The Assessment on the Flood Mitigation Strategies of the Local Government Unit of Santo Tomas, Davao del Norte: A Basis for Policy Formulation

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ABSTRACT

This study evaluates flood mitigation strategies implemented by the LGU of Santo Tomas, Davao del Norte, focusing on indicators such as Rehabilitation of River Banks, Bridges, Dredging, and Reforestation. Through random sampling in selected barangays, 377 respondents provided feedback, indicating Very High Descriptive Equivalents for all strategies. However, the detailed analysis identifies the Rehabilitation of River Banks as an area for improvement (mean score: 4.19), emphasizing the need for enhanced catchment drainage, floodwater capacity, and sediment yield reduction. Recommendations include regular maintenance of drainage channels, river widening, and the establishment of riparian buffer zones. Future research should explore flood-prone residents' perceptions of LGU strategies. A proposed policy on River Bank Rehabilitation emphasizes an ecosystem-based, participatory approach to enhance resilience, increase public awareness, and promote sustainable development. Strategies encompass riparian vegetation restoration, bank stabilization, invasive species control, water quality improvement, floodplain management, and public education. Implementation rests with the LGU of Sto. Tomas and stakeholders, with ongoing monitoring and evaluation to ensure effectiveness and facilitate adjustments. This study provides valuable insights and a practical policy framework to enhance flood mitigation, specifically focusing on river bank rehabilitation in LGU-Santo Tomas, Davao del Norte.

Keywords: Flood Mitigation Strategy, Assess level flood Mitigation

INTRODUCTION

For the past several years the Municipality of Sto. Tomas, Davao del Nortehas been confronted with the problem of flooding. Each year, an average of two flooding incidents hit the low-lying barangays of this town. In the recent years flood incidents have been more catastrophic in terms of damage to lives, properties and areas despite massive infusion of resources for flood-control infrastructures by the national government and separate but limited flood-mitigation and control efforts of various affected government units. Adaptation to climate change and climate disaster management is increasingly considered necessities that must be accommodated in the policy. The role of cities and local actors in climate adaptation and resilience to disasters is considered pivotal in these response processes (Grimmond, 2007; Rosenzweig et al., 2018).

South Africa as a whole is concerned about the potential of flooding, with the provinces of the North-West, Eastern Cape, Limpopo, and Kwa-Zulu Natal being the most at risk. (Munyai et al. 2021). The Eastern Cape and Kwazulu-Natal provinces, which saw the worst floods in April 2022, have both experienced significant flooding. Landslides that swept away homes, bridges, and almost 400 other people were murdered and nearly 50,000 others were evacuated in Kwazulu-Natal as a result of the catastrophic property damage.

(Volgraff and Cele 2022). In addition to casualties, the Eastern Cape flood tragedy caused significant infrastructural damage, which had a detrimental effect on the environment and socioeconomic conditions. (Dube 2022).

For community action development, community intervention programs that consider community readiness must be developed (Ohmer et al., 2018). Given that each community has a unique context, the development of resilience in one community cannot be accomplished in a one-size-fits-all manner (Demiroz & Haase, 2019).

Both the uplands and lowlands of Tuganay Watershed (TW) are degraded in alarming levels five decades after when original municipalities were created and carved-out within the TW and when human settlement, agricultural production and natural resources exploitation began to disturb the then virginal, thickly-forested and for a and fauna-rich watershed. Its upland ecosystem is degraded and its forestlands are denuded and ecologically damaged.

Being one of the most flood-hit municipalities within the TW area, there is a pressing challenge for the LGU to strengthen its efforts to address the present situation and sought assistance from other Government Organizations (GOs) and Non-Government Organizations (NGOs) to collectively converge all resources and act together in mitigating the problem of flooding. Without the aid from other stakeholders in the TW area, long-raging and effective impacts of flood-mitigation public actions are farfetched as limited government resources would be defused ineffectively and thinly while the flooding problem is seen to worsen in the next years ahead.

According to Dube et al. (2021), the rise in the frequency of extreme weather events is worrisome because it offers difficult obstacles to the socioeconomic growth of these communities, with the most disadvantaged and vulnerable individuals feeling the effects the most. (Dube et al. 2021).

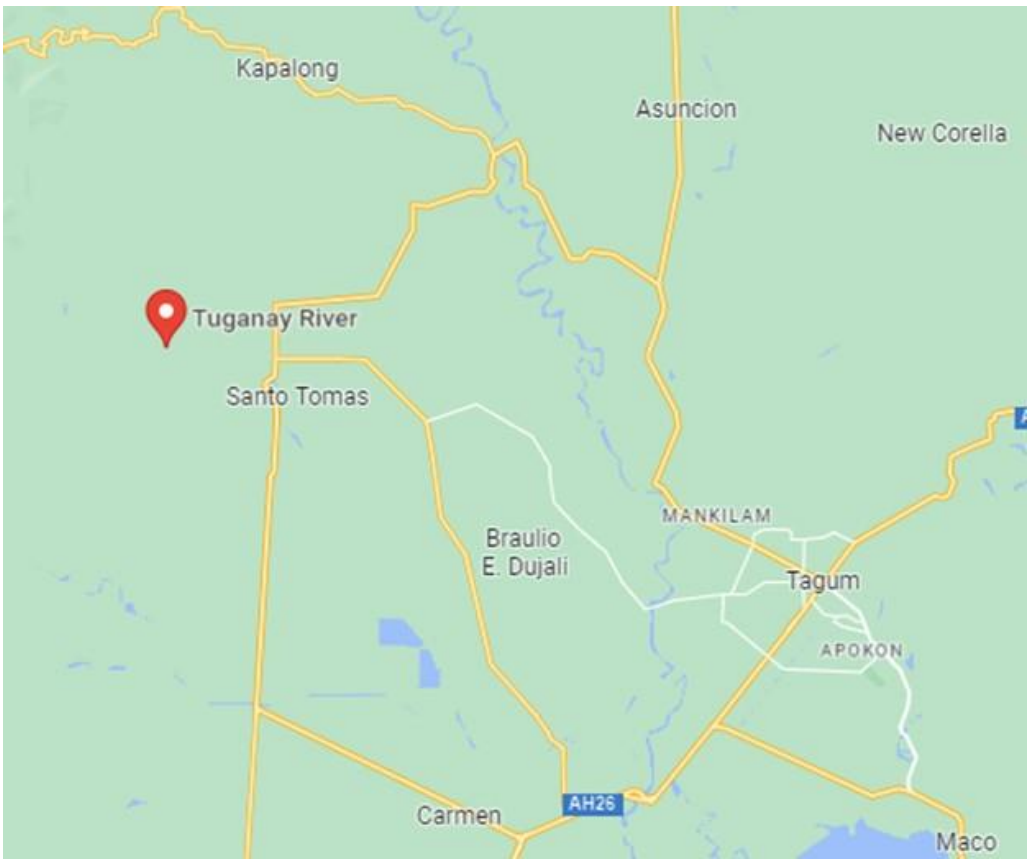

Figure 1. Locational Map Showing the Municipality of Sto. Tomas within the Tuganay Watershed area.

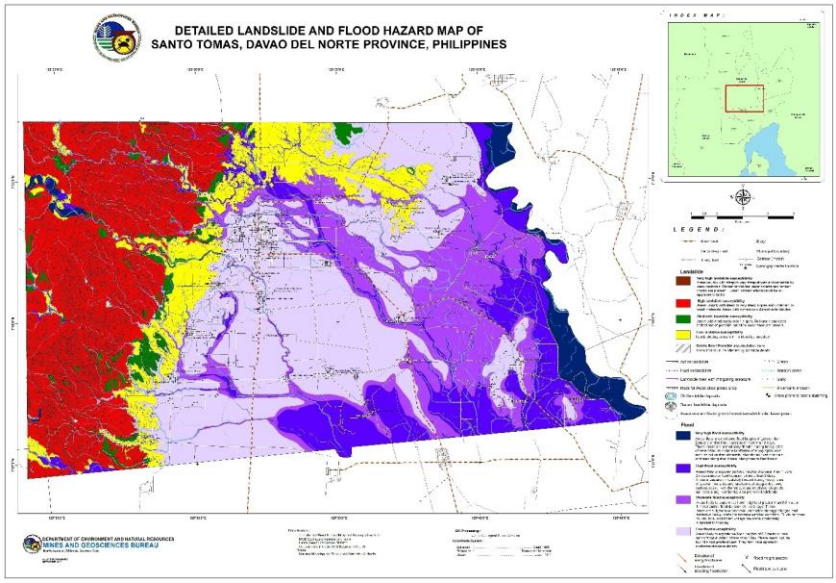

Figure 2: Landslide and Flood Hazard Map of Sto. Tomas

The following data were extracted by the researchers from the Municipal Disaster Risk Reduction Management Office (MDRRMO, Municipal Environment and Natural Resources (MENRO), Municipal Planning and Development Office (MPDO) and other sources support the validity and authenticity of the research.

Table 1. Barangays Susceptible to Flooding by Area in Hectares

Barangay	Level of Flood Susceptibility by Area in Hectares					
	VH	H	M	L	None	Grand Total
Balagunan	6.99	68.20	99.36	517.27	1,148.08	1,839.90
Bobongon	50.92	56.85	74.22	641.41	2,191.02	3,014.43
Casig-Ang		480.34	89.18	26.39		595.91
Esperanza	394.89	359.04	112.67	32.25	0.00	898.85
Kimamon	172.13	161.84	115.37	971.86	195.96	1,617.16
Kinamayan		71.74	618.48	455.82		1,146.05
La Libertad		252.99	140.19	1,161.99		1,555.17
Lungaog		19.78	376.64	267.69	2.38	666.49
Magwawa	35.66	36.06			765.81	837.53
New Katipunan		107.72	303.62	369.52	708.66	1,489.53
New Visayas		29.64	25.66	289.30	1,069.67	1,414.27
Pantaron		12.39	90.57	330.48	101.65	535.09
Salvacion	95.89	232.20	400.82	180.39		909.30
San Jose		127.29	51.14	17.08	2,335.32	2,530.83
San Miguel		281.80	415.24	313.37		1,010.42
San Vicente		555.92	215.68	91.13		862.73
Talomo	105.11	513.04	607.02	0.29		1,225.46
Tibal-og		202.36	367.24	1,805.90	426.70	2,802.20
Tulalian	0.31	83.38	9.90	762.69	1,012.26	1,868.53
Total	**861.89**	**3,652.58**	**4,112.98**	**8,234.86**	**9,957.51**	**26,819.83**
By Watershed						
Tagum-Libuganon Watershed	**1,410.6524**	538.6576				
Tuganay Watershed	421.6824	4,322.1395				

Source: MGB 2017 VH- Very High; H –High; M- Medium; L-Low

(Data on estimated damage of properties, infrastructures, crops livestock, and affected individuals from LGU).

Table 2. Affected Areas/Individuals/Damages in Sto. Tomas

Hazard Events and Description	Affected Areas	Number of Casualties (Dead, Injured, Missing)	Number of Affected (Persons, Families)	Number of Houses (Totally, Partially Damaged)	Damage to Properties (Infra, Agri, Institutional, Private/Comm'l.)	Sources of Information
Flood due to Tropical Depression Zoraida (11/12/2013)	19 barangays	None	1,850 families	No data	Agriculture - 2,500 ha.Infrastructure - P2,022,468.00 Pesos	LDRRMO,MSWDO, and MAGRO Report
Flood due to LPA (1/16/2014)	9 barangays	None	924 families	No data	Agriculture - 713.77 ha./P1,408,632.00 pesos.Infrastructure - P378,800.00	LDRRMO,MSWDO, and MAGRO Report

Source: MDRRMO, 2015

In fighting against physical forces of nature and flood-prone land formation, draconian problem-focused measures must be jointly made by the affected and frontline municipal LGUs. Given the low-lying topographic formation of the municipality-ranging from slightly below to almost within and just a little above sea level, as well as the alarming deforestation states in the TW uplands and highlands, this worsening problem of flooding is so serious enough that it threatens the livability and sustainability of its urban centers and población foremost, and the low-lying flood-prone barangays, as well as it threatens the viability of lowland agricultural lands and the economic stability of the people. If this flooding problem is not mitigated jointly and collaboratively, its negative effects will escalate in the years to come in terms of property damage, inundated areas, lives, and the budgetary consideration of this IRA-dependent LGU.

There is a pressing challenge therefore to assess the flood mitigation strategies of the LGU and whether there is a need to enhance the way various policy interventions implemented respond properly to the clamor and need of the constituents to form an integrated, unified, and coordinated response and policy regime aimed to mitigate and address flooding problems in the municipality of Sto. Tomas, Davao del Norte.

Research Question

The study was to determine the assessment of the flood mitigation of the Local Government Unit of Sto. Tomas.

Specifically, this sought answers to the following questions:

1. What is the profile of the Local Government Unit of Sto. Tomas, Davao del Norte that is related to its vulnerability to flooding?
2. What are the levels of flood mitigation/strategies employed by LGU Sto. Tomas when analyzed by:
    - rehabilitation of the river bank;
    - rehabilitation of bridges;
    - continuous dredging and de-clogging of canals; and
    - reforestation program?

3. Based on the result of the study, what policy can be formulated?

THEORETICAL FRAMEWORK AND CONCEPTUAL FRAMEWORK

This study is based on a paradigm called Protection Motivation Theory (PMT) that is used to comprehend consumer decisions in fields like health and disaster relief. PMT depends on the notion that the decision of whether to invest in property-level protection measures has several specific elements. First, it is characterized by uncertainty and hazard, in that floods are low probability/high-risk events, where the

possibility of occurrence and the associated repercussions are difficult to anticipate. Second, the expenses associated with floods could be very substantial and difficult to quantify, including intangible and indirect costs. Third, resistance and resilience measures typically need to be deployed as a bundle to be successful. This could imply that, when taken into account as part of a modification, recovery after a flood may not be necessary. (Walter, 2020).

The stream flow regimes linked to frequent flood events have changed as a result of population growth and the development of a particular area. The remedies for the aforementioned phenomena—increased runoff volumes, flood damage, and stream-bank erosion—depend on the goals and aspirations of the affected people. A variety of factors, such as socio-demographics, experience, attitudes, and perceptions of flood danger, affect people's intentions to take steps to protect themselves against flooding. (Weyrich et al., 2020). However, human behavior models give a streamlined portrayal of the primary motivating factors and subsequent behaviors involved in particular circumstances. Additionally, Papagiannaki et al. (2019) included concern about floods' likelihood and effects as a mediator variable in the flood-risk prevention model. The findings revealed that concern had a sizable positive impact on people's intentions to engage in flood mitigation behaviors. This suggests that in addition to considering flood risk perception as the primary element influencing people's decision to prepare for disaster, we also need to consider other variables that may have an impact on risk perception.

People will think about adaptive ways to deal with the threat once it reaches a particular degree. They frequently weigh the advantages of certain actions and determine whether they can perform them before taking this action. The term "coping appraisal" refers to this process in the Protection Motivation Theory. Numerous researches have demonstrated that threat appraisal and coping appraisal have different effects on people's intentions to implement flood mitigation measures (Bubeck et al., 2018). In addition to this, it pointed out that possible feedback from already-adopted mitigation measures on risk perceptions has hardly been considered by current studies. To end, it provided a review of various factors that drive precautionary behavior other than risk perceptions.

The Conceptual Framework used the Input-Process-Output-Outcome parameter. The primary goal of this research is to look into the different approaches of the Local Government Unit of Sto. Tomas to cope with the adverse effect of flooding in the low-lying areas of its area of responsibility. The conceptual framework shows the sequence of conducting the research work to come up with the desired information on the status of the various flood mitigating strategies, the level of flood mitigation strategies placed or implemented in the

most vulnerable areas and the possible policy interventions that would address and enhance the implementation of those mentioned flood mitigating strategies.

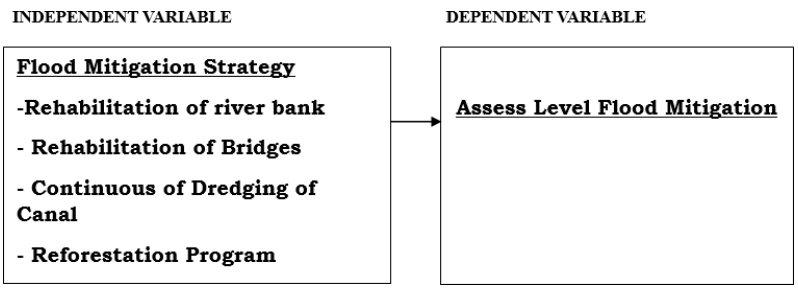

Figure 1. The Conceptual Paradigm, showing the variable of the study

According to Brown (1996), the input-process-output-outcome is very useful as it highlights the difference between input, process, output, and outcome measures. These different levels of measurement are most meaningful when tracked in combination with, the UK government. This framework shows the linear

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relationships between inputs, processes, outputs, and outcomes of the study. It also provides a visual interpretation of the different stages the study used to generate the outcome.

Significance of the Study

The basis of the assessment is looking into the flooding mitigation programs/strategies of the municipality of Sto. Tomas, Davao del Norte. What is covered is the only issue on flood mitigation and reduction efforts relating to the government entity although consequent and corollary issues on flood response and flood rehabilitation are expectedly and secondarily dragged into the study. The study is limited to within the five years (2017-2023). This research would be beneficial to the following:

Local Government Unit of Sto. Tomas. This will give idea to the lawmakers as well as the planners how necessary to always consider peoples' participation in crafting policies, regulations, and local laws as interventions to the flooding problem in low-lying areas that would redound to the welfare of the constituents in the grassroots level of the town.

STCAST. The outcome of this research will be beneficial to the school as part of the database of knowledge and information for students and other researchers as their media for further study on the relation of the environment to natural and man-made disasters.

Future Researchers. The results/findings in this research will greatly help and serve as the foundation of information in the furtherance of the study that focuses on the flood mitigation of various Local Government Units in Davao del Norte.

Definition of Terms

The following terms were defined operationally and conceptually:

Assessment –refers to the systematic basis for making inferences about learning and development. It is the process of defining, selecting, designing, collecting, analyzing, interpreting, and using information to increase learning and development. From Merriam-Webster.com Dictionary (2023), the systematic basis for making inferences about learning and development. It is the process of defining, selecting, designing, collecting, analyzing, interpreting, and using information to increase learning and development.This refers to the assessment of the levels of different flood mitigation strategies that the Local Government Unit of Sto. Tomas has implemented it.

Mitigation –refers to the action of reducing severity, seriousness, and lessening of something/reducing the risk of loss from the occurrence of any undesirable events represents any process, activity, or action designed to avoid, reduce, or remedy significant adverse environmental effects likely to be caused by a developmental project (Marshall, R. 2012). The interventions done by the local government intended to lessen or not eliminate the adverse effect of flooding in the floodplains.

Flooding– refers to the condition of becoming filled or covered with a large amount of water. From Miller et al., (2008) and Stromberg (2007), is the most expensive natural disaster, but it has also had the greatest impact on humanity. Flood occurrences caused the most property damage and the greatest number of fatalities of all-natural catastrophes (Perry, 2000). This also refers to periodic calamity that burdens the local officials of the LGU as well as the affected residents in the low-lying areas.

Policy Formulation– refers to a set of ideas or a plan of what to do in a particular situation that has been agreed to officially by a group of people. It is part of the pre-decision phase of policy making. It involves identifying and/or crafting a set of policy alternatives to address a problem, and narrowing that set of solutions in preparation for the final policy decision. (Cochran and Malone, 1999,46). The result of this

study would determine whether there is a necessity to craft a policy that will enhance the implementation of the identified indicators on flooding mitigation.

METHODOLOGY

This part includes the design of the study, the respondents, the instruments, the data-gathering procedures, and the statistical tools.

As related to the flooding in the TW area hitting the municipality, this study assesses and analyzes the plan, projects, and policies accomplished during the combined terms of the two sets of LGU administration since 2017 in the area of a. flood control/mitigating infrastructures b. flood-mitigating land use plans and c. flood-mitigating local policies.

The secondary data would come from the land use and comprehensive development plans, zoning ordinances, local sanggunian's archives, resolutions and ordinances, yearly accomplishment reports, state of the municipal addresses (SOMAs), flood disaster reports from Municipal/Provincial Risk Reduction and Management Councils. Detailed content analysis and cross-checking would be made in the inclusion of the data relevant to the study.

Research Design

The design used in this research is quantitative-descriptive research. Bryman (2012) stated that quantitative research is a technique that focuses on quantifying data gathered and analysis. In relation, the descriptive research design is frequently used as a precursor to quantitative research designs, the general overview giving some valuable pointers as to what variables are worth testing quantitatively Shuttle worth (2008). Based on a logical methodology that highlights theory testing and is influenced by empiricist and positivist ideologies. In Addition, quantitative research is the collection and analysis of numerical data that may be used to discover patterns and averages, make predictions, verify causal linkages, and generalize results to larger groups. (Bhandari, 2021).

The researchers will use descriptive design to obtain information to systematically describe a phenomenon, situation, or status of the flood-mitigating strategies of the LGU and the satisfaction of the residents in the flood-prone areas towards the effectiveness and efficiency of the programs and policies implemented.

Research Respondents

The subject of this research was the populace/residents of the flood-prone areas of the municipality specifically from barangays Bobongon, Kinamayan, San Miguel, and San Jose. They were asked to participate in the research through answering the prepared survey questionnaires.

To determine the respondents of the research study, the researchers used random sampling where every member of the study population had the chance to be selected. Random Sampling is a technique in which a member of the population has an equal chance of being chosen, through the use of an unbiased selection method according to Simkus, 2022. Data is then collected from as large a percentage as possible of this random subset (Thomas, 2020). It consists of a total of 377 out of 19, 392 total population of legal age consisting of 136 respondents from Barangay Bobongon, 109 from Kinamayan, 68 from San Jose, and 64 from San Miguel, Sto. Tomas, Davao del Norte.

Research Instruments

This study used a survey questionnaire and performed data observation and documentation that is intended to know the different perceptions of the affected individuals residing in the flood-prone area. The first part

of the questionnaire contains the scale, interpretation, and description which determine the level of each indicator. Next are the questions regarding the flood mitigation strategies employed by the LGU.

The Likert Scale is being used in this study. This enables the user to express the intensity/level of their conformance or disagreement to a given situational question. It has also various options for the responses allowing the respondents to show the degree of positive or negative responses or emotions with the subject matter (McLeod, 2008).

Scale	Interpretation	Description
5	Strongly Agree	This means that respondents Strongly b Agree with the given statement
4	Agree	This means that respondents Agree with the given statement
3	Somewhat Agree	This means that respondents Somewhat Agree with the given statement
2	Disagree	This means that respondents Disagree with the given statement
1	Strongly Disagree	This means that respondents Strongly Disagree with the given statement

The scale above was used as the basis for interpretation and to determine the responses of the respondents towards flood mitigating strategies of LGU.

Other parameter limits, with their corresponding descriptions, were applied to the level of flood mitigation strategies atmosphere.

Parameter Limits	Descriptive Equivalent	Interpretation
4.20 – 5.00	Very High	This indicates that the flood mitigation strategy is observed at all times.
3.40 – 4.19	High	This indicates that the flood mitigation strategy is observed most of the time.
2.60 – 3.39	Moderate	This indicates that the flood mitigation strategy is observed sometimes.
1.80 – 2.59	Low	This indicates that the flood mitigation strategy is observed rarely.
1.00 – 1.79	Very Low	This indicates that the flood mitigation strategy is not observed.

DATA GATHERING PROCEDURES

This research seeks to know the different perceptions of the respondents on the flood-mitigating strategies of the Local Government Unit of Sto. Tomas, Davao del Norte, the status of the identified flood mitigating strategies and the proposed policy to be formulated.

There are necessary steps to be followed when performing data collection to come up high level of credibility that would also provide solid ethical reliability and trustworthiness.

Data Collection. The researchers approached the identified respondents and explained to them the intention of the study to assess their response or perception towards various flood mitigation strategies of the Local Government Unit. In addition, the researchers assured them of the confidentiality of the information and that their right to privacy would be upheld.

Distribution of Survey Questionnaire. The questionnaires were distributed and administered to the selected residents of flood-prone barangays, particularly to the residents directly affected by flooding as the chosen respondents of the study, and facilitated the same to aid them and to easily understand the significance of the

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study.

Tabulation of Responses. The questionnaire distributed to the respondents was collected and tabulated by the researchers and afterward forwarded to the data analyst.

Data Analysis. Collected information or data were forwarded to the Data analyst for analysis and assigned statistician for the interpretation of the result.

Statistical Tool

To attain a valid and reliable interpretation of data, the only tool being used is Mean. It was the most common measure of central tendency and referred to as the average value of a group of numbers. This is done by summing up all the figures, dividing by the number of values, that is the average or mean It is calculated from the formula ΣX / N.

RESULTS AND DISCUSSION

The entire chapter shows the results and discussions of the researchers' study. Particularly, this presents the data in tables with their corresponding descriptive interpretations.

Profile of the Local Government of Sto. Tomas

Historical

The recorded history of Santo Tomas showed that in 1950 it was classified as one of the barrios of the municipality of Kapalong, Davao del Norte. Back then, the area was a lush forest inhabited by the indigenous community of Aetas locally known as "Ata".

The original name of the municipality is "Tibal-og," derived from an Aeta word for a pig that is "Balo-og". According to the folktale, a native Ata went hunting in the wilderness and shot a wild pig that fell down a creek. The natives butchered the pig on the creek and a man passed by and asked them the name of the creek. Without giving much thought they replied "Balo-og". Later, the passerby recalled the name of the creek that traverses the settlements of the natives as "Kibalo-og" which eventually became Tibal-og.

According to pioneering residents, during the pre-war period, the plains of the municipalities of Kapalong and Panabo were planted to abaca. The entry of the Philippine Abaca Development Company (PADCO) paved the way for the clearing of frontier communities for settlement and cultivation purposes. Swidden farming or "kaingin" grew rampant. As the clearedareas turned into settlements and were gradually occupied by the lowland migrants, the hill tribes moved deeper into the hinterlands. Meanwhile, the abacas were infested resulting in the gradual phase-out of the industry.

The Davao Penal Colony (DAPECOL) then under the Bureau of Prisons (now Bureau of Corrections), applied for a concession to log the forest area to generate additional income for the sustainability of its operations. It was granted Original Timber License No. 1042 – 54 on May 9, 1955, and it also segregated a reservation (GSS–300 and 424–D) for settlement purposes. The late President Ramon Magsaysay issued Proclamation No. 132 mandating the National Resettlement and Rehabilitation Administration (NARRA) to manage and control the settlement project.

The settlement area was located extensively in the two barangays of the municipality of Kapalong, Barangays Tibal-og, and La Libertad covering a total of 7,255 hectares. The government started to distribute land to the landless farmers at 5 hectares each. Such a program of the national government attracted migrants from Luzon, Visayas, and other regions of Mindanao. The reservation area eventually turned into

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progressive human settlements and made Tibal-og a promising center of agriculture and trade. In light of this development, President Carlos P. Garcia created a new municipality out of the Municipalities of Kapalong and Panabo under Executive Order No. 352 dated August 14, 1959. The late Governor Vicente P. Duterte of the undivided Province of Davao, the father of President Rodrigo Roa Duterte, named the new town Santo Tomas, in honor of the Patron Saint of his hometown Danao, Cebu.

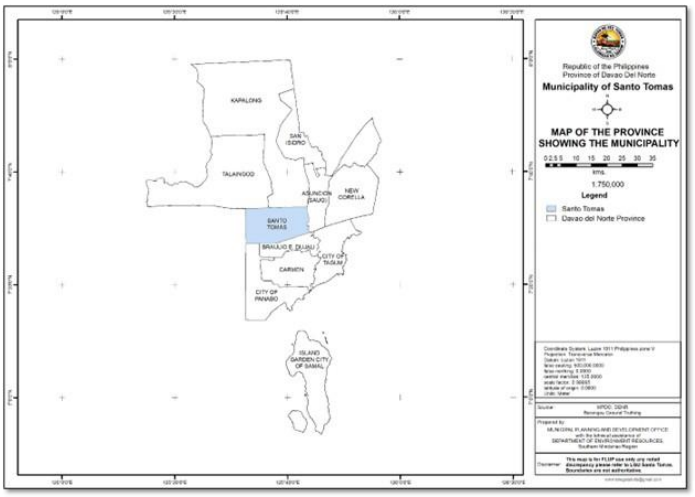

Figure 4. Map of Sto. Tomas

The twelve (12) original barangays of the newly created municipality were: Balagunan, Bobongon, Esperanza, Kimamon, Kinamayan, La Libertad, Lunga-og, San Miguel, Talomo, Magwawa, New Katipunan and Tibal-og. Figure No. 4 shows the Location Map of the Municipality of Santo Tomas, Davao del Norte.

The initial development of the municipality was reported during Mayor Ganade's elective term in 1967. The first comprehensive development plan cum land use plan was formulated during the time of Mayor Aniceto Solis. It was during Mayor Estela's administration that the development plan was enhanced and crystallized into tangible infrastructure and utilities particularly roads, bridges, school buildings, public market, cultural center, expansion of the Municipal Hall, water system, and rural electrification. He relentlessly pushed for the Clean and Green Program that earned the municipality Regional Recognition thrice and a National Finalist Award. Mayor Joel Bayanay further enhanced the projects of the preceding Mayor such as the cultural center and the public market through PREMIUMED. Mayor Royo adopted the Minimum Basic Needs (MBN) approach to development i.e. delivery of social services anchored on the felt needs of the people promoted by the Provincial Government of Davao del Norte.

Another table shows the list of Local Chief Executives who have served the Local Government of Santo Tomas. Their term of office and the corresponding significance of their tenure are as follows:

Table No. 4. List of Municipal Mayors in the Municipality of Santo Tomas, Davao del Norte from 1959-2019

Term of Office	**Municipal Mayor**
1959-1960 (9 months)	Lt. Col. Porferio Jain – Administrator of NARRA, first appointed Municipal Mayor.
1960-1963 1967-1971 (7 years)	Feliciano Ganade – second appointed Mayor and second elected Mayor

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1963-1967 1971-1986 (19 years)	Aniceto S. Solis – First elected Mayor. Stepped down after the EDSA Revolution
1986-1998 2004-2013 (21 years)	Dr. Maximo M. Estela, M.D. – He was an SB member when he took over as OIC under Cory Aquino's Revolutionary Government.
1998-2001 (3 years)	Raymundo P. Pamaong (4 days); Joel Z. Bayanay (10 months); Dr. Salvador R. Royo (1 year and 9 months) – Mayoral election results were contested by candidates Salvador Royo and Queen Sebastian which were resolved only after 16 months. Two OICs were appointed pending the resolution of the electoral protest.
2001-2004 (3 years)	Dario G. Romano
2013-2016 (3 years)	Benigno R. Andamon
2016-2019 (3 years)	Daniel S. BatosalemJr, MDMG
2019-2022 (3 years)	Ernesto T. Evangelista
2022- Present	Roland S. Dejesica

Source: MPDO, Santo Tomas, Davao del Norte

Moreover, Health facilities (health stations) and services including distribution of Philhealth cards to the less privileged, livestock dispersal, construction of public terminals, and maintenance of roads and bridges were among the programs and projects implemented during his tenure. Mayor Dario Romano prioritized poverty alleviation, nutrition, sports, and infrastructure through the procurement of heavy equipment. It was during his incumbency that Santo Tomas bagged the Consistent Regional Outstanding Award in Nutrition (CROWN) and amateur boxing under the Batang Pinoy Program peaked.

The resurgence of Mayor Estela's leadership after winning the 2004 election brought in myriad national and foreign-funded programs and projects like the Agrarian Reform Community Development Program (ARCDP) of DAR/WB, Mindanao Sustainable Settlement Area Development (MinSSAD) Project of the Department of Agrarian Reform and JBIC, the Makamasang Tugon of the DSWD, the Mindanao Rural Development Program (MRDP), a WB- supported program of the Department of Agriculture. These programs ushered in more projects like farm-to-market roads, bridges, school buildings, health centers, multipurpose centers, housing, potable water systems, and livelihood projects for the farmers, especially the indigenous community. His administration's centerpiece was the successful implementation of the Ecological Solid Waste Management Program (RA 9003) which became one of the country's "best practices" showcase and learning centers for other LGUs, government officials, NGOs, and the private sector. It also earned commendations from national officials and even from foreign countries, specifically Japan.

Mayor Andamon worked for the continuation of the municipal vision of development and worked for the opening and concreting of barangay roads including the funding of the concreting of Santo Tomas-Tagum Road with the support of the Provincial Government. It was also during his incumbency that the University of Southeastern Philippines (USEP) was opened upon the closure of Bukidnon State University.

Mayor Daniel Batosalem Jr. worked on building a strong strand of accessibility, and transformative governance for optimum service delivery. This manifests in sectoral projects that were implemented within

his term such as the concreting of the Santo Tomas-Tagum City road, other municipal roads, and barangay roads. The agriculture sector is also a consistent Gawad-Saka Awardee for best practices. The CHED-supervised and Municipality-managed Santo Tomas College of Agriculture, Sciences, and Technology (STCAST) was also implemented under Mayor Batosalem's term.

With the onset of the new administration, Mayor Ernesto T. Evangelista is very keen on pursuing all the unformulated but required plans to be formulated not only to comply with the national requirement but to implement them as well with the end goal of achieving efficiency, effectiveness, and sustainability in local governance with his coined line "Aksyon ang Solusyon." To give weight to his political mantra and to strengthen his social responsibility and great aspiration to give quality services to the people, he launched his social arm and working office named "Dangpanan ni Tomas" which makes the local government very accessible to constituents. This is the indication of Mayor Erning Evangelista's desire to devise good local governance and reform making the Municipality of Santo Tomas conducive to people and the best town to live in.

HUMAN RESOURCE/DEMOGRAPHIC PROFILE

Socio-Economic

Household Population Distribution by Age Group and Sex, 2015 and 2010

Santo Tomas ranked No. 5 among the Most Populous Cities and Municipalities in Region XI as of 2015 according to the Philippines Statistics Authority (PSA). It has a population of 118,750 (including the institutional population) and a household population of 118, 353. There is an increase of 9,369 persons or 8.6 % from the 2010 household population of 108,984.

Table 5. Household Population by Age Group and Sex in Santo Tomas, Davao del Norte, 2015 and 2010

Age Group	2015			2010		
	Male	Female	Total	Male	Female	Total
Under 1	1,332	1,240	2,572	1,286	1,230	2,516
1 – 4	5,463	5,196	10,659	5,587	5,055	10,642
5 – 9	6,822	6,353	13,175	6,232	5,792	12,024
10 – 14	6,142	5,822	11,964	5,821	5,362	11,183
15 – 19	5,791	5,487	11,278	5,905	5,750	11,655
20 – 24	5,897	5,621	11,518	5,744	5,266	11,010
25 – 29	5,710	5,227	10,937	4,948	4,360	9,308
30 – 34	4,908	4,268	9,176	4,304	3,877	8,181
35 – 39	4,208	3,721	7,929	3,470	3,253	6,723
40 – 44	3,330	3,156	6,486	3,080	2,823	5,903
45 – 49	2,921	2,693	5,614	2,690	2,577	5,267
50 – 54	2,514	2,422	4,936	2,374	2,226	4,600
55 – 59	2,111	2,125	4,236	1,922	1,803	3,725
60 – 64	1,661	1,611	3,272	1,212	1,117	2,329
65 – 69	996	985	1,981	725	739	1,464
70 – 74	521	594	1,115	506	634	1,140
75 – 79	358	469	827	331	330	661
80 and over	292	386	678	295	358	653
TOTAL	**60,977**	**57,376**	**118,353**	**56,432**	**52,552**	**108,984**
%	**51.52**	**48.48**	**100.00**	**51.78**	**48.22**	**100.00**

Source: National Statistics Office/Philippine Statistics Authority

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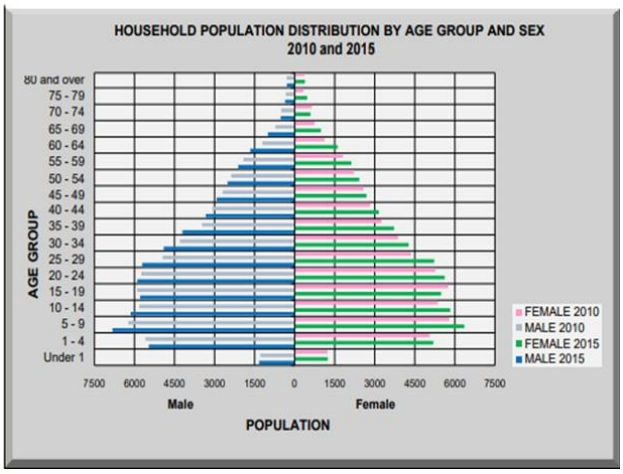
The Local Government Unit household survey of 2015 conducted by the Barangay Health Workers (BHW) placed the population at 123,370, about 4.1 % higher than the PSA data (Table 5).

Similarly, the number of households increased from 24,406 in 2010 to 26,905 in 2015. The average household size has slightly increased from 4.48 to 4.58, respectively.

There are more males than females in Santo Tomas as shown in the results of the 2015 and 2010 censuses where the male population accounts for 52% while the female is 48%.

Figure 5: Household Population Distribution by Age Group and Sex



Population by SchoolAge, WorkingAge and Dependent-Age Groups and Sex

The school-going age population (3–21 years old) of Santo Tomas in 2015 is 43,911 or 37.1% of the household population. Of these, 51.29 percent are males while 48.71 percent are females. On the other hand, the working-age population 15-64 years old is 75,382, or 63.69% of the total. The dependency ratio is placed at 57 dependents to every 100 working-age population, a significant decrease from 71:100 in 2006 (cf. CDP 2005-2016). The sex ratio for each age group shows the predominance of males over females except in the age group 65 years and over where females outnumbered male.

Table 6. Population Composition by School Age, Working Age, Dependent Age Groups by Sex in Sto. Tomas, 2015

Age group	Both sexes	Male		Female		Sex Ratio (males for every 100 females)
		No.	%	No.	%	
School-going population	**43,911**	**22,520**	**51.29**	**21,391**	**48.71**	**105**
Pre-school (3-6) *	10,404	5,202	50.00	5,202	50.00	100
Elementary (7-12) *	14,632	7,316	50.00	7,316	50.00	100
Secondary (13-16) *	8,946	4,473	50.00	4,473	50.00	100
Tertiary (17-21) *	9,929	5,530	55.69	4,400	44.31	126
Working-Age (15-64)	**75,382**	**39,051**	**51.80**	**36,331**	**48.20**	**107**
Dependent Population	**42,971**	**21,926**	**51.03**	**21,045**	**48.97**	**104**
Young (0-14)	38,370	19,759	51.50	18,611	48.50	106
Old (65 and over)	4,601	2,167	47.10	2,434	52.90	89

*Source: Philippine Statistics Authority * - Computed using Sprague Multiplier*

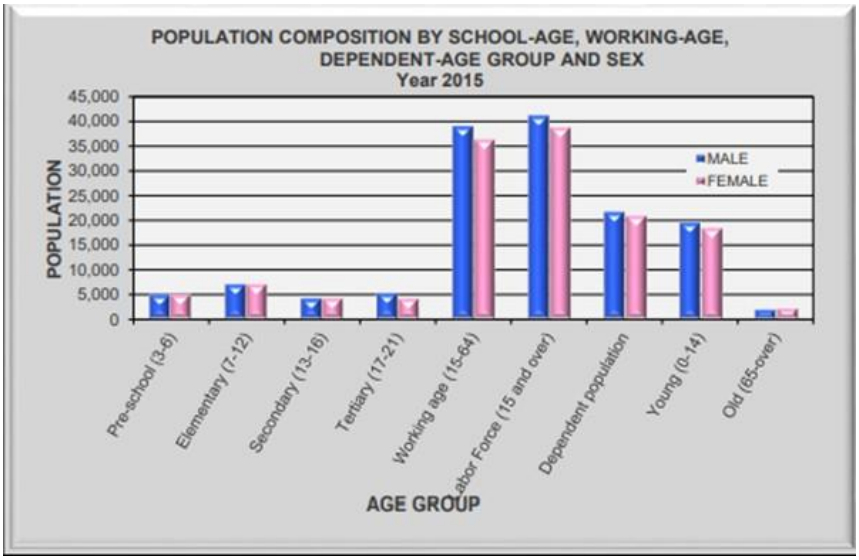


Figure 6. Population Composition by School- Age, Working Age, Dependent Group, and Sex

Projected Population and Households

Using the latest census of 2015, the population was projected until 2028 which is the terminal year of this plan. Assuming that the population grew at a constant rate of 1.6%, Santo Tomas will have a total population of 145,920 persons and 32,427 households in 2028. Likewise, Tibal-og, the urban center, will be populated by 50,816 people while the remaining 18 rural barangays will have a total population of 95,104. The projection for barangay population showed that apart from Tibal-og which is the urban center, barangays Kimamon, Bobongon, La Libertad, New Katipunan, and Balagunan will continue to increase in population size assuming that there will be no significant development in other barangays in the coming years.

Table 7. Projected Population and Households in Santo Tomas, Davao del Norte, 2015-2028

Year	Population	Household
2015	118,750	26,291
2016	120,647	26,810
2017	122,574	27,239
2018	124,533	27,674
2019	126,522	28,116
2020	128,543	28,565
2021	130,597	29,022
2022	132,683	29,485
2023	134,803	29,956
2024	136,956	30,435
2025	139,144	30,921
2026	141,367	31,415
2027	143,626	31,917
2028	145,920	32,427

Source of Basic Data: NSO/PSA Computed using the 2010-2015 annual growth rate of 1.6% & the 2015 average household size of 4.5

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Table 8. Population Projection by Barangay in Santo Tomas, Davao del Norte, 2016–2028

Barangay	2015 (Base Year)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
URBAN														
Tibal-og	41,354	42,015	42,686	43,368	44,061	44,764	45,480	46,206	46,944	47,694	48,456	49,230	50,017	50,816
Sub-Total –Urban	**41,354**	**42,015**	**42,686**	**43,368**	**44,061**	**44,764**	**45,480**	**46,206**	**46,944**	**47,694**	**48,456**	**49,230**	**50,017**	**50,816**
RURAL														
Balagunan	6,151	6,249	6,349	6,451	6,554	6,658	6,765	6,873	6,983	7,094	7,207	7,323	7,440	7,558
Bobongon	6,551	6,656	6,762	6,870	6,980	7,091	7,205	7,320	7,437	7,555	7,676	7,799	7,923	8,050
Casig-ang	3,504	3,560	3,617	3,675	3,733	3,793	3,854	3,915	3,978	4,041	4,106	4,171	4,238	4,306
Esperanza	2,935	2,982	3,030	3,078	3,127	3,177	3,228	3,279	3,332	3,385	3,439	3,494	3,550	3,607
Kimamon	7,411	7,529	7,650	7,772	7,896	8,022	8,150	8,281	8,413	8,547	8,684	8,822	8,963	9,107
Kinamayan	5,890	5,984	6,080	6,177	6,275	6,376	6,478	6,581	6,686	6,793	6,902	7,012	7,124	7,238
La Libertad	6,401	6,503	6,607	6,713	6,820	6,929	7,040	7,152	7,266	7,382	7,500	7,620	7,742	7,866
Lunga-og	3,598	3,655	3,714	3,773	3,833	3,895	3,957	4,020	4,084	4,150	4,216	4,283	4,352	4,421
Magwawa	1,610	1,636	1,662	1,688	1,715	1,743	1,771	1,799	1,828	1,857	1,886	1,917	1,947	1,976
New Katipunan	6,372	6,474	6,577	6,682	6,789	6,897	7,008	7,120	7,233	7,349	7,466	7,586	7,707	7,830
New Visayas	2,716	2,759	2,803	2,848	2,894	2,940	2,987	3,035	3,083	3,132	3,182	3,233	3,285	3,337
Pantaron	2,711	2,754	2,798	2,843	2,888	2,935	2,981	3,029	3,077	3,127	3,177	3,227	3,279	3,331
Salvacion	3,493	3,549	3,605	3,663	3,722	3,781	3,841	3,903	3,965	4,029	4,093	4,158	4,225	4,292
San Jose	3,376	3,430	3,485	3,540	3,597	3,654	3,713	3,772	3,832	3,894	3,956	4,019	4,083	4,148
San Miguel	3,399	3,453	3,508	3,565	3,621	3,679	3,738	3,798	3,858	3,920	3,983	4,046	4,111	4,177
San Vicente	2,307	2,344	2,381	2,419	2,458	2,497	2,537	2,578	2,619	2,661	2,703	2,746	2,790	2,835
Talomo	4,589	4,662	4,737	4,812	4,889	4,967	5,047	5,127	5,209	5,293	5,377	5,463	5,550	5,639
Tulalian	4,382	4,452	4,523	4,595	4,669	4,743	4,819	4,896	4,974	5,054	5,135	5,217	5,300	5,385
Sub-Total	**77,396**	**78,632**	**79,889**	**81,165**	**82,461**	**83,779**	**85,117**	**86,477**	**87,859**	**89,262**	**90,688**	**92,137**	**93,609**	**95,104**
TOTAL	**118,750**	**120,647**	**122,574**	**124,533**	**126,522**	**128,543**	**130,597**	**132,683**	**134,803**	**136,956**	**139,144**	**141,367**	**143,626**	**145,920**

Source: MPDO Computed using the 2010-2015 annual growth rate of 1.6%

Doubling Time of Various Growth Rates of Population

Doubling time refers to the length of time a particular population would double its size under a given growth rate. It has been found that a population growing at the rate of one (1) % annually doubles its size in 69.3 years. A quick way to estimate doubling time is to divide 69.3 by the growth rate expressed in percentage. Given the unpredictability of population growth as shown in Table DE-18, the number of years it will take for the population to double would depend on the dynamics of demographic factors such as migration, births, and deaths. Using the current growth rate of 1.6% which is considered conservative and the lowest since 1970, the population of 118,750 in 2015 is projected to double in 43 years or the year 2058. On the other hand, if the projection is averaged from 1990 to 2015 due to the fluctuating trend within the past 25 years, the population growth rate is computed at 2.24%. The population in 2015 will double within 31 years or in 2046.

Table 9. Doubling Time of Various Rates of Growth in Santo Tomas, Davao del Norte

Censal Year	Rates of Growth (%)	Doubling Time (Years)
1970	2.39	29
1975	8.28	8
1980	7.10	10
1990	4.32	16
1995	2.43	29
2000	1.93	36
2007	1.97	35
2010	4.34	16
2015	1.60	43

Source: NSO/PSA for growth rates Computed by MPDO

PHYSICAL FEATURES

Geographical Location

Santo Tomas is located on the island of Mindanao, Region XI, and falls under the second political district of Davao del Norte. It lies between 7° 25’ N to 7° 35’ N latitude and 125° 30’ E to 125° 50’ E longitude. It was created from the mother Municipality of Kapalong through Executive Order No. 352 dated August 14, 1959,

by then Pres. Carlos P. Garcia. It is bounded on the north by the Municipalities of Kapalong and Talaingod, on the east by the Municipality of Asuncion and the City of Tagum, on the west by Davao City, and the south by the Municipality of B.E. Dujali and City of Panabo (Map Nos. 2 & 3 – Location Map).

Land Area by Barangay

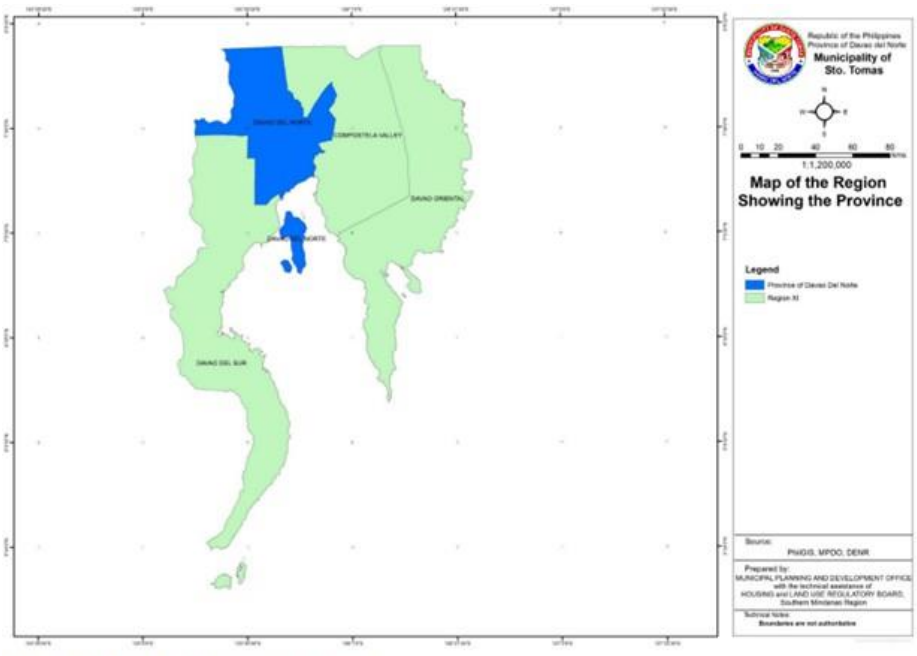
The municipality has 19 barangays with an aggregate land area of 26,819.83 hectares. Bobongon is the biggest with 3,014.43 hectares, closely followed by Tibal-og with 2,802.20 hectares and San Jose with 2,530.83 hectares. Barangay Pantaron is the smallest barangay with only 535.09 hectares (Map No. 4 – Barangay Map).

Table 10. Land Area by Barangay in Santo Tomas, Davao del Norte

Barangay	Land Area (has.)	(%)
URBAN		
Tibal-og	2,802.20	10.45
RURAL		
Balagunan	1,839.90	6.86
Bobongon	3,014.43	11.24
Casig-ang	595.91	2.22
Esperanza	898.85	3.35
Kimamon	1,617.16	6.03
Kinamayan	1,146.05	4.27
La Libertad	1,555.17	5.80
Lunga-og	666.49	2.49
Magwawa	837.53	3.12
New Katipunan	1,489.53	5.55
New Visayas	1,414.27	5.27
Pantaron	535.09	2.00
Salvacion	909.30	3.39
San Jose	2,530.83	9.44
San Miguel	1,010.42	3.77
San Vicente	862.73	3.22
Talomo	1,225.46	4.57
Tulalian	1,868.53	6.97
TOTAL	**26,819.83**	**100.00**

Source: Municipal Planning and Development Office (MPDO)

N.B. Total land area changed from the original 32,041 hectares to 26,819.83 hectares as a result of combined GPS/GIS mapping application.



Map No. 2: Map of the Region Showing the Provinces

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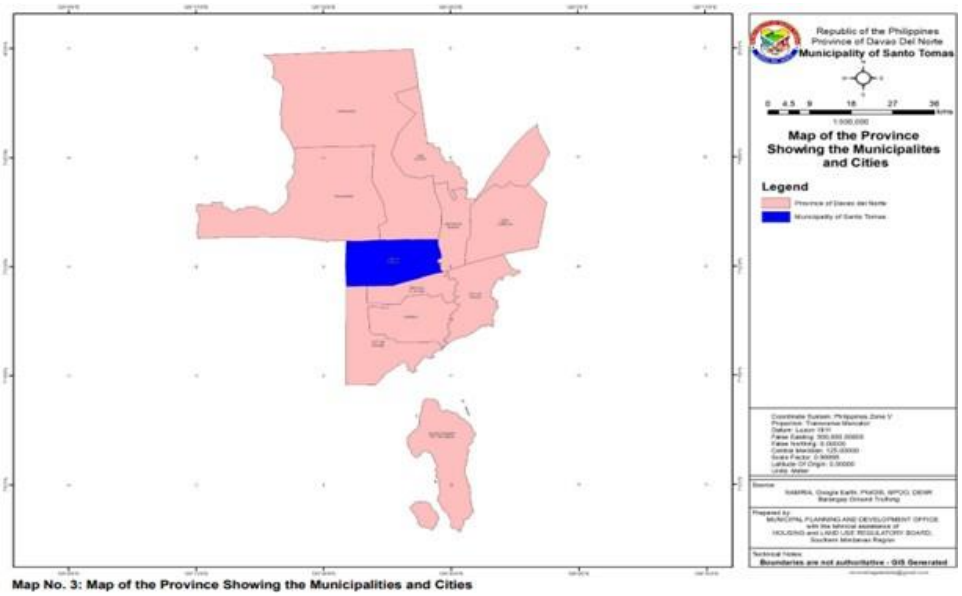
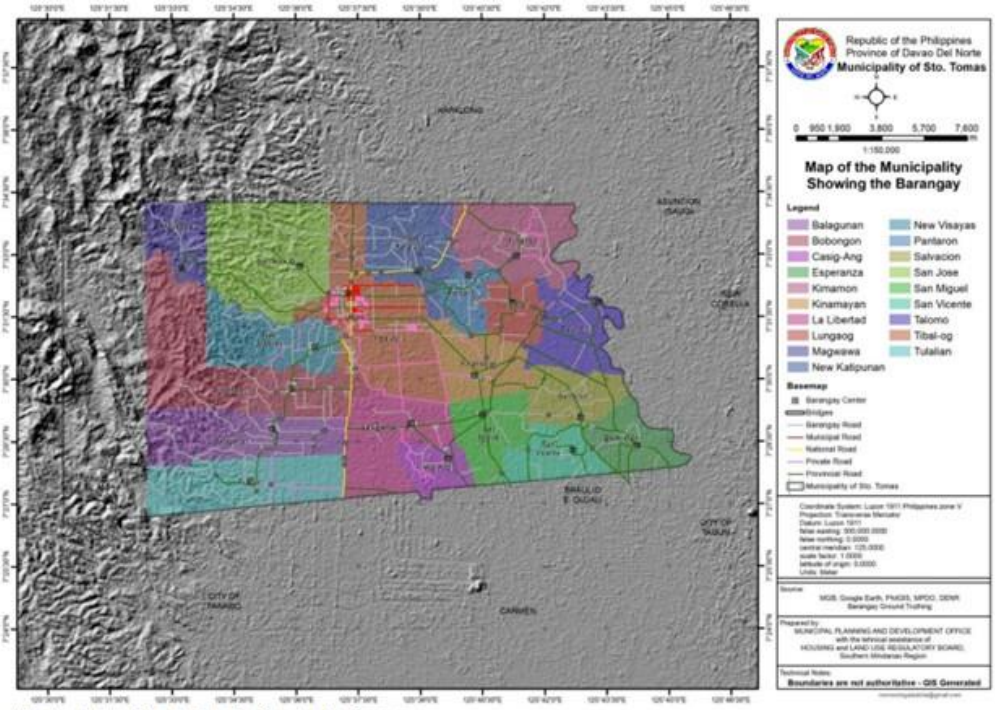


Map No. 3: Map of the Province Showing the Municipalities and Cities



Map No. 4: Map of the Municipality Showing the Barangays

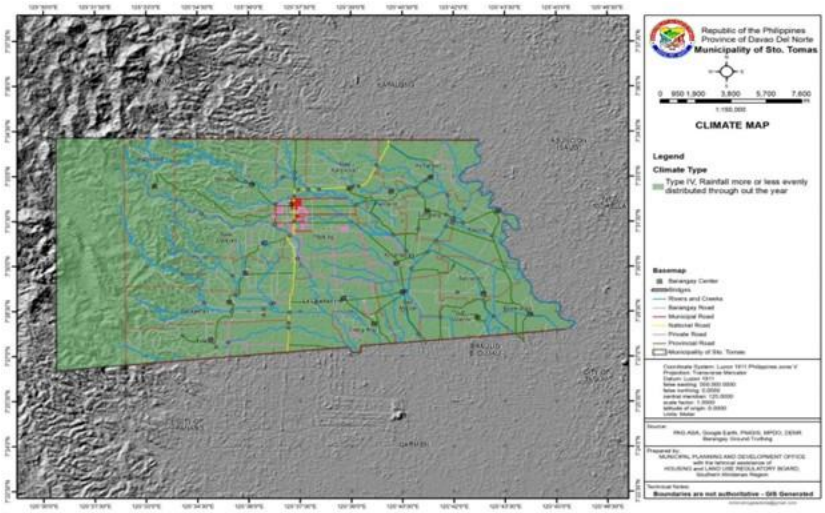
Topography

From the south stretching to the eastern and northeastern part of Santo Tomas is a vast expanse of fertile plains and gently rolling lands. The mountainous portions are toward the western and northwestern areas, near the boundary of Davao City and the Municipalities of Kapalong and Talaingod. The elevation ranges from 10 meters to 556 meters above sea level. 1.3.4 Climate and Rainfall Pattern The municipality's climate is Type IV characterized by more or less even distribution of rainfall throughout the year. The average monthly rainfall as of 2015 is 182.24 millimeters and the average daily rainfall is 5.96 mm. The months of May, June, and October registered the highest monthly rainfall of 395.01, 356.47, and 326.16 millimeters, respectively. The average rainy days per month are 13.9 days. The most number of rainy days are in June and September with 23 days each followed by November with 21 days and January and October with 17 days each. It is worth noting that while May has only 8 rainy days, it has the heaviest downpour registering 395.01 mm. in the whole month.

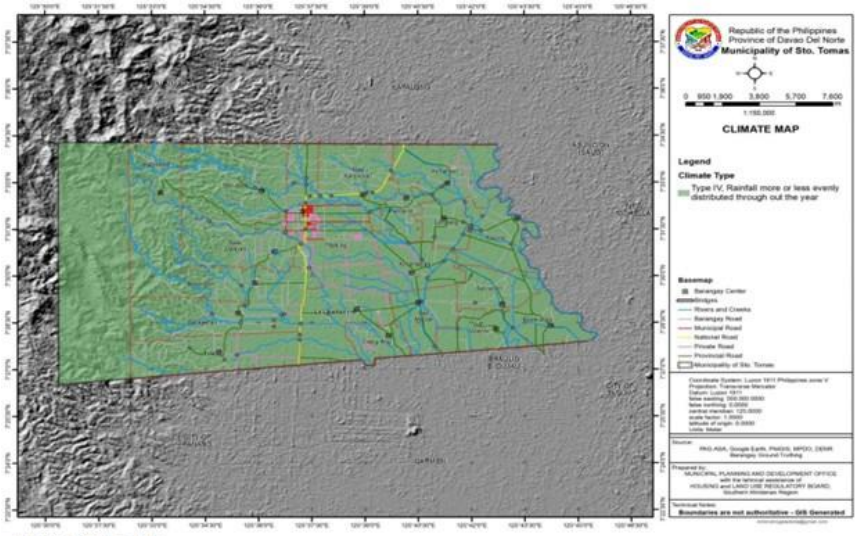
Table 11. Monthly Rainfall Data in Santo Tomas, Davao del Norte, CY 2015

Month	No. of Rainy Days	Amount of Monthly Rainfall (mm)	Average Daily Rainfall (mm)
January	17	133.47	4.31
February	1	12.00	0.43
March	9	30.45	0.98
April	12	100.82	3.36
May	8	395.01	12.74
June	23	356.47	11.88
July	10	142.42	4.59
August	15	149.54	4.81
September	23	261.59	8.72
October	17	326.16	10.52
November	21	140.97	4.70
December	11	137.94	4.45
Total	**167**	**2,186.84**	**71.49**
Average	**13.92**	**182.24**	**5.96**

Source: Municipal Agriculture Office (MAgrO)

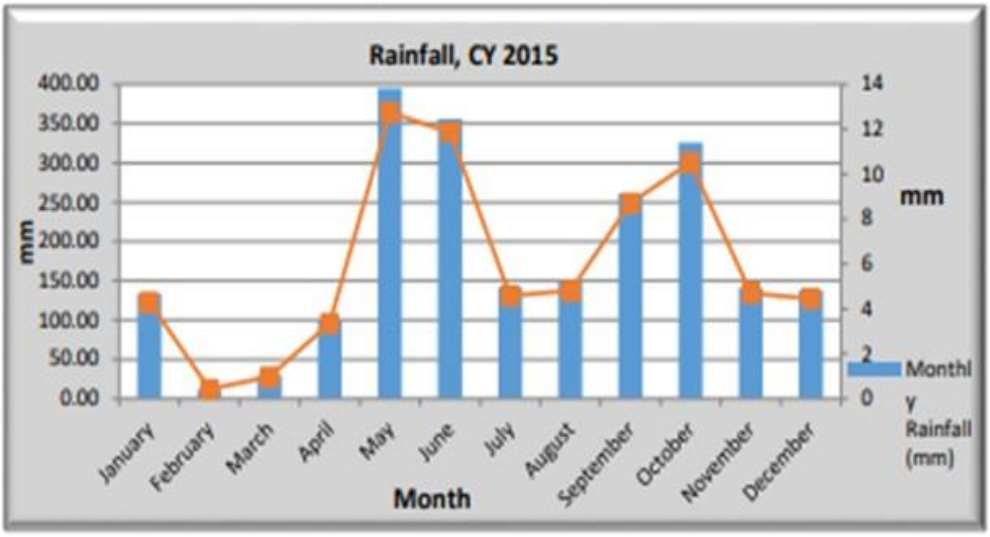


Map No. 5: Climate Map



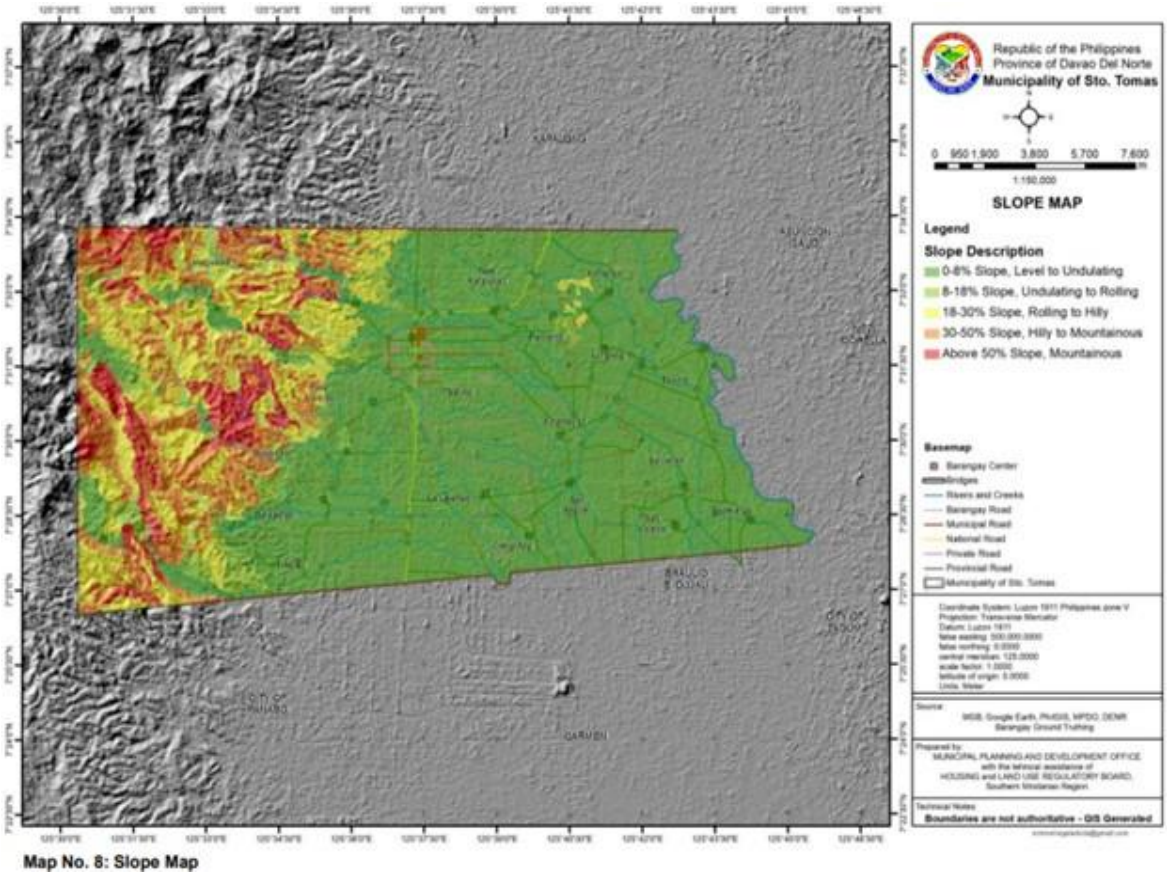
Map No. 5: Climate Map

Graph PF- 1: Rainfall, CY 2015



Slope

Slope affects the selection and positioning of crops and influences the type of management infrastructure to be adopted to sustain land productivity over time. About 74% of the municipality's land area or 19,811.47 hectares falls under the slope range 0-8%. These can be found in all barangays. Barely 4% falls under the slope range of 8-18% undulating to rolling while 11% is within 18-30% is rolling to hilly. Hilly to mountainous is only 8.6%. Areas with a slope of 50% and above can be found in the upland barangays of Balagunan, Bobongon, Magwawa, New Visayas, San Jose, the portion of Tibal-og and Tulalian (Map No. 8 – Slope Map)



Map No. 8: Slope Map

Table 12. Slope Classification in Sto. Tomas, 2016

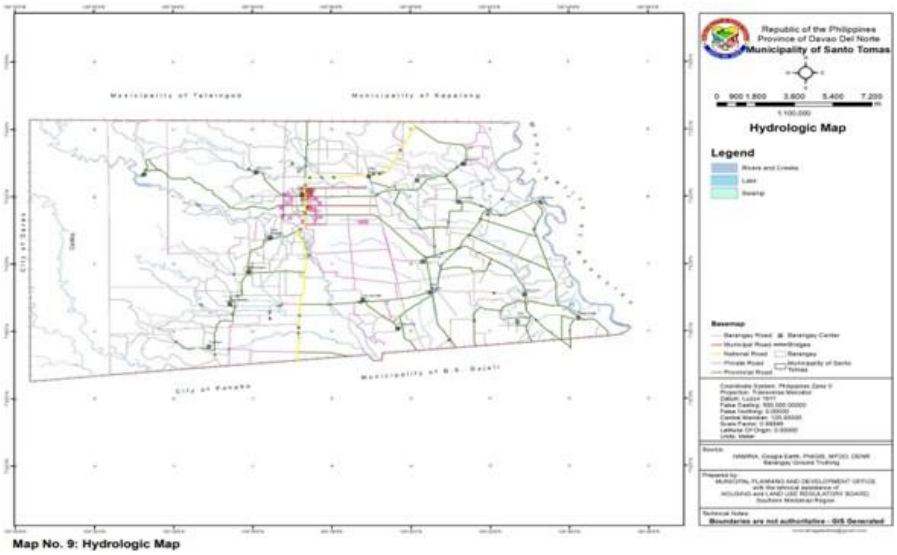
Slope Classification	Description	Area (has.)	(%)
0 – 8%	Described as Level to Undulating	19,811.47	73.87
8 – 18%	Described as Undulating to Rolling	998.30	3.72
18 – 30%	Described as Rolling to Hilly	2,834.38	10.57
30 – 50%	Considered as Hilly to Mountainous	2,306.14	8.60
50% Up	Considered Mountainous	869.55	3.24
Total		**26,819.83**	**100**

Source: DENR

Hydrogeologic Study

Hydrology

There are six (6) rivers, one (1) lake, and nine (9) creeks in the municipality that flow into Davao Gulf. The rivers that traverse the municipal areas are Alexandra, Inagulan, Bobongon, Tuganay, Libuganon, andLunga-og. The major rivers such as Tuganay and Libuganon drain the TagumLibuganon watershed and the Tuganay watershed through the broad plain west and north of the Davao Gulf. The nine (9) creeks areGahok Creek in New Visayas, Montero Creek in Tulalian, Kiyamutan Creek in Libertad, Salao Creek in San Jose, Lunga-og Creek in New Katipunan, Kimamon Creek in Kimamon, Talos Creek and Tibal-og Creek in San Jose, Barobo Creek in Tibal-og. Lake Imelda with an area of 7.7 hectares is located in Barangay Esperanza. Springs can also be found in New Katipunan, San Jose, Magwawa, and Tulalian (Map No. 9 – Hydrologic Map).



Map No. 9: Hydrologic Map

Erosion-Prone Areas

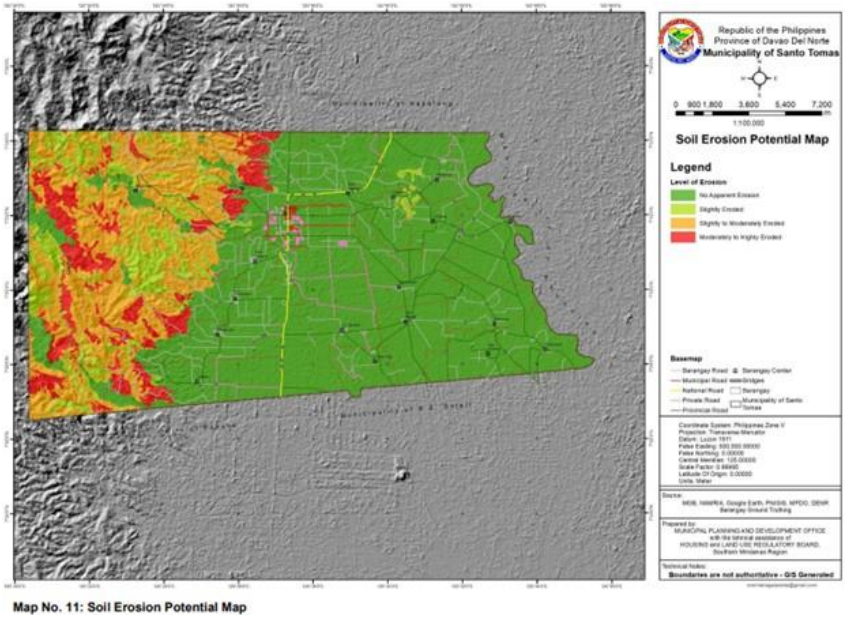
Some portions of Santo Tomas are prone to soil erosion in varying degrees of susceptibility but about 75% or 20,022 hectares of the municipal area are erosion-free. Regarding slope classification, about 21,000 hectares of the municipality are level to undulating and thus not predisposed to erosion. It is estimated that 3,932.12 hectares are slightly to moderately eroded and 1,350.57 hectares are moderately to highly eroded

(Map No. 10 – Rain Induced Landslide Susceptibility Map).

Table 13. Erosion-Prone Areas in Santo Tomas, Davao del Norte

Erosion Code	Eroded Area (has.)	Barangays Affected
No Apparent Erosion	20,022.30	Portions of all barangays
Slightly Eroded	1,514.84	Portions of Balagunan, Bobongon, Kimamon, Lunga-og, Magwawa, New Visayas, Pantaron, San Jose, Tibal-og, Tulalian
Slightly to Moderately Eroded	3,932.12	Portions of Balagunan, Bobongon, Magwawa, New Visayas, San Jose, Tulalian
Moderately to Highly Eroded	1,350.57	Portions of Balagunan, Bobongon, Magwawa, New Visayas, San Jose, Tibal-og, Tulalian
Total	**26,819.8255**	

Source: MPDO, MGB, BSWM



Map No. 11: Soil Erosion Potential Map

Hazard Profile

A hazard is a dangerous phenomenon, substance, human activity, or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihood and services, social and economic disruption, or environmental damage. Awareness of the different hazards in the locality prompts both the government and citizenry to be actively engaged in the identification, analysis, treatment, monitoring, and evaluation of disaster risks to reduce their vulnerabilities enhance their capacities, and ensure that the people are at the heart of decision-making and implementation of disaster risk reduction and management as provided for in RA 10121. 1.4.1 Inventory of Hazards, The Mines and Geoscience Bureau (MGB) of the Department of Environment and Natural Resources (DENR) has identified and reported two (2) hazards to which the municipality is susceptible. These are flooding and landslides. The Municipal Agriculture Office (MAO) has also identified grass fire, pestilence, and drought as additional hazards to crops, particularly rice

and bananas. Flooding is a perennial phenomenon in the municipality that affects mostly the low land portion of the municipality. Landslides, often rain-induced, are likely experienced in some areas in 9 barangays with steeper slopes. Although the Colosas fault line of Paquibato District, Davao City traverses portions of Balagunan and Tulalian, episode of earth-shaking, earthquake-induced landslide, and liquefaction attributed to said fault line has yet to be recounted. Drought is expected whenever the El Nino phenomenon occurs and impacts the entire municipality. Pestilence is also expected during long dry spells and flooding.

Table 14. Inventory of Hazards in Santo Tomas, Davao del Norte

Barangay	Flood	Rain Induced Landslide	Earthquake Induced Landslide	General Shaking	Liquefaction	Drought	Pestilence
Balagunan	√	√	√	√	√	√	√
Bobongon	√	√	√	√	√	√	√
Casig-ang	√	x	x	√	√	√	√
Esperanza	√	x	x	√	√	√	√
Kimamon	√	√	x	√	√	√	√
Kinamayan	√	x	x	√	√	√	√
La Libertad	√	x	x	√	√	√	√
Lunga-og	√	x	x	√	√	√	√
Magwawa	√	√	√	√	x	√	√
New Katipunan	√	√	x	√	√	√	√
New Visayas	√	√	√	√	√	√	√
Pantaron	√	√	x	√	√	√	√
Salvacion	√	√	x	√	√	√	√
San Jose	√	√	√	√	√	√	√
San Miguel	√	x	x	√	√	√	√
San Vicente	√	x	x	√	√	√	√
Talomo	√	x	x	√	√	√	√
Tibal-og (Pob.)	√	√	x	√	√	√	√
Tulalian	√	√	√	√	√	√	√

Source: MGB and Phivolcs
Legend: √ Susceptible
X Not susceptible

Records of Previous Disasters and Likelihood of Occurrence

Flooding is experienced every year in the municipality, particularly in the low-lying barangays. The most severe ones happened in two consecutive years (2013-2014) due to tropical depression Zoraida and due to Low Pressure Area (LPA) (Table PF-14). These hazardous events brought untold havoc to the lives of the residents and damage to public and private properties. Hazards are anticipated to step up in the next few years given the climate change scenario. Floods it seems are here to stay in Santo Tomas as it is situated in river basins of two major watersheds unless drastic and grand-scale measures are put in place. MDRRMO also reported that rain-induced landslides are occurring every three (3) years in areas with steep slopes.

Table 15. Records of Previous Disasters in Santo Tomas, Davao del Norte

Hazard Events and Description	Affected Areas	Number of Casualties (Dead, Injured, Missing)	Number of Affected (Persons, Families)	Number of Houses (Totally, Partially Damaged)	Damage to Properties (Infra, Agri, Institutional, Private/Comm'l.)	Sources of Information
Flood due to Tropical Depression Zoraida (11/12/2013)	19 barangays	None	1,850 families	No data	Agriculture - 2,500 ha.Infrastructure - P2,022,468.00 Pesos	LDRRMO,MSWDO, and MAGRO Report
Flood due to LPA (1/16/2014)	9 barangays	None	924 families	No data	Agriculture - 713.77 ha./P1,408,632.00 pesos.Infrastructure - P378,800.00	LDRRMO,MSWDO, and MAGRO Report

Source: MDRRMO, 2015

Table 16. Likelihood of Hazard Occurrence in Santo Tomas, Davao

Hazard Events	Return Period in Years
Flood	Every 1 year to 3 years
Rain Induced Landslide	Every > 3 years to 10 years
Ground Shaking	Undetermined
Liquefaction	Undetermined
Earthquake - induced landslide	Undetermined

Source: MDRRMO

Flood-Prone Areas

All barangays in Santo Tomas are susceptible to flood affecting an estimated area of 16,862.23 hectares as reported by the MGB. Very highly susceptible to flood are the barangays of Esperanza, Kimamon,Talomo, Salvacion, Bobongon, Magwawa, Balagunan, and a very small portion of Tulalian (Map No. 15 – Rain Induced Flood Susceptibility Map). The Tagum-Libuganon Watershed has 1,410.6524 hectares of very highly and 538.6576 hectares of highly susceptible areas as these are mostly the low-lying barangays of Santo Tomas. On the other hand, Tuganay Watershed has 421.6824 hectares of very high susceptibility and 4,322.1395 hectares of high susceptibility. The basis for delineating flood-prone areas is slope (0-3%), low elevation, and proximity to major drainage systems and natural water bodies and waterways.

Table 17. Barangays Susceptible to Flooding by Area in Hectares in Santo Tomas, Davao del Norte

Barangay	Level of Flood Susceptibility by Area in Hectares					
	VH	H	M	L	None	Grand Total
Balagunan	6.99	68.20	99.36	517.27	1,148.08	1,839.90
Bobongon	50.92	56.85	74.22	641.41	2,191.02	3,014.43
Casig-Ang		480.34	89.18	26.39		595.91
Esperanza	394.89	359.04	112.67	32.25	0.00	898.85
Kimamon	172.13	161.84	115.37	971.86	195.96	1,617.16
Kinamayan		71.74	618.48	455.82		1,146.05
La Libertad		252.99	140.19	1,161.99		1,555.17
Lungaog		19.78	376.64	267.69	2.38	666.49
Magwawa	35.66	36.06			765.81	837.53
New Katipunan		107.72	303.62	369.52	708.66	1,489.53
New Visayas		29.64	25.66	289.30	1,069.67	1,414.27
Pantaron		12.39	90.57	330.48	101.65	535.09
Salvacion	95.89	232.20	400.82	180.39		909.30
San Jose		127.29	51.14	17.08	2,335.32	2,530.83
San Miguel		281.80	415.24	313.37		1,010.42
San Vicente		555.92	215.68	91.13		862.73
Talomo	105.11	513.04	607.02	0.29		1,225.46
Tibal-og		202.36	367.24	1,805.90	426.70	2,802.20
Tulalian	0.31	83.38	9.90	762.69	1,012.26	1,868.53
Total	**861.89**	**3,652.58**	**4,112.98**	**8,234.86**	**9,957.51**	**26,819.83**
By Watershed						

Forest And Forestland

The computed existing forest area in Santo Tomas is 1,499.1666 hectares. DENR reported that the classified forestland in Santo Tomas is 4,689.98 hectares or about 17% of the total land area of the municipality. However, with the new municipal land area as mapped out through GIS, some of these forestlands may have been considered outside the territorial jurisdiction of Santo Tomas. BSWM classified around 6,304.87 hectares in Santo Tomas as suitable for forestry including A & D areas that have steeper slopes (18% and above) that must be protected and conserved. About 2,686.2084 hectares of forest land are under the reforestation program of the DENR involving different farmers' groups and stakeholders who are residents of Santo Tomas. These farmer groups are from Barangays Balagunan, Bobongon, Magwawa, New Visayas, San Jose, Kinamayan, San Miguel, and Tibal-og however, some of the project areas are located outside the municipality's area of responsibility (AOR). This might be one of the reasons for the discrepancy in the

hectarage of the existing forest and the current reforestation areas.

Agriculture

Based on GIS mapping, the existing agricultural area of the municipality is 18,191.5707 hectares. The Bureau of Soils and Water Management (BSWM) has declared 19,784.76 hectares as the Strategic Crops Development Zone under the Strategic Agriculture and Fisheries and Development Zone (SAFDZ). The Municipal Agriculture Office (MAgrO) revealed that 18,213.51 hectares or 92% are currently utilized for agricultural and fishpond production. Some 18,154.95 hectares or 99.68 % are planted for various crops; 0.21% is accounted for fishponds (38.3 has.) and the remaining 0.11% or 20.26 hectares are devoted to livestock and poultry production.

Status Of Flood Mitigation Strategies

Being always visited by a flood, the Local Government Unit of Sto. Tomas has come up with various interventions not just to eliminate but to lessen or mitigate the adverse impact of flooding in the community. Proper consultation and discussion with the affected individuals in the community resulted in the identification of flood mitigation strategies that would address the clamor of the affected residents in the flood-prone areas.

Programs and projects with corresponding fund allocations are implemented at the grassroots level such as the rehabilitation of River Bank, Rehabilitation of Bridges, Continuous Dredging and De-clogging of Canals, and the Reforestation Program under the stint of former Mayor Ernesto Evangelista (2019-2022).

Rehabilitation Of River Banks

The municipality of Sto. Tomas has implemented the rehabilitation of river banks in various areas of the locality yet the researchers with the knowledge of the Municipal Engineering Office have identified Purok 3A, Tagaytay Bridge Bobongon to be the location of study. This flood mitigation strategy bearing a Program of Work No. 2020-04-018-M was implemented with an appropriation of P 2,700,000.00 that emanated from the LDRRM Fund CY-2020 with the target of completion set on September 04, 2020, but unfortunately, the project was completed on October 19, 2020, under contract with Jagger Enterprises amounting to P 2,677,959.26.

Rehabilitation Of Bridges

This project entitled, “Rehabilitation of Bridges” (POW No. 2022-08-036-M) is implemented at Purok 3,

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Unit 2, Barangay Kinamayan under the Local Government Support Fund (LGSF), financial assistance coming from the Department of Budget and Management (DBM) with an appropriation of P 2,000,000.00 under the contact with Heavy John Engineering Consultancy amounting to P 1,970,000.00. It covers the installation of 162 linear meters of sheet piles, embankment, and removal and replacement of wingwalls. It is set to be completed on November 14, 2022, but basedon the report coming from the Municipal Engineer's Office (CY 2020 Municipal Funded Infrastructure Projects and Other Public Works) the current status of the projects is ongoing.

Continuous Dredging And De-Clogging Of Canals

This project with POW No. 2022-08-039-M is implemented in various areas of the Local Government Unit but to lessen the number of respondents for the study conducted, the researchers have chosen barangay San Miguel as their place of study. It has an appropriation of P 500,000.00 coming from the 5% MDRRM Fund CY 2022 (Maintenance and Other Operating Expenses) under contract with Tagum Distributor Center Corporation for P 494,040.00 and is expected to be completed on August 05, 2022, but due to some unavoidable circumstances, the project was finished on December 12 of the same year.

Reforestation Program

The LGU, particularly the Municipal Environment and Natural Resources Office (MENRO) is implementing a yearly Reforestation Program dubbed as, "*Seedling Production and Growing Program*." It aims to protect, preserve, and enhance environmental conservation and stability that plays, to mitigate

climate change effects that play a vital role in mitigating the adverse effect of flooding in the municipality. Per the Forest Land Use Plan of the municipality, it is evident that Barangay San Jose is the highest based on the Forestland Classification with a total of 1,486.13 hectares against its total area of 2,530.83 hectares. with an appropriation amounting to P 400,000.00.

Level of Flood Mitigation Strategies in terms of Rehabilitation of River Banks

Displayed in Table 18 is the assessment of flood mitigation strategies of the Local Government Unit of Sto. Tomas in terms of rehabilitation of river banks. Item number 1. "*reduces frequency and degree of flooding*" has the highest mean of 4.26 with a descriptive equivalent of Very High, followed by item number 2. *"keeps river banks and other waterways free from obstruction,"* with a mean of 4.25 that still belongs to a Very High descriptive equivalent. On the contrary, item number 5. *"reduces sediment yield by preventing bank erosion"* has the lowest mean of 4.11 with a descriptive equivalent of high. It is then very evident that rehabilitation of the river bank has a descriptive equivalent to High which is interpreted that the flood mitigation strategy is observed most of the time by the residents in the flood-prone areas.

River Restoration Theory, according to Bennet et al. (2011), can be characterized as the many alterations being made to the riparian zones close to the channels and floodplains, as well as inside the river channels themselves. One of the natural calamities that drives people who once lived next to rivers away is river bank erosion. Many of those affected by erosion lose not only their houses, means of support, and possessions but often their previous identities; as a result, they frequently make great efforts to be recognized as an identity. (Das, 2010). Less conventional ways of bank stabilization, according to Thorne et al. (1997), maybe more practical and increase sediment continuity, hence enhancing sustainability and lowering the need for more stabilization in the future.

Table 18. Assessment of flood mitigation strategies in terms of Rehabilitation of River Banks

Items	Mean	SD	Descriptive Equivalent
1. reduces frequency and degree of flooding	4.26	0.94	Very High
2. eeps river banks and other waterways free from obstruction	4.25	0.82	Very High
3. facilitates catchment drainage to prevent local flooding	4.19	0.96	High
4. increases flood water capacity and reduces water velocity	4.14	0.99	High

5. reduces sediment yield by preventing bank erosion	4.11	0.98	High
Average	**4.19**	**0.94**	**High**

Level of Flood Mitigation Strategies in terms of Rehabilitation of Bridges

It is noted in this table that items numbers 4 "*undergoes proper inspection and maintenance to sustain its usage"* and 5 *"has sufficient waterways to counteract the flood water"* of flood mitigation strategies in terms of rehabilitation of the bridge have the same mean of 4.38 with a descriptive to Very High, followed by item number 3 "*decreases loss of lives, damages to crops, livestock and properties"* that has also a Very High descriptive equivalent.

Item numbers 2 and 3 both got the descriptive equivalent of High but were still not able to pull down the result to the next lower descriptive equivalent, meaning the rehabilitation of the bridge as one of the flood mitigation strategies employed by the LGU indicates that it is observed at all times.

The most recent revision of the CIRIA manual (Construction Industry Research and Information Association) by Kirby et al., (2015) and Kitchen et al., (2021) provides an exhaustive state of knowledge on the assessment of debris impact and hydrodynamic forces on bridges, drawing on standards, recommendations, and research from various countries. These findings have demonstrated that a major underestimation of forces may be produced for situations in which free surface effects are significant, for deeply submerged bridge decks, or large blockage ratios, according to Oudenbroek et al. (2018a, b). Studies using several sensors to monitor the bridge structure and river flow are rare, and there are no field observations of all these concurrent events occurring during floods Crotti and Cigada (2019).

Table 19. Assessment of flood mitigation strategies in terms of Rehabilitation of Bridges

Item	Mean	SD	Descriptive Equivalent
1. carries exceptional loads such blockage during floods.	4.18	0.95	High
2. minimizes the cost and flood Volumes.	4.15	0.91	High
3. decreases loss of lives, damages to crops, livestock, and properties.	4.27	0.91	Very High
4. undergoes a proper inspection and maintenance to sustain its usage.	4.38	0.85	Very High
5. has sufficient waterways to counteract the flood water.	4.38	0.84	Very High
TOTAL	**4.27**	**0.89**	**Very High**

Level of Flood Mitigation Strategies in terms of continuous dredging/de-clogging of Canals

Table 20 depicts a picture of how continuous dredging and do-clogging of canals impact the lives and

properties of the affected populace as one of the flood mitigation strategies done by the municipality. It shows that all of the items got a descriptive equivalent of Very High as per the level of observance.

To explain, Item number 5 *"removes the build-up of sediments that block drainage"* has a mean of 4.37 which denotes a descriptive equivalent of Very High shows superiority in terms of rank and top among the five items and is consequently followed by item number 1 *"reduces vulnerability to floods, pests, and communicable diseases",* 4 "ensures that waterway traffic continues to flow smoothly", 2 "*decreases the occurrence of the flood",* and 3 "*decreases the volume of floating solid waste"* as the least that has a mean of 4.21 with a descriptive equivalent of still Very High.

It is understood that continuous dredging and de-clogging of canals as a flood mitigation strategy practiced by the local government is observed at all times by the flood-affected individuals of the identified barangay.

Heinrich et al. (2015) point out that dredging works take large material amounts from river beds, sediment that needs adequate disposal other than the landfill and that does not occur in inadequate places, due to its maintenance necessity and possible associated impacts.

Dredging dates back millennia and played a key role in the development of cities and trade by Vanderostyne & Cohen (1999). Its mechanization since the 19th century has facilitated the construction of large navigation works (canals, inland waterways) and land reclamation projects central to state territorial expansion and claims (Mukerji, 2009; Swayamprakash, 2019).

Table 20. Assessment of flood mitigation strategies in terms of continuous dredging/de-clogging of Canals

Items	**Mean**	**SD**	**Descriptive Equivalent**
1. reduces vulnerability to floods, pests and communicable diseases	4.33	0.87	Very High
2. decreases the occurrence of flood	4.22	0.90	Very High
3. decreases the volume of floating solid waste	4.21	0.90	Very High
4. ensures that waterway traffic continues to flow smoothly	4.30	0.87	Very High
5. removes build-up of sediments that block drainage	4.37	0.82	Very High
Average	**4.29**	**0.87**	**Very High**

Level of Flood Mitigation Strategies in terms of Reforestation Program

In Table 21 we can see that out of the five items under the reforestation program, almost all got a descriptive equivalent of Very High (item numbers 5, 1, 4, and 3) except, item number 2 *"decreases the incidence of damage to structural utilities and flooding"* which has a mean of 4.19 and has a descriptive equivalent of High.

Nonetheless, the average mean of this flood mitigation strategy remains on top as per descriptive equivalent is concerned which denotes that the mitigation strategy is observed most of the time.

According to Farley et al. (2005), reforestation reduces water yields more proportionally in areas with intermediate rainfall (60 percent, 1000–1250 mm per year) than in areas with high rainfall (30 percent, 1250–2000 mm per year). To increase the efficiency of reforestation for lowering the water table, planting should be prioritized in recharging zones (such as slopes and hilltops) over discharge zones (such as floodplains). (van Dijk et al., 2007). Because vegetation reduces runoff and channel flow, which enhances infiltration and material deposition, riparian plants can minimize the amount of sediment that enters streams. (Broadmeadow and Nisbet, 2004). 30 meters of riparian vegetation can capture about half of the suspended material. (Newbold et al., 2010).

Table 21. Assessment of flood mitigation strategies in terms of Reforestation Program

Items	Mean	SD	Descriptive Equivalent
1. promotes flood mitigation, water purification, and soil retention	4.34	0.80	Very High
2. decreases the incidence of damage to structural utilities and flooding	4.19	0.91	High
3. serves as a barrier to surface runoff and erosion	4.21	0.99	Very High
4. reduces flood impacts on down- stream communities	4.25	0.87	Very High
5. maintains environmental sustainability- ability and improve livelihoods	4.44	0.77	Very High
Average	**4.29**	**0.87**	**Very High**

Level of Flood Mitigation Strategies

In Table 22, all of the flood mitigation strategies employed by the Local Government Unit of Sto. Tomas, Davao del Norte in response to the flooding incidence in the locality are ranked according to Mean and Descriptive Equivalent.

To add, on top are indicators 3 *"Continuous Dredging and De-clogging of Canals* and 4 *"Reforestation Program"* having an equal Mean of 4.29, followed by indicator 2 *"Rehabilitation of Bridges"* with a Mean of 4.27, and indicator 1 *"Rehabilitation of River banks"* occupies the lowest position.

To end, the summary shows the overall mean and descriptive equivalent of different indicators as flood mitigation strategies of the local government. It is shown and interpreted that flood mitigation strategies are observed at all times.

Even though flooding is a multifaceted threat with numerous causes and effects, a decision-maker is most likely to simply manage the aspects of flooding about which they are knowledgeable or concerned. In other words, the actions that decision-makers make will depend on the aspects of flooding they are considering and how they interpret the "problem" of flooding. Flood problem framing is the term we use to describe how someone conceptualizes floods and their effects by Shön and Rein (1994) and Elliott (2003). The conceptualization of an issue affects "which aspects of the problem are addressed, where managers seek relevant knowledge, and which solutions are considered pertinent," according to research on problem framing (Cravens et al. 2021).

Table 22. Summary of the assessment of flood mitigation strategies

Indicators	Mean	SD	Descriptive Equivalent
1. Rehabilitation of River Banks	4.19	0.94	High
2. Rehabilitation of Bridges	4.27	0.89	Very High
3. Continuous Dredging and De-clogging of Canals	4.29	0.87	Very High
4. Reforestation Program	4.29	0.87	Very High
Over-all	**4.26**	**0.89**	**Very High**

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter presents the summary, discussion, recommendation of the study, and policy recommendation.

Summary

The studyis focused on the flood mitigation strategies of LGU-Santo Tomas, Davao del Norte preferably on the four (4) indicators as follows: a. Rehabilitation of River Banks b. Rehabilitation of Bridges c. Continuous Dredging and De-clogging of Canals and d. Reforestation Program.

Of the nineteen (19) barangays in the municipality, Barangays San Miguel, Kinamayan, Bobongon, and San Jose were selected where the study would be conducted, and through random sampling, 377 respondents were asked through answering questionnaires. It turned out that all of the respondents' answers depict that the flood mitigation strategies employed by the Local Government Unithave a Very High Descriptive Equivalent that denotes that the strategies are observed at all times.

Conclusion

Table 22. The summary of the assessment on flood mitigation strategies showed that all the indicators got a Very High Descriptive Equivalent but among the three (3) indicators, only the Rehabilitation of River Banks got the lowest mean of 4.19.

To get the exact reason why this happened, we analyzed Table 18 which covers the assessment of flood mitigation strategies in terms of Rehabilitation of River Banks and it was found that among the five (5) items only two (2) got the Very High descriptive equivalents (Items 1 and 2) and the three (3) items left had High descriptive equivalents.

Therefore, there is a need to enhance the delivery of services that focus on the following items; Item numbers 3. facilitates catchment drainage to prevent local flooding, 4. increases flood water capacity and reduces water velocity, and 5. reduces sediment yield by preventing bank erosion.

Recommendation

Based on the findings, analysis, and conclusion drawn in this study, the following recommendations were summarized:

Item # 3:Clear and maintain drainage channels: Regularly clean and maintain existing drainage channels, ditches, and culverts to ensure that water can flow freely without obstructions. Remove debris, vegetation, and any other blockages that may impede the flow of water.

Item #4:Widening and Re-channeling of rivers should be done to increase drainage capacity. This involves deepening channels and installing larger culverts.

Item # 5: a. Vegetation and riparian buffer zones: Establish and maintain a dense vegetation cover along riverbanks and shorelines. Plant native trees, shrubs, and grasses that have deep root systems, which help stabilize the soil and prevent erosion. Riparian buffer zones act as a natural filter, trapping sediment and reducing its transport into the water. b. Bank protection structures: Install bank protection structures such as gabion baskets, riprap, or retaining walls in areas with high erosion risk. These structures can help dissipate the energy of flowing water and protect the bank from erosion. However, they should be designed and installed in a way that minimizes adverse impacts on the natural environment.

Future researchers must conduct further research focusing on the perception of the flood-prone residence relative to the flood mitigation strategies employed by the Local Government Unit of Sto. Tomas, Davao del Norte.

POLICY RECOMMENDATION

Policy On The Rehabilitation Of River Banks

The rehabilitation of river banks is a critical aspect of environmental conservation and management. Rivers provide essential ecosystem services, including water supply, biodiversity, and recreation. However, human activities, such as agriculture, industrialization, and urbanization, have had adverse effects on the health and well-being of river systems. As such, this policy seeks to guide the rehabilitation of river banks to restore their ecological function and improve the quality of life of the communities that depend on them.

Objectives:

The objectives of this policy on the rehabilitation of river banks are:

1. To facilitate catchment drainage to prevent local flooding;
2. To increase flood water capacity of the river and reduce water velocity during the occurrence of flood;
3. To reduce sedimentation yield by preventing soil erosion;
4. To enhance the resilience of river systems to the effects of climate change;
5. To increase public awareness and participation in the conservation of river systems.

Scope:

This policy applies to all river systems in the Municipality of Sto. Tomas, Davao del Norte, including their tributaries and wetlands. It also applies to all stakeholders involved in the management and conservation of river systems, including government agencies, non-governmental organizations, community-based organizations, and private sector entities.

Principles:

The following principles shall guide the rehabilitation of river banks:

1. Ecosystem-based approach: The rehabilitation of river banks shall be guided by an ecosystem-based approach that considers the interdependence of ecological, social, and economic factors.
2. Participatory approach: The rehabilitation of river banks shall involve the participation of all stakeholders, including local communities, in the planning, implementation, and monitoring of activities.
3. Sustainable development: The rehabilitation of river banks shall be guided by principles of sustainable development, which seek to balance economic, social, and environmental factors.
4. Precautionary principle: In situations where there is uncertainty about the potential environmental impacts of a proposed activity, precautionary measures shall be taken to avoid or minimize adverse effects.
5. Adaptive management: The rehabilitation of river banks shall be guided by an adaptive management approach, which seeks to learn from experience and adjust management strategies accordingly.

Strategies:

The following strategies shall be employed in the rehabilitation of river banks:

1. Restoration of riparian vegetation: The rehabilitation of river banks shall involve the restoration of riparian vegetation, including trees, shrubs, and grasses. This will reduce soil erosion, stabilize river banks, and provide habitats for wildlife.
2. Bank stabilization: Bank stabilization measures, such as the construction of gabions, retaining walls, and vegetative cover, shall be employed to reduce bank erosion and sedimentation in river systems.
3. Control of invasive species: Invasive plant species shall be controlled to prevent their spread and to promote the growth of native riparian vegetation.
4. Water quality improvement: Measures shall be taken to improve water quality in rivers and their tributaries, including the reduction of pollution and sedimentation.
5. Floodplain management: The management of floodplains shall be guided by principles of sustainable development and involve the participation of all stakeholders in the planning and implementation of activities.
6. Public education and awareness: The public shall be educated and made aware of the importance of river systems, their conservation, and the role of the public in the protection and restoration of river banks.

Implementation:

The implementation of this policy on the rehabilitation of river banks shall be the responsibility of the Local Government Unit of Sto. Tomas in collaboration with other government agencies, non-governmental organizations, community-based organizations, and private sector entities. The implementation shall be guided by the principles and strategies outlined in this policy.

Monitoring and Evaluation:

The implementation of this policy shall be monitored and evaluated regularly to assess its effectiveness and to make necessary adjustments.

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ASSESSMENT OF THE FLOOD MITIGATION STRATEGIES OF STO. TOMAS, DAVAO DEL NORTE: BASIS FOR POLICY FORMULATION

Questionnaire

Scale	Interpretation	Description
5	Strongly Agree	This means that respondents Strongly Agree with the given statement
4	Agree	This means that respondents Agree with the given statement
3	Somewhat Agree	This means that respondents Somewhat Agree with the given statement
2	Disagree	This means that respondents Disagree with the given statement
1	Strongly Disagree	This means that respondents Strongly Disagree with the given statement

Name:_____ Barangay/Purok:_____

Gender: _____ Family Status: _____

FLOOD MITIGATION STRATEGIES

To the evaluator: Please check the appropriate box for the ratings *(Sa Evaluator: Palihog i-tsek ang tama nga kahon para sa ratings*

Rehabilitation of River Bank **(*Rehabilitasyon sa mga kilid sa Sapa*)**	**5**	**4**	**3**	**2**	**1**
The flood mitigation strategy (*Ang pamaagi sa pagpugong sa baha*),					

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1. reduces frequency and degree of flooding *(napakunhod ang ka daghanon sa pagbaha)*					
2. keeps riverbanks and other waterways free from obstruction *(napadayon nga walay babag ang sapa ug ang mga agianan sa tubig)*					
3. facilitates catchment drainage and to prevent local flooding (*padayon nga pag-agas sa kanal ug napugngan ang local nga pagbaha)*					
4. increases the river floodwater capacity and reduces the water velocity *(napataas ang kapasidad sa sapa ug napakunhod ang kusog sa tubig)*					
5. reduces sediment yield by preventing on-going bank erosion (*nabawasan ang sedimento pinaagi sa pagpugong sa padayon nga pagkubkob sa kilid sa sapa)*					
Rehabilitation of Bridges ***(Rehabilitasyon sa mga Tulay)***	**5**	**4**	**3**	**2**	**1**
The flood mitigation strategy (*Ang pamaagi sa pagpugong sa baha*),					
1. carries exceptional loads such as bridge/culvert blockage during the floods (*modala ug talagsaong gidaghanon sa mga bara panahon sa baha)*					
2. minimizes the costs and flood volumes *(mapamenos ang gasto ug gidaghanon sa tubig baha)*					
3. decreases loss of lives and damages to crops, livestock and properties *(makapamenos sa pagkawala sa kinabuhi ug kadaot sa mga pananom, kahayupan ug kabtangan*					
4. undergoes proper inspection and maintenance to sustain its usage for flood mitigation (*miagi ug saktong inspeksyon ug pagmentinar aron mapadayon ang paggamit niini alang sa pagpaminus sa baha*					
5. has sufficient waterway to counteract the flood water *(adunay igong agianan sa tubig aron masumpo ang tubig baha*					
Continuous Dredging and De-clogging of Canals ***(Padayon nga Pagkalot ug Pagkuha sa bara sa mga Kanal)***	**5**	**4**	**3**	**2**	**1**
The flood mitigation strategy (*Ang pamaagi sa pagpugong sa baha*),					
1. reduces vulnerability to floods, pests and communicable diseases. *(makapamenos sa among kahuyang sa baha, peste ug makatakod nga mga sakit.*					
2. decreases the occurrence of flood *(makapamenos sa panghitabo sa baha)*					
3. decreases volume of floating solid waste (*makapamenos sa gidaghanon sa mga nanglutaw nga basura)*					
4. ensures that waterway traffic continues to flow smoothly *(nagsiguro nga ang agianan sa tubig magpadayon nga hapsay)*					
5. removes buildup of sediment that block drainage and contribute to flash flooding during heavy rain events *(magtangtang sa mga linugdang nga makababag ug makatampo sa pagbaha panahon sa kusog nga ulan)*					
Reforestation Program *(Programa sa Pagpananom ug mga Kahoy)*	**5**	**4**	**3**	**2**	**1**
The flood mitigation strategy (*Ang pamaagi sa pagpugong sa baha*),					
1. promotes flood mitigation, water purification, and soil retention services *(nagpasiugda sa pagpaminus sa baha, paghinlo sa tubig, ug mga serbisyo sa pagpabilin sa yuta)*					
2. decreases the incidence of dasmage to structural utilities (roads and bridges) and flooding of floodplain *(makapamenos sa insidente sa kadaot sa mga structural utilities (mga dalan ug tulay) ug pagbaha sa kapatagan)*					
3. serves as barriers to surface runoff and erosion *(nagsilbi nga babag sa dagan sa tubig ug pagdahili sa yuta)*					

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4. reduces flood impacts on downstream communities *(makapamenos sa mga epekto sa baha sa ubos nga mga komunidad)*					
5. maintains environmental sustainability and improve livelihoods *(nagmintinar sa pagkamalahutayon sa kinaiyahan ug pagpalambo sa panginabuhian)*					