

II. BIO-PHYSICAL PROFILE

2.1 Geography

Sta. Cruz is one of the 15 municipalities of Davao del Sur in Region XI. Situated within longitudes 125° 16' 10" and 125° 29' 25" E and latitudes 6° 46' 46" and 6° 59' 22" N, it is bounded on the North by Davao City; on the East by Davao Gulf; and on the West and South by Digos City.

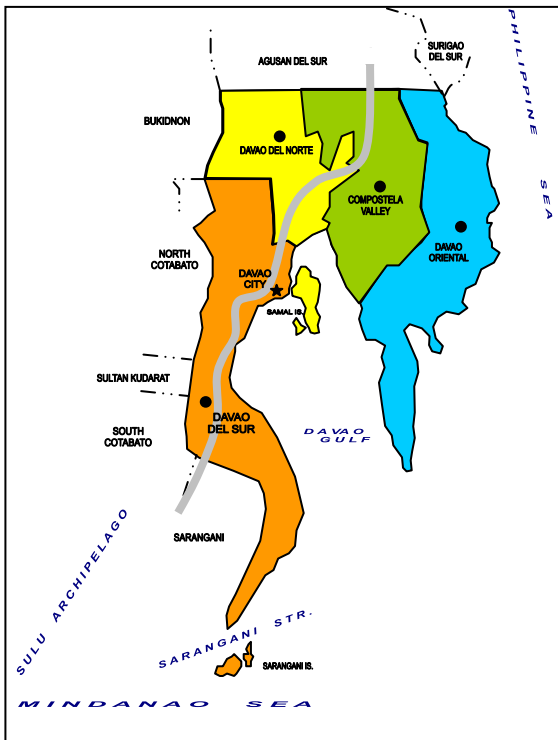


Fig. 1 – Map of Region XI

It is accessible by land transportation vehicles plying the Davao-Digos City, Davao-Kidapawan City, Davao-Cotabato City, Davao-Koronadal City and Davao-Tacurong City routes passing through the 27-kilometer stretch of national highway that traverses its 11 barangays.

From Davao City, the administrative center of Region XI, it is 38 kilometers away or 45-minute ride. It is 16 kilometers or about 15-minute ride from Digos City, the government's seat in Davao del Sur. (Fig. 2)

2.2 Land Area

The land area of Sta. Cruz per Board of Technical Survey and Maps is 27,960 hectares. However, based on the Field Appraisal and Assessment Sheets (FAAS) and Tax Maps of the Municipal Assessor's Office the total land area of the municipality is 28,759.7855 or about 7.31% of the province's area (393,401 hectares). This excludes the Kapatagan contested area.

Among the 18 barangays, Sibulan has the biggest land area of 6,390.6581 hectares or 22.22% of the total land area.

Poblacion Zone III has the smallest area of 105.3148, only 0.37% of the total. (Figure 3)

Table 1– LAND AREA BY BARANGAY, 2000

BARANGAY	AREA (has.)	%	DISTANCE FROM POB. (kms.)
URBAN (POB.)			
Zone I	1,693.1927	5.89	0.0
Zone II	1,809.4315	6.29	
Zone III	105.3148	0.37	
Zone IV	302.7400	1.05	
Sub-Total	3,910.6790	14.00	
RURAL:			
Astorga	2,155.2317	7.49	10.7
Bato	412.6461	1.43	8.0
Coronon	1,255.4523	4.37	6.0
Darong	1,483.3187	5.16	13.0
Inawayan	966.7734	3.36	17.0
Jose Rizal	1,689.3589	5.87	15.0
Matutungan	362.9329	1.26	11.0
Melilia	397.8105	1.38	9.0
Saliducon	1,130.2211	3.93	8.0
Sibulan	6,390.6581	22.22	21.0
Sinoron	1,824.9807	6.35	5.0
Tagabuli	579.8071	2.02	7.0
Tibolo	5,713.1612	19.87	28.0
Tuban	486.7538	1.69	3.0
Sub-Total	24,849.1065	86.00	
Grand Total	28,759.7855	100.00	

Source: Municipal Assessor's Office
Sta. Cruz, Davao del Sur

2.3 Land Classification and Actual Land Use

The Department of Environment and Natural Resources (DENR), Region XI commissioned the CERTEZA Surveying Office to survey the region in 1982-1989. The survey for Sta. Cruz yielded a total land area of 33,474 hectares classified as follows: alienable and disposable land, 14,049 hectares or 41.97% of the total area and inalienable timberland/forestland, 19,425 hectares or 58.03%. Of the total inalienable land, 13,380 hectares or 68.88% was declared as Mt. Apo Natural Park Reservation with the remaining 6,045 hectares as timberland.

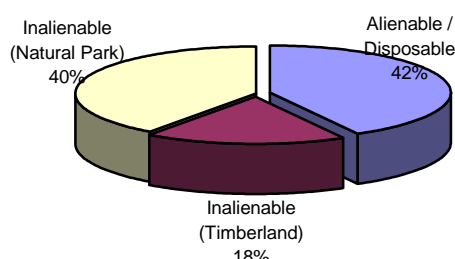


Fig. 4- LAND CLASSIFICATION BY HECTARAGE, 2000

Sources: Land Service Unit, Bureau of Lands
Dept. of Environment and Natural Resources

On the other hand, data from Community Environment and Natural

Table 2- LAND CLASSIFICATION, 2001

LAND CLASSIFICATION	LOCATION	AREA	%
1. Alienable & Disposable Lands (A & D)	Brgys. Bato, Sinoron, Zones I-IV, Coronon, Astorga, Darong, Sibulan, Inawayan, Tuban & Tagabuli	11,304	40.7
2. Forestlands		16,468	59.3
2.1 Production Forest		0	
2.2 Protection Forest			
a)NIPAS Areas	Brgys. Tibolo, Coronon, Sinoron, Sibulan, Melilia	16,284	
b)Non-NIPAS Areas	Jose Rizal, Matutungan & Saliducon Brgys. Tuban & Tagabuli	184	
Total		27,772	100

Source: CENRO, Digos City

Resources Office (CENRO) showed that Sta. Cruz has a total land area of 27,772 hectares, of which 11,304 or 40.7% are alienable and disposable while 16,468 or 59.30% are protection forest. Of these, 16,284 hectares or 98.88% was declared as Natural Integrated Protected Areas System (NIPAS) while only 184 hectares or 1.12% are non-NIPAS located in Tuban and Tagabuli. (Table 2 and Figure 5)

Corollary to these, the Report on Real Property Assessments showed the land uses as follows:

Table 3 - LAND ASSESSMENT BY AREA, 2002

Land Use	Land Area (in has.)	%
Residential	69.0235	0.24
Agricultural	11,319.8516	39.36
Commercial	2.8760	0.01
Industrial	353.7453	1.23
Institutional - Hospital	2.8760	0.01
Government	241.5822	0.84
Religious	2.8760	0.01
Educational	785.1421	2.73
Forest (Mt. Apo Natural Park)	15,981.8128	55.57
Total	28,759.7855	100.00

MAssO, Sta Cruz, Davao del Sur

Sta. Cruz shares the problem of many LGUs – the determination of its authentic land area. Presented below are the contradicting figures from the different line agencies.

Table 4- MUNICIPAL LAND AREA BY SOURCES OF DATA

Source of Information	Municipal Land Area (has.)	Basis
1. Board of Technical Survey and Maps (BTSM)	27,960	
2. DENR Region XI	33,474	Surveyed by CERTEZA Surveying Office
3. CENRO Digos	27,772	Land Classification
4. DA-BSWM Land Resource and Evaluation Project (LREP)	24,200	Land Use Survey
5. Municipal Assessor's Office (MAssO)	28,759.7855	Tax Maps and Land Declarations

For purposes of planning and pending resolution of this issue, the Municipal Planning Office adopts the Municipal Assessor's Office (MAssO) figure of 28,759.7855 hectares.

2.4 Topography

Sta. Cruz's topography is extreme. Mountain ranges and high relief that include part of the famed Mt. Apo, the highest mountain peak in the Philippines, straddle the south, central, north and northwestern portions of the municipality. The rugged topography of the central area gradually undulates toward the coastal plains of the northeastern, eastern and southeastern parts. Here, settlements sprawl contiguously along the coast of Davao Gulf under the vast monotony of coconut plantations. On the western frontier, a plateau stretches toward Barangay Kapatagan of Digos City.

The municipal elevation ranges from 10 meters to 2,939 meters above sea level (m.a.s.l.). Of the 18 barangays, 7 are uplands, 9 are upland-lowland and coastal and 2 are lowland-coastal.

2.5 Slope Classification

Only 13% of Sta. Cruz's area is classified as level to nearly level (0-3%

Table 5 – SLOPE CLASSIFICATION, 2000

SLOPE CATEGORY	DESCRIPTION	LAND AREA (Has.)	%
A. 0-3%	Level to nearly Level Land	3,738.7721	13
B. 3-5%	Gently Sloping Area	862.7936	3
C. 5-8%	Gently Undulating & Rolling	1,150.3914	4
D. 8-15%	Moderately Undulating & Rolling	3,163.5764	11
E. 15-18%	Steeply Undulating & Rolling Land	16,680.6756	58
F. 18% & Over	Very Steeply Sloping Land	3,163.5764	11
Total		28,759.7855	100

Source: Extracted from Topographic Map of the Bureau of Coast and Geodetic Survey (BCGS), 1956

slope). These can be found on the coastal part of the municipality. About 3% is gently sloping (3-5%) while 4% is gently undulating and rolling (5-8%). Some 11% is moderately undulating and rolling (8-15%). Approximately, 58% are steeply undulating and rolling land (15-18% slope) and the remaining 11% are very steep sloping land i.e. 18 % and above. (Figure 6)

2.6 Soil Type and Suitability

Sta. Cruz has four (4) basic soil types. About 4,026.37 hectares or 14% of the total land area were classified as San Manuel silty clay loam. Tugbok clay loam is about 7,477.5442 hectares or 26%; Miral clay loam, 4,889.1635 hectares or 17%; and undifferentiated mountain soil, 12,366.7078 hectares or 43% of the total. (Figure 7)

Table 6 – SOIL TYPE

SOIL TEXTURE/TYPE	LAND AREA (Has.)	%
San Manuel Silty Clay Loam	4,026.3700	14
Tugbok Clay Loam	7,477.5442	26
Miral Clay Loam	4,889.1635	17
Undifferentiated Mountain Soil	12,366.7078	43
Total	28,759.7855	100

Source: Bureau of Soils, Region XI

2.7 Meteorology

2.7.1 Climate

Two types of climate prevail in Sta. Cruz. The first type has pronounced dry and wet seasons. Generally the months of November to April are dry periods. Wet season occurs from May to October. This type of climate is observable in the plain and coastal areas. In the mountainous barangays, the fourth type of climate is consistently experienced. Rainfall is more or less evenly distributed throughout the year. Most often in these areas heavy downpour occurs every afternoon while in the morning the sun shines.

2.7.2 Rainfall

Although the rainfall observation was in Davao City, PAG-ASA assured that the figures also apply to Sta. Cruz due to climatic affinity of the two areas. The year 2000 recorded the highest monthly average rainfall of 196 mm. while the lowest, 112.18 mm. was in 1998. However, the highest amount of rainfall was recorded in October 1977 with 449.3 millimeters and the lowest was in March 1998 with 7.1 millimeters only. Apparently, rainfall is more or less evenly distributed throughout the year in Sta. Cruz except in the months of April and December.

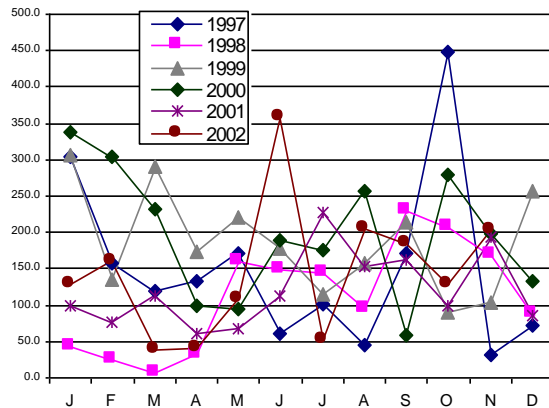


Fig. 8 – 6-YEAR RAINFALL PATTERN

Table 7 – RAINFALL PATTERN, 1997-2002

MONTH	AMOUNT OF RAINFALL (In Millimeters)					
	1997	1998	1999	2000	2001	2002
January	303.4	43.4	307.1	337.0	98.0	127.9
February	156.9	24.7	135.4	303.9	76.2	160.6
March	119.1	7.1	290.5	231.5	113.7	38.8
April	133.8	30.6	173.6	98.8	61.1	40.8
May	170.7	160.4	220.2	94.4	67.9	107.5
June	60.0	149.3	177.5	188.4	112.9	357.7
July	100.6	144.5	115.1	175.0	226.5	51.1
August	45.4	94.1	157.8	257.2	152.4	204.8
September	170.3	229.8	214.8	58.6	161.2	185.3
October	449.3	206.2	89.8	279.8	99.1	129.5
November	31.8	169.3	104.0	199.1	193.1	202.5
December	71.8	86.8	257.1	133.8	85.8	-
Total	1,813.1	1,346.2	2,242.9	2,357.5	1,447.9	1,606.5
Monthly Average	151.09	112.18	186.91	196.46	120.66	133.88

Source: Philippine Atmospheric Geographical & Astronomical Services Administration (PAGASA), Davao City
N.B. Data reflect Davao City observation

2.7.3 Temperature

The mean annual temperature in the 6-year period just hovered within the range of 27.2 °C – 28 °C. The lowest was in 1990 at only 27.2 °C and the highest was in 1998 at 28 °C. Very slightly, temperature drops in the months of November to February.

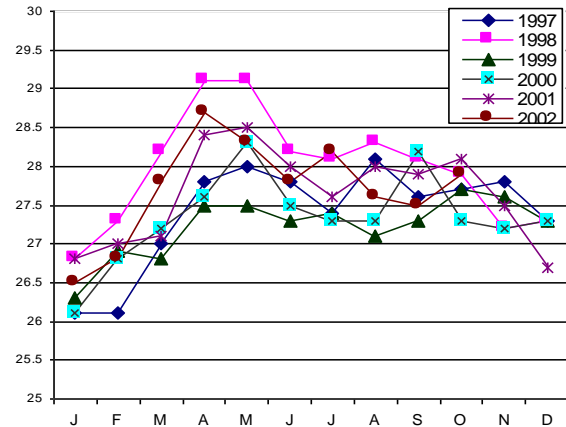


Fig. 9 – 6-YEAR TEMPERATURE PATTERN

Table 8 – MEAN ANNUAL TEMPERATURE, 1997-2002

MONTH	MEAN TEMPERATURE (°C)					
	1997	1998	1999	2000	2001	2002
January	26.1	26.8	26.3	26.1	26.8	26.5
February	26.1	27.3	26.9	26.8	27.0	26.8
March	27.0	28.2	26.8	27.2	27.1	27.8
April	27.8	29.1	27.5	27.6	28.4	28.7
May	28.0	29.1	27.5	28.3	28.5	28.3
June	27.8	28.2	27.3	27.5	28.0	27.8
July	27.4	28.1	27.4	27.3	27.6	28.2
August	28.1	28.3	27.1	27.3	28.0	27.6
September	27.6	28.1	27.3	28.2	27.9	27.5
October	27.7	27.9	27.7	27.3	28.1	27.9
November	27.8	27.2	27.6	27.2	27.5	-
December	27.3	27.3	27.3	27.3	26.7	-
Mean Annual Temperature	27.4	28.0	27.2	27.3	27.6	27.7

Source: Philippine Atmospheric Geographical & Astronomical Services Administration (PAGASA), Davao City
N.B. Data reflect Davao City observation

2.7.4 Wind Direction

From 1997 to 2002 the prevailing wind direction and average velocity was recorded by PAG-ASA to reveal three prevailing patterns. January to April, the wind blows in northeast direction at a

minimum wind velocity of 2 meters/second (mps) and maximum of 3 mps. From May to October the direction is toward the South at 1 mps minimum to 2 mps maximum. November to December, the wind blows toward the North at a minimum speed of 2 mps and maximum of 3 mps. (Figure 10)

Fortunately, Davao Gulf municipalities of which Sta. Cruz is one, are outside the typhoon belt. However, flash floods occasionally occur during heavy rain.

Table 9 – PREVAILING WIND DIRECTION AND AVERAGE VELOCITY (mps)

MONTH	WIND DIRECTION AND AVERAGE VELOCITY (mps)*					
	1997	1998	1999	2000	2001	2002
January	NE-3	NE-3	NE-2	NE-3	NE-2	N-3
February	N-3	NE-3	N-3	NE-2	N-3	N-3
March	NE-3	N-2	NE-2	NE-2	N-2	NE-3
April	NE-3	NE-3	NE-2	NE-2	NE-2	NE-2
May	S-2	NE-2	S-1	S-2	S-2	S-2
June	S-2	SW-2	S-1	S-2	S-2	S-2
July	S-2	S-2	S-2	S-2	S-2	S-2
August	S-2	SW-2	S-2	S-2	S-2	S-2
September	S-2	S-2	S-2	S-2	S-2	S-2
October	SW-2	S-1	S-2	N-2	S-2	S-2
November	NE-2	N-2	N-2	N-2	N-2	-
December	N-3	N-2	NE-2	N-2	N-3	-
Prevailing Wind Direction & Average Velocity	S-2	NE-3	S-2	S-2	S-2	S-2

Source: Philippine Atmospheric Geographical & Astronomical Services Administration, (PAGASA), Davao City
 N.B. Data reflect Davao City observation
 *To convert meter/second (mps) to kilometer/hour (kph), multiply by 3.6

2.7.5 Relative Humidity

Average relative humidity was highest in 1999-2000 at 82% and lowest in 1998 at 78%. A slight pattern of low humidity is observed between March and June.

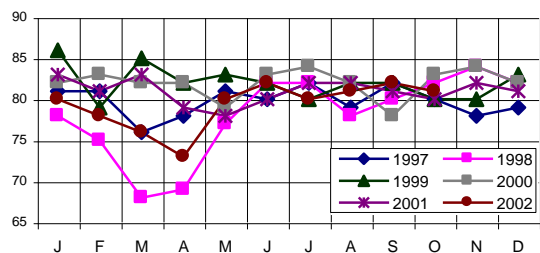


Fig. 11 – 6-YEAR RELATIVE HUMIDITY PATTERN

Table 10– AVERAGE RELATIVE HUMIDITY, 1997-2002

MONTH	AVERAGE RELATIVE HUMIDITY					
	1997	1998	1999	2000	2001	2002
January	81	78	86	82	83	80
February	81	75	79	83	81	78
March	76	68	85	82	83	76
April	78	69	82	82	79	73
May	81	77	83	79	78	80
June	80	82	82	83	80	82
July	82	82	80	84	82	80
August	79	78	82	82	82	81
September	82	80	82	78	81	82
October	80	82	80	83	80	81
November	78	84	80	84	82	-
December	79	82	83	82	81	-
Relative Annual Average	80	78	82	82	81	79

Source: Philippine Atmospheric Geographical & Astronomical Services Administration (PAGASA), Davao City

2.8 Hydrology and Forest Resources

Sta. Cruz has seven (7) rivers, namely: Baracatan, Baruring, Sibulan, Pilan, Tagabuli, Tuban and Coronon. The heaviest volume of run-off is in Sibulan while Coronon River is almost dried up during dry season. Tributaries of these rivers are the 49 creeks that originate from 52 springs. All of these drain to Davao Gulf. (Annex 1.1 and Figure 12)

The upstream portion of the municipal watershed particularly towards Mt. Apo is relatively wooded by more or less 127 species of forest trees resulting to abundant aquifer. This is one resource that attracted the San Miguel Corporation to set up a Brewery, a water-based industry in Darong. As of 2000, the Davao Brewery operation consumed around 425,385 cubic meters of raw water to produce its beer product for the same year.

2.9 Mineral Resources

The Bureau of Mines and Geo-Science Services (BMGS) geological investigation in 1990 found out a positive reserve of sulfur ore (elemental) at 86,400 m.t. in Mt. Apo National Park. In Saliducon, rock phosphate with a probable reserve of 1,000 metric tons and raw materials for cement are subject to

investigation. Guano had been extracted in Saliducon with an estimated reserve range of 10,000-25,000 kilograms. Limestone ore reserves for agro-industrial use are present in Tagabuli. However, until this date no further exploration or investigation has been conducted by the BMGS. (Figure 13)

Table 11 - MINERAL RESOURCES BY LOCATION, PROBABLE QUANTITY OF RESERVES, OPERATOR AND STATUS

TYPE OF MINERAL RESOURCES	LOCATION	NAME OF OWNER/ OPERATOR	POSITIVE & PROBABLE RESERVE	STATUS
1. Sulphur Ore	Mt. Apo	Bureau of Mines and Geo-Sciences	86,400 mt.	Geologically investigated
2. Guano	Saliducon	Mr. Benjamin Sia	25,000 kgs.	Commercial and business permits had expired
3. Rock Phosphate	Saliducon	-	1,000 mt.	To be investigated
4. Cement Raw Materials	Tagabuli	-	-	To be investigated
5. Limestone Ore Reserves for Agro-Industrial Lime	Coronon	Horizon Aggregates Inc	960,000 mt.	-do-
6. Sand and Gravel				Commercial permit

Source: Mines and Geo-Sciences Services
Department of Environment and Natural Resources
Region XI, Davao City

Per record of the same office, it was reported that Coronon has a total reserve of 960,000 metric tons of sand and gravel. Boulders strewn all over as a result of volcanic action in the past are now being crushed as aggregates and sold as construction material. Two operators were given permits to quarry sand, gravel, and boulders in Pilan River, between Sinoron and Zone II. Legaspi Concrete Products operates the crushing site in Zone IV and Horizon Aggregates, Inc. in Coronon.

2.10 Flooded and Erosion-Prone Areas

Slight seasonal flooding is observed in Inawayan, Cawit Creek in Astorga, Zone I, Pilan River in Zone III, Loay Creek in Zone II, Tuban and Bato. Overflow of accumulated water run off in Pilan River is felt most in Ceboley Beach, proximate to the mouth of the river. (Figure 14)

Coronon River is moderately flooded due to overflow of creek and river, flash flood and accumulation of rainwater and run off. During heavy downpour portions of the national road in Inawayan, Zone II and Bato are under water due to flash flood. This causes traffic jam and more serious problems such as loss of lives and destruction of properties.

Severe soil erosions are noted in Barangays Sibulan, Tibolo, Rizal, Astorga, Coronon, Zone II, Sinoron, Saliducon, Melilia, Matutungan and Bato. (Figure 15)

2.11 Fishery and Aquatic Resources

Aside from Mt. Apo that was proclaimed as NIPAS, Sta. Cruz is also part of the Davao Gulf eco-system. It has eleven barangays with wide coastal areas, namely: Inawayan, Darong, Astorga, Coronon, Zone I, Zone II, Zone III, Zone IV, Tuban, Tagabuli and Bato. Its shoreline is 24.8 kilometers and the municipal water is 37,200 hectares.

Seagrass area was estimated at about 140 hectares, 70% of which are abundantly growing in Bato waters with eel grass as common specie.

Mangrove area is 124 hectares with “bakhaw, pagatpat, potutan and tangal” (Rhizophora spp... and Sonneratia spp...) as dominant species. These are found mostly in Tuban and Bato areas.

Remaining coral cover is about 134 hectares classified as branching, table, brain and soft corals. Bato has vast area of coral reef and sea grasses where underwater activities like snorkeling and scuba diving can be conducted. The presence of 2.5-hectare Pasig islet is also potential for seascape tour where migratory birds seek refuge on certain season of the year.

For inland fish resource, the municipality has 56.1 hectares of brackish water fishpond.