 |
| Union | 0 | 12 | 0 | 12 |
| Villareal | 0 | 7 | 1 | 8 |
| TOTAL | 319 | 851 | 227 | 1078 |

Data Source: BPLO

Gubat Public Market

Gubat Public Market is located at the heart of the town proper, along Manook Street, the main transit route of the town. The public market is the center of economic activities of the town and neighbor towns Barcelona, Bulusan and Prieto Diaz. It is also the powerful economic engine that provides entrepreneurial opportunities and jobs for the people of Gubat. It showcases a combination of local produce and goods where most households buy their food fresh every day.

More than simply a place to buy food and goods, the public market also brings social and cultural value to Gubat. It offers local delicacies and products unique to the town. And for the travellers, it is the place where one can have a glimpse of how Gubatnon live their everyday lives.

Unfortunately, the market was razed in a major fire in June 2014. The main building where the wet section was located as well as the C-section around it was totally destroyed. It displaced 302 of the 386 market vendors.

The incident made a significant impact on the municipality's economy where 83% of its market vendors lost their primary source of livelihood. As a temporary answer for the displaced vendors, the local government allowed them to set up stalls along the market's surrounding roads. But this proved to be impractical, in that it led to both traffic congestion and sanitation problems. Also, there is a drastic decline in the collection revenue from market charges because of the local government's non-billing of fees from vendors who were affected by fire.

With these constraints, the rebuilding the public market became a high priority for the local government, but, financing for the immediate reconstruction was beyond the municipality's capability. It took three years just to rebuild the main building.

As a key component of the local economy, the new administration not only envisions reconstructing the old public market but envisions building a modern commercial facility that will be the center of economic activities in the eastern part of the province. A two-storey complex was designed. The complex will include the newly constructed main building at the center and a C-section building around it with street-front stores and commercial shops at the ground level and another commercial block at the second level.

Before the fire in 2014, the public market collects occupancy fees for 386 tables and stalls. Data from the Municipal Treasurer's Office showed that in 2013, the local government collected a total of P2.38 million for stall rentals. It was only 66% of the target annual collection of P3.6 million.

In 2016, the local government further decreased its rental collection. Total collection reached P990, 000 for rental fees, 58% lower than the collection before the fire. The decrease in collection is attributed to the non-billing of fees from vendors who were affected by fire. Further, owners of the old market built temporary stalls after the fire using their own fund which resulted to non-collection of fees from them, a concession made with the LGU.

Figure 8 shows the revenue being collected in 2016 with the market's current state and revenue before the fire in 2013:

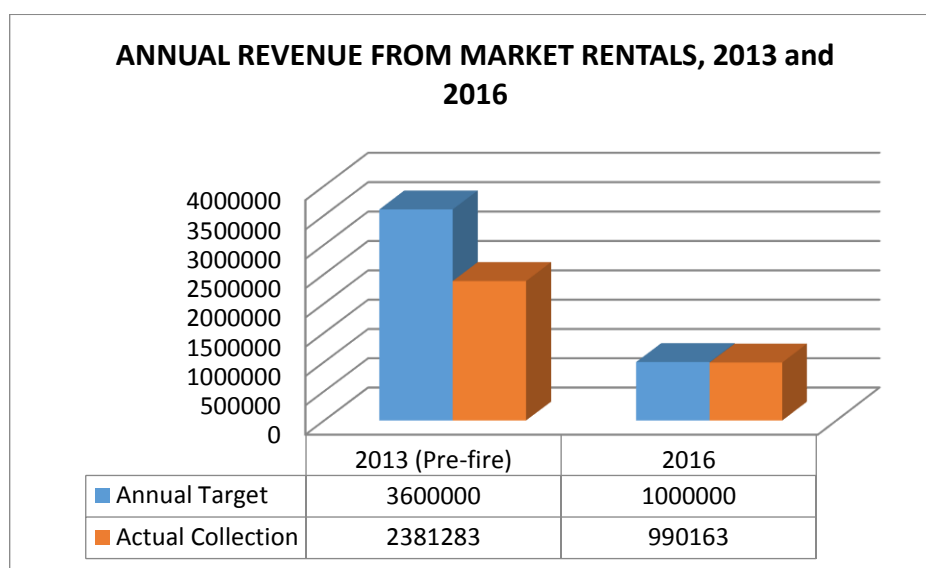


Figure 8. Annual Revenue from Market Rentals in 2013 and 2016.

Data Source: Municipal Treasurer's Office

Another factor for the low collection of revenue from the market rentals is the local government's out-dated market charges. The rate of market rentals only ranges from P1.00 - P2.30 per square meters per day which displays a very low rate compared to charges imposed by other second class municipalities in the province. With this, the local government is now on the process of updating its revenue code to significantly increase its collection.

Though the population growth rate of the municipality is low, there is a relative increase in daytime population and temporary inhabitants. The municipality is home to two tertiary educational institutions, the Bicol University- Gubat Campus and Database Computer School that house around 2,000 populations of students coming from different parts of the region. Likewise, the emerging tourism industry in the municipality also has great influence on the observed increase of daytime or temporary inhabitants. In 2018 alone, arrivals of tourists have reached 32,779 as surfing and other coastal and marine activities attracted people to visit the municipality.

To complement the needs of tourists, establishments like resorts, inns and restaurants are sprouting. Currently, there are around 10 accommodation establishments and 6 restaurants in the municipality.

Financing and Related Services

As of 2018, there are three (3) banks: two (2) rural banks, one (1) consolidated bank and three (3) Automated Teller Machines operating in the municipality providing financial services to the general public. Complementing the banks are six (6) money changers, three (3) money shops, four (4) pawnshops, and several credit institutions. These institutions provide loans and other allied services to the public.

Banks

- Rural Bank of Guinobatan
- Rural Bank of San Jacinto, Masbate
- First Consolidated Bank

Pawnshops

- ML Lhuellier Pawnshop
- Cebuana Lhuellier Pawnshop
- Palawan Pawnshop
- FR Santiago Pawnshop

Money Shops

- Western Union
- Moneygram
- ML Lhuellier Pawnshop
- Cebuana Lhuellier Pawnshop
- Palawan Pawnshop
- LBC

Credit Institutions

- Gubat St. Anthony Credit Cooperative
- ASA Philippines
- PALFSI (People's Alternative Livelihood Foundation Of Sorsogon. Inc.)
- CARD
- HELP
- 1 Puhunan

Current Land Use

Agricultural lands occupy the major part of the municipality's landscape, with a total area of 9,921.59 hectares or 86.87% of the total land area. Agricultural lands can be found in all barangays except the urban poblacion barangays, namely, Cota na Daco, Balud del Norte, Balud del Sur, Manook, Luna Candol, Paradijon, Pinontingan and Panganiban. These are primarily devoted to permanent crops like palay, coconut and other crops. High value crops like vegetables, citrus, fruit trees, banana and root

crops are found in areas not planted to permanent crops, or intercropped on coconut lands.

Urban use area comprises 1.5% of the total land area or 170.44 hectares. Residential areas cover 691.05 hectares. Commercial and institutional areas cover 23.3 hectares and 77.74 hectares, respectively. There is only .17 hectare devoted for tourism purposes, 4.71 hectares for agri-industrial purpose, 10.46 hectares for cemeteries and 8.12 hectares for parks and playgrounds. The controlled dumpsite located at Tagaytay covers an area of 1.12 hectares. Mangrove forests cover an area of 682.91 hectares.

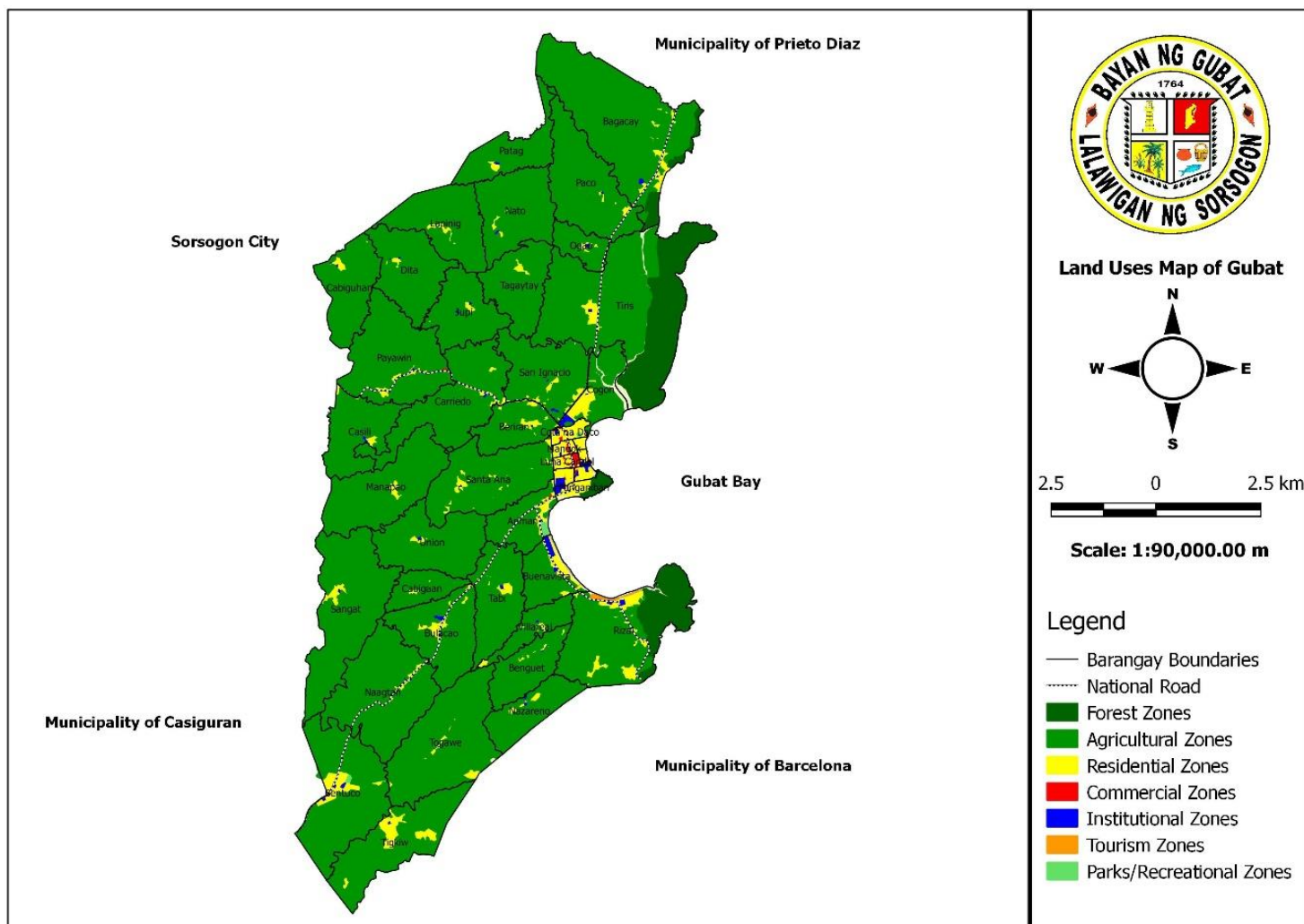


Figure 9. Land Use Map of Gubat.

C. Planning Context

As stated in the Comprehensive Land Use Plan (CLUP) 2019 - 2028, the vision of the municipality is “Gubat as a center of trade, industry, agro-ecotourism, and quality education.” “It shall be a prime example in the practice of well-managed and principled government that will speed up and sustain competitive and progressive local economy; significantly expanding and improving infrastructure anchored on a climate-adaptive and sustained green environment; while maintaining a God-loving, peaceful, gender-fair, and educated community towards a healthy, self-reliant, dignified, and participative society.”

The success indicators of being self-reliant are safe and disaster-sensitive human settlements, healthy and stable environment, increased capacity to recover after disasters and enhanced adaptive capacity to climate change and its impacts and related hazards.

Goals stated in the CLUP 2019-2028 relevant to climate risks and disasters and adaptation are:

Economic Development

1. Expand support to agri-fishery development and introduce adaptive measures against climate change for sustainability and food security;
2. Improve mobility of goods, services, workers and tourists through the establishment of an integrated transport system and a progressive mass communication industry;

Social Development

1. Ensure adaptive, safe, risk-resilient, disaster-sensitive, and decent human settlement;
2. Ensure peaceful, safe, and secured communities;

Environmental Management

1. Ensure a healthy and productive environment that is resilient to climate hazards and natural disasters;
2. Build green infrastructure facilities that promote environmental sustainability;
3. Conserve floodplains;
4. Encourage the use of renewable sources of energy and water recycling facilities;
5. Ensure protected area management and rehabilitation; and
6. Improve solid waste and waste water management.

Institutional

1. Strengthen partnership and collaboration to enhance delivery of social good, sustainable development, and climate change adaptation strategies; and
2. Enhance frontline service delivery efficiency and effectiveness.

Infrastructure

1. Expand infrastructure support to agriculture, farm to market roads, and irrigation;
2. Build disaster-risk sensitive facilities to mitigate the negative impact of climate change; and
3. Ensure sustainable tourism facilities, amenities, and services.

These goals were aligned with UN Sustainable Development Goals, and the Philippine Development Plan - Ambisyon Nation 2040.

D. Planning Approach

The LCCAP 2019-2028 of the Municipality of Gubat is a local adaptation of the National Framework Strategy on Climate Change (Climate Change Commission, 2010). As such, it is formulated within the context of the municipality's goals and objectives and its capacity to adapt to climate change impacts and related disasters as presented in the Comprehensive Development Plan 2017-2023 and Comprehensive Land Use Plan 2019-2028. Prior to the formulation, an in-depth Vulnerability and Adaptation Assessment was conducted in all barangays of Gubat following the guide provided in LGU Guidebook on the Formulation of LCCAP. It was done to gather all data relevant to LCCAP formulation, identify areas and sectors exposed to different climate-related and geophysical hazards, determine climate change impacts, vulnerability and adaptive capacity of areas and sectors at risk, and validate existing local, regional, and national data. Climate and Disaster Risk Assessment (CDRA) results were also made an integral part in LCCAP formulation. It was done to examine the degree of exposure of human and natural systems to climate stimuli and hazards, assess vulnerabilities and sensitivities, and provide sound information to supplement local planning process.

The Municipality of Gubat LCCAP 2019-2028 was formulated using the Climate Change Framework of NFSCC (Figure 10). It carefully considers impacts of climate change in different sectors and how vulnerabilities should be addressed using adaptation, mitigation, and cross-cutting strategies supported by means of implementation.

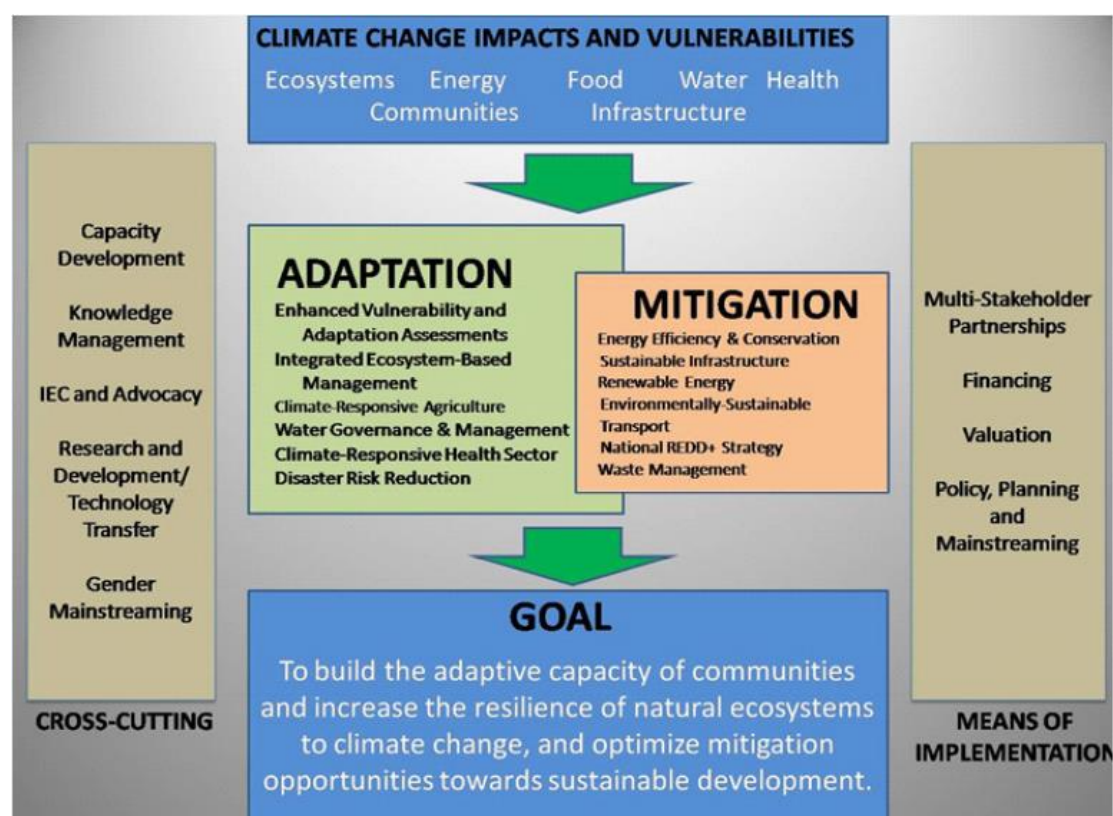


Figure 10. Operational Diagram of NSCC.

This plan was also anchored on the guiding principles of NFSCC as follows:

1. The Framework envisions a climate risk-resilient Philippines with healthy, safe, prosperous and self-reliant communities, and thriving and productive ecosystems.
2. The goal is to build the adaptive capacity of communities and increase the resilience of natural ecosystems to climate change, and optimize mitigation opportunities towards sustainable development.
3. The Philippines, as a State Party to the United Nations Framework Convention on Climate Change (UNFCCC), is committed to its core principle of common but differentiated responsibilities and respective capabilities.
4. The precautionary principle guides the State's climate change framework and shall take precautionary measures to anticipate, prevent or minimize the causes of climate change and its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures.
5. The Framework is risk-based, and strategies/activities shall be formulated, with decisions made based on the causes, magnitude and impact of risks.
6. Climate change knowledge is science-based, and shall draw from scientific contributions and best practices from communities taking into considerations local circumstances.
7. The national priorities, and therefore, the pillars, of the National Framework Strategy on Climate Change shall be adaptation and mitigation, with an emphasis on adaptation as the anchor strategy. Whenever applicable, mitigation actions shall also be pursued as a function of adaptation.
8. Adaptation measures shall be based on equity, in accordance with common but differentiated responsibility; special attention must be given to ensure equal and equitable protection of the poor, women, children and other vulnerable and disadvantaged sectors.
9. Even with inadequate scientific information, anticipatory adaptation measures should be undertaken to prevent or minimize the causes and potential impacts of climate change, whenever necessary.
10. The Framework adopts the Philippine Agenda 21 for Sustainable Development, to fulfill human needs while maintaining the quality of the natural environment for current and future generations.
11. The principle of complementation shall be observed to ensure that climate change initiatives by one sector do not restrict the adaptation of other sectors.
12. The Framework recognizes the roles of agencies and their respective mandates as provided by law. The Framework also recognizes the principle of subsidiarity and the role of local governments as front-liners in addressing climate change.
13. The Framework recognizes the value of forming multi-stakeholder participation and partnerships in climate change initiatives, including partnerships with civil society, the private sector and local governments, and especially with indigenous peoples and other marginalized groups most vulnerable to climate change impacts.
14. Policy and incentive mechanisms to facilitate private sector participation in addressing adaptation and mitigation objectives shall be promoted and supported.

II. VULNERABILITY AND ADAPTATION ASSESSMENT RESULT

A. Climate Related Hazards and Its Impacts to LGU

Current Climate and Climate Change Trends

In the absence of local data, of current climate data used in this paper were obtained from the report Climate Change in the Philippines published by PAG-ASA in February 2011. Said report provided climate and climate change trends in all regions of the Philippines including Sorsogon Province which was used in this analysis.

The climate projections for Gubat, Sorsogon were based on the projected changes of different climate variables for 2020 and 2050 using the observed baseline from 1971 to 2000 (PAGASA, 2011) (Table 13). The climate projection information includes temperature, rainfall, and frequency of extreme events.

Table 13. Climate Change Projections.

| Climate Variable | Observed Baseline | Specific Change Expected and Reference Period | General Changes Expected in Climate Variables | Information About Patterns of Change | Exposure Unit |
|--------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Temperature | 25.9°C DJF 27.4°C MAM 27.9°C JJA 27.3°C SON | DJF 0.8°C (2020); 2.1°C (2050) MAM 1.1°C (2020); 2.1°C (2050) JJA 0.9°C (2020); 1.8°C (2050) SON 0.9°C (2020); 1.5°C (2050) | Increase in temperature 0.8 - 1.1 in 2020 and 1.5 - 2.1 in 2050; highest projected increase of 1.1 during MAM in 2020; highest projected increase of 2.1 during DJF and MAM in 2050 | Increase in temperature is likely by 2020 and 2050; hotter during DJF (Amihan season) in 2050 | All |
| Rainfall | 958.1 DJF 427.9 MAM 660.4 JJA 973.6 SON | DJF 5.1 (2020); 7.4 (2050) MAM -6.8 (2020); -11.4 (2050) JJA 14.6 (2020); 27.3 (2050) SON 10.8 (2020); 16.2 (2050) | Decreased rainfall in MAM; increased rainfall the rest of the year | Reduction in rainfall during the summer months; rainfall increase the rest of the year, highest during JJA; wetter wet season, drier dry season | All |
| Number of hot days >35°C | 360 | 411 days (2020) 1627 days (2050) | More number of hot days in 2020 and 2050 | Increase in hotter hot days in 2020 and 2050 | All |
| Number of dry days <2.5 mm rainfall | 6378 | 7288 days (2020) 6816 days (2050) | More number of dry days (2020); reduced in 2050 compared to 2020, higher than OBS | Increase in drier dry days in 2020 and 2050 | All |
| Number of days with rainfall > 200mm | 15 extreme rainfall events exceeding >200 mm | 86 days (2020) 94 days (2050) | More days with extreme rainfall events >200mm in 2020 and 2050 | | All |
| Sea level | 1986 - 2005 Global/Phil mean sea level [Check NASA data] | Projected change by 2100 relative to 1986-2005 Global mean sea level 0.28 to 0.61 m for RCP 2.6 0.36 to 0.71 m for RCP 4.5 0.38 to 0.73 m for RCP 6.0 0.52 to 0.98 m for RCP 8.5 | SLR in Philippines is larger than global average SLR | Increased hazard posed by storm surge and coastal flooding | All |
| Typhoon/ Super typhoon | ___Strong wind / heavy rain events (Milenyo data, compare to Sisang); 19-20 annual average frequency | 18-19 annually | Slight decrease in frequency (nationwide); however, more typhoon category storms to affect Sorsogon | Increased flooding, landslide and strong wind hazards | All |

Temperature

Sorsogon Province experienced an increasing temperature from 1971 to 2000 as seen on Figure 11 below. The highest average annual seasonal temperature in this period is 27.9 C during the months of June, July, August (JJA) while the lowest average annual seasonal temperature is 25.9C experienced during the months of September, October and November (SON). From 2006 to 2035, temperature is expected to increase by an average of 0.925 C with 28.5C as the highest projected temperature during the months of March, April, and May (MAM). In year 2050 or from 2036 to 2065, temperature is projected to increase by an average of 1.75C with 29.5C as the highest temperature during the months of MAM.

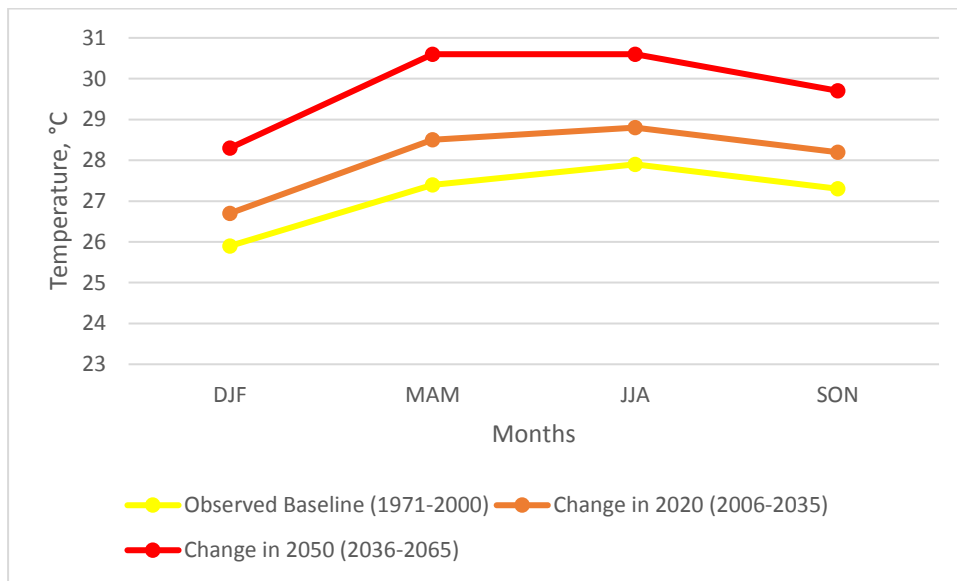


Figure 11. Seasonal temperature increases (in °c) in 2020 and 2050 under medium-range emission scenario in sorsogon province.

On the national average level, the Philippine experienced increasing temperature from 1951-2010 (Figure 12). An increase of 0.648 C for the period of 59 years or an average of 0.0108 C per year was observed.

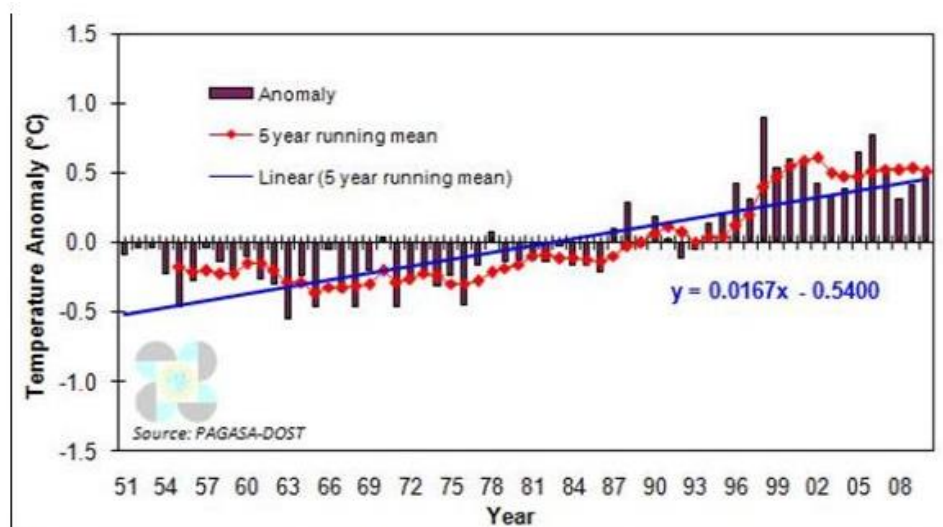


Figure 12. Observed annual mean temperature anomalies (1951-2010) in the Philippines based on 1971-2000 normal values.

Rainfall

Using the observed baseline data from 1971 - 2000, the average annual rainfall is 755 mm with 958.1 mm as the maximum rainfall during the months of SON and minimum rainfall during the months of MAM at 427.9 mm. From 2006-2035, average annual rainfall is expected to increase by 5.93% or to 810.33 mm. However, during the months of MAM it is projected to decrease to 398.80 mm or by 6.8%. In 2050 or during the period of 2036 to 2035, average annual rainfall is projected to increase to 845.03 mm or by 9.9%. In the months of MAM, rainfall is projected to decrease to as low as 379.12 mm or by 11.4% (Figure 13).

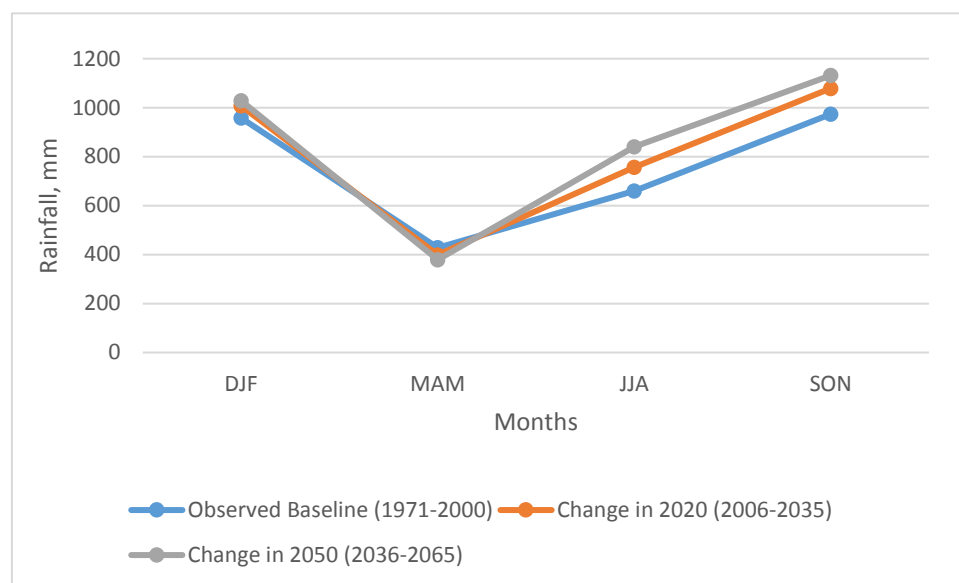


Figure 13. Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in Sorsogon province.

Extreme Weather Events

As defined by PAG - ASA, extreme weather events are extreme temperature, dry days, and extreme rainfall. In this context, data assessed in Catarman, Northern Samar were used for the Municipality of Gubat as instructed by PAG - ASA.

Extreme temperature is assessed as the number of days with temperature exceeding 35 °C based on the threshold values used in other areas of Asia Pacific Region. From 1971 to 2000, there was a total of 360 days with extreme temperature (Figure 14). It is projected to increase in the coming years, with 411 days from 2006 to 2035 and 1,627 days from 2036 to 2065.

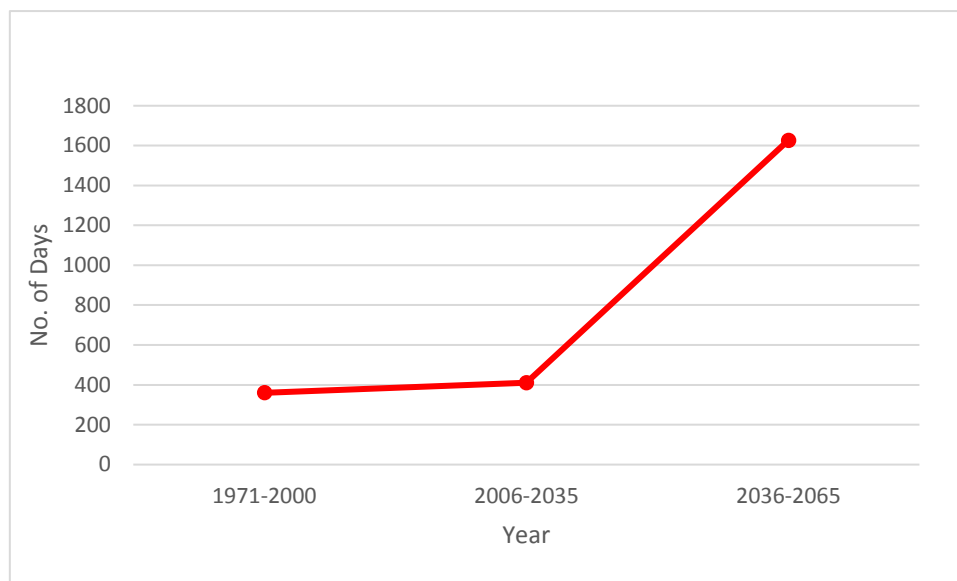


Figure 14. Number of days with $T_{max} > 35$ C in 2020 and 2050 in Sorsogon province.

On the other hand, dry days are assessed as the number of days with rainfall less than or equal to 2.5 mm per day following the standard values used by World Meteorological Organization in other countries. As depicted in Figure 15 below, there were 6,378 dry days from 1971 to 2000. It is projected to increase to 7,288 dry days in 2006 to 2035 but will eventually decrease to 6,816 dry days from 2036 to 2065.

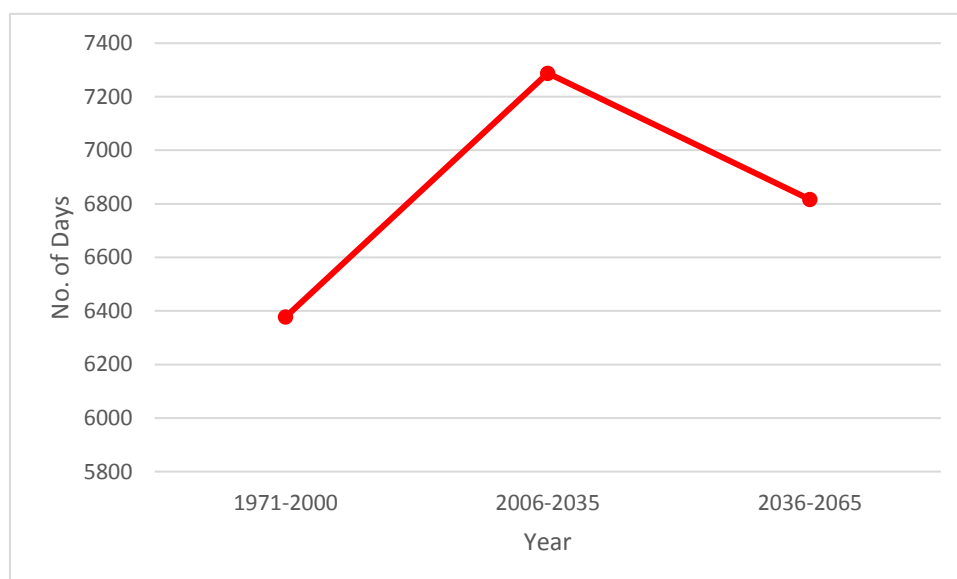


Figure 15. Number of dry days in 2020 and 2050 in Sorsogon province.

Extreme rainfall is assessed as the number of days with rainfall greater than 300 mm. Being a wet tropical country, this amount of rainfall can lead to disastrous events such as flooding and rain-induced landslides and lead to substantial amount of damage, loss of properties, and casualties. In Catarman, there were 15 days with extreme rainfall from 1971 to 2000. It is projected to increase to 86 days and 94 days from 2006 to 2035 and from 2036 to 2065, respectively (Figure 16).

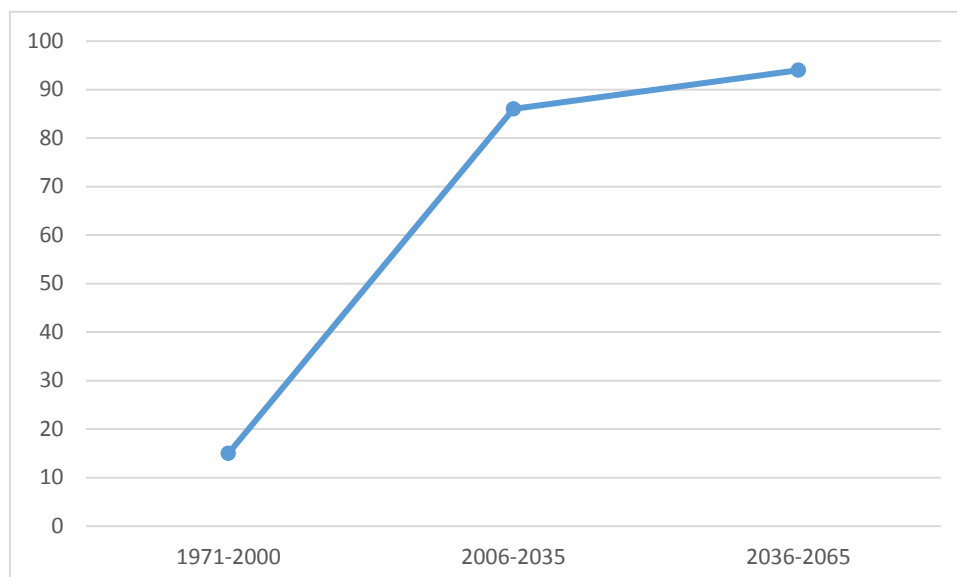


Figure 16. Number of days with rainfall > 300 mm in 2020 and 2050 in Sorsogon province.

Based on this climate projection, the municipality will experience an increase in temperature by 2020 and 2050 for all seasons with the highest increase in temperature during the months of March, April, and May (summer months). Decrease in rainfall will occur in the months of March, April, May, while the number of hot days is expected to have a significant increase by 2020 and will continue by 2050, and would be hotter during Amihan season (December, January, February). Although there will be more dry days in 2020 compared to 2050, days would be drier in both years compared to the baseline. However, it is also expected to have more days with extreme daily rainfall of >200mm for 2020 and 2050.

B. Risk Areas and Threats

Hazards can be classified into geologic and climate-related hazard. Geologic hazards include ground shaking, liquefaction, and tsunami while climate related hazards are flooding, rain-induced landslide, and severe winds. For the Municipality of Gubat, climate-related hazards which are taken into account in this plan include impacts of increasing temperature such as dry spell and drought, impacts of extreme precipitation such as rain-induced landslide and flooding, sea level rise, strong winds, and strong surges brought about by super typhoons. Geologic hazards are deemed as pre-existing conditions which further increase the sensitivity and vulnerability to climate change risks and hazards and, therefore, may be integrated into other plans of the municipality such as Local Disaster Risk Reduction Management Plan (LDRRMP).

The Municipality of Gubat is a relatively lowland area and highest elevation doesn't exceed 166 meters above sea level. Risk areas are those located beside the rivers, riverbanks, coastal areas, and hills with steep slopes. Located on the eastern Pacific coast, the municipality is also frequented by typhoons and tropical storms passing through Eastern Visayas and Bicol Region. This catalyzes events of landslides, flooding, storm surge accompanied with strong winds causing damages to natural, lifeline and critical facilities, and infrastructures. Being an agricultural community, the most at-risk and threatened sector is the agriculture sector.

Flood Hazard Areas

Based on the Climate Disaster Risk Assessment (CDRA) and as noted during Focus Group Discussions for Vulnerability and Adaptation Assessment (VAA), flooding in Municipality of Gubat is attributed to the following factors:

- Continuous and heavy rainfall that accumulates in low-lying areas with poor drainage
- Overflowing of rivers and creeks
- Storm surge due to typhoons
- Tidal changes due to monsoons and low pressure area

Flooding is expected to intensify due to climate change especially during rainy season. Destruction of properties, casualties, and disruption in delivery of goods and services are just some of the negative impacts of flooding which require measures in order to reduce risks and sensitivity of communities.

Based on the Flood Hazard Map developed by DENR-MGB (Figure 18), 30% of the total land area or 34,503,065.77 hectares are susceptible to flooding from very high to low susceptibility. Of this total area, 9% is very highly flood-susceptible, 2% at high flood susceptibility, 3% at moderate flood susceptibility, and 16% at low flood susceptibility (Figure 17).

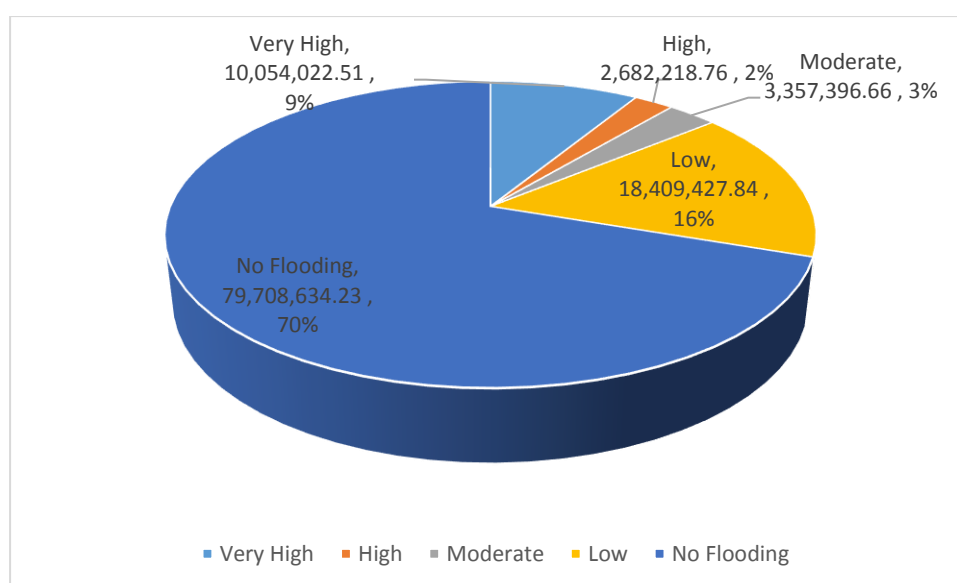


Figure 17. Flood susceptibility land area and percent

Barangay Cogon and Bagacay have the largest area highly susceptible to flood relative to total land area. Areas include mangroves and along the Tingting river in Brgy. Cogon. These areas are likely to be inundated by floods with depth of 1.0 to 1.5 m during 25-year and 50-year flood events. Flood duration is several days to one week.

All poblacion barangays are moderately susceptible to flood. These areas are likely to be inundated by floods with depth of 0.5 m to 1.0 m during 25-year and 50-year flood events. Flood lasts for a few days.

Brgy. Ariman, Carriedo, and Jupi have the largest area with low susceptibility to flood and likely to be inundated by floods with depth of less than 0.5 m during 25-year and 50-year

flood events. Flood duration is from several hours to a few days. Flooding on these barangays are triggered by overflowing of Tingting river and rivulets in Carriedo and Jupi and Basiao river in Ariman.

In the event of flooding, the most affected sector is agriculture. Flooding leads to loss of farming potential and decreases farm productivity, especially areas planted with rice. In recent flooding events caused by tail end of the cold front in early 2018 and Tropical Depression Usman later of the same year reported by the Municipal Agriculture Office, 61% of the total rice area of 1,207 hectares were inundated for a period of 14 days and 59% or 1,207 hectares were inundated for a period of 3 days, respectively (Table 14).

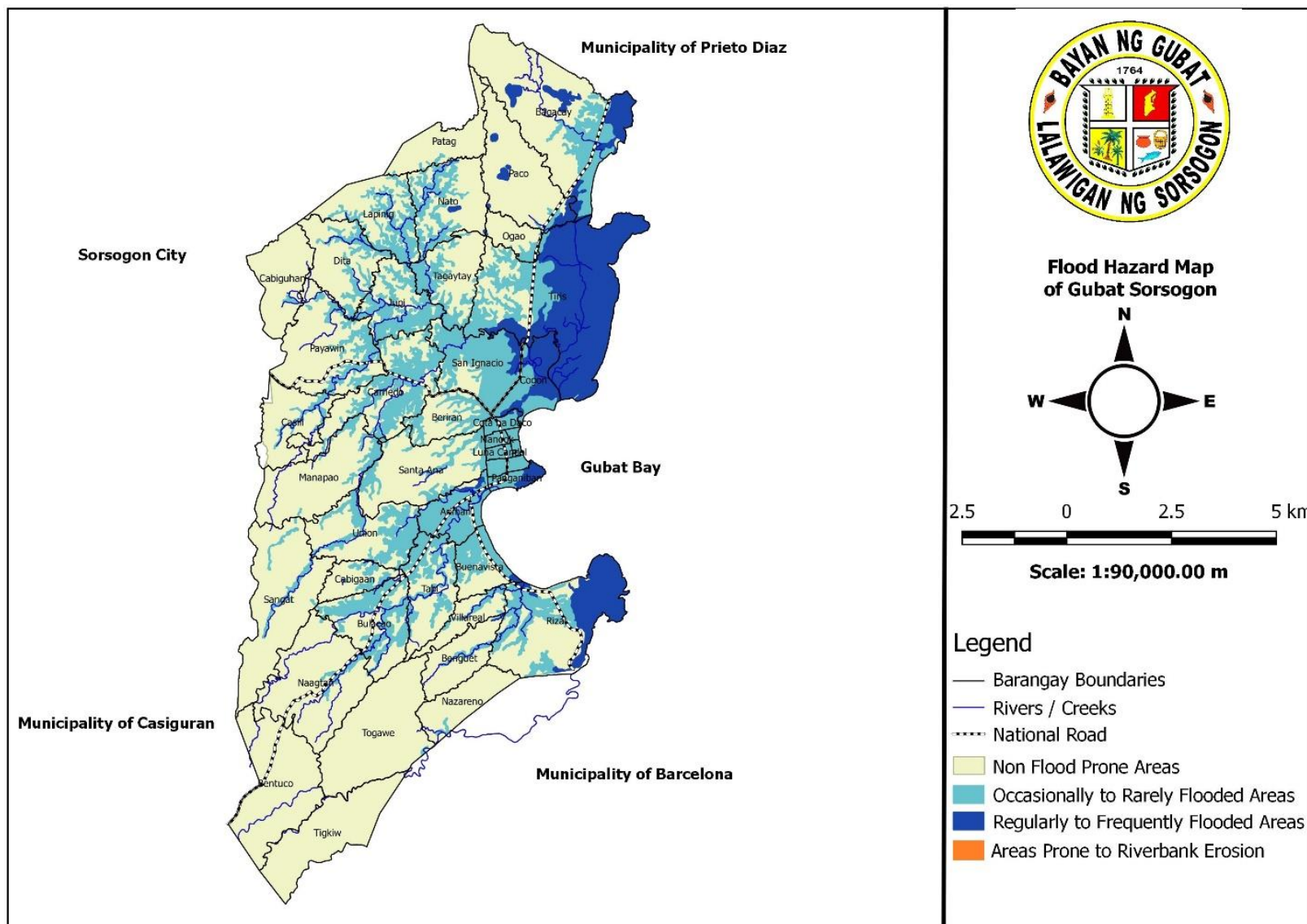


Figure 18. Flood Hazard Map of Gubat.

Table 14. Flood damage report due to Tail End of the Cold Front and Tropical Depression Usman in 2018.

| BARANGAY | TOTAL RICE AREA (ha) | TECF 2018 (Jan. 2-15, 2018) | | TD USMAN (Dec. 28-30, 2018) | |
|--------------|----------------------|-----------------------------|------------|-----------------------------|------------|
| | | AREA DAMAGED (ha) | % | AREA DAMAGED (ha) | % |
| Ariman | 101.50 | 101.50 | 100% | - | 0% |
| Bagacay | 90.30 | 63.50 | 70% | 90.30 | 100% |
| Benguet | 33.25 | 24.06 | 72% | 33.25 | 100% |
| Bentuco | 28.59 | 3.32 | 12% | - | 0% |
| Beriran | 87.05 | 43.05 | 49% | 61.91 | 71% |
| Buenavista | 55.58 | 55.58 | 100% | 45.92 | 83% |
| Bulacao | 113.19 | 40.52 | 36% | 1.85 | 2% |
| Cabigaan | 34.09 | 34.09 | 100% | - | 0% |
| Carriedo | 130.88 | 15.08 | 12% | 92.29 | 71% |
| Casili | 30.09 | 7.94 | 26% | 30.09 | 100% |
| Dita | 37.85 | 24.40 | 64% | 37.85 | 100% |
| Jupi | 140.63 | 24.03 | 17% | 90.99 | 65% |
| Lapinig | 57.51 | 57.51 | 100% | 44.06 | 77% |
| Luna Candol | 12.47 | 12.47 | 100% | 6.97 | 56% |
| Manapao | 68.44 | 5.28 | 8% | 35.82 | 52% |
| Naagtan | 33.32 | 0.66 | 2% | 9.82 | 29% |
| Nato | 104.32 | 104.32 | 100% | 55.66 | 53% |
| Nazareno | 16.42 | 16.42 | 100% | - | 0% |
| Ogao | 45.65 | 45.65 | 100% | 31.04 | 68% |
| Paco | 23.48 | 23.48 | 100% | 23.48 | 100% |
| Patag | 6.08 | 6.08 | 100% | - | 0% |
| Payawin | 85.66 | 78.72 | 92% | 61.68 | 72% |
| Rizal | 89.45 | 5.99 | 7% | 61.42 | 69% |
| San Ignacio | 140.02 | 56.24 | 40% | 100.72 | 72% |
| Sangat | 27.59 | 27.59 | 100% | - | 0% |
| Sta Ana | 25.76 | 25.76 | 100% | 0.99 | 4% |
| Tabi | 115.94 | 115.94 | 100% | 84.85 | 73% |
| Tagaytay | 66.50 | 7.24 | 11% | 66.50 | 100% |
| Tigkiw | 7.68 | 7.68 | 100% | 7.03 | 92% |
| Tiris | 90.55 | 76.00 | 84% | 60.58 | 67% |
| Togawe | 2.66 | 2.66 | 100% | 2.66 | 100% |
| Union | 111.28 | 111.28 | 100% | 61.90 | 56% |
| Villareal | 18.91 | 18.91 | 100% | - | 0% |
| TOTAL | 2,032.69 | 1,242.95 | 61% | 1,206.79 | 59% |

Source: Municipal Agriculture Office

Landslide Prone Areas

Landslide is one of the geohazards present in the Philippines which may be triggered by natural or anthropogenic causes. The National Geographic Society defines landslide as movement of earth material such as rock, soil, and debris from a sloped area of land caused by geologic and morphologic properties of the area and human activities. It's characterized by upward downward movement of slope-forming materials such as rock, soil, artificial fill, or a combination of these. Movement is either by falling, toppling, sliding, spreading, or flowing. On the other hand, erosion is defined by the National Geographic Society as the process of being

worn away by earth, driven by water, wind, or ice, moving the rock or soil to another place. (National Geographic Society, 2014).

In the Municipality of Gubat, landslide is usually triggered by heavy and/or continuous rainfall and is exacerbated by human activities such as rampant deforestation, steepening of slopes following development projects such as road construction and building heavy infrastructures on slopes. Erosion is usually found on riverbanks, creating impacts mostly on the agricultural system by adding more stressors to the system or aggravating the existing stressors. There are several risks and disasters associated with landslide in the municipality such as significant damage to agricultural crops, destruction of agricultural facilities and infrastructures, and disruption of mobility of people and goods following landslide on roads and pathways, rendering it impassable to both transportation vehicles and people.

Based on the Landslide Susceptibility Map (Figure 19) barangays which have areas highly susceptible to landslide are Bentuco, Tigkiw, Naagtan, Sangat, Manapao, Tagaytay, Cabiguna, Nato, and Lapinig. During the FGD, some landslide events which took place in each barangay were noted and presented on Table 15.

Table 15. Landslide and erosion events and impact analysis.

| Barangay | Date | Impact Records by the Community |
|----------|----------------------------------|-------------------------------------------------------|
| Bentuco | During or after intense rainfall | Impassable road |
| Bulacao | January 2018 | Riverbank erosion, damage to coconut trees |
| Naagtan | January 2018 | Impassable road, damage to ricefield |
| Union | January 2018 | Damage to streelights, impassable roads and footpaths |
| Nazareno | December 2017 | Insignificant effect to the community |
| Ogao | 2005 | Vehicular accidents, fear among residents |
| Tigkiw | 2001 | Damage to coconut trees |



DETAILED LANDSLIDE SUSCEPTIBILITY MAP OF THE MUNICIPALITY OF GUBAT, SORSOGON PROVINCE, PHILIPPINES

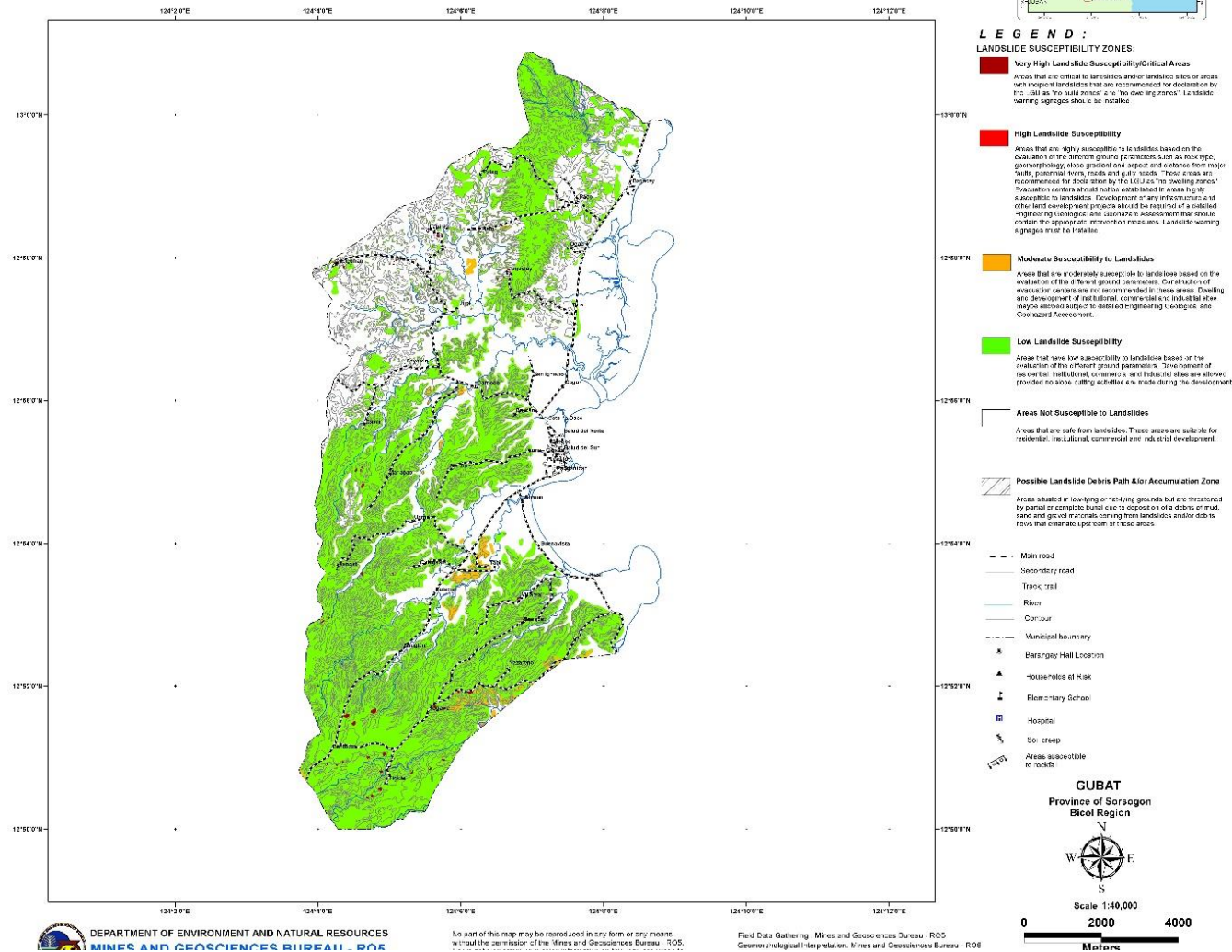


Figure 19. Landslide map of Gubat.

Sea Level Rise

Global mean sea level changes are controlled by thermal expansion of sea water and increase of meltwater from ice sheets and glaciers in the ocean. For the 20th century, an increase of 1.7 mm/year was calculated from tide gauge and satellite observations and a total of 19 cm sea level rise for 1901 to 2010. However, a rate of 5-7 mm/year was observed at the Tropical Western Region to the east of the Philippines (Figure X). This value is more than twice the global average and may aggravate SLR impacts and increase the risk exposure especially areas along coastal stretch. Legazpi City, which is the nearest study focal point to the municipality of Gubat, has a rate of 3-4 mm/year (Figure 20).

Historical sea level of Legazpi City from 1960 to 2016 shows an increasing sea level change. Meanwhile, the projected sea level rise in 2100 is more than 0.7 m which is 3-5% higher than the global average (Figure 21).

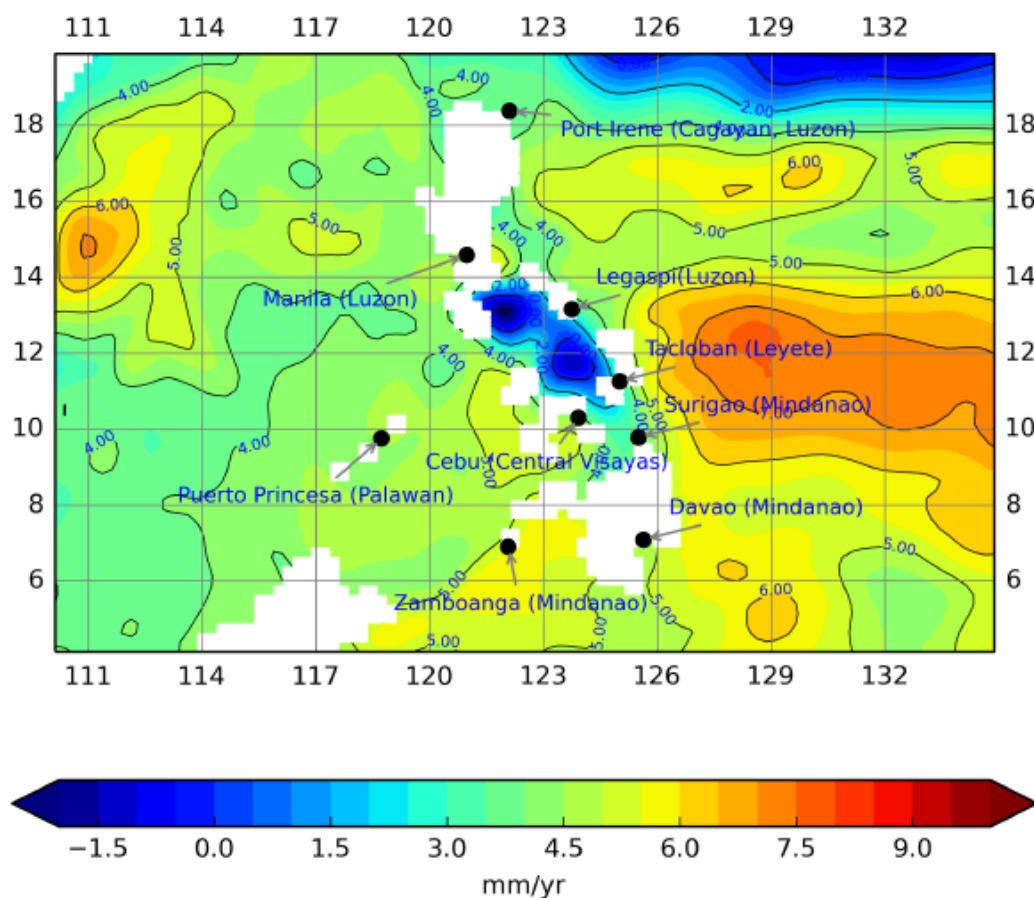


Figure 20. Sea level changes in the Philippines region from 1993-2015 in the Philippines region.

Source: Philippine Sea Level Report, 2016

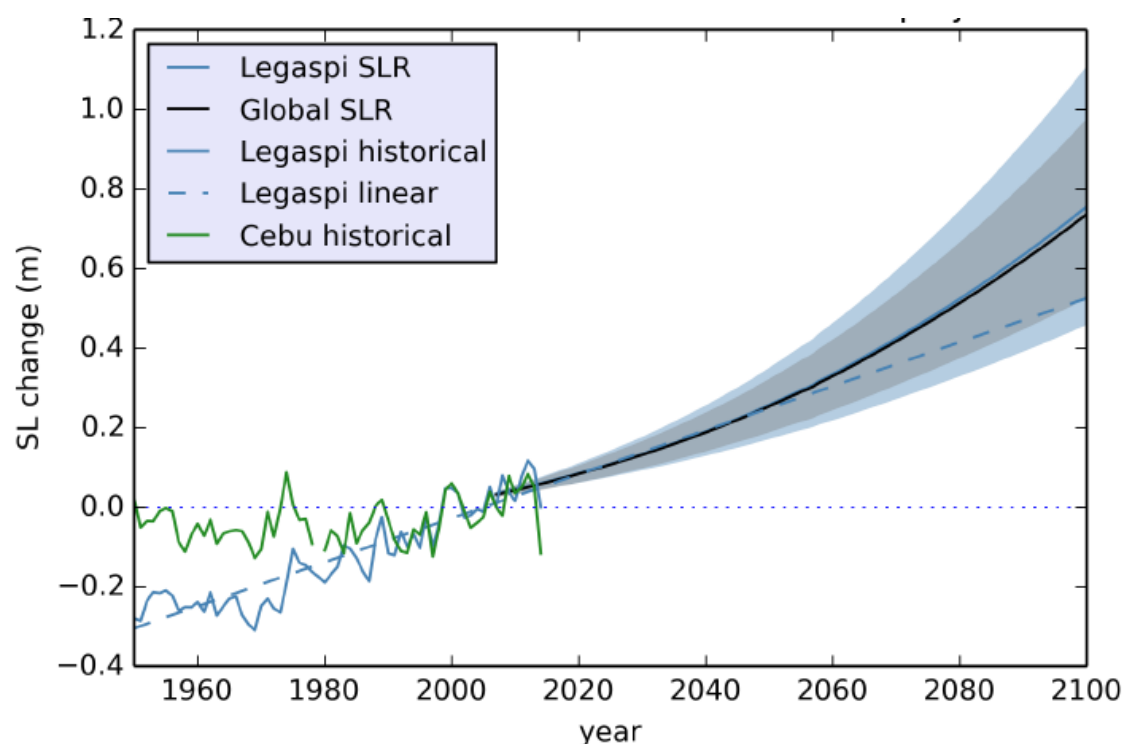


Figure 21. Historical observations and RCP85 Sea level projections.
Source: Philippine Sea Level Report, 2016

Storm Surge and Tsunami

With regard to storm surge, the total area susceptible is 2,111.59 hectares broken down to: highly – 1,945.54 hectares; moderate – 126.51 hectares; and, low – 39.54 hectares. Meanwhile, 1,796 hectares is susceptible to tsunami, which is broken down as follows: highly susceptible – 276.94 hectares; moderately susceptible – 81.69 hectares; and, low susceptible – 1,438.27 hectares (Figure 22). Should there will be a tsunami with a wave height of seven (7) meters, all the urban barangays including ten (10) coastal barangays will be severely affected.

In 2008, the World Bank carried out *in situ* vulnerability assessment to establish which of Gubat's thirteen coastal villages were at highest risk and to establish areas of engagement. Adopting the UNDP formula for risk, i.e., Risk = Hazard x Exposure x Vulnerability, the villages of Bagacay and Rizal were found to rank highest in the risk index. Bagacay, with a population of 3,181 in 2007, has a third of its population living within 500 meters of the shoreline. In Rizal, one-fifth of the population is similarly situated. Villagers living directly behind the seawall were found to be at highest risk. Most of them were fisherfolk whose houses would not withstand strong typhoons, with or without climate change. Found to be at high risk of flooding, in addition to the fishing village, were the elementary school, the village hall, and the health center in Bagacay, which were situated a few meters from the seawall.

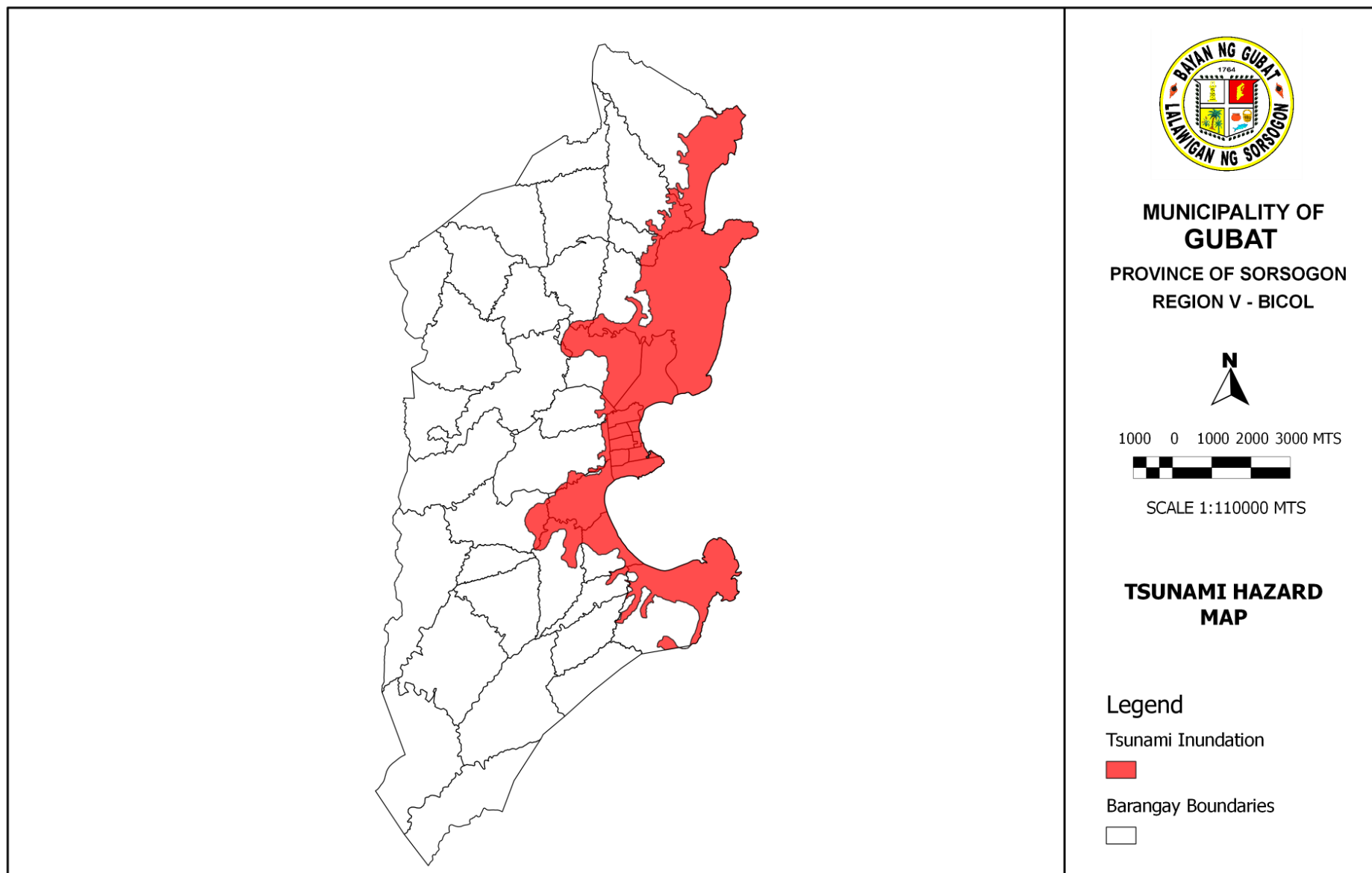


Figure 22. Tsunami hazard map of Gubat.

Extreme Climate and Weather Events

Historical data and current extreme weather and climate events affecting the municipality show that it is usually El Nino-related drought and dry spell, La Nina-related and tail end of the cold front-flood events, and extreme tropical depression and super typhoons particularly during the northeast monsoon from October to February. Located on the typhoon path, there were 34 tropical cyclones that crossed Sorsogon Province from the year 1948 to 2013 or an average of one tropical cyclone every two years (Figure 23). The most intense tropical cyclones which directly crossed the municipality are Typhoon Sisang in 1987 and Typhoon Milenyo in 2006 resulting to significant damages in properties, agricultural crops, and the general landscape of the area. Extreme climate events that were recorded during the FGD of LCCAP and CDRA are as follows:

- El Nino in 1997-1998 that resulted to insufficient water supply to households and agricultural lands
- Tail end of the cold front in January 2018 causing heavy rainfall that caused flooding which lasted to 15 days in low lying areas
- Increasing frequency and intensity of typhoons annually

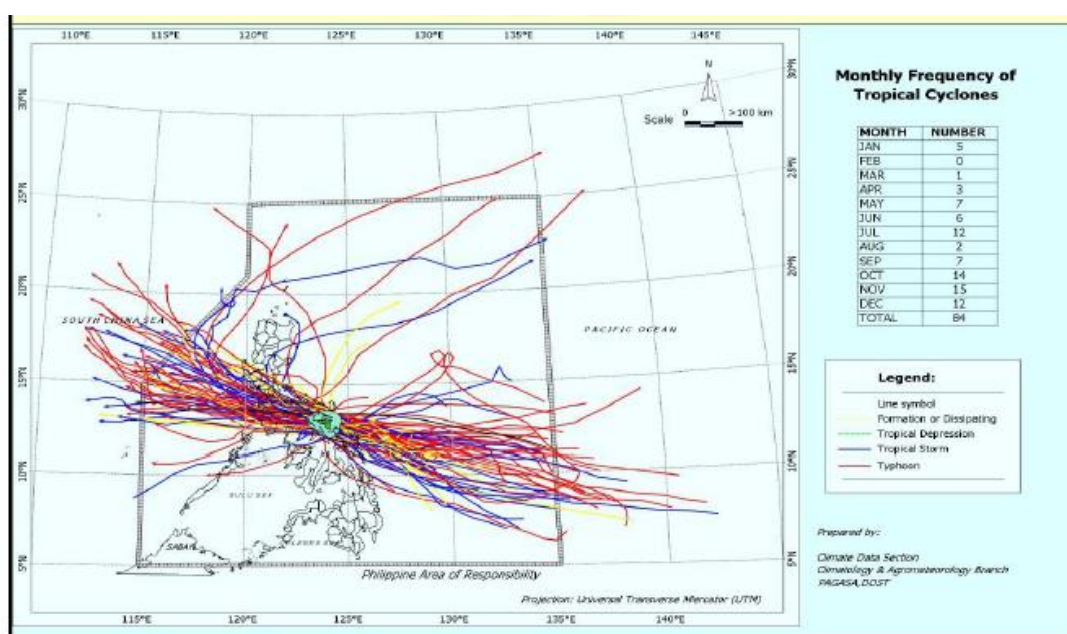


Figure 23. tracks of tropical cyclones which crossed Sorsogon province and 50 kilometers from boundaries from 1948 to 2006.

C. Elements, Sectors, and Institutions Exposed to Climate Change Hazards and Its Impacts

Exposure Analysis

The following table shows the results of the exposure analysis during the conduct of LCCAP FGD in all barangays and enhanced using the results of CDRA. Results show impact pathway for every climate change driver to population, natural resources, critical point facilities, and lifeline utilities. Data and information on the impact pathway on urban use utilities are already integrated in the four aforementioned elements. Exposed locations and elements were also identified and are shown in the table.

Table 16. Exposure analysis and influence diagram.

| Climate Change Driver/Hazards | Primary Impact | Secondary Impact | Tertiary Impact | Hazard Areas - Exposed Features | |
|------------------------------------|---------------------------------|------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| | | | | Location | Exposed Elements |
| POPULATION | | | | | |
| Increased Precipitation: Flooding | Damage to properties | Increased repair/maintenance cost | Debt, poverty | Bagacay, Benguet, Beriran, Cota na Daco, Lapinig, Manook, Paco, Panganiban, Tabi, Tagaytay, Union, Villareal, Cogon, Ogao, Balud del Sur | Minimum of 825 households |
| | Flooded housing units | Damage to properties | Increased repair and maintenance cost | | |
| | | Increased water-borne diseases incidence | Increased health care cost | | |
| | | Increased number of evacuees | Displacement | | |
| | | Increased number of casualties | Increased relief operations, response, and rehabilitation costs | | |
| Increased Precipitation: Landslide | Fear among residents | Increased anxiety and trauma incidence | Low productivity | Ariman, Cabigaan, Cabiguhan, Luna Candol, Manapao, Naagtan, Patag, Sangat, San Ignacio, Sta. Ana, Tabi, Tagaytay, Union | Whole community; Nato - 17 HH |
| | Damage to houses and properties | Increased casualties | Additional financial burden | Benguet, Carriedo, Casili, Dita, Luna Candol, Manapao, Nato, San Ignacio, Sangat, Villareal | 123 households |
| | | Increased repair cost | Increased relief operations, response, and rehabilitation costs | | |
| | | Increased number of evacuees | Displacement | | |

| | | | | | |
|----------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Decreased Precipitation/Increased Temperature: Dry Spell | Drying up of natural spring | Insufficient water supply | Increased cost of living (additional water cost) | Ariman, Cabigaan, Cabiguna, Dita, Naagtan, Ogao, Sta. Ana | Natural springs and population dependet on these for household water supply |
| | Increase in ambient temperature and presence of dust particles | Increased morbidity/mortality from respiratory and hypertensive diseases | Lower productivity, Increased cost of living | Municipal-wide | Population with respiratory and hypertensive medical concerns |
| Increased intensity of typhoons: Strong winds | Damage to residential infrastructures and properties | Increased number of casualties | Additional financial burden | Municipal-wide | Whole population |
| | | Increased repair cost | Increased rehabilitation and rescue oeprations cost | | 594 households living in makeshift materials |
| | | Increased number of evacuees | Poverty | | |
| Increased intensity of typhoons: Strong winds | Storm surge | Damage to properties | Additional financial burden | Bagacay, Paco, Tiris, Cogon, Cota na Daco, Balud del Norte, Balud del Sur, Pinontingan, Panganiban, Ariman, Buenavista, Rizal | Coastal human settlements |
| | | Increased casualties | Poverty | | |
| NATURAL RESOURCES | | | | | |
| Increased Precipitation: Flooding | Submerged rice fields | Decreased yield | Low income | All rice-producing barangays (32 rural barangays and Luna Candel) | 1,242.95 hectares of ricefield |
| | | Increased incidence of pest infestation and bacterial infection | | | |
| | Damage to irrigation system | Increased production/maintenance/rehabilitation/repair cost | Low food supply | | Irrigation system of the 33 barangays |
| | | Uneven distribution of water | | | |

| | | | | | |
|------------------------------------|--------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| | Damage to vegetable crops | Decreased yield | Low food supply | 32 HVCC producing barangays | HVCC farmers |
| | Damage to livestock animals and facilities | Increased repair cost | Low food supply | 32 | No. of livestock farmers |
| | | Increased mortality rate | Low income | | |
| | Submerged fish ponds | Decreased salinity level of fish pond water | Low food supply | Bagacay, Paco, Tiris, Cogon | Fish pond operators |
| | | Increased turbidity of water | Low income | | |
| | | Increased mortality of fingerlings | | | |
| | Submerged streets and pathways | Disruption in mobility of agricultural produce and services | Low food supply | Ariman, Buenavista, Bulacao, Casili, Luna Candol, Manapao, Naagtan, Sta. Ana, Tigkiw, Togawe, Villareal | All rice, HVCC, and livestock farmers |
| | | Increased post harvest losses | Low income | | |
| | Damage to natural springs (liyang) | Decreased water quallity | Increased morbidity/mortalit y from poor water quality | Ariman, Cabigaan, Cabiguna, Dita, Naagtan, Ogao, Sta. Ana | Natural springs and population dependet on these for household water supply |
| | | Increased contamination incidence of household water supply | Increased health care cost | | |
| | Disruption in ecological balance | Decreased environmental stability | Ecosystem imbalance | Forestland, Upland, and Lowland ecosystems | All flora and fauna species; Biodiversity |
| | | Increased ecosystem disturbance | Decreased integrity of ecosystem to support life | | |
| | | Loss of biodiveristy | | | |
| Increased Precipitation: Landslide | Damage to agricultural crops | Decreased yield | Low food supply | Ariman, Bentuco, Cabigaan, Luna Candol, Manapao, Naagtan, Tabi, Tagaytay, Tigkiw | Rice farmers |
| | Damage to bunds or levees | Increased production/maintenance/re habilitation/repair cost | Low income | | HVCC farmers |

| | | | | | |
|----------------------------------------------------------|--------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Damage to roads, streets, and pathways | Increased post harvest losses | | | |
| Decreased Precipitation/Increased Temperature: Dry Spell | Insufficient water supply, cracked soil | Decreased yield | Low income and low food supply | All rice-producing barangays (32 rural barangays) | 620.24 hectares of rainfed ricefields |
| Increased intensity of typhoons: Strong winds | Damage to upland crops/fruit trees | Decreased yield | Low income | All 32 rural barangays | HVCC farmers |
| | Damage to livestock animals and facilities | Increased mortality of livestock animals | Low food supply | | Livestock farmers |
| Increased intensity of typhoons: storm surge | Damage to bunds of fish ponds | Overflowing of fishpond lots | Low income | Bagacay, Paco, Tiris, Cogon | Fish pond operators |
| | Entry of seawater to fish ponds | Increased mortality of fingerlings | Low food supply | | |
| CRITICAL POINT FACILITIES | | | | | |
| Increased Precipitation: Flooding | Flooded schools | Disruption in classes | Increased repair cost of damaged school properties | Bagacay, Bentuco, Carriedo, Cabiguhan, Cota na Faco, Manook, Pinontingan, Paradijon, Tagaytay, Bentuco, Bulacao, Rizal, Nazareno, Ogao, Manapao, Nato, Nazareno, Dita, Patag, Tiris, Sangat, Togawe, Union, Jupi, San Ignacio | High susceptibility - Bagacay ES, Carriedo ES, Cabiguha ES Medium susceptibility - Aguinaldo ES, Bentuco ES, Bonifacio ES, Cogon ES, Gubat South CS, Jupi ES, Ogao ES, Rizal ES, Sta. Ana ES, Tagaytay ES, Tabi ES, Bagacay NHS, Bentuco NHS, |
| | | Increased incidence of water-borne diseases among children/students | Increased health care cost | | |
| | | Damage to school properties | Loss of learning opportunities for students | | |

| | | | | | |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | | | Bulacao NHS Low susceptibility - Beriran ES, Bongsaran ES, Children's Nook, Dita ES, EEC, Gubat North CS, Lapinig ES, Landmark Baptist Academy, Manapao ES, Nato ES, Nazareno ES, Paco ES, Patag ES, San Ignacio ES, Sangat ES, Tiris ES, Togawe ES, Union ES, Jupi NHS |
| Increased precipitation: Landslide | Damage to school buildings and properties | Disruption in classes | Loss of learning opportunities for students | Patag, Rizal, Bagacay, Sta. Ana | Bongsaran ES, Patag ES, Sta. Ana ES, Bagacay ES |
| Increased intensity of typhoons: Strong winds | Damage to critical point facilities such as school buildings, health center, evacuation center, and barangay hall | Increased repair cost Disruption in the delivery of basic social services | Additional financial burden | Municipal-wide | All critical point facilities |
| | Damage to schools | Damage to school properties | Increased repair cost of damaged school properties | Municipal-wide | All schools |

| | | | | | |
|---------------------------------------|-------------------------------------------|------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| | | Disruption in classes | Loss of learning opportunities for students | | |
| | | Increased risk to students | | | |
| | | Increased casualties | | | |
| LIFELINE UTILITIES | | | | | |
| Increased Precipitation: Flooding | Impassable roads, pathways, and spillways | Disruption in mobility of people (esp. students) and goods | Limited access to social services | Ariman, Buenavista, Bulacao, Casili, Luna Candol, Manapao, Naagtan, Sta. Ana, Tigkiw, Togawe, Villareal | Students, tricycle drivers, and people going to the poblacion area |
| | | Naanod an mga basura | Loss of income | | Whole population of these barangays |
| | | Increased risk to people | Increased difficulty in response and rescue operations | | |
| Increased Precipitation: Landslide | Damage to roads, streets, and pathways | Disruption in mobility of emergency and response vehicles | Limited access to health services | Ariman, Cabiguhan, Patag, Sta. Ana | Ariman - foot path; Cabiguhan - road; Patag - road; Sta. Ana - road; |
| | | Fear among residents | | | |

Sensitivity and Threat Level Assessment

Communities identified the hazards during the FGDs and workshops which are mostly tropical cyclones and El Nino (drought and dry spell). A historical timeline was materialized using the consolidated data and after verification from the MDRMO and PAG-ASA records. Community members noted that current temperature is hotter than in the previous years. Summer season has also started earlier than before. Tropical cyclones have become frequent but the intensity of each has turned stronger compared before. Impacts to the communities were also noted as remembered by the participants.

Table 17. Timeline of hazards and impact to the community.

| Year | Hazard | Impacts to the Community |
|-----------|---------|--------------------------------------------------------------------------------------------------------------|
| 1960 | Welming | Shoreline erosion, damage on properties of coastal communities |
| 1987 | Sisang | Severe damage on agricultural crops, houses, and properties, casualties |
| 1997-1998 | El Nino | Dry spell, insufficient water supply to households and agricultural land, disease outbreak |
| 1999 | Awring | Landslie, damage on agricultural crops |
| 2006 | Milenyo | Damage on agricultural crops and properties, long-duration brownout |
| 2006 | Caloy | Damage on fishing vessels, sudden increase in prices of marine products |
| 2007 | Reming | Flooding in fishponds, damage on agricultural crops and houses |
| 2013 | Yolanda | Damage on agricultural crops and properties |
| 2014 | Glenda | Damage on seawall, properties, and agricultural crops |
| 2014 | Ruby | Damage on agricultural crops and properties |
| 2014 | El Nino | Dry spell, insufficient water supply to households and agricultural land, disease outbreak |
| 2015 | Nona | Damage on agricultural crops and properties |
| 2018 | Basyang | Flooding, damage on agricultural crops and properties, disruption in mobility of people, goods, and services |

Vulnerable Areas and Groups

Population

An area of 1,005.4 hectares are considered as highly susceptible to flood. Although majority of these are mangrove areas which are located on intertidal zones, a significant portion of the population is still affected by flood occurrence. A minimum of 825 households were identified to be experiencing flooding events during extreme rainfall. This is already a conservative value considering that the poblacion barangays are usually inundated after extreme precipitation especially the coastal communities. Flooding events are intensified due to clogging of drainage canals.

There are 125 households in 10 barangays identified to be situated on landslide-prone areas, some of which already experienced a landslide incidence in close proximity to their houses.

Increased intensity of typhoons associated with strong winds can lead to destruction of houses and properties. According to the data of RCBMS (2016), a total of 594 households are living on makeshift materials which could be possibly damaged by strong winds. In addition, typhoons can also trigger storm surges on coastal areas. The municipality has 13 coastal barangays, 2 of which have settlement areas on uplands and 4 of which have extensive mangrove area which acts as protection from strong waves and high tides. Poblacion coastal barangays from Cota na Daco to Balud del Sur are highly affected to the damages posed by storm surges as their human settlement areas are just along the coast, majority of which are informal settlers. A total of 87 informal settlers reside on these 3 coastal poblacion barangay (RCBMS, 2016).

Increasing temperature can lead to drying up of natural springs and wells. Most of the rural barangays have still households dependent on natural springs and wells for their water supply. In addition, it can trigger heat-driven diseases such as hypertension and skin diseases (chicken pox, measles). The following table shows the ten leading causes of morbidity in all ages from 2016 to 2018:

Table 18. Top 10 leading causes of morbidity in all ages from 2016 to 2018.

| 2016 | | 2017 | | 2018 | |
|--------------------------------|--------|--------------------------------|--------|--------------------------------|--------|
| Causes | Number | Causes | Number | Causes | Number |
| 1. Acute Respiratory Infection | 760 | 1. Hypertension | 491 | 1. Acute Respiratory Infection | 2086 |
| 2. Hypertension | 232 | 2. Acute Respiratory Infection | 373 | 2. Upper Respiratory Infection | 1357 |
| 3. Wounds/ Abscess | 151 | 3. Urinary Tract Infection | 93 | 3. Hypertension | 493 |
| 4. Urinary Tract Infection | 68 | 4. Diabetes Mellitus | 66 | 4. Infected Wounds | 493 |
| 5. Influenza | 60 | 5. Iron Deficiency Anemia | 65 | 5. Osteoarthritis | 234 |
| 6. Fever | 54 | 6. Wounds/ Abscess | 31 | 6. Allergies | 231 |
| 7. Iron Deficiency Anemia | 40 | 7. Influenza | 27 | 7. Asthma | 163 |
| 8. Pneumonia | 35 | 8. Peripheral Neuritis | 15 | 8. Dental Caries | 132 |
| 9. Asthma | 30 | 9. Asthma | 12 | 9. Diarrhea | 74 |
| 10. Skin Disorders | 20 | 10. Osteoarthritis | 8 | 10. Abdominal Disorders | 10 |

Natural Resources

The natural resources of the municipality will be the most highly affected element from climate change hazards. This covers all the agricultural production lands and mangrove forests of the municipality.

Around 82.56% or 9429.07 hectares out of the total land area of 11,421.17 hectares is classified as agricultural. All 34 rural barangays are agricultural while one urban barangay, Luna Candel, has a small portion of its area devoted to palay and coconut. As of 2018, coconut

areas accounted for 7,251.21 hectares or 76.90% of the total agricultural area while farms grown to palay totalled 2,032.69 hectares or 21.56%. Meanwhile, there was an estimated 22.42 hectares planted to abaca under coconuts in the barangays of Tigkiw, Togawe and Bentuco. For the year 2018, pili under coconut was around 320.22 hectares, with 10,971 number of productive trees. Banana was estimated at 50 hectares planted under coconut while rootcrops is at 16.27 hectares. Vegetable are planted in backyard gardens while a few farmers also venture in commercial vegetable raising. Collectively for all vegetable crops, a total area of 19.05 hectares was planted during the year 2018. Infrastructures at risk include irrigation systems, farm to market roads, and post-harvest facilities.

Flooding incidents inundate rice paddies which could lead to a decrease in yield and farm productivity ultimately resulting to decrease in income and food supply. In 2018, 61% of the total rice area equivalent to 1,242.95 hectares were flooded due to heavy rains brought by tail end of the cold front. On the same year during the TY Usman, 59% or a total area of 1,206.79 hectares were flooded which lasted for 3 days.

In the event of dry spell or drought, irrigation water supply is compromised. A total of 620.24 hectares or 30.51% of the total rice area is rainfed and dependent on rainfall for irrigation. Rainfed farmers would be most affected by increasing temperature especially during the wet cropping season from June to September. In the previous years, rainfall was abundant in the month of June leaving no problem to our rainfed farmers. Nowadays, sufficient rainfall does not come until late July or August which prompts rainfed farmers to change their cropping schedule and being left behind by irrigated rice farmers. By the time they harvest their rice, prices would have already gone down.

Mangrove forest of Gubat totals to 486 hectares situated in 7 coastal barangays. This provides coastal protection, marine ecosystem stabilizer, habitat of economically-significant aquatic organisms, carbon sequestration, and raw materials to houses such as nipa. Damage on mangrove forest would lead to ecological imbalance and puts coastal communities at great risk to storm surge and tsunami.

Critical Point Facilities

Climate change-related hazards can substantially impact critical point facilities such as evacuation centers, barangay halls, health centers and school buildings. At present, only 11 out of 42 barangays have evacuation centers while some barangays utilize their multi-purpose halls and barangay halls as evacuation camps when necessary.

Some of the schools in the municipality are susceptible to flooding and landslide. There are 3 schools identified to be highly flood-susceptible, 14 are at medium susceptibility and 10 are at low susceptibility to flood while there are 5 schools located on landslide-prone areas.

Lifeline Utilities

Roads, streets, pathways, and footpaths are inundated in case of flooding affecting the mobility of people, goods, and services. Most flood-prone roads are located along the three river systems of the municipality, to wit: Tingting river, Basiao river, and Bulacao river. Pathways and footpaths flooded are usually located on bunds and/or along riverbanks which disrupt access of affected households to transportation utilities.

D. Climate Change Vulnerability Assessment

Vulnerable areas and sectors were identified in the exposure database. A sensitivity and threat level assessment was then conducted given the identified exposed units. Sensitivity

indicators from the exposure database were analyzed to determine the important indicators that contribute to the sensitivity of the element to expected climate stimuli. The sensitivity analysis was then used as a guide to rate the degree of impact. The score is based on the parameters in Table 19.

Table 19. Degree of impact score and description.

| Degree of Impact | Degree of Impact Score | Description |
|------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High | 3 | Estimated direct impacts in terms of number of fatalities, injuries and value of property damage will be disastrous given the extent of exposure and current sensitivity of the system. Medium to long term indirect impacts will also be experienced which may affect development processes. Significant costs needed to return to pre-impact |
| Moderate | 2 | Moderate direct impacts in terms of number of fatalities, injuries and value of property damage are expected given the extent of exposure and current sensitivities of the system. Short to medium term indirect impacts will also be experienced which may affect development processes. Medium to low cost needed to return to pre-impact levels within a short to medium time period. |
| Low | 1 | Estimated direct and indirect impacts are low to negligible which can be felt within a short term period. Minimal impacts to development processes and no significant cost needed to return to pre-impact levels. |

Assessing the vulnerability also includes examining various adaptive capacities of the system, whether the system/exposed elements are able to cope with the impacts (Table 20). Vulnerability is a function of sensitivity and adaptive capacity.

Table 20. Adaptive capacity score and description.

| Degree of Adaptive Capacity | Adaptive Capacity Rating | Description |
|-----------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low | 3 | The system is not able to accommodate changes in the climate. Addressing the impacts will be costly. The LGU and property owners will require external assistance to address the impacts. |
| Moderate | 2 | Addressing the impacts will require significant cost but it is still within the capacity of the system to adapt to potential impacts. It can accommodate within its resources the cost for adapting and mitigating impacts. |
| High | 1 | The system is able to accommodate changes in climate. There are adaptation measures in place to address impacts. |

Using the rating from the degree of impact and adaptive capacity, the vulnerability index scores are generated to indicate whether the vulnerability of the area/system is high or low (Table 21). Systems with low vulnerability can be described as systems where the impacts are considered high but adaptive capacities are also high. Results of the vulnerability assessment are presented in Table 22.

Table 21. Vulnerability Index Scores (Degree of impact x Adaptive Capacity= Vulnerability)

| Degree of Impact Score | Adaptive Capacity Score | | | Vulnerability | Vulnerability Index Range |
|------------------------|-------------------------|--------------|---------|---------------|---------------------------|
| | High (1) | Moderate (2) | Low (3) | | |
| High (3) | 3 | 6 | 9 | High | >6-9 |
| Moderate (2) | 2 | 4 | 6 | Moderate | >3-6 |
| Low (1) | 1 | 2 | 3 | Low | ≤3 |

Table 22. Vulnerability rating for each climate change hazard in six elements.

| Climate Change Hazard | Vulnerability Rating Table | | | | |
|-----------------------------------------------|----------------------------|------------------|-------------------|-------|----------|
| Increased Precipitation: Flooding | Exposure Elements | Degree of Impact | Adaptive Capacity | Index | Category |
| | Population | 3 | 2 | 6 | Moderate |
| | Urban | 3 | 2 | 6 | Moderate |
| | Natural Resources | 3 | 3 | 9 | High |
| | Critical Facilities | 2 | 2 | 4 | Moderate |
| | Lifeline Utilities | 2 | 2 | 4 | Moderate |
| Increased Precipitation: Landslide: | Exposure Elements | Degree of Impact | Adaptive Capacity | Index | Score |
| | Population | 2 | 2 | 4 | Moderate |
| | Urban | 1 | 2 | 2 | Low |
| | Natural Resources | 3 | 3 | 9 | High |
| | Critical Facilities | 1 | 2 | 2 | Low |
| | Lifeline Utilities | 2 | 2 | 4 | Moderate |
| Increased temperature: Dry Spell | Exposure Elements | Degree of Impact | Adaptive Capacity | Index | Score |
| | Population | 2 | 1 | 2 | Low |
| | Urban | 2 | 1 | 2 | Low |
| | Natural Resources | 3 | 3 | 9 | High |
| | Critical Facilities | 1 | 1 | 1 | Low |
| | Lifeline Utilities | 1 | 1 | 1 | Low |
| Increased intensity of typhoons: Strong winds | Exposure Elements | Degree of Impact | Adaptive Capacity | Index | Score |
| | Population | 3 | 2 | 6 | Moderate |
| | Urban | 3 | 2 | 6 | Moderate |

| | | | | | |
|----------------------------------------------|---------------------|------------------|-------------------|-------|----------|
| | Natural Resources | 3 | 3 | 9 | High |
| | Critical Facilities | 3 | 2 | 6 | Moderate |
| | Lifeline Utilities | 3 | 2 | 6 | Moderate |
| Increased intensity of typhoons: Storm surge | Exposure Elements | Degree of Impact | Adaptive Capacity | Index | Score |
| | Population | 3 | 2 | 6 | Moderate |
| | Urban | 3 | 2 | 6 | Moderate |
| | Natural Resources | 3 | 3 | 9 | High |
| | Critical Facilities | 3 | 2 | 6 | Moderate |
| | Lifeline Utilities | 1 | 1 | 1 | Moderate |

III. LOCAL CLIMATE CHANGE ACTION PLAN OBJECTIVES

The following objectives are taken from the Comprehensive Development Plan of the LGU which is already in the process of implementation. Objectives are revised or enhanced as needed and consistent with the strategic priorities and intermediate outcomes of the National Climate Change Action Plan:

A. Food Security

Ensure availability, stability, accessibility, and affordability of safe and healthy food amidst climate change

- To increase farm productivity by 90% for food self-sufficiency in year 2026
- To increase production of healthful agricultural products by 100%
- To make use of idle large agricultural areas by 90% in year 2026
- To strengthen support to farmers thru funding and technical assistance
- To ensure 100% awareness on the implementation of inter-cropping techniques
- To ensure irrigable areas irrigated by 100% in year 2026
- To reduce products wastage by 90% and increase farmer's income
- To increase livestock production by 90% by year 2026 to reach a minimum income of marginalized animal/livestock raisers
- To ensure adequate fish catch
- To provide alternative livelihood for fisher folk: fish processing and fish ponding

B. Water Sufficiency

Ensure resiliency, good quality, sustainable management, and conservation of natural water resources

- To improve irrigation system support by 100% for agricultural development in 10 years.
- To search and develop possible site for mini-hydro power plant and facilities by end of 2026
- To improve level 3 water system services and facilities by 100% by end of 2026

C. Ecological and Environmental Stability

Enhance ecological and environmental stability and resiliency through conservation, protection, and rehabilitation

- To protect and/or rehabilitate protected areas
- To increase forest vegetation cover
- To strictly enforce environmental laws
- To nurture coastal resource and marine areas
- To prevent deforestation in watershed areas, riverbanks, beachfronts and mangrove areas
- To reduce land, water, and air pollution
- To provide an efficient and effective solid waste management system and garbage collection and disposal
- To strictly implement RA 9003

D. Human Security

Reduce risks of population to climate change hazards and related disasters

- To enhance functionality of Local Housing Board
- To provide resettlement areas and shelter complete with amenities
- To provide functional and complete health facilities

- To decrease morbidity rate
- To sustain zero incidence of food and water borne diseases
- To enhance knowledge and skills of Nutrition Council members and Barangay Nutrition Scholars (BNS) nutrition programs
- To encourage community a clean and healthy living
- To provide regular skills and procurement of additional equipment for nutrition council and BNS
- To provide mental wellness and healthy lifestyle activities
- To sustain $\geq 95\%$ fully immunization of children
- To sustain $>95\%$ of Households with access to safe water supply and sanitary toilet facilities.
- To sustain $< 10\%$ malnutrition rate

E. Climate-friendly industries and services

Develop, promote, and sustain climate-change resilient, eco-efficient, and environment-friendly industries and services

- To rehabilitate and open up new roads that will hasten economic, agricultural, industrial and tourism development by 90% at end 2026
- To build infrastructures compliant to CCA-DRR-CSPP and Gender and with the zoning classification
- To develop sewerage system by 100% by end of 2026
- To increase the school building strength and adaptability to climate change and disaster
- To increase the number of identified safe areas as relocation for HHs identified settling in hazardous areas by 2026
- Increase adaptability to Climate Change and/or desired standards by 90% of all government facilities by 2026 and onwards
- Increase number of projects completed on time and its adaptability to climate change by end of 10 years and onwards
- Look for funding and procure and/or identify parks and assembly areas by end of 2026

F. Sustainable Energy

Promote development of sustainable and renewable energy

- To install adequate solar powered streetlights to municipal and barangays roads by end of 2026.
- To search and develop possible site for mini-hydro power plant and facilities by end of 2026

G. Knowledge and Capacity Development

Enhance knowledge and capacity for climate change adaptation, mitigation, and disaster risk reduction of communities in all sectors

- To strengthen capability of marginalized farmers on new farming techniques which are climate-adaptive
- To increase level of awareness and knowledge of children and youth on climate change mitigation, adaptation, and disaster risk reduction
- To increase enrollment rate in child development centers, primary, secondary and tertiary level by 80% in year 2026
- To increase survival rate and/or completion rate in primary, secondary and tertiary level by 80% in year 2026
- To decrease number of dropouts by 75% by 2026

- To increase literacy rate 75% to 85% to equally reach the national standard requirements
- To improve programs on manpower training and its completion rate to 80%
- To increase Alternative Learning System (ALS) program assistance and other education privileges of scholars

IV. ACTION PLAN

The following table presents the action plan of the Municipality of Gubat from 2019 to 2028. Policy recommendations during the FGD with the barangays and policy interventions gathered from CDRA were translated into programs, projects, and activities. Each identified PPA was aligned to the seven strategic goals of NCCAP. Budget requirements and source funding were also identified.

Table 23. Local Climate Change Action Plan from 2019 to 2028.

| Adaptation Goals | Specific Adaptation Objectives | Link to Climate Change | Objectively Verifiable Indicators | Adaptation Actions (PPAs) | Office/Person Responsible | Input Requirements | Source of Fund |
|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------|--------------------|----------------|
| FOOD SECURITY | | | | | | | |
| Increase farm productivity | Reduce harvest loss due to climate change related hazards and disasters | Flood due to extreme precipitation | Increased palay yield from 4 MT/ha to 5.5 MT/ha | Provision of climate change resilient rice varieties | MAO | 12 M | LGU, DA |
| Ensure food self-sufficiency | Maximize farm yield | Drought due to increasing temperature and longer and drier days | More than 100% of rice self sufficiency by 2028 | Provision of hybrid rice farming inputs | MAO | 150 M | DA, PSF |
| Increase income in the agriculture and fisheries sector | Increase resilience and adaptive capacity of farmers to climate change hazards and disasters | Strong winds brought by super typhoons | 10 4WD tractors, 10 transplanters, 10 combine harvester provided by 2028 | Provide 4WD transplanter and harvester farm machineries | MAO | 45M | LGU, DA, PSF |
| Ensure livelihood income in agriculture sector despite climate change risks and related disasters | Reduce post harvest loss | | 8 existing post harvest rehabilitated and 8 new pre/post harvest facilities constructed by 2028 | Construction/rehabilitation/improvement of pre- and post-harvest facilities | MAO | 16 M | LGU, DA, PSF |
| | Increase resilience and adaptive capacity of farmers to climate change hazards and disasters | | At least 75% of farmers insured starting 2020 | Enrolment of farmers to crop insurance of PCIC every cropping | MAO | | PCIC DA |
| Ensure food self-sufficiency | | | At least 50% farmers practicing coconut-based diversified farming | Replanting of coconut and diversified based farming | MAO | 50 M | LGU, DA, PSF |
| | | | Increased organic area by at least 50% by 2025 | Provision of organic farming inputs | MAO | 25 M | LGU, DA, PSF |
| | | | | Establishment of pasture lands and provision of cutters for fresh and/or fermented silage | MAO | 50 M | LGU, DA, PSF |

| | | | | | | | |
|---------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----|-------|--------------|
| | | | Animal treatment services regularly provided to livestock farmers | Provide animal treatment services to livestock farmers | MAO | 4M | LGU, DA |
| Increase income of fishers | Provide support to sustain livelihood income to fishers | | Fishing gears and other paraphernalia provided to municipal fisherfolk | Provision of fishing gears and other paraphernalia | MAO | | |
| Ensure food self-sufficiency | | | Tilapia Hatchery improved by 2025 | Improvement of Tilapia Hatchery | MAO | 5M | LGU, DA |
| | | | Tilapia fingerlings made always available for distribution starting 2020 | Intensification of production of fingerlings and distribution to recipients and fish stocking in river systems | | | |
| WATER SUFFICIENCY | | | | | | | |
| Increase farming productivity and income of farmers | Provide sufficient water supply for lowland and upland farming | Drought due to increasing temperature and longer and drier days | Irrigation system constructed/provided to identified rice areas by 2022 | Identify appropriate irrigation system to unirrigated rice areas in all barangays | MAO | 150 M | LGU, DA, PSF |
| Improve resilience of farmers to climate change related risks and hazards | | | Increase irrigable areas by 25,% of total rainfed areas and 5% of tail end of irrigation systems | Construction of irrigation dam and line canal to identified rice areas | | | |
| | | | | Provision of STW and PISOS to identified rice areas | | | |
| | | | | Construction of Small Farm Reservoirs in identified areas | | | |
| Ensure health and promote the well-being of all | Construct/rehabilitate water systems | Drought due to increasing temperature and longer and drier days | Main water supply from Oroc Cold Spring and additional solar powered water connection with 2,500 L tanks | Rehabilitation of the Poblacion Level III Water System Transmission Pipes | MEO | 1.5 M | LGU, NGA |
| Enhance the adaptive | | | | | | | |

| | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------|------------|----------|
| capacity of the population to climate change impacts | Provide sufficient potable water supply to households | | Improved water systems in at least 5 barangays by 2021 | Improvement of water system in barangays to increase household coverage | MEO | 7.5 M | LGU, NGA |
| | Protect natural springs by planting more trees around the area | | Springs developed in at least 5 barangays by 2025 | Spring Development | MEO | 2.5 M | LGU, NGA |
| ECOLOGICAL AND ENVIRONMENTAL STABILITY | | | | | | | |
| Ensure enviromental stability and ecological integrity through protection, conservation, and rehabilitation Enhance resiliency and sustainability of natural ecosystems | Strengthen resilience of coastal communities against climate change related disasters Increase carbon sequestration Rehabilitate and stabilize upland ecosystems | Sea Level Rise | Increased number of beach forest trees planted by 2024 | Establish beach forest nursery | MENRO | 300,000.00 | LGU |
| | | Storm Surge due to High Intensity of Typhoons Flooding due to extreme precipitation Increasing temperature | 15 hectares of abandoned fish ponds planted with mangroves by 2024 | Plant mangroves in identified mangrove planting sites | MENRO | 300,000.00 | LGU |
| | | | 15,000 trees planted in upland areas by 2020 | Identify areas suitable for upland perennial tree planting activities | MENRO | 50,000.00 | LGU |
| | | | Tree planting activities conducted in all identified landslide-prone areas by 2024 | Conduct tree planting activities on landslide-prone areas in coordination with school, CSOs, and communities | MENRO | 300,000.00 | LGU |
| Ensure enviromental stability and ecological integrity through protection, conservation, and rehabilitation | Protect environment from natural and anthropogenic hazards | Increasing temperature | Ordinance on prohibition in burning of straw enacted by what year | Enact an ordinance on non burning of rice straw | SB | | |
| | Strengthen coastal law enforcement | | Ordinance on non burning of domestic wastes and leaves enacted in all barangays | Enact ordinance on prohibition in burning of domestic wastes and leaves in all barangays | SB | | |
| | Ensure strict implementation of the Municipal Fisheries Code | | No. of Bantay Dagat increased from 3 in 2018 to 5 in 2020 | Increase the number of Bantay Dagat for seaborne operations | MAO, PNP, FLET | 14 M | LGU |

| | | | | | | | |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------|------------|------|
| Enhance resiliency and sustainability of natural ecosystems | | | Seaborne patrolling conducted daily starting what year | Conduct daily seaborne patrolling in municipal waters | MAO, PNP, FLET | 2 M | LGU |
| Increase compliance of community in protecting natural ecosystems | Enact ordinance on illegal logging | Increasing temperature | Illegal logging incidence reduced to 0 by 2024 | Strictly enforce laws on illegal logging by increasing the number of forest rangers | MENRO, PNP | 50,000.00 | LGU |
| | | | Incidence of cutting trees along springs reduced to 0 by 2019 | Enact an ordinance prohibiting cutting of trees along springs | MENRO, SB | 50,000.00 | LGU |
| Ensure enviromental stability and ecological integrity through protection, conservation, and rehabilitation | Implement Solid Waste Management Act of 2009 | Increasing temperature | BSWM Committees formed and functional in all barangays by 2019 | Form Barangay Solid Waste Management Committee in all barangays | MENRO, BLGU | 50,000.00 | LGU |
| | Ensure proper waste disposal of domestic wastes Protect water bodies from domestic pollution | Flooding due to extreme precipitation | Schedule of garbage collection in all barangays in place and observed by 2019 | Schedule garbage collection in all barangays | MENRO | 300,000.00 | LGU |
| | | | MRF in each barangay constructed by 2019 | Construct MRF in 42 barangays | MENRO | 300,000.00 | LGU |
| | | | Trash bins in place in all barangays by 2019 | Place trash bins in strategic locations in all barangays | MENRO | 50,000.00 | LGU |
| | | | Water treatment facility installed and operational by 2020 | Installation of water treatment facility in the municipality | MENRO | 2.5 M | DPWH |
| Ensure enviromental stability and ecological integrity through | Increase the protected area within the municipal waters | Increasing temperature Increasing intensity of typhoons | 37 hectares of MPA established by 2020 | Establishment of a Marine Protected Area | MENRO | 300,000.00 | LGU |

| | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------|------------|---------------------|
| protection, conservation, and rehabilitation in coastal waters Enhance resiliency and sustainability of marine ecosystems | Ensure sufficient fish stock for recovery and sustainability | | 15 hectares of Crab Sanctuary established by 2022 | Establishment of a Crab Sanctuary | MENRO | 500,000.00 | NGO |
| HUMAN SECURITY | | | | | | | |
| Enhance resilience and adaptive capacity of communities Ensure safety and well-being of communities to impacts of climate change related events and disasters Reduce risks and damages of communities to climate change hazards and related disasters | Provide appropriate infrastructures and facilities for human security | Landslide due to extreme precipitation | 100 Housing units for relocation constructed by 2025 | Construct housing units for relocation | MPDO, MEO | 75 M | LGU, NGA |
| | Reduce the number of injuries and preventable deaths due to climate change related disasters to 0 | Flooding due to extreme precipitation | All households located on hazard-prone areas relocated by 2028 | Mandatory relocation of identified households located on hazard-prone areas in all barangays | MPDO, MEO | 10 M | LGU, NGA |
| | Formulate Zoning Map for every barangay | | Zoning Map adopted in all barangays by what year | Declaration of no-build zones in hazard-prone areas in all barangays | MPDO, BLGU | 2.5 M | LGU, NGA (DAR-ARCP) |

| | | | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------|------------|---------------|
| Ensure safety and well-being of communities to impacts of climate change related events and disasters Reduce risks and damages of communities to climate change hazards and related disasters | Keep the communities updated and informed in times of climate related disasters | Increased intensity of typhoons | Automated Weather Station installed and functional by 2028 | Install monitoring systems such as rain gauge and automated weather station in strategic areas in coordination with DOST | MDDRMO | 5 M | LGU, NGA, PSF |
| | | | EWS weather updates provided daily starting what year | Provide daily weather updates on information to barangays on EWS thru text messages. | MDDRMO | 180,000.00 | LGU |
| Enhance resilience and adaptive capacity of communities | Provide basic needs of affected population Provide health services during climate change related disaster events | Increased intensity of typhoons | BHS Drugroom established and operational in all barangays by 2022 | Establishment of BHS Drugroom in all barangays | MHO | 4.2 M | LGU, DOH |
| | | Flooding due to extreme precipitation | Motorcycle ambulance procured and operational in all barangays by 2022 | Procurement of motorcycle ambulance for all barangays | MHO | 4.2 M | LGU |
| | | Landslide due to extreme precipitation | Emergency health equipment procured and functional in all barangays by 2028 | Procurement of emergency health equipment for 42 barangays | MHO | 8.4 M | LGU |
| | | | Medical station in all evacuation camps established and functional by 2022 | Construction of Medical Stations in all Evacuation Camps | MHO | 1.1 M | LGU, PSF |
| | | | Emergency Response Team formed and | Form Emergency Response Team in every barangay | MDDRMO, LGU | 20,000.00 | LGU |

| | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------|---------------|---------------|
| | | | functional in 42 barangays by 2025 | | | | |
| | | | | Stockpile resources to include food and NFI, medicines, assistive device and mobility aids for PWDs and older persons in 42 barangays | MSWDO | 50 M | LGU, PSF |
| | | | 2 ambulance maintained and operational | Maintain emergency and response vehicles (fuel, supplies, and lubricants) | MDRRMO | 2 M | LGU, PSF |
| CLIMATE-SMART INDUSTRIES AND SERVICES | | | | | | | |
| Ensure safety and enhance adaptive capacity of communities to climate change hazards and related disasters Reduce risks and damages to communities and natural resources from climate related risks and disasters | Decrease the number of affected individuals and preventable deaths due to landslide and flooding | Landslide due to extreme precipitation | Slope protection built on identified areas by 2029 | Build slope protection structures in identified landslide-prone areas | MEO | 100 M | LGU, NGA, PSF |
| | | | Vetiver grass planted on 15 hectares by 2022 | Plant vetiver grass in landslide-prone areas | MENRO | 300,000.00 | LGU, NGA, PSF |
| | | | 10,000 bamboos planted on riverbanks by 2022 | Plant bamboos along riverbanks | MENRO | 300,000.00 | LGU, NGA, PSF |
| | | Flood due to extreme precipitation and sea level rise | Flood incident on flood-prone areas with built flood control structures reduced to 0 by 2025 | Construct riverbank protection structures in flood-prone areas | MEO | 100 M | LGU, NGA, PSF |
| | | | Footpath, pathways, and farm to market roads identified by MAO constructed by 2022 | Construction of footpath, pathways and FMR on areas at high susceptibility to flood | MEO | 100 M | LGU, NGA, PSF |
| Ensure protection of coastal | Construct a seawall that can reduce the | Sea level rise | Seawall extended in Brgy. Bagacay by 2028 | Repair/Rehabilitation/Construction of Seawall (Barangay Bagacay) | MEO | 48,000,000.00 | LGU, NGA |

| | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------|--------|---------------|---------------|
| communities from flooding caused by storm surge and sea level rise | impact of strong typhoons | | Seawall constructed in Brgy. Pinontingn by 2026 | Repair/Rehabilitation/Construction of Seawall (Barangay Pinontingan) | MEO | 30,000,000.00 | LGU, NGA |
| | | | Seawall constructed in Brgy. Ariman by 2025 | Repair/Rehabilitation/Construction of Seawall (Barangay Ariman) | MEO | 30,000,000.00 | LGU, NGA |
| | | | Seawall extended in Brgy. Balud del Norte and Sur by 2026 | Repair/Rehabilitation/Construction of Seawall (Barangay Balud del Norte) | MEO | 31,000,000.00 | LGU, NGA |
| | | | Seawall extended in Brgy. Panganiban by 2025 | Repair/Rehabilitation/Construction of Seawall (Barangay Panganiban) | MEO | 28,000,000.00 | LGU, NGA |
| | | | Seawall rehabilitated in Brgy. Balud del Sur by 2024 | Repair/Rehabilitation/Construction of Seawall (Barangay Balud del Sur) | MEO | 20,000,000.00 | LGU, NGA |
| | | | Warning signages and billboards installed in hazard prone areas | Provide warning signages and billboards to hazard prone areas | MDRRMO | 500,000.00 | LGU |
| Prevent series of floods | Improve the drainage systems by providing additional connections and unclog the existing ones | Extreme precipitation | Drainage and canal system improved by 2025 | Improvement of drainage and canal system | MEO | 50 M | LGU, NGA |
| Enhance adaptive capacity and resiliency of communities through eco-friendly, climate-adaptive, and sustainable services | Increase the school building strength and adaptability to climate change and disaster | Increased intensity of typhoons | school buildings constructed by 2028 | Provision of climate-sensitive senior high classrooms and facilities | MEO | 5 M | LGU, NGA, PSF |
| | | Landslide due to extreme precipitation | Evacuation center constructed in 31 barangays by 2028 | Construction of evacuation center in all barangays without it | MEO | 93 M | LGU, NGA, PSF |
| | | | Relocation site established in 13 barangays by 2028 | Establishment of relocation site for households located on hazard-prone areas | MEO | 40 M | LGU, NGA, PSF |
| | Decrease the number of affected individuals and preventable deaths due to climate | Flood due to extreme precipitation and sea level rise | | | | | |

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| | related risks and disasters | | | | | | |
| Ensure financial security and enhance economic prosperity | Provide alternative livelihood activities to affected population | Drought due to increasing temperature and longer and drier dry days | Agricultural Research and Devt Facility constructed and operation by 2028 | Establishment of Agricultural Research and Development facility | MAO | 5 M | LGU, DA, PSF |
| Enhance adaptive capacity of households dependent on agriculture and fisheries sector | | Extreme precipitation | 10 Livelihood activities initiated and sustained by 2025 | Livelihood with starter kit program for marginalized women in coastal barangays (fish processing, fish pond, backyard gardening) | MAO | 5M | LGU, DA, PSF |
| | | Increased intensity of typhoons | Organic Agriculture Techno Demo and Training Farm operational by 2020 | Maintain Organic Agriculture Techno Demo and Training Farm | MAO | 2M | LGU, DA |
| | Minimize post harvest loss | | Post harvest facilities for fisheries products constructed and operational by 2025 | Provide post harvest facilities for fisheries products | MAO | 5 M | LGU, DA, PSF |
| SUSTAINABLE ENERGY | | | | | | | |
| Promote energy efficiency and conservation and develop sustainable and renewable energy | Increase use of renewable source of energy | Increasing temperature | At least 20 solar lights installed along tertiary national, municipal, and barangay roads | Install 20 no. of solar powered streetlights to municipal and barangay roads by the end of 2026 | MEO | 1.6 M | LGU, NGA |
| | | | Solar panels installed on 2 new municipal buildings by 2019 | Install solar panels on new municipal buildings | MEO | | LGU |
| Enhance adaptive capacity of energy systems and infrastructures | Ensure sufficient water supply to agricultural areas | Longer and drier dry days | Solar-powered irrigation systems constructed by 2022 | Construction of solar-powered irrigation systems | MAO, MEO | 150 M | LGU, NGA |
| KNOWLEDGE AND CAPACITY DEVELOPMENT | | | | | | | |

| | | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------|-----------------|
| <p>Enhance safety and adaptive capacity of communities to climate change hazards and related disasters</p> <p>Enhance knowledge and capacity for climate change adaptation, mitigation, and disaster risk reduction of communities in all sectors</p> | <p>Increase the level of awareness of communities to impacts of climate change and its related hazards and disasters</p> | <p>Increasing temperature, extreme precipitation, sea level rise</p> | <p>DRRM trainings conducted in all barangays by 2022</p> | <p>Conduct DRR-CCA trainings in 42 barangays</p> | <p>MDRRMO</p> | <p>300,000.00</p> | <p>LGU, PSF</p> |
| | | | <p>Training on VA&A use conducted in all barangays by 2022</p> | <p>Conduct training on use of vulnerability and adaptation assessment tools in communities</p> | <p>MDRRMO</p> | <p>30,000.00</p> | <p>LGU, PSF</p> |
| | | | <p>Developed 3,000 IEC materials for distribution to students by 2022</p> | <p>Develop climate change adaptation and mitigation social marketing materials for distribution to students</p> | <p>MDRRMO</p> | <p>100,000.00</p> | <p>LGU, PSF</p> |
| | | | <p>Multi-Hazard exercises conducted in 42 barangays by 2022</p> | <p>Conduct Multi-Hazard Exercises (earthquake, fire, evacuation, flood drills, tsunami drills) in 42 barangays</p> | <p>MDRRMO</p> | <p>150,000.00</p> | <p>LGU, PSF</p> |
| | | | <p>DRR-CCA planning tools acquired by 2019</p> | <p>Acquire state-of-the-art usable and accessible knowledge products for use in DRRM and CCA planning tools</p> | <p>MPDO, MDRRMO</p> | <p>1M</p> | <p>LGU, PSF</p> |
| | <p>Enhance the capacity of social groups to assist in DRR-CCA trainings and risk reduction during climate related disasters</p> | <p>Increasing temperature, extreme precipitation, sea level rise</p> | <p>All staff and personnel of DRR trained in monitoring, forecasting, and early warning by 2020</p> | <p>Conduct trainings for DRR personnel assigned on monitoring, forecasting, and early warning</p> | <p>MDRRMO</p> | <p>210,000.00</p> | <p>LGU, PSF</p> |
| | | | <p>Orientation an training on DRR-CCA to special bodies by 2022</p> | <p>Conduct orientation and training on DRRM and CCA to members of local special bodies such as Local School Board, Local Health Board, and Municipal Dev't Council, MDRRMC, BDRRMC</p> | <p>MDRRMO</p> | <p>60,000.00</p> | <p>LGU, PSF</p> |
| | | | <p>Community Disaster Volunteers team identified and organized in 42 barangays by 2022</p> | <p>Identify and organize Community Disaster Volunteers</p> | <p>MDRRMO</p> | | |
| | | | <p>MDRRMC and BDRRMCs of all</p> | <p>Expand membership of MDRRMC/BDRRMCs to include additional CSOs</p> | <p>MDRRMO</p> | <p>100,000.00</p> | <p>LGU, PSF</p> |

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| | | | barangays functional by 2019 | | | | |
| | | | Trained and functional Barangay Health Emergency Response Team (BHERT) in all barangays by 2022 | Organization and training of BHERTs in all barangays | MHO | 2.1 M | LGU, PSF |
| | Increase the adaptive capacity of schools on climate change related risks and disasters | Increasing temperature, extreme precipitation, sea level rise | Meeting with DepEd to mainstream CCA in academic curriculum conducted by 2022 | Coordinate with DepEd and schools to mainstream climate change adaptation and disaster risk assessment in academic curriculum | MDRRMO | | |
| | Increase level of awareness and knowledge of children and youth on climate change mitigation, adaptation, and disaster risk reduction | | Assisted in the Formulation of School Disaster Preparedness Plan of all schools | Assist in formulating School Disaster Preparedness Plan | MDRRMO | | |
| | | | Barangay Emergency Response Training conducted in 42 elementary schools by 2022 | Conduct Barangay Emergency Response Training in elementary schools | MDRRMO | 100,000.00 | LGU, PSF |
| | | | DRR-CCA mapping tools acquired by 2022 | Acquire state-of-the-art DRRM and CCA mapping tools | MPDO, MDRRMO | 1 M | LGU |
| | | | | | | | |
| | Strengthen capability of marginalized farmers on new farming techniques which are climate-adaptive | Increasing temperature, extreme precipitation, sea level rise | Climate Smart FFS and FBS conducted yearly starting 2020 | Provide Climate-Smart trainings to farmers | MAO | 2.5 M | LGU, DA, PSF |
| | | | Trainings on climate-adaptive technologies in animal raising conducted yearly starting 2020 | Conduct training on climate-adaptive technologies in animal raising | MAO | 1 M | LGU, DA, PSF |
| | | | Trainings on climate-adaptive | Conduct training on climate adaptive technology on fisheries | MAO | 1M | LGU, DA, PSF |

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| | | | technologies on aquasilviculture by 2020 | | | | |
| TOTAL | | | | | | 1,256,500,000.00 | |

V. MONITORING AND EVALUATION PLAN

Table 24. Monitoring and Evaluation Plan from 2019 to 2028.

| | Indicator Focus | Baseline | Target | Timing | Location |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------|--------|----------------------------------------------------------------------|
| Reduce harvest loss due to climate change related hazards and disasters | Volume of palay yield per hectare per cropping season | 4 MT/ha rice yield | 5.5 MT/ha rice yield | 2028 | All rice-producing barangays |
| | Percent of palay yield lost due to post harvest loss | 10% palay yield lost due to post harvest | 5% palay yield loss due to post harvest | | All HVCC producing barangays |
| Maximize farm yield | Percent of palay yield lost due to pests and diseases | 5% palay yield loss due to pests and diseases | 3% palay yield lost due to pests and diseases | | All freshwater systems suitable and allowable for tilapia production |
| Increase resilience and adaptive capacity of farmers to climate change hazards and disasters | Volume of HVCC yield | 8.36 MT/ha HVCC yield | 10 MT/ha HVCC yield | 2028 | |
| | Number of livestock animals | 3,063 farmers insured | At least 75% of the total farmers insured | 2020 | |
| | No. of farmers insured under PCIC program | At least 6 trainings conducted | At least 10 trainings conducted yearly | 2020 | |
| Reduce post harvest loss | No. of climate information forums and climate smart trainings conducted | 4 farm machineries distributed | 30 farm machineries provided | 2028 | |
| Provide support to sustain livelihood of fishers | No. of farmers with access to climate information | 8 post harvest facilities | 8 post harvest facilities rehabilitated and 8 post harvest facilities constructed | 2028 | |
| | No. of farm machineries distributed | 58,870 tilapia fingerlings dispersed in 2018 | 70,000 tilapia fingerlings distributed annual | 2020 | |
| | No. of post harvest facilities constructed and improved | | | | |
| | Area dedicated to organic farming | | | | |
| | Volume of organic farming yield | | | | |
| | Area of pasture land | | | | |

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| | No. of fishing gears and paraphernalia provided No. of filashia fingerlings stocked in freshwater fish ponds and designated rivers | | | | |
| Construct/rehabilitate water systems Provide sufficient potable water supply to households | No. of households with Level 3 water system No. of barangays with rehabilitated or constructed water system No. of springs developed No. of barangays with improved water system | 200 households with Level 3 water system as of 2019 10 barangays in need of rehabilitation of water system | 75% increase in no. of households with Level 3 water system 5 barangays | 2021 | Poblacion barangays Cogon Tiris San Ignacio Beriran |
| Provide sufficient water supply for lowland and upland farming | Area of irrigated Riceland No. of irrigation system | 1,032.45 ha irrigated rice field 31 irrigation system and 12 shallow tube wells (STW) | At least 25% additional irrigated area | 2022 | All rainfed rice areas in rice producing barangays |
| | | | | | |
| Strengthen resilience of coastal communities against climate change related disasters Increase carbon sequestration Rehabilitate and stabilize upland ecosystems | Number of beach forest trees planted Number of mangrove trees planted Area of abandoned fish ponds reverted to mangroves Number of perennial trees planted in upland areas | No beach forest area 486 ha of mangroves 15 ha of abandoned fish ponds | Additional 15 hectares of mangroves | 2024 | Tiris |

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| | | | | | |
| Enact ordinance on illegal logging | Municipal ordinance | No municipal ordinance | Enacted municipal ordinance on illegal logging | 2019 | Municipal-wide |
| Implement Solid Waste Management Act of 2009 | Presence of BSWM Committees | No BSWM committees | BSWM Committees | 2019 | All barangays |
| Ensure proper waste disposal of domestic wastes | Schedule of trash collection | Segregated collection | Regular schedule of garbage collection | | |
| Protect water bodies from domestic pollution | No. of MRF | 26 barangays with MRF | MRF constructed | | |
| | No. of trash bins installed | | | | |
| Increase the protected area within the municipal waters | No. and area of Marine Protected Area declared | 2 fish sanctuaries (31 ha total area) | Additional 37 ha MPA | 2020 | Pinontingan and Panganiban |
| Ensure sufficient fish stock for recovery and sustainability | Area of Crab Sanctuary declared | No crab sanctuary - ongoing consultations and proposal | Additional 15 ha crab sanctuary | 2022 | Cogon |
| Ensure strict implementation of the Municipal Fisheries Code | No. of violations No. of Bantay Dagat Fish Biomass Survey Results Biophysical assessment results | 6 apprehensions in 2018 3 Bantay Dagat | 0 violation 5 Bantay Dagat | 2020 | Municipal-wide |
| Provide appropriate infrastructures and facilities for human security | No. of housing units for relocation | 50 housing units in San Ignacio relocation site | 100 housing units | 2025 | Landslide-prone barangays: Ariman, Cabigaan, Cabiguhan, Luna Candol, Manapao, Naagtan, Patag, Sangat, San Ignacio, Sta. Ana, Tabi, Tagaytay, Union |
| Reduce the number of injuries and preventable deaths due to climate change related disasters to 0 | No. of households relocated | | All identified households relocated | 2028 | |

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| | | | | | Flood-prone barangays: Bagacay, Benguet, Beriran, Cota na Daco, Lapinig, Manook, Paco, Panganiban, Tabi, Tagaytay, Union, Villareal, Cogon, Ogao, Balud del Sur |
| Provide basic needs of affected population | No. of BHS Drugroom established | 0 | 42 | 2022 | 42 barangays |
| Provide health services during climate change related disaster events | No. of motorcycle ambulance procured | 0 | 42 | 2022 | 42 barangays |
| | No. of barangays with emergency health equipment | 0 | 42 | 2028 | 42 barangays |
| | No. of evacuation camps with medical stations | 0 | 11 | 2022 | Cota na Daco, Bentuco, Bulacao, Cogon, Dita, Ogao, Paco, Payawin, Tabi, Rizal |
| | No. of barangays with organized, trined and functional BHERTs | 0 | 42 | 2022 | 42 barangays |
| Formulate Zoning Map for every barangay | Zoning Ordinance/Zoning Map in every barangay | CLUP for submission to PLUC | Approved CLUP | 2019 | Municipal-wide |
| Keep the communities updated and informed in times of climate related disasters | Number of Automated Weather Station installed | 0 Access through social and electronic media | 1 AWS installed 100% of population | 2028 | Municipal-wide |

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| | Number of population with access to climate information updates Frequency of weather updates sent to population via text message | During disasters and selected portion of population only | Daily updates before, during, and after disaster | | |
| Provide basic needs of affected population | Number of barangays with formed and functional Emergency Response Team Number of operational ambulance | 0 2 ambulance | 1 ERT in every barangay 2 ambulance maintained and operational | 2025 Starting 2019 | 42 barangays Municipal-wide |
| Provide alternative livelihood activities to affected population | No. of livelihood activities sustained for affected population | 5 livelihood activities sustained for affected population in 2018 | 10 livelihood activities provided and sustained | 2025 | Municipal-wide |
| Decrease the number of affected individuals and preventable deaths due to landslide and flooding | No. of slope protection structure constructed No. of flood control structures constructed No. of coastal barangays with seawall infrastructure | 2 barangays 2 barangays | All identified landslide-prone areas All identified flood-prone areas 5 barangays | 2028 | Landslide-prone and flood-prone barangays |
| Increase the school building strength and adaptability to climate change and disaster | No. of climate-sensitive school buildings constructed | 0 | All school buildings | 2028 | Municipal-wide |
| Decrease the number of affected individuals and preventable deaths due to climate related risks and disasters | No. of barangays with evacuation center | 11 barangays | 31 barangays | 2028 | All barangays except Cota na Daco, Bentuco, Bulacao, Cogon, Dita, Ogao, Paco, Payawin, Tabi, Rizal |

| | | | | | |
|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|
| Decrease the number of affected individuals and preventable deaths due to landslide and flooding | Area planted with vetiver grass No. of bamboos planted along riverbanks | None | 15 hectares planted with vetiver grass 10,000 bamboos planted along riverbanks | 2022 | Identified areas by concerned agency |
| Decrease the number of affected individuals and preventable deaths due to landslide and flooding | Area planted with vetiver grass No. of bamboos planted along riverbanks | None | 15 hectares planted with vetiver grass 10,000 bamboos planted along riverbanks | 2022 | Identified areas by concerned agency |
| Increase use of renewable source of energy | No. of solar-powered buildings | 1 (GSAC) | 2 Municipal Hall buildings | 2022 | Pinontingan (Municipal Compound) |
| Increase the level of awareness of communities to impacts of climate change and its related hazards and disasters | Number of DRR-CCA mapping tools acquired | 0 | 1 DRR-CCA mapping tool | 2019 | Municipal-wide |
| Increase the level of awareness of communities to impacts of climate change and its related hazards and disasters | No. of DRR-CCA trainings conducted No. of trainings on use and application of VA&A conducted No. of IEC materials distributed to students No. of Multi-Hazard exercise conducted No. of DRR-CCA planning tool acquired | 0 0 0 0 0 | 42 42 3,000 42 1 | 2022 2022 2022 2022 2022 | Municipal-wide |
| Enhance the capacity of social groups to assist in DRR-CCA trainings and risk reduction during climate related disasters | No. of trained MDRRMO personnel on monitoring, forecasting and early warning | 1 0 0 | All DRR personnel At least 5 special bodies 42 | 2020 2022 2022 | Municipal-wide |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------|------------------|----------------|
| | No. of special bodies who received orientation on DRR-CCA No. of Community Disaster Volunteers team organized No. of MDRRMC and BDRRMC functional | 1 MDRRMC, 42 BDRRMC | 1 MDRRMC, 42 BDRRMC | 2019 | |
| Increase the adaptive capacity of schools on climate change related risks and disasters Increase level of awareness and knowledge of children and youth on climate change mitigation, adaptation, and disaster risk reduction | No. of dialogue with DepEd with regard to mainstreaming DRR-CCA in academic curriculum conducted No. of Barangay Emergency Response Training in schools conducted | 0 0 | 1 All schools in 42 barangays | 2022 2022 | Municipal-wide |

VI. REFERENCES

- Kahana, R., Abdon, R., Daron, J., & Scannell, C. (2016). *Projections of mean sea level change for the Philippines*. Philippines.
- Landslide. (2014). In *National Geographic Society online*. Retrieved from <https://www.nationalgeographic.org/encyclopedia/landslide/>
- Local Government Academy. (2014). *LGU Guidebook on the Formulation of Local Climate Change Action Plan (LCCAP) Book 1*. Pasig City, Philippines.
- Local Government Unit of Gubat. (2018). *Coastal Environment Profile*. Gubat, Sorsogon, Philippines.
- Local Government Unit of Gubat (2019). *Draft Comprehensive Land Use Plan 2019 - 2029*. Gubat, Sorsogon, Philippines.
- Local Government Unit of Gubat (2016). *Comprehensive Development Plan 2017 - 2026*. Gubat, Sorsogon, Philippines.
- Local Government Unit of Gubat (2016). *Climate and Disaster Risk Assessment*. Gubat, Sorsogon, Philippines.
- Philippine Atmospheric, Geophysical and Astronomical Services Administration. (2011). *Climate Change in the Philippines*. Philippines.
- The World Bank. (2013). Getting a Grip on Climate Change in the Philippines. Retrieved from <http://documents.worldbank.org/curated/en/473371468332663224/pdf/788090WP0P13010nge0Executive0Report.pdf>

