

(MDG-F 1656 Outcome 3.4)

Climate Resilient Farming Communities in Agusan del Norte
through Innovative Risk Transfer Mechanism

VULNERABILITY AND ADAPTATION ASSESSMENT REPORT

Municipality of Jabonga, Province of Agusan del Norte



A Climate Change Adaptation Project of the
INTERNATIONAL LABOUR ORGANIZATION (ILO),
a specialized agency of the United Nations
with GOP Partners:
DEPARTMENT OF LABOR AND EMPLOYMENT (DOLE)
DEPARTMENT OF TRADE AND INDUSTRY (DTI), and
THE PROVINCE OF AGUSAN DEL NORTE

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International
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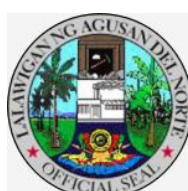


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Acronyms

A&D	Alienable and Disposable
CLUP	Comprehensive Land Use Plan
CBMS	Community Based Monitoring System
CCAP	Climate Change Adaptation Project
DA	Department of Agriculture
DOLE	Department of Labor and Employment
DTI	Department of Trade and Industry
EWS	Early Warning System
FFS	Farmers Field School
FGD	Focus Group Discussion
FLGC	Farm Level Grain Center
GOP	Government of the Philippines
ILO	International Labour Organization
LGU	Local Government Unit
PAGASA	Philippine Atmospheric, Geophysical, Astronomical Services Administration
UPLBFI	University of the Philippines Los Banos Foundation, Inc.
MFT	Municipal Focal Team
MPDP	Multi Purpose Drying Pavement
MT	Metric Ton
LGU	Local Government Unit
NGA	National Government Agencies
NGO	Non-Governmental Organization
NIA	National Irrigation Administration
RBO	Rural-Based Organizations
V & A	Vulnerability and Adaptation

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Message

Through the MDG-F 1656 Climate Change Adaptation Project (CCAP), the ILO supported the conduct of the Vulnerability and Adaptation (V&A) Assessments in priority areas in Agusan del Norte, including the Municipality of Jabonga.

Understanding vulnerabilities of farming communities to risks brought about by climate change is a crucial step in the effort to enhance their adaptive capacity and protect their livelihoods. Climate change brings about risks which disrupt not only the environment but also the social and economic systems, threatening lives, properties and livelihoods of vulnerable populations. This report characterizes risks and its impact on farming communities. It also presents current and potential adaptation strategies which provides CCAP, and more importantly, concerned local government unit, a sound basis for pro-active and responsive development action on climate change adaptation.

Aligned with the Global Jobs Pact, this demonstration project provide guidelines aimed at stimulating economic diversification among vulnerable communities, generating alternative livelihoods for vulnerable farmers, thereby providing protection to rural workers and their families. Farmers represent the greater majority of workers in the country. Their livelihood is largely depend on land productivity, labour and good weather. Farmers, in the province of Agusan del Norte, as with farmers in other parts of the country possess limited resources, oftentimes not owning the land they till, and only have labour as their main productive asset.

Adopted at the conclusion of the International Labour Conference in 2009, the "Global Jobs Pact," underlines the need to include green jobs and green technologies in the recovery packages and policies. It stipulates that the "decent work response to the crisis" should contribute to "a fair globalization, a greener economy and development that more effectively creates jobs and sustainable enterprises, respects workers' rights, promotes gender equality, protects vulnerable people, assists countries in the provision of quality public services and enables countries to achieve the Millennium Development Goals."

The CCAP implementers and all concerned, therefore, have to consider findings of this V&A Assessment Report. Adaptation options and strategies aimed at reducing risk exposure and averting further deterioration of the environment – the very base of farmers' livelihood- have to be pursued, including some economic diversification options along with their financing requirements, training and capability building needs.

For its part, the CCAP will develop innovative financial mechanisms, including insurance scheme to support diversification of farmers' livelihoods along with needed training and capability building initiatives.

At this point, I would like to congratulate the local officials and the Municipal Focal Team (MFT) members of Jabonga for having completed the laudable task of data collection, analysis and the preparation of this report. I would also like to thank the DOLE, DTI, DA and DENR Focal Persons who supported the ILO Project Manager in the Technical Working Group of the V&A as well as the mentors and other collaborators from the University of the Philippines Los Baños, SUCCEED, Inc and the Caraga Learning Service Providers Network.

Lastly, we thank the Spanish Government, which provided the grant to the Joint Programme on Climate Change Adaptation through the UN MDG-Achievement Fund.

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OFFICE OF THE MUNICIPAL MAYOR

Message



The world is constantly evolving. This is the reality that directly contributes to what we have and are now: from politics to socio-economics; from banking and finance to product, market and distribution; from pure and applied sciences to plain cause and effect theories; from radical and mainstream theological practices to deeper philosophical syllogisms; and, from complex cosmic discoveries to determined climatological phenomena and causes. These few compounds but relational dualisms set the realities of our constantly evolving home...the Earth...the World...our Home.

We may have constantly probed even deeper on all the fields of our existence to extend further our home's life and its occupants. But, the indubitable reality is that our home now is just purely reacting to the constant changes which are premeditatedly caused by its occupants. And now what? The occupants already feel how their home reacts.

The Municipality of Jabonga has been in constant dealing with how our climate has been behaving. This dealing is already somewhat attached to the lives of every Habonganons, year in and year out. Hence, adaptation measures and strategies are put in place anticipating the regular occurrence of flooding.

On the part of the local governance and administration, taking bias on our agricultural sector services, regular programs are operational ensuring agricultural productivity. While some mitigating measures are still being proposed and laid to in the market for possible funding sources, other measures are initiated in partnership with some national line agencies and non-government organizations. .

These things, of climate change adaptation concerns, are presented in detail on the Vulnerability and Adaptation Report. This document then pictures out the situation of Jabonga when our "home" normally shows her reaction to the constant evolution of climate.

It is our hope then that this V&A report could be one of our best efforts as stewards of our mother earth for the future of the next generations.

Glicerio M. Monton Jr.
Municipal Mayor

ILO CCAP Acknowledgments

This Vulnerability and Adaptation (V&A) Assessment Report is a product of the Climate Change Adaptation Project (CCAP) resulting from collaborative efforts of several stakeholders to include:

Writers and Researchers of Jabonga CCAP Municipal Focal Team:

Led by Sahibbon B. Julasiri and Roilan M. Beronilla with additional support from Ramon M. Lagura, Engr. Samuel C. Monoy, Ranielo A. Morit, Dr. Roberto L. Blacano, Dioscoro P. Boco, Editha L. Grana, and Aldrin P. Montero.

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Led by Lorraine B. Villacorta, CCA Project Manager of the International Labour Organization and Alvin P. Aclan, Municipal Anchor for Jabonga and also from the Province of Agusan del Norte; together with other TWG members: Brenda B. Corvera and Gemma L. Clarin of the Department of Trade and Industry (DTI)- Caraga; Maida Lynn Sanchez of the Department of Labor and Employment (DOLE)-Caraga; Rofel C. Cabaltera, Lauro G. Hinaloc and Adela G. Antiga of Province of Agusan del Norte (AdN); Abel F. Wagas of the Department of Agriculture (DA)- Caraga; Virgilio G. dela Cruz and Jose Salve Cabiling of the Department of Environment and Natural Resources (DENR)- Caraga.

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The Jabonga Municipal Focal Team

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The Project Brief

The International Labour Organization (ILO), a specialized agency of the United Nations, in partnership with the Department of Labor and Employment (DOLE), Department of Trade and Industry (DTI) and the Province of Agusan del Norte is implementing a three-year Climate Change Adaptation Project (CCAP) entitled, “**Climate Resilient Farming Communities in Agusan del Norte through Innovative Risk Transfer Mechanisms**”. This is under Outcome 3 of the **Joint Programme on “Strengthening the Philippines’ Institutional Capacity to Adapt to Climate Change”**, a joint programme of the United Nations and the Government of the Philippines implemented with support from the Spanish Government through the UN Millennium Development Goals- Achievement Fund (MDG-F) Thematic Window on Environment and Climate Change.

The CCA Project Objectives

This CCAP in Agusan del Norte aims to showcase key determinants of adaptive capacity at work [economic conditions as well as availability and access to financial and productive resources], where target vulnerable populations are provided access to financial and productive resources for purposes not only of helping them cope in the event of climate change triggered disasters but of improving their socio-economic lot, especially through diversified livelihoods schemes. Livelihood diversification is deemed critical as new types of livelihoods are often required to effectively adapt to disasters and climate change vulnerabilities

The Project Sites

The CCAP is implemented by the ILO and its partners in Agusan del Norte, one of the four provinces in the Caraga Region (Northeastern Mindanao) in Southern Philippines which economy is primarily based on agriculture. It is the region’s leading rice producer and other major crops include coconut, banana, corn, mango and an emerging crop-abaca. The province continues to be a major timber producer, with plywood plants operating in Butuan City, Buenavista and Magallanes. It has a land area of 273, 024 hectares and a

Specific Objectives and Expected Outputs

Project’s specific objectives are two-folds: (1) *To develop and test financial safety nets for vulnerable population, especially women, and* (2) *To develop the capacities of vulnerable populations to participate and avail of the benefits under economic diversification and a democratized governance system.*

To these ends, under the project, innovative financing and insurance schemes will be developed, tested together with viable climate change adaptation options and documented to aid replication and up-scaling. Specifically, the Project’s SMART outputs are:

- (1) Guidelines for the Innovative Financing;
- (2) Agreement with a Financing Institution to implement the Financing scheme;
- (3) Climate Change Adaptation Insurance Fund; and
- (4) Knowledge Management products & Policy Paper on possible up-scaling/replication

population of 314,027 (2007 Census), 49% of which are women. Approximately 55.6% (or 31,913) of the total households live below poverty line, [more than twice higher than the national average of 24.4%].

Four priority municipalities in the Province of Agusan del Norte have been selected namely: Buenavista, Jabonga, Las Nieves and Remedios T. Romualdez (RTR). These areas were selected on the basis of a set of criteria which included: (a) contribution to provincial agricultural production in terms of area/ yield and number of families dependent on farming as a main income; (b) general environmental condition and history of climate risk exposure based on incidence of extreme events and proportion of farming families affected by these events; (c) availability and access to support providers of training, markets and technology; (d) availability and access to financing institutions; (e) availability and access to insurance schemes and other risk transfer mechanisms; (f) level of pertinent knowledge and skills for agribusiness, environmental and resource management; climate and disaster risk management; (g) existence of GO-LGU -NGO/PO and/or collaborative initiatives relating to agribusiness and climate/ disaster risk reduction; (h) poverty incidence; and (i) peace and order issues and concerns.

The priority areas cover 52.39% of the land area in the province or 143,045 hectares which is home to 37.03% of the provincial population or 116,289 people. Likewise, the home of 38.97% (or 12,440) of the households are living below poverty line and 67.35% (2,046 households) of the food-poor in the province. 106 NGOs/POs, including Financing Institutions, are reported to operate within these areas (39.70%) of the reported 267 provincial data.

Foreword

“The changes in temperature and rainfall patterns, along with climate extremes such as droughts and floods, brought about by climate change threaten lives and livelihoods of the vulnerable populations. Men and women living in the rural areas and whose livelihoods are most dependent on weather, such as farmers and fishers, are likely to be most vulnerable”.¹

This Vulnerability and Adaptation (V&A) Assessment of the farming communities of the Municipality of Jabonga is conducted by the *MDG-F 1656 CCAP in Agusan del Norte* as it strives to begin its efforts in enhancing adaptive capacity of these communities with a good understanding of the climatic and natural hazards they face. A characterization of these hazards as experienced by the communities in the past, the present and as projected in the future along with a close look at the adaptation practices and/or coping strategies employed is deemed crucial in the task of enhancing their adaptation to climate change.

A result of the collaborative efforts of the implementers and partners of CCAP, this V&A Assessment report, provides a background to the discussion of the climatic hazards, impacts [to livelihoods, property and lives] and adaptation, and the characterization of the biophysical, the socio-economic and infrastructural milieu of these communities. In the analysis of future vulnerabilities and potential adaptation options, this assessment looks at climate change scenarios for 2020 and 2050 [PAGASA downscaled climate change scenarios for rainfall and temperature] with focus on the following components: advancement in science and technology, population growth rate, adaptation capacity/capability building, LGU budget/relevant investments as well as land conversion.

The V&A Methodology

In accordance with the overall approach of the CCAP, this V&A Assessment was done in a participatory and collaborative manner ensuring full participation all key stakeholders particularly from the LGU and farmers in concerned communities. Moreover, in keeping with the capability-building thrust of the Project, the V&A was conducted through a *“learning-by-doing”* approach with the members of the Municipal Focal Teams (MFTs) and the Partners Technical Working Group (TWG composed of ILO, DOLE, DTI, Province of Agusan del Norte along with DA and DENR), trained and mentored on the methodology by V&A experts from the academe (UPLB).

Guided by the TWG and the academe mentors, the MFTs *gathered available written materials, consolidated secondary information sources, conducted Focus Group Discussions (FGDs) and Key Informant Interviews (KIs) in the communities and mapped out production and settlement areas as well as hazards* with farmers. This report, as well as the other three Municipal V&A Assessment Reports were prepared and written by the MFTs. The report is enhanced and finalized through cliniquing sessions with the TWG anchors, V&A mentors and, finalization and packaging support group, (SUCCEED, Inc.).

A full description of the methodology can be obtained in the V&A Toolkit which comes as an accompanying section of this report.

¹Culled from: a) ILO (2008) Report of the Committee of Employment and Labour Market Implications of Climate Change; b) UNDG (2010) Integrating Climate Change Considerations in the Country Analysis and the UNDAF.

Towards the end, the study will present prioritized options for climate change adaptations in the affected communities, ranging from the social, technological (i.e. production, management of the environment), physical/infrastructural, institutional or socio-political, as well as economic.

The ILO and its partners including the local government unit of Jabonga and other prospective collaborators hope to take off from where this V & A Assessment Report ends. The CCAP will provide support to the farming communities in pursuing selected priority CCA options as provided in the report. Particular focus will be given to options which will have direct impact on the farmers' economic condition and livelihood as well as their ability to access financial and productive resources. As such, while the CCAP would not be able to directly provide financial support to the building of infrastructures, activities will be undertaken to assist the communities in accessing support for these.

Ms. Lorraine B. Villacorta
Project Manager, ILO-MDGF CCAP

Executive Summary

This vulnerability and adaptation assessment is part of a bigger project on innovative financing and insurance schemes of the ILO CCA Project. This assessment is viewed to characterize the municipality's climate change vulnerabilities, current adaptation strategies and point to adaptation options for the future.

Area Characterization

The municipality of Jabonga is one of the oldest towns of Agusan del Norte located in the Northern part of the province. It is bounded by the Municipality of Malimono on the North, by the Municipality of Kitcharao on the Northeast, Municipality of Tubay on the Southwest, Municipality of Santiago on the South and the Butuan bay on the West. It has an approximate area of 14,700 hectares and having a fifty (50) km. stretch of lakeshore. Jabonga could be easily distinguished and identified if associated with Lake Mainit which is the fourth largest fresh water lake in the Philippines.

It is composed of fifteen (15) barangays, with five [5] located along the coast of Lake Mainit, five [5] along the National Highway, four [4] along the coast of Butuan Bay and one is located three kilometers east of the national highway.

Jabonga has a total land area of 29,300 hectares. Of the total land area, 5,450 hectares or 18.6 % is alienable and disposable while 23,850 or 81.4% belongs to timberland.

Predominantly, the municipality is rolling to hilly slopes on the east and west portions while a wide portion of flat land is located due south adjacent to the flow of Kalinawan river which is located in Barangay Colorado, Magsaysay, Libas, Cuyago and Baleguian.

Jabonga lies at the lower portion of Lake Mainit which is the catch basin of the run-off water of approximately 100 rivers and creeks from the four [4] municipalities surrounding it: Jabonga, Kitcharao, Alegria and Mainit.

A total of twenty eight (28) rivers and creeks are found in Jabonga where eighteen (18) are tributaries to Lake Mainit, eight (8) flows to the Butuan bay while two (2) flows directly to Kalinawan river. The two major river systems of Jabonga are Puyo river and Kalinawan river. Puyo river is the major tributary to the Lake Mainit while Kalinawan river is the only outlet of the Lake Mainit that drains to Butuan bay.

Maraiging creek, Camalig creek, Baleguian river, Sayagan creek and Puyo river are utilized for irrigation purposes.

The municipality is characterized with type IV climate, with evenly distributed rainfall all year round (PAGASA, Butuan office).

Observed (2010) average daily rainfall showed heavy downpours (at 13.5 mm) on the period of October to December, daily average mean temperature is at its peak in January and February (26°C), daily average of maximum temperature at 34.0°C in June, and daily average relative humidity is as high as 89% also during the month of January.

The Municipality of Jabonga is exposed to 7% of the typhoons that hit the country as it is situated along the typhoon belt, specifically along the typhoon built areas from Surigao del Norte and Surigao del Sur. From 1964 to 1994 it encountered six (6) super typhoons.

Jabonga has a total population of 24,545 based on the 2009 census. There are 5,641 families or 4,390 households. It is predominantly a rural town with more than 85% of its people residing in the rural barangays. The municipality has a very low population growth rate at .30%/annum.

More than half of the total population lives under the poverty threshold based on Caraga Region Standard. Survey shows that the average annual income per household is only 24,000.00 pesos (CBMS 2008).

Coconut and rice are the two priority crops in the municipality. The said two crops constitutes 77% of the total agricultural area, with coconut at 55% (2,647 hectares) and rice 15% or 682 hectares (372 rain fed and 310 irrigated). Coconut farming is the primary source of livelihood of the population involving 1,455 farmers, and rice ranking with 454 farmers.

Average annual production of coconut is recorded at 1.6 MT/annum, rice at 4.2 MT and 3.8 MT for irrigated and rain-fed areas, respectively. Total coconut annual production is computed at 4,236 MT/annum and rice at 5,431 MT/annum (from irrigated with 2,604 MT and rain fed at 2,827 MT).

Fishing (both marine and inland) is one important source of food and income being a coastal municipality.

Other forms of livelihood engage are livestock/poultry production, vegetable production, small cottage industry, masonry, carpentry, “Trisikad” driving, etc.

MPDPs, FMRs, FLGC, mechanical dryers, irrigation system, and SWIP are the most common facilities available in the area. Communication, transportation, power and water system are also presently servicing the basic needs of the population.

Trading and marketing, credit and financing are some supported services provided by the LGU.

Current Hazards and Observed Climate Change Impact

Floods, drought and typhoons are the main sources of hazards in the municipality.

Flood occurrence in the municipality was experienced almost every year that lasted for 3-4 months. This regularly happens during the months of November to February, largely covering ten (10) out of the fifteen barangays (i.e. Poblacion, Cuyago, Magsaysay, Colorado, Baleguian, A. Beltran, San Pablo, Bunga), and severely affecting five (5) of the seven (7) rice producing barangays..

During the occurrence of flood, 54.38% (or 2,619 has.) of the agricultural production area is adversely affected, including 310 hectares of irrigated rice fields. Losses to yield due to typhoons and flooding registered an average of 33% in the past seven years (2003-2009), largely in the rainfed areas, with minimum damage in the irrigated areas. *(Please see AnnexB5)*

Coconut areas were moderately affected.

Destruction of houses, buildings, government facilities, irrigations, farm to market roads, culvert and other facilities were quite significant during occurrence of hazards.

In 2006, there were reports of 5 lives lost due to drowning in a flash flood in Barangay Magsaysay. Almost annually around 100 families (2%) in Barangays Magsaysay, Colorado, and Poblacion were forced to evacuate as their houses submerged when flood water rose. Children and elderly were commonly affected with diarrhea, coughs, colds and fever inside the evacuation centers. Minimal harvest and inadequacy of food stocks had resulted to financial losses in the inundated communities causing starvation aggravated by the increase on the cost of basic commodities and inhibition of livelihood.

Adaptation Strategies

The most common past adaptation strategies of the farmers and communities during hazards (both flooding and typhoon) include adjustment in farming techniques (utilization of drought or flood tolerant plant varieties, change of crops, diversified farming), paid labor and engaging into other forms of livelihood (off farm). On the part of the LGU, the declaration of state of calamity and the allocation of 5% calamity fund became an immediate recourse to provide much needed relief goods and other assistance, rehabilitation of school buildings, roads, culverts and other government facilities.

Current adaptation measures devised by the LGU include the following: i) setting up of the relocation sites of the IPs, ii) securing production of harvest through insurance (crop and livestock), iii) installation of early warning devices at strategic places, iv) identification of evacuation centers, and v) updated disaster contingency plan.

Limited fund is one major identified constraint to adaptation strategies resulting to insufficiency of relief assistance (i.e. food, equipments, etc.), non-completion of infrastructure facilities, and provision of economic assistance to affected population, among others. Moreover, laxity on enforcement of some national and local ordinances was also observed.

Scenario Analysis and Future Adaptation Strategies

PAGASA Butuan office forecasted in the years 2020 and 2050 for the whole province of Agusan del Norte with increasing temperature and rainfall compared with currently observed

climate trend. In 2020, the agency projected an optimum increase of approximately 1.3% (or 1.33°C) on the average maximum temperature during the months of April-June, and on the average rainfall, an increase of an average of 9.83% (13.8 mm/day) between the months of October to January. In 2050, it is projected at 2.97% (2.93°C) on the average maximum temperature and the average rainfall, at 5.6% (6.1 mm/day), during the same dry and rainy periods (as 2020).

The scenario building for two periods (2020 and 2050) takes into critical account some development variables including; population growth rate, state of development of science and technology, land use pattern (conversion), and LGU budget and overall adaptation capacity. There are also three scenarios in every period.

Probable impact will be mainly weighed on the aspect of food sufficiency and security, livelihood and income, and lives and properties. Over-all impact was rated with Low (30% and below), Moderate (31-60%) and High (60% and above). Calculations of impact also seriously consider the formula (provided by experts) with a range of 8-14% damage to crops in every 1°C increase in temperature.

Given the above considerations, rating of the overall impact in the municipality of Jabonga for the year 2020 was: Scenario 1 with Moderate, scenario 2 as Low, and scenario 3 as High. In the year 2050, scenario 1 is rated as High, scenario 2 as Low and scenario 3 as High.

To respond to the predictions of impacts, strategies are pushed, thereby enhancing all-sided adaptation capacity of various stakeholders headed by the LGU: a) Physical/infrastructural – Enhance/rehabilitation of irrigation facilities, Kalinawan River deepening, Puyo river re-channeling; b) Technological – provision/installation of portable/automatic weather station, refrain from intensive use of scientific agricultural inputs, emphasize the contribution/significance of EWDs to farming systems, adoption of technology in farming system relative to climate change; c) Economic - provision of high yielding rice variety, high tolerance to changes in temperature, Intensify crop diversification program and integration of other crops to maximize and optimize production, adoption/observance of planting calendar in relation to crop/commodity planted, emphasize savings in earnings for any occurrence of hazards or eventual climate changes; d) Political/ institutional - intensify enforcement of environmental laws, intensify the conduct of orientation sessions/refresher courses on the various adaptive measures significant in farming resilient communities, to continue proactive partnership with NGOs, POs to be more resilient, to continue to access resources from other NGAs and other funding institutions for more climate resilient/adaptive livelihood interventions to farmers, etc..

Mother earth has gone beyond its borders of indulging manmade dreadful activities. Climate change is for real. Its brunt is already felt at varying degree in different parts of the globe. With apparent limitations of the LGU, all the more with the most vulnerable communities and sectors (small farmers and women), it is logical to rally all stakeholders towards a unified strategic thinking and seek external support to realize some critical, abrupt and effective adaptation strategies, to cushion the destructive outcome of global warming and ease the difficulties of the already impoverished population, and to survive mankind.

Introduction

The formulation of this Vulnerability and Adaptation Assessment report of the municipality of Jabonga, Agusan del Norte is spearheaded and funded by the International Labour organization (ILO), under its Climate Change Adaptation Project (CCAP), in cooperation with the Department of Labor and Employment (DOLE), Department of Trade and Industry (DTI)-Region XIII and the provincial government of Agusan del Norte. This is inspired by the vision of addressing the needs of the vulnerable sectors of our society in times of crisis that the global warming and climate change may bring, to find effective solutions on how the affected sectors could adapt, henceforth, mitigate the impact and survive that bleak scenario of climate change.

Chapter 1 – narrates the municipality’s Area Characterization, covering: the Bio-Physical profile showing its location and topography, land area and land use patterns, geology, slope and elevation, the drainage and river systems, climate and rainfall patterns; Socio-economic Profile such as demography and settlement patterns, income and poverty incidence, agriculture and fishery production, commerce and trade, livelihood; and the Institutional Profile, infrastructure projects and facilities, transportation, communication, power and water supply systems and the support services on the aspect of trading and marketing, credit and financing;

Chapter 2 – the Current Hazards and the Observed Climate Change Impacts, discussed on: the Causes of Hazards (e.g. floods, droughts, typhoons, etc); the Place and Time of Occurrence; and, the Impacts of the Climate Change to crop production, livelihoods, and lives and properties including infrastructures;

Chapter 3 – the municipality’s presentation of its Adaptation Strategies: Past and Current Adaptation Strategies; and the Identified Gaps and Requirements to make it more effective;

Chapter 4 – the Scenario Analysis, that tackles: the Components (i.e. assumptions, PAGASA climate forecast for 2020 and 2050, etc.); the Three Scenarios in different periods (2020 and 2050) considering population growth rate, state of science and technology, LGU budget and adaptation capacity, and land conversion; Rating of Vulnerabilities; and, the Future Adaptation Strategies i.e. economic, technological, physical/infrastructural, and political/institutional; And,

Chapter 5 – the Conclusion on the imminent threats of specific hazards in the municipality, considering degree of vulnerabilities, hence, the urgency to act on the recommended adaptation strategies;

The annexes that shows list of maps and tables and references of information are listed on the latter part of the document.

1

AREA

CHARACTERIZATION

1. AREA CHARACTERIZATION

1.1. BIOPHYSICAL CHARACTERIZATION

The municipality of Jabonga traces its origin to a village formerly occupied by Negritos and a few Christian immigrants, led by a Manobo Negrito named Angelecio Montante. Also called Agaras, the village became known as Celopan, a name derived from the bamboos growing along the bank of the river that were made into smoking pipes called “Celopan”.

Sometime during the middle of the nineteenth century, the increasing number of inhabitants, joined by other Christian immigrants from other places transferred to a new settlement which is the present site of barangay Colorado. At the same period, the Spanish Government was sending missionaries including the northern part of the island of Mindanao. The contingent that went up the Calinawan River reached the settlement of Colorado, a name derived from the word “colorado” meaning colored, because of the white-spotted arms of Domingo Monoy, the brave settler who faced the newcomers. Proceeding upstream, the missionaries reached the village of Celopan. Seeing a local inhabitant (a “native”) inside a hut, the floor of which was just one meter above the water, they asked him what the place was called. Thinking that the Spaniards were referring to the hut, the native answered “Habongan”. Thus, Celopan was renamed “Habonga” which later became Jabonga.

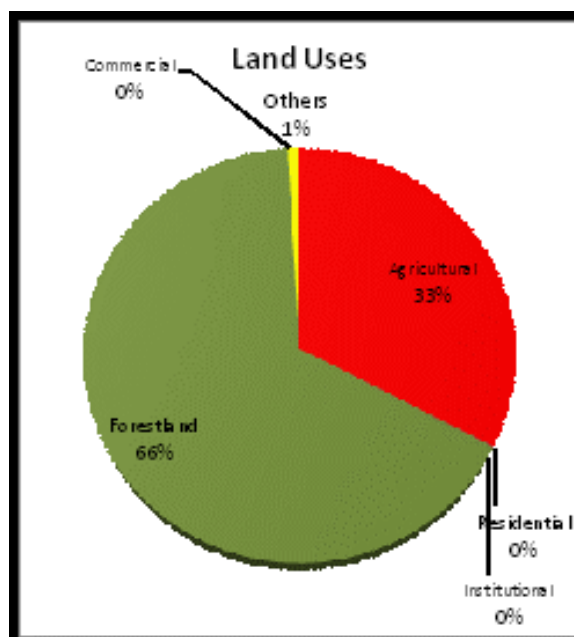
1.1.1. Location and Topography

Location

Jabonga is one of the oldest towns located in the Northern part of Agusan del

Norte. It is bounded by the Municipality of Malimono on the North, by the Municipality of Kitcharao on the Northeast, Municipality of Tubay on the Southwest, Municipality of Santiago on the South and the Butuan bay on the West. It has fifteen [15] barangays where five [5] of them are located along the coast of Lake Mainit, five [5] are along the National Highway, four [4] are along the coast of Butuan Bay and one is located three kilometers east of the national highway. Jabonga could be easily distinguished and identified if associated with Lake Mainit which is the fourth largest fresh water lake in the Philippines having an approximate area of 14,700 hectares and having a 50- km. stretch of lakeshore. *(Please see Annex A1 on the location map)*

Figure 1: Land Uses



Land Use Area and Land Use Pattern

Jabonga has a total land area of 29,300 hectares. Of the total land area, 5,450 hectares or 18.6 % is alienable and disposable while 23,850 or 81.4% belongs to timberland. (Please see Annex A2: land Use Map, p.56)

1.1.2. Geology

Jabonga is located within the influence area of Lake Mainit. The Malimono Ridge which divides the Lake Mainit forms numerous peaks. On the eastern side are hilly portion which forms higher peaks. Kicharao silt loam and clay loam are the two soil types of Jabonga which are best suited for agriculture.

Slope

Jabonga has a predominantly rolling to hilly slopes on the east and west portions while a wide portion of flat land is located due south adjacent to the flow of Kalinawan river which is located in Barangay Colorado, Magsaysay, Libas, Cuyago and Baleguian. (Please see Annex A3, Slope map)

Elevation

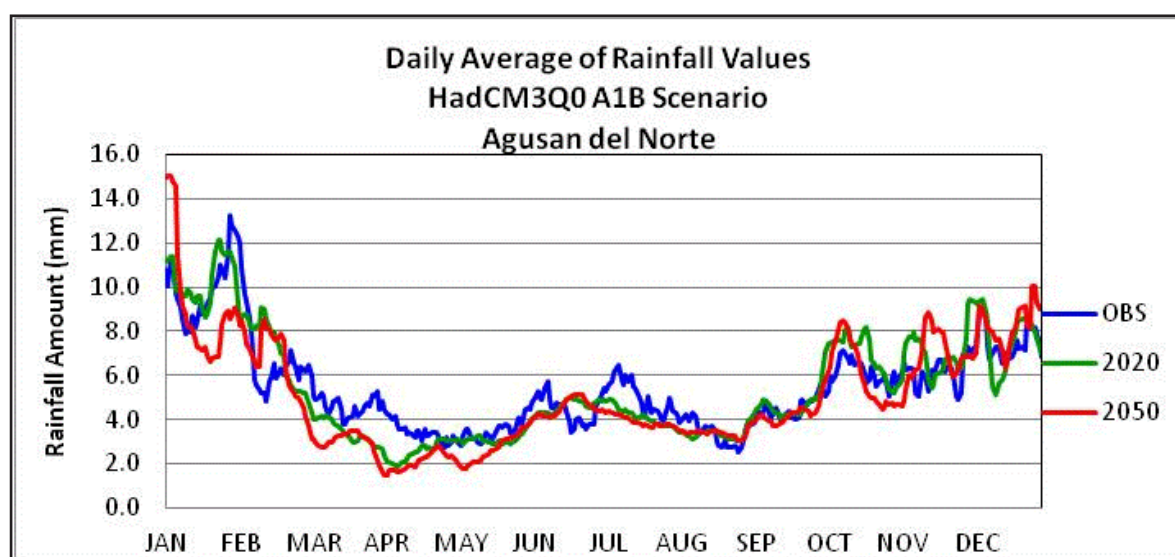
The Malimono Ridge on the western portion of Jabonga has numerous peaks that are uniformly sharp with an elevation of 500 to 600 meters above sea level. Mountain peaks which are as high as 1000 meters above sea level flank the eastern side of the town. Wide corridor of very low elevation peaks bend due south.

Drainage and River Systems

There is a total of 28 rivers and creeks in Jabonga where 18 are tributaries to Lake Maiinit, 8 flows to the Butuan bay while 2 flows directly to Calinawan river. The two major river systems of Jabonga are Puyo river and Kalinawan river. Puyo river is the major tributary to the Lake Mainit while Calinawan river is the only outlet of the Lake Maiinit that drains to Butuan bay. Lake Mainit and Butuan bay are the two major surface waters. Maraiging creek, Camalig creek, Baleguian river, Sayagan creek and Puyo river are utilized for irrigation purposes.

Jabonga lies at the lower portion of Lake Mainit which is the catch basin of the run-off water of approximately 100 rivers and creeks from the four [4] municipalities surrounding it: Jabonga, Kitcharao, Alegria and Mainit.

Figure 2: Average daily Rainfall, PAGASA Butuan Office (2010)



1.1.3 Climate and Rainfall Patterns

The municipality is characterized with type IV climate, with evenly distributed rainfall all year round (PAGASA Butuan office), and is not within the typhoon built area.

Average Monthly/Daily Rainfall

It is observed that at least once a year the municipality of Jabonga experienced a 24-hour rainfall at >299mm. At this instance flooding always occurs heavily affecting 8 barangays – Barangays Bunga, San Pablo, Poblacion, Colorado, Magsaysay, Cuyago, Baleguian and A. Beltran.

The months of January to February register the highest rainfall amount which reaching 13.0 mm. This went down to an average of 4.0 mm during the months of March to September. From October down to December the rainfall amount averaged to 6.0 mm. The total average rainfall for the whole year was estimated at 6.15mm.

It is projected that by year 2020, the average rainfall amount shall increase to 6.25

mm, while the projection for 2050 will go down to 5.64 mm due to the impact of climate change.

Average Mean Temperature

The observed minimum temperature occurred in the month of January was recorded at 26.0 degrees centigrade. By the year 2020, the lowest temperature would also likely to occur in the months of January and February which is projected at 27.0 degrees centigrade. And, by 2050, the lowest temperature would likely occur in the month of January which would be at 27.9 degrees centigrade.

Daily average Maximum temperature

The observed maximum temperature occurred in the month of June recorded at 34.0 degrees centigrade. By 2020, it is projected that the highest temperature would be up to 35.2 degrees centigrade that would occur in the month of June. And, by 2050, it is projected that the highest temperature will be at 37.1 degrees centigrade which would likely occur in the month of May.

Figure 3: Daily Average Mean Temperature, PAGASA Butuan Office (2010)

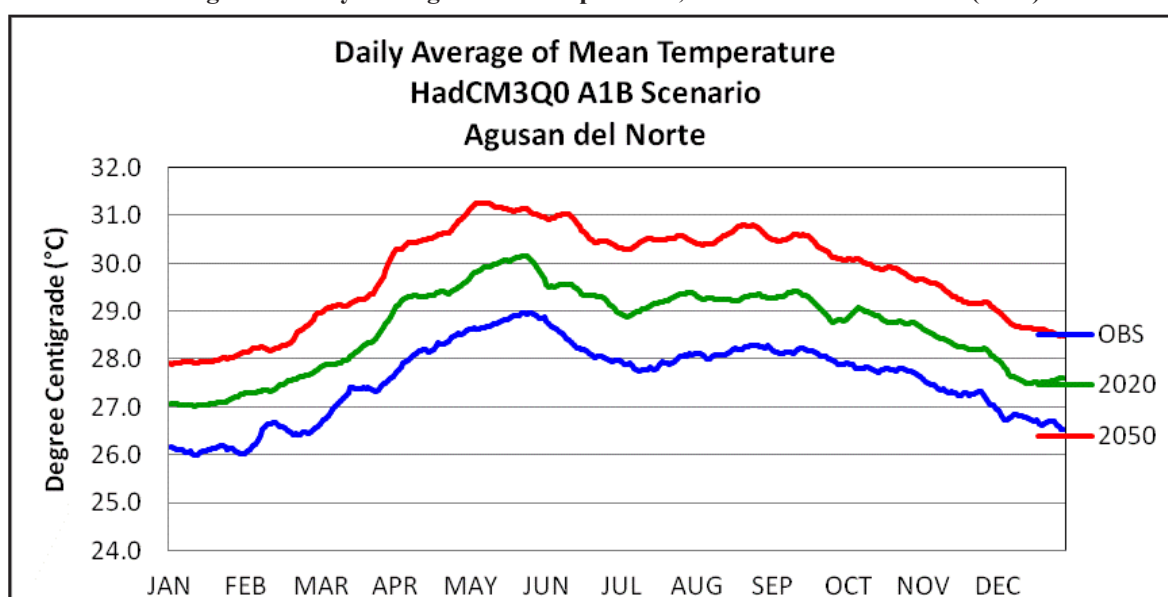
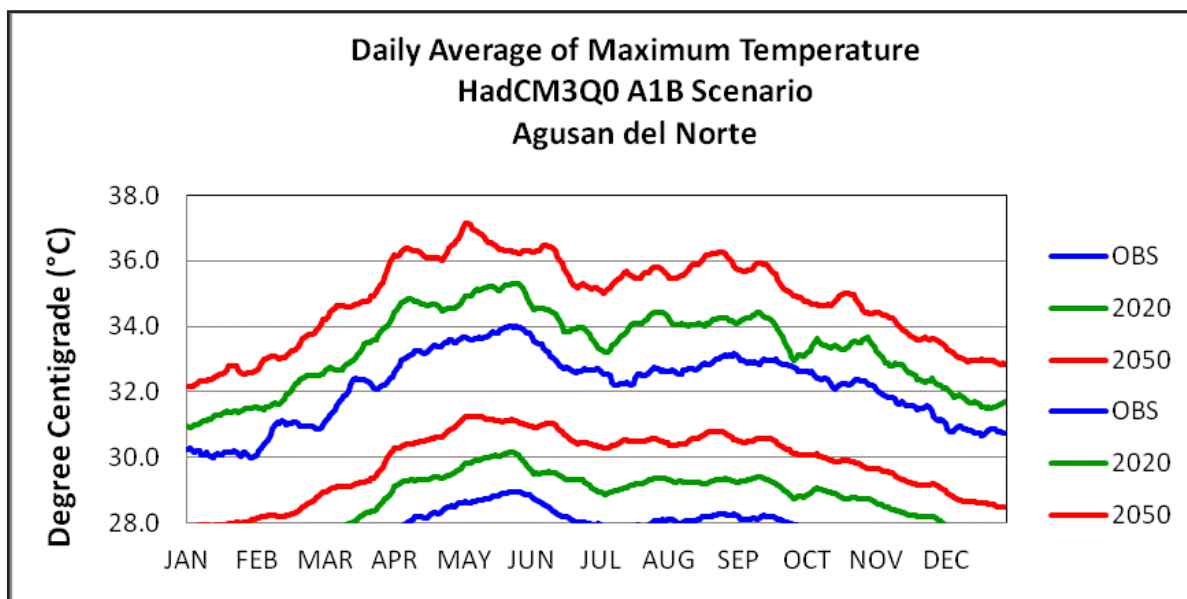


Figure 4: Daily Average Maximum Temperature, PAGASA Butuan Office (2010)



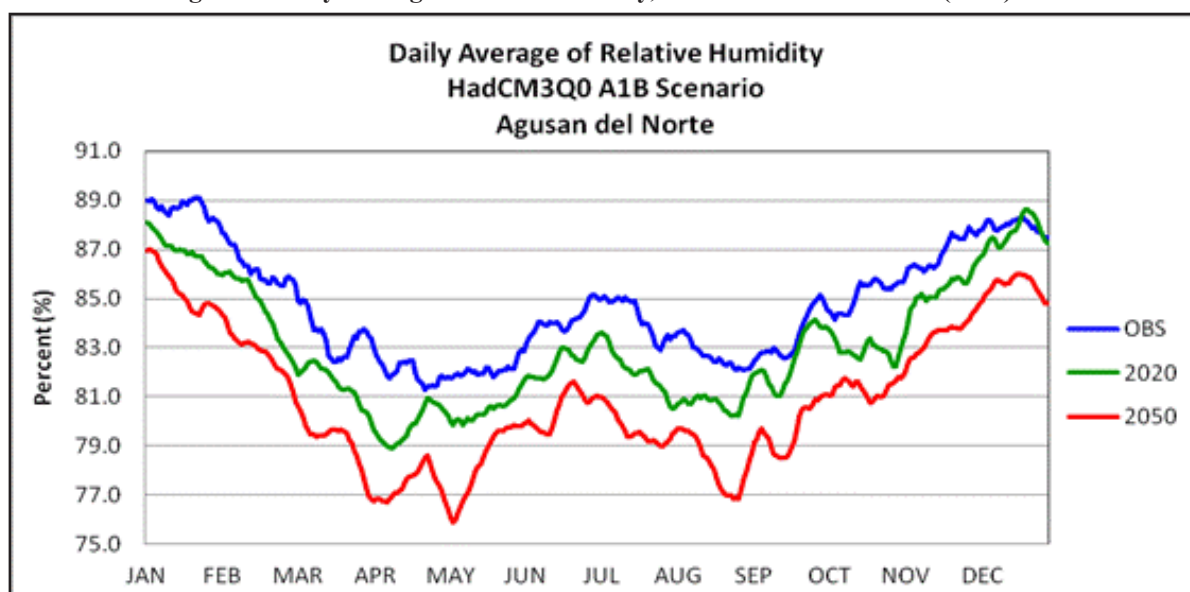
Daily Average Relative Humidity

The observed highest percentage of relative humidity was registered at 89.0% in the month of January and February, and the lowest percentage at 81.5% in the month of May.

By 2050, it is expected that the highest relative humidity would likely reduce to 87.0% in January and the lowest point would be at 77.0% on the month of May.

It is projected that by 2020, the highest percentage of relative humidity will be at 88.0% in the months of January and December, and the lowest at 79.0% in the month of April.

Figure 5: Daily Average Relative Humidity, PAGASA Butuan Office (2010)



Cyclone/Typhoon

Jabonga always experience cyclones/typhoons due to its geographical location which is along the typhoon built area, specifically those coming from Surigao del Norte and Surigao del Sur.

Typhoon Ineng	- 1964
Typhoon Nitang	- 1964
Typhoon Ruping	- 1985
Typhoon Puring	- 1993
Typhoon Besing	- 1994

Based on the record, the municipality has experienced five [5] super typhoons from year 1964 to 1994:

The Municipality of Jabonga is exposed to 7% of the typhoons that hit the country.

1.2 SOCIO-ECONOMIC PROFILE

1.2.1 Demographics: Population Size, Density, Urban-Rural Distribution

natural growth of its economic activities.

Population and Number of Households

Jabonga has a total population of 24,545 based on the 2009 census. There are 5,641 families or 4,390 households. It is predominantly a rural town with more than 85% of its people residing in the rural barangays. The continuing shift of settlement to the national road network makes rural population growth even higher than the interior lakeside urban core. Jabonga has an average household size of six [6]. (Please see Table 1 besides).

Table 2: Population by Gender

Gender	No. of Population
Male	11,671
Female	12,874
Total	24,545

The rural character of the place is projected to continue since Poblacion area is losing dominance in drawing the influx of the population. It is not in-migration that is driving the population to increase but the

Table 1: Population Distribution and Density Per Barangay			
Barangay	Population	Area [sq km]	Density
Poblacion	3190	8.9	358
Baleguian	2349	13.7	172
Bangonay	2793	91.6	31
A.Beltran	1256	2.5	502
Bunga	1287	11.9	108
Colorado	1790	8.8	203
Cuyago	1852	48.5	38
Libas	1610	31.9	52
Magdagooc	1459	8.9	164
Magsaysay	1203	3.4	354
Maraiging	615	26.3	23
San Jose	1158	7.2	161
San Pablo	1114	11.4	98
San Vicente	1760	9.8	180
Santo Niño	1109	4.5	246
Total	24,545	289	84.9

MPDO-Jabonga, 2010

Projected Population Changes

The municipality has a very low population growth rate at .30%/annum. The rate of out- migration can be even higher than its birth rate mainly due to the lack of employment opportunities and the unsustainability of economic activities brought about by damaging impact of natural hazards

At current growth rate (0.3%)/annum population is projected to increase to 25,291 by 2020 and 27,669 by 2050.

1.2.2 Income and Poverty Incidence

The recent Community-Based Monitoring System [CBMS] survey result conducted in 2008, portray the impoverished state of the municipality, with the majority of the total population living under the poverty threshold based on Caraga Region Standard.

Income Level

The 2008 CBMS survey showed that there are 2,981 households (or 81% of the total number of households) are living below

poverty threshold, and 73% of the total number of households is living with income below the food threshold.

CBMS survey further shows that the average annual income per household is a meager 24,000.00 pesos.

Housing, water, and sanitation

Despite the vast area there are about 8.6% that are considered squatters, with 3.1% living in makeshift structures. Moreover, the survey revealed 18% of the population with no access to safe water and 13.5% no access to sanitary toilet facility that are major causes to diseases and sickness. (Please see table 4, p.30)

Figure 6: Makeshift houses near the lake



Table 3: Magnitude and Proportion of Income Level		
INDICATOR	Households	
	Magnitude	Proportion
Households with income below poverty threshold	2981	80.9
Households with income below food threshold	2674	72.6
Households experienced food shortage	451	12.2
Unemployed members of the working force	185	5.5

Source: CBMS 200

Table 4: Magnitude and Proportion of Housing, Water and Sanitation		
INDICATOR	Households	
	Magnitude	Proportion
Households living in makeshift structure	114	3.1
Households who are squatters	315	8.6
Households without access to sanitary toilet facility	499	13.5
Households without access to safe water	666	18.1

Source: CBMS 2008

Table 5: Magnitude and Proportion of Health and Nutrition

INDICATOR	POPULATION					
	MAGNITUDE			PROPORTION		
	Total	Male	Female	Total	Male	Female
Mortality of 0-5 yrs. old children	32	15	17	1.2	1.1	1.3
Mortality of women due to pregnancy-related causes	2	-	-	0.5	-	-
Malnourished children [0-5 yrs. old]	27	18	9	1	1.3	0.7

BMS 2008

Health and Nutrition

The children (from 0-5 yrs. old) considered malnourished was computed at 1% and mortality rate at 1.2%.

Education

Literacy rate of Jabonga registers 90%. However, in the children aging 6-12 years old 23.6% were not attending elementary education and 50% of those from 13-16 years old could not attend high school. Only 1.01% of the population possesses trade skills.

1.2.3. Agricultural Production System

Crop Production

Coconut, rice, corn, banana, abaca and vegetables are the main crops produced in the municipality covering an aggregate area of 4,800 hectares. Coconut is on top in terms of area with 2,647 (55%) of the total agricultural land. This is followed by banana

and rice. Though, banana is also found under the coconut trees. (Please see annex B3, Crop Production)

Figure 7: Schools by the streets



For the purpose of this study coconut and rice are the two priority crops in the municipality. The said two crop constitutes 77% of the total agricultural area, with coconut at 55% (2,647 hectares) and rice 15% or 682 hectares (372 rain fed and 310 irrigated). Coconut farming is the primary source of livelihood of the population involving 1,455 farmers, with rice ranking third with 454 farmers (following next to banana at 619 farmers).

Average production on crops stated in the table above show that harvest is sufficient and technologically accepted; coconut at 1.6 MT/annum, rice at 4.2 MT and 3.8 MT for irrigated and rain-fed areas, respectively. Total coconut production is computed at 4,236 MT/annum and rice at 5,431 MT/annum (from irrigated with 2,604 MT and rain fed at 2,827 MT).

Rice production varies through years. It is observed that production is significantly high in 2006 with acceptable level of production losses compared to other years. This is because of the adaption to new technology like the organic farming practice and the government interventions through inputs subsidy.

Poultry and Livestock Production

Poultry (chicken/ducks) and swine are the dominant animals raised by common households in the municipality which contribute to income generation and nutritional food requirements of the populace. A little on sheep and goat production give share to milk and meat requirement of the community.

Large cattle animals and carabaos were most likely raised in aid to farming operations of most farming households. Very few are raised for purposes of meat production to meet market requirements. (Please see Figure 8)

It is noticed that most barangays having larger numbers of animals raised are also the flood prone barangays.

Fish Production Data

Fishing (both marine and inland) is one important source of food and income being a coastal municipality. The fish catch survey conducted from the year 2005-2008 of the Municipal Agriculture Office, revealed an average fish catch from marine fisheries at 115.83 kg/mo. and 112.90 kg/mo. for motorized and non-

motorized fishing operations respectively.

While fish catch on inland fisheries is higher at 213.05kg/month, income derived from fishing is still quite below as expected. There is also a need to assist fishermen with alternative livelihood and financing to enhance their fishing gears and paraphernalia.

Fish catch in Jabonga is way below compared with other adjacent municipalities (both in the marine and inland fisheries). These can be attributed to the increasing numbers of fishermen operating in a constricted fishing grounds..

Figure 8: Poultry and Livestock Production, MAO

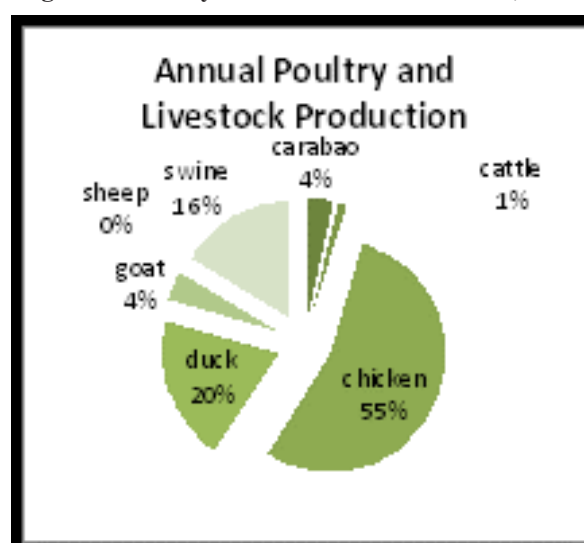
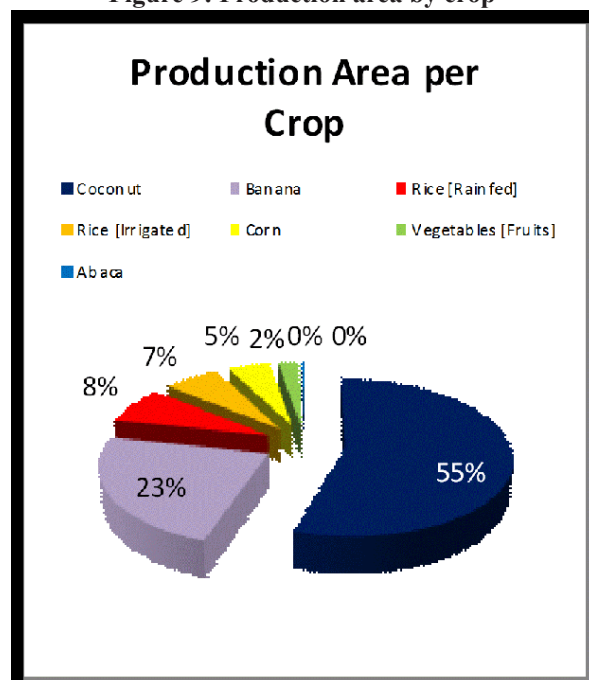


Figure 9: Production area by crop



MAO-Jabonga, 2010

1.2.4 Commerce and Trade

Players involved in the buying and trading of agricultural crops/commodities within the municipality are also players in the neighboring municipalities. Other players even come from outside the province of Agusan del Norte. In terms of volume of palay, players from other municipalities absorbed 60% of the total harvest/produced by the farmers and only 40% is cornered by the players within. This scenario is similar with vegetables, banana and fisheries products.

1.2.5 Livelihood

- a) Crop Production - production of vegetables in backyard and even in commercial scale were among the economic activities of several households in the barangays. Technology, vegetable seeds assistance and rice seeds subsidy were accorded by the LGU in collaboration with the DA.
- b) Livestock Production - most households raise small animals like poultry/ducks, swine and goats for subsistence. Large cattle animal to include cows and carabaos were raised for meat production and for draft animals as well. Assistance through dispersal scheme and on animal health care and management through vaccination, medication and treatment were among the adaptive measures given by LGU in coordination with the agriculture department.
- c) Fish Production - Fishing in coastal marine and in inland lake are among the major livelihood activities of the household member of the populace. Gillnet fishing, hook and line, fish pot and fish coral were among the fishing type of operation of most fisher folks. Provision of fishing paraphernalia to marginal fishermen, policy formulation and fish fingerling seeding in communal fishing ground in fresh water bodies were among the adaptive measures provided by LGU towards improving livelihood, conservation and protection for resource sustainability.
- d) Small Cottage Industry - furniture and cabinet making utilizing wood and rattan are other sources of economic and livelihood activities in the community. Other small cottage industry (Handicraft) like mat weaving plate making out of nito¹ and bag making out of boli² were also being done as income generating activities among households including indigenous people [IP].

Figure 10: Dried Fish from the Lake



¹ Shrub specie

² A variety of palm tree

1.3 INSTITUTIONAL PROFILE

1.3.1 Infrastructure

Agri Facilities

There are ten [10] units of multi-purpose drying pavements (MPDP) located in barangays A. Beltran, Baleguian, Cuyago, Bangonay, Magsaysay, Colorado, Libas and Poblacion. These MPDP facilities helped farmers dry their farm produce to attain market quality thereby ensuring competitive price.

A Farm Level Grain Center (FLGC) serves as the main post harvest facility of the farmers where harvest can be dried, milled and stored before it will be sold to buyers. This is operated by the municipal government of Jabonga.

Transportation

Farm to Market Roads (FMRs) in 12 sites of Jabonga stretching 30 kms. are generally graveled roads but lack periodic maintenance. These FMRs connect the hinterland barangays to the Poblacion and to the market centers for the trading of farm produce.

Communications

Major telephone companies are operating in Jabonga specifically in Barangay Poblacion. Repeater towers are installed by Globe and SMART telecoms. The Municipality of Jabonga also has its telecommunication system operated by National Telecommunications Commission and has Postal Services.

Irrigation Facilities

Irrigation facilities of five (5) communal irrigation system (CIS) are located in barangays A. Beltran, Baleguian, Maraiging,

Cuyago, and Puyo, These, however, need rehabilitation so as to optimize its capacity and maximize the utilization of the irrigable areas thereby increasing productivity and income of rice farmers.

Small water impounding project [SWIP]

The barangay A. Beltran SWIP irrigation system is programmed for repair this year. This could irrigate around 35 hectares of rice farms in the barangay.

1.3.2 Support Services

Trading and Marketing

In complementation with trading and marketing of palay and milled rice of the Farm Level Grains Center [FLGC], a partnership with the Provincial government of Agusan del Norte on the Palay Equalization Fund with an amount of P2.5M was infused without interest and payable within 5 years.

Credit and Financing

The Local Government Unit is intensifying its agricultural support programs in partnership with other financial institutions such as the rural banks, Cooperatives, Quedancor³, and Land Bank of the Philippines⁴. Other financing inputs were also accessed through special projects (e.g. NMCIREMP of Department of Agrarian Reform-International Fund for Agricultural Development (DAR-IFAD), which provided micro-financing to farmers thru self-help groups.

The LGU also has a regular program on subsidies for inputs, seedlings, and small farm implements. Regular trade fairs are initiated by the Office of the Municipal Agriculture during annual founding celebrations.

³ A defunct Quasi-Government institution that provided financial credit to farmers through their cooperatives.

⁴ A government financial institution

2

CURRENT HAZARDS AND OBSERVED CLIMATE CHANGE IMPACTS

2. CURRENT HAZARDS AND OBSERVED CLIMATE CHANGE IMPACTS

2.1 SOURCES AND TYPES

“The KI and GP results show that 94% of the responses indicated that they have observed increase in temperature; drought with 53%; pest infestation on crops with 37%; heavy rainfall with 33%; 14% have observed flooding; siltation with 11%; salt intrusion in water with 8% and other responses with 11%”, the baseline study report stated. *(Please see figure besides)*

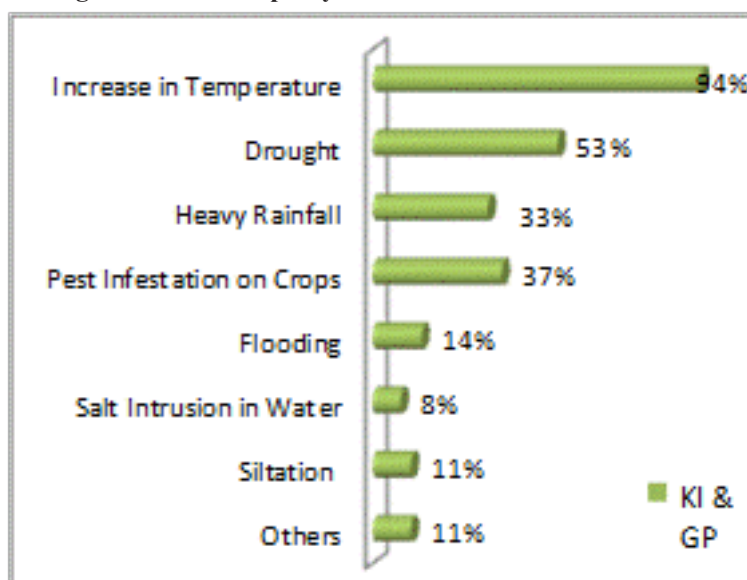
2.1.1 Floods

The flooding was attributed to the location of the municipality that is lying along the lower portion of the lakeshore of Lake Mainit. The lake is the catch basin of the run-off water of approximately 100 rivers and creeks from the four [4] municipalities surrounding it: Jabonga, Kitcharao, Alegria and Mainit that caused the rising of water level of Lake Mainit with 6-8 meters high from its normal water level. This is aside from the “backflow” of Kalinawan River, brought about by rapid siltation and soil erosion from the denuded watersheds.

2.1.2 Droughts

In 1983, a year before super typhoon Nitang also hit the municipality, the most severe drought experienced by the

Figure 11: Percentage of Responses on the Observed Climatic Changes in the Municipality



Source: BSG Consolidated KI & General Poll Results

municipality. This even caused a huge forest fire on the southern portion of the Mallimono Ridge just a few kilometers from Barangay Poblacion on its western part aside from the damages caused to all crops.

2.1.3 Typhoons

Typhoon is another source of hazard in the municipality. From the period 1964 till the present it hit five times. This is due to the fact that Jabonga is within the typhoon built area. *(Please see Annex A6, tracks of tropical typhoons)*

2.2 PLACE AND TIME OF OCCURRENCE

Flood occurrence in the municipality was experienced almost every year that lasted for 3-4 months. This regularly happens during the months of November to February mostly affecting ten out the fifteen barangays (i.e. Poblacion, Cuyago, Magsaysay, Colorado, Baleguian, A. Beltran, San Pablo, Bunga) and 5 of the 7 rice producing barangays. (Please see AnnexA8: Most Affected Areas by Flooding, p.62)

The following are the significant dates and time of occurrence of disasters:

Typhoon Puring (1993)

Typhoon Puring's appearance in Jabonga in 1993 brought havoc to the entire municipality. It blown up roofs and other parts of many residential and institutional buildings, eroded some road networks, side slopes and washed away surfaces of concrete and graveled roads. Plants and agricultural crops were up-rooted, potable as well as irrigation waters were cut off due to the damage of its conveyor structures and sources. As if the

lives of many Jabonganons were put to stop for several days.

Typhoon Besing (1994)

Typhoon Besing was among the strongest that hit Jabonga. More residential buildings and public gathering structures were destroyed, roads were un-passable for several days (i.e. the rehabilitation/ improvement project of Bangonay to poblacion Jabonga circumferential road), damaging the 95% of its structure. New water ways were formed, rivers and lakes were silted, power lines were downed, and drainage structures were clogged. The irrigation facilities of Puyo CIS were greatly damaged as well as the smaller irrigation facilities of the other CIS.

Flood (1996)

Farm lands were underwater for several days, school buildings were submerged and livelihood activities were stopped. Poblacion Jabonga and other low lying barangays were cut-off from the outside due to power failure,

Figure 12: Flooding in the Poblacion Area, beside the Lake Mainit, MAO



cell phones were made useless and vehicles could not pass thru the main thoroughfares.

Flood (2006)

Heavy rains brought flood to many parts of the municipality. It also eroded/

washed out roads particularly the Poblacion to Magdagooc barangay road. Several kilometers of other barangay roads, as well as canals, and cross drainages were likewise damaged.

2.3 IMPACTS [EXTENT/DEGREE]

The KI and GP results show that 94% of the poll and key informants indicated that they have observed decrease in production as one of the effects of climatic changes. Some 76% have observed that climatic changes have led to cropping failure; others observed incidence of crops and fish diseases with 70%; illness of family members with 37% and decrease in fish catch with 17%.

2.3.1 Damage to Crops

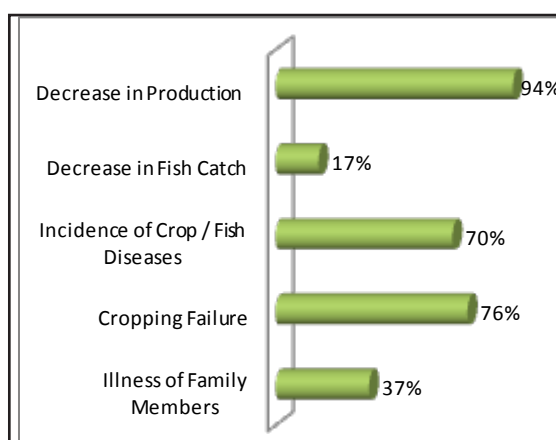
Since flooding will last for 3-4 months, livelihood activities of the people were also disrupted. Farm activities had started late since some of the farmers had waited until flood subsides. Farm preparation usually starts in the month of April or May, hence, the 3 cropping seasons in a year was reduced to two cropping seasons.

During the occurrence of flood, 54.38% or 2,619 has. of the agricultural production area was adversely affected of which 310 has. of these are irrigated rice fields. Coconut areas were moderately affected.

Losses to yield due to typhoons and flooding registered an average of 33% in the past seven years (2003-2009), largely in the rainfed areas while the irrigated areas were in minimum. (Please see Annex B7)

For coconut production, there was no recorded data on losses related to climate change but during dry spell harvest was noticeably shrinking.

Figure 13: Percentage of Responses on the observed Effects of Climatic Changes in the Municipality



Robbery was rampant in the coconut areas which significantly reduced income of farmers. This prompted the LGU in the formulation of policies in this regard. Likewise, a related policy regulating the buying of coconut from non-coconut farmers significantly helped control the production losses on the part of coconut farm owners. Program intervention like coco dryer, inputs assistance and provision of seed planting materials of superior quality/hybrid further helped improved production capacity.

In fish production, the reproductive capacity of fish decreases as temperature increases. Abrupt change of temperature through excessive rains and siltation resulted to fish kill due to low dissolved oxygen in water.

2.3.2 Damage to Livestock

The damage on this aspect includes small animals like poultry, ducks, swine, goat and even large ruminants. Causes of losses in livestock and poultry were attributed to drowning, diseases, and snake and other animal bites during and after the incidence of hazard

2.3.3. Damage to Property and Infrastructures

Destruction of houses, buildings, government facilities, irrigations, farm to market roads, culvert and other facilities were quite significant during occurrence of hazards. *(Please see Annex B10).*

2.3.4 Loss of Life

In 2006, there were reports of five (5) lives lost (drowned) in Barangay Magsaysay because of flash flood. Almost annually around 100 families (2%) in Barangays Magsaysay, Colorado, and Poblacion were forced to evacuate as their houses submerged when flood water rose. Children and elderly were easily affected with diarrhea, coughs, colds and fever even inside the evacuation centers. Lesser harvest and inadequacy of food stocks had resulted to further starvation as cost of basic commodities had increased and inhibition of livelihood.

2

Figure 14: An elementary School in Underwater during a flood (MAO)



3

ADAPTATION STRATEGIES

3. ADAPTATION STRATEGIES

3.1. PAST ADAPATATION STRATEGIES

The baseline survey conducted said, “In order to cope with the effects of climate change, 78% of the KI and GP respondents have engaged in other production activities; others have engaged in paid labor with 49%; another 44% have accessed loans; 43% have engaged in natural farming technology and other responses with 5%”. (Please see figure besides).

Rehabilitation was done to school buildings, roads, culverts and other government facilities. Distribution of relief goods, vegetable seeds and other small animal were also being done by LGU in coordination with other government and private sector groups to the affected persons.

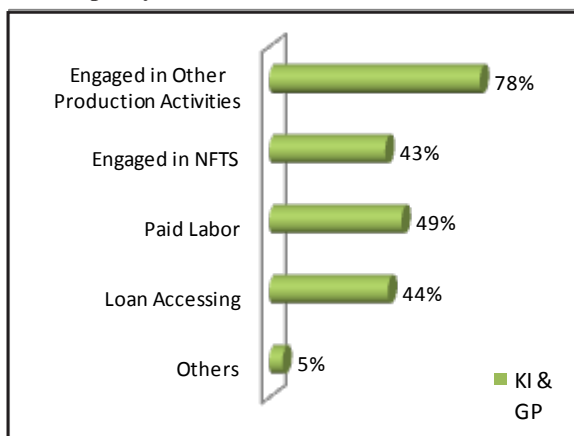
Other defined current adaptation strategies are the following:

3.1.1. Relocation site of IP communities are in-placed

One of the most vulnerable communities during the occurrence of flooding and erosion are the IP communities [Mamanua Tribe]. They constitute 9% of the total population of the municipality. Impact to them during flooding is not just displacement from their abode but also greatly affects one of the main sources of their livelihood, fishing from the lake and the rivers.

Currently, there are two [2] resettlement sites established for two [2] IP communities – in Sitio Coro at Barangay Colorado and in Sitio Dinarawan at Barangay San Pablo. Sitio Coro is situated a few meters along the Kalinawan River, the main outlet of

Figure 15: Percentage of Responses on the Coping Mechanisms Employed by Households in the Municipality



Source: Consolidated KI & General Poll Results

Lake Mainit, and Sitio Dinarawan is situated along the west portion of Lake Mainit. Basic utilities and facilities are provided in these settlements such as Day Care Centers, Electrification and Potable Water System.

Moreover, some Mamanuas who hold elective positions (as councilors) in Barangay San Pablo helped assist in the maintenance of the resettlement sites.

3.1.2 Securing production through Crop Insurance System

The Municipal Agriculture Office is encouraging farmers to have their crops, especially rice, get insured at Philippine Crops Insurance Corporation (PCIC) as part of extension services rendered to the farmers. Most farmers positively responded to the strategy of securing their crops with minimal premium contribution to compensate the amount of damages to crops. Recently,

techno-demo on rice production, insurance at PCIC has been packaged to show case the importance of this practice. This endeavor is among the intervention strategy of the LGU to enhance resiliency and strengthen adaptive capacity of the farmers.

3.1.3 Some livestock [large cattle] are insured at PCIC

Farmer beneficiaries of large cattle dispersal program of the LGU-DA linkages are likewise required to pay livestock insurance at PCIC. Insuring the cattle is one of the eligibility criteria for a farmer to become a qualified recipient of the program.

Similarly, this mechanism is one of the workable adaptive measures put in place to safeguard the animals and make certain the continuity of the program thereby expanding the number of farmers beneficiaries.

3.1.4 Early warning Devices (EWDs) are installed at strategic areas

The Municipality of Jabonga has installed Early Warning Devices [EWDs] at the areas identified as strategic in monitoring hazard (i.e. typhoon). The following devices are:

- Rain Gauge – to monitor the rainfall amount specially on the 24-hour of incessant rain -installed in barangays Bunga, San Pablo, Poblacion, Bangonay, Cuyago and Maraiging;
- Water Level Gauge - to monitor the water level of Lake Mainit, Kalinawan River and Puyo River. The two (2) rivers are the major rivers that contribute to flash

floods and eventual flooding.

- Hand Held Radios - provided to designated observers of Rain Gauge and Water Level Gauge to have immediate and prompt means of relaying information to proper authorities for immediate actions for the vulnerable communities.

3.1.5 Evacuation centers are officially identified

The identification and designation of evacuation centers for families whose houses will be directly affected by the disaster was already included in the Disaster Contingency Plan of the municipality. For example, in ten (10) barangays most vulnerable to flooding, school buildings and barangay multi-purpose buildings are officially identified and designated as the evacuation centers. In Barangay Colorado, moreover, some private residential structures are likewise designated, because all public facilities and structures are located in flooded sites.

3.1.6 Updated Disaster Contingency Plan

The Municipality of Jabonga has just updated its Disaster Contingency Plan to make it more effective and responsive to emergency situations. The plan includes some short-term and long term programs and projects to mitigate adverse effects of calamity and climate changes. Priority programs and projects are also mainstreamed in the Development Plan of the municipality, to other concerned agencies such as the Office of the Civil Defense Region XIII, Regional Development Council and the Lake Mainit Development Alliance [LMDA].

3.2 OTHER CURRENT ADAPTATION STRATEGIES

3.2.1 Adaption/Observance of planting calendar

Almost annually, it is from the months of November to February when farming activities

covering 2,064 hectares of rice and other high value commercial crops have cease operation, the same area usually frequented and most affected by flooding. Hence, farming activities are favorably scheduled within the months of March to October.

3.2.2 Crop diversification and rotation

Crop diversification and rotation strategy is generally adapted in all major crops except that of rice. In the first cropping season for rice, farmers use the excess water from floods to irrigate their fields. In the second cropping rain fed rice areas are planted with corn and other high value commercial crops such as squash.

Crop diversification is likewise practiced in coconut areas with short-term cash crops.

3.2.3 Crops & livestock insurance

Currently, 80% of carabaos in the

municipality are insured at the Office of the Municipal Agriculturist thru its insurance scheme program. In terms of crops specifically rice, in 2009, there were 60 hectares of rice fields insured at PCIC.

3.2.4 Organic farming practices

Organic farming technology is initially practiced by the rice and vegetable farmers. Some NGOs operating in the area are among the staunch advocate and propagators of the technology.

3.2.5 Enforcement of environmental ordinances

A local ordinance on “No burning of rice straw” was strictly enforced.

3.3 NEEDS/REQUIREMENTS [GAPS] OF THE STRATEGIES

Limited fund is one major identified constraint to adaptation strategies resulting to insufficiency of relief assistance (i.e. food, equipments, etc.), non-completion of infrastructure facilities, and provision of

economic assistance to affected population, among others. Moreover, laxity on enforcement of some national and local ordinances was also observed. (*Please see Annex B12: Assessment of Past Adaptation Strategies, p.73*).

Figure 16: MFT members in consultation with other stakeholders.



4

SCENARIO ANALYSIS

4. SCENARIO ANALYSIS

4.1. SCENARIO COMPONENTS

Different probable scenarios in 2020 and 2050 will be illustrated in this section given some assumptions on several critical variables affecting vulnerability and adaptation of the municipality, such as; advancement in science and technology, population growth rate, budget allocation of LGUs and level of its overall adaptation capacity, and land conversion.

The scenario building exercise below was put in a context of the general forecast of PAGASA for the next ten to forty years for the whole country stating that the climate scenario is basically “increasing in temperature and decreasing in rainfall”.

Projected hazards in the municipality for the two periods (2020 and 2050) include flooding, typhoon and dry spell.

In the projection of impacts of global warming, this study has taken into account the agreed assumptions of some climate change

experts in the Philippines (i.e. UPLB) setting a formula that “for every 1° C increase in temperature will result in decrease in yield ranging between 8% to 14%”.

With the changes in climate and subsequent hazards that would result to potential damages, the study will attempt to project possible impact on crop production on two priority crops given focus in this study (i.e. coconut and rice), on food security and sufficiency, livelihood and income, and in the potential threats to lives and properties.

Impact rating will also be done on each scenario according to projected overall cumulative potential damages (i.e. food production and security, lives and properties, and livelihood and income) as follows; LOW with 30% and below, MODERATE at 31% up to 59% and HIGH at 60% and above.

Figure 17: The Conduct of V&A Assessment



4.1.1 Year 2020

PAGASA Butuan office forecasted in the year 2020 for the whole province of Agusan del Norte a maximum increase of approximately 1.3% (1.33°C) on the average maximum temperature during the months of April-June (with the month of May as the hottest at 33.8°C), and on the average rainfall, an increase of an average of 9.83% (13.8 mm/mo) between the months of October to January. Hence, in the province of Agusan del Norte, during the targeted period it will be hotter during the dry months while also having more rains during wet months.

Dry spell

Expected reduction in Coconut will be set at 18% due to 1.3°C increase in temperature (or 14% x 1.3°C). Thus, the absolute volume of reduction for coconut will be at 762.75 MT (4,236 MT x 18%).

Reduction for rice is computed at 639 MT (2,827 MT x 18% for rain fed and 2,604 MT x 5% for irrigated).

Increase rainfall and Typhoons

During rainy period (Oct-Jan), rice farmers had refrained planting in anticipation

of the floods. Losses of yield in the past seven years registered 33% thus with increase rainfall at almost 10%, total reduction in rice due to flooding and typhoons is set at 40% or 2,619 MT.

Reduction in coconut is estimated at 5% (212 MT) as this is not heavily affected by rainfall based in the past experiences.

Potential threat to lives will be low but to properties and infrastructure will be at moderate levels.

Scenario 1 (2020)

Assumptions for this scenario are:

- advances in Science and Technology are at current level
- population growth rate is 0.3% per annum (current growth rate),
- there is no corresponding increase in budget of the LGU which resulted to low level of adaptation capacity and minimal investment in intervention;
- no land conversion were made (meaning no change in land use).

Projected population is estimated at 25,291 at 0.30%/annum growth rate. Rice consumption will be at 3,237 MT at 128 kg/capita consumption (NFA, 2008).

Figure 18: A Rice field that will be submerged during flooding



Net rice production of scenario 1 of 2020 is estimated at 3,261 MT, with the estimated consumption at 3,237 MT will mean a shortage of rice for food. Net production for Coconut will be 3,262 MT. While the equation of rice production for food is almost equal with demand, this will still mean lesser income for other household needs

further increasing poverty incidence in the municipality. With low level of budget and adaptive capacity, the overall vulnerability rating in this scenario is considered **MODERATE**. (Please see Annex B15: Scenario Analysis Matrix 2020)

Scenario 2: Year 2020

Assumptions for this scenario are:

- There is marked positive advancement of Science and Technology;
- The population growth rate is marked down at current level at 0.15% (or half of the current growth rate);
- there is an increasing adaptation capacity with increasing budget; and,
- Without land conversion (meaning no change in land use).

Projected population is estimated at 24,965 at 0.30%/annum growth rate. Rice consumption will be at 3,196 MT at 128 kg/capita consumption (NFA, 2008).

Net rice production of scenario 1 of 2020 is estimated at 3,261 MT, with the estimated consumption at 3,196 MT will mean a shortage of rice for food of 576 MT (18%). Net production for Coconut will still be 3,262 MT. Positive advancement in science and technology could translate a 10% increase in production thereby mitigating losses from climate hazards. With increased budget for adaptation the overall vulnerability rating in this scenario is considered **LOW**.

Scenario 3: Year 2020

Assumptions for this scenario are:

- advancement in Science and Technology are at current level;
- population growth rate increased to 1.30% from the current level of 0.30% per annum (current growth rate);
- no improvement in the LGU's

adaptation capacity coupled with decreasing budget; and

- there will be aggressive conversion of land from agricultural to commercial and residential use (meaning production areas markedly decrease to give way to other development initiatives), at 10% of total rice area.

Projected population at 1.30% growth rate is computed at 27,929. At this level, projected demand for rice consumption will be at 3,575 MT.

Aggressive land conversion is set at 10% in rice areas constricting the production area to 613 hectares with equivalent output of 5,170 MT. Due to dry spell and increased rainfall, additional reduction of 40% (2,811 MT) will be included making net rice production at 2,632 MT. With increased consumption brought about by growing population, a shortage of 943 MT (26%) will still be registered.

The increased population, largely in the urban core, that is also within the flood prone area can be one critical factor of vulnerability, considering that in this scenario budget of LGUs will be decreased and adaption capacity is at current level. These factors further aggravate the situation raising the vulnerability rating of the municipality into **HIGH** level.

4.1.2 Year 2050

By the year 2050, PAGASA Butuan office forecasted for the whole province of Agusan del Norte an increase of approximately 2.97% (2.93°C) on the average maximum temperature during the months of May-June (with the month of May as the hottest at 35.1°C) compared with the observed (current temperature). On the average rainfall, the same agency also projected an increase of 5.6% (6.1 mm/mo) between the months of October to January. Hence, the province of

Agusan del Norte, will be more hotter in the dry months, more wet during rainy months (while with lesser rains compared with 2020). (Please refer to the Annex B16).

The increase in temperature of 2.93°C during the dry months would translate to forty one percent (41%)³ decrease in crop production (at a maximum of 14% per 1°C increase in temp). This phenomenon will bring damage to the three priority crops but most especially with coconut and banana which are grown the whole year round and un-irrigated.

Potential Impact:

Dry Spell

Expected reduction in Coconut will be set at 41% due to 2.93°C increase in temperature (or 14% x 2.93°C). Thus, the absolute volume of reduction for coconut will be at 1,737 MT (4,236 MT x 41%).

Rice production in the irrigated areas during dry months will not be adversely affected as it will be harvest season during the months of April to June. Though, the non-irrigated areas are expected to be hit. Total reduction will come from 5% each for the irrigated areas (due to late harvesting) and 41% from non-irrigated areas or approximately 24% (or 1,289 MT/annum) of the total rice production volume.

Figure 19: Coconut Trees under cropped with Banana trees



Increase rainfall

During rainy period (Oct-Jan), rice farmers had refrained planting in anticipation of the floods. Losses of yield in the past seven years registered 33% thus with increase rainfall at almost 5.6%, total reduction in rice due to flooding and typhoons is set at 35% or 1,900 MT.

Reduction in coconut is estimated at 5% (212 MT) as this is not heavily affected by rainfall based in the past experiences.

Potential threat to lives will be low but to properties and infrastructure will be at moderate levels.

Scenario 1: (Year 2050)

Assumptions for this scenario are:

- advances in Science and Technology are at current level
- population growth rate is 0.30% per annum (current growth rate),
- there is no corresponding increase in budget of the LGU which resulted to low level of adaptation capacity and minimal investment in intervention;
- no land conversion were made (meaning no change in land use).

Projected population is estimated at 27,669 at 0.30%/annum growth rate. Rice consumption will be at 3,541 MT at 128 kg/capita consumption (NFA, 2008).

Net rice production of scenario 1 of 2050 is estimated at 2,240 MT, with the estimated consumption at 3,541 MT will mean a shortage of rice for food at 1,300 MT (or 37 %). Net production for Coconut will be 3,262 MT. With low level of budget and adaptive capacity, the overall vulnerability rating in this scenario is considered **HIGH**. (Please see Annex B16: Scenario Analysis Matrix 2050)

Scenario 2: (Year 2050)

Assumptions for this scenario are:

- There is marked positive advancement of Science and Technology;
- The population growth rate markedly decreases down to 0.15% (or half of the current growth rate);
- there is an increasing adaptation capacity with increasing budget; and,
- Without land conversion (meaning no change in land use).

Projected population is estimated at 16,016 at 0.15%/annum growth rate. Rice consumption will be at 3,335 MT at 128 kg./capita consumption (NFA, 2008).

Net rice production of scenario 2 of 2050 is estimated at 2,240 MT, with the estimated consumption at 3,335 MT will mean a shortage of rice for food at 1,095 MT (or 33%). Net production for Coconut will be 3,262 MT. The positive advancement in science and technology is projected to translate a 10% increase in production thereby mitigating some losses from climate hazards. With increased budget for adaptation the overall vulnerability rating in this scenario is considered **LOW**.

Scenario 3: (Year 2050)

Assumptions for this scenario are:

- advancement in Science and Technology are at current level;
- population growth rate increased to 1.30% from the current level of 1.30% per annum (current growth rate);
- no improvement in the LGU's adaptation capacity coupled with decreasing budget; and
- there will be aggressive conversion of land from agricultural to commercial and residential use (meaning production areas markedly decrease to give way to other development initiatives), at 20% of total rice area.

Projected population is estimated at 41,147 at 1.30%/annum growth rate. Rice consumption will be at 5,267 MT at 128 kg/capita consumption (NFA, 2008).

Apart from reduction in rice production due to increase temperature and increase rainfall, additional decrease will be set at 20% due pressure of increasing population resulting to land conversion from agricultural (especially rice areas in the lowland) to residential, commercial and industrial uses. Net rice production of scenario 3 of 2050 is estimated at 1,720 MT, with the estimated consumption at 5,267 MT will mean a shortage of rice for food at 3,547 MT (or 49 %). With no improvement in LGUs capacity and decreasing budget, vulnerability rating in this scenario is seen as **HIGH**.

4.2 VULNERABILITY RATING

The above's scenario building and analysis reveal ratings at 2020 as Moderate for scenario 1, Low for scenario2, and High for scenario 3. At 2050, overall impact will

be High for scenario 1, Low for scenario 2 and High for scenario 3. *(Please see Figure 20 on the next page)*

$$^{3}14\% \times 2.93^{\circ}\text{C}$$

Figure 20: Summary of Vulnerability Rating

Year	Scenario 1	Scenario 2	Scenario 3
2020	Moderate	Low	High
2050	High	Low	High

(Potential Impact/Damages: **Low** = 30%; **Moderate**=31-59%; **High**= 605 and above)

4.3 ADAPTATION TO CLIMATE CHANGE SCENARIOS

Taking off from the above stated scenarios, below are the forwarded adaptation strategies with reference to the past and current adaptation measures involving varying stakeholders in the municipality: (Please see Annex B17).

4.3.1. Physical/Infrastructural

This involve the construction and / or improvement of major facilities such as irrigation system, deepening and re-channeling of some rivers, and major road networks.

- Enhance/rehabilitation of irrigation facilities
- Kalinawan River deepening
- Puyo river re-channelling

4.3.2 Technological

Main interventions in this category are the protection of lake/coast line, improvement of EWDs and installation of portable weather station.

- Provision/Installation of Portable/automatic weather station
- Refrain from intensive use of agricultural inputs
- Emphasize the contribution/significance of EWDs to farming systems
- Adoption of technology in farming system relative to

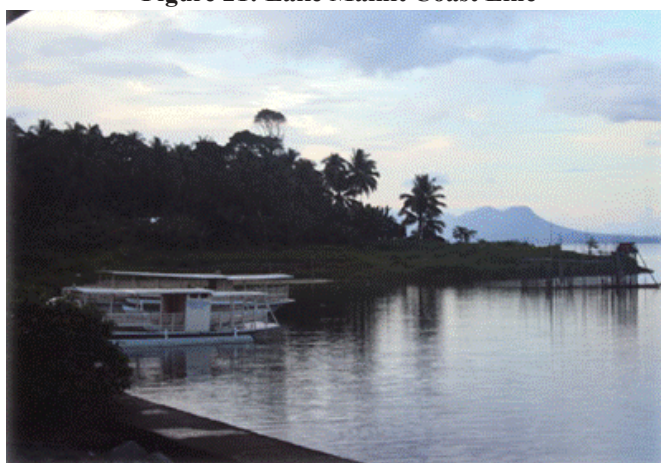
- climate change Science and Technology Development

4.3.3 Socio-Economic

This covers approaches on improving farming technologies and support systems (i.e. subsidies, financial assistance and life and production insurance system). Other measures also include population control and good nutrition.

- Provision of high yielding rice variety , high tolerance to changes in temperature
- Intensify crop diversification program and integration of other crops to maximize and optimize production\$
- Adoption/observance of planting calendar in relation to crop/ commodity planted

Figure 21: Lake Mainit Coast Line



- Emphasize savings in earnings for any occurrence of hazards or eventual climate changes

4.3.4 Political/Institutional

Exercise political will in the enforcement of laws and ordinances, fund allocation and accessing, and partnership with other stakeholders (i.e. line agencies, NGOs, private sector, etc.) constitute the important activities on the part of the LGU.

- Intensify enforcement of environmental laws
- Intensify the conduct of orientation sessions/refresher courses on the various adaptive measures significant in farming resilient communities
- LGU to continue proactive partnership with NGOs, POs to be more resilient
- LGU to continue to access resources from other NGAs and other funding institutions for more climate resilient/adaptive livelihood interventions to farmers
- Continue to improve the adaptation strategies currently practiced
- Advocate regulation of population growth in accordance with preferred reproductive health programs
- Emphasize food nutrition through crop production at home
- Intensify extension services, information dissemination campaign on the significance of manageable number of household members
- LGU to continue in appropriating local funds for agricultural development programs

4.4. Priority Adaptation Strategies

4.4.1 Economic

- Provision of high yielding rice variety, high tolerance to changes in temperature
- Intensify crop diversification program and integration of other crops
- Adoption of technology in farming system relative to climate change
- Financing support systems for other livelihood options and production insurance (i.e. crops and livestock/poultry)

4.4.2. Technological

- Acquisition of portable automatic weather station

4.4.3. Physical/Infrastructure

- Enhancement and rehabilitation of irrigation facilities
- Kalinawan River Deepening
- Puyo River Re-channeling

4.4.4. Political/Institutional

- Intensify the enforcement of environmental laws
- Intensify the conduct of orientation sessions on various adaptive measures significant in resilient farming communities
- Continue to improve current adaptation practices
- LGU to continue in appropriating local funds for agricultural development programs

5 CONCLUSIONS

5. CONCLUSIONS

Floods, typhoons and drought are the major hazards observed in the Municipality of Jabonga that posed danger to the communities. Due to its geographical location as lying along the Lake Mainit and is situated within the typhoon belt area, the Municipality of Jabonga is frequently experiencing floods almost every year, even with just a 24-hour incessant heavy rainfall. Severely affected are Ten [10] of the fifteen [15] barangays in the municipality, including five [5] of the seven [7] rice producing barangays covering 310has of rice area.

In the coming years, 2020 and 2050, climate in the province of Agusan del Norte is forecasted to be with increasing temperature and rainfall. This forecast is expected to wrought havoc to the municipality, as

typhoons, floods and drought could inflict more damage in terms of rice and coconut production, endangering food sufficiency and security, affecting livelihood and reduce income, thereby raising further poverty situation in the municipality.

It is imperative, therefore, that all stakeholders, much more the marginalized sectors (farmers and fisher folks) in the municipality, must devise effective means to mitigate the adverse effect of climate change. Under the leadership of the LGU of Jabonga, strategies shall put in place at all fronts (i.e. economic, physical/ infrastructural, technological, political/institutional) to enhance overall adaptation capacity of the municipality.

Figure 22: A fisherman in Lake Mainit



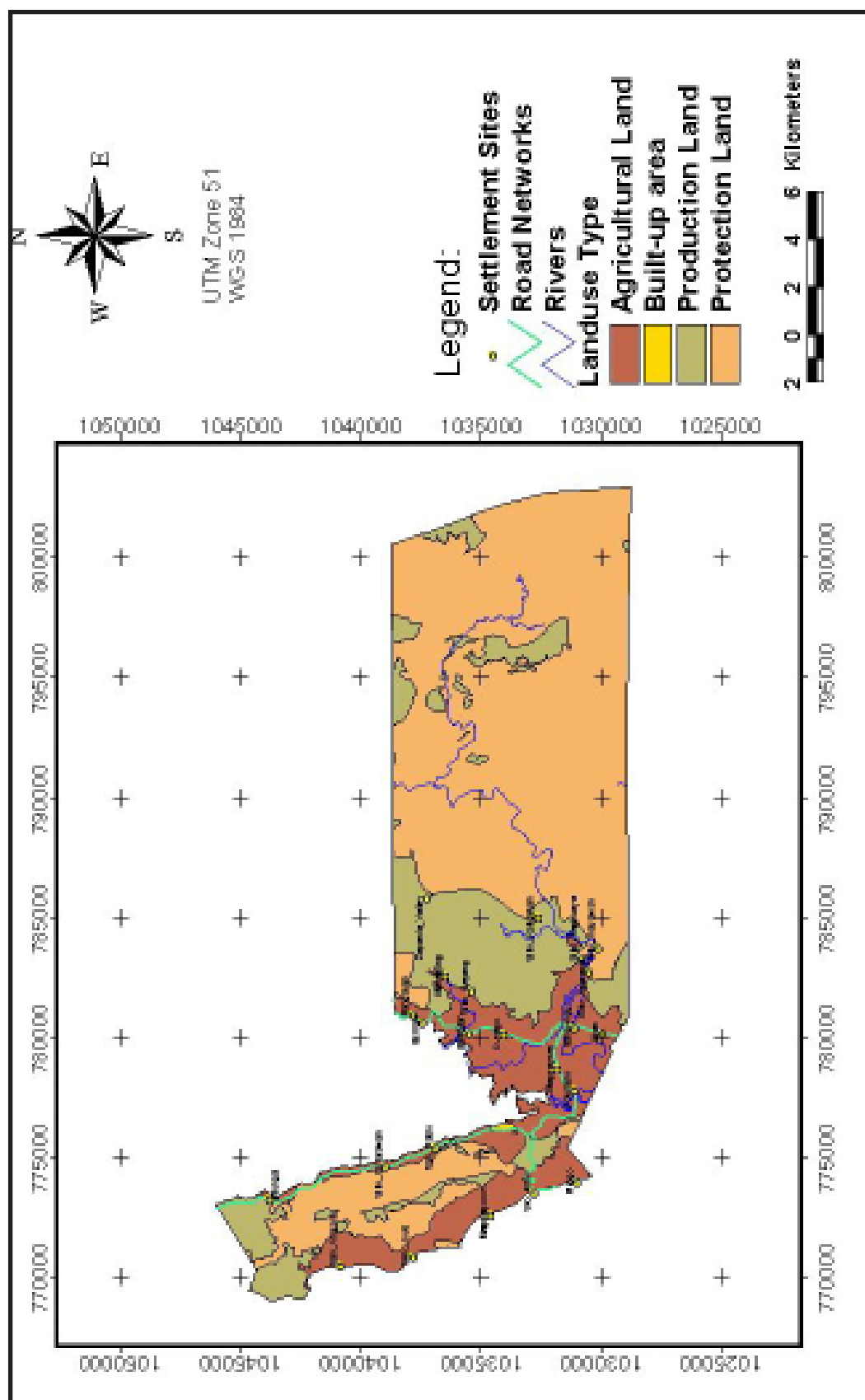
Annex-A

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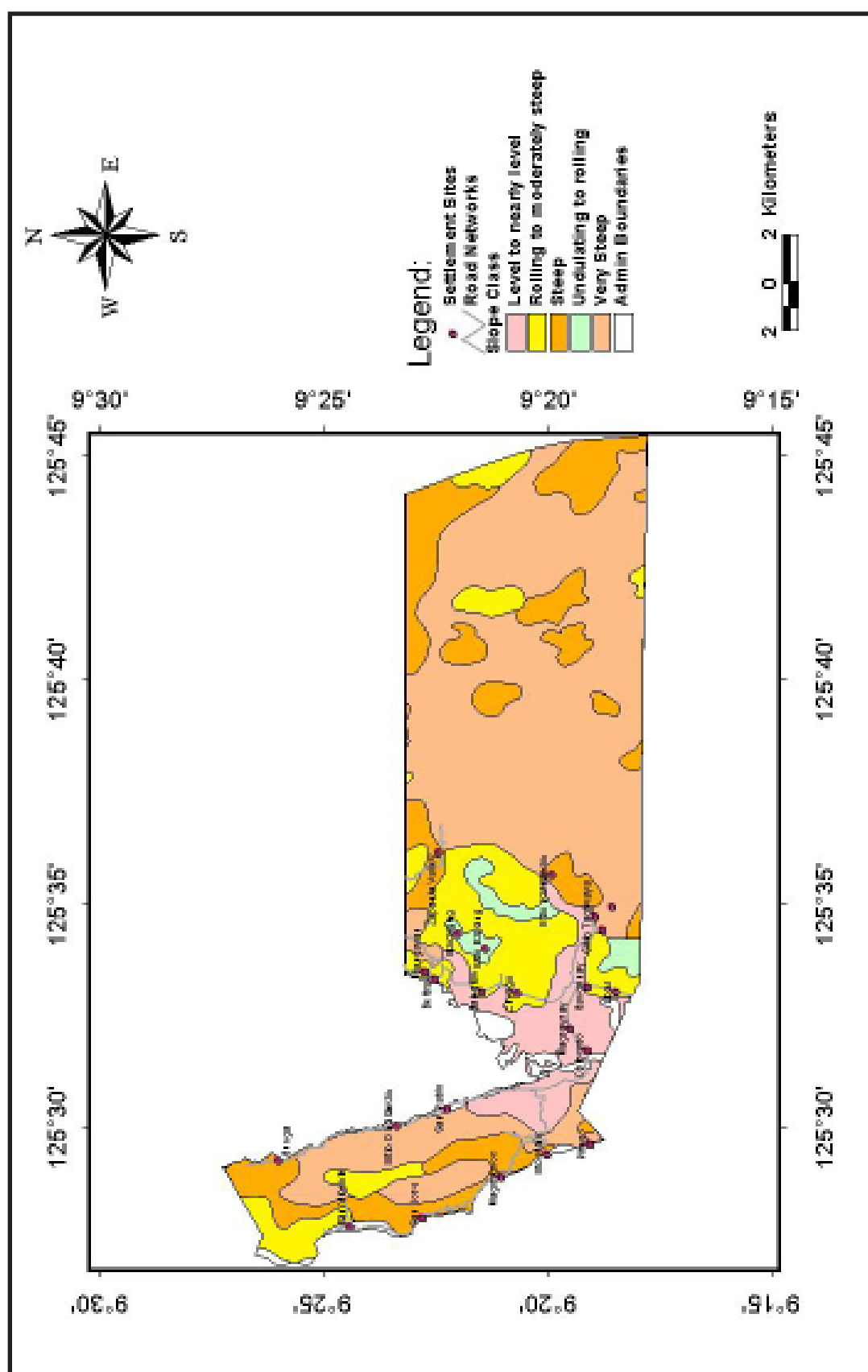
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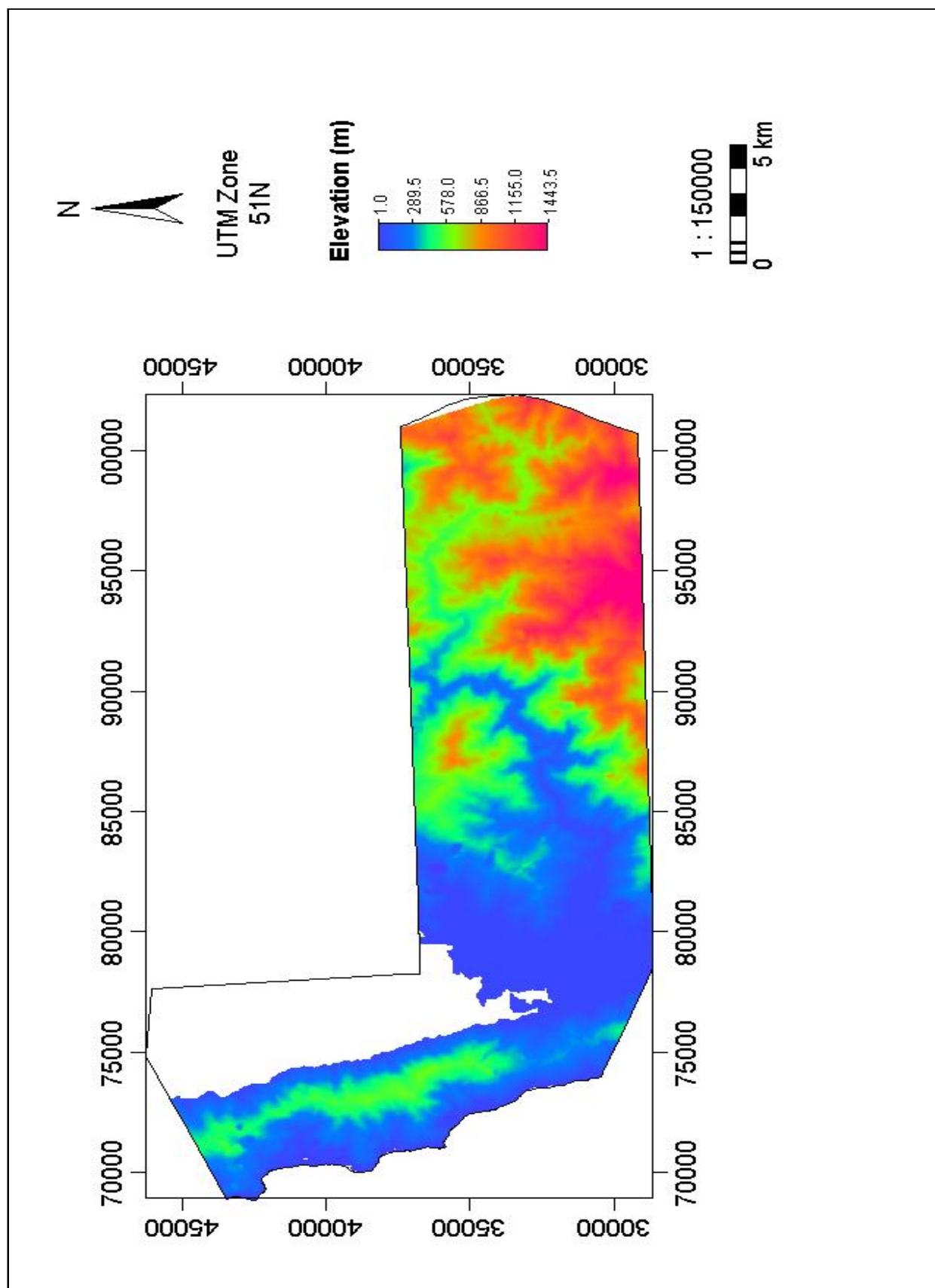
ANNEX -A



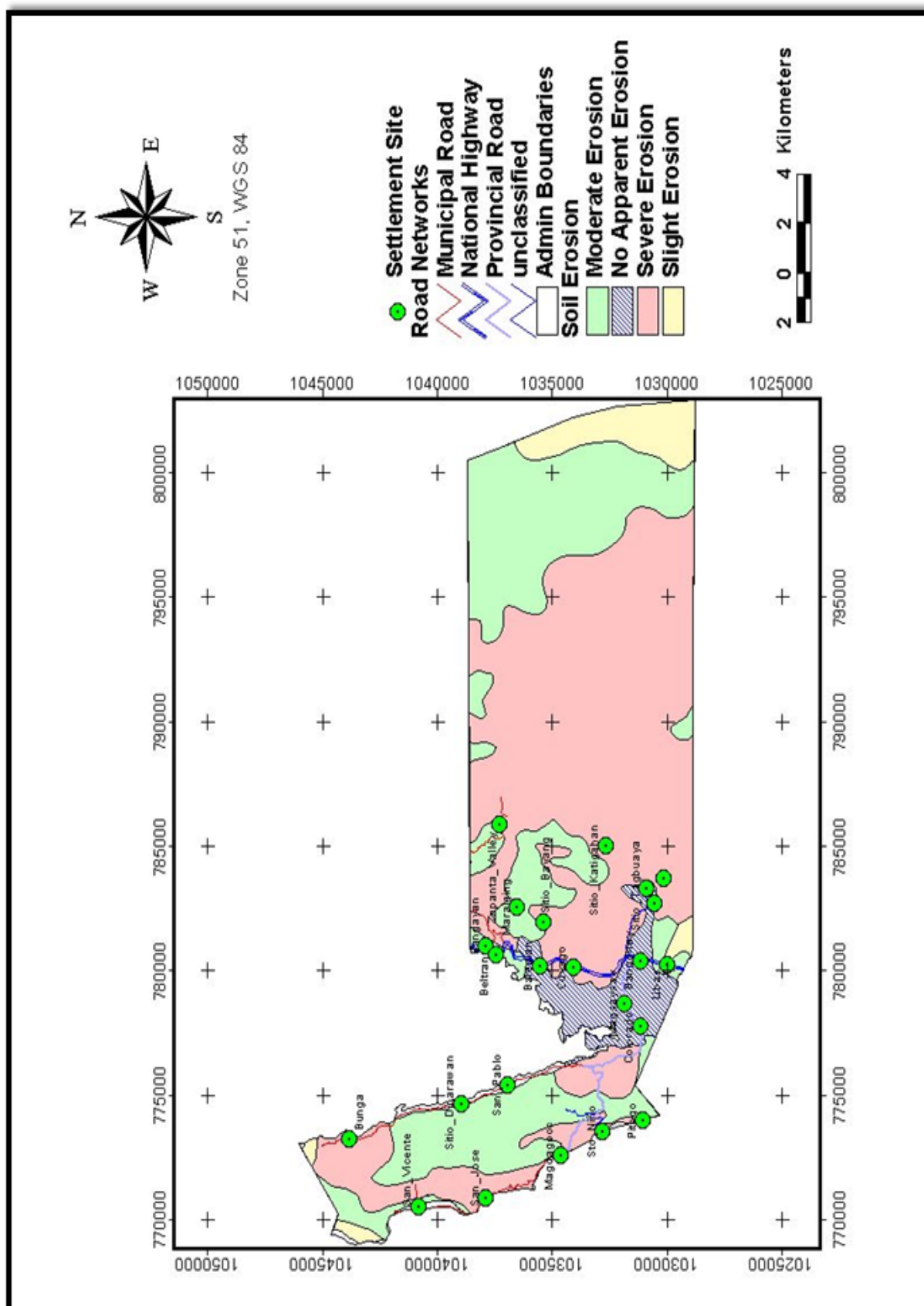
Annex A 2: Land Use Map



Annex A 3: Slope Map

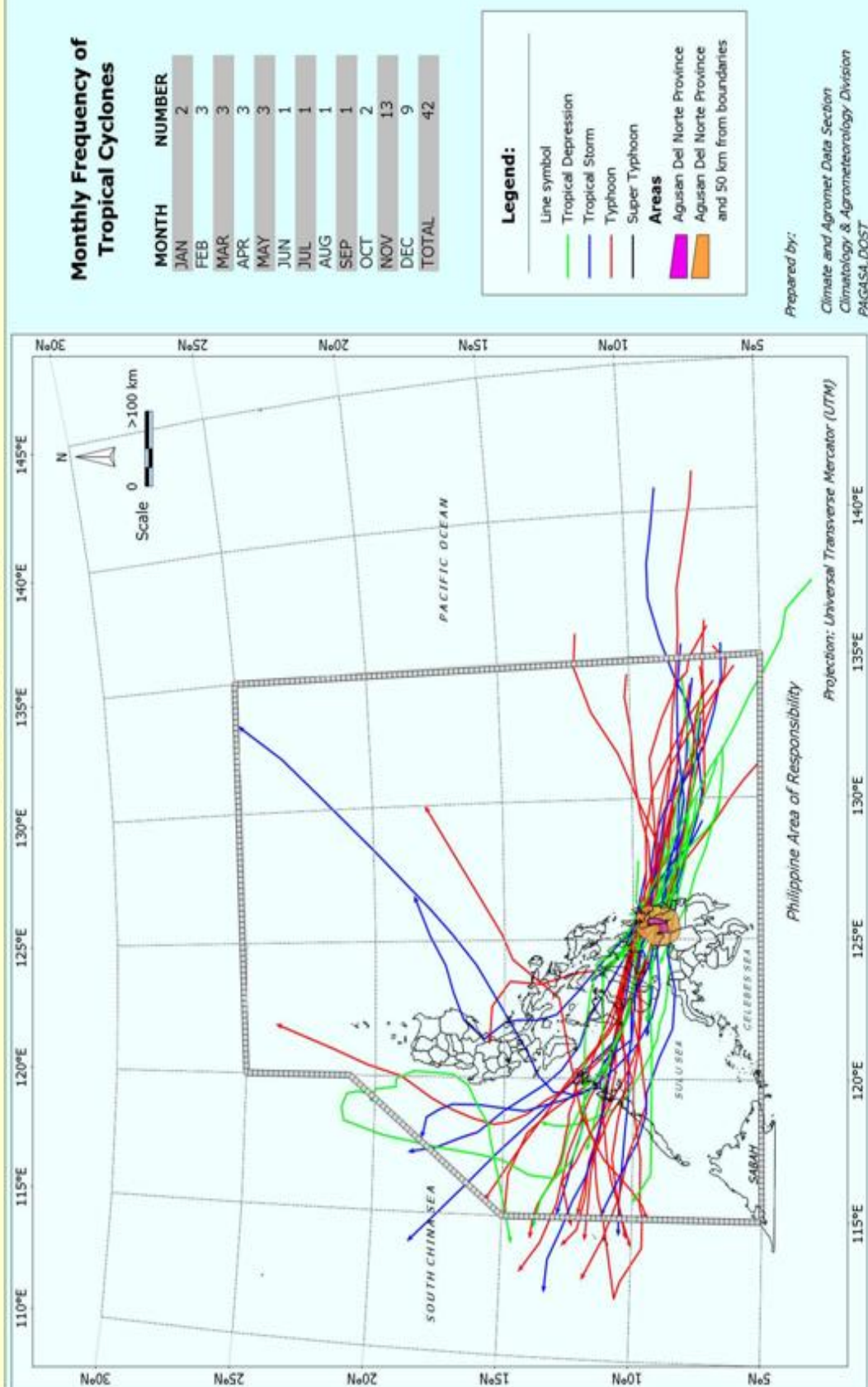


Annex A 4: Elevation Map



Annex A5: Erosion Map (Source: BARSAIL)

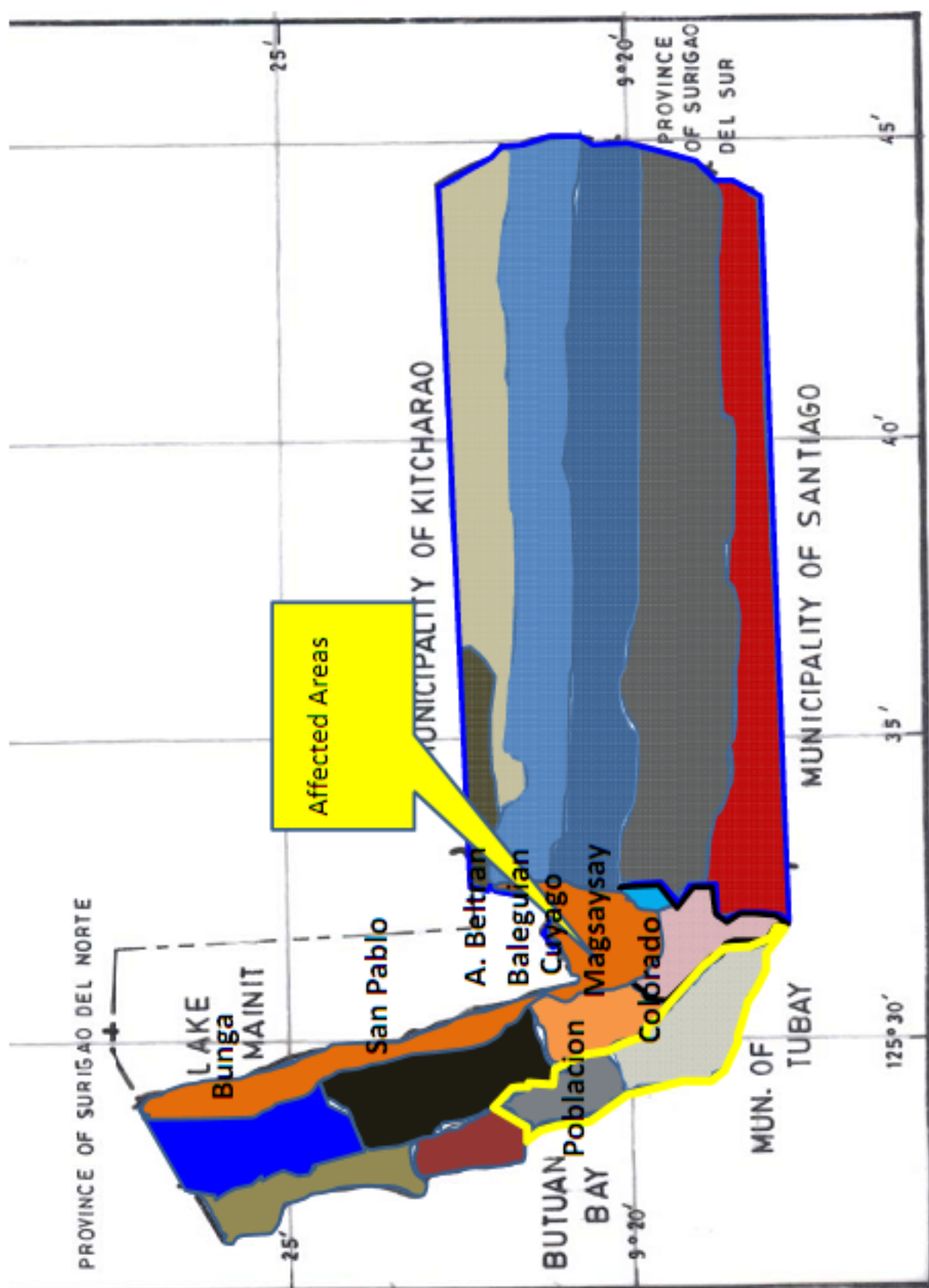
Tracks of Tropical cyclones which crossed the Province of Agusan Del Norte and 50 kilometers from boundaries from 1948 - 2009



Annex A 6: Tracks of Tropical Cyclone Which Crossed Agusan del Norte, PAGASA



MDG-F 1656 Outcome 3.4 - Climate Resilient Farming Communities in Agusan del Norte through Innovative Risk Transfer Mechanism; Implemented by ILO, DTI, DOLE, & the Province of Agusan del Norte



Annex A 8: Most Affected Areas during Flooding

Annex-*B*

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Annex B 1: Land Use Distribution		
LAND USE CATEGORY	AREA [in hectare]	% as to Total Land Area
Agricultural	9,589	32.73
Residential	23.5	0.08
Institutional	6.0	0.02
Forestland	19,416	66.27
Commercial	2.0	0.01
Others: Built up Areas	263.42	0.90
TOTAL	29,300	100

Annex B 2: Magnitude and Proportion of Education

INDICATOR	POPULATION					
	MAGNITUDE			PROPORTION		
	Total	Male	Female	Total	Male	Female
Children 6-12yo not attending elementary	811	428	383	23.6	23.4	23.8
Children 13-16yo not attending high school	799	460	339	43.9	49.8	37.8
Children 6-16yo not attending school	825	479	346	15.7	17.4	13.8

Source: MAO-Jabonga, 2009

Annex B 3: Crops Production per Hectare per year

Crops	Prodn Area [hectare]	Ave. Prodn.	Frequency of harvest /year	Ave. Income/	Farmers	1st level handlers/
		(MT.)		Harvest/ha.		labor force/ha.
1. Rice (Irrigated)	310.0	4.20	2	50400.00	208	45
2. Rice (Rainfed)	372.0	3.80	2	45600.00	246	45
3. Corn	232.0	1.98	2	23760.00	200	15
4. Banana	1127.0	2.00	4	7600.00	619	6
5. Abaca	12.5	0.48	4	18240.00	4	12
6. Coconut	2647.39	0.44	4	7600.00	1455	15
7. Vegetables (Fruit)	116.0	4.80	2	8241.75	142	15
	4,816.89				2,874	

MAO-Jabonga, 2009

Annex B 4: Poultry and Livestock Production

Specie	Total Population	Female/ Population (hds)	Production (hd/eggs)	Remarks
POULTRY				
Chicken	7,174	358	7,160	*production in chicks
Ducks	2,639	2,111	84,448	*production in egg
Swine	2,156	1,010	1,616	*production in piglet
SMALL RUMINANTS				
Goat	526	327	343	*production in kids
Sheep	9	7	5	
LARGE RUMINANTS				
Cattle	134	99	34	*production in calf
Carabao	472	304	106	*production in calf

Annex B 5: Fish Production in Jabonga, MAO

TYPE OF FISHING	NO. OF FISHING		AVE. FISH		FREQUENCY	NUMBER OF	
	BOAT		CATCH IN MT.		OF FISHING	FISHERMEN	
	Motorized	Non-motorized	Motorized	Non-motorized	ACTIVITY	Motorized	Non-motorized
Marine Fisheries	254	189	115.83	112.90	20x/ month	287	153
Inland Fisheries	119	86	213.05	213.00	20x/ month	<u>251</u>	<u>80</u>
Total	373	275	328.88	325.90		538	233

Source: MAO-Jabonga, 2009

Annex B 6: Inventory of Poultry and Livestock

Barangay	No. of Farmers	S P E C I E (NO.)															
		LIVESTOCK										Dog	POULTRY				
		Cattle		Carabao		Goat		Sheep		Swine			Chicken	Ducks	Turkey	Goose	
										M	F						
		M	F	M	F	M	F	M	F	M	F						
1.A. Beltran	22	0	0	5	7	12	29	0	0	36	48	82	326	48	0	0	0
2.Baleguian	162	1	8	22	17	30	39	0	0	82	98	201	582	2,262	0	0	0
3.Bangonay	217	8	29	43	33	17	39	0	0	106	142	90	1,203	60	0	0	2
4.Bunga	62	0	0	0	2	9	15	0	0	67	59	54	397	30	0	0	4
5.Colorado	167	19	10	27	87	21	39	7	2	187	66	136	691	15	0	0	0
6.Cuyago	120	1	3	12	6	14	18	0	0	42	66	98	401	32	0	0	0
7.Libas	103	2	22	10	37	6	31	0	0	140	62	44	915	18	0	0	9
8.Magdagooc	48	0	2	0	0	10	8	0	0	27	51	75	123	43	0	0	4
9.Magsaysay	120	3	6	38	89	15	13	0	0	120	54	66	896	0	2	0	2
10.Maraiging	126	0	3	4	6	28	41	0	0	20	32	70	292	14	0	0	0
11.Poblacion	69	1	8	4	14	3	9	0	0	74	148	103	494	30	2	0	0
12.San Jose	12	0	0	0	0	5	10	0	0	23	34	18	59	16	0	0	8
13.Sto. Niño	63	0	0	1	2	11	12	0	0	20	25	30	254	36	0	0	0
14.San Pablo	40	0	2	0	1	15	11	0	0	14	44	27	235	10	0	0	0
15.San Vicente	95	0	6	2	3	3	13	0	0	60	81	52	306	41	0	0	0
TOTAL	1,426	35	99	168	304	199	327	7	2	1,018	1,010	1,146	7,174	2,639	4	29	29

Source: MAO-Jabonga, 2009

Major Crops	Annex B 7: Average Yield/Loss of the Municipality per Year in MT													
	2003		2004		2005		2006		2007		2008		2009	
	yield	loss	yield	loss	Yield	Loss	yield	loss	yield	loss	yield	Loss	yield	loss
Rice	2591.6	784.3	2659.8	750.2	2728.0	1159.4	2932.6	409.2	2796.2	682.0	2728	1295.8	2864.4	1227.6
Coconut	4368.2	1588.4	4500.6	1058.9	4632.9	1323.7	5030.0	537.5	4659.4	397.1	4500.6	661.8	4765.3	794.2
Marine	117.0	0.85	114.0	0.65	117.0	0.75	118.0	0.65	116.0	0.70	115.8	0.90	119.0	0.85s
Inland	212.0	0.65	214.0	0.76	212.0	0.70	213.5	0.60	214.0	0.75	215.0	0.85	214.0	0.8

Annex B 8: List of Infrastructure Damage by Hazards

Structures/Facilities	Description	Quantity/ Length	Remarks
Road Network	Graveled Concrete Earth Canals RCPC Box Culverts	25km 1.85km 35.0km 0.268km 0.045km 0.028km	Washed out Eroded Eroded Eroded Washed out Clogged up
Irrigation	Canal Lines Diversion	0.356km 0.050km	Washed out Washed out
Residential	Partially damaged	538 units	20-60%
Institutional	Partially damaged	18 units	30-50%
Potable Water system Pipelines reservoirs	Dis-aligned/cut- off Leaks, eroded	785 l.m. 3 units	Washed-out Broken/silted
Electrical Poles/ power lines	Toppled down Severed from poles	3 units 350 l.m.	Dilapidated Lying on the ground

Annex B 9: Past Adaptation by Affected People and Places

	Hazard: (Flood)
Communities	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families
LGUs	- Provided relief assistance i.e. foods, clothing and temporary shelters - Utilized fully the 5% reserve fund - Regularized agricultural support program: vegetable, rice and corn seeds subsidy, livestock dispersal, fingerlings seeding in the lake, machineries and facilities - Established partnership with other institutions [gov't line agencies, prov'il, NGOs and private sectors] on the rehab efforts on the effects of hazards. - Installed EWDs: rain gauge, water level gauge and hand-held radios - Regular updating of Disaster Risk Management Plan - MAO had regularized meeting schedule with the RBOs - Provided financial and human resource support to the LMDA - Enacted Environmental Protection Ordinance
Farmers	- Some farmers subjected their crops and farm with insurance - Observance with planting calendar - Adaption of organic farming - Crop diversification

Annex B 10: Disaster History/ Time line

	1940-1945	1964	1978	1980	1983	1984	1985	1986	1993	1994	1996	2006	2008-2009
DISASTER	War	Typhoon (Ineng)	Earthquake	Flood	El Nino Phenomenon [Drought]	Typhoon Niting / landslide	Typhoon Roping / Flood	Flood	Typhoon Puring / Flood	Typhoon Besing	Flood	Flood	Flood
ADVERSE EFFECTS	Civil Dis- turbance; famine, high number of casualties, burning of houses per- petrated by impe- rial army of Japan, deaths, women and chil- dren were abused	Famine due to food shortage, destruction of sources of livelihood and houses	Damaged houses, disfigured images in the church	Damaged houses, farmland underwater, death of livestock	Crop areas are generally affected due to extreme drying up of land Forest fires	Damaged houses, farmland underwater, destruction of sources of liveli- hood, 15 casualties	Damaged houses, farmland underwater, destruction of sources of livelihood	Damaged houses, farmland under water, de- struction of sources of livelihood, 2casualties	Damaged houses, farmland under water, de- struction of sources of livelihood	Damaged houses, farmland underwater, destruction of sources of livelihood	Damaged houses, farmland underwater, destruction of sources of livelihood	Damaged houses, farmland underwater, destruction of sources of liveli- hood,	5,853 fami- lies were severely affected comprising 23,771 per- sons for the entire mu- nicipality
ASSISTANCE EXTENDED	Japanese reparation 75,00/fami- ly assistance extended from US	Relief assis- tance from the church hinabang gikan sa DSWD		DSWD relief assistance	Cloud shed- ding Provision of shallow tube well to farmers de- pendent to irrigation	DSWD relief assistance, Burial as- sistance, 10 thousand pesos/fam- ily DND	Relief assis- tance from DSWD	Relief assis- tance from DSWD	relief as- sistance from DSWD, PLGU, MLGU	relief as- sistance from DSWD, PLGU, MLGU, BLGU	relief as- sistance from DSWD, PLGU, MLGU, BLGU	relief as- sistance from DSWD, PLGU, MLGU	DSWD- 217,694.00, PLGU- 30,080.00, OCD- 17,000.00, ADRA- 143,640.00, MLGU- 555,600.00 (relief assis- tance goods and used clothing)
LESSONS LEARNED	Liberation form foreign domination/ intervention	Cooperation and pre- paredness are always necessary	Lack of awareness what to do in times disaster makes people vul- nerable to any disaster occurrence	Cooperation and pre- paredness are always necessary	Preservation and conser- vation of watersheds Resiliency Adaptability to crop diver- sification	Cooperation and pre- paredness are always necessary	Cooperation and pre- paredness are always necessary	Cooperation and pre- paredness are always necessary	Cooperation and pre- paredness are always necessary	Cooperation and pre- paredness are always necessary	Cooperation and pre- paredness are always necessary	Cooperation and pre- paredness are always necessary	Cooperation and pre- paredness are always necessary

Annex B 11: Past Adaptation by Affected People and Places

	1940-1945	1964	1978	1980	1983	1984	1985	1986	1993	1994	1996	2006	2008-2009
Disaster	War	Typhoon (Ineng)	Earthquake	Flood	El Nino Phenomenon [Drought]	Typhoon Nitang / landslide	Typhoon Ruping / Flood	Flood	Typhoon Puring / Flood	Typhoon Basing	Flood	Flood	Flood
Community		Bayanihan system and sharing of foodstuffs		Bayanihan system and sharing of foodstuffs		Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families	Bayanihan system and sharing of foodstuffs, offered temporary abode to affected families
LGU		Provided relief assistance i.e. foods, clothing and temporary shelters		Provided relief assistance i.e. foods, clothing and temporary shelters	Provided Shallow Tube Wells, Provided of subsidy on agricultural services to farmers	Provided relief assistance i.e. foods, clothing and temporary shelters	Provided relief assistance i.e. foods, clothing and temporary shelters	Provided relief assistance i.e. foods, clothing and temporary shelters	Provided relief assistance i.e. foods, clothing and temporary shelters	Provided relief assistance i.e. foods, clothing and temporary shelters	Provided relief assistance i.e. foods, clothing and temporary shelters	Provided relief assistance i.e. foods, clothing and temporary shelters	Provided relief assistance i.e. foods, clothing and temporary shelters

Table 1. Details of the Climate Change Adaptation Practice.

Climate Change Adaptation Practice	Location A. Household Level B. Barangay/Community Level C. Municipal level D. Provincial level (Indicate the specific name of Barangay or municipality where practiced)	Description (Answer the ff: 1. What is being done? 2. Materials Used? 3. How is it being done? 4. Why is it being done?)	Origin of Practice		Climate Drivers A. Floods B. Drought C. Typhoon D. Landslide E. Seasonality (e.g. Late or early onset of rainy season or prolonged rains) F. Others (Please Specify)	Impacts A. Increased income B. Generated employment C. Reduced poverty D. Environmental E. Others (Please Specify)	Extent of Use (percentage of use in a certain area) A. Low – 1 - 33% B. Moderate – 34-66% C. High – 67-100%
			Locally Initiated A. Adopted B. Modified	Externally Introduced A. Adopted B. Modified			
1. Intensification of Organic Farming Practices	A, b, c	1. Tied-up with partner NGOs 2. Rice hull, chicken dung, water lily, virme, panyawan, madre de cacao 3. Decomposition processes 4. Resource degradation		A, b	f. resource degradation	A, b, c, d	b
2. Crop Diversification	A, b, c	1. Identification of viable crops 2. Seeds 3. Observance of proper farming practice 4. Additional production		A, b	e	A, c	B
3. Crop and Livestock Insurance Scheme	A, b	1. IEC 2. Consultation, forum 3. Assurance for economic mitigating measure		A, b	A, b, c, d, e	e. mitigate possible losses	b.

4. Observance of Planting Calendar	A, b, c	1. IEC 2. IEC materials 3. Meetings, forum 4. Mitigate possible losses	A, b	A, b, d, e	A, c	B
5. Intensification of IEC on Environment, Health and Nutrition, Population and Climate Change	B, c	1. Brgy visitation 2. IEC materials 3. Meetings, forum, consultation 4. For mitigating and adaptation measures	A, b	A, b, c, d, e f. current climate	D, e. increased awareness and resiliency	B
6. Rainforestation Program	c	1. Planning stage, partnership with other agencies 2. Meetings, seminars, trainings 3. Resource degradation	A, b	A, b, c, d, e f. human greediness	d	A
7. Rehabilitation of Riverbanks	b	1. Partnership with LMDA 2. Bamboos and mangrove species 3. Contracting of NGOs, thru community-based program 4. Erosion, flash flooding	a, b	A, b, c, d, e	B, d	B
8. Subsidy Program of LGU on Agri Inputs, Facilities and Equipments	A, b, c	1. Regular programming of annual agri plans 2. Agri inputs, equipments and facilities 3. Farmer-beneficiary master listing 4. Increase production/income	A, b	A, b, c, d, e	A, c, d	B
9. Strengthening of RBOs as partners for AgriDev Program of the LGU	B, c	1. Regularized RBO mtngs 2. Masterlisting of RBOs 3. Promote and strengthen partnership for agricultural development	A, b	f. to address agri productivity	A, c, d	c

Annex B 12: Assessment of Past Adaptation Strategies

Strategies	Sufficiency	Constraints
1. Relief assistance	– Relief operation program is always channelled thru MSWDO providing every household with relief goods [only on the affected areas]	
2. Agricultural support program: vegetable, rice and corn seeds subsidy, livestock dispersal, fingerlings seeding in the lake, machineries and facilities	– A regular program which helped some farmers avail with	– 60-70% of marginalized farmers have not availed yet
3. Installed EWDs: rain gauge, water level gauge and hand-held radios	– Installed at strategic locations for flash flooding mitigating measure and timely evacuation execution	– Regular monitoring schedule
4. Enacted Environmental Protection Ordinance	– Tied up with partner LGUs within the influence area of Lake Mainit for the Unified Fishery Ordinance thru the Lake Mainit Development Alliance [LMDA] – Have representation at the Carac-an Watershed PAMB	– Laxity in the enforcement of Environmental Protection Ordinance
5. Partnership with other institutions [gov't line agencies, LGU Province, NGOs and private sectors] on the rehab efforts on the effects of hazards.	– Development Projects are prioritized on the possible effects of hazard on road networks, potable water structures and distribution lines, expansion of rice production area	– Improvement of major road networks not completed yet but still on-going [15-20km]

Annex B 13: Maximum Temperature, PAGASA Butuan Office

Month	MEAN		BIAS	Projected Change (%)		BIAS CORRECTED PROJ CHANGE		
	Observed 1971-2000	Model 1971-2000		2020	2050	TMAX		
						1971-2000	2020	2050
Jan	30.1	27.5	-2.6	1.1	2.3	30.1	31.2	32.4
Feb	30.8	28.5	-2.3	1.1	2.3	30.7	31.9	33.1
Mar	31.8	29.2	-2.6	1.2	2.8	31.8	33.0	34.6
Apr	33.1	29.8	-3.3	1.5	3.1	33.1	34.6	36.1
May	33.8	29.6	-4.2	1.3	2.9	33.8	35.1	36.7
Jun	33.0	28.9	-4.1	1.2	2.9	33.0	34.2	35.9
July	32.5	29.3	-3.2	1.3	3.0	32.5	33.8	35.5
Aug	32.8	30.0	-2.8	1.3	3.1	32.8	34.1	35.9
Sept	32.9	30.3	-2.6	0.9	2.6	32.9	33.8	35.5
Oct	32.3	28.6	-3.7	1.2	2.4	32.3	33.5	34.7
Nov	31.6	27.8	-3.8	1.0	2.3	31.6	32.6	33.9
Dec	30.8	27.2	-3.6	0.9	2.2	30.8	31.7	33.0

Annex B 14: Rainfall, PAGASA Butuan Office (mm)

Month	MEAN		BIAS	Projected Change (%)		BIAS CORRECTED PROJECTED CHANGE (mm)					
	Observed 1971-2000	Model 1971-2000				RR (mm/day)			RR Total (mm)		
				2020	2050	1971-2000	2020	2050	Obs 1971-2000	2020	2050
Jan	9.9	3.9	2.5	12.8	2.6	9.7	10.9	10.0	300.7	337.9	310.0
Feb	7.6	2.7	2.8	0.0	3.7	7.5	7.7	7.5	210.0	215.6	210.0
Mar	4.8	4.5	1.1	-26.7	-35.6	5.0	3.7	3.2	155.0	114.7	99.2
Apr	3.6	5.0	0.7	-26.0	-40.0	3.5	2.6	2.1	105.0	78.0	63.0
May	3.4	6.6	0.5	-9.1	-24.2	3.3	3.0	2.5	102.3	93.0	77.5
Jun	4.5	7.6	0.6	0.0	0.0	4.6	4.6	4.6	138.0	138.0	138.0
July	5.1	7.0	0.7	-12.9	-18.6	4.9	4.3	4.0	151.9	133.3	124.0
Aug	3.4	6.0	0.6	-8.3	-8.3	3.6	3.3	3.3	111.6	102.3	102.3
Sept	4.7	5.1	0.9	2.0	-7.8	4.6	4.7	4.2	138.0	141.0	126.0
Oct	6.3	4.8	1.3	12.5	0.0	6.2	7.0	6.2	192.2	217.0	192.2
Nov	6.4	4.7	1.4	8.5	6.4	6.5	7.2	7.0	195.0	216.0	210.0
Dec	7.0	5.5	1.3	5.5	18.2	7.2	7.5	8.4	223.2	232.5	260.4

Annex B 15: Scenario Analysis Matrix (2020)

SCENARIO 1

Climate Scenario: increasing temperature and decreasing rainfall	Extent of areas to be affected	No. of people to be affected	Damage to Lives	Damage to properties	Livelihood impacts	Others e.g. human health, etc.
Current S&T devt.	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	80-90% of the population	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -depleted water sources
Current population growth	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo -depleted water source

Current adaptive capacity	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo -depleted water sources
Current LGU budget levels	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo -depleted water source
W/out land conversion	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
Summation or scenario narrative						

SCENARIO 2

Increasing S&T devt.	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	17,236	No lives lost	Lessened by 50%	-Increased Production -Decreased Production Cost -Income	-Improved health and sanitation status -decreased malaria and dengue cases -stabilized water sources -decreased malnutrition rate among 6-0yo
Decreasing population growth	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	17,236	No lives lost	Lessened by 50%	More equitable access to livelihood opportunities	-Improved health and sanitation status -decreased malaria and dengue cases -stabilized water sources -decreased malnutrition rate among 6-0yo
Increasing adaptive capacity	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	17,236	No lives lost	Lessened by 90%	Increased production and profitability	-Improved health and sanitation status -decreased malaria and dengue cases -stabilized water sources -decreased malnutrition rate among 6-0yo
Increasing LGU budget levels	--2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	17,236	No lives lost	Lessened by 50%	Increased production and profitability	-Improved health and sanitation status -decreased malaria and dengue cases -stabilized water sources -decreased malnutrition rate among 6-0yo

W/out land conversion	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	17,236	No lives lost	Lessened by 50%	Available open access for agricultural production and other livelihood activities	-Improved health and sanitation status -decreased malaria and dengue cases -stabilized water sources -decreased malnutrition rate among 6-0yo
Summation or scenario narrative						

SCENARIO 3

Current S&T devt.	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	80-90% of the population	Increased loss of life due storm surge and flood inundation	Increased damage to properties and coastal lines and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -depleted water sources -loss of habitats and species -increased malnutrition rate among 0-6yo
increasing population growth	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and coastal lines and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -depleted water sources -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo

Current adaptive capacity	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and coastlines and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -depleted water sources -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
Decreasing LGU budget level	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and coastlines and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -depleted water sources -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
With land conversion	-2,619has. of agri land heavily affected with heavy production losses of all major crops -2,917has. is moderately affected -Butuan Bay, Lake Mainit Fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and coastlines and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -depleted water sources -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
Summation or scenario narrative						



Annex B 16: Scenario Analysis Matrix (2050)

SCENARIO 1

Climate Scenario: increasing temperature and decreasing rainfall	Extent of areas to be affected	No. of people to be affected	Damage to Lives	Damage to properties	Livelihood impacts	Others e.g. human health, etc.
Current S&T devt.	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	80-90% of the population	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species
Current population growth	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
Current adaptive capacity	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo

Current LGU budget levels	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra coastlines and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
W/out land conversion	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra coastlines and infra due to storm surge and flash flood	Livelihood activities will be disrupted Food security is affected	-health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
Summation or scenario narrative						
SCENARIO 2						
Increasing S&T devt.	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	17,236	No lives lost	Lessened by 50%	-Increased Production -Decreased Production Cost -Income	-Improved health and sanitation status -decreased malaria and dengue cases -decreased malnutrition rate among 6-0yo

Decreasing population growth	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	17,236	No lives lost	Lessened by 50%	More equitable access to livelihood opportunities	-Improved health and sanitation status -decreased malaria and dengue cases -decreased malnutrition rate among 6-0yo
Increasing adaptive capacity	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	17,236	No lives lost	Lessened by 90%	Increased production and profitability	-Improved health and sanitation status -decreased malaria and dengue cases -decreased malnutrition rate among 6-0yo
Increasing LGU budget levels	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	17,236	No lives lost	Lessened by 50%	Increased production and profitability	-Improved health and sanitation status -decreased malaria and dengue cases -decreased malnutrition rate among 6-0yo
W/out land conversion	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	17,236	No lives lost	Lessened by 50%	Available open access for agricultural production and other livelihood activities	-Improved health and sanitation status -decreased malaria and dengue cases -decreased malnutrition rate among 6-0yo
Summation or scenario narrative						

SCENARIO 3

Current S&T devt.	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	80-90% of the population	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	-Livelihood activities will be disrupted -Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
increasing population growth	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	-Livelihood activities will be disrupted -Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
Current adaptive capacity	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	All sectors are affected	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	-Livelihood activities will be disrupted -Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo

Decreasing LGU budget level	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	-Livelihood activities will be disrupted -Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
With land conversion	-90% of Agricultural areas is adversely affected -Butuan Bay, Lake Mainit and within Jabonga fishing areas	Increased no. of farmers affected including other sectors	Increased loss of life due storm surge and flood inundation	Increased damage to properties and infra due to storm surge and flash flood	-Livelihood activities will be disrupted -Food security is affected	-fish catch will lessen -health and sanitation worsen -risks from malaria and dengue increased -loss of habitats and species -increased malnutrition rate among 0-6yo
Summation or scenario narrative						

Annex B 17: Future Adaptation Strategy by Category

Category	Strategy	Critical Factors
	Flooding	Flooding
Physical/Infra	Construction/installation of additional irrigation pipelines/canals	Implementation of ARISP
	Completion of the Improvement of major road network	Prioritized intervention from the prov'l gov't and congressional fund
	Deepening of Kalinawan River	Availability of fund sources considering the magnitude of fund requirement
	Rechanneling of Puyo River	
	Construction of additional MPDPs	Additional fund sources
Technological	Riverbank/Lake coastline protection from synthetic farm inputs residue for Lake's biodiversity protection	Mainstreaming of climate change adaptation and biodiversity protection and conservation plans into the LGUs CDP
	Provision/installation of Portable/Automatic Weather Station	Prioritization for annual budgeting
	Upgrading of installed EWDs	Regular monitoring and reporting by permanent detailed personnel
Socio-Economic	Provision of high yielding rice variety , high tolerance to changes in temperature	Upgrading of MAOs personnel capacity
	Adoption/observance of planting calendar in relation to crop/commodity planted	
	Intensify crop diversification program and integration of other crops to maximize and optimize production	
	Intensification of livestock and poultry program for dispersal and meat production	- Improvement of breeding facilities - Augment MAOs annual budget
	Intensify the expansion of crop and farm insurance coverage	- Funding sources - Identification farmer beneficiaries
	Advocate regulation of population growth in accordance with preferred reproductive health programs	
	Emphasize food nutrition through crop production at home	
	Life Insurance Scheme of farmers	
	Intensify extension services, information dissemination campaign on the significance of manageable number of household members	



Political/ Institutional	Strict enforcement of Fishery and environment laws/ordinance	- Political will
	LGU to continue proactive partnership with NGOs, POs to be more resilient	
	LGU to continue in appropriating local funds for agricultural development programs	- Plan prioritization with budgetary needs
	LGU to continue to access resources from other NGAs and other funding institutions for more climate resilient/ adaptive livelihood interventions to farmers	- Packaging of Project Proposals
	Strengthening rainfall data monitoring	
	Utilize FLGC	

Annex B 18: Criteria/Indicators and the Corresponding Weights in Percentage

Criteria/Indicators of Effectiveness	Assigned Weights (%)
1. Cost Effectiveness (the higher the positive return from the given inputs/ costs, the more cost-effective)	8
2. Contribution to Poverty Reduction (potential of the adaptation practice to reduce poverty)	15
3. Increase Income (potential of the adaptation practice to increase income)	15
4. Contribution to Employment (potential of the adaptation practice to provide employment)	5
5. Size of beneficiary group (more positive impacts to greater number of people, the more efficient the adaptation strategies)	4
6. Absence of adverse impacts on other sectors/group (less negative impacts to other group/sectors, the more effective the CCA strategy)	0
7. Environmental Soundness (the more environmental friendly the practice, the more effective)	10
8. Ease of Implementation (the strategy is easily employed, absence of barriers for implantation)	15
9. Socio-cultural Acceptability (the more acceptable the CCA practice to greater number of stakeholders, the more effective)	10
10. Immediate impact/response to urgent needs (the more immediate positive impacts of adaptation practice the more effective)	10
11. Potential for Up-scaling (the greater the potential for wider application, the more effective)	10
TOTAL	100%

Annex B 19: Scoring of the Adaptation Practice Based on the Weighted Percentage Given for each Criterion/ Indicator

Climate Change Adaptation Practice	Criteria/Indicators of Effectiveness											
	Cost Effectiveness [6]	Contribution to Poverty Reduction [15]	Increase Income [15]	Contribution to Employment [5]	Size of beneficiary group [9]	Absence of adverse impacts on other sectors/ groups 0	Environmental Soundness [10]	Ease of Implementation [10]	Socio-Cultural Acceptability [10]	Immediate Impact [10]	Potential for Up-scaling [10]	Total Score [100]
1.Intensification of Organic Farming Practices	6	10	15	2	8	0	8	10	10	5	10	84
2.Crop Diversification	6	10	15	2	8	0	8	10	10	8	10	87
3.Crop and Livestock Insurance Scheme	6	8	8	2	5	0	4	10	10	8	8	69
4.Observance of Planting Calendar	6	7	13	3	5	0	8	10	10	10	10	82
5.Intensification of IEC on Environment, Health and Nutrition, Population and Climate Change	6	10	8	3	9	0	10	10	10	5	10	81
6.Rainforestation Program	2	5	5	3	9	0	10	5	10	10	5	64
7. Rehabilitation of Riverbanks	6	5	5	4	9	0	10	8	8	8	9	72
8.Subsidy Program of LGU on Agri Inputs, Facilities and Equipments	6	15	8	4	8	0	8	10	10	10	10	89
9.Strengthening of RBOs as partners for AgriDev Program of the LGU	6	10	8	4	9	0	10	10	10	8	10	85

Annex B 20: Ranking of Adaptation Practices Based on their Weighted Score

Ranking	
1.	Subsidy Program of LGU on Agri Inputs, Facilities and Equipments – 89%
2.	Crop Diversification – 87%
3.	Strengthening of RBOs as partners for AgriDev Program of the LGU – 85%
4.	Intensification of Organic Farming Practices – 84%
5.	Observance of Planting Calendar – 82%
6.	Intensification of IEC on Environment, Health and Nutrition, Population and Climate Change – 81%
7.	Rehabilitation of Riverbanks – 72%
8.	Crop and Livestock Insurance Scheme – 69%
9.	Rainforestation Program – 64%

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