Guide to the Report Template

1. Three (3) templates are classified below. The main reference document for these templates is the LGU Guidebook on the Formulation of the Local Climate Change Action Plan, which *strongly suggests identifying mitigation options to help reduce carbon footprints of the LGU and communities1.* The templates were customized for LGUs at varying stages in developing the mitigation components of their respective LCCAPs.

PROPOSED Template 1	Designed for LGUs that DO NOT HAVE ANY or are still in the process of drafting the following documents: • Local Climate Change Action Plan (using the current DILG suggested narrative template) • Disaster Risk Reduction and Management Plan • Greenhouse Gas Inventory Report • Greenhouse Gas Management Plan
PROPOSED Template 2	Designed for LGUs that **HAVE AT LEAST ONE** of the following documents: • Disaster Risk Reduction and Management Plan • Greenhouse Gas Inventory Report • Greenhouse Gas Management Plan
PROPOSED Template 3	Designed for an LGU that HAS AN EXISTING LCCAP .The aim of this template is to guide the LGU in incorporating and/or drafting a comprehensive LCCAP version that incorporates both mitigation and adaptation components.

2. These PROPOSED templates were developed by the USAID B-LEADERS Project to guide LGUs in preparing their respective LCCAP reports by providing an outline as well as key elements and details of the report.

3. Black Texts are provided as suggested contents of each of the sections in the template. However, LGUs are encouraged to use their judgment, when using this template to create reports that best describe the situation of their LGUs. At any time, when applicable, LGUs are encouraged to use existing texts from their own reports (e.g. CLUP, SEPP etc.) to fill out the suggested sections. This will not only streamline efforts but also harmonize this report with other LGU documents.

4. Explanatory notes or arrows ( ) and highlighted paragraphs are included in the template to guide report writers to significant paragraphs or sections that need tailor-fitted inputs specific to the LGUs.

5. A workshop on LCCAP Mitigation Section formulation is usually conducted to fill out certain mitigation sections of this template. It is encouraged that the LGUs go through the workshop or accomplish the worksheets prior to filling out the mitigation section of this LCCAP Template.

6. Part 3: Adaptation Section provides examples of texts that should be included. These are lifted from current LCCAP reports using their chosen approaches. LGUs are requested to document their chosen adaptation planning approach/es in this Section.

   For Template 2, Part 3: Adaptation Section essentially contains vulnerability assessment under the DRRM plan. LGUs with DRRM plans are requested to copy-paste their results, as contained in the DRRM plan, in this Section. Similarly, LGUs with GHG inventory reports/ management plans are requested to summarize their results in the applicable Sections in Part 2.

7. LGUs are highly encouraged to annex their studies, spreadsheets or other supporting documentations; and

8. For concerns and inquiries, LGUs may contact USAID B-LEADERS project :

DANILO VILLAS - olinad6756@yahoo.com
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Insert LGU Logo here

(Name of LGU) Local Climate Change Action Plan (LCCAP): A Convergence of Mitigation and Adaptation

With support from:

Executive Summary

In response to the call for climate action, the (Name of LGU) Government has committed to provide measures to adapt to the effects climate change and reduce its GHG emissions through various adaptation and mitigation initiatives set in this Plan.

The (Name of LGU) has formulated this LCCAP which is tailored to the need, capacity and capability of the (City/Municipality) and that such will be mainstreamed in the operation and undertakings of this LGU for the sound materialization of the (City's/ or Municipality's) long term vision.

This document is intended to serve as a blueprint and sets the direction of the (Name of LGU) with regards to its climate change action, particularly in the aspect of mitigation and adaptation through GHG emissions reduction strategies and enhancing the adaptive capacity of the vulnerable urban systems, respectively.

Specifically, (Name of LGU) has identified the following goals: (EDIT AS NEEDED, include a summary of both adaptation and mitigation goals. LGUs with GHG Inventories/ management plan are requested to summarize their emission results and emission reduction targets HERE. Refer to Part 2: Section 2 & 3 for items to be summarized.)

- Increase the resiliency of natural ecosystems from the effects of the changing climate in order to sustain the goods and services each ecosystem provides
- Develop climate-resilient communities; equipped with the knowledge and capacity to adapt to the impacts of climate change
- Ensure water supply sustainability and access
- Improve agricultural production and income through environmentally sound ways while enhancing adaptive capacity
- Achieve energy independence through intensifying the use of renewable energy
- Support global climate action in GHG emission reduction by reducing xx % of year 2028 emissions.

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Acronyms and Abbreviations (EDIT AS NEEDED AND INCLUDE ONLY ACRONYMS AND ABBREVIATIONS USED IN YOUR RESPECTIVE LCCAP)

EXAMPLE ACRONYMS

ACCRN - Asian Cities Climate Change Resilience Network
CIDRA – Climate Disaster Risk Assessment
CLUP – Comprehensive Land Use Plan
DILG – Department of Interior and Local Government
DRRM –Disaster Risk Reduction and Management
GHG- Greenhouse Gases
HLURB – Housing and Land Use Regulatory Board
ICLEI- International Council for Local Environmental Initiatives
IEC- Information education campaign
IPCC – Intergovernmental Panel on Climate Change
LCCAP – Local Climate Change Action Plan
LGU – Local Government Unit
NCCAP – National Climate Change Action Plan
USAID – United States Agency for International Development
WWF – World Wildlife Fund
ZO – Zoning Ordinance

PART 1: BACKGROUND

Section 1 Rationale

Section 1.1 (Name of LGU) and Climate Change

Insert LGU Vision/Mission/Goals

Climate change is one of the strongest development agenda of the 21st century; global scientific studies conducted by the Intergovernmental Panel on Climate Change (IPCC) have confirmed that the change in global temperature is already irreversible. The last three decades have been successively warmer at the Earth's surface than any preceding decade since 1850 (IPCC, 2013). The glaciers around the world continue to melt resulting to an alarming rate of sea level rise. Concentrations of the greenhouse gases in the atmosphere have increased to unprecedented levels in the past years, especially carbon dioxide wherein 30% from anthropogenic emissions has been absorbed by the ocean causing acidification.

Based from the observed changing climate patterns and increasing greenhouse gas emissions, the warming cannot be explained by natural causes alone. "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century" (IPCC 5th Assessment Report, 2014).

Climate change is happening worldwide. The Philippines, located at Western Pacific Ocean where storms originate, is not exempted from it. The manifestations of extreme weather events which cause losses in terms of livelihood, infrastructure, and even lives have become more frequent in recent years. This became evident in the year 2013 when Super Typhoon Yolanda hit the country killing 6, 300 people. Based from the events of 2013, German Watch, an environmental organization, listed the Philippines as the country most affected by climate change (Global Climate Change Index 2015). In the same index based on 1994-2013 records, the Philippines ranked 5th in the list, with Honduras, Myanmar and Haiti on top. According to them, "less developed countries are generally more affected than industrialized countries."

[INSERT LGU DESCRIPTION] (Example: Batangas City, a coastal and industrialized city in the Philippines, is not excluded from the adverse impacts of the changing climate. Although its western orientation generally protects it from the worst effects of tropical cyclones, it is listed as one of the cities to have threatened economies since its economic drivers can be paralyzed when stronger typhoons hit the country (WWF Philippines, 2016). More storms enter the Philippine Area of Responsibility (PAR) and the City's "proximity to the sea and the dependence of the economy to fishing makes it vulnerable to impacts like rising sea levels, storm surges, warmer sea surface temperatures, and ocean acidification (Rappler, 2014)". Hence, biodiversity in the Verde Island is also at risk.

Section 1.2 Legal Mandates

With the passage into law of Republic Act 9729 or the Climate Change Act of 2009, local government units (LGUs) were tasked to serve as frontline agencies in the formulation, planning, and implementation of climate change action plans in their respective areas. Cognizant of the fact that climate change is a multi-sectoral concern, the involvement of all levels of government in the urban resilience planning process is crucial in order to attain higher probability of desired outcomes.

Furthermore, The National Climate change Action Plan (NCCAP) which was adopted in April 2010 and which outlines the country's agenda for adaptation and mitigation for 2011 to 2028 is a multi-sectoral process that considered the concerns of various sectors.

[INSERT LOCAL ENVIRONMENTAL INITIATIVES INCLUDING PARTNERSHIPS FORGED] (Example: Following this, the Batangas City Local Climate Change vulnerability assessment is being undertaken with the ICLEI – Asian Cities Climate Change Resilience Network (ACCCRN) process. Also, GHG Management Framework is being undertaken following the process suggested by by the USAID B-LEADERS Project.)

This plan outlines the specific programs and strategies for adaptation and mitigation and provides key actions that enhance the adaptive capacity and resilience of communities to climate change. The NCCAP outlines seven strategic priorities namely 1) food security, 2) water sufficiency, 3) human security, 4) environmental and ecological stability, 5) sustainable energy, 6) climate-smart industries and services, and 7) knowledge and capacity development. The NCCAP recognizes that certain activities cut across strategic priorities and sectors. These include gender and development, technology transfer, research and development, information, education and communication (IEC), and capacity building.

Section 1.3 Relationship to Other Plans and Documents

The LCCAP formulation is mainly anchored on the local government's two major planning documents, namely: 1) Comprehensive Land Use Plan (CLUP) and 2) Comprehensive Development Plan (CDP). The CLUP is an essential document and tool in determining the local government's land allocation and regulation. It is used in demarcating areas for development and is the basis of the Zoning Ordinance (ZO). At the national level, formulation of CLUP is being regulated by the Housing and Land Use Regulatory Board (HLURB).

On the other hand, the CDP refers to the city's sectoral and cross-sectoral programs. This provides strategic directions and guidance to the city's multi-sectoral programs, projects, and activities (PPAs) on the following identified sectors: 1) social, 2) economic, 3) infrastructure and physical development, and 4) environmental. The plan addresses the city's development challenges. The CDP formulation involves the participation of various stakeholders and is updated every three years. The oversight national agency for CDP is the Department of Interior and Local Government (DILG).

This Plan builds on the assumption that the enabling activities and support provided by the DILG and/or, especially in capacitating the LGU, are present and would have been in place. Toward the end, it is recognized that the LCCAP builds on existing policies, programs, and good practices both national and local including but not limited to: [INSERT LOCAL ENVIRONMENT RELATED PLANS AND POLICIES]

EXAMPLES:

- CDP
- CLUP
- Creation of Board (Solid Waste Management Board-Toxic Hazardous Substances, Etc.)
- Environment Code
- GHG Inventory Report
- GHG Management Plan
- Local Disaster Risk Reduction and Management Plan as mandated by RA 10121
- Local Shelter Plan
- Transportation Management Plan

Section 2: Scope and Content

[EDIT ACCORDING TO YOUR TIMETABLE].The Local Climate Change Action Plan (LCCAP) is expected to be updated every [years] coinciding with the updating of Comprehensive Land Use Plan (CLUP) and subjected for review every [years] to ensure consistency with the local plans. This plan covers the period 2018 to 2028

The remaining sections of Part 1: Background outlines other background information relevant to this plan such as the planning process, and the (Name of LGU) institutions primarily responsible for the creation of this plan.

Part 2: Mitigation outlines how (Name of LGU) can best manage its emissions given its resources and the policies that have been made available to address these.

Part 3: Adaptation presents how (Name of LGU) can best manage risks and protect vulnerable populations from the anticipated impacts of climate change following the guidelines as stated by the DILG in developing the LCCAP.

Part 4: Conclusions and Recommendations provide a summary of the steps to be undertaken by (Name of LGU) as it implements its activities under this plan.

Appendices provide information on related studies, plans and outputs that were either conducted as part of the planning process for this LCCAP, or were used as reference documents in the drafting of this Plan

Section 3: Local Government Profile

(INSERT LGU PROFILE) YOU MAY COPY EXISTING WRITE-UPS FROM OTHER LGU DOCUMENTS. AT THE VERY LEAST, THIS SECTION SHALL CONTAIN THE FOLLOWING:

- BRIEF HISTORY
- FACTS AND FIGURES
- SOCIO ECONOMIC PROFILE

Section 4: Existing and Implemented Climate Change Plans and Programs

[EXAMPLE IS PROVIDED] EDIT AS NECESSARY]**:** Batangas City formulated and enacted an Environment Code which implementation has gradually been running since 2011. The table below summarized some of the city's notable initiatives.

TABLE XX. VARIOUS ENVIRONMENTAL, MITIGATION-RELATED INITIATIVES OF [NAME OF LGU]

SECTOR	INITIATIVE
Industry/Commercial Establishments	• Green building design and use of eco-friendly construction materials • Issuance of City Environmental Certificate and City Environmental Permit to Operate
Stationary Energy	• Retrofitting of government buildings and facilities • Installation of solar panels for streetlights and newly constructed government buildings • Promotion of switching to the use of energy-efficient bulbs

SECTOR	INITIATIVE
Agriculture	• Issuance of City Environmental Certificate and City Environmental Permit before operating piggeries/poultries/farms • Promotion of the use of biogas digesters for large scale piggeries/poultries/farms • Promotion of organic farming
Waste	• Implementation of community-based incentive program for the environment (Gawad Punong Lungsod sa Pagandahan ng Barangay/Gawad Parangal sa Huwarang Barangay/Dangal ng Lungsod Awards/Search for Most Liveable Communities Award) • Zero Plastik-Papel sa Kalye • Mandatory operation of MRF in every barangay • Implementation of Article XII: Ecological Solid Waste Management of the Environment Code of Batangas City (includes mandatory waste segregation at source, banning of styrofoam and regulation on the use of plastic as food containers, banning of open burning of waste, banning charcoal-making, accreditation of private haulers of solid waste and waste water for new establishments etc.) • Rehabilitation of old slaughterhouse and construction of new one with wastewater treatment facility • Closure of Controlled Dumpsite and Construction/Operation of Sanitary Landfill
Transportation	• Implementation of Batangas City Traffic Ordinance and Tricycle Franchising Ordinance • Number coding of private vehicles • Route zoning of public utility vehicles • Anti-smoke belching • Issuance of Mayor's permit • Promotion of engine-shift program for tricycles • Promotion of the use of electric vehicles and bicycles
Forest/Land Use	• Implementation of Zoning Ordinance and Comprehensive Land Use Plan • Greening or tree/mangrove planting • Establishment of Urban Greenbelt and City Carbon Sink area at the central business Zone • Establishment of Eco-Park and gardens at school grounds • Public-Private Partnership for the Garbo-Forest Project at Closed City Dumpsite

TABLE XX. VARIOUS ENVIRONMENTAL, ADAPTATION-RELATED INITIATIVES OF BATANGAS CITY SINCE 2011

	Activity
Coastal and Marine Resources	City-Wide and coastal clean up
	Riverbank stabilization through various tree planting activities
Forest Resources	Tree Servicing Program

Disaster Risk Reduction and Management	Continuous training on DRRM • Prevention preparation and recovery Early warning system

Section 5: LCCAP Planning Process

The (Name of LGU) has committed to provide measures to adapt to the effects of climate change and reduce its GHG emissions through various adaptation and mitigation initiatives. Below is the timeframe set by (Name of LGU) to develop its LCCAP.

[EXAMPLE: EDIT AS NECESSARY]

Suggested Activities	Steps to be taken	May	June	July	Aug	Sept	Oct	Nov
Create Climate Change Action Committee	Issuance of an Executive Order creating the Local Climate Change Committee							
Undergo GHG Community Level Inventory Training	Seek training assistance from PLLENRO to provide GHG Inventory Training							
Conduct GHG Inventory	*Data Assessment *collection or generation *GHG emission calculation, Report preparation							
Undergo Climate and Disaster Risk Assessment (CDRA)	Seek assistance from DILG							
Workshop: Mitigation Plan	Identify relevant partners (e.g. private sector, academe, other government agencies, NGOs)							
	Identify mitigation potential (PPAs)							
	Prioritization of identified PPAs							
Workshop: Adaptation Plan	Identify relevant partners (e.g. private sector, academe, other government agencies, NGOs)							
	Identify adaptation measures							
	Prioritization of PPAs							
Drafting of LCCAP								
Presentation to the City Mayor								
Adoption of the City Council								
Submission of LCCAP								

For Template 2, you need not include the table above.

Section 5.1 Adaptation Action Plan Approach

[EXAMPLE: YOU MAY USE THIS EXAMPLE IF THE ACCCRN PROCESS WILL BE/ WAS UNDERTAKEN TO DEVELOP ADAPTATION PLAN. PLEASE NOTE THAT THERE ARE OTHER PRESCIBED APPROACHES SUCH AS THE CDRA APPROACH. PLEASE DESCRIBE YOUR APPROACH HERE, AS WRITTEN IN YOUR DRRM PLAN IF AVAILABLE.]

The LGU Guidebook on the Formulation of LCCAP (Book 1), developed by the Local Government Academy (LGA), was used as reference in writing and packaging this document. The local government of (Name of LGU) underwent the ICLEI – Asian Cities Climate Change Resilience Network (ACCCRN) process (Figure 4. The ICLEI-ACCRN Process) in the course of developing the LCCAP.

The ICLEI – ACCCRN process consists of a streamlined and replicable process that cities can implement without the need for much external support. It is a rapid appraisal of a local government's existing urban systems and how climate change can impact the functions and services provided of said systems. The following activities were undertaken:

Phase 1: Engagement
- Political support, governance structure, internal resources, initial scoping
- Plan stakeholder engagement
- Climate scoping exercise

Phase 2: Climate Research and Impacts Assessment
- Analyze critical urban systems which may be impacted by climate change
- Review climate change data, scenarios and priority impacts
- Confirm climate change scenarios, priority impacts and assessment of LGU's capacity to respond to priority climate impacts
- Identify the LGU's fragile urban systems; carry out a risk assessment for these systems

Phase 3: Vulnerabilities Assessment
- Identify the perceived vulnerable areas and people in the LGU
- Determine the adaptive capacity of urban systems
- Identify data gaps for further data collection or research which may be required for a particular urban system

Phase 4: Resilience Strategy
- Develop Climate Resilience Strategy which responds to projected climate risks as they affect critical urban systems
- With the help of stakeholders, develop intervention proposals, and prioritize the interventions
- Gain political support for resilience strategies and interventions

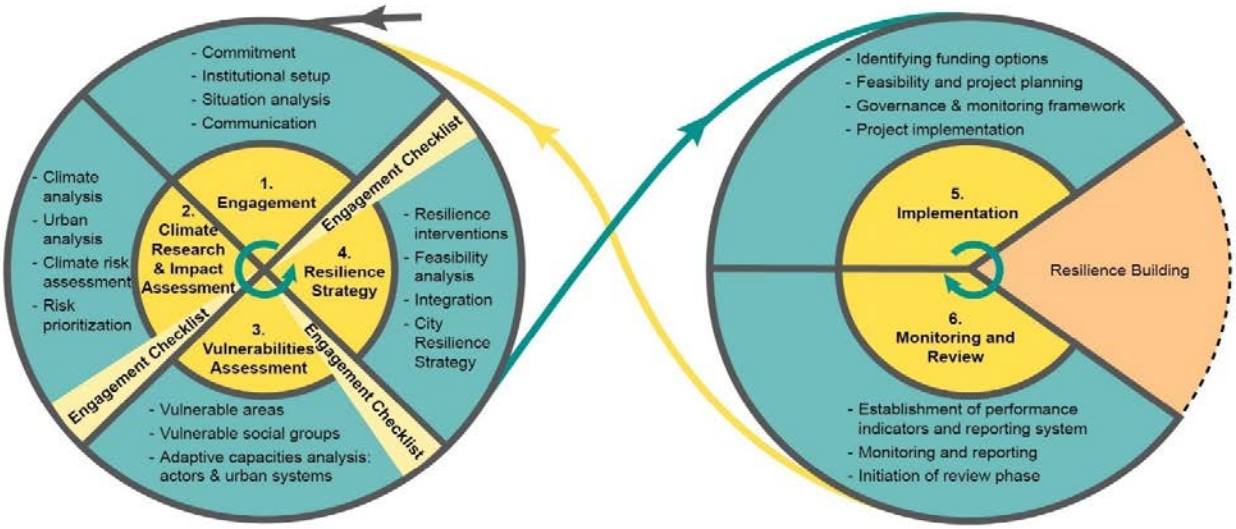

FIGURE 4. THE ICLEI-ACCRN PROCESS

Section 5.2 Mitigation Action Plan Approach

[EXAMPLE: PROVIDE DETAIS OF YOUR MITIGATION PLAN. YOU MAY USE THE FOLLOWING TEXTS IF YOUR LGU HAS ADOPTED THE GHG MANAGEMENT PROCESS AS SUGGESTED BY THE USAID.]

The GHG mitigation approach starts with a premise that the [NAME OF LGU] cannot manage the emissions that it cannot measure. Thus, responding to climate change through GHG accounting and management, the [NAME OF LGU] first intends to complete inventories of emissions for both government operations (entity level)[1] and the community governed by the LGU (community level)[2]. Based upon the understanding of emissions provided by these inventories, the [NAME OF LGU] Government intends to prepare a GHG Management Plan that sets the blueprint for achieving future emissions reductions through policy initiatives, projects, and program of activities.

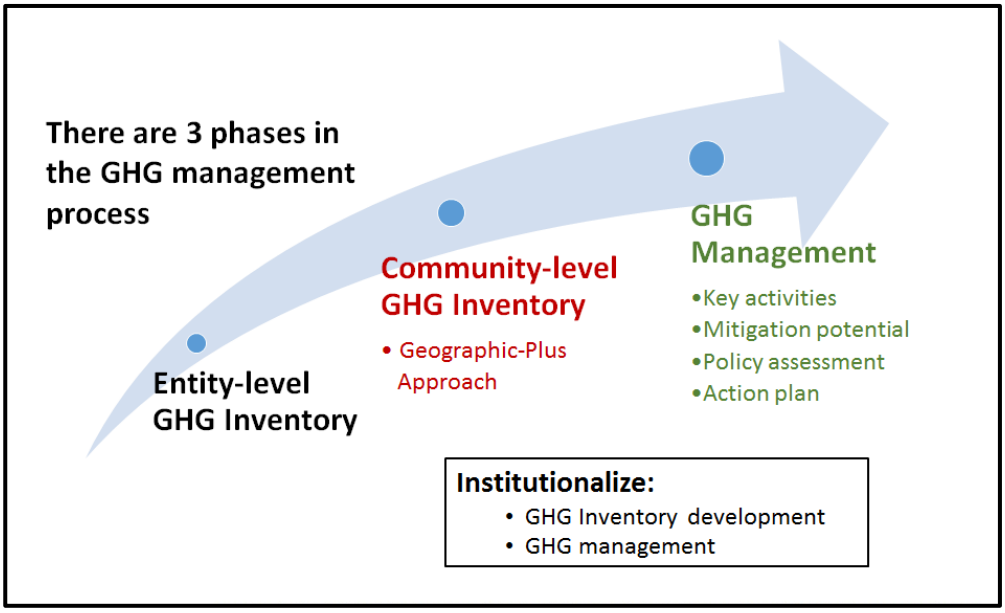

Figure 5. GHG Management Process

The Community-level GHG inventory report describes and accounts for GHG emissions caused by activities within the whole [NAME OF LGU] arising from the following major sectors:

[PLEASE SELECT / ENUMERATE SECTORS FROM THE LIST PROVIDED. INCLUDE ONLY THE SECTORS RELEVANT TO YOUR LGU AND INCLUDED IN THE INVENTORY]

Stationary energy
Electricity consumption
Transportation
Waste (Solid and Waste water)
Agriculture

[1] Entity Level Inventory refers to the inventory of organizational GHG emissions released by activities that are owned by, managed by, or operated on behalf of the Local Government Unit.
[2] Community Level Inventory refers to the inventory of community-wide GHG emissions released due to activities occurring within the geopolitical boundary of the Local Government Unit.

Forestry / Land Use
Industry

The GHG inventory report was completed primarily in accordance with the guidance set forth in the GHG Inventory Toolkit developed for the Climate Change Commission through the support of the United States Agency for International Development (USAID). The toolkit has been used by the Philippine League of Local Environmental and Natural Resources Officers (PLLENRO) in building the capacity of the local government units in developing, implementing and supporting climate change mitigation policies, plans, and programs through Greenhouse Gas (GHG) accounting and management.

The GHG Inventory Toolkit is adapted from the World Resources Institute's (WRI) Greenhouse Gas Protocol, the current international standard for corporate greenhouse gas inventories, the 2006 IPCC Guidelines for National GHG inventories, and Tracking Greenhouse Gases: An Inventory Manual published by the Department of Environment and Natural Resources (DENR). Guidance from the following sources was also used: GHG Management in Local Governments: A Guide developed by the Greenhouse Gas Management Institute (GHGMI) with funding support from USAID, International Local Government Greenhouse Gas Emissions Analysis Protocol (IEAP) developed by ICLEI, and the newly published Global Protocol for Community-Scale Greenhouse Gas Emissions[3] from WRI, ICLEI, and the C40 Climate Leadership Group were also used to supplement the GHG Protocol.

[IF USING OTHER PROTOCOLS, LIST THEM HERE.]

Section 5.3 Establishing a Climate Core Team

Recognizing that climate change functions and resilience building is not only about the environment, the Climate Core Team which developed this LCCAP is composed of staff from a range of departments. This is to ensure the inclusion of different points of view and areas of expertise. The Climate Core Team represents the interests of a wide spectrum of the local government's operations. As such, it is also the Core Team's task to ensure that the future PPAs of the local government provides the opportunity to address climate change considerations across all areas of its operations.

The (Name of LGU) established a Climate Change Action Committee by virtue of Executive No. __.The members of the Core Team are indicated in Table XX.

TABLE XX. MEMBERS OF THE (NAME OF LGU) CLIMATE CORE TEAM

Name	Position	Responsibility
	Chairman	[BRIEF DESCRIPTION OF RESPONSIBILITY]
	Vice Chairman	

[3] Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC) Pilot Version 1.0, May 2012, C40 Climate Leadership Group, ICLEI, World Resources Institute.

	Member	

Function and Responsibilities [EDIT AS NECESSARY]:

1. Prepare the Local Climate Change Action Plan (LCCAP) and facilitate effective integration of planned initiatives into the City's development plans;
2. Identify programs and schemes relevant for implementation of the activities identified in the Climate Change plans;
3. Encourage institutional capacity building to effectively fulfill the long-term mitigation and adaptation plan requirements;
4. Contacts across the local government to participate in the climate change related programs;
5. Coordinate the necessary communication and collaboration with all relevant departments of the city and other stakeholders;

Section 5. 4 Stakeholder Engagement

Climate change planning process is supported by consultation with other groups in the local government such as national government agencies, local NGOs, community leaders, university partners and private sector organizations. The LGU has partnered/ intends to partner with the following:

[EXAMPLE : INSERT PARTNER AGENCIES OTHER THAN THE LGU AND DILG, WHO ARE/WILL BE INSTRUMENTAL IN THE LCCAP PROCESS]

- **USAID –** plays a role in building responsive local governance through helping communities adapt to a changing environment. They provide programs and projects for climate change mitigation and adaptation, promoting strategies for economic growth with lower emissions.

- **PLLENRO –** plays a significant role in mobilizing provincial, city and municipal environment officers and other stakeholders in addressing climate change and other environmental concerns. Provides capacity development for their LGU members by forging linkages with local and international partners.

- **ICLEI –** assist local governments by designing, promoting, and drawing external support for programs and campaigns that develop local resiliency and sustainability.

- **UPLB – SESAM –** the City's partner in conducting researches and studies within its jurisdiction. It provides technical assistance with regards to environmental concerns of the City.

- **AMEn/SaCaRM –** organizations that support the City's environmental endeavors.

PART 2: MITIGATION

Section 1 Introduction

Under Republic Act 9729 or the Climate Change Act of 2009, local government units (LGUs) were tasked to serve as frontline agencies in the formulation, planning, and implementation of climate change action plans in their respective areas. Cognizant of the fact that climate change is a multi-sectoral concern, the involvement of all levels of government in the urban resilience planning process is crucial in order to attain higher probability of desired outcomes. Section 14 of this Act specifically recognizes the role that LGUs play in mainstreaming climate change efforts within the government and requires them to formulate and implement and LCCAP that is consistent with local and national policies and frameworks.

To complement this Act, Memorandum Circular No. 2014-135 or the Guidelines for the Formulation of the LCCAP was released by the Department of Interior and Local Government. Section 3.3.5 of the Memorandum Circular strongly suggests LGUs to identify mitigation options to help reduce their carbon footprints and contribute to efforts in addressing climate change.

Recently, the Philippines has ratified the Paris Agreement, a global pact that aims to limit GHG emissions and pursue efforts to address these emissions. The Philippines now stands to access the Green Climate Fund which seeks to help developing countries to limit or reduce GHG emissions and help vulnerable groups adapt to the impacts of climate change. It is expected that the LGUs will be at the forefront in complying with the Agreement, for and on behalf of the country.

Furthermore, President Rodrigo Duterte in his pronouncement in March 2017 has urged the LGUs to submit the LCCAP by year end. DILG Memorandum dated March 30, 2017, signed by Undersecretary Austere Panadero has reiterated this call for LGUs as well.

Thus, development of a greenhouse gas (GHG) inventory and the GHG Management Plan are activities that can support better planning for mitigation options that the LGUs can implement. (Name of LGU) has taken this into fore, and plans to undertake both studies.

Section 2: Mitigation Potential Assessment

Section 2.1 GHG Inventory and GHG Management Plan

[IF GHG INVENTORY REPORT AND/OR MANAGEMENT PLAN IS AVAILABLE, EDIT THIS SECTION BY COPYING THE RESULTS OF THE REPORT.

OTHERWISE, IF A GHG ACCOUNTING HAS YET TO BE IMPLEMENTED YOU MAY EDIT THE TEXT PROVIDED]

[EXAMPLE – Batangas City]

Batangas City was able to estimate its GHG emissions within the City's geographic boundary, as well as certain additional emissions caused by consumption within the

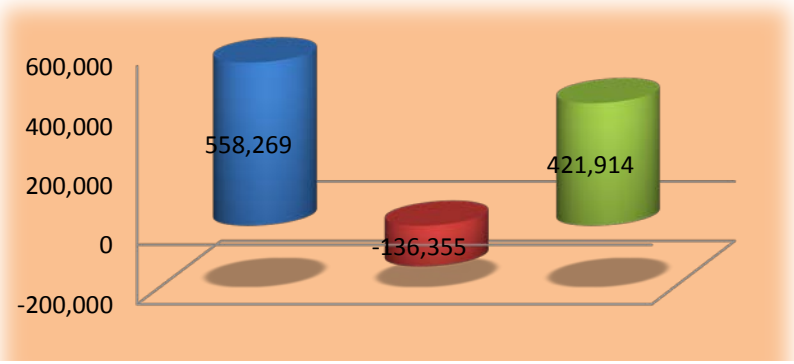

FIGURE 1. 2010 GHG GROSS EMISSIONS AND REMOVALS FROM BATANGAS CITY

community but emitted elsewhere. Aside from providing GHG emission data, the Batangas City GHG Inventory Report illustrates the methodological decisions and main assumptions underpinning the inventory, including details on inventory boundaries, quantification methods, data collection approaches and information sources considered and used in developing the GHG emissions inventory. Results of the first inventory cover the reporting period from January 1, 2010 to December 31, 2010.

The Batangas City's GHG emissions are produced from six (7) main sources, namely: stationary fuel combustion, electricity consumption, transportation, waste, industry, agriculture and forestry & other land use. As shown in Table and Figure below, Batangas City has a higher emission of 558,269 tons CO2e compared to the forest removal of -136,355 tons CO2e resulting to net emission of 421,914 tons CO2e.

Excluding the forest removals, the total gross emissions of Batangas City for 2010 amount to 558,269 tons CO2e. Largest emission came from the industry sector amounting to about 30% (164,528 tons CO2e). The second largest contributor is the transportation sector at 23% (128,899 tons CO2e) coming mostly from the water transportation. The third largest contributor is the electricity consumption sector at 20% (117,614 tons CO2e) which is mainly from electricity consumed by the City's residential and commercial buildings.

Batangas City is rapidly developing to a major urban commercial and industrial center which caused the high GHG emissions from industrial processes. The reality of ever growing population of the locality and its continuous economic progress has also resulted to the increasing demand for electricity in Batangas City. The agriculture sector emission is also high since livestock and poultry is a flourishing industry which supplies most of the requirements of Metro Manila and other provinces.

GHG EMISSIONS/REMOVALS PER SECTOR FROM BATANGAS CITY, 2010

Sources	GHG Emissions/ Removals (tons CO2e)	% of Gross Emissions	% of Removals
ENERGY	250,025	44.79%	
Stationary Energy	121,126	21.70%	
Stationary Fuel Combustion	3,512	0.63%	
Electricity Consumption	117,614	21.07%	
Transportation	128,899	23.09%	
Land Transportation	33,971	6.09%	
Water Transportation	94,928	17%	
WASTE	56,636	10.14%	
Solid Waste	10,088	1.81%	
Wastewater	46,548	8.34%	
INDUSTRY	164,528	29.47%	
AGRICULTURE, FORESTRY & OTHER LAND-USE (AFOLU)	-49,275		
Agriculture	81,449	14.59%	
Forestry and Other Land use	-130,725		
Biomass Loss	5,631	1%	

Forest Growth Uptake	-136,355		100.00%
Gross Emissions (w/o Forest Growth Uptake)	558,269	100.00%	
Removals (Forest Growth Uptake)	-136,355		100.00%
Net Emissions (w/ Forest Growth Uptake)	421,884		

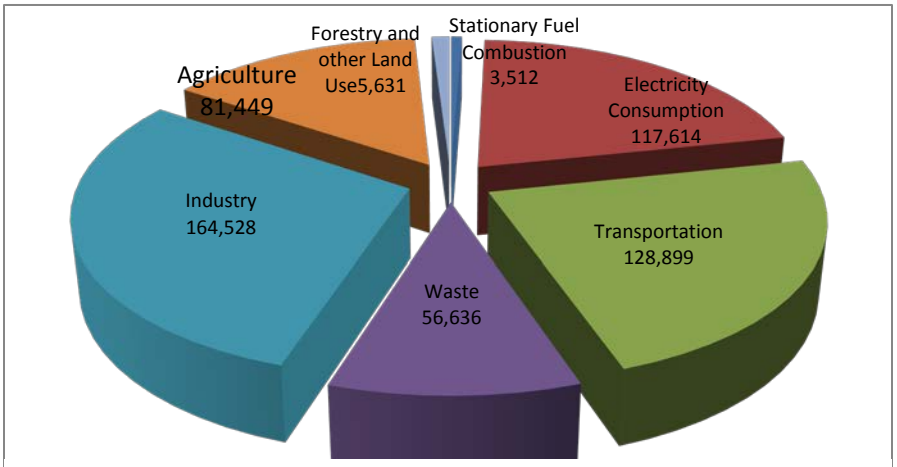

FIGURE 2. GHG GROSS EMISSIONS PER SECTOR FROM BATANGAS CITY, 2010

Furthermore, Batangas City is in the process of updating its Invetnory Report using 2015 as its base year. Using data fromboth 2010 and 2015, Batangas City is projected to emit the following GHGs in the next ten years (See Table 8).

TABLE 1. BASELINE GHG EMISSIONS (PROJECTIONS – 2016 ONWARDS), BATANGAS CITY

					Projected GHG Emissions based on tCO2e/Php	Projected GHG Emissions based on tCO2e/capita
Year	Total Revenue, Php	% growth rate	Population	% growth rate	tCO2e	
2007	1,010,397,804.75					
2008	1,083,571,381.17	7.24%				
2009	1,236,418,599.55	14.11%				
2010	1,243,362,096.95	0.56%			457,288.00	
2011	1,330,882,309.14	7.04%				
2012	1,693,826,326.89	27.27%				
2013	1,529,988,383.47	-9.67%				
2014	1,815,442,801.59	18.66%				
2015	2,312,904,767.10	27.40%	329,874		793,991.89	793,991.89
2016	3,789,463,170.42	63.84%	354,170	7.4%	1,300,876.31	852,471.27
2017	4,850,512,858.13	28.00%	361,714	2.1%	1,665,121.68	870,629.34
2018	6,208,656,458.41	28.00%	369,418	2.1%	2,131,355.75	889,172.52
2019	7,947,080,266.77	28.00%	377,287	2.1%	2,728,135.36	908,112.85
2020	10,172,262,741.46	28.00%	385,323	2.1%	3,492,013.26	927,455.14
2021	13,020,496,309.07	28.00%	393,530	2.1%	4,469,776.97	947,209.02
2022	16,666,235,275.61	28.00%	401,913	2.1%	5,721,314.53	967,386.52
2023	21,332,781,152.78	28.00%	410,473	2.1%	7,323,282.60	987,990.06
2024	27,305,959,875.56	28.00%	419,216	2.1%	9,373,801.72	1,009,034.07
2025	34,951,628,640.71	28.00%	428,146	2.1%	11,998,466.20	1,030,528.18

In response to the call for climate action, the Batangas City Government has committed to reducing its GHG emissions through mitigation initiatives set in its GHG Management Plan, drafted in 2014. The LGU has identified the following objectives:

- To reduce local generation of greenhouse gas emissions
- To magnify the weight of impact of the result of the conducted GHG inventory
- To identify initiatives according to the results per sector of the GHG inventory and accounting
- To serve as guide and provide basis for the formulation of the Climate Change Action Plan
- To promote better air quality and move towards the use of renewable energy.
- To serve as reference for the GHG management team in the effective conduct of succeeding GHG inventories and come up with the most reliable data which shall be used for periodic evaluation.
- To guide policy makers and key players in the government and private sectors to formulate recommendations of doable strategies to reduce greenhouse gas emission by their respective sectors and more by the City.

[EDIT THE TEXT PROVIDED BELOW IF GHG ACCOUNTING HAS YET TO BE IMPLEMENTED. OTHERWISE DELETE THIS SUBSECTION]

The role of Local Government Units (LGUs) in climate change mitigation complements that of the national government, and is crucial, particularly with regard to planning and implementing policy initiatives that show the largest impact at both entity and community levels.

As a part of its commitment to mitigating climate change, the (Name of LGU) has committed to do bottom-up GHG inventories to complement those completed by the national government. Following the completions of the inventories, the (Name of LGU) will initiate processes to monitor, inventory and manage GHG emissions at both entity and community levels. Overall, these processes will allow the (Name of LGU) to analyze the emissions produced within its geographic boundary and to identify appropriate climate change mitigation options. The plan serves as (Name of LGU) blueprint for climate action, laying out the framework, targets and goals to reduce emissions, and concrete approaches and options that the <municipality/ city> can adopt and implement to pursue to achieve its reduction targets and details a (management) plan to implement such strategies. It articulates the strategies, policy options, programs, and activities – both existing and future actions – to institutionalize as common and best practices on climate change mitigation.

Shown below is the planned activities and timeframe for the development of the GHG Inventory and Management Plan.

Suggested Activities	Steps to be taken	May	Jun	Jul	Aug	Sep
Create Climate Change Action Committee	Issuance of an Executive Order creating the Local Climate Change Committee					
Undergo GHG Community Level Inventory Training	Seek training assistance from PLLENRO to provide GHG Inventory Training					
Conduct GHG Inventory	*Data Assessment *Data collection or generation *GHG emission calculation, *Report preparation					
Prepare the GHG Management Plan	Identify relevant partners (e.g. private sector, academe, other government agencies, NGOs)					
	Identify mitigation potential (PPAs)					
	Prioritization of identified PPAs					

Section 2.2. Resource Assessment

[IF RESOURCE ASSESSMENT STUDIES HAVE BEEN UNDERTAKEN OR IF THE LGU PLANS/ IS UNDERTAKING SUCH STUDIES, EDIT THIS SECTION AND ATTACH SUPPORTING DOCUMENTATION AS ANNEX. EXAMPLES OF SUCH STUDIES INCLUDE MANGROVE POTENTIAL STUDIES, USE OF THE LEDS TOOLKIT TO ASSESS VARIOUS PPAs, ETC]

To complement the GHG inventory report and the GHG managment plan, the following resource assessment results have been considered in formulating this LCCAP.

TABLE 2. RESOURCE ASSESSMENT RESULTS, SUMMARY

Resource	Activities	Maximum Mitigation Potential
Agriculture	Crop Management	Not yet quantified
	Livestock Management	Not yet quantified
Waste Management	Waste water management (that may impact Batangas City Water Resources)	Not yet quantified
Land Use change and Forestry	Forest Preservation	Not yet quantified
	Mangrove Preservation and Planting	29.92 tCO2e
Energy Resource	Natural Gas Power Plants – efficiency	Not yet quantified
	Biomass to energy	191,000 tCO2e
	Renewable energy – solar	66,250MWh/day or
	Renewable energy – wind	Not yet quantified

Section 2.3Cost Benefit Analysis of Mitigation Actions

[IF STUDIES HAVE BEEN UNDERTAKEN IN RELATION TO COST BENEFIT OF MITIGATION ACTIONS, OR IF THE LGU PLANS/ IS UNDERTAKING SUCH STUDIES, EDIT THIS SECTION AND ATTACH SUPPORTING DOCUMENTATION AS ANNEX. EXAMPLES OF SUCH STUDIES USE OF THE LEDS TOOLKIT TO ACCESS VARIOUS PPAs, ETC]

EXAMPLE:

A co-benefit analysis study of certain mitigation action options have also been conducted for Batangas City through the use of the LEDS toolkit. Results of the analysis are summarized below while details of the LEDS toolkit can be found in Appendix 2.

The co-benefits of mitigation options for the energy (power and transport) sector include air quality improvement and related human health benefits, energy security, and power sector employment impacts. Specifically, such options avoid or reduce the generation of air pollutants from on-grid power generation, demand-side combustion of fuels, off-grid electricity generation and other fuel production. It also reduces outdoor air pollution, which is associated with adverse health effects ranging from worsened asthma symptoms to early death from heart and lung disease. It also results in reduced risk of morbidity and premature mortality.

Improvements in energy security can result from several changes in the energy sector, such as increasing combinations of fuel diversity, transport diversity, import diversity, energy efficiency, and infrastructure reliability. Furthermore, by accounting for the power generation potential and anticipated use of the projects, the average number of job-years per gigawatt hour may be assessed as a co-benefit.

For the waste sector, co-benefits of mitigation actions include income generation, human health, energy security, and employment impacts. There are market (e.g., income generated by sales of the compost product), and non-market co-benefits (e.g., energy security contributions of energy-related waste sector options), which can add to the cost-effectiveness of a mitigation option.

For the forestry sector, co-benefits include: (i) human health benefits due to reduced air pollution from electricity generation as in the case of biomass utilization; and (ii) for forest protection options, the sale of commodities generated by forest and agroforestry plantations designated for production.

The co-benefits for cement clinker reduction, cement waste heat recovery, and biomass co-firing mitigation options in the industry sector include human health benefits due to reduced air pollution from electricity generation. All result in positive health co-benefits (i.e. negative costs) from improved air quality.

Within the agriculture sector, co-benefits can be assessed through its air quality-related human health impacts, energy security impacts, and power sector employment impacts of those mitigation options with an impact on the energy sector (e.g., biodigesters).

- Table 9 summarizes the co-benefits that can be monetized for the mitigation options included in the Mitigation Cost-Benefit Analysis (CBA) Study for the Philippines in 2015. The estimates are cumulative and cover the time period of 2015-2050 for mitigation options in all sectors.

TABLE 3. MONETIZED CO-BENEFITS OF MITIGATION OPTIONS IN ALL SECTORS

Sector	Mitigation Option	Co-benefits Compared to Baseline (Cumulative 2015-2050) [Billion 2010 USD] Discounted at 5%				Cost per Ton Mitigation (2015-2050) [2010 USD] co-benefits only
		Health	Congestion	Income Generation	Total Co-benefit	
Symbol		F	G	H	I	J
Formula					sum(F,G,H)=I	-I/D=J
Energy	Biodiesel Blending Target	0.00	N/Aa	N/Aa	0.00	0.0
	Biodigesters	-0.36	N/Aa	N/Aa	-0.36	348.0

Sector	Mitigation Option	Co-benefits Compared to Baseline (Cumulative 2015-2050) [Billion 2010 USD] Discounted at 5%				Cost per Ton Mitigation (2015-2050) [2010 USD] co-benefits only
		Health	Congestion	Income Generation	Total Co-benefit	
	Energy Efficient Street Lighting with HPS Technology	N/Ab	N/Aa	N/Aa	N/Ab	N/Ab
	Energy Efficient Street Lighting with LED Technology	0.16	N/Aa	N/Aa	0.16	-11.7
	Forest Protection	0.16	N/Aa	N/Aa	0.16	-0.3
	Forest Restoration and Reforestation	-0.19	N/Aa	N/Aa	-0.19	0.5
	Home Appliance Improvements	0.01	N/Aa	N/Aa	0.01	-0.2
	Home Lighting Improvements	0.19	N/Aa	N/Aa	0.19	-21.6
	Methane Recovery from Sanitary Landfills for Electricity	-0.13	N/Aa	N/Aa	-0.13	1.6
	NREP Biomass	0.22	N/Aa	N/Aa	0.22	-14.0
	NREP Solar	0.37	N/Aa	N/Aa	0.37	-33.6
	NREP Wind	1.27	N/Aa	N/Aa	1.27	-14.8
	Biofuels	–	–	–	–	–
	Driver Training	13.7	9	–	22.7	-2162
	Jeepney Modernization	–	–	–	–	–
	Road Maintenance	–	–	–	–	–
	Two-Stroke Replacement	125.1	–	–	125.1	-2720
	Methane Recovery from Sanitary Landfills	–	–	–	–	–
	Methane Flaring	0.019	–	–	0.019	-194
Waste	Composting	0.183	–	–	0.183	-7.17
	MSW Digestion	-0.127	–	–	-0.127	1.56
	(M2) Forest Restoration and Reforestation	–	–	–	0.00	0.00
	(M1) Forest Protection	–	–	6.5	6.5	-38.26
	Biomass Co-firing	0.038	–	–	0.038	-0.3
	Crop diversification	0.231	–	–	0.231	-21.9
	Bio-digesters	–	–	–	0	0
		4.738	–	–	4.738	-67.1
		–	–	–	0.0	0.0
		-0.364	–	–	-0.364	348.0

Notes:

[[1] Range of health co-benefits reflects uncertainty regarding the level of reduction in PM2.5 emissions from diesel jeepneys running on cleaner (10 ppm sulfur) fuel. Studies in the U.S. (MECA, 1999) and Japan (WWFC, 2000) have found 10-50% reductions in PM2.5 from uncontrolled diesel trucks switching from 300 ppm to 500 ppm to ultra-low sulfur fuel.

[2] Equal to the value of co-benefits divided by GHG mitigation potential. This could also be termed "Value of Co-Benefits per Ton Mitigation."

* N/A indicates that a given mitigation option was not selected for inclusion in the retrospective systems analysis. These mitigation options were evaluated individually against the baseline.

– indicates inapplicability of a given co-benefits category

a This co-benefit was not calculated for energy sector mitigation options.

- b Co-benefits were not calculated for this mitigation option.
- c No mitigation potential.
- Abbreviations:
- CNG = Compressed natural gas; LDV = light-duty vehicle; MCTC = motorcycle/tricycle; MVIS = motor vehicle inspection system; SLF = sanitary landfill; OD = open dump; CDF = controlled disposal facility; MRF = material recycling facility.
- Column Definitions:
- [F] Co-benefits: Health: Monetized public health benefits reflect the reduced risk of premature death from exposure to air pollution exposure. For the transport sector, these are based on reduced emissions of fine particles from vehicle tailpipes. For the energy sector, these are based on the reduced power plant emissions of SO2, fine particulates, and NOX.
- [G] Co-benefits: Congestion: Monetized congestion benefits reflect less time wasted on congested roadways. These are specific to the transport sector.
- [H] Co-benefits: Income Generation: Economic co-benefits from creation of new markets and/or expansion of productive capacity. For forestry, these include timber and fruit production from re-forested areas. For waste, these include recyclables and composting from waste diverted from landfills.
- [I] Total Co-benefits: Sum of valuation of monetized co-benefits. Co-benefits that were quantified but not monetized (i.e. energy security) are summarized in Table III. 36 and Table III.37
- [J] Cost per Ton Mitigation: co-benefits only: Value of monetized co-benefits (represented as a negative cost) divided by mitigation potential.

Section 3: Plan and Objectives

The GHG Management Plan sets forth the main vision of the (Name of LGU), (State vision of the City. Example: which is to be the first well diversified agro-industrial center and international gateway that is carbon neutral, which makes it tourist-friendly, most liveable with safe environment and quality infrastructure, powered by a globally-competitive citizenry, and inspired by transparent, firm, and fair leadership. More in particular, the (Name of LGU) Government envisions the community as:

EXAMPLES:

* A city with a yearly reduction of 25% in GHG emission from 2014 to 2030 achieving the carbon-neutral state (edit according to your LGU)

* A city of land management that respects the carrying capacity of the natural resources and guarantees that development is within the assimilative capacity for solid waste and other pollutants from human activities. Reduce vulnerability of land area of the City to extreme weather events resulting to storm surge, flooding and landslide.

* A place of Eco-Industrial Parks signifying responsible industrial development as they comply to pollution prevention, cleaner production, waste minimization, and with established functional environmental management

* A haven of tourist and recreational spots because of its natural and environmentally-inspired or eco-friendly built landscape with the complements of fresh air and clean waters

Section 4: Mitigation Actions

Section 4.1 GHG Reduction Potential

[IF GHG INVENTORY REPORT AND/OR MANAGEMENT PLAN IS AVAILABLE, EDIT THIS SECTION BY COPYING THE TARGETS AS SET IN THE GHG MANAGEMENT PLAN

IF GHG INVENTORY REPORT AND/OR MANAGEMENT PLAN IS NOT AVAIALBLE, EDIT THIS SECTION AS APPROPRIATE]

Using a conservative <insert % of growth rate> growth rate for population as well as on emissions, the CENRO/ MENRO aims to compute for the most realistic and attainable percentage of reduction that the City Government can commit and implement. This can be done by implementing current and planned mitigation actions as set forth in this Plan.

The quantification of GHG emissions and reductions of the PPAs of the (Name of LGU) will be undertaken and will be reflected in the succeeding versions of the plan.

Section 4.2 GHG Mitigation Measures Summary [EDIT THIS SECTION USING RESULTS OF THE WORKSHOP EXERCISES. IF YOU HAVE YOUR GHG MANAGEMENT PLAN, COPY THE INITIATIVES HERE]

(Name of LGU) is already implementing noteworthy initiatives that have GHG reduction potentials. Table 8 summarizes these initiatives.

EXAMPLES:

TABLE 4. SUMMARY OF EXISTING GHG REDUCTION MEASURES

SECTOR	INITIATIVES
Energy	• Energy conservation measures at the LGU • Use of clean energy technologies e.g. solar street lights, LEDs, switching to CFLs from incandescent bulbs, etc. • Automation and streamlining of services at City Government • Purchase and use of new vehicles and discarding unserviceable and road unworthy vehicles by the City Government • Electrification of Verde Island with the use of solar energy
Transportation	• Vehicle volume reduction schemes such as private vehicle number coding scheme, PUJs zoning of route operation, division of tricycle operation to daytime & nighttime • Local transportation regulatory programs like issuance of Mayor's Permit and franchising • Construction and operation of the City Integrated Bus Terminal outside Poblacion / Urban area
Traffic Management	• Pedestrianization (provision of pedestrian lanes, pedestrian overpass, sidewalk railings) • Implementation of one-way zones • Re-routing • Implementation of Pay Parking areas • Traffic signalization of intersections • Operation of CCTV cameras at strategic street locations • Provision of traffic signages, overhead directional signs, pavement markers and traffic lane dividers • Implementation of Batangas City Traffic Ordinance and Tricycle Franchising Ordinance
Waste	• Waste segregation at source scheme • Scheduled garbage collection according to type of waste • Zero Plastik at Papel sa Kalye Program • Banning stryfoam and regulation on the use of plastic as food containers • Banning open burning of waste • Closure of controlled dumpsite and construction/operation of sanitary landfill with MRF facility • Operation of MRFs at barangays and schools with the 3Rs (reduce, re-use & recycle) • Rehabilitation of old slaughterhouse and construction of new slaughterhouse with waste water treatment facility

	• Implementation of community clean and green programs (Gawad Punong Lungsod sa Pagandahan ng Barangay, Gawad Parangal Para sa Huwarang Barangay, Dangal ng Lungsod Awards, Search for the Most Liveable Communities Award) • Promotion of the construction of septic tanks and use of bio-gas digesters to livestock businesses
Environment (Forestry and other environment sectors)	• Implementation of the Environment Code of Batangas City • Rehabilitation of the old dumpsite area to a Garbo-Forest with wildlife rescue station and functional park • Banning charcoal-making • Tree/Mangrove planting and regulation on the cutting of trees/mangroves • Coastal and /or city-wide Clean-Up • Conduct of IECs and annual environmental celebrations for heightening environmental awareness • Formation of Eco-Rangers (green speakers/advocates composed of volunteer college students) • Implementation of Anti-Smoking • No To Mining Advocacy/Campaign
Industry/Commercial Establishments	• Construction and/or operation regulation through the issuance of City Environmental Certificate and City Environmental Permit to Operate
Agriculture	• Yellow Corn Production, Management and Marketing • Conduct of skill training for organic farming and provision of assistance by the City Government

[EDIT AS APPLICABLE. IF GHG EMISSION REDUCTIONS HAVE BEEN QUANTIFIED FOR A PARTICULAR PPA, FILL OUT THE CORRESPONDING CELLS IN THE TABLE BELOW AND PROVIDE DETAILS IN THE APPENDIX]

The following lists the mitigation options considered by (Name of LGU) in its various plans and studies. The column on tCO2e reduction potential, % contribution to total reduction and details of the PPA has been left blank as of this writing. Succeeding versions of this Plan will include information on these items.

EXAMPLES:

TABLE 5. SUMMARY OF PLANNED GHG REDUCTION MEASURES

Measures	tCO2e reduction potential	% contribution of reduction to total	Details
GHG Management of Emissions from Local Government Operations			

Measures		tCO2e reduction potential	% contribution of reduction to total	Details
1	Disaggregate and monitor monthly electricity consumption in the City Hall per building / per floor by conducting energy audits, switching to more efficient lighting (e.g. CFLs, LEDs) for LGU offices, continue efforts on switching to solar street lights, and implementing energy conservation measures in LGU offices			
2	Reduce the fuel allowance of LGU-owned vehicles and encourage carpooling to official trips			
3	Implement a Daylight Saving Time System			
4	Implement paperless transaction policy in LGU offices			
5	Re-Install MRF at the City Government premise			
6	Strictly maintain proper solid waste disposal system and other environment-related regulations (e.g. no smoking) at government offices and premises. Enforcement team for these must be strengthened			
7	Implement green building design for construction or renovation of government buildings and infrastructures			
Energy				
8	Use of solar energy in two barangays in Isla Verde			
9	Use of Biogas digesters (for pig farms)			
Climate Smart Transportation				
10	Utilizing public transportation and high occupancy vehicles			
11	Improving transportation system efficiency			

Measures		tCO2e reduction potential	% contribution of reduction to total	Details
12	Supporting the adoption of renewable fuels and clean energy			
13	Promoting non-motorized transportation and moving information			
14	Reducing GHG emissions and improving livability through planning			
Low Carbon Neighborhoods, Buildings, and Industry				
	Designing low carbon neighborhoods			
15	Improving building and equipment energy efficiency			
16	Improving building and equipment energy efficiency (E.g. shift to LED lights and appliances)			
17	Promoting low carbon energy sources for buildings and industry			
18	Reducing GHG emissions from industry			
Low Carbon Consumption and Intelligent Waste Management				
19	Low carbon consumption Intelligent waste management			
20	Waste minimization			
Sustainable Agriculture				
21	Promote low-carbon crops and cropland management practices			
22	Improve the management of livestock and pastures			
Forestry				
23	Reduce deforestation			
24	Improve forest management			

Measures		tCO2e reduction potential	% contribution of reduction to total	Details
24	establish forests on un-forested land (e.g create beach forests)			

Section 4.3 Priority Mitigation Measures for 2017-2028

Given the list of planned mitigation PPAs identified in the previous section, climate change team has endeavored to prioritize measures to be undertaken by the City based on various criteria. A two level analysis was done to identify these measures:

- First level screening involved feasibility check; and
- Second level screening involved impact evaluation

Results of these exercises are outlined below:

The feasibility of each identified mitigation strategy was assessed using the following criteria:

PLEASE IDENTIFY CRITERIA AND WEIGHTS APPLICABLE TO YOUR LGU [USE RESULTS OF THE WORKSHOP EXERCISES FOR THIS SECTION. IN SOME CASES, A MORE DETAILED PRIORITIZATION EXERCISE HAS BEEN DONE. IF AVAILABLE, EDIT THIS SECTION TO REFLECT THE PROCESS.]

EXAMPLE:

TABLE 6. PRIORITIZATION OF MITIGATION MEASURES

Criteria		Assigned Weights
1	Mitigation potential (MP)	30%
2	Technical capacity to implement projects (TC)	15%
3	In line with the city's vision (CV)	40%
4	Sustainable development benefits and opportunities (SD)	15%

On the other hand, impacts of the proposed mitigation strategy were assessed using:

- Timeframe – most actions should be able to be completed within a short or medium timeframe
  - Urgent – within 3 yrs 80 -100%
  - Necessary within the next 6 years – 60 -79%
  - Preferred – 59% and below

TABLE 7. PRIORITY MEASURES SCORING RESULTS, BY WEIGHTS

Measures		Criteria				Scores
		1(MP)	2 (TC)	3 (CV)	4 (SD)	
GHG Management of Emissions from Local Government Operations						
1	Switching to more efficient lighting (e.g. CFLs, LEDs) for LGU offices, continue efforts on switching to solar street lights, and implementing energy conservation measures in LGU offices	**15**	**15**	**40**	**10**	**80**
2	Reduce the fuel allocation of LGU-owned vehicles and encourage carpooling to official trips	**15**	**15**	**40**	**10**	**80**
4	Implement paperless transaction policy in LGU offices	**5**	**15**	**10**	**15**	**45**
5	Re-Install Materials Recovery Facility at the City Government premise • Segregate organic from inorganic wastes • Waste diversion rate increased	**20**	**15**	**40**	**15**	**90**
7	Implement green building design for construction or renovation of government buildings and infrastructures	**10**	**5**	**20**	**15**	**50**
Energy						
8	Use of solar energy San Agapito, Isla Verde and 5 other Brgys)	**30**	**10**	**40**	**15**	**95**
	Use of low emission development strategies for commercial building (i.e. solar power)					
Climate Smart Transportation						
9	Improving transportation system efficiency • Synchronizing traffic signal lights • Re-routing scheme (Relocation of major traffic generators)	**10**	**15**	**40**	**15**	**80**
12	Promoting non-motorized transportation and moving information • Promotion of carless days, biking lanes, walkways) • Pedestrianization • Rationalizing parking on public spaces	**15**	**15**	**10**	**15**	**55**
Low Carbon Neighborhoods, Buildings, and Industry						
14	Designing low carbon neighborhoods	**20**	**5**	**20**	**15**	**60**

Measures		Criteria				Scores
		1(MP)	2 (TC)	3 (CV)	4 (SD)	
	• Energy efficiency in lighting and equipments residential, commercial and industry					
Low Carbon Consumption and Intelligent Waste Management						
19	Low carbon consumption - Local food production (i.e. gulayan sa paaralan) - Shift to low carbon intensive food	**10**	**10**	**20**	**15**	**55**
	Intelligent Waste Management - Increase composting of organic waste - Invest in improved waste water collection and treatment	**25**	**10**	**40**	**15**	**90**
20	Waste minimization (i.e. recycling, minimized packaging)	**10**	**15**	**30**	**15**	**70**
Sustainable Agriculture						
21	Promote low-carbon crops and cropland management practices (e.g. corn)	**15**	**15**	**40**	**10**	**80**
22	Improve the management of livestock and pastures (biogasdisgeter)	**30**	**15**	**30**	**15**	**90**
Forestry						
23	Improve forest management (i.e. Reduce deforestation)	**15**	**10**	**35**	**15**	**75**
24	Afforestation (e.g. beach forest)	**15**	**15**	**35**	**15**	**80**
	Rehabilitation of mangrove forest	**30**	**15**	**35**	**15**	**95**

Section 5: Monitoring and Evaluation

PPAs identified as Urgent in the above section were assigned detailed performance indicators for proper evaluation and tracking. The following table presents these identified measures.

EXAMPLES: [USE RESULTS OF WORKSHOP EXERCISES FOR THIS SECTION]

TABLE 8. MONITORING AND EVALUATION MATRIX FOR URGENT MEASURES

Strategy Number	Budget Tagging Code	Performance Indicator	GHG emissions Indicator	Target	Manner of Collection	Data Source	Who will take responsibility for collecting the data	How often should the data be collected
Switching to more efficient lighting (e.g. CFLs, LEDs) for LGU offices, continue efforts on switching to solar street lights, and implementing energy conservation measures in LGU offices	TBD	* No. of bulbs replaced	kWh consumption	*50% shifted to LEDs and CFLs – 1st year	Collecting/gathering record	Purchase Orders	GSD/ Accounting/ City ENRO	Annually
		*No. of solar streetlights installed						
		*No. of offices observing energy conservation measures						

Reduce the fuel allocation of LGU-owned vehicles and encourage carpooling to official trips	TBD	*Fuel allocations reduced	Liters of fuel saved	100 liters per vehicle in a month	Budget office	Accounting office (Actual Fuel payments)	City ENRO	Monthly
Re-Install Materials Recovery Facility at the City Government premise ☐ Segregate organic from inorganic wastes ☐ Waste diversion rate increased	TBD	MRF installed * percent reduction in volume of organic/inorganic wastes * percentage of waste diversion rate	cubic meter of waste recovered/waste density	MRF operational by 2018 *__% in waste reduction	City ENRO - SWM Division (	Based on approved 10-yr plan - City ENRO	City ENRO	Monthly
Use of solar energy in two barangays in Isla Verde	TBD	No. of barangays using solar energy	kWh of electricity displaced	Two barangays with solar plant installed	reports from meralco	Meralco	City ENRO	Quarterly
Improving transportation system efficiency ☐ Synchronizing traffic signal lights	TBD	No. of traffic lights synchronized	estimated fuel saved	100% of traffic lights synchronized	Reports from TDRO	TDRO	City ENRO	annually
Intelligent Waste Management Increase composting of organic waste	TBD	Volume of waste composted	Volume of waste composted	20% volume of waste composted in 2024	Data gathering	Brgy SWM Committee	City ENRO	monthly

Invest in improved waste water collection and treatment		Waste water treatment facility constructed	Volume of waste water managed	waste water treatment facility constructed by 20__	Data gathering	CHO	City ENRO	annually
Improve the management of livestock and pastures (biogasdigester)	TBD	No. of biogas digester installed in coop-based piggeries	Volume of livestock waste water	100% compliance	Data gathering	Environment Compliance Officer of the cooperative	City ENRO	annually
Afforestation (e.g. beach forest)	TBD	Hectarage of beach forest	Hectarage of beach forest					
Mangrove Reforestation	TBD	Hectarage of mangrove area reforested	Hectarage of mangrove area reforested	2 hectares of mangroves planted a year	Planting schedule data	City ENRO	City ENRO	annually

PART 3: ADAPTATION

For Template 1, (CITE THE PROCESS TO BE UNDERTAKEN TO DEVELOP THE ADAPTATION PLAN)

For Template 2. (CITE THE PROCESS TO BE UNDERTAKEN TO DEVELOP THE ADAPTATION PLAN. IF A DRRM PLAN I AVAILABLE, SUMMARIZE THE CONTENTS OF THE PLAN AND INSERT HERE A SUMMARY OF THE PROCESS AND INSERT OTHER APPLICABLE TEXTS AS REQURIED IN THE VARIOUS SECTIONS OF THIS PART 3: ADAPTATION.

BATANGAS CITY HAS BEEN GIVEN AS AN EXAMPLE FOR YOU TO FOLLOW)

For Template 3, COPY-PASTE YOUR CURRENT LCCAP IN THE CORRESPONDING SECTIONS IN THIS PART 3: ADAPTATION. NOTE THAT THIS SECTION FOLLOWS THE CURRENT SUGGESTED TEMPLATE FOR THE LCCAP. MINOR EDITS WITH YOUR CURRENT LCCAP MAY BE NEEDED TO REALLIGN IT WITH THE FORMAT SUGGESTED HERE.]

Section 1: Introduction

In response to RA 7160 or the Local Government Code in upholding the general welfare of the populace, the leadership of the City Government (Name of LGU) undertakes formulation and implementation of complementary preventive and adaptive policies, programs / projects and activities. Since climate change requires long-term management, adaptation and mitigation are two inseparable topics. Any practical response must be complemented by certain measures that will be beneficial in the long run. Mitigation actions can affect adaptation actions, and vice versa thus, both are needed in achieving multiple goals. Section 14 of the Climate Change Act requires that “municipal and city governments shall consider climate change adaptation, as one of their regular functions”.

EXAMPLE: IF ACCCNR PROCESS HAS BEEN UNDERTAKEN. I F NOT, DESCRIBE THE PROCESS USED.

Through the ICLEI-Asian Cities Climate Change Resilient Network Process, the City/Municipality has undergone vulnerability assessment through the analysis of the fragilities of its identified weak urban systems relative to its climate-related hazards. Results of the vulnerabilities assessment were acknowledged in order to address these and incorporate in the future plans. Adaptation strategies were formulated in this plan aiming for the resiliency of the city towards the adverse impacts of climate change.

Section 2: Vulnerabilities Assessment

Under Phase 2 and 3 of the ICLEI-ACCCRN Process, fragile urban systems of the City that are perceived to be impacted by climate change were identified and were then carried out for assessing vulnerabilities of each. These are as follows:

[EXAMPLE: BATANGAS CITY-EDIT AS APPLICABLE TO YOUR LGU]

Section 2.1 Climate-Related Hazards and Impacts

Past Hazards and Climate Events

Phenomena such as increased precipitation, heat stress, floods and other extreme weather events, referred to as climate exposures, are increasingly having an impact on infrastructure and systems within local governments. As part of developing the LCCAP, the local government of Batangas collected available local climate data including previous disasters and future climate projections. Using the DRRM Plan, a list of past hazards and climate-related disasters experienced by Batangas City in (2000-2014; ideally from 30 years ago) was consolidated:

TABLE 9. LIST OF PAST HAZARDS AND CLIMATE-RELATED DISASTERS EXPERIENCED BY BATANGAS CITY

Date of Event	Type of Hazard (typhoon, flooding, drought)	Impacts of the Event
November 25, 2006	**Typhoon Reming**	Caused flooding in some areas of the City, Several infrastructures such as dikes, roads, bridges, and sea walls were damaged.
May 15, 2006	**Typhoon Caloy**	State of Calamity 42 barangays were affected 325 houses totally damaged 987 houses Partially damaged 100-150 M worth of infrastructure and agricultural crops damaged
September 28, 2006	**Typhoon Milenyo**	2 barangays were affected 18 houses totally damaged 54 houses partially damaged
October 31, 2009	**Typhoon Santi**	Large volume of water in Calumpang river, resulting in the clogging of the river by uprooted trees and other debris which triggered the collapse of the foundation of Bridge of Promise. The loss of the bridge impacted the City, particularly in terms of traffic management.
November 9, 2013	**Typhoon Yolanda**	15 barangays were affected 110 houses totally damaged 372 houses partially damaged
July 10, 2014	**Typhoon Glenda**	105 barangays were affected 217 totally damaged 2453 houses totally damaged City-wide Loss of power and water supply Damages to infrastructure and the loss of Calumpang Bridge.

Climate Scenario

The local government of Batangas reviewed local and regional information about how the climate is already changing, as well as how it is expected to change in the future. This includes, where available, identifying the amount of change expected in climate, such as average temperature, precipitation, sea level rise, wind speeds and extreme events (if applicable) projected in the area based from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAG-ASA).

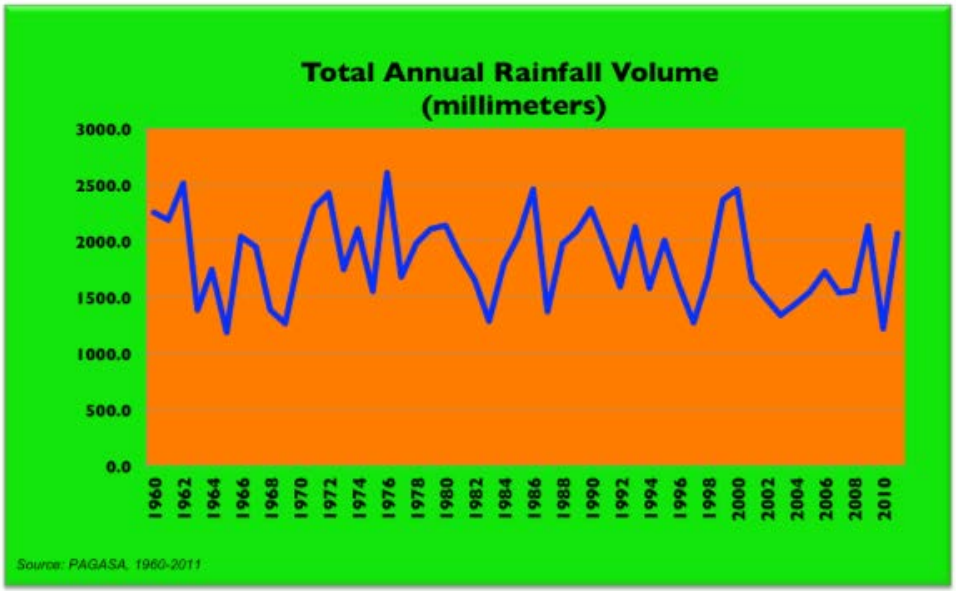

FIGURE 3. TOTAL ANNUAL RAINFALL VOLUME (MM) IN BATANGAS CITY (1960-2010)

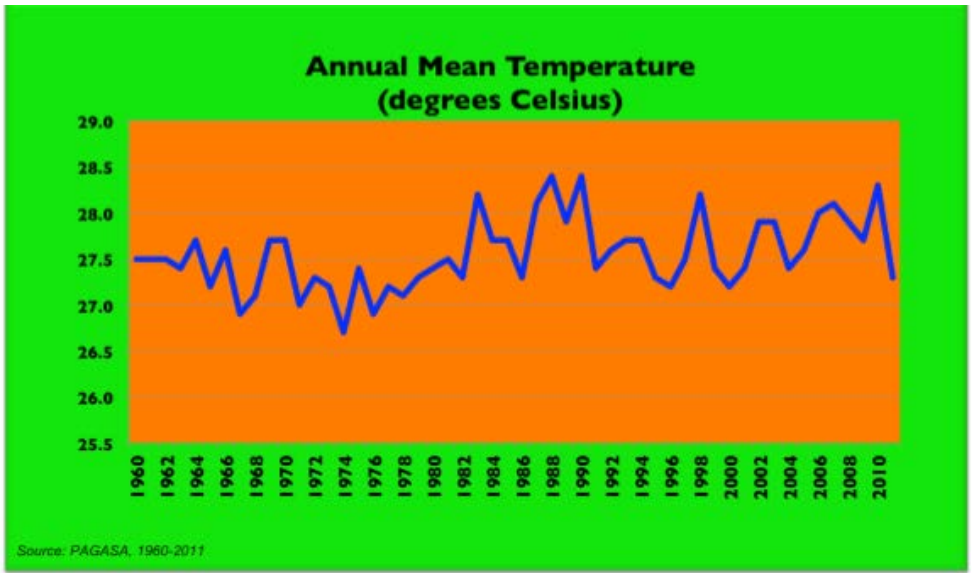

FIGURE 4. ANNUAL MEAN TEMPERATURE (°C) IN BATANGAS CITY (1960-2010)

In the shorter term (2006-2035), PAGASA predicted that rainfall would decrease by 24.1% to 29.9% during the dry months as compared to the 1971-2000 baselines. Also, an increase of 9.1% in rainfall during the months of June, July, and August is expected with reference to the same baseline.

According to the Climate Change in the Philippines published by DOST-PAGASA in 2011, there is no definite proof that there is an increase in the frequency of tropical cyclones occurring in the Philippine area of responsibility. However, they stated that there is a very slight increase in the frequency of tropical cyclones with sustained winds of greater than 150kph being exhibited during El Niño events.

Section 2.2 Urban Systems Analysis

Resilient urban systems are defined as "systems that are able to maintain their functions and linkages in the face of climate stresses and changes" (ICLEI-ACCCRN). Adopting the "Urban Climate Resilience Planning Framework" developed by ISET, resilient urban systems are those characterized by:

- Flexibility and diversity – mix of multiple options, assets and functions are distributed or decentralized, not all affected by a single event
- Redundancy – alternatives/ back-up systems/ contingency plans, capacity for contingency situations, multiple pathways, and options for service delivery in case one or several options fail
- Safe failure – ability to absorb sudden shocks or slow onset stress so as to avoid catastrophic failure

Based on these definitions as well as priorities identified in the city's development priorities (Annual Investment Plan), the local government identified the following fragile urban systems:

Energy

Based on the city's 2015 SEPPP, 99 out of 105 barangays are serviced by the Manila Electric Company (MERALCO) with electricity. On the other hand, the six barangays in Verde Island depend on diesel-fired power generators and solar energy devices for electricity requirements. In the 2012 GHG Inventory Report, the energy sector (electricity consumption) ranked as the 3rd GHG emitter in Batangas City comprising 21% of the total emission. Some initiatives had been done like the installation of solar panels for street lights and retrofitting of government buildings and facilities to reduce GHG emission.

The City's environment code promotes the use of solar energy especially in its off-grid barangays as alternative to fossil fuel. This reduces cost of transporting generators as well as extending transmission and distribution lines to remote areas such as Verde Island. The promotion and campaign on energy conservation is also one of the emission reduction strategies of the City.

Water

Calumpang River is a major tributary to Batangas Bay that traverses several barangays of Batangas City which include Malitam, Wawa, Cuta, Pallocan West, Kumintang Ibaba, Gulod Labac, Libjo, Gulod Itaas, Dalig, San Pedro, Tingga Itaas, Tingga Labac and Barangays 1, 2, 3, 4 and 6 of the Poblacion. The two mouths opening to Batangas Bay are located between Cuta and Wawa and the other between Wawa and Malitam which is about two kilometres from the Batangas port. From its mouth in Malitam up to the boundary of the municipality of Ibaan, the river is approximately eight kilometres in length with an average width of about 90 meters. From San Pedro down to Malitam, the river has an average depth of seven meters which is navigable to small motorized bancas (Batangas Coastal Resources Management Foundation (BCRMF), 2000).

Batangas City experiences several geologic and meteorological hazards every year. On a regular basis, minor floods affect coastal and riverbank communities during the monsoon seasons or passages of typhoons (Batangas City State of the Environment). Geohazard assessments showed that the low-lying areas are susceptible to flooding. High hazard areas are found in the coastal areas and those traversed by Calumpang River. Sea-level rise is possible to occur due to warming of sea surface temperature thus, barangays facing the Bay is not excluded. Extreme rainfall events, which is one of the seen impacts of climate change may impact water supplies, drainage infrastructures, critical facilities and other properties.

Transport

The city has undergone rapid development and growth driven by the different economic activities that sprouted within the city. The rate of growth especially in terms of commercial and retail has been dramatic which is attributed mainly to the opening of the port, the completion of the Southern Tagalog Access Road (STAR) from Sto. Tomas, Batangas to Batangas City and other industrial, commercial and residential developments within the city.

Being the business, political, industrial, and educational capital of the province, the City is a hub of diverse activities, and trips are generated as people move from one activity to another. In addition, the industries in the City entail the transport of raw materials and finished products, adding burden to the city's transport infrastructure.

Almost all activities are concentrated within the poblacion limiting the space for parking spaces. While there is potential to expand in the east side, access is limited to two 2 bridges lacking in capacities to accommodate the present traffic demand. Air pollution in the center of the City is mainly due to increasing number of vehicles (tricycle, jeepneys and private cars) operating and passing through the city.

Ecosystem

Calumpang River was classified as Class C in 1993 according to DENR Memorandum Circular No. 1993-07. Class C waters are intended for the propagation and growth of fish and other aquatic resources, for secondary recreation such as boating, and for industrial water supply for manufacturing processes after treatment. However, recent studies compiled by the local government have shown that the river is now classified as Class D, thus, the city government declared that the rehabilitation and restoration of the river into Class C are among its top development priorities (Batangas City Environment Code, 2010). The current situation can be attributed to the growing swine industry in the City.

Batangas, being the leading meat and poultry supplier in CALABARZON (Bureau of Agricultural Statistics, 2002), is expected to be predominated by different types of livestock raisers, such as backyard, small scale, medium scale and large scale. Unfortunately, the absence of waste treatment facilities appears to be almost universal in commercially oriented hog operations in the Philippines. Direct field observation and biochemical analysis along the Calumpang River indicated large volume of hog wastes disposed directly to creeks, streams and canals untreated and find their way into river systems.

In addition, the portions of coastal areas and riverbanks have become informal settlements of the Badjao migrants. With the worsening condition and changing climate pattern, river water quality could further deteriorate. It could impact the suitability of water for agricultural use that could lead to lower classification.

Protected Zone

Mangroves are integral components of the landscape of Batangas City. Known to be highly efficient in sequestering large amount of carbon, mangrove forests are vital in climate change mitigation. The mangrove forest formation of Batangas City comprises a variety of mangrove tree species. Despite environmental pressures, the formation is still intact and regenerations are still abundant. These species are well-distributed in the protected zones covering two barangays: Wawa and Malitam (Badjaoan Community) and near Calumpang River. However, the mangrove forest formation is in critical condition due to deforestation, pollution and degradation. Without the mangrove forest, the coastal lands and settlements become more prone to the onslaught of storm surge and flooding.

Marine Diversity

Batangas City's coastal water covers the depth and breadth of Batangas Bay, a portion of the Verde Island Passage (VIP), and the Calumpang River Delta. Its coastline is teeming with tropical fishes, shellfishes, corals and other marine organisms. The VIP is one of the landmarks that put the name of Batangas City into international publicity. It was declared as the Center of the Center of Marine Biodiversity and is one of the busiest sea lanes in the country.

According to Dr. Kent Carpenter and Dr. Victor Springer, recognized marine biologists, the Verde Island Passage is home to nearly 60% of the world's known fish species, including humphead wrasses and giant groupers, and some of the most threatened marine mega fauna such as the hawksbill, olive ridley, and green seaturtles. Harboring over 300 species of corals, the reefs are said to have the largest concentration of corals in the country and even in the whole world. Its coral health is relatively good but is prone to the effects of global warming and increased pollution level, leading to loss of diversity (Katimbang, 2009).

Coastal settlements along the Batangas bay continue to increase and crowd further putting pressure on its environmental quality and adding to the waste problem of the City in coastal areas. Wastewater discharge from Batangas City's industries is estimated at almost 600 million liters per year, 98% of which is from manufacturing, refinery and power industries (Gonzales, 2009). The present use of the Verde Island Passage as a sea lane threatens the environmental integrity of marine ecosystem in the area because of possible oil spills and dumping of garbage by sea vessels and other commercial boats. But the most damaging activities that cause the decimation of coral reefs are illegal fishing methods and overfishing that are practiced by both transient and local fishermen.

To protect the coral reef cover of the City, four (4) ordinances were enacted establishing four Marine Protected Areas (MPA) in Barangays San Agapito and San Agustin Kanluran in Isla Verde, Ilijan and Pagkilatan. The OCVAS deploys and installs markings and buoys to identify the areas specifically core zone and buffer zone of the sanctuary, and conducts regular monitoring conducted by the organized City Bantay-Dagat.

Food

Based on OCVAS records, the actual total area planted by crops is 5, 857 hectares.

Crop Production and Consumption Pattern. The staple food of the Batangueños is rice. In 2015, per record from the OCVAS, the city's estimated production of rice is 152.63 cavans per 15.00 metric tons. This production quantity is not sufficient to supply the demand required for rice by the city's total population estimated at 726, 639 cavans (339, 551 population x 2.14 cavans[4]). To satisfy and meet the population's demand, the city has to depend for its rice supply requirements from the provinces of Mindoro Oriental/Occidental and the Central Luzon provinces.

Though Batangas City has limited production of rice, other crops such as vegetables, root crops, corn and fruits like mangoes, atis, tamarind and bananas are produced in the area. The city government through the OCVAS has launched a massive program on yellow corn production among its identified beneficiary farmers. Considered as a high value crop, yellow crop is a major ingredient in the livestock feed processing industry (feed millers).

Food Insufficiency. The calculation of food sufficiency level reveals that Batangas City is heavily dependent on supply of agriculture and fishery commodities from nearby towns and cities. This is due to insufficient production of major agricultural products such as green corn, root crops and tubers, vegetables, fruits, fish and its products, poultry (broiler), and cattle (fattener) in the last few years. Therefore, Batangas City serves as a net importer of these commodities.

[4] Standard per capita requirement of rice

In contrast, Batangas City is found to be highly sufficient in the production of fattener swine providing its population an adequate supply of meat products from pigs. This also makes the city a net exporter of swine during the same period. These findings imply the need to increase the production and productivity of major food crops in order to increase the city's food sufficiency level.

There are limited sources of income for fishermen in barangays with fish sanctuaries are located. Fishing activities in these areas are also restricted. Livelihood projects for this sector should delve on eco-tourism particularly those who are helping to protect marine sanctuaries.

In summary, Table below presents the fragilities of priority urban systems in Batangas City.

TABLE 10. CHARACTERIZATION OF PRIORITY FRAGILE URBAN SYSTEMS IN BATANGAS CITY

Urban System	Fragility Statement
Energy	Dependent on one energy source. Almost all energy supply system in Batangas City come from a sole private distributor, MERALCO. All systems involving energy such as communications, transport, and water are connected. As such, power and production shortages can paralyze other systems (e.g., problems in transport system and faulty communication in times of disaster).
Water	Batangas City experiences several geologic and meteorological hazards every year. On a regular basis, minor floods affect coastal and riverbank communities during the monsoon seasons or passages of typhoons. Barangays in the lowlands can easily be flooded especially those traversed by Calumpang River
Transport	Lack of parking spaces Inadequate infrastructure resulting to traffic congestion. The present transport system lacks alternatives and only depends on existing roads and bridges causing so much traffic. The volume of vehicles plying the streets is more than what infrastructure can hold. However, adding more infrastructures may result to the loss of available green spaces. Poblacion areas are considered flood prone which requires additional intervention. On the mitigation side, traffic congestion means more fuel consumption and CO_2 emissions.
Ecosystem	Proliferation of coastal settlements. Coastal settlements along the Batangas Bay continue to increase and crowd putting pressure on its environmental quality. The population residing in the coastal areas within the Batangas City is estimated to grow annually by about 2.5%. This increase can contribute to more solid and liquid wastes finding their way into the bay. Poor coral reef health. The increasing pollution load in Batangas Bay and the number of industries expanding their operations for the last ten years since 1997 may have contributed to the further deterioration of coastal water quality. This also affected the health of coral reefs. But the most damaging activities that cause the decimation of coral reefs are illegal fishing methods and overfishing that are practiced by both transient and local fishermen. Degrading water quality of Calumpang River. Pollution of the river was attributed to the lack of sewerage and sewage system in the City plus the fact that improperly disposed solid and liquid waste of households living along the river banks find their way into the river.

Urban System	Fragility Statement
	Less mangrove cover. Without the mangrove forest, the coastal lands and settlements become more prone to the onslaught of storm surge and flooding.
Food	Dependence on import. Food supply of the city is dependent on imported goods. A calamity can abruptly increase the prices of food supply and a problem in transport will paralyze our supply. Declining fish catch

Section 2.3 Risk Assessment

Climate change impacts can pose additional risks and threats to already fragile urban systems. Batangas City identified four different climate-related hazards which can affect their priority urban systems. These include 1) changes in rainfall (including flooding, drought, and rain-induced landslides), 2) increase in temperature, 3) occurrence of extreme weather events, and 4) sea level rise. Perceived effects of these climate-related hazards were identified and rated against the likelihood and the consequence of its impact(s). Details of the scoring are illustrated in Annex 3.
18 summarizes the priority climate risks (rated as medium and high) per urban system of Batangas City.

TABLE 11. PERCEIVED CLIMATE RISKS PER URBAN SYSTEM OF BATANGAS CITY

Urban System	PERCEIVED CLIMATE RISK/S		
	High Risk	**Medium Risk**	**Low Risk**
Energy	Changes in Rainfall • Increased rainfall can directly affect solar-powered lights within the city. Extreme Weather Events • Can affect energy distribution in flooded areas • Systems with high demand for energy result to large scale damage of perishable goods/distribution/ production level of goods and services	Changes in Rainfall • Can affect energy distribution of energy thus limiting the amount of consumption in comparison to MAM. Increased Temperature: • Hotter temperatures can result to increased energy consumption. This may lead to power and energy shortage in certain areas as a coping mechanism of the energy system.	Increase in Temperature • Can directly affect overhead lines – related to integrity of line
Water		Changes in Rainfall • Lack of rainfall can dry up wells and springs	

Urban System	PERCEIVED CLIMATE RISK/S		
	High Risk	**Medium Risk**	**Low Risk**
		causing shortage of water supply. • Increased rainfall can cause seepage to groundwater leading to contamination and poor water quality. <u>Increase in Temperature</u> • Hotter temperatures can result to decrease in water supply coming from springs, deep well, and shallow wells. • Hotter temperatures can result to increase in water demand. <u>Extreme Weather Event</u> • Extreme weather events can damage water supply sources (pipelines). <u>Sea Level Rise (SLR)</u> SLR coupled with over-extraction of groundwater puts a lot of water sources at risk to salt water intrusion (poor water quality)	
Transport		<u>Changes in Rainfall</u> <u>Increase in Temperature</u> • Increase in demand for public utility vehicles <u>Extreme Weather Event</u> • Flooding can disrupt transport of goods and services.	<u>Changes in Rainfall</u> • Rain-induced landslides may result to impassable roads.

Urban System	PERCEIVED CLIMATE RISK/S		
	High Risk	**Medium Risk**	**Low Risk**
		• Increased traffic incidence • Possible suspension of sea transportation	
Ecosystem	<u>Changes in Rainfall and Sea Level Rise</u> • Possibility of coastal communities to be inundated or even washed out when associated with storm surge <u>Increase in Temperature</u> • Warmer water temperature can result in coral bleaching, making the reef ecosystem less likely to recover. Also, changes in water temperature may affect habitat ranges which in turn can disturb the ecosystem state. If these happens, marine diversity in Verde Island will be at stake.	<u>Extreme Weather Event</u> • Less mangrove cover makes coastal settlements more vulnerable	
Food	<u>Increase in Temperature</u> • Increased temperature is good for certain kinds of crops while damages other kinds, e.g. rice, vegetables. • Death of livestock and poultry due to extreme heat <u>Extreme Weather Event</u> • Disrupts fishing even destroys fishing vessels • Uproot even the sturdiest of trees		

Urban System	PERCEIVED CLIMATE RISK/S		
	High Risk	**Medium Risk**	**Low Risk**
	• Damages crops and livestock		

Section 2.4 Vulnerabilities Assessment

Existing city maps were further supported by a more in-depth assessment conducted by experts from the University of the Philippines Los Baños (UPLB). Multi-hazard map from the Department of Environment and Natural Resources (DENR) served as basis to generate flood and landslide susceptibility maps which were further validated through ground truthing, field surveys, and interviews. Storm surge modeling was also employed.

Flooding and Landslides. Error! Reference source not found.8 shows the city's flood and landslide susceptibility map. The study showed that hillslope areas, mostly located on the southern part of the city, are the most vulnerable to landslides. This is evidenced by tension cracks which have already started to manifest around Barangay Conde Labak's road networks and houses.

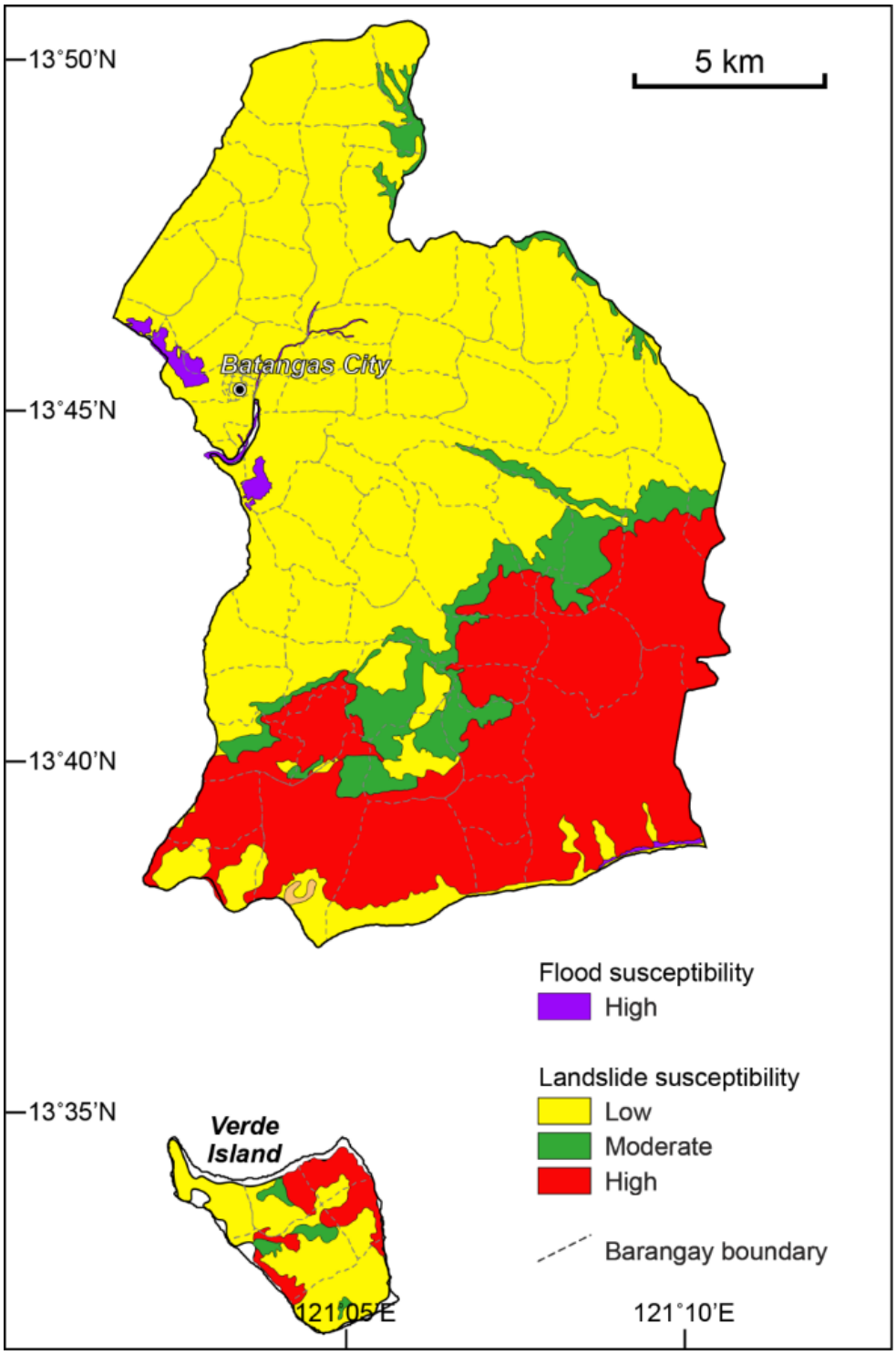

FIGURE 5. BATANGAS CITY'S FLOODING AND LANDSLIDE SUSCEPTIBILITY MAP (SOURCE: BATANGAS CITY STATE OF THE ENVIRONMENT

On the other hand, low-lying barangays including Santa Rita Aplaya, Santa Clara, Cuta, Wawa and Libjo are the most vulnerable to flooding. These barangays can also be severely affected by storm surges. There are two types of flooding observed in the City: inland and coastal flooding. Based on the maps generated, selected barangays were visited and ground-truthed. For inland flooding, these were Sirang Lupa, Libjo,

and Pallocan, and Tinga. For coastal flooding, Cuta and Wawa were studied. Summary of the assessments are derived and indicated in **Error! Reference source not found.** 19.

TABLE 12. SUMMARY OF FLOOD HAZARDS ASSESSMENT AND SUSCEPTIBILITY IN SELECTED BARANGAYS OF BATANGAS CITY (Derived from the Batangas City State of the Environment, flood susceptibility parameters adopted from the Mines and Geosciences Bureau's [MGB] 1:10,000 Scale Flood Assessment and Mapping Report).

Location	Flood Susceptibility Rating (Usual; Worst)	Remarks/Recommendations
INLAND FLOODING		
SIRANG LUPA		
Bridge over Tangisan River along the road going to Brgy. Sirang Lupa N 13°44'3.7" E 121°03'29.2"	Low; Low	Water from the Tangisan River rose to about 6 m during the 2013 Habagat event and caused flooding of about 0.5 m. Flood waters receded after about 1 hour; recurrence (about three times) of the flood was reported within the said period. River width is about 15 m and dikes are installed on its western portion. Bank erosion of about 10 m was also noted. **Recommendation:** Monitor and assess the integrity of dike, and stability of riverbanks.
LIBJO		
National Road (near boundary of Brgy. Libjo and Brgy. San Vicente) N 13° 44.198' E 121° 04.325' Alt: 36 m	Low; Low	No occurrence of flood due to high riverbanks.
Residential area (Sitio Old San Vicente) N 13° 43.937' E 121° 04.225' Alt: 20 m	Low; Moderate	Flood height reached a maximum height of 1 m during a historical heavy rainfall event in the late 90's(?). Malitam River does not overflow and flooding does not occur even during typhoons, monsoons, or prolonged rainfall. **Recommendations:** Construct and improve engineering structures along the river. Develop an early warning device/system. Designate and identify relocation sites for residents.
Riverbank of Malitam River (Sitio Old San Vicente) N 13° 43.805' E 121° 04.284' Alt: 2 m	Low; High	Flood height reached a maximum height of 1.5 m during a heavy rainfall event in 2007(?); Malitam River overflowed by as much as 2.5 m. **Recommendations:** Construct and improve engineering structures along the river. Develop an early warning device/system. Designate and identify relocation sites for residents.

Location	Flood Susceptibility Rating (Usual; Worst)	Remarks/Recommendations
Riverbank of Malitam River under the wooden bridge (Sitio Old San Vicente) N 13° 43.755' E 121° 04.215' Alt: 9 m	Low; Low	No occurrence of flood due to high riverbanks.
Residential area (Sitio Tadak) N 13° 44.082' E 121° 04.289' Alt: 12 m	Low; Low	Flood height reached a maximum height of 0.2 m during a historical heavy rainfall event in the late 90's(?). Malitam River does not overflow and flooding does not occur even during typhoons, monsoons, or prolonged rainfall. Dike on the northwest riverbank mitigates flooding and erosion. **Recommendations:** Monitor the integrity of engineering structures (e.g., dike) along the river. Develop an early warning device/system. Designate/identify relocation sites for residents.
Elementary school N 13°44'24.1" E 121°04'16.3"	Low; Low	No occurrence of flood. **Recommendation:** Improve drainage canals.
Riverbank of Calumpang River (rivermouth) N 13°44'6.5" E 121°03'32.2"	Low; High	Flood reaches about 1.5 m high during intense rainfall; latest flooding event was last October. (*A great flood happened during the 1980's and slowly broke off the sandbar from the riverbank) **Recommendation:** Improve riverbank management.
Riverbank of Calumpang River N 13°44'3.7" E 121°03'29.2"	Low; High	The highest flood height is about 2 m from the river level. The water receded after about 6 hours. Floods are not tide-related but are influenced by intense rainfall. Last flooding event was October 2013. **Recommendation:** Improve river bank management.
PALLOCAN		
Macatangay St., Brgy. Pallocan N 13°45'10.7" E 121°3'54.3"	Low; Low	There was no significant flooding experienced in this part of Pallocan for the last decades. There were minor ponding of water due to heavy rains before the bridge in Pallocan was constructed. **Recommendations:** Maintain drainage and continue the improvements of waste management.
Tarnate St., Bgy. Pallocan N 13°45'13.6" E 121°3'47.9"	Low; Low	There was also no significant flooding during the last decades. This street is the nearest to the river. There are some accounts of flooding during the 80s. Flood depth during the said flood was about 3m. The maximum

Location	Flood Susceptibility Rating (Usual; Worst)	Remarks/Recommendations
		increase in water level during heavy rains reaches half of the dikes for the last decades. **Recommendations:** Maintain drainage and continue the improvements of waste management.
TINGA		
Sitio Dos, Bgy. Tinga, Labac N 13°46'30.9" E 121°04'14.2"	Low; Low	No occurrence of flood. The area is at higher elevations relative to the other barangays.
COASTAL FLOODING		
Brgy. Wawa N 13°44'14.92" E 121°03'26.98"	Low; Low	Rare occurrence of wave inundation from storm surges and southwest monsoons. **Recommendations:** Monitor the integrity of engineering structures along the coast. Improve domestic waste disposal to ensure efficient flow of flood waters. Develop an early warning device/system. Designate/identify relocation sites for residents.
Brgy. Cuta N 13°44'45.50" E 121°02'52.90"	Low; Low	Rare occurrence of wave inundation from storm surges and southwest monsoons. **Recommendations:** Monitor the integrity of engineering structures along the coast. Improve domestic waste disposal to ensure efficient flow of flood waters. Develop an early warning device/system. Designate/identify relocation sites for residents.

Storm Surges. Usually brought about by strong typhoons, storm surges refer to unusually high coastal waters which are over and above the expected tide in the area. The UPLB study noted that "storm surges are highly dependent on local features such as barrier islands, inlets, bays, and rivers that affect the flow of water. They are also affected by the shape of the coastline. Storm surges are higher when a storm makes landfall on a concave coastline (curved inward) as opposed to a convex coastline (curved outward)."

The Japan Meteorological Agency Storm Surge Model (JMA Storm Surge Model)[5] was used to calculate the storm surge values while FLO-2D was used to map the resulting inundation. For the purposes of the study, Typhoon Glenda (Rammasun) in 2014 was simulated as these had direct impact on Batangas City. A hypothetical typhoon was also simulated using the track of with Typhoon Yolanda's (Haiyan) wind speed and pressure to produce a worst case scenario.

Figures 9 and 10 show the storm surge flow depth and storm surge hazard map for Batangas City. The model was simulated using Typhoon Glenda's track and Typhoon Yolanda's parameters. In general, the city has low to medium storm surge hazard but high hazard areas can be found very near the coast. The most affected barangays based on the simulation are barangays Santa Rita Aplaya, Sta. Clara, and Wawa. The report mentioned that "storm surge hazard reaches the inland portion primarily because of the presence of streams, while high elevation areas are not affected by storm surges."

[5] The JMA Storm Surge Model is a numerical code developed by JMA to simulate and predict storm surges mainly caused by tropical cyclones. The model's numerical scheme is based on two-dimensional shallow water equations.

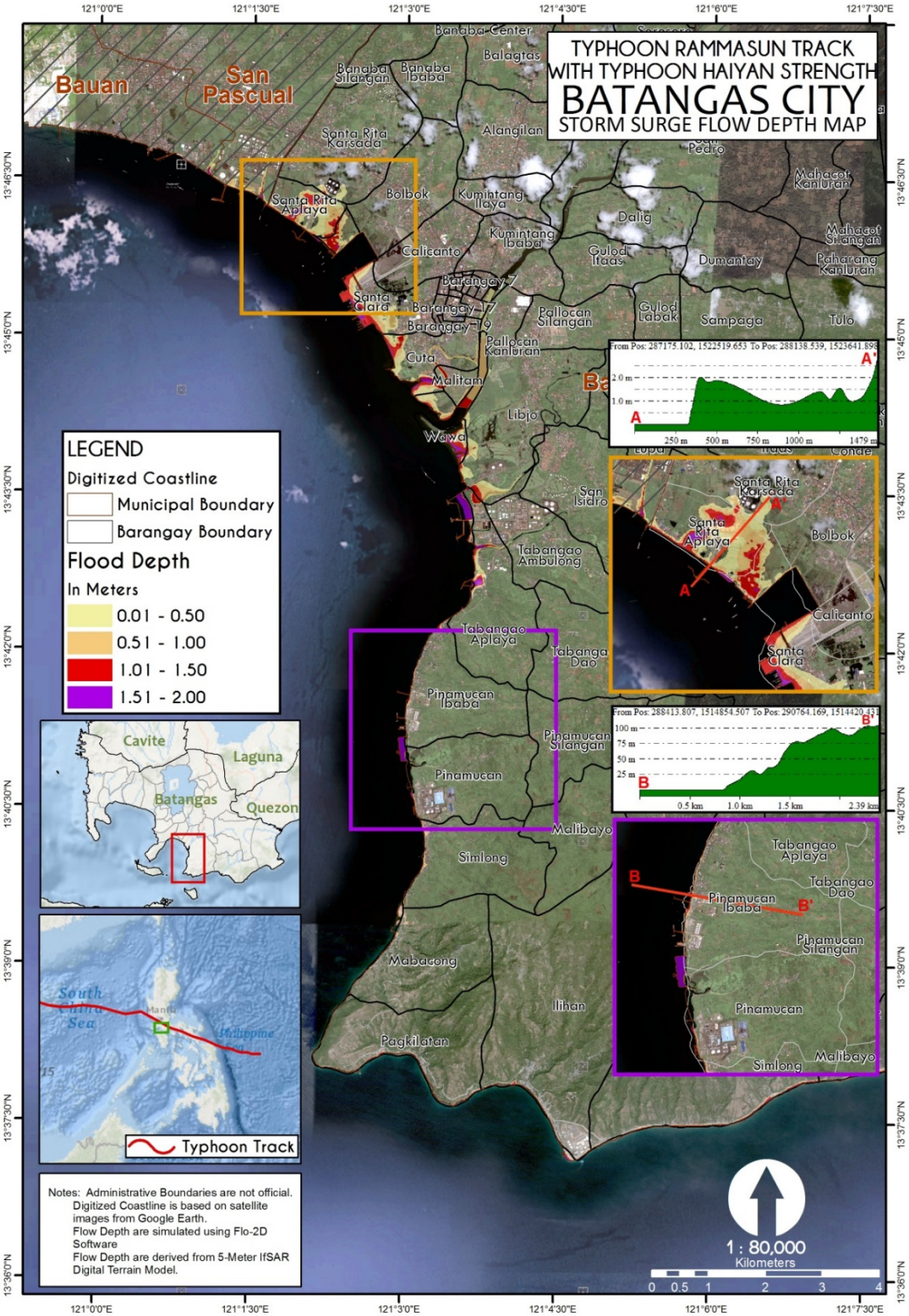

FIGURE 6. STORM SURGE FLOW DEPTH MAP OF BATANGAS CITY STIMULATED USING TYPHOON GLENDA'S (RAMNASUN) TRACK AND TYPHHON YOLANDA (HAIYAN) INTENSITY (SOURCE: BATANGAS CITY STATE OF THE ENVIRONMENT)

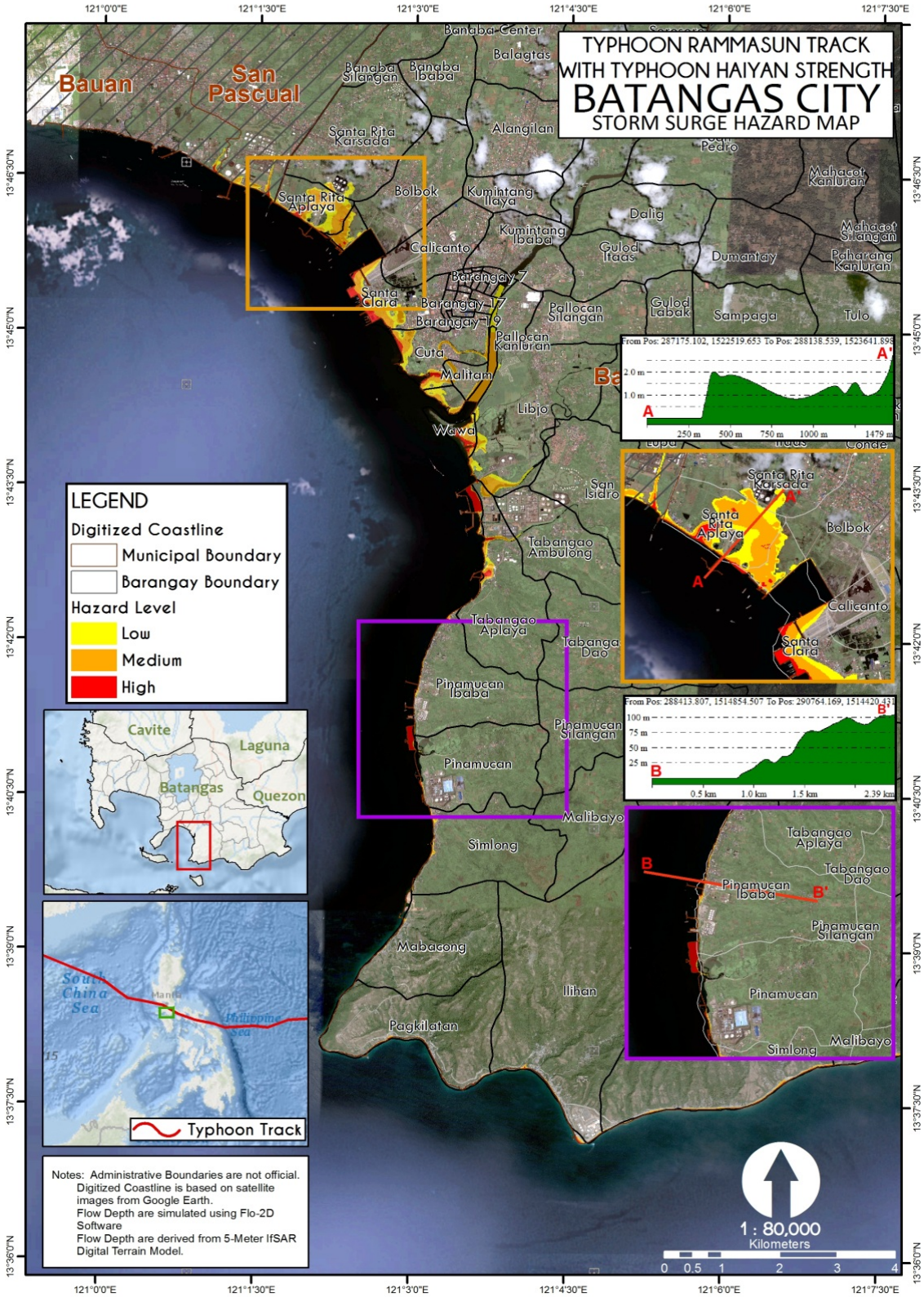

FIGURE 7. STORM SURGE HAZARD MAP OF BATANGAS CITY SIMULATED USING TYPHOON GLENDA'S (RAMMASUN) TRACK AND TYPHOON YOLANDA'S (HAIYAN) INTENSITY (SOURCE: BATANGAS CITY STATE OF THE ENVIRONMENT)

Vulnerable People

Two types of actors within the vulnerable areas have been identified – those vulnerable (least able to respond) to climate impacts and those who can aid the local government in helping the vulnerable households better deal with climate risks. A summary of actors that were identified is shown in **Error! Reference source not found.**20.

TABLE 13. VULNERABLE PEOPLE AND THE SUPPORTING ACTORS

Urban System	Climate Fragility Statements	Vulnerable Actors	Potential Supporting Actor
WATER	Vulnerability to sea-level rise and storm surge due to geographic location of Batangas City Secondary impact: salt- water intrusion	Residents of Coastal barangays affected	LGU Schools Industries Barangays not affected
	Increased precipitation disrupts/damages water supply infrastructure	Water district	
	Increased temperatures will lead to increased demand for water thereby posing additional stress on the supply system	Residents relying on the supply system	LGU
TRANSPORT	The present transport system lacks alternatives and only depends on existing roads and bridges causing so much traffic. Traffic congestion means more fuel consumption and CO_2 emissions.	Residents in Poblacion area and the daily commuters	LGU - TDRO
	The volume of vehicles plying the streets is greater than what infrastructure can hold.	Residents	LGU

	Adding more infrastructures results to the loss of available Green Space	Residents	LGU Barangay Officials Residents Schools Business Private Sectors NGO
FOOD	Food supply of the city is dependent on imported goods. Batangas City is heavily dependent on supply of agriculture and fishery commodities from nearby towns and cities due to insufficient production of major agricultural products such as green corn, root crops and tubers, vegetables, fruits, fish and its products, poultry (broiler), and cattle (fattener) in the last few years. Declining fish catch	Residents Farmers Fisher folks Residents	LGU – OCVAS DENR Universities (Research)
ECOSYSTEM	Degrading water quality of Calumpang River Public land and portions of coastal areas and riverbanks have become informal settlements. Informal settlers suffer from poor environmental conditions because of overcrowding and lack of water and sanitation facilities. They are also the most vulnerable to natural disasters such as those caused by typhoons and tropical cyclones.	LGU Farmers Fisher folks Indigenous people	LGU – ENRO UPLB-SESAM USAID Industries NGOs Schools LGU Barangay Officials UPLB-SESAM Private sectors

	Declining coral reef condition	LGU Residents and Fisher folks	LGU Barangay Officials DENR UPLB-SESAM Private sector
ENERGY	Almost all energy supply system in Batangas City come from a sole private distributor, MERALCO. All systems involving energy such as communications, transport, and water are connected. As such, power and production shortages can paralyze other systems (e.g., problems in transport system and faulty communication in times of disaster).	Residents LGU	LGU USAID
	Shortage of power supply in Verde Island	Isla Verde Residents	LGU USAID Meralco Private sectors

Section 2.5 Adaptive Capacity Assessment

An assessment of the adaptive capacities of the urban systems has been conducted, according to the following criteria:

- Economic: availability of financial resources for that system
- Technology/ Infrastructure: capacity of infrastructure and technologies being adapted for that system to address future climate risks
- Governance: institutionalization of responsibilities; coordination among relevant actors
- Social: community awareness and engagement
- Ecosystems: environmental impacts/consideration

TABLE 14. ADAPTIVE CAPACITY OF BATANGAS CITY URBAN SYSTEMS

Urban System	Adaptive Capacity of Urban System		
	Low	**Medium**	**High**
Water supply	• Technology/Infrastructure • Governance	• Economic • Societal • Ecosystem	
Food	• Technology/Infrastructure • Governance	• Societal • Ecosystem	• Economic

Energy	• Technology/Infrastructure	• Economic • Societal • Ecosystem	• Governance
Transport	• Societal	• Technology/Infrastructure • Governance	• Economic • Ecosystem
Ecosystem	• Ecosystem • Technology/Infrastructure • Societal	• Economic • Governance	

Section 3: Plan Objectives

This section discusses how the results of the Vulnerabilities Assessment presented in the previous chapter can be mainstreamed into the existing planning documents of the local government including the CLUP, CDP, and ELA. The objectives laid here represents the City's intentions to adapt through implementing this plan; objectives where the adaptation actions will be based on.

[EXAMPLE: EDIT AS NECESSARY]

- To develop a resilient Badjao Community
- To enhance productivity and income of farmers and fishermen by empowering them and at the same time, promoting environmentally sound farming and fishing practices
- To protect and maintain water quality standards to ensure a safe and healthy environment
- To continuously explore other possible sources of water to meet the domestic, industrial and commercial demand for potable water
- To develop the conceptual transportation plans in relation to the general physical infrastructure.

Section 3.1 Link to other plans

The Comprehensive Land Use Plan of the City serves as its long-term guide for the envisioned spatial development pattern. The Comprehensive Development Plan, on the other hand, covers the sectoral aspects for the development planning of the City, namely: social, economic, environmental, physical, and institutional. It helps identify the applicable programs, projects, and activities to be undertaken by the City towards its progress.

Both plans aim to address the existing socio-economic issues and concerns of Batangas City and both aims for community well-being and development while sustainably using/ allocating the City's resources. Accordingly, these plans can greatly influence the local development patterns. Acknowledging that climate change is not just an environmental issue but also a social one to be dealt with, there is a need to further consider this in the planning process.

The adaptation plan is one of the tools to address climate change issues at the local level. This can be mainstreamed in the aforementioned plans knowing the climate vulnerabilities of the City.

Section 4: Adaptation Actions

Developing Adaptation Options and Strategies

Adaptation strategies should be designed in order to address vulnerabilities identified by the local government. There are a number of methodologies which can be used to develop adaptation strategies. The ICLEI – ACCCRN process uses the intervention mapping methodology (Details in Annex 1) building on the results of Section 2: Vulnerabilities Assessment. The proposed adaptation options were identified using the following resiliency indicators (as cited in the ICLEI – ACCCRN Process):

- **Redundancy**: A resilient system can function and achieve results through multiple paths or nodes. In contrast, a "single best solution," is not resilient because if this single option fails, the system collapses. Back-up systems or decentralized nodes for service delivery in a linked network are preferable.

- **Flexibility and diversity**: Essential systems should be able to work under a variety of conditions; they should not be rigid or designed only for one specific situation. Any system will fail if overloaded beyond its capacity but it should be designed to fail under stress in a safe and predictable way, rather than suddenly and catastrophically.

- **Re-organization and Responsiveness:** Under extreme conditions, systems should be able to respond and change to meet unexpected shocks. This requires flexibility 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.

- **Access to Information**: Resilient systems have mechanisms to learn from and build on experience, so that past mistakes are not repeated and lessons from other cities can be integrated into planning. This requires procedures for monitoring and evaluating performance under stress, and requires multiple sources of knowledge and documentation (strengthening "corporate memory").

Section 4.1 Feasibility and Impact of Proposed Resilience Interventions

The feasibility of each adaptation strategy was assessed using the following criteria:

- Technical capacity to implement projects
- Political will and in line with the city's vision
- Benefits over costs
- Responsible entities

On the other hand, impacts of the proposed adaptation strategy were assessed using:

- Timeframe – most actions should be able to be completed within a short or medium timeframe
- Overall impact - the proposed intervention will have a significant and measurable impact on the targeted climate risk

TABLE 15. POTENTIAL CLIMATE CHANGE ADAPTATION STRATEGIES

Urban System	Perceived Climate Risk/s	Proposed CC Adaptation Strategy
	Almost all energy supply system in Batangas City come from a sole private distributor, MERALCO. All systems involving energy such as communications, transport, and water are connected. As such, power and	

Energy	production shortages can paralyze other systems (e.g., problems in transport system and faulty communication in times of disaster).	
Water	<u>Changes in Rainfall</u> • Lack of rainfall can dry up wells and springs causing shortage of water supply. • Increased rainfall can cause seepage to groundwater leading to contamination and poor water quality.	• Roof top water harvesting to be made mandatory to deal with water stress due to anticipated increasing temperatures and decreasing precipitation. • Sewage system, water sanitation, and waste water treatment: pollution control at the source through natural techniques
	<u>Increase in Temperature</u> • Hotter temperatures can result to decrease in water supply coming from springs, deep well, and shallow wells. • Hotter temperatures can result to increase in water demand.	• Roof top water harvesting to be made mandatory to deal with water stress due to anticipated increasing temperatures and decreasing precipitation.
	<u>Extreme Weather Event</u> • Extreme weather events can damage water supply sources (pipelines).	• Improvement of drainage system and waterways (sustainable drainage design)
	<u>Sea Level Rise (SLR)</u> • SLR coupled with over-extraction of groundwater puts a lot of water sources at risk to salt water intrusion (poor water quality)	• Construction of sea walls/breakwater • Development and establishment of community-based EWS
Transport	The present transport system lacks alternatives and only depends on existing roads and bridges causing so much traffic. Traffic congestion means more fuel consumption and CO_2 emissions.	• Improvement of traffic management
	Adding more infrastructure results to the loss of available green space	• Monitoring compliance of commercial establishments in implementing strict parking regulations
Food	Food supply of the City is dependent on imported goods. Batangas City is heavily dependent on supply of agriculture and fish from nearby towns and cities due to insufficient production of major agricultural products such as green corn, root crops and tubers, vegetables, fruits, fish and its products, poultry (broiler), and cattle (fattener) in the last few years.	• Increase the production and productivity of major food crops in order to increase the city's food sufficiency level. • Planting of typhoon resilient crops

	Declining fish catch	• MPA conservation and creation of alternative livelihood program
Ecosystem	Declining coral reef condition	Coral Reef Assessment, Monitoring and Development • Capacity building for ENRO staff
	Public land and portions of coastal areas and riverbanks have become informal settlements. Informal settlers suffer from poor environmental conditions because of overcrowding and lack of water and sanitation facilities. They are also the most vulnerable to natural disasters such as those caused by typhoons and tropical cyclones.	Badjao Eco-Village

TABLE 16. FEASIBILITY AND IMPACT OF PROPOSED CLIMATE ACTIONS

Potential Climate Resilience Interventions	**Feasibility**			**Impact**
	Technically (high/medium/low)	**Politically (high/medium /low)**	**Cost (high/medium /low)**	**(short/medium /long term)**
Construction of sea wall/ mechanical barriers	2	2	1	3
Distribution of Flood evacuation map for each flood-susceptible barangay	3	3	3	2
Improvement of drainage system and waterways (sustainable drainage design)	2	3	1	3
Sewage system, water sanitation, and waste water treatment. Pollution control at the source through natural techniques	2	2	1	3

Roof top water harvesting to be made mandatory to deal with water stress due to anticipated increasing temperatures and decreasing precipitation. (Government blgds)	2	3	2	2
Implementation of parking space in each commercial establishment to avoid sidewalk parking (Newly built establishments – included in CEC requirement)	3	3	3	1
Increase the production and productivity of major food crops in order to increase the city's food sufficiency level.	1	2	1	2
creation of alternative livelihood program	3	2	2	2
Water quality testing in Calumpang River	3	3	2	3
Establishment of constructed wetlands	1	1	1	3
Badjao ECO-Village	3	3	3	3
Coral Reef Assessment and Monitoring	1	2	2	3

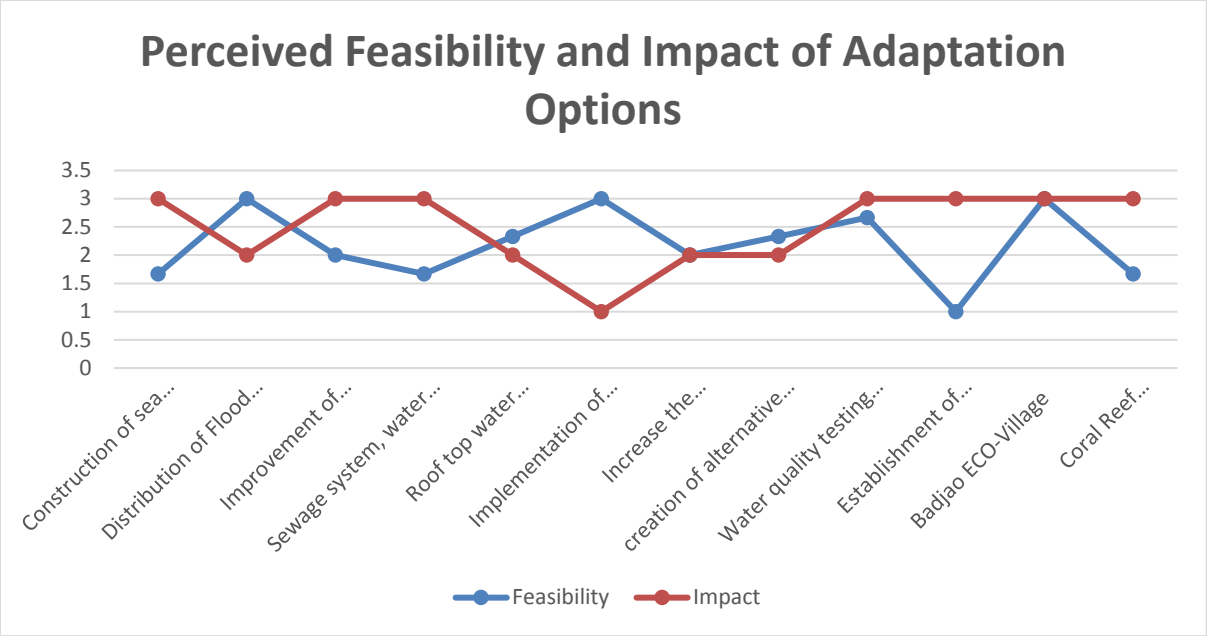

FIGURE 8. GRAPHICAL REPRESENTATION OF FEASIBILITY AND IMPACT SCORES

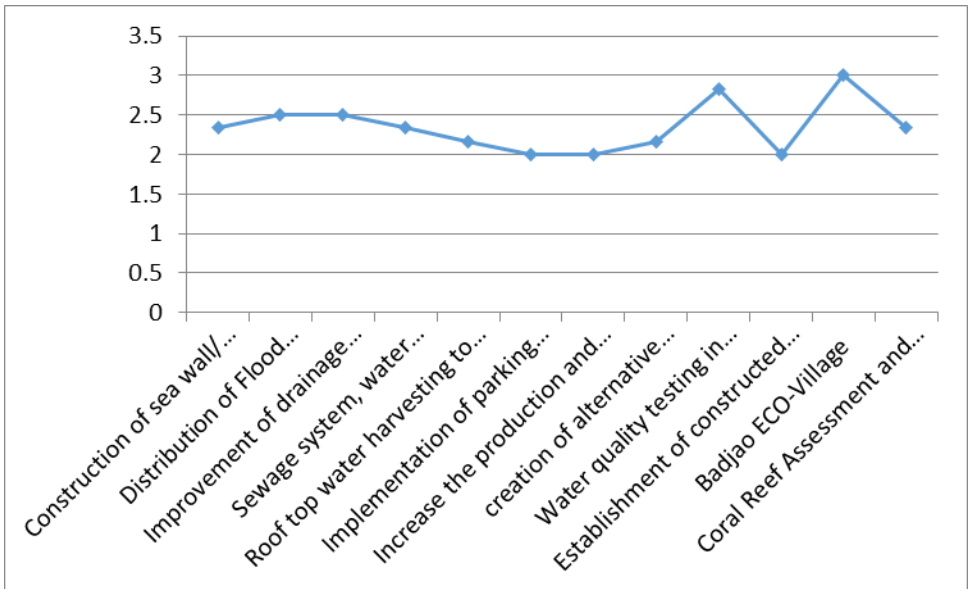

FIGURE 9. COMBINED FEASIBILITY AND IMPACT SCORES

TABLE 17. MONITORING TABLE

	Strategy	Indicator	Description of Indication	Target	Manner of Collection	Data Source	Responsible Office	Frequency of Collection	Resourcing needed	Estimated Cost
WATER	Construction of sea wall/ mechanical barriers	No. of coastal barangays with sea wall/ mechanical barriers established	How many coastal barangays have sea wall established?	2 coastal barangays by 2025	Through monitoring	Barangay record	CEO GSD CDRRMO	After every scheduled construction	Financial, human resources, staff time	
	Distribution of Flood evacuation map for each flood-susceptible barangay	No. of flood-susceptible barangays with individual flood evacuation map	How many barangays have received their flood evacuation map?	3 evacuation map provided per year	Monitoring/ Checklist	LGU records	CDRRMO CPDO	Annually	Human resources, staff time	
	Improvement of drainage system and waterways (sustainable drainage design)	No. of barangays with improved drainage	How many barangays have improved drainage systems?	drainage system of Two priority frequently flooded barangays	Drainage survey in poblacion	LGU records	CEO	Annually	Technical assistance, financial, human resources, time	
	Sewage system, water sanitation, and	No. of piggeries complying to	How many piggery owners in	2 pilot barangays	Monitoring	Monitoring report	City ENRO, CHO, OCVAS	Quarterly	Human resources, staff time	

	waste water treatment. Pollution control at the source through natural techniques	the rules and regulations	selected pilot barangays have been complying with the rules and regulations set by the City?						
	Roof top water harvesting to be made mandatory to deal with water stress due to anticipated increasing temperatures and decreasing precipitation.	No. of rainwater harvesters installed and operated	How many rainwater harvesters were installed and operating within the LGU	__ rainwater harvesters installed by 201_	On-ground monitoring of LGU, surveys	LGU records	City ENRO CEO GSD		Financial, equipment, staff time, human resources
FOOD	Increase the production and productivity of major food crops in order to increase the city's food sufficiency level	No. of capability training conducted among farmers and fisherfolks relative to CCA on agricultural and fisheries production	How many capability building related to agricultural and fisheries productions have been conducted?	At least one capability building conducted per year	Trainings	Records from responsible office	OCVAS	Annually	Financial, human, staff time

	creation of alternative livelihood program	No. of coastal barangays with alternative livelihoods	How many coastal barangays were given alternative livelihood?	2 coastal barangays by 2024	Seminars, trainings	Residents	City ENRO, OCVAS, DENR	Annually	Financial resources, human resources, staff time	
ECOSYSTEM	Water quality testing	Physico-chemical parameters	How will water quality be monitored	Physico-chemical parameters in standard or acceptable level	Collection of water samples from different stations	Previous studies	City ENRO, commissioned third party laboratories	Quarterly	Time, Financial Resources,	
	Establishment of constructed wetlands	Percentage of social acceptance	What percentage of the upland population is willing to have constructed wetlands established?	100% acceptance	Survey	Upland residents	City ENRO, commissioned UPLB researchers	Once	Technical assistance, Equipments, Human resources	
	Badjao ECO-Village	Socio-demographic status of badjaos	How have the badjaos been living years after the ecovillage had been established?	20 % of household has improved lifestyle in the span of 2 years	Survey	Previous studies	City ENRO, commissioned researchers from UPLB	Once	Time, financial, human resources, technical assistance	
	Coral Reef Assessment and Monitoring	Percentage of Coral reef cover	How much percentage of coral reefs still exists?	% of coral cover	Coral reef survey; comparison from the last survey	Previous studies	City ENRO with assistance from DENR staff	Semi-annual	Staff Time, financial, human resources, equipment,	

	technical assistance

PART 4: WAY FORWARD

Information Education Campaigns

The (Name of LGU) Government has identified the following actions to build community awareness on GHG management and climate change adaptation and mitigation opportunities:

EXAMPLES:

- Include IEC on GHG management in the implementation of Article 19 (Environmental Education & Information) of the E-Code
- Include GHG management initiatives in the Criteria (Best Environmental Practice) for the yearly Search for the Most Livable Communities
- Implement the “Green Pet” Project (establishment of Kinder “Gardens” by kindergarten pupils)
- Include IECs (lectures or fliers) and establish “Green Nook” for Q&A on GHG Management during the regular conduct of Barangay Caravan and at prominent business establishments (e.g. SM City Batangas, Nuciti, etc.) for interactive information dissemination of materials
- Mainstream GHG management in the operation of the Environment Committees or the Barangay Solid Waste Management Committees (BSWMC) of the 105 Brgy. Councils to promote the community’s low carbon vision.
- Create Climate Change Action committees in the local business councils for the purpose of establishing formal avenues of communication for the business sector to be more aware and involved
- Create a dedicated Climate Change Action portal in the city’s website
- Seek and provide incentives or support for communities implementing community-based GHG reduction initiatives
- Develop and implement basic climate change modules for local public and private schools in the community
- Encourage industries to do entity level inventory regularly

APPENDICES

APPENDIX 1: SAMPLE TEMPLATE FOR ASSESSING IMPACTS OF MITIGATION ACTION

TABLE 18. MONITORING AND EVALUATION MATRIX FOR URGENT MEASURES

Strategy Number	Budget Tagging Code	Performance Indicator	GHG emissions Indicator	Target	Accomplishment	Remarks
Switching to more efficient lighting (e.g. CFLs, LEDs) for LGU offices, continue efforts on switching to solar street lights, and implementing energy conservation measures in LGU offices	TBD	* No. of bulbs replaced	kWh consumption	*50% shifted to LEDs and CFLs – 1st year		
		*No. of solar streetlights installed				
		*No. of offices observing energy conservation measures				
Reduce the fuel allocation of LGU-owned vehicles and encourage carpooling to official trips	TBD	*Fuel allocations reduced	Liters of fuel saved	100 liters per vehicle in a month		

Re-Install Materials Recovery Facility at the City Government premise ☐ Segregate organic from inorganic wastes ☐ Waste diversion rate increased	TBD	MRF installed * percent reduction in volume of organic/inorganic wastes * percentage of waste diversion rate	cubic meter of waste recovered/waste density	MRF operational by 2018 *__% in waste reduction		
Use of solar energy in two barangays in Isla Verde	TBD	No. of barangays using solar energy	kWh of electricity displaced	Two barangays with solar plant installed		
Improving transportation system efficiency ☐ Synchronizing traffic signal lights	TBD	No. of traffic lights synchronized	estimated fuel saved	100% of traffic lights synchronized		
Intelligent Waste Management Increase composting of organic waste Invest in improved waste water collection and treatment	TBD	Volume of waste composted Waste water treatment facility constructed	Volume of waste composted Volume of waste water managed	20% volume of waste composted in 2024 waste water treatment facility constructed by 20__		

Improve the management of livestock and pastures (biogasdigester)	TBD	No. of biogas digester installed in coop-based piggeries	Volume of livestock waste water	100% compliance		
Afforestation (e.g. beach forest)	TBD	Hectarage of beach forest	Hectarage of beach forest			
Mangrove Reforestation	TBD	Hectarage of mangrove area reforested	Hectarage of mangrove area reforested	2 hectares of mangroves planted a year		

APPENDIX 2: SAMPLE TEMPLATE FOR ASSESSING IMPACTS OF ADAPTATION ACTION

	Strategy	Indicator	Description of Indication	Target	Result	Remarks
WATER	Construction of sea wall/ mechanical barriers	No. of coastal barangays with sea wall/ mechanical barriers established	How many coastal barangays have sea wall established?	2 coastal barangays by 2025		
	Distribution of Flood evacuation map for each flood-susceptible barangay	No. of flood-susceptible barangays with individual flood evacuation map	How many barangays have received their flood evacuation map?	3 evacuation map provided per year		
	Improvement of drainage system and waterways (sustainable drainage design)	No. of barangays with improved drainage	How many barangays have improved drainage systems?	drainage system of Two priority frequently flooded barangays		
	Sewage system, water sanitation, and	No. of piggeries complying to the rules	How many piggery owners in selected pilot barangays	2 pilot barangays		

	waste water treatment. Pollution control at the source through natural techniques	and regulations	have been complying with the rules and regulations set by the City?