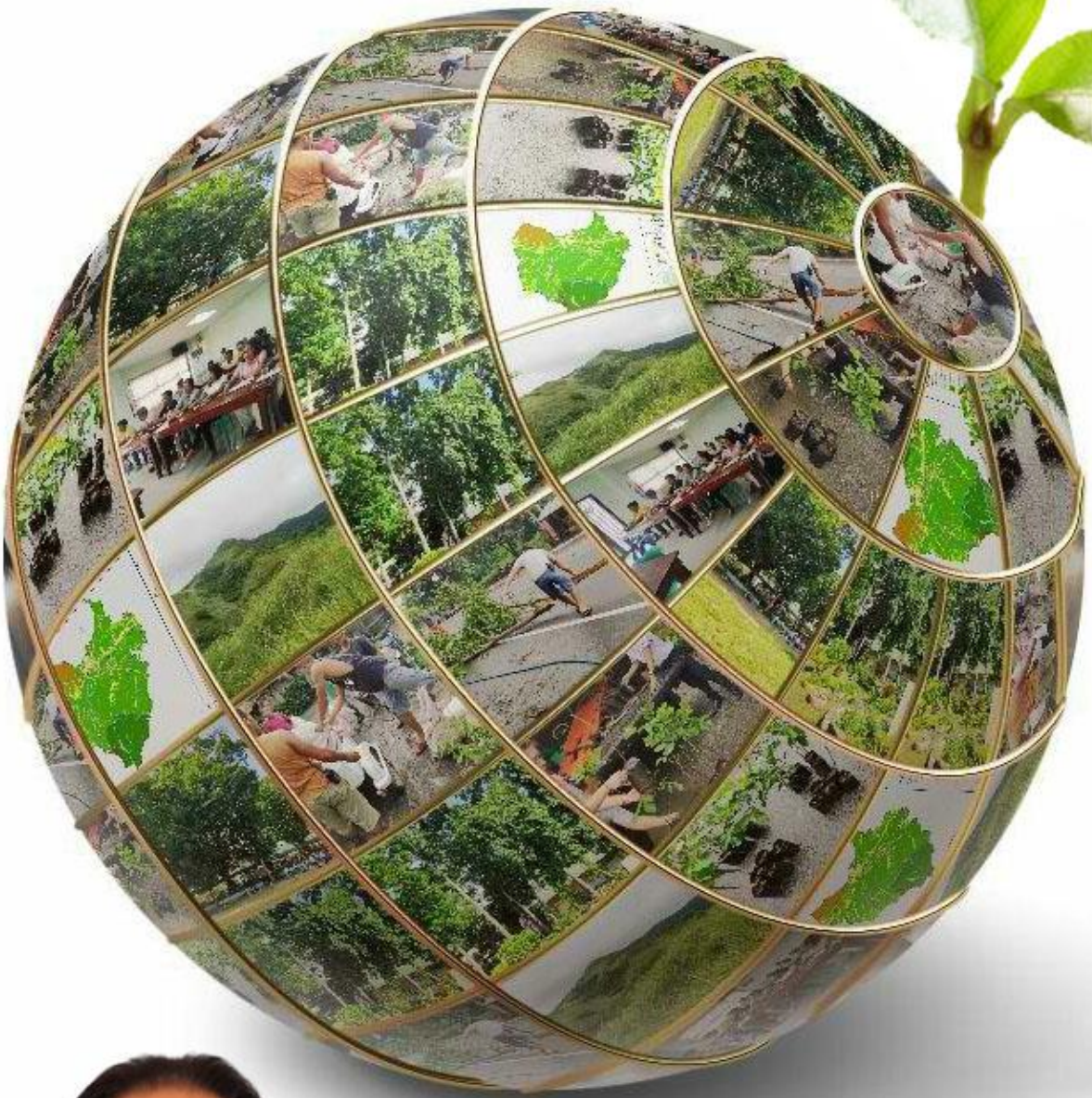
2020-2025

LOCAL CLIMATE CHANGE ACTION PLAN



MUNICIPALITY OF ALAMINOS
PROVINCE OF LAGUNA
REGION IV-A

MUNICIPALITY OF ALAMINOS
PROVINCE OF LAGUNA
REGION IV-A

LOCAL CLIMATE CHANGE ACTION PLAN (LCCAP)

2020-2025

EXCERPT FROM THE MINUTES OF THE MEETING OF THE MUNICIPAL DISASTER RISK REDUCTION AND MANAGEMENT COUNCIL OF ALAMINOS, LAGUNA HELD ON NOVEMBER 29, 2019 AT THE CONFERENCE ROOM, MULTIPURPOSE BUILDING, MUNICIPALITY OF ALAMINOS, LAGUNA.

IN ATTENDANCE:

Name	Designation
HON. ELADIO M. MAGAMPON, M.D.	MUNICIPAL MAYOR
MR. CORSENI R. SALCEDO	MUNICIPAL ADMINISTRATOR
MS. EDEN GESMUNDO	MLGOO
CHRISTIAN V. SABINOSA	MDRRMO/MENRO-designate
MS. GLADYS D. THOMPSON	MUNICIPAL AGRICULTURIST
ENGR. FLORENTINO DESTACAMENTO	MUNICIPAL ENGINEER
MS. IRENE BANAWA	MUNICIPAL BUDGET OFFICER
MS. JUANITA RIVERA	GSO
MS. LEISURELLY BANZUELA	SANITARY INSPECTOR
SFO3 MELVIN R BUENAVENTURA	OIC-MUNICIPAL FIRE MARSHAL
F01 MAUREEN ENRACA	BFP
PSSG ANGELO MENDOZA	PNP
MS. EDEN C. GESMUNDO	MLGOO
MR. IRWIN ROMMEL COSME F. DONATO	MDRRMO – OPERATIONS
MS. JOAN M. AGANA	MDRRMO – ADMIN
MS. ZETTE RUDLY REYES	MDRRMO – RESEARCH
MR. ALLAN P. HIDALGO	DEPED DISTRICT SDRRM COOR
MR. NORIEL MAURICIO	SNEAKY VICE PRES.
MR. BENJAMIN SANCHEZ	SNEAKY
MR. SAMUEL BUISER	PHMI PRES
MR. ALLAN P. HIDALGO	SDRRM-COOR
MR. RECHMEL CHAVEZ	KABALIKAT CIVICOM
MS. CONNIE C. SANTOS	KABALIKAT CIVICOM
MR. ANTONIO C. BONDAD	KAGAWAD
MS. JOAN GAPIANGAO	MENRO STAFF

MDRRMC RESOLUTION NO. 09-2019

RESOLUTION APPROVING THE LOCAL CLIMATE CHANGE ACTION PLAN 2020-2025.

WHREREAS, Article II, Section 1 of the 1987 Philippine Constitution states that, "The State shall protect and advance the rights of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature";

Republic of the Philippines
Province of Laguna
MUNICIPALITY OF ALAMINOS

HON. ELADIO M. MAGAMPON, M.D.
Municipal Mayor

WHREREAS, In response to the urgency for action on climate change, the Philippines passed Republic Act No. 9729, also known as the "Climate Change Act of 2009". Section 2 of the law states that "it is the policy of the State to afford full protection and the advancement of the right of the people to a balances and healthful ecology... to fulfill human needs while maintaining the quality of the natural environment for current and future generation";

WHEREAS, The Local Government Unit is mandated to exercise their inherent powers such a police power, as well as share with the national government the responsibility in the management and maintenance of ecological balance in their respective territorial jurisdiction as stated in Section 2a, 15, 3i of Republic Act No. 7160 or the Local Government Code of 1990;

WHEREAS, In addition, Section 14 of Republic Act No. 9729, as amended By Republic Act No. 10174 (People's Survival Fund), provides that, LGUs shall be the frontline agencies in the formulation, planning and implementation of climate change action plans in their respective areas, consistent with the provisions of RA 7160, the National Framework Strategy on Climate Change (NFSCC), and the National Climate Change Action Plan (NCCAP);

WHEREAS, The Local Climate Change Action Plan (LCCAP) LCCAP is the action plan formulated by the LGUs to address climate change concerns. The LCCAP focuses on both climate change adaptation and mitigation and describes how LGUs plan to respond to climate change and mainstream such into local development plans.

NOW WHEREFORE, on motion of Ms. Noriddi Carreon and duly seconded by Mr. Samuel Buiser – PHMI President, be it,

RESOLVED, in adherence to RA 10174 to formulate an integrated Local Climate Change Action Plan for the Municipality of Alaminos, hereby approving the LCCAP 2020-2025. Thus, the LCCAP 2020-2025 shall be recommended by the MDRRMC to Sangguniang Bayan for approval.

RESOLVED FURTHER, that copies of this resolution be attached to the LCCAP 2020-2025 and to the Sangguniang Bayan for their approval.

UNANIMOUSLY APPROVED: November 29, 2019

I HEREBY CERTIFY, that the foregoing resolution was duly approved by the Municipal Disaster Risk Reduction and Management Council in a meeting held on November 29, 2019

CHRISTIAN V. SABINOSA
MDRRMO III

Attested:

HON. ELADIO M. MAGAMPON, M.D.
Municipal Mayor, MDRRMC Chairman

MESSAGE OF THE MAYOR

In response to what has essentially become a global climate crisis, pursuant to Climate Change Act (Republic Act 9729), the Local Government of Alaminos Laguna complied to the policy framework with which to systematically address the growing threats of Climate Change on community life and its impact on the environment.

The indicators of climate change in the form of rising temperature, variability of precipitation, frequency and intensity of typhoons, the risks of more droughts, floods, heat waves, and forest and grassland fires have impacts on the economy, environment and communities. The Municipality of Alaminos was also vulnerable to the impacts of climate change, and has already experienced noticeable adverse effects in recent years. Without concerted local action, the adverse effects of climate change are expected to intensify in the medium or long term.

Thus, the **Alaminos Climate Change Action Plan** was formulated through the coordinated efforts of all the members of the Municipal Disaster Risk Reduction and Management Council and all Civil Society Organizations that values the preservation of the ecological balance in the Municipality of Alaminos. It shall recognize the value of forming multi-stakeholder participation and partnerships in climate change initiatives, including with civil society, private sector and other marginalized groups most vulnerable to climate change impacts.

Further, the deliberate consultations, meetings and series of workshop conducted by the technical working group and the barangays intended to innovate measures and strategies that shall best address the vulnerable communities. The commitment of the MDRRMC through The Alaminos Climate Change Action Plan shall provide local intervention, increasing the level of adaptation, mitigation and response in making a climate resilient Alaminos.

The concerted efforts will make best results, in the advancement of the right of the people to a balanced, safe, resilient and healthful ecology, to fulfill human needs while maintaining the quality of the natural environment for current and future generations of the Municipality of Alaminos

To our vision of a progressive and sustainable development in Alaminos – "SULONG MAGANDANG ALAMINOS!".

HON. ELADIO M. MAGAMPON, M.D.

Municipal Mayor

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

LIST OF FIGURES

DEFINITION OF TERMS

Adaptation	-	refers to the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.
Adaptive capacity	-	refers to the ability of ecological, social or economic systems to adjust to climate change including climate variability and extremes, to moderate or offset potential damages and to take advantage of associated opportunities with changes in climate or to cope with the consequences thereof.
Anthropogenic causes	-	refer to causes resulting from human activities or produced by human beings.
Capacity	-	a combination of all strengths and resources available within a community, society or organization that can reduce the level of risk, or effects of a disaster. Capacity may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership and management. Capacity may also be described as capability.
Civil Society Organizations	-	non-state actors whose aims are neither to generate profits nor to seek governing power. CSOs unite people to advance shared goals and interests. They have a presence in public life, expressing the interests and values of their members or others, and are based on ethical, cultural, scientific, religious or philanthropic considerations. CSOs include nongovernment organizations (NGOs), professional associations, foundations, independent research institutes, community-based organizations (CBOs), faith-based organizations, people's organizations, social movements, and labor unions.
Climate Change	-	refers to a change in climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period typically decades or longer, whether due to natural variability or as a result of human activity.
Climate Risk	-	refers to the product of climate and related hazards working over the vulnerability of human and natural ecosystems.
Climate Variability	-	refers to the variations in the average state and in other statistics of the climate on all temporal and spatial scales beyond that of individual weather events.
Community-Based Disaster Risk Reduction and Management	-	a process of disaster risk reduction and management in which at risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities, and where the people are at the heart of decision-making and implementation of disaster risk reduction and management activities.
Complex Emergency	-	a form of human-induced emergency in which the cause of the emergency as well as the assistance to the afflicted IS complicated by intense level of political considerations.
Contingency Planning	-	a management process that analyzes specific potential events or emerging situations that might threaten society or the environment and establishes arrangements in advance to enable timely, effective and appropriate responses to such events and situations.

Disaster	-	refers to a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts which exceed the ability of the affected community or society to cope using its own resources.
Disaster	-	a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. Disasters are often described as a result of the combination of: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences, Disaster impacts may include loss of life, injury, disease and other negative effects on human, physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, Social and economic disruption and environmental degradation.
Disaster	-	the combination of the probability of an event and its negative consequences.
Disaster Mitigation	-	the lessening or limitation of the adverse impacts of hazards and related disasters. Mitigation measures encompass engineering techniques and hazard-resistant construction as well as improved environmental policies and public awareness.
Disaster Preparedness	-	the knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the Impacts of likely, imminent or current hazard events or conditions. Preparedness action is carried out within the context of disaster risk reduction and management and aims to build the capacities needed to efficiently manage all types of emergencies and achieve orderly transitions from response to sustained recovery. Preparedness is based on a sound analysis of disaster risk and good linkages with early warning systems, and includes such activities as contingency planning, stockpiling of equipment and supplies, the development of arrangements for coordination, evacuation and public information, and associated training and field exercises. These must be supported by formal institutional, legal and budgetary capacities.
Disaster Prevention	-	the outright avoidance of adverse impacts of hazards and related disasters. It expresses the concept and intention to completely avoid potential adverse impacts through action taken in advance such as construction of dams or embankments that eliminate flood risks, land-use regulations that do not permit any settlement in high-risk zones, and seismic engineering designs that ensure the survival and function of a critical building in any likely earthquake.
Disaster Response	-	the provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. Disaster response is predominantly focused on immediate and short-term needs and is sometimes called “disaster relief”.
Disaster Risk	-	the potential disaster losses in lives, health status, livelihood, assets and services, which could occur to a particular community or a Society over some specified future time period.

Disaster risk reduction	-	refers to the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.
Disaster Risk Reduction	-	the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposures to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.
Disaster Risk Reduction and Management	-	the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. Prospective disaster risk reduction and management refers to risk reduction and management activities that address and seek to avoid the development of new or increased disaster risks, especially if risk reduction policies are not put m place.
Disaster Risk Reduction and Management Information System	-	a specialized database which contains, among others, information on disasters and their human material, economic and environmental impact, risk assessment and mapping and vulnerable groups.
Early Warning System	-	the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss. A people-centered early warning system necessarily comprises four (4) key elements: knowledge of the risks; monitoring, analysis and forecasting of the hazards; communication or dissemination of alerts and warnings; and local capabilities to respond to the warnings received. The expression “end-to-end warning system” is also used to emphasize that warning systems need to span all steps from hazard detection to community response.
Emergency	-	unforeseen or sudden occurrence, especially danger, demanding immediate action.
Emergency Management	-	the organization and management of resources and responsibilities for addressing all aspects of emergencies, in particular preparedness, response and initial recovery steps.
Exposure	-	the degree to which the elements at risk are likely to experience hazard events of different magnitudes.
Gender mainstreaming	-	refers to the strategy for making women’s as well as men’s concerns and experiences an integral dimension of the design, implementation, monitoring, and evaluation of policies and programs in all political, economic, and societal spheres so that women and men benefit equally and inequality is not perpetuated. It is the process of assessing the implications for women and men of any planned action, including legislation, policies, or programs in all areas and at all levels.
Geographic Information System	-	a database which contains, among others, geo-hazard assessments, information on climate change, and climate risk reduction and management.
Global Warming	-	refers to the increase in the average temperature of the Earth’s near-surface air and oceans that is associated with the increased concentration of greenhouse gases in the atmosphere.

Greenhouse effect	-	refers to the process by which the absorption of infrared radiation by the atmosphere warms the Earth.
Greenhouse gases (GHG)	-	refers to constituents of the atmosphere that contribute to the greenhouse effect including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride.
Hazard	-	a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihood and services, social and economic disruption, or environmental damage.
Land-Use Planning	-	the process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long-term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses.
Mainstreaming	-	refers to the integration of policies and measures that address climate change into development planning and sectoral decision-making.
Mitigation	-	in the context of climate change, refers to human intervention to address anthropogenic emissions by sources and removals by sinks of all GHG, including ozone-depleting substances and their substitutes.
Mitigation	-	DRRM: structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation, and technological hazards and to ensure the ability of at-risk communities to address vulnerabilities aimed at minimizing the impact of disasters. Such measures include, but are not limited to, hazard-resistant construction and engineering works, the formulation and implementation of plans, programs, projects and activities, awareness raising, knowledge management, policies on land-use and resource management, as well as the enforcement of comprehensive land-use planning, building and safety standards, and legislation. CCA: refers to human intervention to address anthropogenic emissions by sources and removals by sinks of all GHG, including ozone- depleting substances and their substitutes.
Mitigation potential	-	shall refer to the scale of GHG reductions that could be made, relative to emission baselines, for a given level of carbon price (expressed in cost per unit of carbon dioxide equivalent emissions avoided or reduced).
National Disaster Risk Reduction and Management Framework (NDRRMF)	-	provides for comprehensive, all hazards, multi-sectoral, inter-agency and community-based approach to disaster risk reduction and management.
National Disaster Risk Reduction and Management Plan (NDRRMP)	-	the document to be formulated and implemented by the Office of Civil Defense (OCD) that sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives. The NDRRMP shall provide for the identification of hazards, vulnerabilities and risks to 'be managed at the national level; disaster risk reduction and management approaches and strategies to be applied m managing said hazards and risks; agency roles, responsibilities and lines of authority at all government levels; and vertical and horizontal coordination of disaster risk reduction and management in the pre-disaster and post-disaster phases. It shall be in conformity with the NDRRMF.

Post-Disaster Recovery	-	the restoration and improvement where appropriate, of facilities, livelihood and living conditions. of disaster-affected communities, including efforts to reduce disaster risk factors, in accordance with the principles of “build back better”.
Preparedness	-	pre-disaster actions and measures being undertaken within the context of disaster risk reduction and management and are based on sound risk analysis as well as pre-disaster activities to avert or minimize loss of life and property such as, but not limited to, community organizing, training, planning, equipping, stockpiling, hazard mapping, insuring of assets, and public information and education initiatives. This also includes the development/enhancement of an overall preparedness strategy, policy, institutional structure, warning and forecasting capabilities, and plans that define measures geared to help at-risk communities safeguard their lives and assets by being alert to hazards and taking appropriate action in the face of an Imminent threat or an actual disaster.
Private Sector	-	the key actor in the realm of the economy where the central social concern and process are the mutually beneficial production and distribution of goods and services to meet the physical needs of human beings. The private sector comprises private corporations, households and nonprofit institutions serving households.
Public Sector Employees	-	all persons in the civil service.
Rehabilitation	-	measures that ensure the ability of affected communities/areas to restore their normal level of functioning by rebuilding livelihood and damaged infrastructures and increasing the communities’ organizational capacity.
Resilience	-	the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
Response	-	any concerted effort by two (2) or more agencies, public or private, to provide assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected and in the restoration of essential public activities and facilities.
Risk Assessment	-	a methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihood and the environment on which they depend. Risk assessments with associated risk mapping include: a review of the technical characteristics of hazards such as their location, intensity, frequency and probability; the analysis of exposure and vulnerability including the physical, social, health, economic and environmental dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities in respect to likely risk scenarios.
Risk Management	-	the systematic approach and practice of managing uncertainty to minimize potential harm and loss. It comprises risk assessment and analysis, and the implementation of strategies and specific actions to control, reduce and transfer risks. It is widely practiced by organizations to minimize risk in investment decisions and to address operational risks such as those of business disruption, production failure, environmental damage, social impacts and damage from fire and natural hazards.

Risk Transfer	-	the process of formally or informally shifting the financial consequences of particular risks from one party to another whereby a household, community, enterprise or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party.
State of Calamity	-	a condition involving mass casualty and/or major damages to property, disruption of means of livelihoods, roads and normal way of life of people in the affected areas as a result of the occurrence of natural or human-induced hazard.
Sustainable Development"	-	development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two (2) key concepts: (1) the concept of "needs", in particular, the essential needs of the world's poor, to which overriding priority should be given; and (2) the idea of limitations imposed by the state of technology and social organizations on the environment's ability to meet present and future needs. It is the harmonious integration of a sound and viable economy, responsible governance, social cohesion and harmony, and ecological integrity to ensure that human development now and through future generations is a life-enhancing process.
Vulnerability	-	the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. Vulnerability may arise from various physical, social, economic, and environmental factors such as poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental management.
Vulnerability	-	refers to the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.
Vulnerable and Marginalized Groups	-	those that face higher exposure to disaster risk and poverty including, but not limited to, women, children, elderly, differently-abled people, and ethnic minorities.

BACKGOUND

LEGAL MANDATE

Article II, Section 1 of the 1987 Philippine Constitution states that, “The State shall protect and advance the rights of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature”.

In response to the urgency for action on climate change, the Philippines passed Republic Act No. 9729, also known as the “Climate Change Act of 2009”. Section 2 of the law states that “it is the policy of the State to afford full protection and the advancement of the right of the people to a balances and healthful ecology... to fulfill human needs while maintaining the quality of the natural environment for current and future generation”.

The Local Government Unit is mandated to exercise their inherent powers such a police power, as well as share with the national government the responsibility in the management and maintenance of ecological balance in their respective territorial jurisdiction as stated in Section 2a, 15, 3i of Republic Act No. 7160 or the Local Government Code of 1990.

In addition, Section 14 of Republic Act No. 9729, as amended By Republic Act No. 10174 (People's Survival Fund), provides that, LGUs shall be the frontline agencies in the formulation, planning and implementation of climate change action plans in their respective areas, consistent with the provisions of RA 7160, the National Framework Strategy on Climate Change (NFSCC), and the National Climate Change Action Plan (NCCAP).

CLIMATE CHANGE ACTION PLANNING PROCESS

The Local Climate Change Action Plan (LCCAP) LCCAP is the action plan formulated by the LGUs to address climate change concerns. The LCCAP focuses on both climate change adaptation and mitigation and describes how LGUs plan to respond to climate change and mainstream such into local development plans. The LCCAP shall be science and risk-based, since its formulation will consider the assessment of climate change impacts on the most vulnerable communities and areas, and the ecosystems and other resources within their territories. This natural scientific planning and operationalization will help reduce vulnerability and prevent loss of lives and livelihood, and damages to shelters and infrastructures.

The LCCAP used the Enhanced LGU Guidebook on the Formulation of Local Climate Change Action Plan (LCCAP) developed in 2017 by the Department of Interior and Local Government (DIILG), and Local Government Academy (LGA).

Figure 1 shows the planning framework of formulating the LCCAP. The enhanced LGU Guidebook emphasizes that LCCAP formulation is not a linear process, enabling LGUs to revisit any step as new information becomes available, new stakeholders become involved, or other circumstances change.

Figure 1: LCCAP Process

The formulation of the LCCAP involved nine (9) steps:

1. Getting started. This step directed the local government (LGU) unit to look into their current profiles as well as the available data on their current and future projects and plans. The LGU was able to determine possible hindrances and existing gaps in the formulation process as well as the most effective method to enjoin other stakeholders.
2. Stakeholders and Participation. This step guided LGU in identifying the core team to work on the project and the stakeholders and institutions that can provide support.
3. Climate Change Information and Assessment. This step assessed the LHU in two components, in terms of its Risk and Vulnerability and GHG and Mitigation Actions. This step was conducted for better comprehension and to ensure that assessments' results covered information that will produce adaptation and mitigation actions.
4. Goals and Objectives. This step assessed and reviewed goals and objectives in local development plans through "climate lenses" and thus helped LGU define the focus and direction of local climate change actions.
5. Option Identification. This step provided an opportunity for the LGU to determine potential actions to address the impacts of climate change based on the results from the previous Steps
6. Option Assessment. This step facilitated and allowed LGUs and stakeholders to prioritize the PPAs as well as policy options that will be brought to implementation and towards achievement of LCCAP objectives. This step provided an opportunity for the LGU to screen the lost list of options identified in Step 5 and prioritize those using parameters that are most relevant and important to their realities
7. Implementation. In this step, the LCCAP core team shall work with pertinent stakeholders to develop an implementation plan and begin the process of implementing the adaptation and mitigation activities defined in the previous step. It also covers tasks such as budgeting and accessing funding sources like the PSF.
8. Monitoring and Evaluation. In this step, the LGU shall be expected to set baselines, define indicators, measure progress and evaluate successes and setbacks in the LCCAP implementation
9. Adjust and Modify. This step shall provide an opportunity for the LGU to update and incorporate new information into the regular updating of long-range planning documents.

In 2018, the Municipality of Alaminos conducted its CDRA, which contains qualitative and quantitative analysis of climate change exposure, sensitivity and adaptive capacity of the municipality. For the LCCAP, the CDRA was reviewed, enhanced, and used as basis for further analysis, objective-setting, and action planning with the local government and other stakeholders.

MUNICIPAL PROFILE

PHYSICAL PROFILE

The municipality is relatively flat with a gently sloping topographic relief, slopes from zero (0) to 18 percent make up a total of 4,203.19 hectares of the total land area while the remaining 1,142.16 hectares are 18 percent and above slope.

Alaminos has four (4) soil types present - Lipa loam, Macolod, Macolod clay loam and mountain soils. Lipa loam is the dominant type of soil in the municipality, followed by Macolod. These soil types are highly suitable for urban use, recreational use, agriculture, road, parking lots, and sewage disposal facilities.

The municipality of Alaminos falls under Type I and Type 3 of the Philippine Climate Corona Classification. Type 1 climate has two pronounce seasons, which is dry from November to April and wet during the rest of the year. While, Type 3 climate is characterized by having not very pronounced, relatively dry from November to April, and wet during the rest of the year.

The total land area of the municipality is about 5,345.35 hectares. Alienable and disposable (A&D) lands cover 5,202.38 hectares (97.33%) of the total land while forest reserve covers 142.97 hectares (2.67%). Alaminos has no critical/protected area as defined under Republic Act No. 7586, NIPAS Act of 1992. There are, however, areas that are locally proclaimed protected areas to maintain and preserve the natural condition to the greatest extent potential.

The land cover of Alaminos consists of built-up, coconut with cropland mixed, annual crop, grassland, grassland and shrub land, other wooded grasslands, inland water body, open forest/mixed trees and rivers and creeks. Majority of the area is perennial crop such as coconut, lanzones, and rambutan.

Two (2) groundwater availability classifications are present in the municipality - local and less productive aquifers and rocks without any known significant groundwater obtainable through drilled wells, largely untested.

Further the municipality has six (6) major rivers and creeks with water quality classifications Class C and D Class. C is characterized as fishery water for the propagation and growth of fish and other aquatic resources, recreational water class II and industrial water Class I suitable for manufacturing processes after treatment, while Class D is for agriculture, irrigation, livestock, watering, and industrial water supply class II.

HAZARD PROFILE

Alaminos have five (5) natural hazards such as flooding, rain-induced landslide (RIL), ground shaking, earthquake-induced landslide (EIL) and soil erosion. Some barangays are susceptible to only one (1) hazard such as barangays Poblacion 1 and Poblacion 4, while other varies from two (2) to five (5) hazards.

DEMOGRAPHY

The municipality of Alaminos has a total population of 47,859 based on the 2015 Population Census with a 1.92 growth rate (2010-2015). The population is expected to reach 60,080 by 2027 and double in 36 years (2051). Young dependents (0-14 years of age) make up 30 percent of the total population and old dependents (65 and above years of age) contribute 4.93 percent to the population. Population ages 15 to 64 or the productive age group share 65.07 percent of the total population. The sex ratio indicates that there are more males compares to females in the municipality.

Table 1: Summary Population Measures in Alaminos, Laguna

Population Measures	2015
Population	47,859
Population Growth Rate (2010-2015)	1.92
Productive Population	31,144
Reproductive age population	12,144
School age population	18,471
Young Population	14,356
Old Population	2,359
Age Dependency Ratio	49.89
Young Dependency Ratio	42.85
Old Dependency Ratio	7.04
Sex Ratio	101
Source: Alaminos CLUP 2019-2027	

In terms of population distribution, six (6) barangays are classified as urban barangays - barangays Poblacion 1, Poblacion 2, Poblacion 3, Poblacion 4, San Agustin and San Benito. The urban population totals to 24,188 and contribute a 50.54 percent to the total population, while rural barangays comprise of barangays Del Carmen, Palma, San Andres, San Gregorio, San Ildefonso, San Juan, San Miguel, San Roque, and Santa Rosa, have a total rural population of 23,671 and contribute 49.46 percent to the total population. The gross population density is at nine (9) persons per hectare, lower compared the provincial and national figures.

SOCIAL SERVICES

EDUCATION SERVICES AND FACILITIES

Alaminos has a total of 19 elementary schools and 6 (six) high schools. In terms of primary education, all private elementary schools are within the prescribed student-teacher and student classroom ratio. As for public elementary schools, four (4) out of 12 schools have a student-teacher ratio beyond the prescribed standard. These schools include Alaminos Elementary School, San Agustin Elementary School, San Benito Elementary School, and Sta. Rosa Elementary School. While six (6) out of 12 elementary schools have exceeded the prescribed student-classroom ratio, these are: Alaminos Elementary School, Palma Elementary School, San Agustin Elementary School, San Andres Elementary School, Sta. Rosa Elementary School.

HEALTH AND SANITATION SERVICES AND FACILITIES

The Municipal Health Center is located in barangay Poblacion 3. It can accommodate patients in the Poblacion area, as well as the patients from other barangays, which has no barangay health station, these includes barangays Poblacion 1, Poblacion 2, Poblacion 4, Palma, Del Carmen, and San Roque. Alaminos has four (4) cemeteries and memorial parks. The privately-owned memorial parks include Alaminos Memorial Park, Inc., Roloma Memorial Park Corp., and Mulberry Garden Memorial Park. There is only one (1) government-owned cemetery or the Alaminos Public Cemetery, which has already reached its capacity.

SOCIAL WELFARE SERVICES AND FACILITIES

There are three (3) identified social welfare facilities in Alaminos. These are Day Care Centers; each barangay has their own and are reported to have an acceptable and serviceable condition; Senior Citizens Office which provide services such as Senior Citizen ID, and differently-abled persons (DAP) or persons with disabilities (PWD) office. Both the senior citizens' office and DAP or PWD offices are located in the municipal hall of Alaminos.

HOUSING FACILITIES

There are 11,025 occupied housing units in the municipality. Alaminos has a 4.33:1 ratio of household population to occupied housing units. There are nine (9) identified subdivisions in the municipality, four (5) of them are considered socialized housing. These are, Lynville Homes Alaminos, Newborn Village, Sitio Maligaya, La Trenchera de Felimon Masa and Bella Vita. A total of 2,067 dwelling units are available as part of the socialized housing in these subdivisions. Those who are identified as socio-economically disadvantaged can avail these socialized housing units.

PROTECTIVE SERVICES AND FACILITIES

The police station and fire station are located in barangay Poblacion 3, near the municipal hall. Currently, there is no jail in the municipality while the fire force of Alaminos is below the minimum standard, there should be an additional of at least an additional of 12 more fire personnel in the municipality to meet the required population to firefighter ratio.

SPORTS AND RECREATION SERVICES AND FACILITIES

All barangays in the municipality have their own multipurpose covered courts, which are often used, as a venue for barangay events and activities and evacuation centers during disaster events.

ECONOMY

The current economy of the municipality is a combination of agriculture, commercial and industrial industries. The dominant crops in Alaminos include lanzones, rambutan, papaya, banana, pineapple and coconut. In addition to crop production, poultry and livestock industries also contribute to the economy of the area. Currently, there are 21 poultry farms, two (2) piggeries and 1 goat farm. There no mining and quarrying industries in the municipality despite having mineral resources. In terms of secondary sector, there are several gasoline stations, mostly concetrated in barangay San Juan. For commercial industries, there are 470 existing commercial establishment in Alaminos, mostly concentrated in urban barangays.

PHYSICAL INFRASTRUCTURE

TRANSPORTATION NETWORKS

Similar to the province of Laguna, Alaminos is only accessible by land transportation. The transportation network is composed of roads, railways and footpaths. The municipality has a total of 64.85 kilometers of road networks, which is mostly made of concrete (72%) or asphalt (28%). The Philippine National Railway traverses also in Alaminos, specifically in barangays San Andres, San Juan, Poblacion 1, Poblacion 4, San Agustin, and San Benito. However, these railways are no longer used as a form of transportation since the tracks are already paved and there are no facilities or services provided.

POWER SUPPLY

The main electricity Alaminos is the Manila Electric Company (MERALCO). In 2015, 10,475 households have electricity, and the remaining 2.98 percent of total households currently do not have electricity.

WATER SUPPLY

In terms of water supply, three (3) barangays with 148 households are dependent on a hand pump or Level I water supply. These are barangays Poblacion I, San Agustin, and Sta. Rosa. Households from barangays Palma, San Gregorio, San Ildefonso, San Miguel, San Roque, and

Sta. Rosa have 3,892 households relying on a communal water or Level II water source. Majority of the households in Alaminos use a Level III water supply for their daily needs. Alaminos Water District provides service for water supply in barangay Poblacion 1, Poblacion 2, Poblacion 3, Poblacion 4, Del Carmen, San Agustin, San Andres, San Benito, and San Juan.

COMMUNICATION NETWORKS

The postal office operates in the municipal hall and its services include mailing and freight forwarding and delivery. There are also eight (8) freight services offered in the municipality, which are all privately owned. Internet is available in the municipality but with relatively slow connection, depending on the location and the service providers. The three (3) internet providers present in the municipality are PLDT-Smart, Digitel, and Globe. For cellular network, Globe Telecommunication and Smart Communications are available and widely used for calling and messaging. Two (2) cable television service providers are present in Alaminos – Rustic Clear Cable Corporation and Telmarc Corporation located in barangay San Benito.

WASTE MANAGEMENT AND FACILITIES

There are 11 materials recovery facilities (MRFs), however, MRFs in barangays San Gregorio and Del Carmen are not functional.

HERITAGE CONSERVATION PROFILE

Alaminos has areas that are historically significant, however, only the Fule Mansion is registered as heritage conservation object in the municipality. Other potential heritage objectives include old ancestral houses and church.

THE CLIMATE CHANGE ACTION PLANNING FRAMEWORK AND PLANNING APPROACH

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

In 1992, countries joined an international treaty, the United Nations Framework Convention on Climate Change, as a framework for international cooperation to combat climate change. The Framework recognizes the problem despite less scientific evidence then and acknowledges the vulnerability of all countries to the effects of climate change. The ultimate objective of the Framework is to stabilize greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system."

PARIS AGREEMENT

The Paris Agreement was a result of the continuing efforts of the international community to combat climate change. The Agreement entered into ore in 2016 with the intention to bring all nations into a common cause to fight climate change, strengthen the global response to the threat of climate change, strengthen the ability of countries to deal with the impacts of climate change.

Recently, the Philippines ratified the Paris Agreement. Ratification refers to the international act whereby a country indicates its consent to be bound to an international agreement. Ratification is evidenced by depositing an instrument of ratification with the depository. This means that the Philippines now bound to the Paris Agreement, to ensure best efforts through “nationally determined contributions” (NDCs) and to strengthen efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. There will also be a global stocktake every 5 years to assess the collective progress towards achieving the purpose of the agreement and to inform further individual actions by Parties. Specifically, adopting the Decisions – long-term temperature goal, global peaking and

climate neutrality, mitigation, sinks and reservoirs, voluntary cooperation/market and non-market based approaches, adaptation, loss and damage, finance, technology and capacity building support, climate change education, training, public awareness, participation and access to information, transparency, implementation and compliance, and global stock take. This decision also sets out measures to enhance actions.

NATIONAL FRAMEWORK STRATEGY ON CLIMATE

The National Framework Strategy on Climate is the Philippines' roadmap in creating a climate risk-resilient Philippines, with a goal in building the country's adaptive capacity and increasing resilience of natural ecosystems and built environment to the changing climate. The Framework serves as the basis for plans, programs, research and development, and monitoring activities to reduce adverse effects and protect vulnerable sectors.

NATIONAL CLIMATE CHANGE ACTION PLAN 2010-2028

With the approval of the National Strategic Framework on Climate Change the Climate Change Commission formulated the National Climate Change Action Plan. The Action Plan is guided by the following Principles.

GUIDING PRINCIPLES OF THE NATIONAL CLIMATE CHANGE ACTION PLAN

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

recognizes the principle of subsidiarity and the role of local governments as front-liners in addressing climate change.

13. The Framework recognizes the value of forming multi-stakeholder participation and partnerships in climate change initiatives, including partnerships with civil society, the private sector and local governments, and especially with indigenous peoples and other marginalized groups most vulnerable to climate change impacts.
14. Policy and incentive mechanisms to facilitate private sector participation in addressing adaptation and mitigation objectives shall be promoted and supported.

Further, the NCCAP developed priority programs, projects and activities to address the urgent needs and concerns relating to the adverse effects of Climate Change. Seven key strategic priorities were identified to address impacts of global warming. These are food security, water sufficiency, environmental and ecological stability, human security, sustainable energy, climate smart industries and services, and knowledge and capacity development.

Table 2. NCCAP Priority Areas and Key Outcomes

Priority Areas	Outcomes
Food Security	The objective of the national strategic priority on food security is to ensure availability, stability, accessibility, and affordability of safe and healthy food amidst climate change.
Water Sufficiency	In light of climate change, however, a comprehensive review and subsequent restructuring of the entire water sector governance is required. It is important as well to assess the resilience of major water resources and infrastructures, manage supply and demand, manage water quality, and promote conservation.
Environmental and Ecological Stability	Ecosystem resilience and environmental stability during the plan period is focused on achieving one immediate outcome: the protection and rehabilitation of critical ecosystems, and the restoration of ecological services.
Human Security	The objective of the human security agenda is to reduce the risks of women and men to climate change and disasters.
Sustainable Energy	NCCAP prioritizes the promotion and expansion of energy efficiency and conservation; the development of sustainable and renewable energy; environmentally sustainable transport; and climate-proofing and rehabilitation of energy systems infrastructures.
Climate Smart Industries and Services	NCCAP prioritizes the creation of green and eco-jobs and sustainable consumption and production. It also focuses on the development of sustainable cities and municipalities.
Knowledge and Capacity Development	The priorities of the NCCAP on knowledge and capacity development are: • Enhanced knowledge on the science of climate change; • Enhanced capacity for climate change adaptation, mitigation and disaster risk • reduction at the local and community level; and • Established gendered climate change knowledge management accessible to all • sectors at the national and local levels.

ALAMINOS LOCAL CLIMATE CHANGE ACTION PLAN

The Municipality's Local Climate Change Action Plan (LCCAP) 2020 - 2022 is primarily anchored on the National Climate Change Action Plan (NCCAP) 2010-2028. The NCCAP which was adopted in April 2010, outlines the country's agenda for adaptation and mitigation for 2011 to 2028. The NCCAP and Laguna CCAP comprehensively addresses the challenges of climate change by providing a policy environment that encourages the participation of the private sector to increase mitigation opportunities towards sustainable development.

VISION OF THE MUNICIPALITY

This section presents the municipality's vision of development and contextual linkage of its development direction within the regional, national, and international climate change frameworks. The vision is translated into the municipality's development framework that sets the thematic priorities of Alaminos in order to achieve the shared vision of development, aspired by the people and its government. Further translation of the vision is presented in the various programs and projects across key development sectors, namely, economic, social, infrastructure, environmental management, disaster risk reduction and management, and institutional development.

"A vibrant and progressive agri-industrial municipality with high-level, responsive services, sustainable and inclusive economy, where God-loving, well-disciplined, and empowered citizenry are living in a safe, resilient and ecologically balanced environment under a transparent, responsible, innovative and unified leadership."

DEVELOPMENT GOALS AND OBJECTIVES

In order to realize the vision of Alaminos into concrete and physical realities, general development goals are formulated. These general goals are:

1. Expand local economic opportunities through sustainable agri-industrial, commercial, and tourism development for all;
2. Ensure high responsive and improved social services are available and accessed by all;
3. Improve natural resources management and enhance ecological integrity of Alaminos, Laguna;
4. Provide adequate, improved and resilient public utilities services and facilities for all;
5. Improved, efficient, and resilient governance and local administration; and
6. A proactive, safe and resilient municipality, where communities have a strong adaptive capacity towards climate change impacts and disaster risks.

The Municipality's Vision, Goals and Objectives shall be translated and reflected to the Local Climate Change Action Plan. The Vision of the Municipality reflects the international and national frameworks on climate change strategies.

VULNERABILITY AND ADAPTATION ASSESSMENT RESULTS

DISASTER PROFILE

HAZARD SUSCEPTIBILITY

According to DENR-MGB, Alaminos have five (5) natural hazards such as flooding, rain-induced landslide, ground shaking, earthquake-induced landslide and soil erosion. Table 3 shows the existing hazards per barangay in Alaminos. Similarly, stakeholders from workshops conducted identified similar hazard events and experiences, except for soil erosion. It is also noted that landslide occurrence was not determined whether it was rain or earthquake induced.

Table 3. Hazards in the Alaminos, Laguna

Barangay	Flood	Rain-Induced Landslide	Ground Shaking	Earthquake-Induced Landslide	Soil Erosion
Poblacion 1			✔		
Poblacion 2		✔	✔		✔
Poblacion 3			✔		✔
Poblacion 4			✔		
Del Carmen	✔	✔	✔		✔
Palma		✔	✔	✔	✔
San Agustin	✔		✔		
San Andres		✔	✔	✔	✔
San Benito	✔		✔		
San Gregorio	✔	✔	✔	✔	✔
San Ildefonso		✔	✔		✔
San Roque	✔	✔	✔		
San Juan		✔	✔		✔
San Miguel		✔	✔	✔	
Sta. Rosa		✔	✔	✔	✔

Source: CDRA workshop, DENR, 2013

FLOOD HAZARD

Flooding hazard in Alaminos is categorized as low, moderate and high susceptibility with a total land area of 126.03 hectares, 20.62 hectares, and 28.68 hectares, respectively. These are within the boundaries of barangays San Benito, San Roque, San Agustin, and San Gregorio (Table 4).

Its characteristic with relatively flat and Climate Type III which is characterized as relatively dry from November to April and wet during the rest of the year can trigger the flooding events. The presence of river and tributaries situated in barangays San Benito and San Agustin can cause the occurrence of flooding in the area. In addition, the intensity of rainfall also contributes to flooding.

The table below shows the area of barangays susceptible to flooding. Overall, the total area susceptible is 175.30 hectares (3.28 percent), and the remaining 5,170.05 hectares are considered not susceptible to flooding.

Table 4. Susceptibility of Alaminos, Laguna to flooding

Level	Barangay	Area per barangay (Ha)	Total Area (Ha)
Not Susceptible	Poblacion 1	43.61	5,170.05
	Poblacion 2	49.37	
	Poblacion 3	111.66	
	Poblacion 4	28.71	
	Del Carmen	257.93	
	Palma	725.36	
	San Agustin	412.97	
	San Andres	494.64	
	San Benito	265.85	
	San Gregorio	844.37	
	San Ildefonso	380.77	
	San Juan	287.32	
	San Miguel	199.89	
	Sta. Rosa	892.86	
	San Roque	174.75	
Low Susceptibility	San Benito	113.24	126.03
	San Agustin	12.79	
Moderate Susceptibility	San Agustin	5.16	20.62
	San Roque	15.46	
High Susceptibility	Del Carmen	0.07	28.68
	San Agustin	8.01	
	San Roque	7.56	
	San Gregorio	13.00	
		Total Area (Ha)	Percentage to total land area
Total area susceptible		175.30	3.28
Total area not susceptible		5,170.05	96.72
Total		5,345.35	100

Source: MPDO GIS computation 2017, DENR, 2013

RAIN-INDUCED LANDSLIDE HAZARD

The geographic location, slope, elevation, soil and rainfall patterns are some of the factors that contribute to rain-induced landslides (RIL) in Alaminos. The total land area susceptible to RIL is 767.37 hectare (21.64%) of the total land area. About 462.05 hectares (13.02%) is classified as moderate susceptibility while low susceptibility has an area of 1,748.59 hectares or 49.32% (Refer to
Table 5). Infrastructure, livelihood and lives of the people in these areas are at risk. Strict implementation of policies and regulations must be observed in these areas to reduce the vulnerabilities and negative impacts, if relocation is not an option for some areas in the municipality.

In terms of low susceptibility, barangay Palma has the highest area susceptible to rain induced landslide with 631.05 hectares while barangay Poblacion 3 is the least with less than one (1) percent of its area is susceptible. For moderately susceptible barangays, barangay Sta. Rosa is the most susceptible having a total of 190.80 hectares (3.57 percent) of its area, while

barangay San Andres is the least with 70.53 hectares (1.32 percent) moderately susceptible. Among the 15 barangays, barangay San Gregorio has the largest area highly susceptible to RIL with 416.98 hectares at risk, followed by barangay Sta. Rosa with 324.08 hectares.

Overall, barangay San Gregorio is the most susceptible to RIL impacts having a total land area of 739.97 hectares exposed to RIL, while barangay Poblacion 3 is the least susceptible. Moreover, areas in barangays Sta. Rosa and San Miguel are possible landslide debris accumulation zone. This means that implementation of laws and regulations pertaining to this concern should be enhanced, such as no build zone.

On the other hand, a total of 2,326.64 hectares (43.53 percent) are not prone to rain-induced landslides. These areas are suitable for sector-specific development.

Changes of precipitation or amount of rainfall directly affect rain-induced hazards. It can be noted that the highest percentage of susceptibility occurs along rivers and riverbanks due to the soil type, existing land cover and land uses.
Table 5 summarizes of level of susceptibility, locations, area and its percentage in Alaminos.

Table 5. Rain-Induced Landslide per Barangay of Alaminos, Laguna

Level	Barangay	Area per barangay (Ha)	Total Area (Ha)	% Total
Not Susceptible	Del Carmen	86.81	2,326.64	43.53
	Palma	4.00		
	Poblacion 1	38.73		
	Poblacion 2	36.45		
	Poblacion 3	111.64		
	Poblacion 4	21.38		
	San Agustin	430.04		
	San Andres	187.00		
	San Benito	379.09		
	San Gregorio	117.41		
	San Ildefonso	254.93		
	San Juan	154.66		
	San Miguel	157.50		
	San Roque	189.81		
	Sta. Rosa	157.21		
Low Susceptibility	Del Carmen	168.15	1,748.59	14.36
	Palma	631.05		
	Poblacion 1	4.88		
	Poblacion 2	7.33		
	Poblacion 3	0.02		
	Poblacion 4	7.33		
	San Agustin	8.89		
	San Andres	237.11		
	San Gregorio	210.34		
	San Ildefonso	125.84		
	San Juan	132.66		
	San Miguel	18.45		
	San Roque	7.42		
	Sta. Rosa	183.51		
Moderate Susceptibility	San Andres	70.53	462.05	8.64
	Palma	88.07		
	San Gregorio	112.65		
	Sta. Rosa	190.80		
High Susceptibility	Palma	2.24	767.37	32.71
	Del Carmen	3.04		
	San Roque	0.53		

Level	Barangay	Area per barangay (Ha)	Total Area (Ha)	% Total
	San Gregorio	416.98		
	San Miguel	20.50		
	Sta. Rosa	324.08		
Landslide Debris Accumulation	San Miguel	3.44	40.70	0.76
	Sta. Rosa	37.26		
			Total Area (Ha)	Percentage to total land area
Total area susceptible			3,018.71	56.47
Total area not susceptible			2,326.64	43.53
Total			5,345.35	100

Source: MPDO GIS computation 2017, DENR, 2013

EARTHQUAKE-INDUCED LANDSLIDE HAZARD

Due to the physical characteristics of Alaminos, which is relatively flat to gently sloping, 62.88 hectares (1.18%) of the total land area is susceptible to earthquake induced landslides (EIL). Portion of barangays San Andres, Palma, San Gregorio, San Miguel, and Sta. Rosa are exposed to earthquake-induced landslide, which is presented in Table 6. This kind of hazard resulted from ground shaking event.

In terms of the level of susceptibility, 58.07 hectares (1.09%) of land has low susceptibility to EIL, while 4.62 hectares (0.09%) have moderate susceptibility. Only barangay Palma has high susceptibility to EIL having 0.19 (0.004%) hectare of its land exposed. Overall, barangay Sta. Rosa is the most susceptible to this hazard with a total of 26.59 hectares land exposed to EIL, while Poblacion 1, Poblacion 2, Poblacion 3, Poblacion 4, San Agustin, San Benito, Del Carmen, San Ildefonso, San Juan, and San Roque are not susceptible at all.

Table 6. Earthquake-Induced Landslide of Alaminos, Laguna

Level of Susceptibility	Barangay	Area (Ha)	Percentage to Total land area
Not Susceptible	Poblacion 1	43.61	98.82
	Poblacion 2	49.37	
	Poblacion 3	111.66	
	Poblacion 4	28.71	
	San Agustin	438.93	
	San Benito	379.09	
	Del Carmen	258	
	San Ildefonso	380.77	
	San Juan	287.32	
	San Roque	197.76	
Low Susceptibility	San Andres	2.77	1.09
	Palma	17.61	
	San Gregorio	9.07	
	San Miguel	3.59	
	Sta. Rosa	25.03	
Moderate Susceptibility	San Andres	0.27	0.09
	Palma	2.36	
	San Gregorio	0.15	
	San Miguel	0.28	

	Sta. Rosa	1.56	
High Susceptibility	San Andres	0.001	0.004
	Palma	0.19	
		Total Area (Ha)	Percentage to total land area
Total area susceptible		62.88	1.184
Total area not susceptible		5,282.47	98.82
Total		5,345.35	100

Source: MPDO GIS computation 2017, DENR-MGB, 2013

GROUND SHAKING

Ground shaking is the most familiar effect of earthquake. The degree of impact depends on the intensity and magnitude and can be directly damaged the buildings and houses, roads, infrastructures.

In Alaminos setting, there are two (2) ground shaking category which are PEIS Intensity VII and VIII with total land area of 2358.30 hectares or 44.12% and 2987.05 or 55.88%, respectively.

Table 7. Ground Shaking Hazard of Alaminos, Laguna

Intensity Scale	Description	Barangay	Area (Ha)	Percentage to Total Land Area
Intensity I (Scarcely Perceptible)	Perceptible to people under favorable circumstance. Delicately balanced objects are disturbed slightly. Still Water in containers oscillates slowly	Not applicable. For presentation purposes only.		
Intensity II (Slightly Felt)	Felt by few individuals at rest indoors. Hanging objects swing slightly. Still Water in containers oscillates noticeably.			
Intensity III (Weak)	Felt by many people indoors especially in upper floors of buildings. Vibration is felt like one passing of a light truck. Dizziness and nausea are experienced by some people. Hanging objects swing moderately. Still water in containers oscillates moderately.			
Intensity IV (Moderately Strong)	Felt generally by people indoors and by some people outdoors. Light sleepers are awakened. Vibration is felt like a passing of heavy truck. Hanging objects swing considerably. Dinner, plates, glasses, windows and doors rattle. Floors and walls of wood framed buildings creak. Standing motor cars may rock slightly. Liquids in containers are slightly disturbed. Water in containers oscillates strongly.			

Intensity Scale	Description	Barangay	Area (Ha)	Percentage to Total Land Area
	Rumbling sound may sometimes be heard.			
Intensity V (Strong)	Generally felt by most people indoors and outdoors. Many sleeping people are awakened. Some are frightened, some run outdoors. Strong shaking and rocking felt throughout building. Hanging objects swing violently. Dining utensils clatter and clink, some are broken. Small, light and unstable objects may fall or overturn. Liquids spill from filled open containers. Standing vehicles rock noticeably. Shaking of leaves and twigs of trees are noticeable.			
Intensity VI (Very Strong)	Many people are frightened; many run outdoors. Some people lose their balance. Motorists feel like driving in flat tires. Heavy objects or furniture move or may be shifted. Small church bells may ring. Wall plaster may crack. Very old or poorly built houses and man-made structures are slightly damaged though well-built structures are not affected. Limited rock falls and rolling boulders occur in hilly to mountainous areas and escarpments. Trees are noticeably shaken.			
Intensity VII (Destructive)	Most people are frightened and run outdoors. People find it difficult to stand in upper floors. Heavy objects and furniture overturn or topple. Big church bells may ring. Old or poorly built structures suffer considerably damage. Some well-built structures are slightly damaged. Some cracks may appear on dikes, fishponds, road surface and concrete hollow block walls. Limited liquefaction, lateral spreading and landslides are observed. Trees are shaken strongly.	Palma, San Miguel, Sta. Rosa, San Gregorio and San Roque	2,358.30	44.12
Intensity VIII (Very Destructive to Completely Devastating)	Numerous landslides and rock falls occur in mountainous and hilly areas Most buildings are totally damaged. Bridges and elevated concrete structures	San Andres, San Juan, Poblacion 1, Poblacion 2, Poblacion 3,	2,987.05	55.88

Intensity Scale	Description	Barangay	Area (Ha)	Percentage to Total Land Area
	are toppled or destroyed. Massive landslides and liquefaction, large-scale subsidence and uplifting of landforms and many ground fissures are observed. Changes in river courses and destructive seiches in large lake occur.	Poblacion 4, San Agustin, Del Carmen, San Benito, San Roque, San Miguel, Palma, and San Ildefonso		
Intensity IX (Devastating)	People are forcibly thrown to ground. Many cry and shake with fear. Most buildings are totally damaged. Bridges and elevated concrete structures are toppled or destroyed. Numerous utility posts, towers and monument are tilted, toppled or broken. Water sewer pipes are bent, twisted or broken. Landslides and liquefaction with lateral spreading and sandboils are widespread. The ground is distorted into undulations. Trees are shaken very violently with some toppled or broken. Boulders are commonly thrown out. River water splashes violently on slops over dikes and banks.	Not applicable. For presentation purposes only.		
Intensity X (Completely Devastating)	Practically all man-made structures are destroyed. Massive landslides and liquefaction, large-scale subsidence and uplifting of land forms and many ground fissures are observed. Changes in river courses and destructive seiches in large lakes occur. Many trees are toppled, broken and uprooted.			

	Total Area (Ha)	Percentage to Total Land Area
Total area susceptible	5,345.35	100
Total area not susceptible	0.00	0
Total	5,345.35	100

Source: PHIVOLCS Earthquake Intensity Scale (PEIS), MPDO GIS computation 2017, DENR-MGB, 2013

SOIL EROSION

Soil erosion hazard have many factors to be consider such as slope, elevation and soil type and more importantly, the influence of water and wind that can create more damage on the soil erosion events.

In Alaminos, about 2,570.01 or 48.08 % of the total land area of the municipality experienced soil erosion hazard. These barangays are San Andres, San Juan, Poblacion 2, Poblacion 3, Del Carmen, San Ildefonso, Palma, Sta. Rosa, and San Gregorio (Refer to Table 8). Barangays Palma, San Gregorio and Sta. Rosa categorized as moderate susceptibility due to its geographical location, slope ranging 18 – 50 percent with an elevation of 286-728 meters above sea level. Moreover, the soil can also resist erosion have greatly affects the effect of high potential erosion.

Further, Macolod clay loam and Mountain soils are present in portion of barangays categorized as moderately susceptible that is in favor to have a good resistance to erosion. However, the extreme and intense rainfall can increase the speed surface runoff resulting to high sediment load, which is directly affect water bodies.

Table 8. Soil Erosion Hazard of Alaminos, Laguna

Erosion Susceptibility	Barangay	Area (Ha)	Total Area (Ha)	Percentage to Total Area Susceptible
No Apparent Erosion	Del Carmen	146.98	2775.34	51.92
	Palma	476.66		
	Poblacion 1	43.61		
	Poblacion 2	13.83		
	Poblacion 3	74.70		
	Poblacion 4	28.71		
	San Agustin	438.93		
	San Benito	379.09		
	San Gregorio	300.87		
	San Ildefonso	186.58		
	San Juan	75.82		
	San Miguel	199.89		
	San Roque	197.76		
	Sta. Rosa	211.94		
Slight Erosion	Del Carmen	111.04	2162.10	40.45
	Palma	200.86		
	Poblacion 2	35.57		
	Poblacion 3	36.96		
	San Andres	494.64		
	San Gregorio	336.32		
	San Ildefonso	194.19		
	San Juan	211.51		
	Sta. Rosa	541.03		
Moderate Erosion	Palma	47.88	407.91	7.63
	San Gregorio	220.19		
	Sta. Rosa	139.88		
			Total Area (Ha)	Percentage to total land area
Total area susceptible			5,345.35	100
Total area not susceptible			0	0
Total			5,345.35	100

Source: MPDO GIS computation 2017, DENR-MGB, 2013

MULTI-HAZARD

The Multi-hazard was based on the identified five (5) hazards in the Municipality. Table 9 summarizes the area susceptible to hazards per barangay.

Only Barangay San Gregorio are susceptible to all hazards. And all barangays are susceptible to earthquake manifested by ground shaking. In barangay San Benito 30% of the area are susceptible to flooding. In barangay Palma, 99% are susceptible to rain-induced landslide. In terms of earthquake-induced landslide, 3% of barangay Palma and Sta.Rosa are susceptible. And 100% of San Andres are susceptible to soil erosion.

Table 9. Summary of Area Susceptible to Hazards per barangay in Alaminos, Laguna

Barangay	Land Area	Flood	RIL	Ground shaking	EIL	Soil Erosion
Palma	725.36	0.00	721.37	725.36	20.16	248.70
Poblacion 1	43.61	0.00	4.88	43.61	0.00	0.00
Poblacion 2	49.37	0.00	12.92	49.37	0.00	35.55
Poblacion 3	111.66	0.00	0.02	111.66	0.00	36.96
Poblacion 4	28.71	0.00	7.33	28.71	0.00	0.00
Del Carmen	258.00	0.07	171.19	258.00	0.00	111.04
San Agustin	428.93	25.96	8.89	428.93	0.00	0.00
San Andres	494.64	0.00	307.63	494.64	3.04	494.64
San Benito	379.09	113.24	0.00	379.09	0.00	0.00
San Gregorio	857.37	13.00	739.97	857.37	9.22	556.51
San Ildefonso	380.77	0.00	125.84	380.77	0.00	194.19
San Juan	287.32	0.00	132.66	287.32	0.00	211.51
San Miguel	199.89	0.00	42.39	199.89	3.88	0.00
San Roque	197.776	23.02	7.96	197.776	0.00	0.00
Santa Rosa	892.86	0.00	735.65	892.86	26.59	680.92

Source: MPDO GIS computation 2017, DENR-MGB, 2013

EXPOSURE, SENSITIVITY, ADAPTIVE CAPACITY AND VULNERABILITY

POPULATION

Population refers to the households' special location and number of potentially affected persons based on demographic characteristics. Population exposure refers to the spatial location and number of potentially affected persons exposed to a particular hazard.

The indicators used to measure the exposure and adaptive capacity for all hazard events in the municipality are as follows:

Table 10. Exposure and Adaptive Capacity Indicators used for the Population system in Alaminos, Laguna

Exposure	Adaptive Capacity
Affected Area Exposed Population Percentage of Exposed Area	Access to financial assistance Access to information Capacity and willingness to retrofit or relocate Government investments

POPULATION EXPOSURE TO HAZARDS

In terms of flooding, only barangays San Gregorio and San Ildefonso have population exposed to flooding hazards, with 2.07 hectares and 0.10 hectares exposed, both with less than one percent of its population. In terms of the barangay area, barangays Del Carmen, San Agustin, San Gregorio, San Ildefonso, and San Roque have areas exposed to flooding. It shall be noted that areas that are exposed to flooding events shall adhere to local and national policies to mitigate and adapt to the impacts of the events.Table 11 shows the summary of the population exposure to flooding events.

Table 11. Population Exposure to Flood Events in Alaminos, Laguna

Barangay	Exposure		
	A	B	C
	Affected area	Exposed pop'n (Ha)	Exposure %
Poblacion 1	0.00	0.00	0.00
Poblacion 2	0.00	0.00	0.00
Poblacion 3	0.00	0.00	0.00
Poblacion 4	0.00	0.00	0.00
Del Carmen	0.07	0.00	0.00
Palma	0.00	0.00	0.00
San Agustin	25.96	0.00	0.00
San Andres	0.00	0.00	0.00
San Benito	0.00	0.00	0.00
San Gregorio	13.00	2.07	0.01
San Ildefonso	113.24	0.00	0.00
San Roque	23.02	0.10	0.00
San Juan	0.00	0.00	0.00
San Miguel	0.00	0.00	0.00
Sta Rosa	0.00	0.00	0.00

Source: CDRA Workshop, MPDO GIS Computation, 2018

As for RIL, barangays San Benito having a 13.50 percent, Santa Rosa with 13.76 percent and San Gregorio with 13.84 percent, have the highest percentage of its population exposed to RIL, while barangays San Andres, Poblacion 3, and Del Carmen are not exposed and susceptible to this type of hazard (refer to Table 12).

Table 12. Population Exposure to RIL Events in Alaminos, Laguna

Barangay	Exposure		
	A	B	C
	Affected area	Exposed pop'n (in ha)	Exposure %
Poblacion 1	4.88	1.39	0.09
Poblacion 2	12.92	6.25	0.24
Poblacion 3	2.21	0.00	0.00
Poblacion 4	7.33	0.74	0.40
Del Carmen	171.19	7.30	3.20
Palma	721.37	15.33	13.50
San Agustin	8.89	0.00	0.00
San Andres	307.63	3.52	5.76
San Benito	0.00	0.00	0.00

Barangay	Exposure		
	A	B	C
	Affected area	Exposed pop'n (in ha)	Exposure %
San Gregorio	739.96	14.93	13.84
San Ildefonso	125.84	0.58	2.35
San Roque	7.96	0.00	0.15
San Juan	132.66	1.33	2.48
San Miguel	42.39	0.02	0.79
Sta Rosa	735.65	0.53	13.76

Source: CDRA Workshop, MPDO GIS Computation, 2018

Earthquake induced landslide only affect populations residing in barangays Palma, San Miguel and Sta. Rosa (refer to Table 16), in terms of percentage of population exposed, all barangays have an insignificant value or less than one (1) percent. Structures and materials used for houses must be in compliance with the National Building Code to ensure that the population is safe and sustain less damage to their properties.

Table 13. Population Exposure to EIL Events in Alaminos, Laguna

Barangay	Exposure		
	A	B	C
	Affected area	Exposed pop'n (in Ha)	Exposure %
Poblacion 1	0.00	0.00	0.00
Poblacion 2	0.00	0.00	0.00
Poblacion 3	0.00	0.00	0.00
Poblacion 4	0.00	0.00	0.00
Del Carmen	0.00	0.00	0.00
Palma	20.16	0.14	0.00
San Agustin	0.00	0.00	0.00
San Andres	3.04	0.00	0.00
San Benito	0.00	0.00	0.00
San Gregorio	9.22	0.00	0.00
San Ildefonso	0.00	0.00	0.00
San Roque	0.00	0.00	0.00
San Juan	0.00	0.00	0.00
San Miguel	3.88	0.03	0.00
Sta Rosa	26.59	0.06	0.00

Source: CDRA Workshop, MPDO GIS Computation, 2018

On the other hand, all barangays are affected by ground shaking (refer to Table 17). Barangay San Agustin has the highest area of population exposed to ground shaking with 41.59 hectares or 0.78 percent of its total population, followed by San Benito with 0.67 percent and Sta. Rosa with 0.49 percent of its population exposed to this hazard event.

Table 14. Population Exposure to Ground Shaking Events in Alaminos, Laguna

Barangay	Exposure		
	A	B	C
	Affected area	Exposed pop'n (in Ha)	Exposure %
Poblacion 1	10.94	10.94	0.20
Poblacion 2	19.22	19.22	0.36
Poblacion 3	22.50	22.50	0.42

Barangay	Exposure		
	A	B	C
	Affected area	Exposed pop'n (in Ha)	Exposure %
Poblacion 4	11.76	11.76	0.22
Del Carmen	7.43	7.43	0.14
Palma	15.34	15.34	0.29
San Agustin	41.59	41.59	0.78
San Andres	19.37	19.37	0.36
San Benito	35.87	35.87	0.67
San Gregorio	17.95	17.95	0.34
San Ildefonso	14.76	14.76	0.28
San Roque	12.56	12.56	0.23
San Juan	20.83	20.83	0.39
San Miguel	14.95	14.95	0.28
Sta Rosa	26.25	26.25	0.49

Source: CDRA Workshop, MPDO GIS Computation, 2018

Population is also exposed to soil erosion, particularly in barangays San Juan and San Andres, being the barangays with the highest percentage of population exposed, having 0.37 percent and 0.36 percent, respectively (refer to Table 15). Barangays Poblacion 1, Poblacion 4, San Agustin, San Benito, San Roque, and San Miguel are not exposed to this type of hazard.

Table 15. Population Exposure to Soil Erosion in Alaminos, Laguna

Barangay	Exposure		
	A	B	C
	Affected area	Exposed pop'n (in Ha)	Exposure %
Poblacion 1	0.00	0.00	0.00
Poblacion 2	35.55	13.74	0.26
Poblacion 3	36.96	8.34	0.16
Poblacion 4	0.00	0.00	0.00
Del Carmen	111.04	0.70	0.01
Palma	248.70	0.47	0.01
San Agustin	0.00	0.00	0.00
San Andres	494.64	19.37	0.36
San Benito	0.00	0.00	0.00
San Gregorio	556.51	2.46	0.05
San Ildefonso	194.19	1.77	0.03
San Roque	0.00	0.00	0.00
San Juan	211.51	19.84	0.37
San Miguel	0.00	0.00	0.00
Sta Rosa	680.92	0.53	0.01

Source: CDRA Workshop, MPDO GIS Computation, 2018

The table below summarizes the degree of impact to hazard events of Alaminos. A degree of impact value of one (1) means that the estimated direct and indirect impacts are low to negligible and can be felt within a short period of time only. All barangays exposed to flooding, ground shaking, and EIL have low degree of impact, while some barangays exposed to RIL and soil erosion have a combination of degree of impact values of two (2) and three (3). A DOI value of two (2) means that the direct and indirect impacts are moderate in terms of number of fatalities and injuries, while a value of three (3) means that the estimated direct and indirect impacts in terms of number of fatalities and injuries are disastrous.

All barangays have low degree of impact score (1) in terms of flooding, earthquake-induced landslide and ground shaking, while rain-induced landslide and soil erosion have varying degree of impact scores.

Table 16. Degree of Impact of Population to Hazard events of Alaminos, Laguna

Barangay	Degree of Impact				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
Poblacion 1	1	1	1	1	1
Poblacion 2	1	1	1	1	1
Poblacion 3	1	1	1	1	1
Poblacion 4	1	1	1	1	1
Del Carmen	1	1	1	1	1
Palma	1	3	1	1	2
San Agustin	1	1	1	1	1
San Andres	1	2	1	1	3
San Benito	1	1	1	1	1
San Gregorio	1	3	1	1	3
San Ildefonso	1	1	1	1	2
San Roque	1	1	1	1	1
San Juan	1	1	1	1	2
San Miguel	1	1	1	1	1
Sta Rosa	1	3	1	1	3

Source: CDRA Workshop

POPULATION ADAPTIVE CAPACITY TO HAZARDS

Four indicators were used to assess the adaptive capacity of the municipality. Access to financial assistance include the five (5) percent disaster risk reduction and management (DRRM) and gender and development (GAD) fund is utilized; 4Ps for beneficiaries, Cash for Work; calamity loan for Govt employees; Financial assistance such as micro-financing, credit cooperatives, banks. All barangays have access to these financial assistances.

In the same way, all barangays have access to information, such as cellphone, radio, television, mega phone; Earthquake Drill conducted every quarter, presence of Early Warning System such as siren and rain gauge; IEC; flyers and maps about CCA-DRR distributed to barangays.

On the other hand, all barangays have no capacity to retrofit however households are willing to relocate if government will provide incentives and other subsidies.

The municipality have investments on the following: rescue vehicle, command center and equipment (e.g. 2-way radio communication, equipment); produce IEC related to extension programs; with current CDP and CLUP (mainstreamed CCA-DRR); LGU has existing partnership with SUC for technology transfer, in which all barangays can use and access.

Table 17. Adaptive Capacity of Population to Hazard events of Alaminos, Laguna

Barangay	Adaptive Capacity			
	Access to financial assistance (%)	Access to information (%)	Capacity and willingness to retrofit or relocate (%)	Government investments (%)
Poblacion 1	100	100	0	100

Poblacion 2	100	100	0	100
Poblacion 3	100	100	0	100
Poblacion 4	100	100	0	100
Del Carmen	100	100	0	100
Palma	100	100	0	100
San Agustin	100	100	0	100
San Andres	100	100	0	100
San Benito	100	100	0	100
San Gregorio	100	100	0	100
San Ildefonso	100	100	0	100
San Roque	100	100	0	100
San Juan	100	100	0	100
San Miguel	100	100	0	100
Sta Rosa	100	100	0	100

Source: CDRA Workshop

POPULATION VULNERABILITY TO HAZARDS

Table 18 below summarizes the vulnerability ratings of Alaminos in terms of its population and hazards. Vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. All urban barangays have low vulnerability ratings while urban barangays have a combination of low and moderate vulnerability ratings. Barangays Palma, San Andres, San Gregorio, San Ildefonso, San Juan, and Sta. Rosa have moderate vulnerability ratings in terms of RIL and soil erosion.

Low vulnerability ratings in these areas can be attributed to low exposure to hazards of the population of Alaminos.

Table 18. Vulnerability Ratings of Population to Hazard events of Alaminos, Laguna using Exposure and Adaptive Capacity indicators

Barangay	Vulnerability				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
Poblacion 1	Low	Low	Low	Low	Low
Poblacion 2	Low	Low	Low	Low	Low
Poblacion 3	Low	Low	Low	Low	Low
Poblacion 4	Low	Low	Low	Low	Low
Del Carmen	Low	Low	Low	Low	Low
Palma	Low	Moderate	Low	Low	Moderate
San Agustin	Low	Low	Low	Low	Low
San Andres	Low	Moderate	Low	Low	Moderate
San Benito	Low	Low	Low	Low	Low
San Gregorio	Low	Moderate	Low	Low	Moderate
San Ildefonso	Low	Low	Low	Low	Moderate
San Roque	Low	Low	Low	Low	Low
San Juan	Low	Low	Low	Low	Moderate
San Miguel	Low	Low	Low	Low	Low
Sta Rosa	Low	Moderate	Low	Low	Moderate

Source: CDRA Workshop, MPDO GIS Computation, 2018

CRITICAL FACILITIES

Critical facilities include elementary schools, day care centers, government offices such as barangay and municipal halls, health centers, police stations, fire stations, transport terminals, among others. These facilities provide key socio-economic support services. Table 22 shows the indicators used for assessing the exposure and adaptive capacity of the municipality. Due to limited information, only the following indicators were used.

Table 19. Exposure and Adaptive Capacity Indicators used for Critical Facilities in Alaminos, Laguna

Exposure	Adaptive Capacity
Facility Type Area in Square Meters	Capacity and willingness to retrofit Available alternative structures Government Investments Available Alternative Sites

CRITICAL FACILITIES EXPOSURE TO HAZARDS

In terms of degree of impact, flooding, RIL, EIL and soil erosions have a value of one (1), while ground shaking has a value of three (3). A value of one (1) has a low degree of impact, which means that the estimated direct and indirect impacts are low to negligible and can be felt within a short period of time. While critical point facilities with a value of three (3) means that the estimated direct and indirect impacts in terms of property damage will be disastrous given the extent of exposure and current sensitivity of the system. The high degree of impact for ground shaking can be attributed to the materials used, age of the buildings and location. Table 23 shows the exposure and degree of impact on critical point facilities in the municipality.

Table 20. Flood Exposure and Degree of impact on critical point facilities in Alaminos, Laguna

Exposure			Degree of Impact score
A	B	C	
Facility Type	Name	Area (Sq.M)	
Barangay Poblacion 1			
Chapel	Chapel	199	1
Chapel	Chapel	100	1
Church	Munting Kawan	83	1
Day Care Center and Barangay Hall	Day Care Center and Barangay Hall	130	1
Elementary School	Cresmat Learning Center	1,452	1
Government Office	Quezon Farmers' Office	365	1
Barangay Poblacion 2			
Vocational School and Senior High School	KCD Technical Institute	3,200	1
Barangay Hall	Barangay Hall	202	1
Chapel	Chapel	178	1
Senior Citizen Building	Senior Citizen	203	1

Exposure			Degree of Impact score
A	B	C	
Facility Type	Name	Area (Sq.M)	
Elementary and Secondary School	Alaminos Elementary School and Alaminos National High School	27,423	1
Barangay Poblacion 3			
Church	Municipal Church	5,860	1
Barangay Hall	Barangay Hall	38	1
Municipal Building	Municipal Building	2,875	1
Rural Health Unit Building	Rural Health Building	229	1
Police Station	Municipal Police Station	151	1
Government Office	Philippine Coconut Authority Provincial Official	9,263	1
Elementary and Secondary School	St. Paul Learning School	469	1
Pre-School*	Palm Valley International School	1,710	1
Elementary, Secondary, College School	Marcelino Fule Memorial College	10,046	1
Church	Mosque	212.64	1
Barangay Poblacion 4			
Water District	Alaminos Water District	301	1
Church	Church of Christ	163	1
Church	Ang Dating Daan Church	162	1
Church	Jesus is the Lord Church	290	1
Pre-School	Reymarie's Pre-School	1,020	1
Chapel	Chapel	44.5	1
Day Care and Barangay Hall	Day Care and Barangay Hall	122	1
Chapel	Chapel	1,387	1
Pre-School and Elementary School	Marantha Christian School	1,515	1
Barangay Del Carmen			
Chapel	Chapel	77.12	1
Elementary School	Elementary School	1647.32	1
Palma			
Barangay Hall	Barangay Hall	130.14	1
Chapel	Chapel	300.95	1
Chapel	Chapel	740.13	1
Elementary School	Palma Elementary School	5185.13	1
San Agustin			
Others	East PAC Base	25.34	1
Chapel	Chapel	185.96	1
Health Center	Health Center	537.26	1
Barangay Hall	Barangay Hall	116.84	1

Exposure			Degree of Impact score
A	B	C	
Facility Type	Name	Area (Sq.M)	
Elementary School	Elementary School	6422.05	1
Secondary School	Fandialan Integrated National Highschool	3842.89	1
San Andres			
Senior Citizen Building	San Andres Senior Citizen	45.3	1
Barangay Hall	San Andres Barangay Hall	127	1
Elementary School	San Andres Elementary School	8,404	1
Chapel	San Andres Chapel	225	1
-	KALK	135	1
San Benito			
Day Care Center	Day Care Center	116.89	1
Barangay Hall	Barangay Hall	143.93	1
Church	Iglesia ni Cristo	382.32	1
Chapel	Chapel	512.13	1
Government Office	Land Transportation Office	10446.95	1
Elementary School	Elementary School	5125.41	1
San Gregorio			
Barangay Hall	Barangay Hall	156.86	1
Chapel	Chapel	523.25	1
Elementary School	Demesa Elementary School	5492.13	1
San Ildefonso			
Church	Iglesia ni Cristo	621	1
Barangay Hall	Barangay Hall	143	1
Elementary School	Elementary School	3,497.46	1
Water Station	Water Station	33.20	1
San Roque			
Barangay Hall	Barangay Hall	304.6	1
Chapel	Chapel	139.36	1
Elementary School	Elementary School	2850.55	1
San Juan			
Chapel	Our Lady of the Pillar Chapel	88	1
Chapel	Chapel	87.3	1
Barangay Hall	Barangay Hall	136	1
Church	Mormons	4,231	1
Church	Iglesia ni Cristo	2,082	1
Church	Kingdom Hall of Jehovah Witness	600	1
Outpost	West PAH Base	125	1
Elementary School	Elementary School	3,946	1
San Miguel			
Chapel	Chapel	109.64	1

Exposure			Degree of Impact score
A	B	C	
Facility Type	Name	Area (Sq.M)	
Chapel	San Pedro Calungsod Parish	618.42	1
Barangay Hall	Barangay Hall	357.44	1
Elementary School	Elementary School	4855.37	1
Sta Rosa			
Barangay Hall	Barangay Hall	290.63	1
Elementary School	Elementary School	5792.71	1
Chapel	Chapel	292.98	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 21: Rain-induced Landslide Exposure and Degree of impact on critical point facilities in Alaminos, Laguna

Exposure			Degree of impact score
A	B	C	
Facility Type	Name	Area (Sq. M)	
Barangay Poblacion 1			
Chapel	Poblacion 1 Chapel	199	1
Chapel	Poblacion 1 Chapel	100	1
Church	Munting Kawan	83	1
Day Care Center and Barangay Hall	Poblacion 1 Day Care Center and Barangay Hall	130	1
Elementary School*	Cresmat Learning Center	1,452	1
Government Office	Quezon Farmers' Office	365	1
Barangay Poblacion 2			
Vocational School and Senior High School	KCD Technical Institute	3,200	1
Barangay Hall	Poblacion 2 Barangay Hall	202	1
Chapel	Poblacion 2 Chapel	178	1
Senior Citizen Building	Barangay 2 Senior Citizen	203	1
Elementary and Secondary School	Alaminos Elementary School and Alaminos National High School	27,423	1
Barangay Poblacion 3			
Church	Municipal Church	5,860	1
Barangay Hall	Poblacion 3 Barangay Hall	38	1
Municipal Building	Alaminos Municipal Building	2,875	1

Exposure			Degree of impact score
A	B	C	
Facility Type	Name	Area (Sq. M)	
Rural Helath Unit Building	Alaminos Rural Health Building	229	1
Police Station	Alaminos Municipal Police Station	151	1
Government Office	Philippine Coconut Authority Provincial Official	9,263	1
Elementary and Secondary School	St. Paul Learning School	469	1
Pre-School*	Palm Valley International School	1,710	1
Elementary Secondary College School	Marcelino Fule Memorial College	10,046	1
Church	Mosque	212.64	1
Barangay Poblacion 4			
Water District	Alaminos Water District	301	1
Church	Church of Christ	163	1
Church	Ang Dating Daan Church	162	1
Church	Jesus is the Lord Church	290	1
Pre-School	Reymarie's Pre-School	1,020	1
Chapel	Poblacion 4 Chapel	44.5	1
Day Care and Barangay Hall	Poblacion 4 Day Care and Barangay Hall	122	1
Chapel	Poblacion 4 Chapel	1,387	1
Pre-School and Elementary School	Marantha Christian School	1,515	1
Barangay Del Carmen			
Chapel	Del Carmen Chapel	77.12	1
Elementary School	Del Carmen Elementary School	1647.32	1
Barangay Palma			
Barangay Hall	Palma Barangay Hall	130.14	1
Chapel	Palma Chapel	300.95	1
Chapel	Palma Chapel	740.13	1
Elementary School	Palma Elementary School	5185.13	1
Barangay San Agustin			
***	East PAC Base	25.34	1

Exposure			Degree of impact score
A	B	C	
Facility Type	Name	Area (Sq. M)	
Chapel	San Agustin Chapel	185.96	1
Health Center	San Agustin Health Center	537.26	1
Barangay Hall	San Agustin Barangay Hall	116.84	1
Elementary School	San Agustin Elementary School	6422.05	1
Secondary School	Buenaventura Fandialan Integrated National Highschool	3842.89	1
Barangay San Andres			
Senior Citizen Building	San Andres Senior Citizen	45.3	1
Barangay Hall	San Andres Barangay Hall	127	1
Elementary School	San Andres Elementary School	8,404	1
Chapel	San Andres Chapel	225	1
Others	KALK	135	1
Barangay San Benito			
Day Care Center	San Benito Day Care Center	116.89	1
Barangay Hall	San Benito Barangay Hall	143.93	1
Church	Iglesia ni Cristo	382.32	1
Chapel	San Benito Chapel	512.13	1
Government Office	Land Transportation Office - Provincial	10446.95	1
Elementary School	San Benito Elementary School	5125.41	1
Barangay San Gregorio			
Barangay Hall	San Gregorio Barangay Hall	156.86	1
Chapel	San Gregorio Chapel	523.25	1
Elementary School	Demesa Elementary School	5492.13	1
Barangay San Ildefonso			
Church	Iglesia ni Cristo	621	1
Barangay Hall	San Juan Barangay Hall	143	1
Elementary School	San Ildefonso Elementary School	3,497.46	1

Exposure			Degree of impact score
A	B	C	
Facility Type	Name	Area (Sq. M)	
Water Station	San Ildefonso Water Station	33.20	1
Barangay San Roque			
Barangay Hall	San Roque Barangay Hall	304.6	1
Chapel	San Roque Chapel	139.36	1
Elementary School	San Roque Elementary School	2850.55	1
Barangay San Juan			
Chapel	San Juan - Our Lady of the Pillar Chapel	88	1
Chapel	San Juan Chapel	87.3	1
Barangay Hall	San Juan Barangay Hall	136	1
Church	Mormons	4,231	1
Church	Iglesia ni Cristo	2,082	1
Church	Kingdom Hall of Jehovah Witness	600	1
Outpost	West PAH Base	125	1
Elementary School	San Juan Elementary School	3,946	1
Barangay San Miguel			
Chapel	San Miguel Chapel	109.64	1
Chapel	San Pedro Calungsod Parish	618.42	1
Barangay Hall	San Miguel Barangay Hall	357.44	1
Elementary School	San Miguel Elementary School	4855.37	1
Barangay Sta Rosa			
Barangay Hall	Sta Rosa Barangay Hall	290.63	1
Elementary School	Sta Rosa Elementary School	5792.71	1
Chapel	Sta Rosa Chapel	292.98	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 22. Earthquake-induced Landslide Exposure and Degree of impact on critical point facilities in Alaminos, Laguna

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
Poblacion 1	Chapel	Poblacion 1 Chapel	199	1
Poblacion 1	Chapel	Poblacion 1 Chapel	100	1

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
Poblacion 1	Church	Munting Kawan	83	1
Poblacion 1	Day Care Center and Barangay Hall	Poblacion 1 Day Care Center and Barangay Hall	130	1
Poblacion 1	Elementary School*	Cresmat Learning Center	1,452	1
Poblacion 1	Government Office	Quezon Farmers' Office	365	1
Poblacion 2	Vocational School and Senior High School	KCD Technical Institute	3,200	1
Poblacion 2	Barangay Hall	Poblacion 2 Barangay Hall	202	1
Poblacion 2	Chapel	Poblacion 2 Chapel	178	1
Poblacion 2	Senior Citizen Building	Barangay 2 Senior Citizen	203	1
Poblacion 2	Elementary and Secondary School	Alaminos Elementary School and Alaminos National High School	27,423	1
Poblacion 3	Church	Municipal Church	5,860	1
Poblacion 3	Barangay Hall	Poblacion 3 Barangay Hall	38	1
Poblacion 3	Municipal Building	Alaminos Municipal Building	2,875	1
Poblacion 3	Rural Helath Unit Building	Alaminos Rural Health Building	229	1
Poblacion 3	Police Station	Alaminos Municipal Police Station	151	1
Poblacion 3	Government Office	Philippine Coconut Authority Provincial Official	9,263	1
Poblacion 3	Elementary and Secondary School	St. Paul Learning School	469	1
Poblacion 3	Pre-School*	Palm Valley International School	1,710	1
Poblacion 3	Elementary Secondary College School	Marcelino Fule Memorial College	10,046	1
Poblacion 3	Church	Mosque	212.64	1
Poblacion 4	Water District	Alaminos Water District	301	1
Poblacion 4	Church	Church of Christ	163	1
Poblacion 4	Church	Ang Dating Daan Church	162	1
Poblacion 4	Church	Jesus is the Lord Church	290	1
Poblacion 4	Pre-School	Reymarie's Pre-School	1,020	1

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
Poblacion 4	Chapel	Poblacion 4 Chapel	44.5	1
Poblacion 4	Day Care and Barangay Hall	Poblacion 4 Day Care and Barangay Hall	122	1
Poblacion 4	Chapel	Poblacion 4 Chapel	1,387	1
Poblacion 4	Pre-School and Elementary School	Marantha Christian School	1,515	1
Del Carmen	Chapel	Del Carmen Chapel	77.12	1
Del Carmen	Elementary School	Del Carmen Elementary School	1647.32	1
Palma	Barangay Hall	Palma Barangay Hall	130.14	1
Palma	Chapel	Palma Chapel	300.95	1
Palma	Chapel	Palma Chapel	740.13	1
Palma	Elementary School	Palma Elementary School	5185.13	1
San Agustin	***	East PAC Base	25.34	1
San Agustin	Chapel	San Agustin Chapel	185.96	1
San Agustin	Health Center	San Agustin Health Center	537.26	1
San Agustin	Barangay Hall	San Agustin Barangay Hall	116.84	1
San Agustin	Elementary School	San Agustin Elementary School	6422.05	1
San Agustin	Secondary School	Buenaventura Fandialan Integrated National Highschool	3842.89	1
San Andres	Senior Citizen Building	San Andres Senior Citizen	45.3	1
San Andres	Barangay Hall	San Andres Barangay Hall	127	1
San Andres	Elementary School	San Andres Elementary School	8,404	1
San Andres	Chapel	San Andres Chapel	225	1
San Andres	***	KALK	135	1
San Benito	Day Care Center	San Benito Day Care Center	116.89	1
San Benito	Barangay Hall	San Benito Barangay Hall	143.93	1
San Benito	Church	Iglesia ni Cristo	382.32	1
San Benito	Chapel	San Benito Chapel	512.13	1
San Benito	Government Office	Land Transportation Office - Provincial	10446.95	1
San Benito	Elementary School	San Benito Elementary School	5125.41	1
San Gregorio	Barangay Hall	San Gregorio Barangay Hall	156.86	1
San Gregorio	Chapel	San Gregorio Chapel	523.25	1

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
San Gregorio	Elementary School	Demesa Elementary School	5492.13	1
San Ildefonso	Church	Iglesia ni Cristo	621	1
San Ildefonso	Barangay Hall	San Juan Barangay Hall	143	1
San Ildefonso	Elementary School	San Ildefonso Elementary School	3,497.46	1
San Ildefonso	Water Station	San Ildefonso Water Station	33.20	1
San Roque	Barangay Hall	San Roque Barangay Hall	304.6	1
San Roque	Chapel	San Roque Chapel	139.36	1
San Roque	Elementary School	San Roque Elementary School	2850.55	1
San Juan	Chapel	San Juan - Our Lady of the Pillar Chapel	88	1
San Juan	Chapel	San Juan Chapel	87.3	1
San Juan	Barangay Hall	San Juan Barangay Hall	136	1
San Juan	Church	Mormons	4,231	1
San Juan	Church	Iglesia ni Cristo	2,082	1
San Juan	Church	Kingdom Hall of Jehovah Witness	600	1
San Juan	Outpost	West PAH Base	125	1
San Juan	Elementary School	San Juan Elementary School	3,946	1
San Miguel	Chapel	San Miguel Chapel	109.64	1
San Miguel	Chapel	San Pedro Calungsod Parish	618.42	1
San Miguel	Barangay Hall	San Miguel Barangay Hall	357.44	1
San Miguel	Elementary School	San Miguel Elementary School	4855.37	1
Sta Rosa	Barangay Hall	Sta Rosa Barangay Hall	290.63	1
Sta Rosa	Elementary School	Sta Rosa Elementary School	5792.71	1
Sta Rosa	Chapel	Sta Rosa Chapel	292.98	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 23. Ground Shaking Exposure and Degree of impact on critical point facilities in Alaminos, Laguna

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
Poblacion 1	Chapel	Poblacion 1 Chapel	199	3
Poblacion 1	Chapel	Poblacion 1 Chapel	100	3
Poblacion 1	Church	Munting Kawan	83	3
Poblacion 1	Day Care Center and Barangay Hall	Poblacion 1 Day Care Center and Barangay Hall	130	3
Poblacion 1	Elementary School*	Cresmat Learning Center	1,452	3
Poblacion 1	Government Office	Quezon Farmers' Office	365	3
Poblacion 2	Vocational School and Senior High School	KCD Technical Institute	3,200	3
Poblacion 2	Barangay Hall	Poblacion 2 Barangay Hall	202	3
Poblacion 2	Chapel	Poblacion 2 Chapel	178	3
Poblacion 2	Senior Citizen Building	Barangay 2 Senior Citizen	203	3
Poblacion 2	Elementary and Secondary School	Alaminos Elementary School and Alaminos National High School	27,423	3
Poblacion 3	Church	Municipal Church	5,860	3
Poblacion 3	Barangay Hall	Poblacion 3 Barangay Hall	38	3
Poblacion 3	Municipal Building	Alaminos Municipal Building	2,875	3
Poblacion 3	Rural Helath Unit Building	Alaminos Rural Health Building	229	3
Poblacion 3	Police Station	Alaminos Municipal Police Station	151	3
Poblacion 3	Government Office	Philippine Coconut Authority Provincial Official	9,263	3
Poblacion 3	Elementary and Secondary School	St. Paul Learning School	469	3
Poblacion 3	Pre-School*	Palm Valley International School	1,710	3
Poblacion 3	Elementary Secondary College School	Marcelino Fule Memorial College	10,046	3
Poblacion 3	Church	Mosque	212.64	3
Poblacion 4	Water District	Alaminos Water District	301	3
Poblacion 4	Church	Church of Christ	163	3
Poblacion 4	Church	Ang Dating Daan Church	162	3

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
Poblacion 4	Church	Jesus is the Lord Church	290	3
Poblacion 4	Pre-School	Reymarie's Pre-School	1,020	3
Poblacion 4	Chapel	Poblacion 4 Chapel	44.5	3
Poblacion 4	Day Care and Barangay Hall	Poblacion 4 Day Care and Barangay Hall	122	3
Poblacion 4	Chapel	Poblacion 4 Chapel	1,387	3
Poblacion 4	Pre-School and Elementary School	Marantha Christian School	1,515	3
Del Carmen	Chapel	Del Carmen Chapel	77.12	3
Del Carmen	Elementary School	Del Carmen Elementary School	1647.32	3
Palma	Barangay Hall	Palma Barangay Hall	130.14	3
Palma	Chapel	Palma Chapel	300.95	3
Palma	Chapel	Palma Chapel	740.13	3
Palma	Elementary School	Palma Elementary School	5185.13	3
San Agustin	Others	East PAC Base	25.34	3
San Agustin	Chapel	San Agustin Chapel	185.96	3
San Agustin	Health Center	San Agustin Health Center	537.26	3
San Agustin	Barangay Hall	San Agustin Barangay Hall	116.84	3
San Agustin	Elementary School	San Agustin Elementary School	6422.05	3
San Agustin	Secondary School	Buenaventura Fandialan Integrated National Highschool	3842.89	3
San Andres	Senior Citizen Building	San Andres Senior Citizen	45.3	3
San Andres	Barangay Hall	San Andres Barangay Hall	127	3
San Andres	Elementary School	San Andres Elementary School	8,404	3
San Andres	Chapel	San Andres Chapel	225	3
San Andres	Others	KALK	135	3
San Benito	Day Care Center	San Benito Day Care Center	116.89	3
San Benito	Barangay Hall	San Benito Barangay Hall	143.93	3
San Benito	Church	Iglesia ni Cristo	382.32	3
San Benito	Chapel	San Benito Chapel	512.13	3
San Benito	Government Office	Land Transportation Office - Provincial	10446.95	3
San Benito	Elementary School	San Benito Elementary School	5125.41	3

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
San Gregorio	Barangay Hall	San Gregorio Barangay Hall	156.86	3
San Gregorio	Chapel	San Gregorio Chapel	523.25	3
San Gregorio	Elementary School	Demesa Elementary School	5492.13	3
San Ildefonso	Church	Iglesia ni Cristo	621	3
San Ildefonso	Barangay Hall	San Juan Barangay Hall	143	3
San Ildefonso	Elementary School	San Ildefonso Elementary School	3,497.46	3
San Ildefonso	Water Station	San Ildefonso Water Station	33.20	3
San Roque	Barangay Hall	San Roque Barangay Hall	304.6	3
San Roque	Chapel	San Roque Chapel	139.36	3
San Roque	Elementary School	San Roque Elementary School	2850.55	3
San Juan	Chapel	San Juan - Our Lady of the Pillar Chapel	88	3
San Juan	Chapel	San Juan Chapel	87.3	3
San Juan	Barangay Hall	San Juan Barangay Hall	136	3
San Juan	Church	Mormons	4,231	3
San Juan	Church	Iglesia ni Cristo	2,082	3
San Juan	Church	Kingdom Hall of Jehovah Witness	600	3
San Juan	Outpost	West PAH Base	125	3
San Juan	Elementary School	San Juan Elementary School	3,946	3
San Miguel	Chapel	San Miguel Chapel	109.64	3
San Miguel	Chapel	San Pedro Calungsod Parish	618.42	3
San Miguel	Barangay Hall	San Miguel Barangay Hall	357.44	3
San Miguel	Elementary School	San Miguel Elementary School	4855.37	3
Sta Rosa	Barangay Hall	Sta Rosa Barangay Hall	290.63	3
Sta Rosa	Elementary School	Sta Rosa Elementary School	5792.71	3
Sta Rosa	Chapel	Sta Rosa Chapel	292.98	3

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 24. Soil Erosion Exposure and Degree of impact on critical point facilities in Alaminos, Laguna

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
Poblacion 1	Chapel	Poblacion 1 Chapel	199	1
Poblacion 1	Chapel	Poblacion 1 Chapel	100	1
Poblacion 1	Church	Munting Kawan	83	1
Poblacion 1	Day Care Center and Barangay Hall	Poblacion 1 Day Care Center and Barangay Hall	130	1
Poblacion 1	Elementary School*	Cresmat Learning Center	1,452	1
Poblacion 1	Government Office	Quezon Farmers' Office	365	1
Poblacion 2	Vocational School and Senior High School	KCD Technical Institute	3,200	1
Poblacion 2	Barangay Hall	Poblacion 2 Barangay Hall	202	1
Poblacion 2	Chapel	Poblacion 2 Chapel	178	1
Poblacion 2	Senior Citizen Building	Barangay 2 Senior Citizen	203	1
Poblacion 2	Elementary and Secondary School	Alaminos Elementary School and Alaminos National High School	27,423	1
Poblacion 3	Church	Municipal Church	5,860	1
Poblacion 3	Barangay Hall	Poblacion 3 Barangay Hall	38	1
Poblacion 3	Municipal Building	Alaminos Municipal Building	2,875	1
Poblacion 3	Rural Health Unit Building	Alaminos Rural Health Building	229	1
Poblacion 3	Police Station	Alaminos Municipal Police Station	151	1
Poblacion 3	Government Office	Philippine Coconut Authority Provincial Official	9,263	1
Poblacion 3	Elementary and Secondary School	St. Paul Learning School	469	1
Poblacion 3	Pre-School*	Palm Valley International School	1,710	1
Poblacion 3	Elementary Secondary College School	Marcelino Fule Memorial College	10,046	1
Poblacion 3	Church	Mosque	212.64	1
Poblacion 4	Water District	Alaminos Water District	301	1
Poblacion 4	Church	Church of Christ	163	1

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
Poblacion 4	Church	Ang Dating Daan Church	162	1
Poblacion 4	Church	Jesus is the Lord Church	290	1
Poblacion 4	Pre-School	Reymarie's Pre-School	1,020	1
Poblacion 4	Chapel	Poblacion 4 Chapel	44.5	1
Poblacion 4	Day Care and Barangay Hall	Poblacion 4 Day Care and Barangay Hall	122	1
Poblacion 4	Chapel	Poblacion 4 Chapel	1,387	1
Poblacion 4	Pre-School and Elementary School	Marantha Christian School	1,515	1
Del Carmen	Chapel	Del Carmen Chapel	77.12	1
Del Carmen	Elementary School	Del Carmen Elementary School	1647.32	1
Palma	Barangay Hall	Palma Barangay Hall	130.14	1
Palma	Chapel	Palma Chapel	300.95	1
Palma	Chapel	Palma Chapel	740.13	1
Palma	Elementary School	Palma Elementary School	5185.13	1
San Agustin	***	East PAC Base	25.34	1
San Agustin	Chapel	San Agustin Chapel	185.96	1
San Agustin	Health Center	San Agustin Health Center	537.26	1
San Agustin	Barangay Hall	San Agustin Barangay Hall	116.84	1
San Agustin	Elementary School	San Agustin Elementary School	6422.05	1
San Agustin	Secondary School	Buenaventura Fandialan Integrated National Highschool	3842.89	1
San Andres	Senior Citizen Building	San Andres Senior Citizen	45.3	1
San Andres	Barangay Hall	San Andres Barangay Hall	127	1
San Andres	Elementary School	San Andres Elementary School	8,404	1
San Andres	Chapel	San Andres Chapel	225	1
San Andres	Others	KALK	135	1
San Benito	Day Care Center	San Benito Day Care Center	116.89	1
San Benito	Barangay Hall	San Benito Barangay Hall	143.93	1
San Benito	Church	Iglesia ni Cristo	382.32	1
San Benito	Chapel	San Benito Chapel	512.13	1

Barangay	Exposure			Degree of impact score
	A	B	C	
	Facility Type	Name	Area (Sq. M)	
San Benito	Government Office	Land Transportation Office - Provincial	10446.95	1
San Benito	Elementary School	San Benito Elementary School	5125.41	1
San Gregorio	Barangay Hall	San Gregorio Barangay Hall	156.86	1
San Gregorio	Chapel	San Gregorio Chapel	523.25	1
San Gregorio	Elementary School	Demesa Elementary	5492.13	1
San Ildefonso	Church	Iglesia ni Cristo	621	1
San Ildefonso	Barangay Hall	San Juan Barangay Hall	143	1
San Ildefonso	Elementary School	San Ildefonso Elementary School	3,497.46	1
San Ildefonso	Water Station	San Ildefonso Water Station	33.20	1
San Roque	Barangay Hall	San Roque Barangay Hall	304.6	1
San Roque	Chapel	San Roque Chapel	139.36	1
San Roque	Elementary School	San Roque Elementary School	2850.55	1
San Juan	Chapel	San Juan - Our Lady of the Pillar Chapel	88	1
San Juan	Chapel	San Juan Chapel	87.3	1
San Juan	Barangay Hall	San Juan Barangay Hall	136	1
San Juan	Church	Mormons	4,231	1
San Juan	Church	Iglesia ni Cristo	2,082	1
San Juan	Church	Kingdom Hall of Jehovah Witness	600	1
San Juan	Outpost	West PAH Base	125	1
San Juan	Elementary School	San Juan Elementary School	3,946	1
San Miguel	Chapel	San Miguel Chapel	109.64	1
San Miguel	Chapel	San Pedro Calungsod Parish	618.42	1
San Miguel	Barangay Hall	San Miguel Barangay Hall	357.44	1
San Miguel	Elementary School	San Miguel Elementary School	4855.37	1
Sta Rosa	Barangay Hall	Sta Rosa Barangay Hall	290.63	1
Sta Rosa	Elementary School	Sta Rosa Elementary School	5792.71	1
Sta Rosa	Chapel	Sta Rosa Chapel	292.98	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

CRITICAL FACILITIES ADAPTIVE CAPACITY TO HAZARDS

All barangays have no capacity to retrofit however households are willing to relocate, if it is subsidized by the government. On the other hand, barangays have available alternative sites, structures to use in case of any damage or disruption of services. These alternative sites include schools, barangay hall, and day care centers. In addition, the LGU have infrastructure programs such as construction of canal, barangay rural health.

Table 25. Adaptive Capacity of Critical Point Facilities to Hazard events of Alaminos, Laguna

Barangay	Adaptive Capacity			
	Capacity and willingness to retrofit (%)	Available alternative structures (Yes or No)	Government investments (%)	Available Alternative Sites (Yes or No)
Poblacion 1	0	Yes	100	Yes
Poblacion 2	0	Yes	100	Yes
Poblacion 3	0	Yes	100	Yes
Poblacion 4	0	Yes	100	Yes
Del Carmen	0	Yes	100	Yes
Palma	0	Yes	100	Yes
San Agustin	0	Yes	100	Yes
San Andres	0	Yes	100	Yes
San Benito	0	Yes	100	Yes
San Gregorio	0	Yes	100	Yes
San Ildefonso	0	Yes	100	Yes
San Roque	0	Yes	100	Yes
San Juan	0	Yes	100	Yes
San Miguel	0	Yes	100	Yes
Sta Rosa	0	Yes	100	Yes

Source: CDRA Workshop

CRITICAL FACILITIES VULNERABILITY TO HAZARDS

In terms of vulnerability ratings, only ground shaking has a moderate vulnerability rating, while all barangays have low vulnerability ratings in flooding, RIL, EIL and soil erosion. This low vulnerability can be attributed to low exposure, sensitivity and high adaptive capacity of facilities to hazards.

The table below summarizes the vulnerability ratings of Alaminos in terms of its critical point facilities and hazards.

Table 26. Vulnerability Ratings of Critical Point Facilities to Hazard events of Alaminos, Laguna using Exposure and Adaptive Capacity indicators

Barangay	Vulnerability				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
Poblacion 1	Low	Low	Low	Moderate	Low
Poblacion 2	Low	Low	Low	Moderate	Low

Barangay	Vulnerability				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
Poblacion 3	Low	Low	Low	Moderate	Low
Poblacion 4	Low	Low	Low	Moderate	Low
Del Carmen	Low	Low	Low	Moderate	Low
Palma	Low	Low	Low	Moderate	Low
San Agustin	Low	Low	Low	Moderate	Low
San Andres	Low	Low	Low	Moderate	Low
San Benito	Low	Low	Low	Moderate	Low
San Gregorio	Low	Low	Low	Moderate	Low
San Ildefonso	Low	Low	Low	Moderate	Low
San Roque	Low	Low	Low	Moderate	Low
San Juan	Low	Low	Low	Moderate	Low
San Miguel	Low	Low	Low	Moderate	Low
Sta Rosa	Low	Low	Low	Moderate	Low

Source: CDRA Workshop, MPDO GIS Computation, 2018

PRODUCTION AREA

Production areas pertain to natural resource areas utilized for crop, fisheries, and forestland production. In the case of the municipality, only crop production is applicable and therefore used for this assessment. Coconut with cropland mixed is used as the dominant crop of the municipality.

Table 27. Exposure and Adaptive Capacity Indicators used for Production Areas in Alaminos, Laguna

Exposure	Adaptive Capacity
Area by Dominant Crop Exposed Area Exposure %	Access to financing Alternative Livelihood Government Extension Program Government Infrastructure Programs

PRODUCTION AREA EXPOSURE TO HAZARDS

Barangays San Agustin, San Benito, Del Carmen, San Gregorio, and San Roque have production areas exposed to flooding. With barangay San Benito having the highest percentage of area exposed with 0.308 percent of its total production area.

Table 28. Flooding Exposure and Degree of impact on Production Areas in Alaminos, Laguna

Barangay	Exposure			Degree of Impact
	A	B	C	
	Area by Dominant Crop (Ha)	Exposed Area (Ha)	Exposure (%)	
Poblacion 1	27.376313	0.00	0.00	1
Poblacion 2	8.79	0.00	0.00	1
Poblacion 3	74.577	0.00	0.00	1
Poblacion 4	12.048	0.00	0.00	1
Del Carmen	244.568	0.052	0.00021	2
Palma	663.83	0.00	0.00	3
San Agustin	369.815	23.29	0.063	3

Barangay	Exposure			Degree of Impact
	A	B	C	
	Area by Dominant Crop (Ha)	Exposed Area (Ha)	Exposure (%)	
San Andres	452.632	0.00	0.00	3
San Benito	319.192	98.25	0.308	3
San Gregorio	879.815	3.68076	0.0042	3
San Ildefonso	349.067	0.00	0.00	2
San Roque	172.319	19.94	0.116	2
San Juan	225.667	0.00	0.00	2
San Miguel	165.481	0.00	0.00	1
Sta Rosa	839.004	0.00	0.00	3

Source: CDRA Workshop, MPDO GIS Computation, 2018

In terms of RIL, barangays Poblacion 4, Del Carmen, San Ildefonso, San Juan and Sta Rosa are top five barangays with the highest percentage of its production area exposed to this type of hazard.

Table 29. Rain-Induced Landslide Exposure and Degree of impact on Production Areas in Alaminos, Laguna

Barangay	Exposure			Degree of Impact
	A	B	C	
	Area by Dominant Crop (Ha)	Exposed Area (Ha)	Exposure (%)	
Poblacion 1	27.38	3.214	0.117	1
Poblacion 2	8.79	0.614	0.070	1
Poblacion 3	74.58	0.022	0.0003	1
Poblacion 4	12.05	4.050	0.336	1
Del Carmen	244.57	158.42	0.648	1
Palma	663.83	675.178	1.017	1
San Agustin	369.2	8.883	0.024	3
San Andres	452.632	290.679	0.642	3
San Benito	319.192	0.039	0.0001	3
San Gregorio	879.815	896.708	1.0192	3
San Ildefonso	349.067	113.084	0.324	2
San Roque	172.319	7.958	0.046	3
San Juan	225.667	115.3	0.511	1
San Miguel	165.481	41.4	0.250	1
Sta Rosa	839.004	741.414	0.884	2

Source: CDRA Workshop, MPDO GIS Computation, 2018

On the other hand, all urban barangays are not exposed to earthquake induced landslide, however, barangays Palma, San Andres, San Gregorio, San Miguel and Sta Rosa have areas exposed to EIL, with barangays Palma and Sta. Rosa having the highest percentage among all barangays.

Table 30. Earthquake-Induced Landslide Exposure and Degree of impact on Production Areas in Alaminos, Laguna

Barangay	Exposure			Degree of Impact
	A	B	C	
	Area by Dominant Crop (Ha)	Exposed Area (Ha)	Exposure (%)	
Poblacion 1	27.376	0.00	0.00	1
Poblacion 2	8.79	0.00	0.00	1
Poblacion 3	74.577	0.00	0.00	1
Poblacion 4	12.048	0.00	0.00	1
Del Carmen	244.568	0.00	0.00	2
Palma	663.83	19.879	0.030	3
San Agustin	369.815	0.00	0.00	3
San Andres	452.632	3.04	0.007	3
San Benito	319.192	0.00	0.00	2
San Gregorio	879.815	8.891	0.010	3
San Ildefonso	349.067	0.00	0.00	2
San Roque	172.3187	0.00	0.00	1
San Juan	225.667	0.00	0.00	2
San Miguel	165.481	3.852	0.023	2
Sta Rosa	839.004	24.848	0.030	3

Source: CDRA Workshop, MPDO GIS Computation, 2018

In terms of ground shaking exposure, all barangays are exposed to this type of hazard.

Table 31. Ground Shaking Exposure and Degree of impact on Production Areas in Alaminos, Laguna

Barangay	Exposure			Degree of Impact
	A	B	C	
	Area by Dominant Crop (Ha)	Exposed Area (Ha)	Exposure (%)	
Poblacion 1	27.376313	27.376313	1.00	1
Poblacion 2	8.79	8.79	1.00	1
Poblacion 3	74.577	74.577	1.00	1
Poblacion 4	12.048	12.048	1.00	1
Del Carmen	244.568	244.568	1.00	1
Palma	663.83	663.83	1.00	1
San Agustin	369.815	369.815	1.00	1
San Andres	452.632	452.632	1.00	1
San Benito	319.192	320.665	1.005	1
San Gregorio	879.815	879.815	1.00	1
San Ildefonso	349.067	349.067	1.00	1

San Roque	172.319	172.318	0.999	1
San Juan	225.667	225.667	1.00	1
San Miguel	165.481	165.481	1.00	1
Sta Rosa	839.004	839.004	1.00	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 32. Soil Erosion Exposure and Degree of impact on Production Areas in Alaminos, Laguna

Barangay	Exposure			Degree of Impact
	A	B	C	
	Area by Dominant Crop (Ha)	Exposed Area (Ha)	Exposure (%)	
Poblacion 1	27.376	0.00	0.00	1
Poblacion 2	8.79	8.059	0.917	1
Poblacion 3	74.577	24.015	0.322	1
Poblacion 4	12.048	0.00	0.00	1
Del Carmen	244.568	106.193	0.434	2
Palma	663.83	243.183	0.366	3
San Agustin	369.815	0.00	0.00	3
San Andres	452.632	452.632	1.00	3
San Benito	319.192	0.00	0.00	2
San Gregorio	879.815	601.659	0.684	3
San Ildefonso	349.067	182.011	0.521	3
San Roque	172.319	0.00	0.00	1
San Juan	225.667	157.279	0.697	3
San Miguel	165.481	0.00	0.00	1
Sta Rosa	839.004	658.213	0.785	3

Source: CDRA Workshop, MPDO GIS Computation, 2018

For the degree of impact, only ground shaking has a value of one (1) or low. This means that the estimated damage to property is low to negligible. In terms of other hazards, barangays Poblacions 1 to 4 have a low DOI value. This low value is attributed to these barangays having very low crop production areas. For other barangays, there is a combination of high and moderate estimated direct and indirect damage to property/production areas, particularly barangays Sta. Rosa, San Gregorio, Palma, San Agustin, and San Andres, since these barangays have high estimated direct and indirect damage to its production areas. Mitigation and adaptation measure must be strengthened in these areas to reduce impact of damage to flooding, RIL, EIL and soil erosion.

PRODUCTION AREA ADAPTIVE CAPACITY TO HAZARDS

Table 33. Adaptive Capacity on Hazard events in Production Areas in Alaminos, Laguna

Barangay	Adaptive Capacity			
	Access to financing (%)	Alternative Livelihood (%)	Government Extension Program (%)	Government Infrastructure Programs (%)
Poblacion 1	100	60	100	100
Poblacion 2	100	65	100	100
Poblacion 3	100	65	100	100
Poblacion 4	100	65	100	100
Del Carmen	100	60	100	100
Palma	100	65	100	100
San Agustin	100	60	100	100
San Andres	100	60	100	100
San Benito	100	60	100	100
San Gregorio	100	60	100	100
San Ildefonso	100	60	100	100
San Roque	100	30	100	100
San Juan	100	60	100	100
San Miguel	100	85	100	100
Sta Rosa	100	90	100	100

Source: CDRA Workshop, MPDO GIS Computation, 2018

PRODUCTION AREA VULNERABILITY TO HAZARDS

In terms of flooding, rail-induced landslide, soil erosion and earthquake-induced landslide, Alaminos has a combination of low and moderate vulnerability ratings, while in terms of ground shaking, the municipality has a low vulnerability rating. Table 34 below summarizes the vulnerability ratings of Alaminos in terms of its production area and hazards.

Table 34. Vulnerability Ratings of Production Areas to Hazard events of Alaminos, Laguna using Exposure and Adaptive Capacity indicators

Barangay	Vulnerability				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
Poblacion 1	Low	Low	Low	Low	Low
Poblacion 2	Low	Low	Low	Low	Low
Poblacion 3	Low	Low	Low	Low	Low
Poblacion 4	Low	Low	Low	Low	Low
Del Carmen	Low	Low	Moderate	Low	Low
Palma	Moderate	Moderate	Moderate	Low	Moderate
San Agustin	Moderate	Moderate	Moderate	Low	Moderate
San Andres	Moderate	Moderate	Moderate	Low	Moderate
San Benito	Moderate	Low	Low	Low	Low
San Gregorio	Moderate	Moderate	Moderate	Low	Moderate
San Ildefonso	Low	Low	Low	Low	Moderate
San Roque	Low	Low	Low	Low	Low

Barangay	Vulnerability				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
San Juan	Low	Low	Low	Low	Moderate
San Miguel	Low	Low	Low	Low	Low
Sta Rosa	Moderate	Moderate	Moderate	Low	Moderate

Source: CDRA Workshop, MPDO GIS Computation, 2018

LIFELINE UTILITIES

Lifeline utilities include the transportation, water distribution, drainage and power distribution networks. These utilities are considered as assets and the LGU must ensure delivery of these lifeline services. Due to limited data, Alaminos only used transportation networks in the assessment.

Table 35. Exposure and Adaptive Capacity Indicators used for the Lifeline Utilities in Alaminos, Laguna

Exposure	Adaptive Capacity
Road Length in Kilometers Exposed Length in Kilometers Value of exposed Lifeline	Government Infrastructure related investment Available redundant systems (roads)

LIFELINE UTILITIES EXPOSURE TO HAZARDS

Among the hazards, ground shaking is the only hazard with a high degree of impact, while the remaining four (4) hazards – flooding, RIL, EIL and soil erosion varies from DOI values one (1) to two (2). For flooding, 3.55 kilometers of roads are exposed, particularly in barangays San Agustin, San Benito and San Roque. The total road length exposed for other hazards are 36.63 kilometers, 117.57 kilometers, 0.13 kilometers, and 39.72 kilometers, for RIL, ground shaking, EIL and soil erosion, respectively.

Table 36. Flood Exposure and Degree of impact on Lifeline Utilities in Alaminos, Laguna

Exposure					Degree of impact score
Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Barangay Poblacion 1					
Francisco Fule	Municipal	0.16	0	0	1
Medina	Municipal	0.01	0	0	1
Gen. Malvar	Municipal	0.01	0	0	1
Maharlika	National	0.89	0	0	1
Jose Rizal	Municipal	0.01	0	0	1
PNR	Barangay	0.76	0	0	1
Alaminos Bypass	National	0.09	0	0	1
Private	Private	1.08	0	0	1
Socorro Fule	Barangay	0.26	0	0	1
Palma	Barangay	0.01	0	0	1
Barangay Poblacion 2					
Gen. Malvar	Municipal	0.19	0	0	1
Lt. de Villa	Municipal	0.14	0	0	1

Exposure					Degree of impact score
Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Jose Rizal	Municipal	0.30	0	0	1
Daniel Fandiño	Municipal	0.34	0	0	1
Apolinario Mabini	Municipal	0.17	0	0	1
Villanueva	Municipal	0.49	0	0	1
Baylon	Municipal	0.16	0	0	1
Private	Private	9.37	0	0	1
Juan Luna	Municipal	0.17	0	0	1
Barangay Poblacion 3					
Medina	Municipal	0.28	0	0	1
Gen. Malvar	Municipal	0.00	0	0	1
Jose Rizal	Municipal	0.27	0	0	1
Daniel Fandiño	Municipal	0.32	0	0	1
Baylon	Municipal	0.11	0	0	1
Private	Private	4.99	0	0	1
San Pedro I	Municipal	0.34	0	0	1
Juan Luna	Municipal	0.15	0	0	1
San Pedro II	Municipal	0.67	0	0	1
Del Carmen	Barangay	0.54	0	0	1
Limao Road	Provincial	0.51	0	0	1
Schultz	Municipal	0.10	0	0	1
Barangay Poblacion 4					
Francisco Fule	Municipal	0.79	0	0	1
Jose Fule	Municipal	0.47	0	0	1
Marcelino Fule Diversion Route	Municipal	0.82	0	0	1
Kalye Putol	Municipal	0.15	0	0	1
Lt. de Villa	Municipal	0.01	0	0	1
Maharlika	National	0.62	0	0	1
PNR Road	Barangay	0.55	0	0	1
Daniel Fandiño	Municipal	0.00	0	0	1
Mabini	Municipal	0.00	0	0	1
Alaminos Bypass	National	0.02	0	0	1
Villanueva Street	Municipal	0.01	0	0	1
Private	Private	0.06	0	0	1
Socorro Fule	Barangay	0.00	0	0	1
PNR Road	Barangay	0.00	0	0	1
Barangay Del Carmen					
Private	Private	2.80	0	0	1
Del Carmen	Barangay	2.05	0	0	1
Del Carmen - San Crispin	Provincial	0.39	0	0	1
Philippine National Railway	National Railway	1.60	0	0	1

Exposure					Degree of impact score
Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Palma					
Alaminos Bypass	National	0.01	0	0	1
Private	Private	2.74	0	0	1
South Luzon TR4	National	1.18	0	0	1
Alaminos - Lipa	National	2.01	0	0	1
Palma Barangay	Barangay	8.63	0	0	1
Alaminos - San Pablo By-Pass	National	1.16	0	0	1
San Agustin					
Maharlika	National	1.81	0	0	1
PNR Road	Barangay	1.81	0	0	1
Private	Private	5.81	0	0	1
South Luzon TR4	National	1.66	0	0	1
Alaminos - Lipa	National	1.13	0	0	1
San Agustin	Barangay	0.18	0	0	1
Alaminos - San Pablo By-Pass	National	2.24	0.62	46500000	2
San Andres					
Maharlika	National	1.41	0	0	1
PNR Road	Barangay	1.03	0	0	1
Private	Private	5.35	0	0	1
South Luzon TR4	National	1.78	0	0	1
San Andres - San Juan	Provincial	0.51	0	0	1
San Benito					
Maharlika	National	1.86	0.21	3100380	1
PNR Road	Barangay	1.83	0.29	432582	1
Private	Private	3.78	0.57	8530245	1
South Luzon TR4	National	1.19	0.99	14820465	1
San Benito	Barangay	0.72	0	0	1
San Benito - Sta. Veronica	Provincial	1.60	0.66	9964740	1
San Gregorio					
Private	Private	1.69	0	0	1
San Gregorio	Barangay	2.29	0	0	1
San Gregorio - Santiago 1	Provincial	1.09	0	0	1
San Ildefonso					
Private	Private	0.63	0	0	1
San Andres - San Juan Road	Provincial Road	0.15	0	0	1
Sto.Tomas - Alaminos	Provincial	2.39	0	0	1
San Juan					
Marcelino Fule Diversion Route	Municipal	0.10	0	0	1

Exposure					Degree of impact score
Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Maharlika	National	2.29	0	0	1
PNR Road	Barangay	1.59	0	0	1
Private Roads	Private	2.24	0	0	1
South Luzon TR4	National	1.66	0	0	1
Sto.Tomas - Alaminos	Provincial	1.02	0	0	1
San Juan	Barangay	0.23	0	0	1
Alaminos - San Pablo By-Pass	National	0.58	0	0	1
PNR Road	Barangay	0.00	0	0	1
San Miguel					
Alaminos Bypass	Barangay	1.13	0	0	1
Private	Private	3.21	0	0	1
South Luzon TR4	National	1.04	0	0	1
Alaminos - Lipa	National	0.93	0	0	1
San Miguel	Barangay	2.11	0	0	1
Alaminos - San Pablo By-Pass	National	1.09	0	0	1
San Roque					
Private	Private	1.08	0	0	1
San Roque	Barangay	1.88	0	0	1
Sta. Veronica, SPC	Barangay	0.43	0.21	3150000	3
Sta. Rosa					
Private	Private	0.65	0	0	1
Alaminos - Lipa	National	3.03	0	0	1
Sta. Rosa	Barangay	1.28	0	0	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 37. Rain-Induced Landslide Exposure and Degree of impact on Lifeline Utilities in Alaminos, Laguna

Barangay		Exposure				Degree of impact score
	Road/ Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 1	Francisco Fule	Municipal	0.16	0.161411	2421165	1
Poblacion 1	Medina Street	Municipal	0.01	0	0	1
Poblacion 1	Gen. Malvar	Municipal	0.01	0	0	1
Poblacion 1	Maharlika	National	0.89	0	0	1
Poblacion 1	Jose Rizal Street	Municipal	0.01	0	0	1
Poblacion 1	PNR Road	Barangay	0.76	0	0	1
Poblacion 1	Alaminos Bypass	National	0.09	0.013118	196770	1
Poblacion 1	Private Roads	Private	1.08	0.262289	3934335	1
Poblacion 1	Socorro Fule	Barangay	0.26	0	0	1
Poblacion 1	Palma	Barangay	0.01	0	0	1

Barangay		Exposure				Degree of impact score
	Road/ Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 2	Gen. Malvar	Municipal	0.19	0	0	1
Poblacion 2	Lt. de Villa	Municipal	0.14	0	0	1
Poblacion 2	Jose Rizal	Municipal	0.30	0	0	1
Poblacion 2	Daniel Fandiño	Municipal	0.34	0	0	1
Poblacion 2	Mabini	Municipal	0.17	0	0	1
Poblacion 2	Villanueva	Municipal	0.49	0	0	1
Poblacion 2	Baylon Street	Municipal	0.16	0	0	1
Poblacion 2	Private Roads	Private	9.37	3.65597	54839550	1
Poblacion 2	Juan Luna	Municipal	0.17	0	0	1
Poblacion 3	Medina Street	Municipal	0.28	0	0	1
Poblacion 3	Gen. Malvar	Municipal	0.00	0	0	1
Poblacion 3	Jose Rizal	Municipal	0.27	0	0	1
Poblacion 3	Daniel Fandiño	Municipal	0.32	0	0	1
Poblacion 3	Baylon Street	Municipal	0.11	0	0	1
Poblacion 3	Private Roads	Private	4.99	0	0	1
Poblacion 3	San Pedro I	Municipal	0.34	0	0	1
Poblacion 3	Juan Luna	Municipal	0.15	0	0	1
Poblacion 3	San Pedro II	Municipal	0.67	0	0	1
Poblacion 3	Del Carmen	Barangay	0.54	0	0	1
Poblacion 3	Limao	Provincial	0.51	0	0	1
Poblacion 3	Schultz Street	Municipal	0.10	0	0	1
Poblacion 4	Francisco Fule	Municipal	0.79	0.303499	4552485	1
Poblacion 4	Jose Fule	Municipal	0.47	0	0	1
Poblacion 4	Diversion	Municipal	0.82	0.227029	3405435	1
Poblacion 4	Kalye Putol	Municipal	0.15	0	0	1
Poblacion 4	Lt. de Villa	Municipal	0.01	0	0	1
Poblacion 4	Maharlika	National	0.62	0	0	1
Poblacion 4	PNR Road	Barangay	0.55	0	0	1
Poblacion 4	Daniel Fandiño	Municipal	0.00	0	0	1
Poblacion 4	Mabini	Municipal	0.00	0	0	1
Poblacion 4	Alaminos Bypass Road	National	0.02	0.019731	295965	1
Poblacion 4	Villanueva	Municipal	0.01	0	0	1
Poblacion 4	Private Roads	Private	0.06	0	0	1
Poblacion 4	Socorro Fule	Barangay	0.00	0	0	1
Poblacion 4	PNR Road	Barangay	0.00	0	0	1
Del Carmen	Private Roads	Private	2.80	1.700748	25511220	1
Del Carmen	Del Carmen	Barangay	2.05	1.87618	28142700	1
Del Carmen	Del Carmen - San Crispin	Provincial	0.39	0.38611	5791650	3
Del Carmen	Philippine National Railway	National Railway	1.60	1.60	24000000.00	1
Palma	Alaminos Bypass	National	0.01	0	0	1
Palma	Private Roads	Private	2.74	2.71	40650000	2

Barangay		Exposure				Degree of impact score
	Road/ Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Palma	South Luzon TR4	National	1.18	1.072317	16084755	1
Palma	Alaminos - Lipa	National	2.01	2.012628	30189420	1
Palma	Palma	Barangay	8.63	8.54785	128217750	1
Palma	Alaminos - San Pablo By-Pass	National	1.16	1.088679	81650925	1
San Agustin	Maharlika	National	1.81	0	0	1
San Agustin	PNR Road	Barangay	1.81	0	0	1
San Agustin	Private Roads	Private	5.81	0	0	1
San Agustin	South Luzon TR4	National	1.66	0	0	1
San Agustin	Alaminos - Lipa	National	1.13	0	0	1
San Agustin	San Agustin	Barangay	0.18	0	0	1
San Agustin	Alaminos - San Pablo By-Pass	National	2.24	0	0	1
San Andres	Maharlika	National	1.41	0	0	1
San Andres	PNR Road	Barangay	1.03	0	0	1
San Andres	Private Roads	Private	5.35	3.06	45904350.00	1
San Andres	South Luzon TR4	National	1.78	1.62	243000000	2
San Andres	San Andres - San Juan Road	Provincial	0.51	0	0	1
San Benito	Maharlika Highway	National	1.86	0	0	1
San Benito	PNR Road	Barangay	1.83	0	0	1
San Benito	Private Roads	Private	3.78	0	0	1
San Benito	South Luzon TR4	National	1.19	0	0	1
San Benito	San Benito	Barangay	0.72	0	0	1
San Benito	San Benito - Sta. Veronica Road	Provincial	1.60	0	0	1
San Gregorio	Private Roads	Private	1.69	1.287013	19305195	1
San Gregorio	San Gregorio	Barangay	2.29	1.912636	28689540	2
San Gregorio	San Gregorio - Santiago 1	Provincial	1.09	0.913885	13708275	1
San Ildefonso	Private Roads	Private	0.63	0	0	1
San Ildefonso	San Andres - San Juan Road	Provincial	0.15	0	0	1
San Ildefonso	Sto.Tomas - Alaminos Road	Provincial	2.39	0	0	1
San Juan	Marcelino Fule Diversion Route	Municipal	0.10	0	0	1
San Juan	Maharlika	National	2.29	0	0	1
San Juan	PNR Road	Barangay	1.59	0.015256	228840	1
San Juan	Private Roads	Private	2.24	0.015256	228840	1

Barangay		Exposure				Degree of impact score
	Road/ Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
San Juan	South Luzon TR4	National	1.66	0.605955	90893250	1
San Juan	Sto.Tomas - Alaminos Road	Provincial	1.02	0	0	1
San Juan	San Juan	Barangay	0.23	0	0	1
San Juan	Alaminos - San Pablo By-Pass	National	0.58	0.022588	1694100	1
San Juan	PNR Road	Barangay	0.00	0	0	1
San Miguel	Alaminos Bypass Road	National	1.13	0	0	1
San Miguel	Private Roads	Private	3.21	0	0	1
San Miguel	South Luzon TR4	National	1.04	0	0	1
San Miguel	Alaminos - Lipa	National	0.93	0	0	1
San Miguel	San Miguel	Barangay	2.11	0	0	1
San Miguel	Alaminos - San Pablo By-Pass	National	1.09	0	0	1
San Roque	Private Roads	Private	1.08	0	0	1
San Roque	San Roque	Barangay	1.88	0	0	1
San Roque	Sta. Veronica, SPC	Barangay	0.43	0	0	1
Sta. Rosa	Private Roads	Private	0.65	0.058889	883335	1
Sta. Rosa	Alaminos - Lipa	National	3.03	1.48	22200000	3
Sta. Rosa	Sta. Rosa	Barangay	1.28	0	0	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 38. Earthquake-Induced Landslide Exposure and Degree of impact on Lifeline Utilities in Alaminos, Laguna

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 1	Francisco Fule	Municipal	0.16	0.00	0.00	1
Poblacion 1	Medina Street	Municipal	0.01	0.00	0.00	1
Poblacion 1	Gen. Malvar	Municipal	0.01	0.00	0.00	1
Poblacion 1	Maharlika	National	0.89	0.00	0.00	1
Poblacion 1	Jose Rizal	Municipal	0.01	0.00	0.00	1
Poblacion 1	PNR Road	Barangay	0.76	0.00	0.00	1
Poblacion 1	Alaminos Bypass	Barangay	0.09	0.00	0.00	1
Poblacion 1	Private Roads	Private	1.08	0.00	0.00	1
Poblacion 1	Socorro Fule	Barangay	0.26	0.00	0.00	1
Poblacion 1	Palma	Barangay	0.01	0.00	0.00	1
Poblacion 2	Gen. Malvar	Municipal	0.19	0.00	0.00	1
Poblacion 2	Lt. de Villa Street	Municipal	0.14	0.00	0.00	1
Poblacion 2	Jose Rizal Street	Municipal	0.30	0.00	0.00	1

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 2	Daniel Fandiño	Municipal	0.34	0.00	0.00	1
Poblacion 2	Mabini	Municipal	0.17	0.00	0.00	1
Poblacion 2	Villanueva	Municipal	0.49	0.00	0.00	1
Poblacion 2	Baylon Street	Municipal	0.16	0.00	0.00	1
Poblacion 2	Private Roads	Private	9.37	0.00	0.00	1
Poblacion 2	Juan Luna	Municipal	0.17	0.00	0.00	1
Poblacion 3	Medina Street	Municipal	0.28	0.00	0.00	1
Poblacion 3	Gen. Malvar	Municipal	0.00	0.00	0.00	1
Poblacion 3	Jose Rizal Street	Municipal	0.27	0.00	0.00	1
Poblacion 3	Daniel Fandiño	Municipal	0.32	0.00	0.00	1
Poblacion 3	Baylon Street	Municipal	0.11	0.00	0.00	1
Poblacion 3	Private Roads	Private	4.99	0.00	0.00	1
Poblacion 3	San Pedro I Street	Municipal	0.34	0.00	0.00	1
Poblacion 3	Juan Luna Street	Municipal	0.15	0.00	0.00	1
Poblacion 3	San Pedro II Street	Municipal	0.67	0.00	0.00	1
Poblacion 3	Del Carmen	Barangay	0.54	0.00	0.00	1
Poblacion 3	Barangay 3 - Limao Road	Provincial	0.51	0.00	0.00	1
Poblacion 3	Schultz Street	Municipal	0.10	0.00	0.00	1
Poblacion 4	Francisco Fule	Municipal	0.79	0.00	0.00	1
Poblacion 4	Jose Fule	Municipal	0.47	0.00	0.00	1
Poblacion 4	Diversion Route	Municipal	0.82	0.00	0.00	1
Poblacion 4	Kalye Putol	Municipal	0.15	0.00	0.00	1
Poblacion 4	Lt. de Villa Street	Municipal	0.01	0.00	0.00	1
Poblacion 4	Maharlika	National	0.62	0.00	0.00	1
Poblacion 4	PNR Road	Barangay	0.55	0.00	0.00	1
Poblacion 4	Daniel Fandiño	Municipal	0.00	0.00	0.00	1
Poblacion 4	Apolinario Mabini	Municipal	0.00	0.00	0.00	1
Poblacion 4	Alaminos Bypass	National	0.02	0.00	0.00	1
Poblacion 4	Villanueva Street	Municipal	0.01	0.00	0.00	1
Poblacion 4	Private Roads	Private	0.06	0.00	0.00	1
Poblacion 4	Socorro Fule	Barangay	0.00	0.00	0.00	1
Poblacion 4	PNR Road	Barangay	0.00	0.00	0.00	1
Del Carmen	Private Roads	Private	2.80	0.00	0.00	1
Del Carmen	Del Carmen Barangay Road	Barangay	2.05	0.00	0.00	1
Del Carmen	Del Carmen - San Crispin Road	Provincial	0.39	0.00	0.00	1
Del Carmen	Philippine National Railway	National Railway	1.60	0.00	0.00	1
Palma	Alaminos Bypass	National	0.01	0.00	0.00	1
Palma	Private Roads	Private	2.74	0.00	0.00	1
Palma	South Luzon TR4	National	1.18	0.00	0.00	1
Palma	Alaminos - Lipa	National	2.01	0.00	0.00	1

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Palma	Palma	Barangay	8.63	0.00	0.00	1
Palma	Alaminos - San Pablo By-Pass	National	1.16	0.00	0.00	1
San Agustin	Maharlika	National	1.81	0.00	0.00	1
San Agustin	PNR Road	Barangay	1.81	0.00	0.00	1
San Agustin	Private Roads	Private	5.81	0.00	0.00	1
San Agustin	South Luzon TR4	National R	1.66	0.00	0.00	1
San Agustin	Alaminos - Lipa City Road	National	1.13	0.00	0.00	1
San Agustin	San Agustin	Barangay	0.18	0.00	0.00	1
San Agustin	Alaminos - San Pablo By-Pass	National Road	2.24	0.00	0.00	1
San Andres	Maharlika	National	1.41	0.00	0.00	1
San Andres	PNR Road	Barangay	1.03	0.00	0.00	1
San Andres	Private Roads	Private	5.35	0.00	0.00	1
San Andres	South Luzon TR4	National	1.78	0.00	0.00	1
San Andres	San Andres - San Juan Road	Provincial	0.51	0.00	0.00	1
San Benito	Maharlika	National	1.86	0.00	0.00	1
San Benito	PNR Road	Barangay	1.83	0.00	0.00	1
San Benito	Private Roads	Private	3.78	0.00	0.00	1
San Benito	South Luzon TR4	National	1.19	0.00	0.00	1
San Benito	San Benito	Barangay	0.72	0.00	0.00	1
San Benito	San Benito - Sta. Veronica Road	Provincial	1.60	0.00	0.00	1
San Gregorio	Private Roads	Private	1.69	0.00	0.00	1
San Gregorio	San Gregorio	Barangay	2.29	0.00	0.00	1
San Gregorio	San Gregorio - Santiago 1	Provincial	1.09	0.00	0.00	1
San Ildefonso	Private Roads	Private	0.63	0.00	0.00	1
San Ildefonso	San Andres - San Juan	Provincial	0.15	0.00	0.00	1
San Ildefonso	Sto.Tomas - Alaminos Road	Provincial	2.39	0.00	0.00	1
San Juan	Diversion Route	Municipal	0.10	0.00	0.00	1
San Juan	Maharlika	National	2.29	0.00	0.00	1
San Juan	PNR Road	Barangay	1.59	0.00	0.00	1
San Juan	Private Roads	Private	2.24	0.00	0.00	1
San Juan	South Luzon TR4	National	1.66	0.00	0.00	1
San Juan	Sto.Tomas - Alaminos Road	Provincial	1.02	0.00	0.00	1
San Juan	San Juan	Barangay	0.23	0.00	0.00	1
San Juan	Alaminos - San Pablo By-Pass	National	0.58	0.00	0.00	1
San Juan	PNR Road	Barangay	0.00	0.00	0.00	1
San Miguel	Alaminos Bypass	National	1.13	0.00	0.00	1

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
San Miguel	Private Roads	Private	3.21	0.00	0.00	1
San Miguel	South Luzon TR4	National	1.04	0.00	0.00	1
San Miguel	Alaminos - Lipa	National	0.93	0.00	0.00	1
San Miguel	San Miguel	Barangay	2.11	0.00	0.00	1
San Miguel	Alaminos - San Pablo By-Pass	National	1.09	0.00	0.00	1
San Roque	Private Roads	Private	1.08	0.00	0.00	1
San Roque	San Roque	Barangay	1.88	0.00	0.00	1
San Roque	Sta. Veronica SPC	Barangay	0.43	0.00	0.00	1
Sta. Rosa	Private Roads	Private	0.65	0.00	0.00	1
Sta. Rosa	Alaminos - Lipa	National	3.03	0.13	1950000	1
Sta. Rosa	Sta. Rosa	Barangay	1.28	0.00	0.00	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 39.Ground shaking Exposure and Degree of impact on Lifeline Utilities in Alaminos, Laguna

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 1	Francisco Fule	Municipal	0.16	0.16	2421167.44	3
Poblacion 1	Medina Street	Municipal	0.01	0.01	96103.62	3
Poblacion 1	Gen. Malvar	Municipal	0.01	0.01	83891.71	3
Poblacion 1	Maharlika	National	0.89	0.89	13329034.42	3
Poblacion 1	Jose Rizal	Municipal	0.01	0.01	155094.86	3
Poblacion 1	PNR Road	Barangay	0.76	0.76	11372840.40	3
Poblacion 1	Alaminos Bypass	Barangay	0.09	0.09	1403676.51	3
Poblacion 1	Private Roads	Private	1.08	1.08	16152647.82	3
Poblacion 1	Socorro Fule	Barangay	0.26	0.26	3934329.73	3
Poblacion 1	Palma	Barangay	0.01	0.01	105093.31	3
Poblacion 2	Gen. Malvar	Municipal	0.19	0.19	2814596.93	3
Poblacion 2	Lt. de Villa Street	Municipal	0.14	0.14	2095822.52	3
Poblacion 2	Jose Rizal Street	Municipal	0.30	0.30	4460241.88	3
Poblacion 2	Daniel Fandiño	Municipal	0.34	0.34	5038328.38	3
Poblacion 2	Mabini	Municipal	0.17	0.17	2493340.14	3
Poblacion 2	Villanueva	Municipal	0.49	0.49	7368912.30	3
Poblacion 2	Baylon Street	Municipal	0.16	0.16	2384009.28	3
Poblacion 2	Private Roads	Private	9.37	9.37	140538598.30	3
Poblacion 2	Juan Luna	Municipal	0.17	0.17	2494233.40	3
Poblacion 3	Medina Street	Municipal	0.28	0.28	4134476.08	3
Poblacion 3	Gen. Malvar	Municipal	0.00	0.00	36321.85	3

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 3	Jose Rizal Street	Municipal	0.27	0.27	4117329.09	3
Poblacion 3	Daniel Fandiño	Municipal	0.32	0.32	4792132.25	3
Poblacion 3	Baylon Street	Municipal	0.11	0.11	1674811.85	3
Poblacion 3	Private Roads	Private	4.99	4.99	74865837.73	3
Poblacion 3	San Pedro I Street	Municipal	0.34	0.34	5122934.45	3
Poblacion 3	Juan Luna Street	Municipal	0.15	0.15	2283876.95	3
Poblacion 3	San Pedro II	Municipal	0.67	0.67	10025802.54	3
Poblacion 3	Del Carmen	Barangay	0.54	0.54	8027008.67	3
Poblacion 3	Barangay 3 - Limao Road	Provincial	0.51	0.51	7706624.18	3
Poblacion 3	Schultz Street	Municipal	0.10	0.10	1466619.18	3
Poblacion 4	Francisco Fule	Municipal	0.79	0.79	11923685.51	3
Poblacion 4	Jose Fule	Municipal	0.47	0.47	7032873.81	3
Poblacion 4	Diversion Route	Municipal	0.82	0.82	12290470.01	3
Poblacion 4	Kalye Putol	Municipal	0.15	0.15	2230609.72	3
Poblacion 4	Lt. de Villa Street	Municipal	0.01	0.01	109930.82	3
Poblacion 4	Maharlika	National	0.62	0.62	9281949.87	3
Poblacion 4	PNR Road	Barangay	0.55	0.55	8230928.96	3
Poblacion 4	Daniel Fandiño	Municipal	0.00	0.00	21556.26	3
Poblacion 4	Mabini	Municipal	0.00	0.00	66626.48	3
Poblacion 4	Alaminos Bypass	National	0.02	0.02	1479812.37	3
Poblacion 4	Villanueva Street	Municipal	0.01	0.01	110676.71	3
Poblacion 4	Private Roads	Private	0.06	0.06	914821.13	3
Poblacion 4	Socorro Fule	Barangay	0.00	0.00	5378.38	3
Poblacion 4	PNR Road	Barangay	0.00	0.00	709.86	3
Del Carmen	Private Roads	Private	2.80	2.80	42005340.30	3
Del Carmen	Del Carmen	Barangay	2.05	2.05	30710646.37	3
Del Carmen	Del Carmen - San Crispin Road	Provincial	0.39	0.39	5791647.58	3
Del Carmen	Philippine National Railway	National Railway	1.60	1.60	24049309.50	3
Palma	Alaminos Bypass	National	0.01	0.01	92026.39	3
Palma	Private Roads	Private	2.74	2.74	41071870.44	3
Palma	South Luzon TR4	National	1.18	1.18	17651533.16	3

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Palma	Alaminos - Lipa	National	2.01	2.01	30189418.19	3
Palma	Palma	Barangay	8.63	8.63	129484401.66	3
Palma	Alaminos - San Pablo By-Pass	National	1.16	1.16	17440687.67	3
San Agustin	Maharlika	National	1.81	1.81	27224636.34	3
San Agustin	PNR Road	Barangay	1.81	1.81	27119107.67	3
San Agustin	Private Roads	Private	5.81	5.81	87174805.04	3
San Agustin	South Luzon TR4	National R	1.66	1.66	248912138.78	3
San Agustin	Alaminos - Lipa	National	1.13	1.13	17022019.05	3
San Agustin	San Agustin	Barangay	0.18	0.09	1313872.32	3
San Agustin	Alaminos - San Pablo By-Pass	National Road	2.24	2.24	168169555.99	3
San Andres	Maharlika	National	1.41	1.41	21124120.94	3
San Andres	PNR Road	Barangay	1.03	1.03	15486848.42	3
San Andres	Private Roads	Private	5.35	5.35	80251815.58	3
San Andres	South Luzon TR4	National	1.78	1.78	26665004.42	3
San Andres	San Andres - San Juan Road	Provincial	0.51	0.51	7605640.76	3
San Benito	Maharlika	National	1.86	1.86	27973696.79	3
San Benito	PNR Road	Barangay	1.83	1.83	27426217.19	3
San Benito	Private Roads	Private	3.78	3.78	56700063.49	3
San Benito	South Luzon TR4	National	1.19	1.19	17849802.74	3
San Benito	San Benito	Barangay	0.72	0.20	3063338.90	3
San Benito	San Benito - Sta. Veronica Road	Provincial	1.60	1.60	23975830.46	3
San Gregorio	Private Roads	Private	1.69	1.69	25310904.46	3
San Gregorio	San Gregorio	Barangay	2.29	2.29	34383850.58	3
San Gregorio	San Gregorio - Santiago 1	Provincial	1.09	1.09	16404111.38	3
San Ildefonso	Private Roads	Private	0.63	0.63	9478341.83	3
San Ildefonso	San Andres - San Juan	Provincial	0.15	0.15	2277394.33	3
San Ildefonso	Sto.Tomas - Alaminos Road	Provincial	2.39	2.39	35776894.35	3
San Juan	Diversion Route	Municipal	0.10	0.10	1498232.35	3
San Juan	Maharlika	National	2.29	2.29	34389355.55	3

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
San Juan	PNR Road	Barangay	1.59	1.59	23833934.41	3
San Juan	Private Roads	Private	2.24	2.24	33550940.16	3
San Juan	South Luzon TR4	National	1.66	1.66	24901059.49	3
San Juan	Sto.Tomas - Alaminos Road	Provincial	1.02	1.02	15292290.66	3
San Juan	San Juan	Barangay	0.23	0.23	3450000.00	3
San Juan	Alaminos - San Pablo By-Pass	National	0.58	0.58	43224485.55	3
San Juan	PNR Road	Barangay	0.00	0.00	709.86	3
San Miguel	Alaminos Bypass	National	1.13	1.13	16973334.87	3
San Miguel	Private Roads	Private	3.21	3.21	48198579.70	3
San Miguel	South Luzon TR4	National	1.04	1.04	15573246.13	3
San Miguel	Alaminos - Lipa	National	0.93	0.93	13991124.37	3
San Miguel	San Miguel	Barangay	2.11	0.15	2208816.22	3
San Miguel	Alaminos - San Pablo By-Pass	National	1.09	1.09	82033013.99	3
San Roque	Private Roads	Private	1.08	1.08	16178854.54	3
San Roque	San Roque	Barangay	1.88	1.77	26485902.64	3
San Roque	Sta. Veronica SPC	Barangay	0.43	0.43	6402979.75	3
Sta. Rosa	Private Roads	Private	0.65	0.65	9796265.32	3
Sta. Rosa	Alaminos - Lipa	National	3.03	3.03	45430141.49	3
Sta. Rosa	Sta. Rosa	Barangay	1.28	1.08	16243492.37	3

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 40. Soil Erosion Exposure and Degree of impact on Lifeline Utilities in Alaminos, Laguna

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 1	Francisco Fule	Municipal	0.16	0	0	1
Poblacion 1	Medina Street	Municipal	0.01	0	0	1
Poblacion 1	Gen. Malvar	Municipal	0.01	0	0	1
Poblacion 1	Maharlika	National	0.89	0	0	1
Poblacion 1	Jose Rizal	Municipal	0.01	0	0	1
Poblacion 1	PNR Road	Barangay	0.76	0	0	1
Poblacion 1	Alaminos Bypass	Barangay	0.09	0	0	1

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 1	Private Roads	Private	1.08	0	0	1
Poblacion 1	Socorro Fule	Barangay	0.26	0	0	1
Poblacion 1	Palma	Barangay	0.01	0	0	1
Poblacion 2	Gen. Malvar	Municipal	0.19	0	0	1
Poblacion 2	Lt. de Villa Street	Municipal	0.14	0	0	1
Poblacion 2	Jose Rizal Street	Municipal	0.30	0	0	1
Poblacion 2	Daniel Fandiño	Municipal	0.34	0	0	1
Poblacion 2	Mabini	Municipal	0.17	0	0	1
Poblacion 2	Villanueva	Municipal	0.49	0.256843	3852645	2
Poblacion 2	Baylon Street	Municipal	0.16	0	0	1
Poblacion 2	Private Roads	Private	9.37	8.341308	125119620	2
Poblacion 2	Juan Luna	Municipal	0.17	0	0	1
Poblacion 3	Medina Street	Municipal	0.28	0	0	1
Poblacion 3	Gen. Malvar	Municipal	0.00	0	0	1
Poblacion 3	Jose Rizal Street	Municipal	0.27	0	0	1
Poblacion 3	Daniel Fandiño	Municipal	0.32	0	0	1
Poblacion 3	Baylon Street	Municipal	0.11	0	0	1
Poblacion 3	Private Roads	Private	4.99	3.433082	51496230	2
Poblacion 3	San Pedro I Street	Municipal	0.34	0	0	1
Poblacion 3	Juan Luna Street	Municipal	0.15	0	0	1
Poblacion 3	San Pedro II	Municipal	0.67	0	0	1
Poblacion 3	Del Carmen	Barangay	0.54	0	0	1
Poblacion 3	Barangay 3 - Limao Road	Provincial	0.51	0.338841	5082615	2
Poblacion 3	Schultz Street	Municipal	0.10	0	0	1
Poblacion 4	Francisco Fule	Municipal	0.79	0	0	1
Poblacion 4	Jose Fule	Municipal	0.47	0	0	1
Poblacion 4	Diversion Route	Municipal	0.82	0	0	1
Poblacion 4	Kalye Putol	Municipal	0.15	0	0	1
Poblacion 4	Lt. de Villa Street	Municipal	0.01	0	0	1
Poblacion 4	Maharlika	National	0.62	0	0	1
Poblacion 4	PNR Road	Barangay	0.55	0	0	1
Poblacion 4	Daniel Fandiño	Municipal	0.00	0	0	1
Poblacion 4	Mabini	Municipal	0.00	0	0	1

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
Poblacion 4	Alaminos Bypass	National	0.02	0	0	1
Poblacion 4	Villanueva Street	Municipal	0.01	0	0	1
Poblacion 4	Private Roads	Private	0.06	0	0	1
Poblacion 4	Socorro Fule	Barangay	0.00	0	0	1
Poblacion 4	PNR Road	Barangay	0.00	0	0	1
Del Carmen	Private Roads	Private	2.80	1.166694	17500410	2
Del Carmen	Del Carmen	Barangay	2.05	0	0	1
Del Carmen	Del Carmen - San Crispin Road	Provincial	0.39	1.113724	16705860	1
Del Carmen	Philippine National Railway	National Railway	1.60	1.603287	24049305	2
Palma	Alaminos Bypass	National	0.01	0	0	1
Palma	Private Roads	Private	2.74	0.447384	6710760	2
Palma	South Luzon TR4	National	1.18	0	0	1
Palma	Alaminos - Lipa	National	2.01	0.354867	5323005	2
Palma	Palma	Barangay	8.63	0.020032	300480	1
Palma	Alaminos - San Pablo By-Pass	National	1.16	0	0	1
San Agustin	Maharlika	National	1.81	0	0	1
San Agustin	PNR Road	Barangay	1.81	0	0	1
San Agustin	Private Roads	Private	5.81	0	0	1
San Agustin	South Luzon TR4	National R	1.66	0	0	1
San Agustin	Alaminos - Lipa	National	1.13	0	0	1
San Agustin	San Agustin	Barangay	0.18	0	0	1
San Agustin	Alaminos - San Pablo By-Pass	National Road	2.24	0	0	1
San Andres	Maharlika	National	1.41	1.408275	21124125	2
San Andres	PNR Road	Barangay	1.03	1.032457	15486855	2
San Andres	Private Roads	Private	5.35	5.350121	80251815	2
San Andres	South Luzon TR4	National	1.78	1.777667	26665005	2
San Andres	San Andres - San Juan Road	Provincial	0.51	0.507043	7605645	2
San Benito	Maharlika	National	1.86	0	0	1

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
San Benito	PNR Road	Barangay	1.83	0	0	1
San Benito	Private Roads	Private	3.78	0	0	1
San Benito	South Luzon TR4	National	1.19	0	0	1
San Benito	San Benito	Barangay	0.72	0	0	1
San Benito	San Benito - Sta. Veronica Road	Provincial	1.60	0	0	1
San Gregorio	Private Roads	Private	1.69	0.458823	6882345	2
San Gregorio	San Gregorio	Barangay	2.29	0.438694	6580410	2
San Gregorio	San Gregorio - Santiago 1	Provincial	1.09	0	0	1
San Ildefonso	Private Roads	Private	0.63	0.631889	9478335	1
San Ildefonso	San Andres - San Juan	Provincial	0.15	0.151826	2277390	2
San Ildefonso	Sto.Tomas - Alaminos Road	Provincial	2.39	0.567016	8505240	2
San Juan	Diversion Route	Municipal	0.10	0	0	1
San Juan	Maharlika	National	2.29	2.194748	32921220	2
San Juan	PNR Road	Barangay	1.59	1.554767	23321505	2
San Juan	Private Roads	Private	2.24	2.236729	33550935	2
San Juan	South Luzon TR4	National	1.66	1.303808	195571200	2
San Juan	Sto.Tomas - Alaminos Road	Provincial	1.02	1.019486	15292290	2
San Juan	San Juan	Barangay	0.23	0.229	3435000	2
San Juan	Alaminos - San Pablo By-Pass	National	0.58	0.203465	3051975	2
San Juan	PNR Road	Barangay	0.00	0	0	1
San Miguel	Alaminos Bypass	National	1.13	0	0	1
San Miguel	Private Roads	Private	3.21	0	0	1
San Miguel	South Luzon TR4	National	1.04	0	0	1
San Miguel	Alaminos - Lipa	National	0.93	0	0	1
San Miguel	San Miguel	Barangay	2.11	0	0	1
San Miguel	Alaminos - San Pablo By-Pass	National	1.09	0	0	1
San Roque	Private Roads	Private	1.08	0	0	1

Barangay	Exposure					Degree of impact score
	Street Name	Road Class	Road Length (Km)	Exposed Length (Km)	Value of exposed Lifeline (PhP)	
San Roque	San Roque	Barangay	1.88	0	0	1
San Roque	Sta. Veronica SPC	Barangay	0.43	0	0	1
Sta. Rosa	Private Roads	Private	0.65	0.058889	883335	2
Sta. Rosa	Alaminos - Lipa	National	3.03	1.525526	22882890	2
Sta. Rosa	Sta. Rosa	Barangay	1.28	0	0	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

LIFELINE UTILITIES ADAPTIVE CAPACITY TO HAZARDS

Table 41. Adaptive Capacity to Hazards for Lifeline Utilities in Alaminos, Laguna

Barangay	Adaptive Capacity	
	Government Infrastructure Related Investment (%)	Available Redundant Systems (%)
Poblacion 1	85	50
Poblacion 2	90	55
Poblacion 3	87	53
Poblacion 4	85	50
Del Carmen	75	49
Palma	80	55
San Agustin	97	59
San Andres	90	50
San Benito	90	55
San Gregorio	75	48
San Ildefonso	95	50
San Roque	100	50
San Juan	95	55
San Miguel	85	52
Sta Rosa	82	50

Source: CDRA Workshop, MPDO GIS Computation, 2018

LIFELINE UTILITIES VULNERABILITY TO HAZARDS

All barangays have low vulnerability scores for all identified hazard events. The table below summarizes the vulnerability ratings of Alaminos in terms of its lifeline utilities and hazards

Table 42. Vulnerability Ratings of Lifeline Utilities to Hazard events of Alaminos, Laguna using Exposure and Adaptive Capacity indicators

Barangay	Vulnerability				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
Poblacion 1	Low	Low	Low	Low	Low
Poblacion 2	Low	Low	Low	Low	Low
Poblacion 3	Low	Low	Low	Low	Low
Poblacion 4	Low	Low	Low	Low	Low
Del Carmen	Low	Low	Low	Low	Low
Palma	Low	Low	Low	Low	Low
San Agustin	Low	Low	Low	Low	Low
San Andres	Low	Low	Low	Low	Low
San Benito	Low	Low	Low	Low	Low
San Gregorio	Low	Low	Low	Low	Low
San Ildefonso	Low	Low	Low	Low	Low
San Roque	Low	Low	Low	Low	Low
San Juan	Low	Low	Low	Low	Low
San Miguel	Low	Low	Low	Low	Low
Sta Rosa	Low	Low	Low	Low	Low

Source: CDRA Workshop, MPDO GIS Computation, 2018

URBAN SYSTEM

Urban use areas pertain to the built environment currently utilized for residential, commercial, industrial, tourism, sanitary waste management facilities, cemeteries, and other land uses.

Table 43. Exposure and Adaptive Capacity Indicators used for Urban Systems in Alaminos, Laguna

Exposure	Adaptive Capacity
Land Use Category Area Exposure Area in Hectares Percentage of Area Exposed	Government regulations Capacity and willingness to retrofit Available alternative sites Government Investments

URBAN SYSTEM EXPOSURE TO HAZARDS

For this assessment, most of the built-up areas are concentrated in urban barangays. All urban barangays have low degree of impact score for all identified hazards. This means that the estimated direct and indirect damage to property is low to negligible. For the percentage of exposed area, only barangay San Benito has built up areas exposed, with 0.05 percent. For RIL, barangays Poblacions 1, 2, and 4 have exposed built up areas, with barangay Poblacion 2 having the highest percentage among the six (6) barangays with 1.33 percent. All areas exposed to ground shaking.

Table 44. Flood Exposure and Degree of impact on Urban System in Alaminos, Laguna

Barangay	Exposure				Degree of impact score
	Land Use Category	Area (Ha)	Exposure Area (Ha)	Exposure (%)	
Poblacion 1	ISF	0.151	0	0	1
Poblacion 2	ISF	0.261786	0	0	1
Poblacion 4	ISF	0.597	0	0	1
Poblacion 1	Residential	10.939818	0	0	1
Poblacion 2	Residential	19.219608	0	0	1
Poblacion 3	Residential	22.500327	0	0	1
Poblacion 4	Residential	11.758157	0	0	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 45. Rain-Induced Landslide Exposure and Degree of impact on Urban System in Alaminos, Laguna

Barangay	Exposure				Degree of impact score
	Land Use	Area (Ha)	Exposure Area (Ha)	Exposure (%)	
Poblacion 1	ISF	0.151	0.032	0.211	1
Poblacion 2	ISF	0.261786	0.261	1	1
Poblacion 4	ISF	0.597	0.597	1	1
Poblacion 1	Residential	10.939818	1.390	0.127	1
Poblacion 2	Residential	19.219608	6.251	0.325	1
Poblacion 3	Residential	22.500327	0	0	1
Poblacion 4	Residential	11.758157	0.7444	0.063	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 46. Earthquake-Induced Landslide Exposure and Degree of impact on Urban System in Alaminos, Laguna

Barangay	Exposure				Degree of impact score
	Land Use Category	Area (Ha)	Exposure Area (Ha)	Exposure (%)	
Poblacion 1	ISF	0.151	0	0	1
Poblacion 2	ISF	0.261786	0	0	1
Poblacion 4	ISF	0.597	0	0	1
Poblacion 1	Residential	10.939818	0	0	1
Poblacion 2	Residential	19.219608	0	0	1
Poblacion 3	Residential	22.500327	0	0	1
Poblacion 4	Residential	11.758157	0	0	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 47. Ground Shaking Exposure and Degree of impact on Urban System in Alaminos, Laguna

Barangay	Exposure				Degree of impact score
	Land Use	Area (Ha)	Exposure Area (Ha)	Exposure (%)	
Poblacion 1	ISF	0.151	0.151	1	1
Poblacion 2	ISF	0.261786	0.261786	1	1
Poblacion 4	ISF	0.597	0.597	1	1
Poblacion 1	Residential	10.939818	10.939817	0.999	1
Poblacion 2	Residential	19.219608	19.219608	1	1
Poblacion 3	Residential	22.500327	22.500327	1	1
Poblacion 4	Residential	11.758157	11.758158	1.0004	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

Table 48. Soil Erosion Exposure and Degree of impact on Urban System in Alaminos, Laguna

Barangay	Exposure				Degree of impact score
	Land Use	Area (Ha)	Exposure Area (Ha)	Exposure (%)	
Poblacion 1	ISF	0.151	0	0	1
Poblacion 2	ISF	0.261786	0.261786	1	1
Poblacion 4	ISF	0.597	0	0	1
Poblacion 1	Residential	10.939818	0	0	1
Poblacion 2	Residential	19.219608	13.74218	0.715	1
Poblacion 3	Residential	22.500327	8.339871	0.371	1
Poblacion 4	Residential	11.758157	0	0	1

Source: CDRA Workshop, MPDO GIS Computation, 2018

URBAN SYSTEM ADAPTIVE CAPACITY TO HAZARDS

Indicators used to assess the adaptive capacity of barangays include - Government regulations such as presence of Zoning Ordinance or other ordinances related, capacity and willingness to retrofit, availability of alternative sites and government investments.

Available alternative sites for evacuation such schools, barangay hall, covered courts, day care centers are also present in the municipality. Government Investments such as rescue vehicle, command center and equipment (e.g.2-way radio communication equipment); produce IEC related to extension programs; with current CDP and CLUP (mainstreamed CCA-DRR); LGU has existing partnership with SUC for technology transfer contribute to the high score of barangays.

Table 49. Adaptive Capacity to Hazards for Urban System in Alaminos, Laguna

Barangay	Adaptive Capacity			
	Government regulations (%)	Capacity and willingness to retrofit (%)	Available alternative sites (%)	Government investments (%)
Poblacion 1	100	100	100	100

Barangay	Adaptive Capacity			
	Government regulations (%)	Capacity and willingness to retrofit (%)	Available alternative sites (%)	Government investments (%)
Poblacion 2	100	100	100	100
Poblacion 3	100	100	100	100
Poblacion 4	100	100	100	100
Del Carmen	100	100	100	100
Palma	100	100	0	100
San Agustin	100	100	0	100
San Benito	100	100	0	100

Source: CDRA Workshop, MPDO GIS Computation, 2018

URBAN SYSTEM VULNERABILITY TO HAZARDS

All urban barangays have low vulnerability ratings in terms of flooding, ground shaking and earthquake-induced landslide, rain-induced landslide and soil erosion. Table 50 below summarizes the vulnerability ratings of Alaminos in terms of its population and hazards

Table 50. Vulnerability Ratings of Urban Systems to Hazard events of Alaminos, Laguna using Exposure and Adaptive Capacity indicators

Barangay	Vulnerability				
	Flood	RIL	EIL	Ground Shaking	Soil Erosion
Poblacion 1	Low	Low	Low	Low	Low
Poblacion 2	Low	Low	Low	Low	Low
Poblacion 3	Low	Low	Low	Low	Low
Poblacion 4	Low	Low	Low	Low	Low
San Agustin	Low	Low	Low	Low	Low
San Benito	Low	Low	Low	Low	Low

Source: CDRA Workshop, MPDO GIS Computation, 2018

CLIMATE CHANGE AND POTENTIAL IMPACTS

The Philippines ranks third among most countries at risk in the world because of vulnerability and susceptibility to natural hazards of its exposed population. This situation is further aggravated by climate change. Meteorological and meteorologically-induced hazards have intensified within the last decade, resulting in increased deaths and economic losses, especially in areas that are unprepared for such phenomena.

CLIMATE PROJECTIONS

The global climate is drastically changing due to both natural and human-induced influences. According to NASA, compelling evidences of rapid climate change include sea level rise of about 8 inches in the last century, global temperature rise of about 2.0 degrees Fahrenheit (1.1 degrees Celsius) since the late 19th century, warming of oceans of about 0.302 degrees Fahrenheit since 1969, shrinking ice sheets in Greenland and Antarctic, glacial retreat including in Alps, Himalayas, Andes, Rockies, Alaska and Africa, intense occurrence of extreme events, ocean acidification which started from the Industrial Revolution, and decreased snow cover mostly in Northern Hemisphere. Locally, the Philippine Atmospheric, Geophysical and

Astronomical Services Administration (PAGASA) leads the undertaking of scientific and technological services in meteorology, hydrology, climatology, astronomy and other geophysical sciences to ensure protection from natural calamities.

Recently, PAGASA published a document about the projected changes of different climate variables for 2036 and 2065 under the medium-range emission scenario using the observed baseline in 1971-2000 at regional and provincial level. The different climate variables include temperature, rainfall, and frequency of extreme events, number of dry days and the number of days with rainfall of more than 200 mm.

The MDRRMO – OPCEN records rainfall per day using the traditional tipping bucket monitoring device. The records of the MDRRMO rain gauge monitoring is presented below, the monitoring started from June 2018 to November 2019.

The tipping bucket counts the number of tips when raining, the counter was shown in the monitor, to compute for the millimeter, the formula is (number of tips x 0.25 mm "constant variable" = rainfall in mm). Then it will be recorded per day, the average rainfall per month is also computed. Then the rainfall per month between seasons (e.g. DJF, MAM, JJA, SON).

Table 51: Rainfall Monitoring 2019

Rain Gauge Monitoring			
Date	**Average Rain (x 0.25 mm)**	**TOTAL (mm)**	**Seasonal Rainfall DJF, MAM, JJA, SON**
Jun 2018	43	10.75	27.87
Jul 2018	51.63	12.91	
Aug 2018	16.85	4.21	
Sep 2018	41.3	10.325	15.265
Oct 2018	14.06	3.52	
Nov 2018	5.714286	1.42	
Dec 2018	49.8	12.45	13.31
Jan 2019	1.61	0.4	
Feb 2019	1.85	0.46	
Mar 2019	10	2.5	22.425
Apr 2019	61	15.25	
May 2019	18.7	4.675	
June 2019	17.3103	4.3276	23.174
July 2019	36.41	9.1048	
Aug 2019	38.9667	9.7416	
Sep 2019	11.7	2.925	11.4767
Oct 2019	35	2.66	
Nov 2019	23.57	5.8917	
Dec 2019	-	-	

Source: Rainfall monitoring tipping bucket records as of 2019

According to the climate projections of PAGASA as presented in the succeeding table, that there will be an increase in the temperature in the municipality in all seasons in 2036 and 2065, the increase ranges from 1.0°C to 2.4°C. From the observed baseline of 25.0°C in the

months of December, January and February, it is projected to increase to 26.0°C to 26.9°C in 2036 to 2050, according to the projected Seasonal Mean Temperature.

The same increasing trend applies to the months of March, April and May. From a baseline of 27.5°C reference, it is expected to increase of 1.0°C to 2.2°C. While for the months of June-July-August (JJA), with an observed baseline of 27.5°C, the expected increase in temperature ranges from 1.0°C to 2.4°C. It can be noted that, historically, the Philippines experienced the hottest or an increased in temperature during the months of March, April and May, however the projected seasonal mean temperature for the months of June, July and August shows a slightly higher temperature increase in the upper bound. Thus, potentially altering systems and processes in the province. Lastly, in the months of September, October and November, from 26.7°C baseline, it is projected to increase ranging from 1.0°C to 2.3°C.

Table 52. Projected Changes in Seasonal Temperature in the Mid-21st Century (2036-2065) for Laguna relative to 1971-2000

Season	Scenario	Range	Projected Change	
			Change in ˚C	Projected Seasonal Mean Temperature (˚C)
December-January-February (DJF) Observed baseline = 25.0˚C	Moderate emission (RCP4.5)	Lower Bound	1.0	26.0
		Median Bound	1.2	26.2
		Upper Bound	1.6	26.6
	High Emission (RCP 8.5)	Lower Bound	1.1	26.1
		Median Bound	1.6	26.6
		Upper Bound	1.9	26.9
March-April-May (MAM) Observed baseline = 27.5 ˚C	Moderate emission (RCP4.5)	Lower Bound	1.0	28.5
		Median Bound	1.2	28.7
		Upper Bound	1.7	29.2
	High Emission (RCP 8.5)	Lower Bound	1.3	28.8
		Median Bound	1.6	29.1
		Upper Bound	2.2	29.7
June-July-August (JJA) Observed baseline = 27.5 ˚C	Moderate emission (RCP4.5)	Lower Bound	1.0	28.5
		Median Bound	1.3	28.8
		Upper Bound	1.8	29.3
	High Emission (RCP 8.5)	Lower Bound	1.3	28.8
		Median Bound	1.5	29.0
		Upper Bound	2.4	29.9
September-October-November (SON) Observed baseline = 26.7 ˚C	Moderate emission (RCP4.5)	Lower Bound	1.0	27.7
		Median Bound	1.1	27.8
		Upper Bound	1.9	28.6
	High Emission (RCP 8.5)	Lower Bound	1.4	28.1
		Median Bound	1.5	28.2
		Upper Bound	2.3	29.0

Source: PAGASA, 2018

On the other hand, the significant increase in rainfall is expected to happen in 2036 and more drastically in 2050. The next table shows that the months of December-January-February (DFJ) has the highest percentage of projected change in the seasonal rainfall which is 43.9 percent or 276 millimeters. It is also observable that in June-July-August (JJA) has a negative value for the rate of seasonal rainfall change which is -22.7 percent or negative 191.6 millimeters of rainfall amount. This means that, the projected value for the rainfall amount in JJA is less than the observed baseline which is 845 millimeters, which further emphasizes the changing weather conditions and patterns in the province.

The changes with the different climate factors will consequently affect the extremity of the likelihood and severity of hazards and natural calamities in the area. The changes in the seasonal rainfall may affect crop yield, prevalence of vermin and pests, cause disruption in the regular provision of economic and social services, among other.

Table 53. Projected Changes in Seasonal Rainfall in the Mid-21st Century (2036-2065) for Laguna relative to 1971-2000

Season	Scenario	Range	Projected Change		Projected Seasonal Rainfall Amount (mm)
			Percent	Rainfall amount (mm)	
December-January-February (DJF) Observed baseline = 629 mm	Moderate emission (RCP4.5)	Lower Bound	4.2	26.7	655.9
		Median	10.2	64.0	693.2
		Upper Bound	43.9	276.0	905.2
	High Emission (RCP 8.5)	Lower Bound	2.3	14.5	643.7
		Median	13.8	87.1	716.3
		Upper Bound	32.9	207.2	836.4
March-April-May (MAM) Observed baseline = 387 mm	Moderate emission (RCP4.5)	Lower Bound	-2.1	-8.3	378.5
		Median	12.6	48.6	435.4
		Upper Bound	24.8	95.8	482.6
	High Emission (RCP 8.5)	Lower Bound	-14.4	-55.8	331.0
		Median	-0.1	-0.5	386.3
		Upper Bound	28.3	109.4	496.2
June-July-August (JJA) Observed baseline = 845 mm	Moderate emission (RCP4.5)	Lower Bound	-22.7	-191.6	653.4
		Median	-14.3	-121.0	724.0
		Upper Bound	-2.1	-17.7	827.3
	High Emission (RCP 8.5)	Lower Bound	-20.9	-176.2	668.8
		Median	-11.0	-93.0	752.0
		Upper Bound	7.5	63.8	908.8
September-October-November (SON) Observed baseline = 1,067	Moderate emission (RCP4.5)	Lower Bound	-9.0	-96.2	970.3
		Median	-5.8	-61.8	1004.7
		Upper Bound	5.7	60.5	1127.0
	High Emission (RCP 8.5)	Lower Bound	-10.8	-115.5	951.0
		Median	1.4	14.6	1081.1
		Upper Bound	10.5	112.4	1178.9

Source: PAGASA, 2018

IMPACT CHAIN ANALYSIS

In order to adapt and mitigate climate change impacts and reduce the risks of natural hazards, it is crucial to an in-depth and detailed study of the conditions of vulnerability that a particular area or locale of concern faces. This perspective can be gained by, firstly, dissecting the

anatomy of the identified risks, from the hazards that create the conditions for these risks to exist, to the possible damaging effects or “impacts” they can have on society and the environment if they are not managed (or are simply too powerful to handle) and result into disaster events. Once the vulnerability elements have been identified, the next thing to do is to map out these elements into a visual cause and effect representation, with the hazards as cause and the impacts as effects.

The CDRA method makes use of Impact Chain Diagrams or Analysis to effectively illustrate the multifarious cause and effect relationships among the hazards, risks and the affected socio-economic and environmental elements in a particular place. These impact chains are fashioned so as to clearly show what can happen to the various social and economic, environment and infrastructure systems at play if a disaster would occur. By using Impact Chain Analysis, planners can determine the specific hazards of a place and what sectors are most at risk to these hazards based on the severity of projected impacts, which ultimately will give them the necessary information to make informed and tailor-fit mitigation measures for disaster preparedness in the areas of concern.

The figures below or flow charts show both positive and negative effects and impacts on settlements, production, protection and infrastructure areas. These effects and impacts were derived from the CDRA workshop 2018.

SETTLEMENTS DEVELOPMENT AREA

Climate change influences the rate of precipitation and evaporation and the overall water cycle, groundwater, which is the usual source of household water, will be harder to maintain. An increase in temperature would also affect groundwater and if not replenished (via precipitation), it could lead to water shortage. (Refer to Figure 2. Potential impacts and effects of changes in seasonal temperature to settlements).

Increase in temperature also causes an increase in power and water consumption which leads to a higher demand in both electricity and water but with the chances of power and water shortage, prices of these services would increase and will be unaffordable for some. Aside from economic impacts, drought increases the likelihood of prevalence of diseases and pests for warm temperature is a favorable environment for pests and pathogens to proliferate which increases the risk of the residents to contract disease such as measles, food and water-borne diseases.

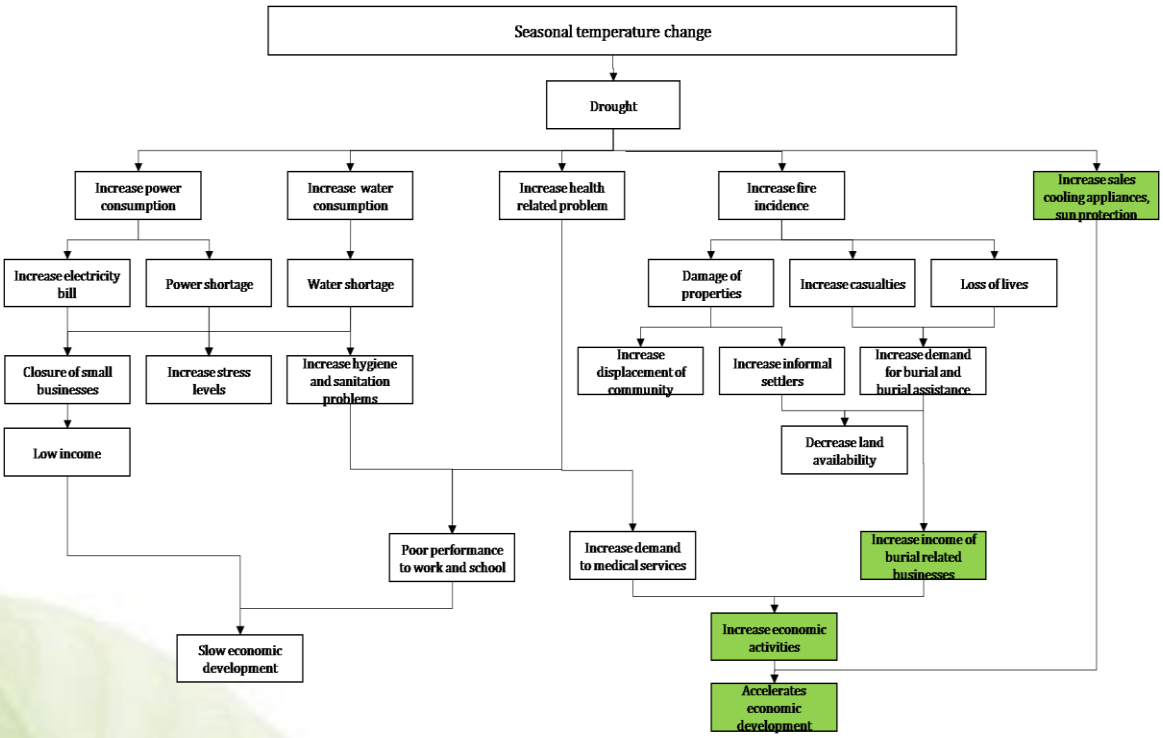


Figure 2. Potential impacts and effects of changes in seasonal temperature to settlements

The figure below shows the impact chain for increase in rainfall in urban areas. Landslide and flooding are a major concern in urban areas especially that most of the populace reside there. It can damage properties and infrastructures, cause overflow of canal/drainage, and loss of lives or higher morbidity rate. Damage in property increases road traffic and disrupt public and private transportation, it also delays delivery of goods and services.

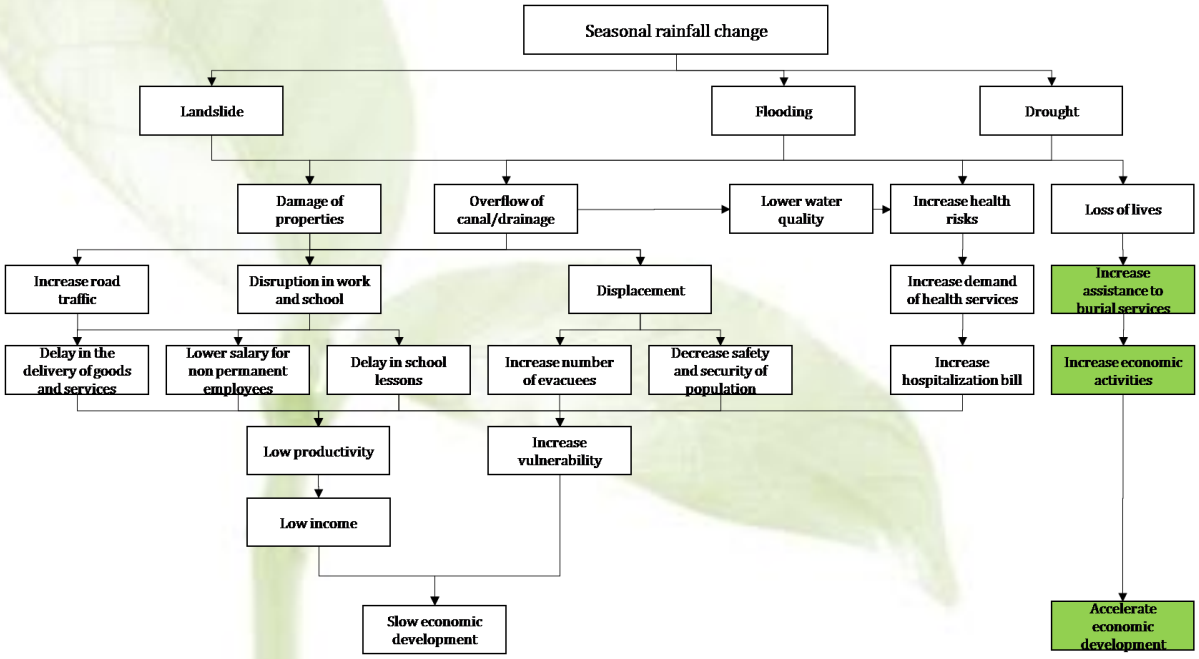


Figure 3. Potential impacts and effects of changes in seasonal rainfall to settlements

PRODUCTION DEVELOPMENT AREA

The impacts of increasing temperature are showed in

Figure 4. Drought is identified to be the only direct impact of increased temperature which may lead to reduced water recharge, reduced river flow, increased stress to crops and animals, and increased likelihood of new predators, pests, and pathogens. Currently, Alaminos is experiencing water interruptions and is said to have insufficient supply of water in some areas and an occurrence of drought may exacerbate the current situation which may occur on the months March-April-May since the expected rainfall is less and temperature may reach up to 29.7℃.

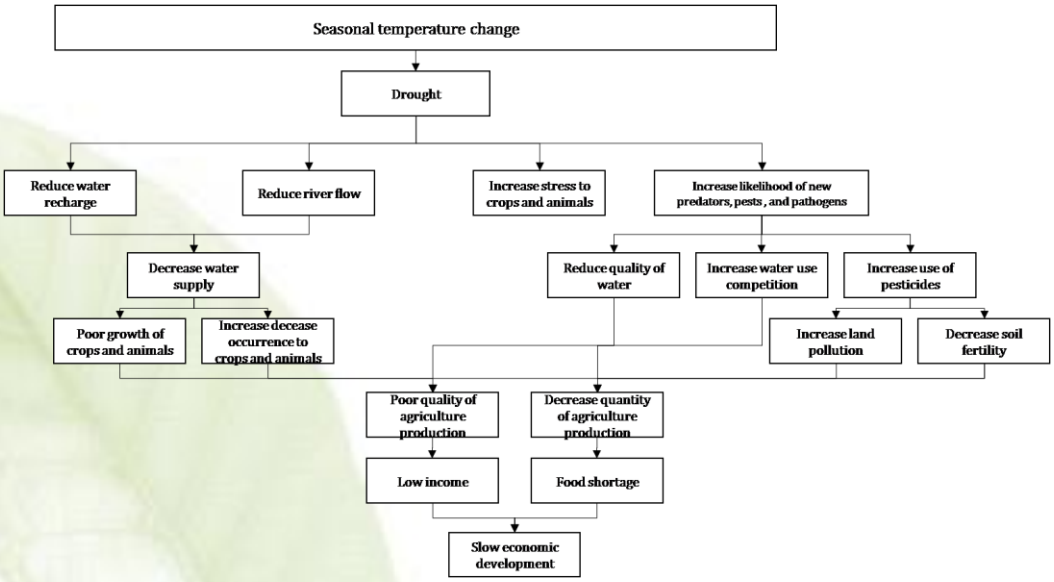


Figure 4. Potential impacts and effects of changes in seasonal temperature to production areas

Alaminos is known to have several poultry services and many residents are also dependent on crops such as lanzones, rambutan, and coconut. These livelihoods will largely be affected because drought reduces soil moisture content which results to poor quality of agriculture produce. Temperature also affects the growth pattern of crops and may adversely affect the productivity of the crops and trees.

Excessive rainfall could lead to landslide, flooding, increased diseases of crops and animals, and change in harvesting and planting cycle. These direct impacts would result to damage in agricultural areas and overflow of fishponds, it may also cause destruction of infrastructures such as farm to market roads. The months September-October-November is projected to have 1178.9 millimeter of rainfall, these could be the months when extreme rainfall could happen. Livelihood and food shortage are the major concern in case there would be intense rainfall (refer to

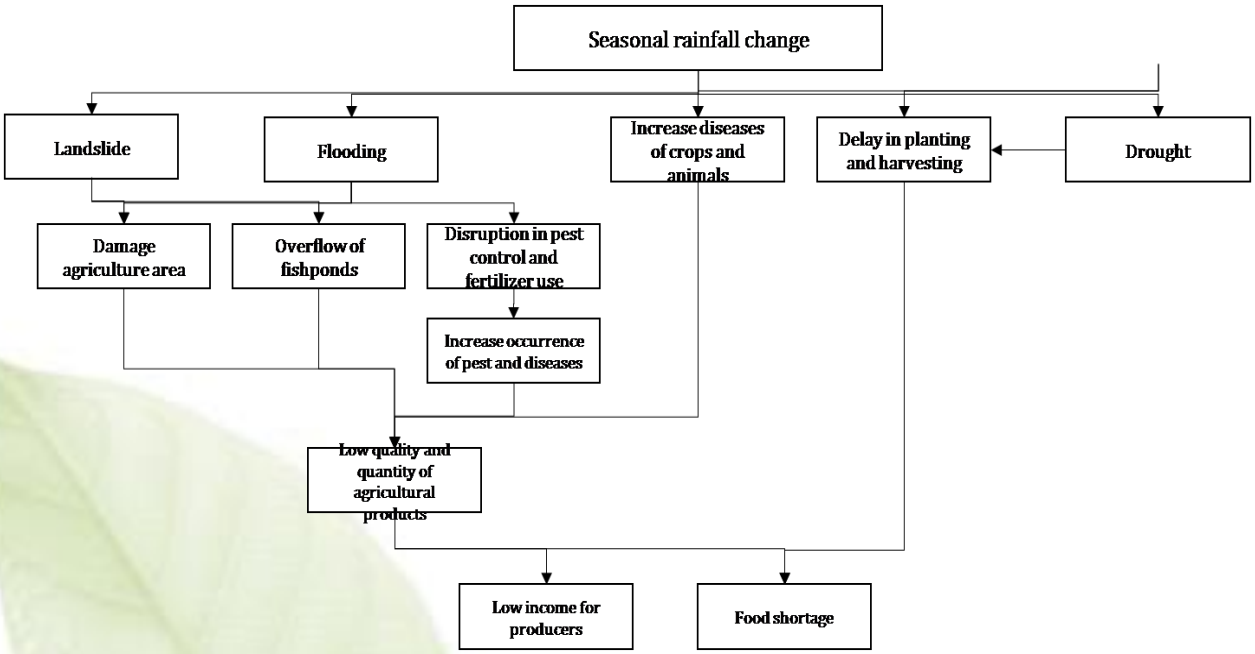


Figure 5).

Figure 5. Potential impacts and effects of changes in seasonal rainfall to production areas

PROTECTION DEVELOPMENT AREA

As shown in

Figure 6, increased temperature means warmer temperature. This affects the moisture content of the soil and could even lead to drought. This reduces the speed of growth of the trees. Warm temperature increases the likelihood of insect outbreaks and invasive species; it reduces river flow and decreases water availability due to faster rate of evaporation. On the positive side, the warm temperature increases the concentration of carbon dioxide which promotes photosynthesis, thus, encourages forest growth. It decreases vulnerability and increases economic activity by reducing the occurrence and impact of hazards, improving forest production, and promotes biodiversity.

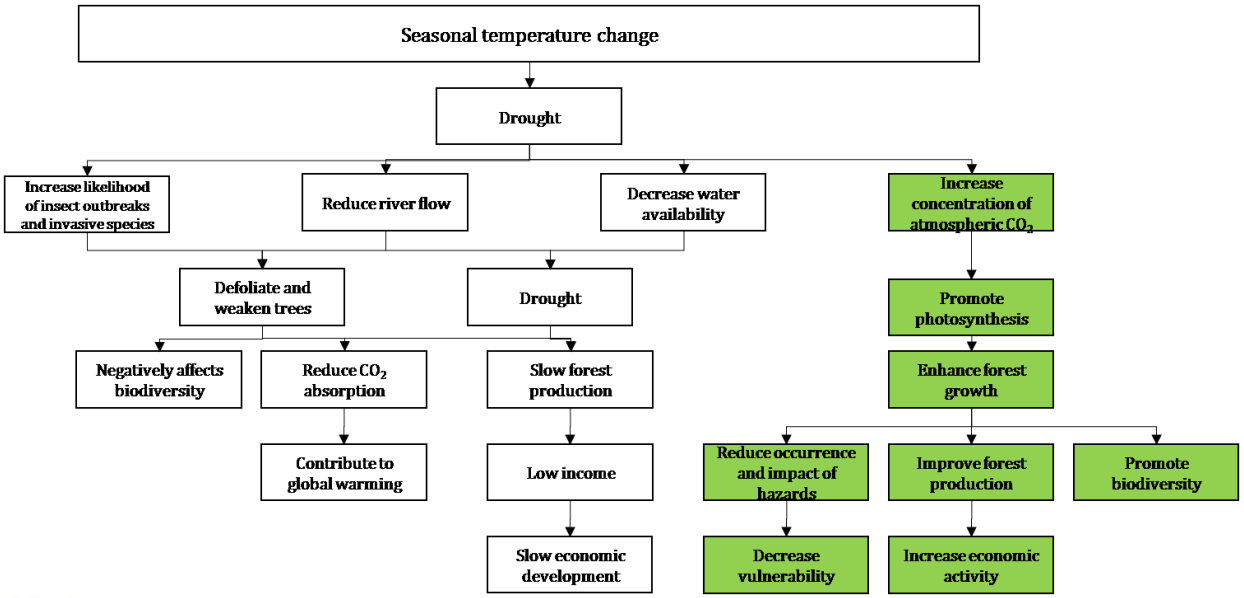


Figure 6. Potential impacts and effects of changes in seasonal temperature to protection areas

The figure below shows the increased rainfall leads to three direct impacts: increased break up of soil and water built up, overflow of rivers and creeks, and an increase of tree mortality. This could lead to soil erosion, landslide, flooding, and even reduced carbon dioxide absorption which inhibit the growth of seeds and seedlings, disturbance of species pattern, lower food availability, lower quality of water. Overall, the disruption of normal amount of rainfall and its increase affects biodiversity in a negative way.

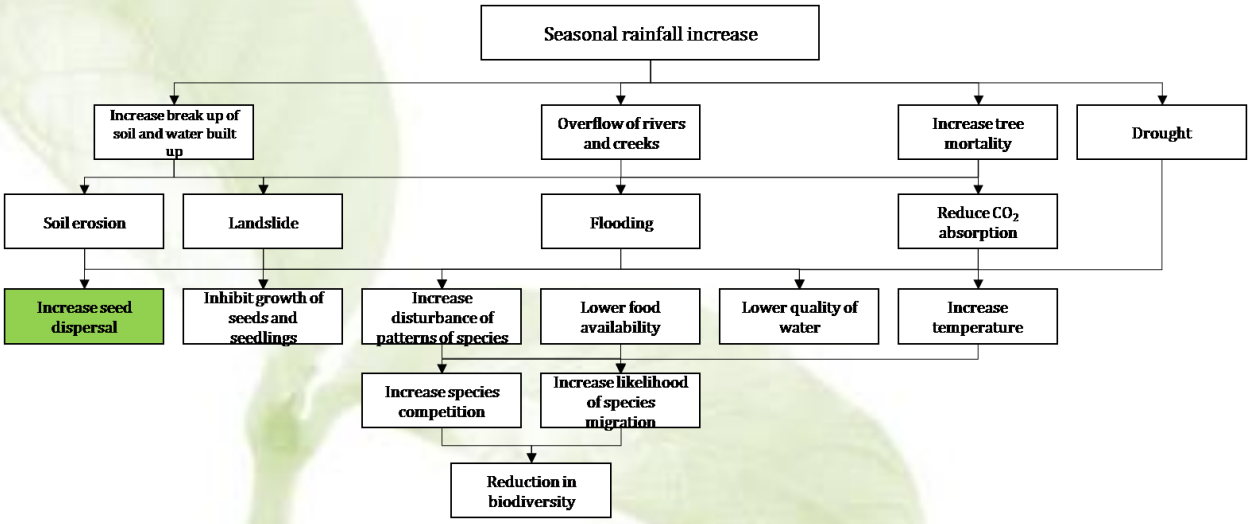


Figure 7. Potential impacts and effects of changes in seasonal rainfall to protection areas

INFRASTRUCTURE DEVELOPMENT AREA

Changes in season temperature may lead to drought and affect the water and power supplies of the area, leading to an increase in demand and shortage of utilities. Increase in temperature also increases likelihood of infrastructure damage. As shown in the figure below:

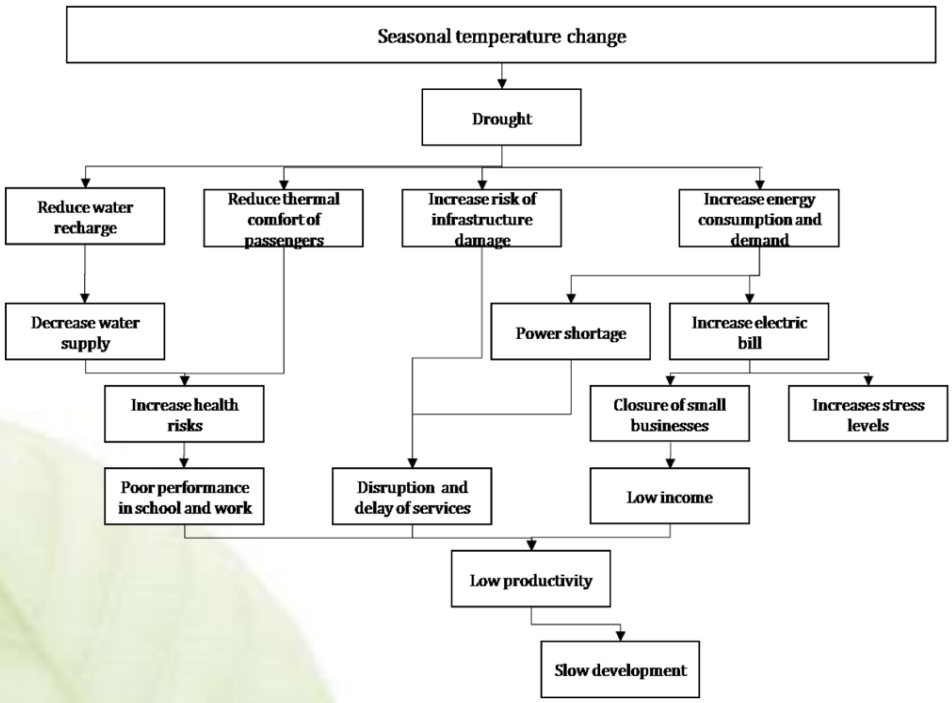


Figure 8: Potential impacts and effects of changes in seasonal temperature to infrastructures

Changes in rainfall may lead to landslide, flooding and also drought in the area. These hazards affect and damage the utility line networks, such as water, power, telecommunications and road and bridges, and overflow canals and drainage systems, potentially delaying deliver of goods and services, and flow of resources in the municipality. These potentials impacts affect both the population and production areas. As shown in the figure below:

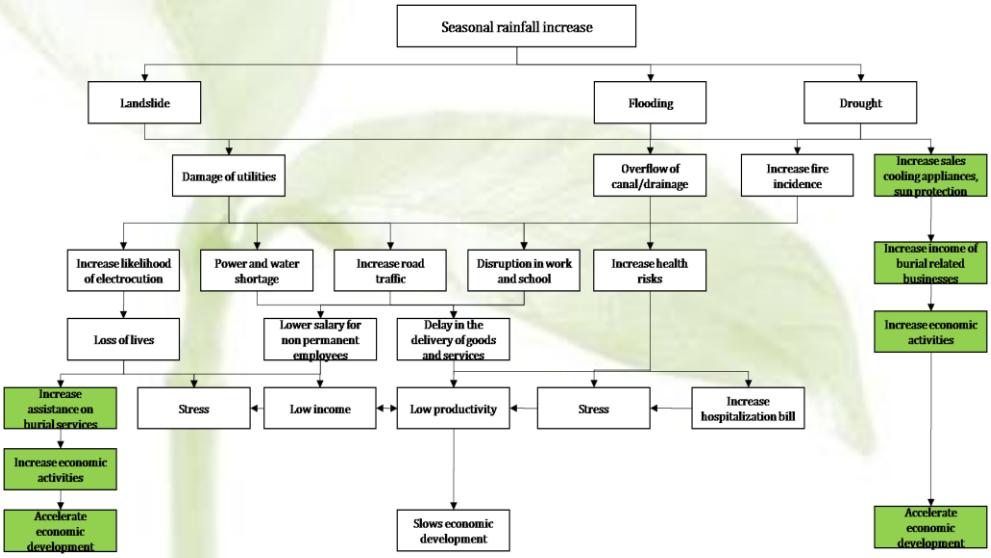


Figure 9. Potential impacts and effects of changes in seasonal rainfall to infrastructures

GREENHOUSE GAS SOURCES AND ESTIMATES

Greenhouse gases trap heat in the atmosphere, which makes the earth warmer, thus resulting to climate change. Carbon dioxide is the most important greenhouse gas emitted by humans. Greenhouse gases come from all sorts of everyday activities, such as using electricity, heating our homes and driving around town. The three top most gases that contributes to the global warming are carbon dioxide (CO2) which is 77% of the global anthropogenic emissions, methane (CH4), 14% and nitrous oxide (N2O). A GHG inventory is an accounting of GHGs that are emitted to and/or removed from the atmosphere over a period of time.

PHILIPPINES GREENHOUSE GAS (GHG) EMISSION

According to the 2012 World Resources Institute Report, the Philippines produced a total of 47,599 million metric tons of carbon dioxide ($MtCO_2e$), contributing to a about 0.33 percent in the world. Historically, the country's GHG emissions increased by 54 $MtCO_2e$ between 1990 and 2012. The average annual change in total emissions during this period was 2.1%, with sector-specific average annual changes as follows: energy (3.4%), agriculture (1.5%), IP (7.1%), waste (2.1%), and LUCF (-12.4%), with the energy and agriculture leading among the sectors.

Energy sector emissions are from transportation, electricity, fuel combustion, among others. The emissions increased by 43 $MtCO_2e$ from 1990 to 2012, with electricity and heat production contributing most the increase, followed by transportation. Between 1990 and 2012, total electricity generation almost tripled. Despite a 66% reduction in the share of power generation from oil, the share of coal-fired power generation grew from 7% to 39% and the share of natural gas increased from 0% to 27%. Hydroelectric, geothermal, waste, wind, and solar photovoltaic power generation almost doubled during this time. The total share of generation from renewables reached 28%.3 As of 2012, total installed electric generation capacity was nearly 17,000 MW.4 Almost 77% of households in Philippines had access to electricity in 2012 and the government is planning to achieve 90% by 2017. In addition, the transportation sector remained the one of the highest GHG emission in the country with the increased number of vehicles sold and used. The Philippines is among the countries that cultivate rice, in the same report, the 13.19 $MtCO_2e$ from 1990 to 2012 increase in agricultural emissions was due to rice cultivation.

Under the Paris Agreement, governments have agreed to hold global mean warming to well below 2°C and pursue efforts to limit warming to 1.5°C. In a recent report by the Climate Action Tracker, the Philippines' commitments are consistent with the 2009 Copenhagen 2°C foal and fall within the country's fair share range but is not fully consistent with the Paris Agreement.

The Philippines' emissions pathway towards 2030, as proposed in its Intended Nationally Determined Contribution (INDC), could be rated "sufficient," however the high uncertainty in its envisioned emissions pathway leads to a "medium" rating. The Philippines' reference—or business as usual (BAU)—scenario, against which the target is measured, has not yet been published and the government has shared no details explaining how the NDC target relates to the LULUCF sector, nor how this will be quantified. Recent statements from the President of the Philippines regarding his country's position on the Paris Agreement (King, 2016b), as well as previous announcements on increasing coal-fired power capacity, add significantly to the uncertainty as to whether the government intends to take substantial action in adopting the policy changes required to meet its INDC target. This lack of details on how the target will be achieved and the role that the LULUCF sector will play in it, leaves the option open for achieving the target by increasing carbon sinks (LULUCF) which is not compatible with what is needed—or fair—to keep global warming below 2°C. Current policies indicate a rapid and ongoing increase in greenhouse gas emissions, which appear inconsistent with meeting the INDC goals.

The INDC submitted on 1 October 2015, the Philippines included a conditional greenhouse gas reduction target of 70% below business as usual (BAU) levels by 2030. The INDC states that

the target is conditional on “the extent of financial resources, including technology development and transfer, and capacity building, that will be made available to the Philippines.” The target covers all emissions from all sectors, including land use, land use change and forestry (LULUCF) (Government of the Philippines, 2015).

ALAMINOS GREENHOUSE GAS INVENTORY (AGHGI)

The Community Level GHG Inventory Manual for Local Government Units in the Philippines identified sources of emissions within the community level. These are stationary combustion from commercial and residential buildings, purchased electricity, mobile combustion, solid waste in landfills, waste water, agriculture, forestry, and industrial processes and products.

SOURCES AND ESTIMATES

As a part of the Alaminos’ commitment in mitigating climate change, the municipality conducted workshops to determine the GHG contribution of different sectors. During the GHG inventory workshop, the local government and stakeholders identified the existing and possible sources of emission in municipality. These are – stationary combustion, mobile combustion, purchased electricity, agriculture, solid waste, and forestry and land use.

STATIONARY COMBUSTION

Stationary combustion fuels are those used by residential and commercial sectors for cooking, lighting, heating and cooling within the geopolitical boundaries of the LGU.

For this inventory, the sources of stationary combustions applicable to the municipality of Alaminos are fuels used for lighting and cooling system used in the community. The table below shows the number of households that used specific fuel type for lighting. Approximately 94 percent of households rely on electricity. Other fuel type used include kerosene (4.48 percent), liquified petroleum gas (0.56 percent), solar panel and lamp (0.18 percent), and others (0.60 percent). It shall be noted that from 2010 to 2015, there has been an increase in renewable energy use. The use of solar panel or solar-powered lighting is expected to increase in the next 10 years as the municipality is investing in the installation of solar powered streetlights.

Table 54. Number of Households by Kind of Fuel for Lighting Alaminos in 2010 and 2015.

Year	No. of HH	Fuel for Lighting							
		Electricity	Kerosene (Gaas)	Liquified Petroleum Gas	Oil	Solar panel	Solar lamp	Others	None
2015	11,154	10,516	489	62	-	11	9	63	4
2010	9,611	8,988	486	76	15	-	-	31	14

Source: PSA, 2015 and 2010

The Philippines is generally a tropical country, climate projections indicate there will be a one (1) degree Celsius increase in seasonal temperature, which will lead in increased use of cooling systems. The commonly cooling systems used in the municipality include refrigerators and air-conditioning units. The organic compound Hydrofluorocarbon (HFC) is the primary refrigerant used in air conditioning and refrigeration units. HFCs are considered potent greenhouse gas than carbon dioxide (CO2) and are leaked anywhere from manufacturing air conditioning equipment, to installation, to the disposal of old units. Additionally, air conditioning and refrigeration units run on electricity that relies primarily on fossil fuels to generate power. As the need for cooling rises, so too will the need for electricity. The air conditioning market is facing major growth in the years to come, introducing many challenges for the future. Fortunately,

there are many solutions to keep people cool and comfortable while also reducing climate pressures.

The table below shows the estimated percentage of households who use air-conditioning and refrigeration units. It should be noted that the type of cooling system is not considered in the analysis, as there are newer units that are eco-efficient and do not use HFCs. Compared to air-conditioning units, more households use refrigerators for food storage.

Table 55. Percentage of households, commercial areas, and institutions with cooling system in Alaminos, Laguna

Barangay	No. of HH	Aircon		Refrigerator	
Poblacion 1	604	10%	60	50%	302
Poblacion 2	543	60%	326	70%	380
Poblacion 3	547	20%	109	80%	438
Poblacion 4	792	5%	40	70%	554
Del Carmen	268	5%	13	30%	80
Palma	571	2%	11	10%	57
San Agustin	1,231	40%	492	60%	739
San Andres	772	50%	386	70%	540
San Benito	1,331	35%	466	55%	732
San Gregorio	847	50%	424	100%	847
San Ildefonso	716	35%	251	80%	573
San Roque	482	20%	96	75%	362
San Juan	757	25%	189	80%	606
San Miguel	537	30%	161	70%	376
Sta Rosa	1,106	1%	11	40%	442

Source: GHG Workshop 2019; PSA, 2015

MOBILE COMBUSTION

Mobile Combustion refers to fuels used for on-road transportation within the geopolitical boundaries of the LGU.

The municipality of Alaminos as sandwiched between two cities in the CALABARZON region – San Pablo City and Sto. Tomas City in Batangas Province. That being said, the public utility jeepneys (PUJs) pass through Maharlika highway – Alaminos Segment. According to the Land Transportation Franchising and Regulatory Board (LTFRB) IV-A, there are registered 468 PUJs that provides service from San Pablo City to Tanauan City. In addition, provincial buses from Quezon province to Metro Manila (Cubao, Buendia, and Alabang) pass through the same road daily. These public utility vehicles contribute to GHG emissions as burning fossil fuels like gasoline and diesel releases carbon dioxide (CO2) and methane (CH4), into the atmosphere. Moreover, based on the DPWH data, the national road in the municipality is considered as beyond capacity with saturated traffic volumes, stop and go situations. This means that drivers do not have freedom to elect their speed.

The table below provides information on the number of registered vehicles in the municipality in 2018. There are about 412 registered tricycles within operating in the municipality, and 69,255 registered PUJs and motorized vehicles from the Land Transportation Office. This data, however, is not conclusive as the LTO is not exclusively used for the municipality. Still, the data provides an estimate on how many vehicles are existing and possibly contributing to GHG emission.

Table 56. Number of Registered Vehicles by Type

Mode of Transportation	Number of Registered Vehicles	Source
Tricycles	412	LGU
Public Utility Jeepney	1,408	LTO
Motor Vehicles	67,847	LTO

Source: LTO, 2018; BPLO, 2019

In order to determine the GHG emission for this type of source, fuel sold were gathered from gasoline stations in the municipality. Currently, there nine (9) gasoline stations, however, only seven (7) gasoline stations were able to provide data with regards to the fuels sold. In addition, it should be noted that these gasoline stations have different starting/operating years. For the purpose of analysis, gasoline stations which started its operations before 2019 were considered, and only 2018 operation were analyzed.

The table below shows the estimated fuel sold per liter in Alaminos. In 2018, the estimated fuel sold is 6,329,091.05 liters, of which 4,491,673.28 or 70.97 percent is diesel and 1,837,417.77 or 29.03 percent is gasoline. Determining which type of fuel emits more greenhouse gases is difficult as there is no sufficient data with regards to the engine model of the vehicles passing through Alaminos. However, the table below provides an idea on which fuel type is more commonly used, which in this case is diesel.

Table 57. Estimated fuel sold per Gasoline Station in Alaminos, Laguna

Gasoline Stations	Estimated Liters Sold		Total
	Diesel	Gasoline	
Petron San Agustin (2018)	*595,856.39*	*455,315.50*	*1,051,171.89*
Felimon Magpantay (2018)	*591,938.43*	*182,776.45*	*774,714.88*
Petron San Andres			
2016	14,171.23	8,935.97	23,107.20
2017	491,846.19	309,905.71	801,751.90
2018	*642,544.27*	*364,545.14*	*1,007,089.41*
2019	549,299.10	519,270.44	1,068,569.54
Shell			
2015	1,563,991.00	742,866.00	2,306,857.00
2016	2,114,530.00	914,863.00	3,029,393.00
2017	1,855,033.00	858,048.00	2,713,081.00
2018	*1,931,163.00*	*715,260.00*	*2,646,423.00*
2019	1,270,244.00	468,239.00	1,738,483.00
Total Gas			
2015	673,084.89	253,850.58	926,935.47
2016	644,483.43	207,559.06	852,042.49
2017	714,516.69	131,793.86	846,310.55
2018	*700,781.09*	*95,329.43*	*796,110.52*
RePhil (2019)	297,311.00	129,170.00	426,481.00
SR Marz			
2018	*29,390.10*	*24,191.25*	*53,581.35*
2019	286,144.38	199,332.11	485,476.49

When compared to the number of registered vehicles in 2018, there diesel-engine vehicles is less than the gasoline-engine type vehicles. The table below shows the number of registered vehicles and the estimated liters of fuel sold from 2015 to 2018.

Table 58. GHG Estimates for Mobile Combustion in Alaminos, Laguna

Year	Registered Vehicles		Estimated Liters Sold (li)	
	Gas	Diesel	Gas	Diesel
2015	33,397	17,592	996,716.58	2,237,075.89
2016	32,488	17,109	2,773,184.66	1,131,358.03
2017	36,438	18,557	1,299,747.57	3,061,395.88
2018	46,079	21,502	1,837,417.77	4,491,673.28

Source: LTO, 2019

PURCHASED ELECTRICITY

Electricity Consumption refers to electricity consumed within the geopolitical boundaries of the LGU. Data on total community electricity consumption should be secured from the electricity providers (e.g. utility company or electric cooperatives) or from government offices. Wherever possible, this data should be segregated by the electricity provider into the different sectors of the community (e.g. residential, commercial, industrial, public facilities).

Table 59. Barangay Households with Electricity in Alaminos, Laguna

Year/Barangay	Total Household	Estimated Electrified Household	Estimated % Household Electrification
Alaminos	11,367	10,763	94.69%
Poblacion 1	832	788	94.71%
Poblacion 2	629	596	94.75%
Poblacion 3	617	584	94.65%
Poblacion4	789	747	94.68%
Del Carmen	639	605	94.68%
Palma	536	507	94.59%
San Agustin	1,273	1,206	94.74%
San Andres	671	635	94.63%
San Benito	1,446	1,369	94.67%
San Gregorio	905	857	94.70%
San Ildefonso	640	606	94.69%
San Juan	701	664	94.72%
San Miguel	436	413	94.72%
San Roque	464	439	94.61%
Santa Rosa	789	747	94.68%

Source: Alaminos CLUP 2018-2027

The table below shows that, generally, the bulk of electricity provided comes from residential clients. The annual consumption is 12,877 Megawatt hour (MWh), only half of commercial consumption which is 6,554 MWh, annually. The total electricity consumption of all the clientele in 2017 is 23,702 MWh and is expected to be more than doubled in 2027, with 48,513 MWh as a total consumption.

Table 60. Annual Electricity Consumption per Clientele in Alaminos, Laguna

Year	Electricity Consumption (MWh)*				
	Residential	Commercial	Industrial	Street Light	Total
2013	9,809	4,770	1,107	201	15,887
2014	9,945	5,108	2,529	180	17,762
2015	10,723	5,785	3,522	179	20,209
2016	12,094	6,469	3,315	201	22,079
2017	12,877	6,554	4,069	202	23,702
2027	25,428	14,503	8,376	206	48,513

Source: MERALCO, 2018

To determine the GHG emission (t-CO_2) in the municipality, the annual electricity consumption was multiplied to the emission factor for the Luzon-Visayas Simple Operating Margin (OM) which is computed at 0.7122 t-CO_2/MWh. The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity[1].

Table 61. GHG Emission of electric consumption per clientele in Alaminos, Laguna.

Year	GHG Emission (t-CO_2) = MWh X emission factor*				
	Residential	Commercial	Industrial	Street Light	Total
2013	6,986	3,397	788	143	11,315
2014	7,083	3,638	1,801	128	12,650
2015	7,637	4,120	2,508	127	14,393
2016	8,613	4,607	2,361	143	15,725
2017	9,171	4,668	2,898	144	16,881
2027	18,110	10,329	5,965	147	34,551

**Emission factor for Luzon-Visayas Simple Operating Margin: 0.7122 t-CO_2/MWh*

It should also be noted that some barangays have solar powered streetlights and barangay halls. Among the proposed projects of the municipality are the construction of solar powered streetlights along the national road. The completion and operation of these streetlights is expected to decrease the electricity consumption and GHG emission of Alaminos.

AGRICULTURE

Agriculture emissions are those generated by agricultural activities like crop production (mainly rice production) and raising of livestock. More specifically, these are emission that result from livestock management (i.e. methane (CH4) and nitrous oxide (N2O) emissions from manure production and use) and from soil management (i.e. nitrous oxide emissions from crop management practices). GHG emissions resulting from fuel combustion in on-farm equipment and human sewage disposal are not reported under the agriculture category.

The municipality has an agricultural land area of 3,614.53 hectares or 67.62 percent of the total land area. These areas are concentrated in rural barangay. In the GHG inventory workshop conducted various fertilizer types such as organic and synthetic fertilizers are being used in the municipality.

In 2016, the CALABARZON region has the highest percentage of distribution of organic fertilizer distributors in Luzon. There are six major inorganize fertilizes available in the Philippine market, these are (1) urea (46-0-0), (2) ammonium sulfate (21-0-0), (3) ammonium phosphate (16-20-0), diammonium phosphate (18-46-0), complete (14-14-14), and muriate of potash (0-0-60).

SOLID WASTE

Solid waste refers to municipal solid waste (“MSW”) generated within the LGU’s geopolitical boundaries that may cause GHG emissions inside the LGU’s geopolitical boundaries (e.g. the LGU operates or has substantial control over the solid waste facility) or the solid waste is transported to a disposal site outside the LGU’s geopolitical boundaries and causes GHG emissions.

[1] *https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf*

Alaminos has several Materials Recovery Facilities (MRF), and the capacity depends upon the waste generated. The Solid Waste Management Plan reported that there will be increase of waste generation due to the increase in population. By 2024, it is projected to have a 28,937.66 kilogram of daily waste generated based on population.

Table 62. . Volume of Solid Waste Generated in Alaminos, Laguna

Source	Types of Waste	Volume of Solid Waste Generated (Kgs/day)	Volume of Solid Waste Generated (Kgs/year)	Disposal Methods/ Treatment Facilities
Domestic	Biodegradable, Recyclable, Residual, Special, Others	21,586.39	7,879,032.35	Collection, Recycling, Vermi Composting
Commercial	Biodegradable, Recyclable, Residual, Special, Others	501.57	183,073.05	
Industrial	Biodegradable, and Recyclable	6.23	2,273.95	
Institutional	Biodegradable, Recyclable, Residual, Special, Others	124.95	45,606.75	
Others	Biodegradable, Recyclable, Residual, Special, Others	51.28	18,717.20	

Source: CLUP 2019-2018

Currently, the municipality transports its waste to another area in the Province of Laguna, the absence of a sanitary landfill coupled with the poor implementation of RA 9003 contributes to GHG emissions. In addition, some barangays such as barangays Del Carmen, Palma, San Benito, San Roque, Santa Rosa, San Gregorio, San Miguel, and San Andres practice garbage burning, while some others practice composting of biodegradable wastes. The MRFs in the municipality are only being used as storage of wastes, waiting to be collected and transferred to San Pedro's sanitary landfill.

FOREST AND LAND USE

Most of the greenhouse gas emissions from forest and land use change are attributed to timber/wood harvesting and conversion of forest into other land uses such as agriculture, settlements, etc. Forest can be a source of greenhouse gas emissions or removal. The net carbon emissions or removal of the forest and land use sector is dependent on two basic biophysical processes:

a. Changes in forest/woody carbon stocks due to the net annual biomass growth of existing forest and non-forest stands, and possible biomass regrowth in abandoned lands;
b. Land use and forest conversion practices which affect the carbon chemistry of the atmosphere via biomass burning, decay and soil carbon release and uptake.

Forest contains a greater range of biodiversity than any other ecosystems and play an important role in economic and social benefits. Alaminos' forest area has an area of 894.52 hectares (16.73%) of the total land area. These are located in barangays San Gregorio, Sta. Rosa and Palma. The municipality does not have a National Integrated Protected Areas (NIPAS) within its jurisdiction, the local government locally proclaimed the forest area as a protected area.

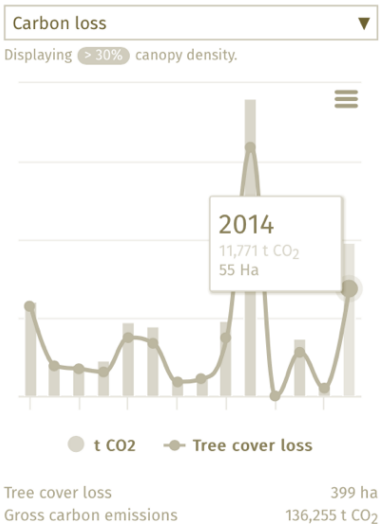
Although, land use change has been evident in the municipality, based on current CLUP 2018-2027, there has been no change in the forest area of the municipality. However, other land uses showed an increase (built up, industrial, road networks) and decrease (agriculture) from 2000 to 2017 land use assessments.

Table 63. Land Use Change from 2000 to 2017 of Alaminos, Laguna

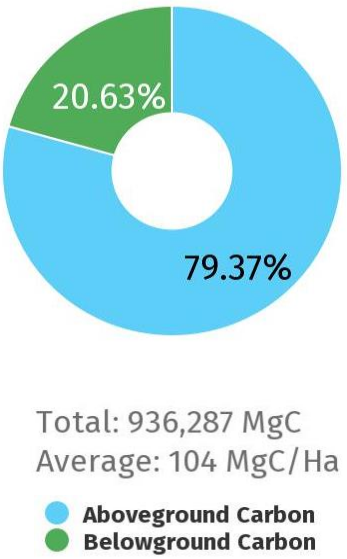
Land use	2000 Area (Ha)	Percentage to Total Area	2017 Area (Ha)	Percentage to Total Area	Percentage Change
Agriculture[1]	3,962.69	72.36	3,614.53	67.62	-8.79
Forest	893.38	16.31	893.38	16.71	0.00
Built up[2]	255.45	4.66	345.37	6.46	35.20
Industrial[3]	37.91	0.69	63.26	1.18	66.87
Transportation	0.30	0.01	128.78	2.41	42860.00
PUD	326.37	5.96	300.03	5.61	-8.07
Total	5,476.00	100	5,345.35	100	-

Source: MPDO GIS computation 2017, 2000 CLUP
[1]includes water bodies, rivers and creeks
[2]includes residential, commercial, institutional

However, during the workshops in the CLUP formulation, one issue identified by the stakeholders is illegal logging in the southern part of Alaminos. Landmark.org, a global platform of indigenous and community lands produced an interactive map that shows the canopy density loss/gain and carbon stored in trees within a given area.



Forest canopy density is a major factor in evaluation of forest status and is an important indicator of possible management interventions. Tree canopy cover, also known as canopy coverage or crown cover, is defined as the proportion of the forest floor covered by the vertical projection of the tree crowns. Based on the analysis of the area, there is about 433 hectares of tree cover loss from 2001 to 2015. In 2014 that the municipality loss about 72.04 hectares of tree cover, while in 2015, less than 5 hectares loss in tree cover. On a positive note, 92 hectares of land was said the estimated tree cover gained from 2001 to 2012.



In terms of carbon stock, the aboveground carbon storage (MgC) of Alaminos is estimated at 743,084.97 MgC while the belowground is approximately 193,202.09 MgC.

The forest area in the municipality is considered a carbon sink that absorbs carbon dioxide (CO_2). The municipality has existing projects such as tree planting activities, reforestation . Alaminos also locally proclaimed its forest areas as protected areas. These initiatives helped maintain and trees and forest areas. In addition, Alaminos, being a third class income municipality is limited to convert its agriculture to 10 percent of total agricultural land.

In addition, Alaminos, being a third class income municipality is limited to convert its agriculture to 10 percent of total agricultural land.

Overall, the main sources of GHG emission are mobile combustion, solid waste and purchased electricity.

ACCAP STRATEGIC FRAMEWORK

The Alaminos Climate Change Action Plan or ACCAP is shall be anchored in the municipality's vision. The key element of the municipality's vision in relation to disaster risk reduction and climate change adaptation are the words **ECOLOGICALLY-BALANCED ENVIRONMENT. RESILIENT** and **SAFE.**

Resilience as defined in Republic Act No. 10121, is the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Safety is defined as the condition of being protected from or unlikely to cause danger, risk, or injury. For this framework, safety or safe shall be used in the context of disaster risk and climate change impacts. Safety shall include preventive and proactive measures.

Ecologically-balanced environment refers to the a state of dynamic equilibrium within a community of organisms in which genetic, species and ecosystem diversity remain relatively stable, subject to gradual changes through natural succession. The key aspect of this word is that the natural balance in an ecosystem is maintained. This balance may be disturbed due to the introduction of new species, the sudden death of some species, natural hazards or man-made causes. Ecologically-balanced environment is one of the key components of sustainable development.

ACCAP GOAL AND OBJECTIVES

The Alaminos vision key words, resilience, safe and ecologically-balanced environment, are translated to disaster risk reduction and management, and climate change adaptation and mitigation.

The overall goal of the municipality is to have **"a proactive, safe and resilient municipality, where communities have a strong adaptive capacity towards climate change impacts and disaster risks."**

In order to achieve the goal, objectives were formulated through consultations with local officials and other stakeholders. Six (6) objectives are as follows:

1. Minimize greenhouse gases from various sources;
2. Ensure preservation and protection of carbon sinks in the municipality.
3. Prevent and reduce the adverse effects of hazards and vulnerability through proactive measures;
4. Provision of immediate disaster response and basic needs of the affected population to preserve lives and properties;
5. Restore and improve damaged infrastructure and disrupted economic functions in accordance with build-back forward principle; and
6. Develop a well prepared and resilient community supported by well-equipped MDDRMC and local relevant local policies;

STRATEGIC FRAMEWORK

ACCAP which sounds similar to *AKAP,* a *Filipino* word that means to embrace, reflects the municipality's and community's willingness to accept and support and realize the goal and objectives of the action plan. The ACCAP Framework shall use the adaptation, response, mitigation strategy (ARMS) as it translates the objectives into strategies – policies, program, projects and activities.

The framework also reflects the four (4) thematic areas of disaster risk reduction and managements in the Philippines – (a) Preparedness, (b) Response, (c) Prevention & Mitigation, and (d) Rehabilitation & Recovery.

Figure 10. DRRM Thematic Areas

Adaption and Response Strategies of the ACCAP are particularly integrated in these thematic areas. The figure below shows the ACCAP Strategic Framework.

Figure 11. ACCAP Framework

ADAPTATION

Adaptation, as defined in Republic Act No. 9729, is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptation, thus, is ensuring that changes are made to enhance resilience or reduce vulnerability to changes in climate. The overall goal of adaptation is to reduce the vulnerabilities and harmful effects associated to climate change and disaster risks.

STRATEGIC ACTIONS

Communication Strategy

Communication is one of the key elements to ensure that the community is aware, knowledgeable and understand climate changes, its cause and its impact. This may lead to a potential behavioral change or shift among communities toward climate change. Programs, projects and activities such as (1) Awareness campaign and information dissemination using various mediums (social media, printed materials), (2) Conduct of training/seminars on CC impacts and vulnerability reduction, and (3) Build adaptive capacity of population, ensures an increase or enhanced knowledge and understanding on vulnerability and impacts of climate change.

Preventive Strategy

In adaptation, it is necessary to change or adjust certain systems in order to reduce the climate change impacts. Adaption measures are also preventive strategies. Preventive strategies are necessary to reduce potentials impacts of climate change and disasters. These include providing climate proof/resilient farm inputs or seedlings, or Infrastructure Redundancy and Design strategy, which includes restoring and improving damaged infrastructure and disrupted economic functions in accordance with build-back forward principle is one effective strategy that the municipality is proposing. This is includes (1) Improve building design adopting resilient engineering measures, (2) Improve drainage facilities, (3) Promote and encourage construction of green buildings, (4) Construct rip-rapping and slope protection to landslide prone areas, and (4) Strengthen energy conservation policies and building standards.

DRR/CCA Integration Strategy

Planning or local plans are now required to have a DRR/CCA component to prevent and reduce the adverse effects of hazards and vulnerability of climate change and to develop a well prepared and more resilient community. To ensure its integration the national government through the Department of Interior and Local Government (DILG) and Housing and Land Use Regulatory Board (HLURB) provides guideline and memorandum circulars for local government units. Policies, programs, projects, and activities include (1) Harmonize DRR/CCA to local plans, (2) Implementation of DRR/CCA enhanced plans through strict implementation of zoning ordinance and PPAs – specifically on the implementation of no build zones in high susceptibility hazard prone areas, river easements, (3) Develop local shelter plan, (4) Develop an evacuation plan and other precautionary and preventive measures, and (5) improve quality of surface and ground water to ensure that river overflow likelihood is reduced.

RESPONSE

Response refers to any concerted effort by two (2) or more agencies, public or private, to provide assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected and in the restoration of essential public activities and facilities. Response includes actions taken to save lives and prevent further damage in a disaster or emergency situation.

STRATEGIC ACTIONS

Responding to climate change impacts and disasters is a strategy to reduce impacts to the population, network systems, natural environment, and facilities. Providing immediate disaster response and basic needs is important to preserve lives and properties. Some PPAs under this strategy are similar to the PPAs identified in the Municipal Disaster Risk Reduction and Management Plan 2020-2025.

Capacity Development Strategy

Capacity development refers to transformations that empower individuals, leaders, organizations and societies. If something does not lead to change that is generated, guided and sustained by those whom it is meant to benefit, then it cannot be said to have enhanced capacity, even if it has served a valid development purpose. The projects included in this strategy are (1) conduct of Alaminos Laguna Emergency Response Team (ALERT) Trainings, (2) conduct of Incident Command System (ICS) Training, (3) Conduct of Emergency Operation Center (EOC) Training, (4) Conduct of DRRM and CCAM Assessment Trainings, (5) Conduct of Reiteration of Response Cluster, (6) Relief and Evacuation Management Trainings, and (7) Conduct of Emergency Medical Service (EMS) Training.

Reorganization and Response Strategy

Reorganization and Response Strategy recognizes that systems should be able to respond and change to meet unexpected shocks. This requires flexible organizations and access to different kinds of resources (information, skills, equipment, knowledge and experience). It also means a high level of coordination and flexible organizational structures capable of adjusting to new conditions. This strategy includes the (1) provision of assistance to disaster affected communities, (2) activation of Municipal DRRM Coordination System, (3) provision of a comprehensive Early Warning System and Information Guide, and (4) Activation of the Alaminos Laguna Emergency Response Team (ALERT).

Equipment and Facilities Improvement Strategy

In order to effectively and efficiently respond to the community needs, especially during emergency situations, improving facilities and equipment is essential. Under this strategy, the follow ing projects is included (1) activation and operationalization of Evacuation Center; (2) Activate and operationalize evacuation center; (3) provision of a comprehensive Early Warning System and Information Guide; (4) Improvement of LGU-wide CCTV monitoring system; (5) Improvement and Maintenance of Rescue Vehicles, and (6) Improve ALERT equipment and facilities, and Purchase Personal Protective Gear.

MITIGATION

Mitigation, in the disaster risk reduction sense, is the structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation, and technological hazards and to ensure the ability of at-risk communities to address vulnerabilities aimed at minimizing the impact of disasters. Such measures include, but are not limited to, hazard-resistant construction and engineering works, the formulation and implementation of plans, programs, projects and activities, awareness raising, knowledge management, policies on land-use and resource management, as well as the enforcement of comprehensive land-use planning, building and safety standards, and legislation.

In the climate change perspective, as defined in Republic Act No. 9729, mitigation refers to human intervention to address anthropogenic emissions by sources and removals by sinks of all GHG, including ozone- depleting substances and their substitutes. Mitigation ensures changes are made to slow climate change by lowering the amount of greenhouse gases, either by reducing sources of these gases (for example, the burning of fossil fuels for electricity, heat

or transport) or enhancing the "sinks" that accumulate and store these gases (such as the oceans, forests and soil). According to the 2014 report on Mitigation of Climate Change from the United Nations Intergovernmental Panel on Climate Change, the overall goal of mitigation is to avoid significant human interference with the climate system, and "stabilize greenhouse gas levels in a timeframe sufficient to allow ecosystems to adapt naturally to climate change, ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

The climate change perspective shall be used for this Plan.

STRATEGIC ACTIONS

Carbon Sinks Improvement Strategy

One climate change mitigating measure is enhancing carbon sinks. Carbon sinks are natural systems that suck up and store carbon dioxide from the atmosphere. In order to enhance carbon sinks, there are two (2) main PPAs that the municipality can do (1) Reforestation and Tree planting activities, and (2) Urban Landscaping and Greening Program.

By implementing these PPAs, the municipality along with its adjacent municipalities and cities can will benefit in reducing trapped GHG in the atmosphere. The municipality can serve as a green lung that plays a vital role in cleaning the air people breathe and absorbing carbon dioxide.

GHG Reduction and Management Strategy

The GHG estimates from identified sources helped determine which industries and sectors contribute or emit the most GHG in the atmosphere. Proposed strategies and PPAs are listed below.

Stationary combustion

1. Procure energy efficient lighting and cooling systems in government buildings
2. Install solar-powered streetlights

Mobile combustion

1. Promote and encourage sustainable and active transportation in the locality
2. Acquire air quality monitoring station and equipment
3. Strengthen anti-belching campaign in the municipality
4. Purchase government electric vehicles
5. Develop transportation route plan
6. Develop policies and programs that reduces emissions along National Highway such as banning use and operation of old engine vehicles

Purchased electricity

1. Increase use of renewable sources of electricity in the municipality
2. Install solar-powered streetlights

Agriculture

1. Promote and strengthen organic farming
2. Promote waste composting
3. Strictly implement zoning ordinance

Solid waste

1. Develop policy banning use of plastic in the municipality
2. Expand source reduction and waste reduction programs and initiatives.
3. Promotion of waste composting
4. Develop water conservation policies
5. Establish sanitary landfill and improve MRFs

Forestry and land use

1. Strictly implement zoning ordinance
2. Strictly implement environmental laws particularly laws related to forest
3. Strengthen policies on illegal logging in the area

Overall, exercising leadership by prioritizing efforts to reduce greenhouse gas emissions in municipal operations is important to ensure reduction of GHG emissions in the municipality of Alaminos.

MEANS OF IMPLEMENTATION

The Alaminos Climate Change Action Plan 2020 – 2025 is implemented using either or both a regulatory or developmental tool. The primary implementation tool for the ACCAP are the Policies and PPAs identified below.

LIST OF PROGRAMS, PROJECTS AND ACTIVITIES

The Structured List of Programs, Projects and Activities (PPAs) is the one of the primary tool to implement the LCCAP. There are 27 major programs and projects that responds to specific strategy. The table below shows the list of PPAs for all sectors including the goals, and objectives.

Table 64. List of LCAAP Program, Projects and Activities in Alaminos, Laguna

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
Adapt					
Awareness campaign and information dissemination	Increase the CCA awareness of the communities	MENRO, MDRRMO, Barangay Offices	MDRRMF	1,800,000.00	2020 - 2025
1. CORAMBLAN Festival	Festivals that advocate preservation and protection of nature	Mayor's Office, Tourism Office	General Fund	5,441,530.25	2020 - 2025
2. Cultural Mapping	Identify the carrying capacity of tourism areas to support climate smart industries and services	Mayor's Office, Tourism Office	General Fund	500,000.00	2020
3. Conduct Tourism Awareness Seminar and Tourism Statistics Orientation to AEs, Tourist Attractions and Destinations within the municipality	Implement a system of collection, analysis and reporting of baseline and new data on green jobs and employment	Mayor's Office, Tourism Office	General Fund	30,000.00	2020
4. Recognition of all tourist attraction and destination	Participation of Recognized AEs, Tourist Destinations	Mayor's Office, Tourism Office	General Fund	45,000.00	2020

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
thru a resolution as per DOT standards					
5. Explore Mt. Pataguin to be cited as the ecotourism project	Rehabilitate/reforest degraded tourism areas	Mayor's Office, Tourism Office, MENRO	General Fund	30,000.00	2020 & 2023
6. Accommodate activities of the different organization's contributory in the records of VAR and MICE	CSOs active participation in governance as organization	Mayor's Office, Tourism Office	General Fund	50,000.00	2020
Environmental Planning, Monitoring and Evaluation Program	Mainstreaming of CC-DRRM in local plans* (PDPFP, CLUP, CDP, ELA) and Implementation of DRR/CCA enhanced plans	Mayor's Office, MPDO	General Fund	939,326.68	2020 & 2025
Conduct of training/seminars on CC impacts and vulnerability reduction	Identify and implement gender-responsive sustainable livelihood and social protection programs for PWDs and vulnerable poor families	MSWDO, MDRRMO	MDRRMF	102,028.69	2020-2025
MDRRM/CCAM trainings, workshops and seminars	1. Conduct training of trainers to respond to the needs of communities for CCA and capacity development of MDRRM Staff 2. Build adaptive capacity of population 3. Build Linkages with Accredited Community and Disaster Volunteers	MDRRMO Barangay Offices, MDRRMO	MDRRMF	800,000.00	2020 - 2025

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
Improve building design adopting resilient engineering measures	Disaster damaged infrastructures are rebuilt in BUILD, BACK, FORWARD approach	MDRRMO, MENRO, MEO	MDRRMF	600,000.00	2023
Improve drainage facilities	Constructed of Line Canals along barangay roads to prevent drainage flooding	Mayor's Office MEO, MENRO	MDRRMF/ 20 % Dev. Fund	3,400,956.41	2020 - 2025
Construct rip-rapping and slope protection to landslide prone areas	Constructed rip rap and slope protection along landslide prone areas	Mayor's Office MDRRMO, MENRO, MEO	MDRRMF/ 20 % Dev. Fund	2,000,000.00	2022
Promote and encourage construction of green buildings	Commercial establishments, Private Homes, Factories, and public infrastructure are inspected in compliance to GREEN BUILDING CODE	MEO, MENRO	General Fund	Transportation expenses during inspection	2020 - 2025
Improvement of quality of surface and ground water	Inspection of Commercial establishments, Private Homes, Factories, and public infrastructure and compliance to Septic Management Ordinance	MENRO, MEO, ALWD	General Fund	60,000.00	2020 - 2025
Strengthen energy conservation policies and building standards	Policies are reviewed and amended to strengthen energy conservation policies	SB, MENRO, MEO	General Fund	10,000.00	2020
Municipal Hall and Public Government Building, Facilities, Equipment Insurance	Insurance coverage in government properties	GSO	General Fund	GSIS premium rate	
Distribution of Climate Resilient farm inputs	Distribution of High-quality crops Distribution of Hybrid Corn Seeds Distribution of Fruit Bearing Trees	MAO	General Fund	1,158,500.00	2020 - 2025

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
Develop an evacuation plan and other precautionary and preventive measures	Evacuation plan incorporated with the hazard maps and barangay evacuation maps.	MPDO, MDRRMO, MEO	MDRRMF	50,000.00	2021
Develop a local shelter plan	DRRCCA enhanced local shelter plan	LHB, MPDO, MDRRMO, MEO, MUDHO	MDRRMF	400,000.00	2021
Respond					
Alaminos Laguna Emergency Response Team (ALERT)	Response team are organized and available in times of emergency and in response to the adverse effects of Climate Change	MDRRMO	MDRRMF	2,190,000.00	2020 - 2025
1. Improve ALERT equipment and facilities	Additional DRRM equipment and supplies are provided	MDRRMO	MDRRMF	2,865,126.00	2020 - 2025
2. Purchase Personal Protective Gear	Ensure the safety of responders	MDRRMO	MDRRMF	600,000.00	2020 - 2025
Activate and operationalize evacuation center	Mobilized Camp Coordination and Camp Management and materials, supplies and equipment in the evacuation center are provided.	MSWDO, MDRRMO	MDRRMF	2,800,000.00	2020 - 2025
Provide assistance to disaster affected communities	Provision of relief (food and non-food items), Nutrition in Emergencies, WASH, Financial Assistance, Psycho-social support to the affected communities	MSWDO, MDRRMO	MDRRMF	1,150,000.00	2020 - 2025

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
Pollution Control Program	Pollution Control functions and responsibilities are designated under the MENRO	MENRO	General Fund	300,000.00	2020
Comprehensive Early Warning System and Information Guide	Barangays lying in moderate to high susceptibility to hazards are informed and equipped with warning system	MDRRMO	MDRRMF	800,000.00	2020 - 2025
Conduct of Alaminos Laguna Emergency Response Team (ALERT) Trainings	Trained Personnel	Mayor's Office/ MDRRMO PDRRMO	MDRRMF	300,000.00	2020 - 2025
Conduct of Incident Command System (ICS) Training	Trained Personnel	Mayor's Office/ MDRRMO PDRRMO	MDRRMF	300,000.00	2020 - 2025
Conduct of Emergency Operation Center (EOC) Training	Trained Personnel	Mayor's Office/ MDRRMO PDRRMO	MDRRMF	300,000.00	2020 - 2025
Conduct of DRRM and CCAM Assessment Trainings	Trained Personnel	Mayor's Office/ MDRRMO PDRRMO	MDRRMF	300,000.00	2020 - 2025
Conduct of Reiteration of Response Cluster, Relief and Evacuation Management Trainings	Trained Personnel	Mayor's Office/ MDRRMO PDRRMO	MDRRMF	300,000.00	2020 - 2025
Conduct of Emergency Medical Service (EMS) Training	Trained Personnel	Mayor's Office/ MDRRMO PDRRMO	MDRRMF	300,000.00	2020 - 2025
Comprehensive Early Warning System and Information Guide	Barangays lying in moderate to high susceptibility to hazards are informed and equipped with warning system	MDRRMO	MDRRMF	800,000.00	2020 - 2025

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
Improvement of LGU-wide CCTV monitoring system	Monitored accident along highway barangays and hazard prone areas	MDRRMO, GSO, PNP	MDRRMF	5,500,000.00	2020 - 2025
Improvement and Maintenance of Rescue Vehicles	MDRRM Rescue Vehicle are well maintained and passed the emission testing	MDRRMO, GSO	MDRRMF	3,000,000.00	2020 - 2025
Mitigate					
Urban Landscaping and Greening Program	Integrated tree planting along riverbanks/ river bank rehabilitation / that reduce the risk of flooding	MENRO, Barangays	MDRRMF	1,564,439.95	2020 - 2025
1. Installation of (aquatic macrophyte biosorption system) AMBS in the rivers and water systems 2. Reforestation and Tree planting activities	Rehabilitation of the river biodiversity. Nurtured Trees along denuded areas and reduction of carbon footprints	MENRO, Barangays, CSOs - Rotary	MDRRMF	106,246.97	2020 - 2022
Procure energy efficient lighting and cooling systems in government buildings	Energy efficient lighting and cooling systems are installed in the municipal government buildings	MEO, GSO	20 % Dev. Fund	100,000.00	2020
Install solar-powered streetlights	1. Development of renewable energy (i.e. Establishment of Solar Panels/Installation of Wind Mill/Bio-Gas) 2. Increase use of renewable sources of	MEO,	20 % Dev. Fund	12,000,000.00	2020 - 2022

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
	electricity in the municipality				
1. Promote and encourage sustainable and active transportation in the locality	Purchase government electric vehicles	MENRO	General Fund	850,000.00	2023
2. Air Quality Monitoring	Orientation on air quality monitoring, clean air act, apprehension of garbage burning violators, and building partnership with air quality monitoring stations.	MEO, MENRO	General Fund	50,000.00	2023
3. Strengthen anti-belching campaign in the municipality	Support to anti-belching campaign	LTO, PNP	General Fund	-	2024
4. Develop transportation route plan	Traffic Management and reduction to GHG emissions	ATMO, GSO	General Fund	10,000.00	2025
Promote and strengthen organic farming	Organically grown food best for human consumption	MAO, CSOs, Barangay Offices	General Fund	529,673.91	2020 - 2025
Farmer's Field School on vegetable production and Sustainable Pig Farming	Improve the adaptive capacity of farmers and livestock farmers through the provision of relevant technologies and information	MAO	General Fund	210,000.00	2020 - 2022
Material Recovery Operation, management and Maintenance	Labor and other exp. for the MRF Program	MAO, MENRO, Barangay Offices	General Fund	5,925,826.44	2020 - 2025
Purchase of Ecologically Sound Garbage Collection Vehicle	Intensified waste segregation and segregated collection	GSO, MENRO	20 % Dev. Fund	1,267,254.00	2021
Enforcement of the ban on the use of plastic in the municipality	Inspection of commercial establishments	MENRO, CSOs, Private Sector, SB	General Fund	464,153.03	2021 - 2025

Programs, Projects and Activities	Expected Output	Responsible Committee/s, Department/s, Organizations	Funding Source	Budgetary Requirements	Time Frame
Promotion of water conservation in the Municipality	1. Adoption of Water conservation policies 2. IEC campaign on water conservation 3. Construction of Elevated Water Tank	SB ALWD MEO	20 % Dev. Fund	1,000,000.00	2022
Strengthen policies on illegal logging in the area and protection of forest areas	illegal logging activities are addressed and reforestation of denuded areas	SB, MENRO, PNP	General Fund	50,000.00	2021 - 2025
			TOTAL	**63,350,062.33**	

The total cost for all projects identified in the LCCAP accounts to PhP 63,350,062.33, the PPAs were already integrated in other department and agencies which they incorporate their PPAs with CCA, or CCET, on which, 27.49% of the total project cost or ₱ 17,417,342.03 is allotted to “Adopt’, 34.42% or ₱ 21,805,126.00 is allotted for “Respond’, and 38.09% or ₱ 24,127,594.30 is for ‘Mitigate’. Among the three thematic strategies, “Mitigate” has the highest budgetary requirement.

PPAs identified in the Alaminos Climate Change Action Plan shall be funded through the following funding sources:

1. 20% Internal Revenue Allotment (IRA) Development Fund which is annual appropriation that are earmarked for development Projects as defined by the Joint Memorandum Circular No. 2011-1
2. Local Disaster Risk Reduction Management Fund or the 5% of the estimated revenue from regular sources shall be set aside to support disaster risk management activities as per Joint Memorandum Circular No. 2013-1 s. 2013
3. General Fund

If the need for further funding for a certain PPAs as prescribed by law, through SB, supplemental appropriation can be made. Also possible sources of local funding may come through external sources that include but do not limit to the locally-based private corporations and enterprises, NGOs/POs, academe and private volunteer group or individuals.

LEGISLATIVE REQUREMENTS

On the other hand, this section focuses on the different legislative requirements for the municipality of necessary to successfully complement and implement the list of PPAs. The legislative requirements are priority legislations that need to be enacted by the Sanggunian Bayan to support development and priorities of the LGU related to disaster risk and climate change. In addition, the adoption of national laws, guidelines are included to reinforce and amend the existing local existing resolutions and ordinances.

The table below shows the legislative requirements of the ACCAP.

Table 65. Legislative requirements of LCCAP in Alaminos, Laguna

Strategy	Programs, Projects, and Activities	Legislative Requirements
Adapt		
Communication Strategy	Awareness campaign and information dissemination	Ordinance requiring public places/offices to post climate change IEC materials
	Conduct of training/seminars on CC impacts and vulnerability reduction	Adoption of CCA policies. Policies observing Climate Change or Earth Hour.
	MDRRM/CCAM trainings, workshops and seminars	-
Preventive Strategy	Improve building design adopting resilient engineering measures	Ensuring that areas for road, bridges, power, water and sewerage/drainage construction and buildings are not constructed in hazard prone areas, materials and engineering techniques to be used are climate resilient Ensuring that infrastructure design comply with the necessary DRR/CCA or climate proof engineering standards
	Improve drainage facilities	
	Construct rip-rapping and slope protection to landslide prone areas	
	Promote and encourage construction of green buildings	
	Strengthen energy conservation policies and building standards	
	Municipal Hall and Public Government Building, Facilities, Equipment Insurance	Resolution/Ordinance requiring public buildings and properties to have insurance
	Distribution of Climate Resilient farm inputs	-
DRR/CCA Integration Strategy	Develop an evacuation plan and other precautionary and preventive measures	Resolution adopting the Climate and Disaster Risk Assessment and requiring
	Develop a local shelter plan	

Strategy	Programs, Projects, and Activities	Legislative Requirements
		Department offices to integrate to local plans
Respond		
Capacity Development Strategy	Conduct of Alaminos Laguna Emergency Response Team (ALERT) Trainings	Resolution/Ordinance requiring municipal and barangay staff and officials to attend trainings
	Conduct of Incident Command System (ICS) Training	
	Conduct of Emergency Operation Center (EOC) Training	
	Conduct of DRRM and CCAM Assessment Trainings	
	Conduct of Reiteration of Response Cluster, Relief and Evacuation Management Trainings	
	Conduct of Emergency Medical Service (EMS) Training	
Reorganization and Response Strategy	Provide assistance to disaster affected communities	-
	Activation of Municipal DRRM Coordination System	
	Activation and operationalization of Evacuation Center	
	Designation of Pollution officer	Creation of Pollution Control Officer
Equipment and Facilities Improvement Strategy	Improve ALERT equipment and facilities	-
	Purchase Personal Protective Gear	
	Activate and operationalize evacuation center	
	Comprehensive Early Warning System and Information Guide	
	Improvement of LGU-wide CCTV monitoring system	
	Improvement and Maintenance of Rescue Vehicles	
Mitigate		
Carbon Sinks Improvement strategy	Reforestation and Tree planting activities	Strengthen policies on illegal logging in the area and protection of forest areas. Policies on the Ban of Illegal Cutting of Trees.
	Urban Landscaping and Greening Program	
	Integration of CCA in final disposal stage of solid waste	Policies that strengthen solid waste segregation, re-use, reduce, recycle and adopting the guidelines of final disposal of waste.
GHG Reduction Strategy	Procure energy efficient lighting and cooling systems in government buildings	Strengthen energy conservation policies and building standards
	Install solar-powered streetlights	

Strategy	Programs, Projects, and Activities	Legislative Requirements
	Incorporate risks from climate change and climate variability in transportation system planning	Strengthen ATMO and Creating core team in formulating the transportation route plan
	Promote and encourage sustainable and active transportation in the locality	
	Establish Air Quality Monitoring System	Strengthen policies on anti-smoke belching. Adoption on the PUV Modernization and strengthen partnership with LTO regarding enforcement on emission testing.
	Strengthen anti-belching campaign in the municipality	
	Develop CCA integrated local road mapping	Strengthen ATMO and Creating core team in formulating the transportation route plan
	Promote and strengthen organic farming	-
	Farmer's Field School on vegetable production and Sustainable Pig Farming	
	Material Recovery Operation, management and Maintenance	Strengthen policies on solid waste management
	Purchase of Ecologically Sound Garbage Collection Vehicle	
	Enforcement of the ban on the use of plastic in the municipality	Ordinance banning single use plastic bags
	Promotion of water conservation in the Municipality	-

MONITORING AND EVALUATION

Monitoring and Evaluation (M&E) is critical to link one planning cycle to another, relying on the new information derived from the assessment of impacts after implementation, effects of regulatory measures after enforcement, and outcomes of the development goals and objectives of the municipality.

The Implementing Rules and Regulations of the Climate Change Act of 2009, Rule VIII, Section 1 states the National Framework Strategy and Program on Climate Change shall be reviewed every three (3) years, or as may be deemed necessary, in consultation with government agencies, local government units, private sector, non-government organizations, and civil society in participatory evaluation process. In addition, one major activity that is mandated under Republic Act No. 7160, Sec. 109 (a) 5, is to coordinate, monitor and evaluate the implementation of development programs and projects

In a similar way, the local government of Alaminos shall conduct a review and evaluation of the ACCAP Framework at the end of its planning period, to ensure that the targets are achieved. The monitoring of the Plan shall be done annually to track progress and completion of the programs, projects and activities. The Municipal Disaster Risk Reduction and Management Council shall lead review, and monitoring and evaluation of the Plan. The participation of private sector representatives (PSRs) is seen as an important player to aid the LGU in monitoring and evaluating the projects and programs to ensure and achieve goals and objectives of the ACCAP.

MONITORING AND EVALUATION PLAN AND TARGET

The Monitoring and Evaluation are based on targets and designed activities during different phases of implementation, so it is important to set appropriate key performance indicators to evaluate the effectivity of the programs indicated in the plan.

Table 66. LCCAP Monitoring and Evaluation Plan and Target in Alaminos, Laguna

Policies, Programs, Projects and Activities	Assumptions/ Risk	Objectively Verifiable Indicators	Targets	Data Sources	OPR/PPR
Adapt					
Awareness campaign and information dissemination	Available resources for Disaster Prevention and Mitigation IEC campaign Risk of low reception of the public	Integrated advocacy on environmental preservation and protection in festivals/tourism activities Number of Distributed IECs	Increase the CCA awareness of the communities	Available number of posted and distributed IECs	MENRO, MDRRMO, Barangay, Mayor's Office, Tourism office

Policies, Programs, Projects and Activities	Assumptions/ Risk	Objectively Verifiable Indicators	Targets	Data Sources	OPR/PPR
Improvement of infrastructures	Design and unclear directions of the development and construction of the drainage system	No. of completed infrastructure projects	Increase number of completed infrastructure projects	Engineering details	MEO
Promote and encourage construction of green buildings	Low reception from private sectors/public	Formulation and implementation of Ordinance promoting and encouraging construction of green buildings	Increase number of green buildings Ordinance	List of Ordinances Inventory of green buildings	MEO, MPDO
Improvement of quality of surface and ground water	Low support from public	Frequency of water interruptions Number of water-borne health related issues	Decrease number of water-borne related health issues No water interruptions	Annual health report	MHO
Strengthen energy conservation policies and building standards	Low reception from private sectors/public	Formulation and implementation of Ordinance in strengthening energy conservation policies and building standards	Ordinance; Increase number of green buildings	List of Ordinances Inventory of green buildings	SB, MEO
Municipal Hall and Public Government Building, Facilities, Equipment Insurance	Low insurance coverage Limited insurance coverage	Good/appropriate insurance coverage in government buildings, facilities and equipment	All government buildings, facilities, and equipment have insurance	Insurance policies	GSO
Distribution of Climate Resilient farm inputs	Delayed download of funding	Climate Resilient farm inputs distributed	Farm inputs distributed to farmers	Documentation Inventory of MAO	MAO, MDRRMO

Policies, Programs, Projects and Activities	Assumptions/ Risk	Objectively Verifiable Indicators	Targets	Data Sources	OPR/PPR
Develop an evacuation plan and other precautionary and preventive measures	Low project priority No funding Capacity of technical staff to prepare plan	Approved evacuation Plan and other preventive measures	Approved evacuation plan and other measures	Evacuation plan	MDRRMO
Develop a local shelter plan	Low project priority No funding Capacity of technical staff to prepare plan	Approved Local Shelter Plan	Approved Local Shelter Plan	Local Shelter Plan	MEO, MPDO
Respond					
Alaminos Laguna Emergency Response Team (ALERT)	Issues in procurement or with Bids and Awards Committee Delayed download of funding	Improved ALERT equipment and facilities Personal Protective Gear purchased	Improved ALERT equipment and facilities Personal Protective Gear purchased	Documentation	GSO, MDRRMO
Activate and operationalize evacuation center	Delayed construction	Established evacuation center	Establish evacuation center	Evacuation center plan	MDRRMO
Provide assistance to disaster affected communities	No disaster affected communities	Assistance to disaster affected households	Provide assistance to all disaster affected households	List of affected communities, Monitoring center, radio	MDRRMO
Conduct of Trainings	Availability of trainers and participants	Certificates of Completion /Attendance to trainings conducted by the LGU/ Certificates of Completion Issued by the LGU	15 responders on 2020, increasing-12% every year	Documentation of trainings	All departments
Comprehensive Early Warning System and Information Guide	Limited EWS per Hazards imminent in the Municipality Availability of EWS Supplier	1 EWS for rainfall 1 audible EWS siren for earthquake and fire	2020 – 15 barangay hazard signages and Fire Alarm	Documentation Receipts	MDRRMO, GSO

Policies, Programs, Projects and Activities	Assumptions/ Risk	Objectively Verifiable Indicators	Targets	Data Sources	OPR/PPR
		2 EWS hazard signages for landslide prone areas 1 EWS hazard signages for flash floods 4 EWS hazard signages for accident prone areas	2021 – landslide EWS 2020 – river level EWS 2022 – 10% Multi-Hazard Modern EWS 2023 – 20% Multi-Hazard Modern EWS 2024 – 30% Multi-Hazard Modern EWS 2025 – 40% Multi-Hazard Modern EWS		
Improvement of LGU-wide CCTV monitoring system	Issues in procurement or with Bids and Awards Committee Delayed download of funding	Number of CCTV units purchased, installed and operating Establishment of CCTV monitoring area/room	All government buildings have operations CCTVs installed Established of CCTV monitoring area/room	Inventory Receipts from GSO	GSO, MDRRMO
Improvement and Maintenance of Rescue Vehicles	Issues in procurement or with Bids and Awards Committee Delayed download of funding	Rescue Vehicles improved	All rescue vehicles are operational	DRRMO/GSO inventory	GSO
Designation of Pollution officer	No Memo designating the MENRO as Pollution Officer	Memo	MENRO designated as Pollution Officer	Memo	Office of the Mayor
Mitigate					

Policies, Programs, Projects and Activities	Assumptions/ Risk	Objectively Verifiable Indicators	Targets	Data Sources	OPR/PPR
Urban Landscaping and Greening Program	Monitoring and nurturing of planted trees	Number of tree plants nurtured and grown	Continuous tree planting and nurturing activities per year	Tree Planting Activities and accomplishment reports	Municipal Wide
Procure energy efficient lighting and cooling systems in government buildings	Issues in procurement or with Bids and Awards Committee Delayed funding	Number government building with energy efficient lighting and cooling system Ordinance requiring government offices to purchase/procure energy efficient lighting and cooling system	All government buildings have energy efficient lighting and cooling system Ordinance passed requiring government offices to purchase/procure energy efficient lighting and cooling system	List of ordinance, receipts	GSO, SB
Install solar-powered streetlights	Issues in procurement or with Bids and Awards Committee Delayed funding Damaged units	Purchased solar-powered streetlights	All areas along national roads have solar-powered streetlights	Monitoring and Evaluation of CDP	MEO, GSO
Partnership with LTO on air quality monitoring	Unwilling to partner Limited funding	Air quality monitoring system partnership	Air quality monitoring system partnership established	MOA	Office of the Mayor, MDRRMO
Strengthen anti-belching campaign in the municipality	Delayed funding Low reception from private sectors/public	Ordinance strengthening Anti smoke belching Established partnership with LTO, PNP	Partnership established Amended ordinance	MOA IEC materias Ordinance	Office of the Mayor, MDRRMO

Policies, Programs, Projects and Activities	Assumptions/ Risk	Objectively Verifiable Indicators	Targets	Data Sources	OPR/PPR
		Number of IEC materials	IEC materials distributeed		
Integration of CCA in Local Road Network Mappin	Data Gathering Difference in Prioritization of Projects Review Delays	Approved Local Road Network and GIS file	Updated Local Road Network with accomplished attribute table for GIS map	Local Road Network	MEO MPDO
Promote and strengthen organic farming	Low reception from farmers	Number of farmers practicing organic farming	Increase in number of organic farmers	List of farmers MAO Inventory	MAO
Farmer's Field School on vegetable production and Sustainable Pig Farming	Low reception from farmers	Attendance Certificate of completion Number of farmers practicing Sustainable livestock and vegetable farming		List of farmers MAO Inventory	MAO
Material Recovery Operation, management and Maintenance	Limited funding	Number of operational MRFs	All MRFs are operational	Solid waste management plan	MENRO
Purchase of Ecologically Sound Garbage Collection Vehicle	Issues in procurement or with Bids and Awards Committee Delayed funding Damaged units	Vehicles	All purchased/new vehicles are ecologically sound	Vehicle documentation	GSO
Enforcement of the ban on the use of plastic in the municipality	Non-compliance of public Discipline of public	Increase in fees/sanctions/penalties	No plastic bags in all commercial establishments	Waste generated information	MENRO, CSOs, Private Sector, SB

Policies, Programs, Projects and Activities	Assumptions/ Risk	Objectively Verifiable Indicators	Targets	Data Sources	OPR/PPR
Strengthen policies on illegal logging in the area and protection of forest areas	Low priority of SB	Ordinance strengthening Illegal logging in the area and protection of forest areas	Decrease illegal logging cases in the area	List of Ordinance	MENRO, SB, PNP

REFERENCES

Alaminos Comprehensive Land Use Plan 2019-2028

Alaminos Disaster Risk Reduction and Management Plan 2020-2023

Climate and Disaster Risk Assessment 2018

DILG Memorandum Circular No. 2014-135 or the Guidelines for the Formulation of the LCCAP

LGU Guidebook On The Formulation Of Local Climate Change Action Plan. Local Government Academy (LGA) Department Of Interior And Local Government. 2014.

National Climate Change Action Plan 2011 - 2028

National Framework Strategy On Climate Change 2010 – 2022

Republic Act No. 7160: An Act Providing For A Local Government Code Of 1991

Republic Act No. 9729: An Act Mainstreaming Climate Change Into Government Policy Formulations, Establishing The Framework Strategy And Program On Climate Change, Creating For This Purpose The Climate Change Commission, And For Other Purposes

Republic Act No. 10121: An Act Strengthening The Philippine Disaster Risk Reduction And Management System, Providing For The National Disaster Risk Reduction And Management Framework And Institutionalizing The National Disaster Risk Reduction And Management Plan, Appropriating Funds Therefor And For Other Purposes.

United Nations Framework Convention on Climate Change

User's Manual on Community-Based Greenhouse Gas Inventory for Local Government Units in the Philippines

ANNEXES

ATTENDANCE

Municipality of Alaminos Laguna
Municipal Disaster Risk Reduction and Management office

1ST LOCAL CLIMATE CHANGE ACTION PLANNING (LCCAP) Meeting
AUGUST 20 2019
Attendance

NO	Name	Designation	Signature
1	Antonio C Adenedo	Kagawad SB	[signature]
2	Mayo-F Ojedra	Kagawad S.Benito	[signature]
3	ALLAN P. HIDALGO	DEPED	[signature]
4	Marina M. Villanueva	DCW - San Ildefonso	[signature]
5	Francia Marie D. Rivera	DILG / Staff	[signature]
6	SFO1 JETTAN M CALABIA	BFP	[signature]
7	Saturnino L. Villanueva	Kagawad	[signature]
8	Romeo P LIHA	KAGAWAD SAN MIGUEL	[signature]
9	ALLAN ARMANDO	ADMIN SAN ANDRO	[signature]
10	DANILO B. SERRANO	BPSO CHIEF - PALMA	[signature]
11	Zosimo G LAYOLA	PEACE & ORDER PALMA	[signature]
12	BAYANI LOLENG	BPSO DEPUTY	[signature]
13	BENJAMIN T. SANCHEZ	SNEAKY	[signature]
14	Noel C Navarro	SNEAKY V.P.	[signature]
15	Maria Lyca Tolentino	Brgy. Kagawad	[signature]
16	Myrna M. Fernandez	Brgy Kagawad 2	[signature]
17	RAYMOND ANGELES	KAGAWAD	[signature]
18	A. ARMANDO	KB CHAIRMAN	[signature]
19	GREGORIO C. BENTO	S/B	[signature]
20	Dan Gabriel Abrigo	GSO / Staff	[signature]
21	Melvin Magpantay	GSO / Staff	[signature]
22	Bodjie Magno	GSO / Staff	[signature]
23			
24			
25			
26			
27			
28			
29			
30			

Municipality of Alaminos Laguna
Manila Bay Clean Up Rehabilitation and Preservation Program

LOCAL CLIMATE CHANGE ADAPTATION PLAN
GHG WORKSHOP

ATTENDANCE

No.	Name	Designation	Email	Contact No.	Signature
1	Luzviminda B. Saldua	Brgy. Kagawad		09105186073	
2	VIOLETA D. MARFORI	KAGAWAD		09217107340	
3	GASPAR B. ALBALATE	RED CROSS/KABALIKAT		09298870296	
4	Romeo P LINA	KAGAWAD			
5	RONALD VELCAMA	KAGAWAD		09060170923	
6	ALLAN ARMANDO	KB CIVICOM BRGY SAN AGUSTIN		09090755486	
7	PUJANES MELVIN B.	KABALIKAT/RED CROSS		09269560365	
8	CONNIE C. SANTOS	KABALIKAT BRGY II		09063615297	
9	Antonio C Adenedo	Kagawad		09129125903	
10	Mayo F. Ojedra	Kagawad	San Benito		
11	Marilyn Barcena	kagawad			
12	Eladio D AVENIDO	Kagawad		09394279357	
13	EDGARDO C. MULAYAUE	C-B.P.S.O.	Pob. III	0948-9930-137	
14	SFO3 MELVIN R BUENAVENTURA	BFP - OIC		09676420824	
15	NAPOLES, ROBERTO Jr. S	BFP		09263974985	
16	PSSG ANGELO H MENDOZA	ALAMINOS PNP		09983607298	

Municipality of Alaminos Laguna
Manila Bay Clean Up Rehabilitation and Preservation Program

LOCAL CLIMATE CHANGE ADAPTATION PLAN
GHG WORKSHOP

ATTENDANCE

No.	Name	Designation	Email	Contact No.	Signature
17	Orlando Lugente	IPSO		09999301518	
18	ALLAN P. HIDALGO	DEPED SDRRM / Sta. Rosa E/S		09476073579	
19	Zosimo A. Tayora	PALMA-T		09285655007	
20	Maria Viela M. Reyes	CSO		09489076199	
21	MARICEL AMERON	Kagawad / STA ROSA		09128k0859[illegible]	
22	RAYMUND ANGELES	KAG / SAN JUAN		09171104581	
23	JOAN D CAPIALLAO	MENRO		0946405[illegible]	
24	Monica F mendoza	MPPC			
25	Jireh R Beña	Phygeneticus Consultant			
26	CHRISTIAN SABINOSA	MDRRMO			
27	DAN FERNANDEZ				
28	FIDEL VILLANUEVA	OPCTM			
29	RAMIL AKIRA	OPCTM			
30	ANNALYZA PAN	OPCTM			
31					
32					

Municipality of Alaminos Laguna
Manila Bay Clean Up Rehabilitation and Preservation Program

LOCAL CLIMATE CHANGE ADAPTATION PLAN
OCTOBER 03 2019

ATTENDANCE

No.	Name	Designation	Email	Contact No.	Signature
1	Carmen I. Reguellano	Redcross/Auditor		09128463053	[signature]
2	Jennifer C. Castillo	Red cross / Secretary		09184691388	[signature]
3	SPO3 Melvin R Buenaventura	BFP			[signature]
4	FO1 Jonas Aldrin T Baldivia	BFP		09669277119	[signature]
5	FO1 Mary Cris M. Mayantang	BFP		09500890527	[signature]
6	Renuncacion J. Aguirre	Kagawad		09481198920	[signature]
7	Myrna M. Fernandez	Kagawad		09301930909	[signature]
8	Marilyn Borenan	Kagawad		09487076031	[signature]
9	Romeo P Lina	KAGAWAD		09182664948	[signature]
10	Ronald G. Vergara	KAGAWAD		[illegible]	[signature]
11	Antonio C Acevedo	Kagawad		09129128903	[signature]
12	Ariel S. Perlazan	KAGAWAD		09126278425	[signature]
13	Mayo F Ojeda	Kagawad		09387877041	[signature]
14	Valerio M Peña Jr.	DEPUTY III		09205078042	[signature]
15	Norial Mauricio	SNEAKY V.P.O		09481840407	[signature]
16	Eladio D Avenido	Kagawad		09394427935	[signature]

Municipality of Alaminos Laguna
Manila Bay Clean Up Rehabilitation and Preservation Program

LOCAL CLIMATE CHANGE ADAPTATION PLAN
OCTOBER 03 2019

ATTENDANCE

No.	Name	Designation	Email	Contact No.	Signature
17	Eustaquio A Abril	CAPT SAN ROQUE			[signature]
18	CHRISTIAN V. SABINOSA	MDRRMO			[signature]
19	GREGORIA M. LATIDO N	Punong Barangay	gregoria0525@yahoo.com	09173257722	[signature]
20	GREGORIO L. BERTO	PUNONG BARANGAY		09338638335	[signature]
21	ALLAN HIDALGO	DEPED DRRM		09476073579	[signature]
22	ALLAN R. ARTAJANDO	[illegible] ADMIN		[illegible]	[signature]
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					

Municipality of Alaminos Laguna
Manila Bay Clean Up Rehabilitation and Preservation Program

LOCAL CLIMATE CHANGE ADAPTATION PLAN
OCTOBER 03 2019

ATTENDANCE

No.	Name	Designation	Email	Contact No.	Signature
1	Marilyn Barcenas	Kagawad		09487074031	
2	Myrna M. Fernandez	Kagawad		09301930909	
3	Resurreccion F. Aquino	Kagawad		09481198920	
4	SF03 Melvin R Buenaventura	BFP			
5	FO1 Jonas Aldrin T Baldivia	BFP		09669277119	
6	FO1 Mary Gris M Mayantang	BFP		09500890527	
7	Carmen I. Pagullano	Redcross Auditor		0912-846-3053	
8	RONALD C. VERGARA	KAGAWAD		09069706833	
9	Jennifer C. Castillo	Redcross / Secretary		0918 469 7358	
10	Romeo P LINA	KAGAWAD		09152664948	
11	APRIL PUNZALAN	KAGAWAD		09126278945	
12	VALERIO M PEÑA JR.	DEPUTY III		09205078062	
13	Noel Mauricio	SNEAKY V.P.O		09481840407	
14	Antonio C Avenido	Kagawad		09129125903	
15	Mayo F. Ofidra	Kagawad		09387877041	
16	Eladio D AVENIDO	Kagawad		09394279352	

Municipality of Alaminos Laguna
Manila Bay Clean Up Rehabilitation and Preservation Program

LOCAL CLIMATE CHANGE ADAPTATION PLAN
OCTOBER 03 2019

ATTENDANCE

No.	Name	Designation	Email	Contact No.	Signature
17	Marilyn Baronas	Kagawad		09487076037	[signature]
18	Eustaquio Akdul	CAPT San Roque			[signature]
19	Leonardo A Arcega	Kagawad		09196096018	[signature]
20	Gregoria M. Catipon	Barangay chairman	gregoria0325@yahoo.com	09172257722	[signature]
21	Gregorio L Berto	Punong Barangay		09338638335	[signature]
22	Allan P. Hidalgo	DEPED DRRM		09476073579	[signature]
23	Allan F Artuyan[illegible]	[illegible] ADMIN		09090753488	[signature]
24					
25					
26					
27					
28					
29					
30					
31					
32					

PHOTO DOCUMENTATIONS

1ST LOCAL CLIMATE CHANGE ADAPTATION ACTION PLANNING DATED AUGUST 20, 2019

LOCAL CLIMATE CHANGE ADAPTATION ACTION PLANNING (GHG WORKSHOP)


FIRE
FIRE


Goals and Objectives
KAGAWAD


MDRRMO


Goals and Objectives
KAGAWAD
KAGAWAD
DSWD