LOCAL CLIMATE CHANGE ACTION PLAN (LCCAP)

2021 - 2025

FOREWORD

"We do not inherit the earth from our ancestors, we borrow it from our children."
-Native American Proverb

As the whole world is facing new threats and the humanity is battling against food and water scarcity, religious conflict, covid19 pandemic and the likes, the problem on climate change is still at the zenith of these global catastrophic risks. The impacts of climate change are global in scope and unprecedented in scale.

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 already confirmed that the change in global temperature is already unequivocal. In the Philippines, the manifestation of extreme weather events which cause losses in terms of livelihoods, infrastructure, and even lives has become more frequent in recent years. 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.

Many municipalities in the Bicol region views Naga City as the region's religious center which has been aptly dubbed as a Pilgrimage City. It is also the center of trade and commerce in Bicol and a fast-growing urban center. It is a common understanding that if the economic condition of Naga collapses then the neighboring municipalities will be affected. However, Naga city is exposed to various natural hazards such as typhoons, flooding, landslide, volcanic eruption and ground movement. Thus, it becomes imperative for the city to have a comprehensive climate change adaptation/mitigation and disaster risk reduction management plan to prepare its residents, physical assets and natural wealth from eventualities that could push back its economy and the quality of life of its people.

As such, the city to put in place its Local Climate Change Action Plan (LCCAP) which integrates climate adaptation/mitigation measures with disaster risk reduction and management measures. This said plan serves as critical intervention on identified sector and eco-system vulnerabilities. Some of the interventions are on-going and expanded while others are being funded by regular programs of the city. However, there are subprojects that would require external funding and technical support for the city to be able to achieve its plan. The subprojects will be further defined including its prioritization as the city continuous to update the various hazard maps and various plans. This is a five (5) year plan (2021-2025), after which the said plan shall be reviewed based on what was achieved vis-à-vis current needs and priorities.

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ACRONYMS

ADB	Asian Development Bank
ADNU	Ateneo de Naga University
AFOLU	Agriculture, Forestry and Other Land Uses
AIDP	Annual Investment Development Plan
CAP	Climate Action Plan
CAPB	Capability Building
CBDRRM	Community-based disaster risk reduction and management
CBRMP	Community-Based Resource Management Program
CBSUA	Central Bicol State University of Agriculture
CC	Climate Change
CCA	Climate Change Adaptation
CCC	Climate Change Commission
CC/DRR	Climate change/disaster risk reduction
CCVA	Climate Change Vulnerability Assessment
CDIA	Cities Development Initiative for Asia
CDP	Comprehensive Development Plan
CENRO	Community Environment and Natural Resources Office
CLUP	Comprehensive Land Use Plan
CSO	Civil Society Organization
DENR	Department of Environment and Natural Resources
DEWATS	Decentralized Wastewater Treatment Systems
DILG	Department of Interior and Local Government
DJF	December January February
DRR	Disaster Risk Reduction
DRRM	Disaster Risk Reduction and Management
DRRMO	Disaster Risk Reduction and Management Office
DRRMP	Disaster Risk Reduction and Management Plan
ELA	Executive Legislative Agenda
EMB-DENR	Environmental Management Bureau – Department of Environment and Natural Resources
EOC	Emergency Operations Center
FGD	Focus Group Discussion
GEF	Grid Emission Factor
GHG	Greenhouse Gas
GIS	Geographic Information Systems
HEA	Hazard Exposure Assessment
HFA	Hyogo Framework for Action
HLURB	Housing and Land Use Regulatory Board
HUDCC	Housing and Urban Development Coordinating Council
ICI	Industrial Commercial and Institutional
IEEE	Institute of Electrical and Electronic Engineers
IPCC	International Panel on Climate Change
IPPU	Industry Processes and Product Use
IRA	Internal Revenue Allotment
JJA	June July August
JFPR	Japan Fund for Poverty Reduction
KBA	Key Biodiversity Area
KII	Key Informant Interview
LCCAP	Local Climate Change Action Plan
LGU	Local Government Unit
LID	Low Impact Development

LUCF	Land Use Change and Forestry
LWUA	Local Water Utilities Administration
MAM	March April May
MFI	Microfinance Institution
MGB	Mines and Geosciences Bureau
MNDC	Metro Naga Development Council
MNWD	Metropolitan Naga Water District
MPDO	Municipality Planning and Development Office
NAWASA	National waterworks and sewerage system authority
NCSO	National Census and Statistics Office
NCUPF	Naga City Urban Poor Federation
NEDA	National Economic and Development Authority
NGA	Non-Government Agency
NGO	Non-government organization
NHA	National Housing Authority
NIPAS	National Integrated Protected Areas System
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAMB	Protected Area Management Board
PDPFP	Provincial Development and Physical Framework Plan
PENRO	Provincial Environment and Natural Resources Office
PES	Payment for Ecological Services
PHILVOCS	Philippine Institute of Volcanology and Seismology
PICE	Philippine Institute of Civil Engineers
PSF	People Survival Fund
SMR	Self-Monitoring Report
SON	September October November
TA	Technical Assistance
TNA	Training needs analysis
TWG	Technical working group
UAP	United Architects of the Philippines
UNISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development
USNOAA	United States National Oceanographic and Atmospheric Administration
VA	Vulnerability Assessment
WACS	Waste Analysis and Characterization Study

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CHAPTER I: BACKGROUND AND RATIONALE

LEGAL MANDATE

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

In response to the urgency for action on climate change, the Philippines passed Republic Act 9729, also known as the "Climate Change Act of 2009". Section 2 states that "it is the policy of the State to afford full protection and the advancement of the right of the people to a balances and healthful ecology... to fulfill human needs while maintaining the quality of the natural environment for current and future generation."

The Local Government Unit is mandated to exercise their inherent powers such a police power, as well as share with the national government the responsibility in the management and maintenance of ecological balance in their respective territorial jurisdiction as stated in Section 2a, 15, 3i of Republic Act 7160 or the Local Government Code of 1990.

Section 14 of RA 9729, as amended by RA 10174, provides that, LGUs shall be the frontline agencies in the formulation, planning and implementation of climate change action plans in their respective areas, consistent with the provisions of RA 7160, the National Framework Strategy on Climate Change (NFSCC), and the National Climate Change Action Plan (NCCAP).

THE NAGA CITY CLIMATE CHANGE ACTION PLAN

The Local Climate Change Action Plan on climate change adaptation/mitigation and disaster risk reduction and management aims to identify critical issues and challenges that must be immediately acted upon by the LGUs and partner organizations to save lives, properties and sustain local economic growth and development. Moreover, the LCCAP identifies investment gaps and opportunities for climate change adaptation and mitigation and disaster risk reduction projects in the immediate, medium and long-term bases.

This climate change action plan was started in 2015 with various offices and core CSO partners. The TWG core members participated in the workshops conducted by the various technical support provided by the National Government Agencies. The validation provided by various technical support services served to enhance the Naga City LCCAP. *While there is a focus on gender mainstreaming, the city mainstreamed inclusivity to its strategy – as a right based approach.* In the development of the said LCCAP, it reviewed previous studies conducted (GTZ, CDIA, ICLEI, SLARIN and etc.), technical support by DILG (ICLEI-ACCRN) and TA80403 (Eco-Town Framework). TA80403 provided not only scientific studies but as well as capacity building

All studies conducted were not only used reference materials or tools in planning in the design of LCCAP but as well as a baseline information in various PPAs integrating climate change adaptation. It also provided specific areas or barangays where to prioritize intervention. The scientific data serves to triangulate the local knowledge of LGU staff and other stakeholders who have been working and/or working in partnership with the city for some, three (3) decades. Time diagramming also played a critical role in describing the degree of degradation by various urban systems and the worsening impact of climate change.

As other LGUs of the Metro Naga Development Council (MNDC) are beneficiaries of the said technical support, the MNDC Strategic planning workshop provided an input. It defined the eco-system approach to fully address climate change resiliency of the City. There were PPA's identified, not a priority, since it requires inter-LGU collaboration. But this made LGU staff aware on the limitations, based on LGU mandate, of their adaptation strategy. One of the critical suggestion by the environmental planners of other LGUs was the Payment for Economic services to address the funding gaps including the ridge-to-reef planning. Furthermore, the various methodology as part of LGU staff capacity building serve to enhance in the finalization of the LCCAP not only the PPAs but as well as the overall strategy – of what is realistic and ideal. TA8493 provided the critical consolidation of the 1st draft submitted which was further reviewed and finalized by the LGU Core team. Final stakeholder's validation was conducted on the final output.

GUIDING PRINCIPLES

Guided by the National Framework Strategy on Climate Change 2010-2022, Naga City adopted the following principles in the formulation of the Naga City Local Climate Change Action Plan (LCCAP 2021-2025).

- The City Government of Naga envisions a climate-risk resilient city with healthy, safe, prosperous and self-reliant communities, and thriving and productive ecosystems;
- Build the adaptive capacity of communities and increase the resilience of natural ecosystem to climate change, and optimize mitigation opportunities towards sustainable development;
- Take precautionary measures to anticipate, prevent or minimize the causes of climate change and its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures;
- The Plan is risk based, and strategies/ activities shall be formulated, with decisions made based on the causes, magnitude and impact of risks;
- Climate change knowledge is science-based, and shall be drawn from scientific contributions and best practices from communities taking into considerations local circumstances;
- Climate Change strategies shall be adaptation and mitigation, with an emphasis on adaptation as the anchor strategy. Whenever applicable, mitigation actions shall also be pursued as function of adaptation;

- Adaptation measures shall be based on equity, in accordance with common but differentiated responsibility; special attention must be given to ensure equal and equitable protection of the poor, women, children and other vulnerable and disadvantaged sectors;
- Even with inadequate scientific information, anticipatory adaptation measures should be undertaken to prevent or minimize the causes and potential impacts of climate change, whenever necessary;
- The LCCAP shall be sustainable that fulfill human needs while maintaining the quality of the natural environment for current and future generations;
- The principle of complementation shall be observed to ensure that climate change initiatives by one sector do not restrict the adaptation of the other sector;
- It shall recognize the value of forming multi-stakeholder participation and partnerships in climate change initiatives, including with civil society, private sector and other marginalized groups most vulnerable to climate change impacts; and
- Policies and incentive mechanisms to facilitate private sector participation in addressing adaptation and mitigation objectives shall be promoted and supported.

THE LOCAL CLIMATE CHANGE ACTION PLANNING FRAMEWORK

PLANNING CONTEXT AND APPROACH

Naga City's development is challenged by four (4) key cross sectional issues as follows: a) Reducing poverty incidence; b) Improving access to services; c) Enhancing quality of life thru livable communities; d) Good governance and responsible citizenship. In view of these challenges, the City has set its development priorities in the following sectors:

- Health and Nutrition
- Housing and the Urban Poor
- Education, Arts and Culture, and Sports Development
- Livelihood, Employment and Human Development
- Peace and Order and Public Safety
- Cleanliness and Environmental Protection
- Transparency, Accountability and Good Governance

The enhancing quality of life thru livable cities was the jump-off point in climate change adaptation where further policies addressed the said cross sectional issue.

PLANNING FRAMEWORK

Two (2) planning frameworks were adopted in the preparation of the LCCAP which are the**: 1) Eco-town Framework and 2) Urban Climate Planning Resilience Framework.** These two frameworks do not differ much in terms of the approaches and methods employed.

However, the Eco-town framework emphasizes more on resiliency and green growth linkages while the DILG prescribed framework focuses on the resilience, capacities and vulnerabilities of urban systems, the LGU and its various actors. It also links action plan to CLUP, CDP, AIDP, ELA and DRRMP.

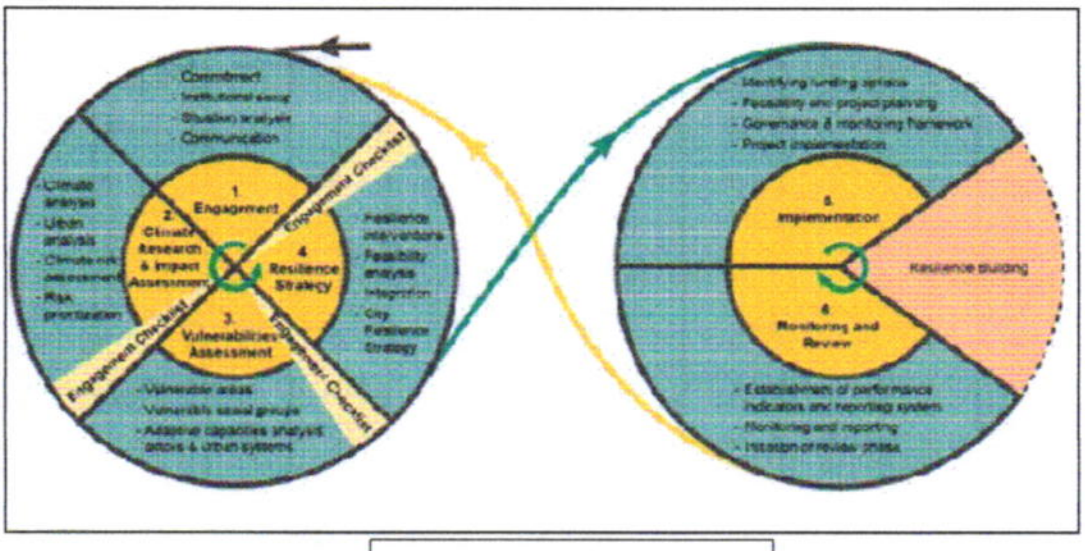


Fig. 1 ICLEI-ACCCRN FRAMEWORK

Naga City underwent the ICLEI – Asian Cities Climate Change Resilience Network (ACCCRN) process (Figure 1) in the course of developing the LCCAP. The Eco-town framework and other technical support from the Climate Resilience and Green Growth in Critical Watersheds-CCC-SEARCA 2014-2016 provided a scientific based and empirical evidence in the LCCAP planning. The later shaped the eco-system approach that deepened the vulnerability assessment of the LCCAP team – the multi-impact of intervention based on the vulnerability of critical watershed. The Strengthening Management System in MINP-GIZ 2014-2016 provided input on the current status of Mt. Isarog as a protected area. Therefore, *the city hopes to achieve a climate change resilient urban systems integrating The NEXUS of energy, land and water in order to achieve its GREEN GROWTH* – an ECO-TOWN.

METHODS EMPLOYED

The tools and methods employed in the Action Planning process are briefly summarized as follows: such as: 1) Validation of results and findings of the assessment studies; 2) Triangulation of assessment studies with the realities of the urban systems and its actors; 3) Participatory Action Planning not only for PPA's but as well as capacity building needs; 4) Multi-criteria method for the prioritization of projects; 5) Cost-benefit analysis of priority projects. The top three priority projects selected by the LGUs were subjected to Extended Cost-benefit Analysis (ECBA) to determine their level of financial, economic, social and environmental viability; 5) Environment and Natural Resources Accounting (ENRA).

THE PLANNING PHASES

The following activities were undertaken:

- **Phase 1 - Engagement:** a) Political support, governance structure, internal resources, initial scoping; b) Plan stakeholder engagement, and; b) Climate scoping exercise
- **Phase 2 - Climate Research, Vulnerability and Impacts Assessment: a)** Review climate change data, scenarios and priority impacts. As other studies from other technical support was done, the said scientific and empirical based studies was integrated in the analysis; b) Identify the LGU's fragile urban systems based on vulnerabilities identified; c) b) Confirm climate change scenarios, priority impacts and assessment of LGU's capacity to respond to priority climate impacts
- **Phase 3 – Assessment of the Adaptation Capability:** a) Identify the perceived vulnerable areas and people in the LGU; b) Determine the adaptive capacity of urban systems; c) Identify potential partnership and resiliency options.
- **Phase 4 - Resilience Strategy:** a) Develop Climate Resilience Strategy which responds to projected climate risks as they affect critical urban systems; b) With the help of stakeholders, develop intervention proposals, and prioritize the interventions; c) Gain political support for resilience strategies and interventions

THE PLANNING TEAM

Recognizing that climate change functions and resilience building is not only about the environment, the Climate Technical Working Group which developed the Naga version of the LCCAP is composed of staff from a range of departments in order to examine different points of view and areas of expertise. The Technical Working Group represents the interests of a wide spectrum of the local government's operations. Through **Executive Order No. 2014-032**, a Technical Working Group (TWG) was created. The 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.

However, to develop the said LCCAP, a Core Team was developed from the following departments: CAgO, DRRMO, CENRO and CEO. The team (unit head) did the research, department-to-department consultation and review of the various studies to develop the results and resources framework. Mini-consultations with various stakeholders including one-on-one interview of key informants was conducted by the core team. Members of the core team also validated output work plan to selected department and their civil society partners.

CHAPTER II: LGU PROFILE

CITY PROFILE

HISTORY

Naga City, a flourishing independent component city in the Bicol Region (Region V) of the Philippines, dubbed as the Queen City of Bicol, the Heart of Bicol and the Pilgrim City. History reveals that Naga was already a prosperous "riverbank community" even before the Spaniards came. A theory is being advanced that because of the community's location, the name Naga is more likely linked to *NAGAS*, a serpent-worshipping northern Indian tribe that settled near or around water springs. On the other hand, a more popular theory tells that the name actually derived its origin from *narra* trees which were then in abundance.

Spanish Governor-General Francisco de Sande, a native of Caceres in Extramuda, Spain had established the modern town in 1575 and named it Ciudad de Nueva Caceres (New Caceres) in his honor, thus becoming the third royal city in the Spanish East Indies after Cebu and Manila. *(Naga City CLUP 2016-2030)*

THE MAKING OF A CITY

Nueva Caceres served as capital of Ambos Camarines and later of Camarines Sur province. In 1919, the Americans reclassified the city into a town and restored its former name. It regained its status as independent component city by virtue of Republic Act (RA) No. 305 which became a law on June 18, 1948 under the sponsorship of Rep. Juan Q. Miranda. On June 6, 1955, it ceased as provincial capital when the Camarines Sur Provincial government moved its seat to neighboring Pili pursuant to RA No. 1336. *(Naga City CLUP 2016-2030)*

MISSION AND VISION

The **Vision** of the city is *"An Maogmang Lugar."* The **Mission** of the City is "to make Naguenos happy and proud of their city and of their living faith through continuous improvement and innovation in inclusive governance and responsible citizenship." According to its CDP, "by 2015, Naga city shall be recognized model of:

- ***Good governance and responsible citizenship*** - Driven by a shared development direction crafted, implemented and continually improved in an inclusive manner; Sustained by a citizenry that asserts their rights and accepts their roles and responsibilities in nation building
- ***People centered development*** - Anchored on quality and accessible services in health, education and other social services, especially for the marginalized and the vulnerable; that enables the private sector to generate the best value from local talents, technology and resources, and provide gainful jobs and entrepreneurial opportunities for the *Nagueno*; and

- ***Abiding faith*** - That expresses itself in social solidarity and a culture of excellence flourishing in a city that is peaceful, safe and in accord with nature; where cultural values are nurtured and religious diversity respected; and where technology enables the *Nagueno* to be part of a global community of people and nations.

GEOGRAPHICAL LOCATION AND LAND AREA

Naga City is located within the heartland of the Province of Camarines Sur. About 377 kilometers south of Manila and 100 kilometers north of Legaspi City, the city's central location within the province, albeit, the region makes it accessible to almost all kinds of transportation. Nesting at the foot of Mt. Isarog, the city has a total land area of 8,448 hectares. The city's *poblacion* area is trisected by the Bicol and Naga Rivers while a number of creeks and rivers crisscross some portion of the topography. It is bounded on the North by the Municipalities of Canaman and Magarao; on the East, by Mt. Isarog and the Municipality of Pili, the capital town of Camarines Sur; on the South, by the Municipality of Milaor; and on the West, by the Municipality of Camaligan. Most of Naga City's total land area of 8,448 hectares is agricultural.

TERRITORIAL COMPOSITION

Naga has a total of 27 Barangays of varying sizes. In terms of population, Dinaga is the smallest with 456 inhabitants as of 2015 while Concepcion Pequeña is the largest with 23,577. In terms of land area, Lerma is the smallest with 5.1 hectares while Carolina is the biggest with 1,777. Lerma is also the densest at 461 persons per hectare while Panicuason is the least dense at only 2 persons per hectare.

TOPOGRAPHY

Naga City's terrain generally slopes upward from the west to east from the city proper up to the foot of Mt. Isarog. Almost fifty eight percent of its land area covers the whole of the *poblacion* area up to the upper barangays of Pacol and San Isidro has a slope range of 0-3 percent (almost level) to 3-8 percent (nearly level to slightly sloping). The easternmost part covering the area of Brgy. Panicuason and Forest and Parks Reserve (under NIPAS) has slopes of 8-18 percent and 18-30 percent and over for those areas that are already part of Mt. Isarog.

POPULATION

Based on the 2015 Census, Naga City has a population of 196,003. Of this total, 49% are male while 51% are female. Children and youth aged 0 to 24 comprised 54% of the total population, 29% of this is school age broken down as follows: 4% preschoolers, 12% elementary, and 13% secondary. The total number of households is 42,152. During the 2015 survey, there is an increase of 21,072 inhabitants over the 2010 total of 174,931 at a growth rate of 2.3%. For year 2030, population is estimated to reach 273,715 if the current growth rate is maintained.

In 2015, the city's household population reached 42, 152, higher than 6,223 compared to the 35, 929 recorded in 2010, yielding an average household size of 4.61, lower than the 4.84 recorded five years back. By comparison, there were 5.20 persons per household in 2000. These mean there are around 5 persons in the average *Nagueño* family over the last 15 years *(CLUP 2016-2013).*

EMPLOYMENT

Of the total labor force, about 57% or 56,726 are considered economically active. Unemployed labor force was estimated at 3,116 persons or 5.8% of the economically-active population. The labor force is 62% of the total population, with female at 52% outnumbering the male population. However, only 57% of this total labor force is economically active. Unemployed labor force was estimated at 3,116 persons or about 5.8% of the economically active population. The remaining 43% unemployed comprise the full-time students, housewives, retirees and other similarly situated people.

LITERACY

In 2000, the literacy rate of the household population ten years old and over was registered at 96.55 percent. Naga City offers quality education from pre-school to tertiary level. There are 181 schools in which 112 are public and 69 are private. There are 29 public and 21 private elementary schools. Secondary school is composed of eight (8) public and 12 private institutions.

Tertiary education is offered by 16 privately-owned and two (2) state-owned schools. In terms of educational attainments, 2% of residents who have gone to schools, have masteral/law degrees, 75% graduated from college, 6% are college undergraduates, 8% finished vocational courses, 7% finished high school and 2% elementary graduates.

HEALTH

There are two (2) public hospitals, one (1) infirmary and five (5) private hospitals in the city. There are also 109 medical and 28 dental clinics.

HOUSING

There were 35,210 housing units in the city based on the 2010 census which is 37% higher compared to 2000 census which recorded 25,674 housing units. Of these, 77% were single houses, 13% were multi-unit residences (apartments, rowhouses, condominiums, townhouses), 9% duplex type residences (which increased by 3 percentage points each) from single houses over the last 10 years. The same survey showed that 88% of the housing units have outer walls and 87% had roofing made of strong materials. *(CLUP 2016-2030)*

POVERTY INCIDENCE

Based on the NSCB estimates, poverty incidence in Naga reached 15.7% in 2012, an improvement over the 16.6% registered in 2006 and the 24.4% in 2009. These official figures are supplemented by two other data sets. One of which is the poverty data generated through the annual Naga City

Poverty and Governance Public Opinion Poll conducted by the Ateneo de Naga Social Science Research Center which shows a significant downtrend in the number of people saying they are poor: from a high of 62% in 2007, it went down to 48% in 2013, 42% in 2014 and 43.5% in 2015. The other source are the data generated through then Community Based Monitoring System (CBMS), a survey conducted by the City Government every three years. In 2015, the CBMS identified a total of 10,872 households (33.4%) as income poor. This means at least 1 in every 3 households has no significant income to satisfy its basic food and non-food needs. Income poverty is highest in Carolina (49.4%) and Concepcion Pequeña (1,291 households). *(CLUP2016-2030)*

ENVIRONMENT AND NATURAL RESOURCES

Environmental challenges include inadequate solid waste collection, air and water pollution, watershed degradation, agricultural land conversion. Degradation of the watershed of the City is due to widespread forest clearing and agricultural encroachment which cause siltation of rivers and its tributaries. Other environment issues confronting the city include the conversion of agricultural lands into urban uses and the proliferation of informal settlers along river easements. The areas along the Naga and Bicol rivers are considered as danger zones to flooding. Low-lying barangays are located in severely flood prone areas in which about 55% of urban families are residing.

Area under vegetation

Mt. Isarog where the highest elevation the city is located offers vast natural resources, including good water source, flora, fauna and other environmental services. The Forest and Park Reserves within the city is protected by NIPAS Law. The forest area of the city is situated primarily within its eastern mountainous portions and covering the western side of Mt. Isarog Natural Park (MINP), with a total of 611.14 *ha* or 7.23 percent of the entire city's land area. Mt. Isarog Natural Park has a total area of 10,122 *ha*.(MINP General Management Plan).

Water Resources

The city has inadequate drainage systems thereby necessitating the establishment of storm drainage systems in the identified flood-prone areas/streets within the city. The water quality of Naga River is classified as Class C which poses another challenge to the rapid development of the City. Most critical is improving the groundwater recharge where the annual groundwater recharge was measured at 2.38 M cu. M. or 49.7 percent of the volume extracted. Mt. Isarog is the source of irrigation (Magarao, Canaman and Bombon) but as well as the source of drinking water (Naga City, Canaman, Magarao, Camaligan, and Gainza).

Air Quality

There are two (2) existing Particulate Monitoring Station (PM10 and PM2.5) strategically located within the political boundary of Naga. In 2015, record shows 71.95 microgram per cubic meter ($\mu g/m^3$) a bit lower than 2014 which is 72.31 $\mu g/m^3$, both under "GOOD" category based on Air Quality Index.

Biodiversity

Mt. Isarog Park management and effectiveness study reported 60.70% in 2010 and 70.00% in 2013 indicating an improvement in its management. There is an on-going biodiversity and management survey for 2015. The status of wildlife in Mt. Isarog based on IUCN and Haribon categories are as follows: Isarog shrew rat is vulnerable; whiskered pitta as nearly threatened (Haribon) and Philippine cockatoo as critically endangered (Haribon). The project not only supports forest conservation in 350 hectares but also the expansion of wildlife habitat through ecological rejuvenation of the river banks and easement areas. These actions improve water holding capacity and regulate water flows and carbon sequestration. ENRO, PAMB with ADENU and CBSUA (Environment department) continue to monitor the endemic flora, fauna and wildlife species in the protected landscape. There is an on-going assessment on the current status of Mt. Isarog by DENR. Environment Protection is the highest expenditure of the project amounting to 26.42% of its total budget. Mt. Isarog Natural Park is being nominated as the 3rd biosphere reserve in the Philippines.

Solid Waste Management

The city government of Naga has initiated/proposed the construction of sanitary landfill facility way back in 2014 as part of the city's program on integrated and sustainable solid waste management system. Upon completion of the necessary permits and requirements, the Environmental Compliance Certificate (ECC) for the operation of sanitary landfill project was granted to the city by the DENR-EMB, Region-V, on November 29, 2017. The ECC covers the Sanitary Landfill/Waste-to-Energy Project with an area of 11.04 hectares located at Barangay San Isidro, Naga City.

In 2019, commencement for the initial construction of sanitary landfill components has started which includes; Materials Recovery Facility, Admin Office, Motor-pool, Composting tank, Guard house, Dike and Waste water treatment facility. On August 14, 2020, right after the Balatas controlled dumpsite was closed, the operation of sanitary landfill facility has started. As of 2020, status for the completion of waste water treatment facility, medical waste vault is on-going. With regards to the proposed Waste-To-Energy Project, there are proponents who submitted their proposal but the city is interested to proponents who can shoulder the project cost.

In addition, as part of the city's efforts in achieving the 75% waste diversion goal as presented in the 10-Year Solid Waste Management Plan on March 6, 2020 at Quezon City, the Naga City SWMO has initiated the conversion of residual plastic waste to liquid petroleum, fabrication of hollow blocks and bricks with mixture of residual plastic, Bio-gas production from food waste and animal waste, compost upgrading and conversion of young coconut husk to charcoal briquettes.

- **Sanitary Landfill Life and Capacity (Estimated):**
  - Estimated landfill capacity is 290,700 m^3 with a garbage density of 0.294 tons/cu. m.

- An estimated landfill life of seven (7) years can be achieved from 2020, with a total of 107.06 m^3 of compacted waste is disposed per day, with a daily cover soil of 15 m^3 and compaction rate of 30%.

Other pertinent data on solid waste management is enumerated below:

- As of June 30, 2020 the city is generating an average of 66.21 tons/day (Gate data) of solid waste.
- 28.80 tons/day are diverted at the curve side (1st level diversion) through collection of recyclables of various IWS groups and continuous Information and Education Campaign (IEC) of the city.
- 33.36 tons or 35.12 % from the total generated waste are diverted in sanitary landfill (2nd level of diversion) through our office initiatives such as; conversion of residual plastic into liquid petroleum, fabrication of hollow blocks and bricks with a mixture of residual plastic, compost upgrading and conversion of young coconut husk to charcoal briquettes.
- A total of 62.16 tons/day of waste are being diverted (65.43% waste diversion rate) and 32.84 tons/day of waste are directly disposed to sanitary landfill.
- 2020 WACS has a total of 49.16 tons/day or 49,160 kg./day.
- A decreased in total volume of waste is expected due to quarantine period where commercial establishments, institutions and manufacturing industries are closed.

There are various projects being proposed by the Solid Waste Management Office such as the establishment of MRF machineries and also the operationalization of a Medical Waste Facility.

Proposed MRF Machineries at Sanitary Landfill (Costings based on estimates)

ITEMS	UNIT	COST	TOTAL
1. INCLINED FEEDING CONVEYOR, Brand new	2 units	1,200,000.00	Php2,400,000.00
2. ROTARY SCREEN TROMMEL, Brand new	2 units	2,800,000.00	5,600,000.00
3. TROMMEL CATCH CONVEYOR, Brand new	1 unit		1,128,750.00
4. SORTING CONVEYOR, Brand new	2 units	3,942,500.00	7,885,000.00
5. DISCHARGE CONVEYOR, Brand new	1 unit		1,155,840.00
6. MULTI-PURPOSE SHREDDER, Brand new	1 unit		2,500,000.00
7. RUBBER EXTRACTOR, Brand new	1 unit		3,600,000.00
8. DENSIFIER, Brand new	1 unit		1,100,000.00
9. GLASS PULVERIZER, Brand new	1 unit		1,500,000.00
10. ELEVATED FLATFORM			1,019,525.00
		TOTAL =	Php27,889,115.00

Fig. 2 PROPOSED MRF MACHINERIES AT SLF

Establishment & Operationalization of Medical Waste Facility at Sanitary Landfill Site

Proposed estimated project cost is 25 million pesos through Public-Private Partnership (PPP) with city counterpart of Php12.5 million

Fig. 3: PROPOSED MEDICAL WASTE FACILITY AT SLF

Solid waste collection and proper disposal covers only about 85% of the households, commercial and industrial establishments. The total garbage collection 2016 reached 89 tons per day (2016) lower than the 101 tons per day (2015). Due to aggressive collection of recyclable at source, 19% is diverted from collection and 25% of the collected waste is diverted at the Balatas Controlled Dumpsite.

WATER RESOURCES AND SUPPLY

Metropolitan Naga Water District (MNWD) is the waterworks system that supplies the requirements of Naga and other four (4) neighboring towns. The total Water Production of the MNWD are sub-divided into two water sources:

1) Springs water production = 15,558 m^3 per day (2019)
2) Pumping stations water production = 41,842 m^3 per day (2019)

The total water production is 57,400 m^3 per day (2019). The main water source comes from three (3) springs located in Pili, Camarines Sur and 21 deep well pumping stations strategically located within its service areas. As of 2019, there are 42,204 active connections. The government also owns Task Force Tubig that installs Levels I and II water systems to complement the MNWD.

ENERGY SOURCES AND SUPPLY

Electric power supply is provided by the Camarines Sur II Electric Cooperative. It is engaged in power retail that sources the power from the Luzon Grid operated by National Grid Corporation of the Philippines (NGCP). Another source of supply will be the Panicuason Hydro-electric plant. Below is a table showing the summary of Annual kilowatt-hour (KWH) consumption of Naga City for the year 2016 to 2019;

CLASSIFICATION	2016	2017	2018	2019
Residential	71,582,095.93	69,036,689.98	79,138,366.10	86,661,974,40
Commercial	87,443,610.20	93,676,362.90	111,588,318.40	122,935,003.58
Public Building	11,839,007.50	11,082,222.00	11,946,029.60	13,981,877.00
Industrial	6,584,722.00	5,529,574.00	5,635,995.00	6,209,082.42
Street Light	3,540,405.69	3,249,006.62	1,764,842.22	1,911,492.35
Total	**180,989,841.32**	**182,573,855.50**	**210,073,551.32**	**231,699,429.75**

Table 1: ANNUAL KWH CONSUMPTION OF NAGA CITY

EXISTING LAND USE

Naga city is still in the process of updating its existing land use information which was prepared in 2000. Table 2 presents the existing land use of the city based on data generated through the city government's Geographic Information System (GIS). In terms of land use, Naga City, as shown in the table, is still predominantly an agricultural city, with agricultural lands accounting for 67.55 percent. The next biggest land use in terms of land area is residential, which accounts for 14.30 percent of the total. Mostly, these are found within or near the downtown area and its peripheries, particularly in Barangays Concepcion Pequeña, Grande and Del Rosario. Several residential subdivisions had already been developed in these barangays. Forest parks and reserves account for 7.23 percent of the total land uses. These areas are concentrated wholly in the eastern part of Naga up to Mt. Isarog. For its land use development needs as determined by the CPDO, the city has established four categories:

1) Need for Controlled Urban Growth
2) Need for Increased Agricultural Income and Productivity
3) Need for Additional/Enhanced Basic Services
4) Need for Sustained Growth

Land use category	Area (hectares)	Percent
Residential	1,208.42	14.30%
Commercial	161.13	1.91%
Industrial	32.2	0.36%
Agricultural	5,709.05	67.59%
Institutional	150.29	1.78%
Idle land/Grassland	504.43	5.97%
Parks	2.49	0.03%
Forest parks and reserves	611.14	7.23%
Dumpsites	3.55	0.04%
Cemeteries	17.11	0.20%
Water bodies	43.72	0.52%
Transportation utilities	4.47	0.05%
Total	8,448.00	100.00%

**Reclassified by SangguniangPanlungsod to non-agricultural land*

Table 2: EXISTING LAND USES AND TOTAL AREA OCCUPIED

The city planners are evaluating its land resources to determine where to allocate lands for these four categories of need which are essential to support the growth of the city.

Comparative Land Uses (Existing and Proposed)

As shown in Table 2 the city's existing land use has agricultural area as the predominant land use with 5,709.05 hectares or 67.59 percent of the city's total land area. This does not include some areas which we classified as areas proposed for Agro-Ecotourism, agri-industrial and the existing marginal

agricultural lands which are oftentimes lying idle which has an aggregate total area of 2,046.52 hectares. Comparing our proposed net urban expansion for the planning period which total to approximately 1,439.95 hectares to our existing agricultural lands of 5,709.05 hectares, the net urban expansion will eat up about 25 percent of our existing agricultural lands. If we add, however, the areas which we proposed for agro-ecotourism, agri-industrial and the marginal agricultural lands to our existing agricultural lands which total to about 2,046.52 hectares, our net urban expansion will eat only about 19 percent of our agricultural lands.

ECONOMIC DEVELOPMENT ISSUES AND DEVELOPMENT EFFORTS AND THRUST/PLANS.

The regeneration of the forest resources has been identified as critically important in the prevention of flash floods, soil conservation, prevention of siltation to Naga River and other water bodies. Forest protection is also important in sustaining water resources such as springs and rivers. However, a review of the city's Comprehensive Development Plan, 2011-20 does not indicate the prioritization for this resource. As a key biodiversity area, this has been supported by DENR & DENR-EMB and civil society partners. Redefining the watershed's role and its multi-function should be presented as a key element in the attainment of a progressive and healthy city with happy people and communities.

Classification	Proposed Land Use		Existing Land Use		Net Urban Expansion Requirement for the Planning Period
	Area (has)	%	Area (has)	%	
Residential	1,886.28	22.33	1,208.42	14.3	487.05
Commercial	340.72	4.03	161.13	1.91	179.59
Agricultural	3,553.23	42.06	5,709.05	67.59	-
Industrial	214	2.53	32.2	0.38	77.91
Institutional	182.47	2.16	150.29	1.78	32.18
Forest Reserves	611.14	7.24	611.14	7.23	-
Parks	9.95	0.12	2.49	0.03	-
Transportation utilities	24.45	0.29	4.47	0.05	19.98
Dumpsite	5.89	0.07	3.55	0.04	-
Cemeteries	33.95	0.4	17.11	0.2	-
Water bodies	43.72	0.52	43.72	0.52	-
Idle lands/ Grasslands/ Marginal Agricultural lands	-	-	504.43	5.97	-
Agri-industrial	346.43	4.1	-	-	346.43
Agro-ecotourism	1,195.66	14.15	-	-	-
TOTAL	**8,448.00**	**100**	**8,448.00**	**100**	**1,439.95**

Table 3: Comparative Land Uses (Existing and Proposed)

The higher incomes and growth rates in the city brought about pollution in terms of air, soil and water. The city is now closing its open dumpsite and is developing new facility at San Isidro which integrates waste processing, recycling and energy generation. Air pollution from vehicles should also be addressed. Recent data from DENR indicate that the Naga River has failed in several water quality parameters including total coliform count. The city is also required to construct a

centralized sewage treatment plant as prescribed by law. The identified constraints in the full development of Naga city are provided in **Table 4.**

Land Use Related Problems	Extent of the Problem	Interventions Needed
Flooding	Two to three days of continuous rains brings about knee-deep flooding especially within the downtown area and the surrounding areas	• Reforestation • Limit Conversion of Lands • Declogging of rivers, waterways, canals • Drainage using low impact development • River dredging • Fast track Land Use Plan • Relocation of CBD I (decreased density and expansion of hazard zones)
Deforestation	"Kaingin" and intrusion of native dwellers inside the City's Protective Areas	• Large-scale reforestation • Forest management • Coordination among RDC, PAMBI, Metro Naga, PDA • Consistent monitoring and assessment/evaluation of City-ENRO, CPDO
Conversion of prime agricultural lands	Premature conversion of prime agricultural lands makes "white elephants" or idle lands out of it	• Update CLUP 2000 and Zoning Ordinance • Increase agricultural income and profitability • Automatic reversion of idle lands • Political will and enabling legislations • Reclassification Fee
Pollution	Naga City's water, air and land pollution brought about by increased social and economic activities	• Sanitation/landfill • Upgrading(closure) of present dumpsite • Dredging/revetment • Waste Management System • Forest management • Coordination among RDC, PAMBI, Metro Naga, PDA

Table 4: FACTORS CONSTRAINING THE DEVELOPMENT OF NAGA CITY

		• Serious enforcement of Forestry and Environment laws • Consistent monitoring and assessment/evaluation of City-ENRO, CPDO
Incompatible Uses	Rampant construction of structures in "flood areas" and environmentally constrained areas like in riverbanks and along creek and major waterways	• Strict enforcement of CLUP 2000 • Easement delineation and recovery • Consistent monitoring and assessment/evaluation of City-ENRO, CPDO
Weather and water hazards	Flood-prone barangays of Naga City as identified in the 1999 NCDMP study have been the most affected.	• Barangay-based IEC campaign • Consistent monitoring and assessment/evaluation of City-ENRO, CPDO • Legislations

ENVIRONMENT AND NATURAL RESOURCES ACCOUNTING

Environment and natural resource accounts (ENRA) of a given municipality will establish the baseline conditions of its natural capital such as land, water, forest, coastal and marine resources that will drive its local economy towards green growth. The physical accounts are subjected to economic valuation to determine the direct and indirect values of the physical and natural assets of a locality. The specific objectives of ENRA are the following:

- To determine in physical and economic terms the state of environment and natural resources in the locality
- To analyse the impacts of climate change and natural disasters on ENR quality and quantity depreciation
- To recommend strategies and measures to improve the status of ENR as a driver of the local economy

The scope of Naga city's ENRA covered the main economic drivers of the municipality, such as, agriculture, forestry, water resources and municipal incomes. The other natural resources of Naga city are equally important but due to lack of data, such natural resources as biodiversity and renewable energy were not analyzed. The main data sources are from secondary sources, namely, CLUP and CDP of Naga city, NAMRIA GIS for land cover (2003 and 2010) and the PDPFP of Camarines Sur. The natural resource component took off from the baseline report of CCC-ADB TA 8493.

LAND USE ACCOUNT

Aggregate Land Cover/Land Uses Accounting. The land cover/land use changes accounting in aggregate values for 2003 and 2010 for Naga city are provided in **Table 5**.

- The total area of Annual crop in 2003 decreased by 58.35% in 2010.
- Built-up area increased in 2010 by 80.30%
- Forest park and reserve decreased in 2010 by 9.2%
- Total area of Perennial crop increased in 2010 by 41.44%
- Grasslands/shrubs decreased in 2010 by 31.38%

Land Cover/Land Use	2010 Total area (Ha)	2003 Total area (Ha)	Percent Change
Annual crop	1,364.42	3,276.61	-58.35
Built-up	3,447.53	1,912.07	80.3
Forest park & reserve	554.77	611	-9.2
Inland Water	43.77	43.72	0.0011
Open Forest	63.34	0	0
Perennial Crop	1,801.58	1,273.66	41.44
Idle lands/grassland/shrubs	346.13	504.43	-31.38
Total Area	7,621.49	7,621.49	

Table 5: NAGA CITY AGGREGATE LAND COVER/LAND USE CHANGES FROM 2003 TO 2010

SUMMARY OF ENRA RESULTS

In the baseline report of this Project (ADB-TA 8493), it has noted the decreasing trend in area planted for all the crops grown in the City. In the ENRA study, the total area planted rice, corn, sugarcane and abaca all posted a reduction in size. The summary of findings are as follow:

- The decline in the area of agriculture is attributed mainly to the conversion of agriculture land to urban uses considering the fact that Naga city is a growth center which is expected to rapidly urbanize. The value of irrigated riceland production declined by 81% as a result of the decreased in land area planted and yield.
- On the other hand, the area planted to corn also decreased but its yield per hectare increased by 58% due to new corn varieties planted and improvement in extension services. Thus, the value of production of corn increased by 36%.
- Forest cover in the watershed of Naga city declined due to kaingin. However, the reforestation efforts in the Protected Areas (NIPAS) increased forest cover by about 12% compensating for the lost in forest cover due to kaingin. The computed net increase in value of the forest cover was P36 million or 14% for the period 2013 as baseline and 2015 as closing stock.

Water supply connections increased by 32% in 2015 (closing account) compared to its 2013 figures (opening account). The groundwater of Naga is however over-extracted and is projected to be depleted in the coming years. It was revealed in a study by LWUA that the annual

groundwater recharge was estimated at only 2.38 M cu. m. per year while current extraction is at 4.79 cu. M. per year.

Table 6: SUMMARY OF PHYSICAL AND ECONOMIC ACCOUNTS OF NAGA CITY: 2013-2015

ENR	Opening Stock (2013)		Closing Stock (2015)		Changes (%)	
	Volume of prod'n (MT)	Economic value (PhP)	Volume of prod'n (MT)	Economic value (PhP)	Physical Account	Economic Account
Agriculture						
Irrigated rice	23,470.72	436,391,097.00	5,526.88	81,455,157.44	(76.40)	(81.33)
Rainfed rice	141.05	2,203,906.25	ND	ND	ND	ND
Paddy rice	30.00	PhP468,750.00	ND	ND	ND	ND
Corn	3,108.10	128,294,318.88	6,403.67	201,795,902.28	106.03	57.29
Livestock & Poultry	**No. of Heads**		**No. of Heads**			
Cow	211.00	2,532,000.00	600.00	7,200,000.00	184.36	184.36
Carabao	2.00	7,400.00	150.00	2,025,000.00	7,400	27,264
Swine	1,523.00	7,310,400.00	2,500.00	12,000,000.00	64.14	64.14
Poultry	294.00	17,640,000.00	300	17,640,000.00		18,000,000.00
Fisheries	77.00mt	87,780,000.00	ND	ND	ND	ND
Domestic water supply	**Daily consumption cu.m.**		**Daily consumption cu.m.**			
Residential	24.51	254,479.63	24.19	251,157.17	(1.30)	(1.30)
Commercial	54.55	566,375.51	53.55	555,992.86	(1.8)	(1.8)
Industrial	ND	ND	ND	ND	ND	ND
Institutional	110.62	1,148,532.00	166.70	1,730,793.71	50.69	50.69
Forest	564ha	250,076,000	644ha	286,052,000	14.18	14.38

CLIMATE

The climatic type of the city falls under Type II. This climatic condition is characterized by a definite absence of dry season and a very pronounced maximum rain period from November to January. The city has an average annual rainfall of 2,104 mm. with an average temperature of 27.1 ^{o} C and situated along or very near the eastern coast.

EXISTING CLIMATE CHANGE POLICIES, PROGRAMS AND PROJECTS

Local Policy Initiatives

The City council has passed Executive Order No. 2015-023 Green City Project. This policy directive supports DILG Memorandum Circular No. 2014-135 which requires LGUs to identify options to reduce their Carbon foot prints and contribute to efforts in addressing climate change. It also promotes projects addressing food security, greening of the city, renewable energy and reduction of pollution. The LCCAP prepared by Naga LGU builds on existing policies, programs, and good practices both national and local including but not limited to:

- Local Disaster Risk Reduction and Management Plan as mandated by RA 10121
- Updated Solid Waste Management Plan as mandated by RA 9003
- Local Shelter Plan-HSDO
- Local Poverty Reduction Action Plan (LPRAP)
- *Guinhawang Nagueno* Program
  Local Ordinance on Women & youth empowerment in Disaster response

PROGRAMS/PROJECTS

Several programs and projects on DRRM and CCA/M are being implemented by the Naga LGU in LCCAP as part of its LCCAP. These are briefly outlined below.

Ecosystem. The following projects were implemented:

- Climate Resilience and Green Growth in Critical Watersheds-CCC-SEARCA 2014-2016
- Strengthening Management Systems in MINP-GIZ 2014-2016;
- National Greening Program-BUB-NGP DENR 2015
- Water Quality Management Area (WQMA) 2016
- Floating Island Bio-filter Project (2020)
- Forest in our Midst Program (FOM) 2019

The Forests-in-Our-Midst (FOM) Program is the City Government of Naga's response to the need for re-greening of Naga City's urban areas thru the establishment and development of urban mini-forests.

- Naga Local Industries Network on Adopt a Waterways Project (LINAW)- 2019

Infrastructure

- Integrated Naga River Revitalization Program-INRRP, CDIA, Urban Nexus, ICLEI 2012-2016;
- Infrastructure development program (storm drainage upgrade) - DRRMF;
- Development of circumferential road as alternate route during disasters:
- Naga River banks Revetment Project

Figure 4: SEGMENT OF NAGA RIVER WITH FINISHED REVETMENT

Tourism

River transport as alternative means of transportation to minimize GHG emission and traffic congestion There are two (2) existing motorized boats being maintained and operated by the City Solid Waste Management Office (SWMO). There are also five (5) mini-wharves that are intended to be loading/unloading areas for passengers.

Figure 5: MV Peñafrancia

Transport

Through Ordinance No. 2011-065 or the "E-Trike Ordinance", the City is starting to switch to an eco-friendlier means of transportation. A total of 100 units of three-wheeled electric power driven vehicle or E-trike were granted franchise by the Sangguniang-Panlungsod.

Figure 6: E-TRIKES LINED UP FOR PASSENGER LOADING LOCATED OUTSIDE CONCEPCION CHURCH. CON. PEQ.

Bicycle Program – thru City Ordinance No. 2017-030 or the "Naga City Bicycle Ordinance", the City promotes:

- safe road conditions and comfortable bicycling environment
- cycling as a convenient, inexpensive and sustainable mode of transportation
- health, sports, recreation and love for Mother Earth

DRRM/CCR

- Urban HEART (mitigation on post disaster diseases)
- ADB-EMI -assessment and capacity development on Climate Change Resilience;
- Community-based Rehabilitation Project in partnership with University of Santo Tomas.

Agriculture

- Mitigation for poultry and livestock projects.-Worldbank
- Climate Smart Farmer Field School
- Urban Gardening/Agriculture

CHAPTER III: VULNERABILITY ASSESSMENT

SUMMARY OF FINDINGS

The varying studies was conducted by TA8936. This section provides the highlights of the results and findings of the assessment studies which include the following: 1) climate change projections and potential future impacts; 2) hazard exposure assessment, 3) climate change vulnerability assessment, 4) GHG inventory and 5) LGU Capacity assessment for the city of Naga. The Focus of the summary is on the most critical barangays, population, physical and natural assets exposed to various hydro-meteorological and geological hazards presently and potentially affecting the city. Equally given emphasis are the impacts of climate change in the six development sectors, namely: health, water resources, transportation, forestry, coastal and marine resources and agriculture sector. Assessments on HEA and CCVA were conducted both at the barangay and city level while the GHG inventory and LGU Capacity assessment were conducted at the city level. The findings of the assessments are translated into issues and challenges that supported the scientific bases of the climate action planning.

National Climate change Scenario

The potential impacts of climate change to the development sectors in cities and municipalities are briefly provided in **Table 7** below.

Climate change parameters	Critical Development Sectors					
	Agriculture	Forestry	Coastal & Marine	Transportation	Water	Health
Temperature increase	Decrease yield due to heat stress; increase pest outbreaks	Increase wildfires; Pest outbreaks; Spread of invasive alien species	Lowers survival of fish, corals, seagrass, mangroves & wildlife; fish kills	Damage to roads; melting of asphalt roads and cracking of cemented roads. discomfort to commuters; high fuel consumption; degradation of bridge structural material	Increase demand for water; Low water supply replenishment; lack of water in dams for domestic, agriculture and energy use	Heat strokes from heat waves; discomfort for young & elderly; increase population of mosquitoes & other vectors
Rainfall Changes	Flooding; drought; damage to crops; soil erosion; low crop productivity; damages to aquaculture	Erosion; landslides; river siltation and flooding; increase mortality of seedlings and young trees	Coastal land flooding; water pollution and siltation; beach erosion; Drowning of mangrove seedlings	Disruption of traffic flow; traffic congestion; Road damage; drainage clogging & overflow. Collapse of bridges due to rampaging waters loaded with debris; Reduced clearance under waterway bridges	Water supply contamination/pollution and Sedimentation Damage to water supply facilities	Increase in water borne diseases; gastro- intestinal diseases; respiratory & skin diseases

Sea level rise	Salinity intrusion; Decrease in crop yield; low production in aquaculture	Lowers survival of mangrove and nipa; drowning of mangrove seedlings	Lowers survival of seagrass, coral reef & wildlife; Beach erosion; wetland loss	Inundation of coastal roads;	Salinity intrusion Water supply system inunda-tion	Water borne diseases; pollution from HH & industry wastes
Sea surface temperatur e increase	Decrease in mariculture yield; fish kills	Lowers survival of mangrove and nipa	Algal blooms; coral bleaching; low fish catch			Toxic effects of contaminated shellfish
El Nino/ Drought	Crop damage; increased livestock deaths; massive fish kills	Wildfires; Low seedlings survival; wildlife population survival	Increased fishing effort; decrease in mariculture yield	Road damage; increase use of fuel	Increased water demand; Low rate of water supply replenishment; lack of water in dams for domestic, agriculture and energy use	Heat stokes; lowers sanitation in water scarce areas;
Storm surge	Affects soil salinity and growth of crops; uproots coconut and other trees; destroys aquaculture	Uproots and/or drowns newly planted and young mangroves; uproots and throws down some trees	Beach erosion; coastal flooding; inundation of coastal settlements; aquaculture destruction; Inundation of wetlands; temporary disturbance of wildlife feeding	Inundation of coastal roads; Destruction of bridges	Saline intrusion to groundwater; destruction of water facilities	Increase in water borne diseases; gastro- intestinal diseases; respiratory & skin diseases

Table 7: POTENTIAL IMPACT OF CLIMATE CHANGE ON DEVELOPMENT SECTORS (Cabrido, 2012)

Local Climate Change Scenario

Precipitation/Temperature Change

It is projected that the temperature of Camarines Sur, in which Naga city is a part, during the summer season will increase by 1.1°C for 2020 and by 2.2°C by 2020. There shall be longer El Nino Spell.

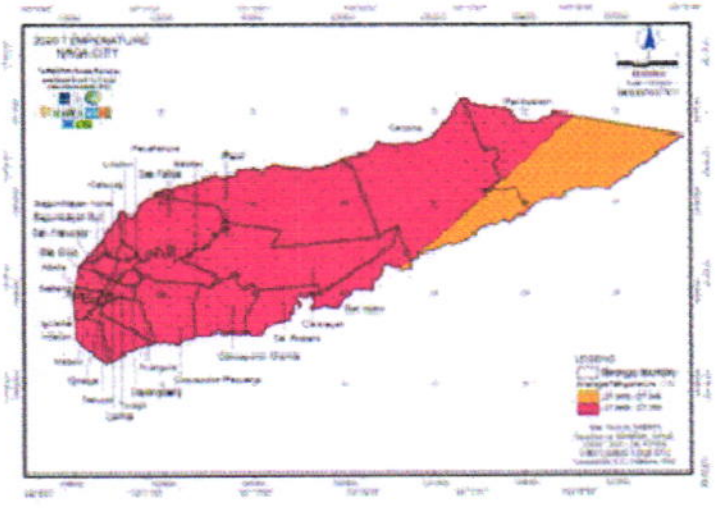


Figure 7: PROJECTED TEMPERATURE (2020), NAGA CITY

Rainfall Change

Rainfall is projected to decrease by almost 15% during the summer months of March, April and May for 2020 and by 25% for 2050. The projected highest rainfall increase is 9.5% during the rainy months of June, July and August for 2020 and by 16.5% for 2050. This means that Camarines Sur including Naga City will suffer more from heat stress and drought during the summer months for the years 2020 and 2050 while the province will experience more rainfall during the months of June, July and August for the two projected years. The frequency of rainfall with greater than 300mm is projected at 4 days by 2020 and 11 days by 2050 which are much higher than the baseline observed value of only 1 day. This simply means more flooding days by 2020 which will further double by 2050. The number of dry days will decrease to 3,698 by 2020 and by 3,811 by 2050 from the observed baseline of 6,219 days. This means that Camarines Sur will have longer wet days than dry days in the near and distant future but with extreme El nino spell.

Frequency (Years)	2	3	5	10	20	30	50	70	80	100
1951 – 2010 Observed values	180.0	213.5	251.5	300.3	348.4	376.6	412.4	436.7	445.8	461.7
2020, bias-corrected (2006 – 2035)	175.9	215.1	262.5	327.9	397.5	440.9	498.6	539.6	555.3	583.5

Table 8: Frequency Table for 1-day Rainfall (mm) based on Observed Values (1951-2010) and Projected for 2020 (2006-2035): Camarines Sur

Sea rising level

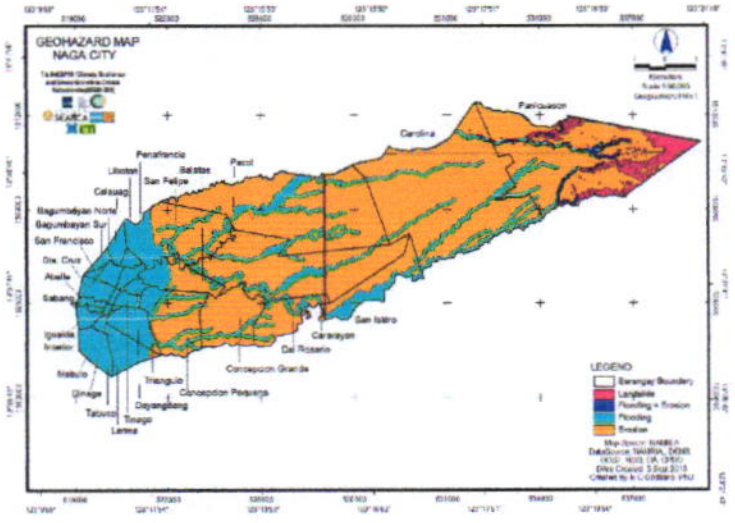
The World Meteorological Organization (WMO) said the Philippines posted the highest average increase in sea levels, at 60 cm, against the global average of 19 cm since the year 1901. As Naga is in the mouth of Bicol River basin, the overflow coming from the Bicol River tributaries results to increase frequency and depth of flooding including the nearby towns downstream of Naga River.

Extreme Events

From 1948-2009 or for a total period of 61 years, Camarines Sur recorded a total of 114 tropical cyclones. Out of the 114 tropical cyclones recorded, 1 is considered as super typhoon, 56 typhoons, 35 tropical storms and 23 tropical depressions. On the average, the province experienced 2 tropical cyclones per year or 1 typhoon every year. The month of October had the most number of tropical cyclones with 26 occurrences and the months of February and April had the least with one occurrence each. *From a range of 1 to 10 – 10 being the most vulnerable – Naga City got a score of 6.10 (WWF and BPI Foundation). It is second to Tacloban City (6.74) in being the city most vulnerable to climate change.*

ELEMENTS, SECTORS AND INSTITUTIONS EXPOSED TO CLIMATE CHANGE IMPACTS

Summary of Hazard Exposure



Under Hazard Exposure Assessment (HEA), existing hazards in the city and their potential future threats are examined considering not only hydro-meteorological but also geological hazards that are of major concern to the local governments (**Figure 8**). The assessment centered on barangays, population, physical and natural assets that are exposed at varying degrees to different natural hazards.

Figure 8: HAZARDS AFFECTING NAGA CITY

Barangays Exposed to Various Hazards

Flooding. Seventeen of the 27 barangays or 63% of the total number of barangays in the city have 90-100% of their area exposed to flooding.

Landslide: On the other hand, only six out of the 27 barangays are exposed to landslides. These barangays include: Cararayan, Carolina, Del Rosario, Pacol, Panicuason, and San Isidro. The total area exposed to landslides comprises only 4% of the total area of the city. Two barangays in the city registered high exposure to erosion, namely: Panicuason (100% of the barangay's total area); and Carolina (98%). About 32% of the city's total land area is exposed to slight erosion and 7% to moderate erosion.

Liquefaction. About 11% of the total land area of the city is exposed to liquefaction. Most of these liquefaction prone areas are located on the western end of the city. Twelve barangays have their whole land area (100%) exposed to liquefaction.

Population Exposed to Various Hazards

Flooding. About 61% of the total population of the city is affected by flooding of different depths. Seventeen of the 27 barangays in Naga city have more than 90% of their total population exposed to floods. These barangays include: Abella; Bagumbayan Norte; Bagumbayan Sur; Calauag; Dayangdang; Dinaga; Igualdad Interior; Lerma; Liboton; Mabulo; Penafrancia; Sabang; Sta. Cruz; Tabuco; Tinago; Triangulo; and San Francisco.

Landslide. Of the total population of the city, less than one percent is exposed to landslides. Six barangays which were found to be exposed to landslides are: Cararayan; Carolina; Del Rosario;

Pacol; Panicuason; and San Isidro. All these barangays have less than 1% of their total population exposed to landslides except Panicuason, which has 27% of its population exposed to landslides.

Liquefaction Forty-one percent (41%) of the total population of the city is exposed to liquefaction. The 13 barangays with 90 - 100% of their total area prone to liquefaction include: Abella (100%); Bagumbayan Sur (100%); Calauag (100%); Dinaga (100%); Igualdad Interior (100%); Liboton (100%); Sabang (99.97%); Mabulo (99.84%); San Francisco (99.78%); Sta. Cruz (99.73%); Lerma (97.71%); Bagumbayan Norte (99.70%); and Penafrancia (96.14%). Population exposed to various hazards such as flood, landslide and erosion is depicted in **Figure 9**.

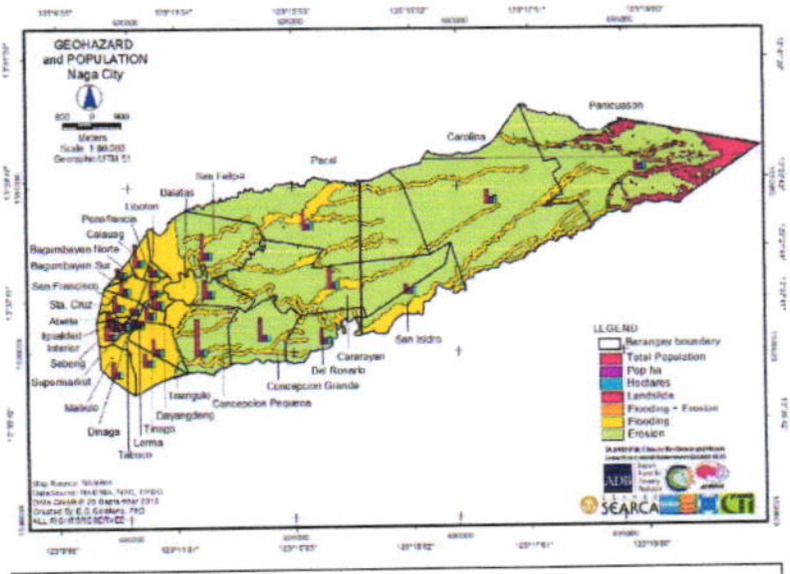


Figure 9: POPULATION EXPOSED TO VARIOUS HAZARDS

Physical Assets of Barangays Exposed to Hazards

Physical facilities exposed to flooding were identified and counted to be 73 in all. These facilities include food/store (14); Hospital/Clinic/Pharmacy (9); Government facilities (6); Police station (5); Motel/Hotel (8); Bank (9); Church (6); Gas Station (6); Tourist Attraction/Recreation (7); Bus Station/Stop/Repair (2); and Train Station (1). A total of 50 physical assets are also exposed to liquefaction. Others are as follows:

- Four bridges in the city are exposed to flooding. These bridges are located in Liboton, San Francisco, Igualdad Interior, and Tabuco. These bridges are also exposed to liquefaction.
- The city has 46 schools located in 17 barangays that are exposed to flooding. On the other hand, 24 schools located in 10 barangays are exposed to liquefaction.
- Of the total length of roads exposed to all types of hazards (i.e., flood, erosion and landslide), about 27% are exposed to flooding. Roads exposed to landslides are located in only two barangays in the city: Cararayan and Panicuason. In addition, about 21 km or 7%of the roads in the city is exposed to liquefaction.

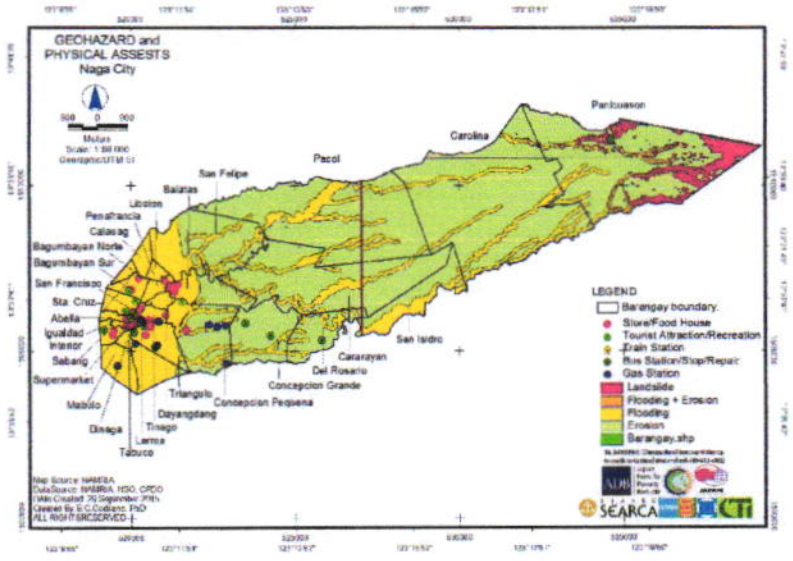


Figure 10: PHYSICAL ASSETS EXPOSED TO VARIOUS HAZARDS, NAGA CITY

Land Uses Exposed to Hazards

Total built-up areas exposed to various flooding depths comprise about 8% of the total city area. Of the total built-up areas exposed to flooding, about 8% is susceptible to deep floods of more than 1.5m depth. Three barangays are considered critical since more than 75% of their total built-up areas prone to floods are susceptible to deep flooding. These barangays are: Dinaga (82%); Mabulo (79%) and Tabuco (77%). About 2,252 hectares of agricultural areas in the city that are planted to annual and perennial crops are exposed to flooding of various depths. Of the total agricultural areas that are exposed to flooding, 15% is affected by deep floods of more than 1.5m depth. Two barangays registered the largest proportion of agricultural areas that are exposed to deep flooding: Tabuco with 84% of its agricultural areas affected; and Mabulo with 74% affected.

SUMMARY FINDINGS OF VULNERABILITY ASSESSMENT (exposure, sensitivity and adaptive capacity)

Sectoral CCVA Assessment: Health Sector

Diarrhea / diarrheal diseases

Twelve of the 27 barangays in Naga City have moderate vulnerability to a diarrhea outbreak. These include Mabolo, Tabuco. Triangulo, Abella, Bagumbayan Sur, Dayangdang, Igualdad Interior, Sabang, Santa Cruz, Tinago, Lerma, and Bagumbayan Norte, with the rest of the barangays having low vulnerability to a diarrhea outbreak. All barangays with moderate susceptibility to a diarrhea outbreak have the highest proportion of total population residing in flood-susceptible areas at > 60% to 80%

Dengue fever / dengue hemorrhagic fever

Twenty-three (23) barangays in Naga City have moderate vulnerability to an outbreak of dengue fever / dengue hemorrhagic fever while four, namely Carolina, Dinaga, Panicuason, and Penafrancia have low vulnerability. The observed gradient in the vulnerability of barangays to a dengue fever outbreak can be explained – in part – by differences in sensitivity to the given climate change impact. In particular, barangays with low vulnerability to an outbreak of dengue fever / dengue hemorrhagic fever are among the barangays with the lowest susceptibility to flooding (< 0.1 meter), and the lowest proportion of total population residing in flood-susceptible areas.

Leptospirosis

Mabulo and Tabuco have moderate vulnerability while the rest of the barangays having low vulnerability to a leptospirosis outbreak. The observed gradient in the vulnerability of barangays to a leptospirosis outbreak can be explained – in part – by differences in sensitivity to the given climate change impact. In particular, Mabolo and Tabuco have the highest susceptibility levels to flooding (> 1.5 meters) among barangays in Naga City.

Sectoral CCVA Assessment: Water Resources Sector

Drought. Overall, Naga City's water resources are moderately vulnerable to drought. Forest cover and land use attributes are factors that increase the drought susceptibility wherein, the built-up area is increasing in all directions from the center of the city. On the average, sixteen (16) barangays have built up area of 11 to 30% of the total land area while 31 to >50% of the total land area is already building up in eleven (11) barangays.

Flood. The water resources of Naga City is moderately vulnerable to flood with two barangays qualifying under the "high vulnerable" category: Mabolo and Triangulo. Both were found to have the largest portion of their total area (more than 90%) under the high inundation zones. Barangays that belong to higher limit of moderately vulnerability include Dayangdang, Dinaga, Igualidad Interior, Lerma, Sabang, San Francisco, Tabuco and Tinago. Barangay Penafrancia has no apparent flooding. However, its settlements and communities are located along or adjacent to the Bicol river and Naga river[1] thereby making it moderately vulnerable to floods. Panicuason registered the lowest vulnerable area to flooding mainly because 89% of its total area is located in rolling to hilly terrain. A review of the flood inundation maps would show that deep flooding would occur in the western portion of Naga City in the vicinity of Bicol and Naga rivers.

Sectoral CCVA Assessment: Transportation

Flooding. All of the city's roads, which include primary roads situated in its western part, are vulnerable to flooding. Historically, the eastern portion, which part covers Mt. Isarog, is not prone to flooding. Within the sub-watershed, the city proper is located in the downstream area making it highly sensitive and exposed to inundation as water flows westward from eastern uplands. Roads in the following 7 barangays have high vulnerability to flooding based on the flood model results

[1] ADPC Report, 2007

conducted by the Project: Cararayan; Carolina; Mabulo; Pacol; San isidro; San Felipe; and Triangulo. The rest of the 20 barangays in the city have moderate vulnerability to floods.

Landslide. Generally, the whole city is not susceptible to landslides except for barangays Carolina and Panicuason. Some road segments in the following five (5) barangays are highly vulnerable to landslides: Cararayan; Carolina; Pacol; Panicuson; and San Isidro. The other 22 barangays have their road segments moderately vulnerable to landslides.

Liquefaction. Naga City has low to moderate vulnerability to liquefaction. Except for strips of land around the town and within Barangay Carolina, the city is less vulnerable to liquefaction. Historically, only one fifth of the city or the entire town proper, is susceptible to liquefaction. The land area outside the city proper and going eastward to Mt. Isarog, is not prone to liquefaction. Seven barangays have road segments with moderate vulnerability to liquefaction: Balatas; Calauag; Carolina; Concepcion Pequenia; San Felipe; Tabuco; and Triangulo. The other 20 barangays have low vulnerability to liquefaction. Overall, the road segment with highest vulnerability to liquefaction belongs to Triangulo, a barangay that is historically prone to the hazard.

Sectoral CCVA Assessment: Forestry sector

The barangays that were identified to harbor forests are Carolina, Pacol, Panicuason and San Isidro. The forestry sector of Naga City is composed of the forestry areas in the Mt. Isarog National Park (MINP) that are inside the administrative boundaries of the city. This consists of 484.02 hectares of closed broad leaved forest and 8.87 hectares of communal forest. The sector also includes the areas consisting of strips in river banks planted to trees and are part of the National Greening Project of the city. The findings are as follows:

- ***Erosion.*** The forests of all the four barangays (Carolina, Pacol, Panicuason and San Isidro) have moderate level of overall vulnerability to soil erosion. All the forests of the four barangays were rated to have moderate vulnerability to erosion.
- ***Flooding.*** Except for Barangay Panicuason, which has a low vulnerability to flooding, the other three forested barangays are moderately vulnerable to flooding when the rivers and tributaries traversing them swell and overflow.
- ***Landslide.*** The overall vulnerabilities to landslides of the forestry sector of the four barangays are moderate in Pacol, Panicuason and San Isidro. Carolina forestry sector has a high vulnerability to landslide.
- ***Drought.*** All four barangays (Carolina, Pacol, Panicuason and San Isidro) have high vulnerability to drought based on projected rainfall volume.
- ***Wildfire.*** Barangays Carolina and Pacol have moderate vulnerability to wildfire while Pacol and Panicuason have low vulnerability to wildfire.

Sectoral CCVA Assessment: Agriculture sector

Naga City remains primarily an agricultural community. Of the city's total land area of 8,448 ha, around 4,550 ha (54%) is devoted to agriculture, and the sector employs 14 percent of the total

households. Eleven (11) barangays of the City's 27 barangays are crop production areas. These barangays include: Carolina (Upland/Hilly); San Isidro (Upland/Hilly); Cararayan; Pacol (Upland/Hilly); Panicuason (Upland/Hilly); San Felipe; Mabolo; Balatas; Concepcion Grande; Del Rosario; and Concepcion Pequeña.

Floods, Drought, Typhoons, Soil Erosion and Pests and Diseases. All the eleven 11 agriculture crop areas, namely: Carolina (Upland/Hilly); San Isidro (Upland/Hilly); Cararayan; Pacol (Upland/Hilly); Panicuason (Upland/Hilly); San Felipe; Mabolo; Balatas; Concepcion Grande; Del Rosario; and Concepcion Pequeña are moderately vulnerable to flood, drought, typhoon, soil erosion and pests and diseases.

NAGA CITY GREENHOUSE GAS INVENTORY

Summary of Findings

The rapid urbanization of the city has raised the concern on its GHG Emission. As a Community-based GHG Assessment has been conducted in 2015, the *Summary of Major Findings.*

- Total emissions of Naga City including the LUCF sector amounted to 246,640.13 tons. The Energy and Transportation sectors contributed almost the same amount in the total emissions of Naga City.
- About 36% of the total emissions came from the Energy sector while around 35% was contributed by the Transportation sector. The Energy sector had an emission of 89,760.04 tons while the transportation sector contributed 86,776 tons.
- Ranking third among the sectors, was the Waste sector with an emission of 46,288 tons of CO_2 or 19% of the total emissions. Following the Waste sector was the Agriculture sector which contributed about 21,632.70 tons or 8.77% of the total emissions. Results indicate that Naga City has small area allotted to crop production and has few livestock. LUCF which contributed 0.89% of the total emissions of Naga City had a total emission of 2,183tons CO_2.

Net Emission

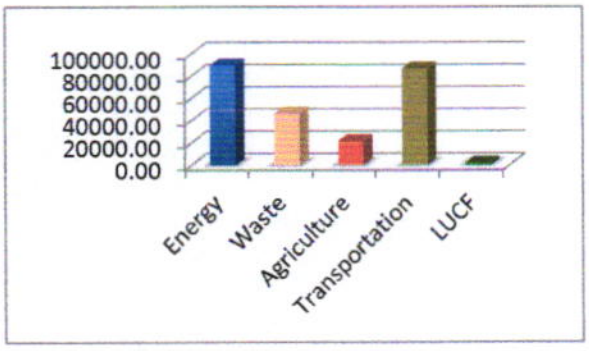


Figure 11: CARBON EMISSION OF THE DIFFERENT SECTORS IN NAGA CITY

Considering the amount of carbon absorbed by the LUCF sector of Naga City (9,501.47 tons CO_2), the net carbon emission of Naga City is 237,138.66 tons. Results show that the LUCF sector of Naga City is not large enough to offset the carbon emission of the City. The estimated per capita emission of CO2 equivalent for the city is 1.4. This per capita value is almost double than the World Bank estimated standard value of 0.7tons CO2e per capita.

VULNERABILITY ANALYSIS ON URBAN SYSTEM

The identified urban system went into further assessment with the following questions asked: based on the identified climate change vulnerability scenario, the following focused question was asked: a) What are the issues faced by our critical urban system?; b) How will projected climate change hazards and vulnerabilities affect to the current challenges or issues?; c) How will the city respond to it based on its devolved and non-devolved function? The purpose of which is not just to focus on *PROJECTS, sectors involved but as well as PROCESSES* in order to sustainably address the issues.

Urban System – Ecosystem

Current Issues Faced: Naga City and 10 LGUs are dependent at Mt Isarog National Park for household, commercial, hydropower, recreational and irrigation. 70% (2013) overall management effectiveness is aggravated by the continuous conversion of buffer zones, illegal intrusion logging. This have threatened wildlife habitat such as Isarog shrew rat is vulnerable (IUCN red alert), whiskered pitta as nearly threatened and Philippine cockatoo as critically endangered (Haribon). Despite the co-management agreement where policy enforcement differs. Climate change worsens the situation by:

Climate Fragility Statement			
Climate Risk 1: Increased Precipitation	**Climate Risk 2: Increased Temperature**	**Climate Risk 3: Rising Sea Level**	**Climate Risk 4: Extreme Events**
Alteration in water holding capacity which will limit ability regulate water flow and increase erosion.	Affects forest cover, capture urban heat and carbon sequestration. Forest fire incidence.	Saline intrusion to river tributaries which affects water use.	Flash flood with fallen trees hasten erosion, damage properties and cause death or injury.
Decrease/overflow of water affecting upland barangays and other LGUs nearby Mt. Isarog river tributaries	Change nutrient content of water may affect agriculture productivity and cause health issues.	Contamination of ground water reservoir	Drinking water and irrigation will be disrupted and water contaminated.
Flooding and dry spell will affect Natural Springs & Water falls and thus, the eco-tourism.	Bio-diversity loss and will affect bio-culture (i.e. herbal healing) and habitat of the indigenous people.	Increase dependence on water from upstream due to saline intrusion in the lowland	Natural springs and water falls may be eroded or completely vanish.

Table 9: ECOSYSTEM CLIMATE CHANGE FRAGILITY ANALYSIS

Urban System – Energy

Current issues faced: Naga's energy system is dependent on a single supplier, thus making it unreliable and unsustainable. Alternative sources of energy are costly with limited information, incentives and partnership mechanism. The energy demand on fossil fuels has the highest rating with households as the biggest emitters according to the study of Community GHG Emission conducted. Climate change add to the following fragility:

Climate Risk 1: Increased Precipitation	Climate Risk 2: Increased Temperature	Climate Risk 3: Rising Sea Level	Climate Risk 4: Extreme Events
Temporary cut off of power supply and increase maintenance cost of transmission lines, and etc.	Warmer days will result to higher energy demand and will cause to power shortage.	Flooding of lowland areas will result to cut-off of power.	Power disruption and destruction of transmission lines.
Humidity increases moisture inside buildings and residences making susceptible to fire incidence.	Increase in urban heat will increase energy demand by residents, offices and commercial establishment.	Need to increase water pumps to remove water from the city in case of flooding.	Blackout by residences, offices and other commercial establishment. Increase use of generators.

Table 10: ENERGY SYSTEM CLIMATE CHANGE FRAGILITY ANALYSIS

Urban System - Environment Health

Critical Issues faced: Absence of ecological landfill, waste water, septage facility and chemical farming run-off have contributed to pollution of rivers, creeks and ground water reservoir. This is excluding GHG emissions were waste management is the 3rd biggest source. Bad smell emits in the evening reaching a 10 kilometer radius. The absence of a waste management system by other municipalities has resulted to illegal dumping of garbage at the boundaries of Naga City. While the city has espoused biological treatment to treat leachate and improved water quality, the UPOP contaminant needs to be addressed. Climate change shall increase the vulnerability on the following :

Climate Fragility Statement			
Climate Risk 1: Increased Precipitation	Climate Risk 2: Increased Temperature	Climate Risk 3: Rising Sea Level	Climate Risk 4: Extreme Events
Ascerbate water pollution, increase water-borne diseases and fish catch decline in downstream Naga River.	Pollution of water supply annd decrease in quality of fresh water source. Increase air pollution due to gas emissions and bad odour.	Increased contamination to ground water reservoir due to frequent flooding.	No safe water available due to heavy floods. Chaos on hazardous waste & the volume of waste to be disposed

Table 11: ENVIRONMENT SYSTEM CLIMATE CHANGE FRAGILITY ANALYSIS

Urban System – Land

Critical Issues Faced: Absence of a provincial physical framework plan is an issue. Based from the ENRA result, Increasing population and urban sprawl have diminished open spaces due to conversion of agricultural areas. Naga City is food deficit with 15% of the agricultural areas in the city are exposed to more than 1.5m flood depths. While this 32% of the city's total land area is exposed to slight erosion. It is Naga City's mandate but requires inter-LGU collaboration required including the national government agencies support. Climate change poses further vulnerability due to the following:

Climate Fragility Statement			
Climate Risk 1: Increased Precipitation	**Climate Risk 2: Increased Temperature**	**Climate Risk 3: Rising Sea Level**	**Climate Risk 4: Extreme Events**
Damage to crops, increase in pest, difficulty in transport of various food products due flooded roads.	Poor agricultural yield since due to changing temperature. Shortage and High cost of food	Saline intrusion to low land farming areas which means low production yield.	Destruction to crops will lead to poverty. Lack of alternative route will lead to food shortage.
Short but severe drought stresses water table and the incease flood incidence will cause liguefaction.	Increase in urban heat, liguifaction and soil erosion.	New technology required and massive budget for the anti-flood and drainage infrastructure retrofit	Severe flooding and destruction of properties and infrastructure

Table 12: LAND CLIMATE CHANGE FRAGILITY ANALYSIS

Urban System - Public Safety and Security

Critical Issues Faced: Increasing population and economic growth has compromise the security and safety of Naga City residents. This requires increase support in equipment, skills, budget for operations and manpower for inter-LGU or TWG joint operations as impact of climate change worsens There is also need to connect road networks to enable movement in extreme event. Increasing felt impact of Climate change will challenged the existing practice due to the following implications:

Climate Fragility Statement			
Climate Risk 1: Increased Precipitation	**Climate Risk 2: Increased Temperature**	**Climate Risk 3: Rising Sea Level**	**Climate Risk 4: Extreme Events**
Severe drought and flooding will affect health conditions of residents and corresponding increase in emergency cases.	Increase in fire incidence. Decrease in agriculture and fishery sector income will contribute decrease in income of local businesses in Naga	Frequent yet severe floods will cause trauma to its residents and higher level of disaster preparedness.	Chaos due to the magnitude of disaster relief operations required. This is excluding incresae in poverty, security and social issues due to

Table 13: PUBLIC SECURITY AND SAFETY FRAGILITY ANALYSIS

Urban System – Shelter

Critical Issues Faced: Economic growth has resulted to expensive real estate prices. As such, it has made housing unaffordable resulting to increase in illegal settlers and shortage in urban poor housing. More pressure to convert upland agricultural areas to residential areas. Climate change will further aggravate the situation by:

Climate Fragility Statement			
Climate Risk 1: Increased Precipitation	**Climate Risk 2: Increased Temperature**	**Climate Risk 3: Rising Sea Level**	**Climate Risk 4: Extreme Events**
Cheaper and affordable housing on areas that is flood prone. This will increase land prices on the upland areas which are agri-land.	Hotter temperature inside houses causing health issues to residents. High incidence of fire to closely built houses.	Settlers at easement areas will be highly vulnerable to floods. More barangays and therefore, households will be flooded.	Huge destruction of properties where 80% of Naga City may be flooded.

Table 14: SHELTER CLIMATE CHANGE FRAGILITY ANALYSIS

Urban System - Water

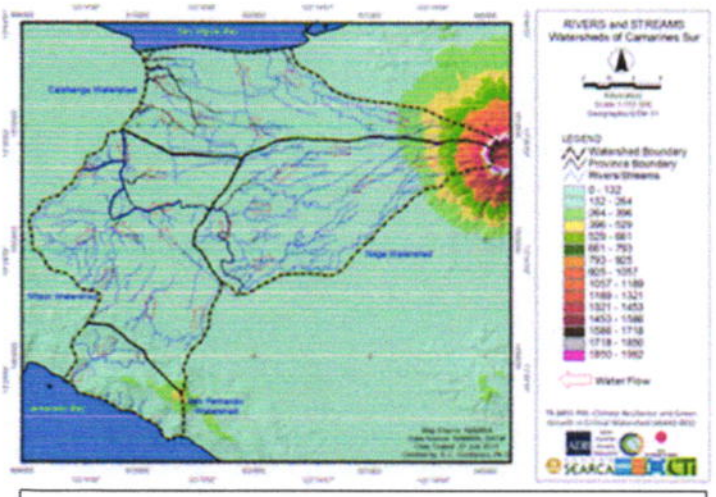


Figure 14: WATERSHED OF CAM. SUR SHOWING DIRECTION OF FLOW OF WATER

Critical Issue faced: Naga City's surface water recharge is only 49.6% due to ground water extraction of MNWD with water supply is extremely vulnerable. Proportion of population without access to potable water shows six (6) barangays with a high percentage of population without access to potable water supply (41-60%). Illegal infrastructure along the easement area and absence of an updated integrated flood management system have affected natural flow of storm water. As it is in the mouth of ulation of the city is affected by flooding of different depths. The said issue is linked with the eco-system approach and will require inter-LGU collaboration and support from NGAS.

The vulnerability of Naga City and the need to address the water shed approach is shown in Figure 3-4: Water from Milaor watershed still goes into the Bicol River connect to Naga River and flows out to San Miguel Bay. This is aside from Sagop Creek that captures residual flooding from Camalig. Climate change will contribute to:

Climate Fragility Statement			
Climate Risk 1: Increased Precipitation	**Climate Risk 2: Increased Temperature**	**Climate Risk 3: Rising Sea Level**	**Climate Risk 4: Extreme Events**
Decrease in water quality due to contamination of pathogens, salination and microbes.	Decrease in water supply which means Naga City has to find other drinking water source.	Contamination of ground water reservoir due to frequent flooding	Cut of of water supply since it is dependent on electric power
Increase in flooding during rainy season but creeks and rivers dry up during dry season	Decrease in water supply due to evaporation of ground water.	Risk to water logging and new areas will be flooded	Naga City will be an island with flood waters coming from Sorsogon, Buhi and Mt. Isarog

Table 15: WATER SYSTEM CLIMATE CHANGE FRAGILITY ANALYSIS

ADAPTIVE CAPACITY ASSESSMENT

This analysis provides an information on how the city will make choices, respond to opportunities including the rules of practice of various institutions and relationship between the various stakeholders, institutional arrangement and the system itself. As identification of adaptation measures based on the urban system, it went as far in where projects that are going to be located in barangays that have high level of exposure of areas and population will be prioritized, not only inside Naga but as well as outside Naga City and its neighboring town. The level of exposure of barangays and population *(Cabrido, 2013)* assessment was iterative bearing in mind the limitations

of LGU capability and funding availability. Critical questions was added all over again: a) Level of vulnerability; b) Frequency; c) Extent or magnitude of the possible damages; Adaptive capacity measures of LGU in place. The barangays with less of these adaptive capacity measures in place will be given higher priority.

URBAN SYSTEMS SCANNING

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

- Economic: availability of financial resources to undertake necessary action that system;
- Technology/ Infrastructure: capability of actors, capacity of infrastructure and technologies being adopted for that system to address future climate risks;
- Governance: Coordination among relevant actors; clear functions and authority of responsible entity? Is there sufficient support from higher levels of government? Are the stakeholders coordinated and supportive of necessary change?
- Social: community awareness and engagement, does the community have the understanding and resources necessary to play their part in this system? Does the system have in-built mechanisms to incorporate community and user input and feedback? Does the system recognize the needs of poor and vulnerable groups in the community?
- Ecosystems: What is the capacity of this system to protect or restore the ecosystem? Is there adequate understanding and data about the current status of the different ecosystems within the city, their strengths and weaknesses?

Urban System	Adaptive Capacity				
	Economic	Technology	Governance	Social	Ecosystem
Ecosystem - Wastershed	Low: co-management agreement with other LGUs; PES PP	Medium: but researches need to be funded by national government	Low: There is a need to talk with other LGUs and provincial government role is important	High: Naga City protection Low:other LGU residents on illegal intrusion.	Low. With a need for a ridge to reef planning that goes beyond city mandate.
Energy	Low: Renewable sources of energy is expensive	Medium: Availability of service providers in the city but still limited	Medium: There is a lack of incentives locally for renewable energy.	Low: Limited awareness of renewable energy	Low. The highest GHG emission is energy consumption from households.
Environment health	Low. Is costly to the city with a long term return of investment	Low. Limited proven technology in the country for energy capture. Link UPOP contaminant as public health issue	High. It is a fully devolved function.	Low: Poor practice of 3-Rs. High: increasing demand from residents	Medium. high environment mitigative measures required but biological treatement used
Land (land use, agriculture and built environment)	Low. Need infrastructure retrofit. Unwilling to adopt to organic farming due to high labour cost.	Low. Absence of Low impact development. Needs access to more user-friendly organic farming inputs.	High: Technology support by agriculture. Low in support from DPWH - no EMS.	Low. Need more environment awarness IEC for residents.	Low: environment mitigative measures required - shift to green growth, low impact development
Public Security and Safety (health, DRRMO and security)	Medium. Need external support due to climate change refugees and inter-LGU collaboration	Medium. Highly subsidized technical support. Community based rehabilitation needs to be in place	High. It is a devolved function with collaboration from NGAS clearly defined.	High: local residents are participative	Medium. DRRM needs to be linked as an environment, physocial and not just infrastructure and humanitarian. (Preventive)
Shelter	Low. Costly for city due to expensive land value including cost of relocation.	Medium. Technology available	High. Functions clearly defined.	Low. Poor repayment. High on demand	Low. Public land and easement area intrusion
Water (water supply, flooding and drought)	Low. Expensive to find other sources or use other technology	Low. Limited availability of technology.	High. Functions clearly defined.	Low. Poor on water conservation. High on demand	High. Needs region wide approach as Naga City is in the catchment basin.

Table 15: ADDRESSING ADAPTIVE CAPACITY OF URBAN SYSTEMS

IDENTIFYING VULNERABLE ACTORS

Based on the results indicated above, who and how many are the vulnerable stakeholders in each barangay? Intervention may be redundant since issues are inter-linked.

Specific Issues by urban system		Potential CC intervention	Area	Urban Actors	
				Vulnerable Actors	Supporting Actors
Ecosystem, Wastershed**					
6 or 22% barangays are exposed to landslides, 4% of the total area and 1% of population affect; flash flood, water source for irrigation and domestic for 4 LGUs.	1.1	Establish bio-retention dams in upland area to prevent flashflood	Panicuason, Cararayan, San Isidro, Pacol, Boundaries of Pili, Calabanga (Yabo, Inarihan, Animas, Panicuason, Langon)	Farmers, Tenants, Residents	DENR/DA/DAR NGOs, MNDC, Academe, CSR
	1.2	River Slope stablization and urban reforestation using bio-engineering methods		Farmers, Tenants, Residents	
	1.3	Establish a fire wall near Calabanga side to prevent forest fire and protect watershed		Upland Residents of Naga, Calabanga, Canaman, Magarao	
Expand diminishing buffer zones and wildlife habitat, Forest lands to landslide, in 4 barangays are highly vulnerable to drought	1.4	Expand reforestation to least 200 Ha in water shed area including river bank			
	1.5	Expand Reforestation in river banks in yabo, inarihan and dancanan creek	4 upland barangays	Riverbank illegal settlers	
	1.6	Barangays area declared as low impact deveopment zone (eco & agri-tourism)	4 upland barangays	Small farmers and farm laborers	DOT, DTI, DENR, DAR
Land (land use, agriculture and built environment)**					
1% of total land area is xposed to liquefaction; 2 barangays land area 100%) exposed to quefaction. 41% of total opulation affected	2.0	Strictly enforce local building code	upland brgy, san felipe, del rosario dayandang, mabulo, Cgrande & pequena, triangulo, balatas	all residents	UAP, IEE, MNCI
	2.1	Implement cc resilient and green building code		MSE's	HULRB, UAP
	2.2	Enforce easement area/hazard zone		MSE's	DPWH, DENR
	2.3	Green planning or Sustainable City Planning ;	All barangays	MSE's	UAP, UP, DENR
	2.4	Ridge-to-reef sustainability plan	Towns of Mt. Isarog	all residents	CCC, DENR
5% of the total griculture areas xposed to flooding are ffected by deep floods f more than 1.5m depth. wo barangays have ore than 74% of their otal agricultural areas xposed to deep ooding.All eleven 11 griculture crop areas re moderately ulnerable to flood, rought, typhoon, soil rosion and pests and iseases:	2.5	CC adoptive Agriculture: Provide technology and value chain financing	Carolina (Upland/Hilly), San Isidro (Upland/Hilly), Cararayan, Pacol (Upland/Hilly), Panicuason (Upland/Hilly), San Felipe, Mabolo, Balatas, Concepcion Grande, Del Rosario, and Concepcion Pequeña	Urban poor, farmers, tenants, low income and middle class residents, PWDs	DA, DAR, CBSUA
	2.6	Diversity crops for ecological stability and resistance against pests and diseases;			
	2.7	Use of SALT technology and soil and water conservation farming practices (i.e. terracing)			
	2.8	Promote extensively IPM			
	2.9	Cultivate flood tolerant species of crops such as rice or drought - upland rice			
	3	Improve or construct natural or artificial irrigation cum drainage facities			
	3.1	enforcement of land conversion regulation; update of CLUP			
	3.2	Promote organic farming, high value crop and improve flower industry			

Public Safety, security and shelter					
3 important physical acilities are exposed to looding. 50 facilities are xposed to liquefaction, bridges 46 schools are xposed to flooding; and 4 schools to liquefaction	5.1	Retrofit of Bridges	3 bridges		DPWH
	5.2	Propose retrofit/construct of CC resilient & inclusive evacuation areas. Lessen density of relocation areas	Selected areas	residents	DPWH, NGOs, CSR
	5.3	Support private sector in CC Retrofit buildings located in highly liquefaction prone areas;	All barangays	Micro and small	DTI, DPWH
	5.4	Inclusive and multi-layered social protection program	All barangays	urban poor, farm laborers	MFIs
	5.5	Enhanced Early warning, evacuation and emergency response program & IERP	all barangays	barangay officials	CSR
	5.5	Enhance disaster preparedness, emergency response and rehabilitation program (inclusive, community based and metro-wide)	all barangays	PWDs, Senior Citizen	CSR, Academe, Donors
	5.5	Community Based Post Disaster Rehabilitation & Trauma Project (Inclusive CBRP)	All barangays	PWDs, Senior Citizen	CSR, Academe, Donors
	5.6	Improve communication for health monitoring Project	upland barangays		
ame in flooding w/ Vater resources of 2 arangays are highly ulnerable to flood.	5.7	Decrease density of urban poor resettlement areas	Mabolo, Triangulo	Urban Poor	CCC,DPWH
	5.8	Improve urban poor resettlement areas for CC retrofit in lowland brgy	CLUPA, Abella, Lerma, Triangulo	Urban Poor	CCC,DPWH
	5.9	Resettle households in easement areas	Mabolo, Triangulo	Urban	CCC,DPWH
Others: Transport, Energy and MSMEs					
High incidence of high blood, heart attach due to intense summer heat . High GHG emission on energy consumption	4.0	Renewable energy Project with MFIs	All barangays	willing residents	
	4.1	Downtown City Greening Program: Green Walk & pilot test Low impact Development	Panganiban, CBD II, Plaza, City Hall	NAP	
	4.2	IEC on energy conservation, LID and others	All barangays		CNPC, UAP
	4.3	Expand e-trike project			
	4.4	Database on GHG monitoring and its update	All barangays		
27% of total road length is exposed to flooding; and 7% to liquefaction	4.5	Develop alternative road program in the upland and lower boundaries	Upland barangays; pili canaman		
	4.6	Improve multi-mode transport (bike, boat, walk and motor)	All barangays	all residents	
	4.7	Improved drainage program	downtown brgy	its residents	DPWH, DENR-EMB, consultants
	4.8	Update integrated flood management master plan			

Water (water supply, flooding and drought)**					
To ensure access to safe water during prolonged el nino	6.4	Implement water treatment Facilities	selected pollutors point	Market, other large ICIs	
	6.5	Implement water harvesting technology and multi-water use	All barangays	ICIs and residents	DeNR
17 or 63% of the total number of barangays have 90-100% of their area exposed to flooding. Total population affected is 61% of the city's total population	6.6	Expand enforcement easement and buffer zone regulations	riverside and creek side brgys	ICIs and residents	DeNR-EMB
	6.7	Desilt and declog canals (Note: on-going preventive maintenance measures)	All barangays	all residents	
	6.7	To establish a storm water construction wetland as a multi-function flood control structure	mabulo and abella	displaced residents on the said site	DeNR-EMB, CCC, DPWH
	6.8	Establish multi-functional drainage system and creek rehabilitation (anti-flood, natural filtration and surface water recharge)	sagop creek, dinakdakan creek	Urban poor MSEs, women, children, PWDs	MNWD, DILG, NGOs, MFIs, DENR, DPWH
Environmental Health					
High incidence of water borne disease. WQMA. howed geometric mean of fecal coliform with high values from 420,280 to 6,710,255 MPN/100ml which indicates fecal contamination of river;Twelve of the 27 barangays have moderate vulnerability to a diarrhea outbreak; 23 barangays have moderate vulnerability to an outbreak of dengue fever / dengue hemorrhagic fever		Continue and expand biological treatement procedure (bio-enzyme, bokashi) to water bodies and landfill	pollutors point, SLF	downtown residents, pollutors point area	WQMA
		Establish bio-filters at selected polluters point	pollutors point, SLF	selected residents	WQMA
		CC related health issues	All barangays	all residents and ICI	DOH
		Establish an HHE-waste Facility	San Isidro	its residents	
		Strictly enforce on IC's and subdivision compliance to establishment of SWM system and/or water treatment facility	All barangays	all resients	with Task force comet
		Improve IEC on CC related issues	All barangays		
		Re-train BRW on CC related issues	All barangays		
		implement Community based rehabilitation system	All barangays	all residents and ICI	MNCCI, CSOs and others
		Implement clean water source			With MWDC

Table 16: VULNERABLE ACTORS AND PROPOSED INTERVENTIONS

CHAPTER IV: PLAN OBJECTIVES

Linkage to the CDP and other national policies

With the various assessment, studies and techncial support provided, the consolidation of the various validation workshops resulted to: a) Enhancement of existing programs indicated in CDP which resulted to identification of new project activities; b) Change of priority to the magnitude of impact/vulnerability of stakeholders; c) prioritization of is doable in the next 10 year period based on existing (local and national) capacities, d) Identification of the funding and technology gaps required including LGU mandate based on prioritized projects/programs.

SUMMARY OF CLIMATE CHANGE ISSUES TO BE ADDRESSED

Hazard risk to barangay, population, physical assets, built-up and agriculture areas

To improve human security by:

- Ensuring that people are able to evacuate to safe areas & emergency needs are met
- Retrofitting schools exposed to deep flooding or build new ones on safer grounds
- Relocate residents occupying houses and buildings highly exposed to landslides to safe sites
- Regulate the expansion of settlements in areas at high risk to landslides
- Strictly enforce road easement and relocate informal settlers

To improve public safety and security by:

- Encourage construction of earthquake and liquefaction resilient buildings and infrastructure
- Retrofit and install safeguards in physical facilities exposed to deep flooding and liquefaction
- Retrofit bridges exposed to flooding and liquefaction or build alternative ones in safer sites
- Improve road drainage using alternative technology as appropriate.
- Identify and construct alternative routes if flooding cannot be controlled
- Zone new safe areas for urban expansion and development
- Establish safeguards against potential impacts of liquefaction

Climate change vulnerability to development sector

Agriculture sector

- To reduce crop vulnerability to various climate change impacts through improve farming practices and adoption of appropriate technologies.
- To reduce flooding in agriculture areas and an all-year round irrigation access.
- To plant crop varieties tolerant to floods or adjust cropping calendar in deeply flooded areas
- To improve provisions of cc related safety nets and access to a variety of financing products.

Health

- To reduce factors triggering and medical services diarrheal diseases, dengue and leptospirosis
- To improve access to psycho-social support to PWD's and women & its caregiver
- To improve waste segregation practice and other contaminates that will aggravate public health issues
- To improve infrastructure triggering urban heat and indirectly address increasing morbidity.

Forestry

- To identify and undertake measures to conserve soil and control soil erosion.
- To provide alternative livelihood to upland farmers
- To identify and undertake measures to reduce flooding in forest areas, stabilize landslide prone areas.
- To identify and undertake measures to improve water retention in forest watersheds
- To institute measures to prevent wildfires in droughty forest areas
- To address diminishing forest/buffer zones by expansion of wildlife habitat through rehabilitation of rivers and creeks, urban greening program and designation of barangays as low density development.

Transport

- To undertake measures to reduce flooding in roads and alternative routes for road construction
- To undertake measures to stabilize landslide prone areas
- To provide a multi-mode transport system anchored on the existing mode of public transport (*padyak*, jeepney, tricycle).

Water Sector

- To identify and develop water conservation and harvesting technologies, improve surface water recharge by introducing low impact development technology.
- To undertake measures to reduce exposure of water supply resources to flood
- To stabilize slopes prone to landslides and build alternate routes
- To reduce flooding in deeply flooded areas through flood control and drainage infrastructures

Addressing greenhouse emission

- To identify and undertake measures to reduce GHG emissions and improve sequestration
- To develop and institutionalize a data reporting system on energy consumption by industries, transportation, commercial and residential establishments
- To generate research information on the chemical processes adopted by IPPU industries
- To calculate GHG inventory based on reliable and complete data, especially from the Industries.
- To develop and institutionalize a data reporting system on energy consumption by industries, transportation, commercial and residential establishments
- To enhance the city's natural environment's capacity to absorb GHGs

LCCAP GOALS, OBJECTIVES AND OUTCOMES

	Results	Performance Indicators	MOV	Risk & Assumptions
	***Goal**: Sustainable development promoted through increase resilience of vulnerable sectors and the urban systems*	*Tonnes of carbon dioxide equivalent (t CO2eq) reduced	GHG Monitoring Report	
		% decrease in poverty level. Indicator: Household living below the poverty threshhold	CBMS Report	Force Majeure (e.g. act of nature) impacts investment
		% Decrease on incidence of water-borne CC-sensitive diseases.	CBMS, CHO Report	
		Reduced morbidity. Indicators: General Medical Consultation Rate (GMR), Hospitalization Rate (HR)	CBMS Report, CHO Report	
	***Objectives:** Reduced impact of climate change induced shocks in Naga City due to increase capacities of communities in the mitigation and adaptation activities.*	Decrease in energy intensity residences, institutions & businesses	GHG Monitoring Report	Government regulations and policies that facilitate growth and stability of LGUs and CC
		Reduced emission due to increase of low-carbon/non-motorized transport	GHG Monitoring Report	
		Reduced emissions from increase application of bio-diversity conservation	GHG Monitoring Report	
		Reduced emissions from increase application of sustainable land management methods	GHG Monitoring Report	
		Total No. of lives to be saved from disruption due to climate-related disasters	CSWD & DRRMO Report, M & E Report	Ffavourable Political climate in supporting CC programs
		Number of men and women benefiting from the adoption of diversified climate resilient livelihood options	PESO, CAGo, DSWD Report	
1	*Resilient communities through available improve food security & ecosystem ensured*	# of Appropriate technologies on IWRM, CCA and mitigation adopted	CDPO Report	Availability of techical support from NGAs
		Quality and diversity of the financial services offered	CAgO and PESO Report	
		600 HA. of improved land quality through soil/water conservation methods (Indicators: NPK Level)	CAgO - M & E Report	
		Increased Recreational value of restored ecosystem (marketability & willingness to pay)	Acto Report	
		% decrease in barangay/population susceptible to landslide, flood and liguefaction	DRRMO	
		% increase in surface water recharge	ENRO report	
2	*Reduce hazard through integrated water resource management practice established*	Increase in temporary retention areas (vol. Of storm water reduced or peak flow control)	DRRMO Report	Extreme weather condition or learning curves lead to delays
		% increase of expanded wildlife habitat:	CeNRO Report	
		Improved in water quality & availability: *changes in aquifer levels, vol. of reduction in water wastage, water pollution/turbidity (TDS)*	CeNRO Report	
		% decrease in barangays experiencing flooding for more than 24 hours	DRRMO Report	
		% savings (or avoided costs) from traditional water drainage infrastRucture	CEO Repot	

3	*Reduced risk of men and women to worsening climate change impact and disasters (Human Security)*	Recovery period (no. of days) and the degree of efficiency with which recovery is carried out	DRRMO Report	Budgetary limitations of city due to frequent disaster
		Decrease in Density per square meter urban poor resetlement site; No. of informal settlers relocated	CBMS report	
		% increase in access to inclusive community-based rehability program (gender and disability segregrated)	PDAO Office	
		Number of male and female benefitting from CC related health measures	CHO Report	
4	*Climate change-resilient, eco-efficient entrepreneurs and green growth oriented city promoted*	% increase in businesses whose production processes are more environmentally friendly.	PESO Report	Quality training for certain CCIS related skills can be difficult to secure.
		Number and value of physical assets made more resilient to CC, considering human benefits	PESO Report	
		% of total waste diverted against total waste collected	SWMO Report	
		Percentage reduction in energy consumption in the various sectors	CGHD report	
		% increase in modal share of low-emission and non-motorized transport	PSO report	

Table 17: NAGA CITY LCCAP RESULTS MATRIX FRAMEWORK

CHAPTER V: CLIMATE CHANGE ADAPTATION AND MITIGATION ACTIONS

Resilient communities through available improve food security and ecosystem ensured

1. Rehabilitate and protect Mt. Isarog
    - Implement rehabilitation project including establishment of wildfire break or buffer zones.
    - Coordinate with MNDC to expand forest fire break (Calabanga & Pili)
    - Linkage with MNDC on Mt. Isarog wide protection Naga City with MNDC to lobby for Mt. Isarog Wide
    - Community Based Resource Management Program (CBRMP) utilizing Payment for Environmental Services (PES)
2. Expand buffer zone and protect Key Biodiversity Areas (KBA's)
    - Identify and delineate CC adopted ecological management zones
    - Develop framework. Plan for low density development in upland barangays.
    - Develop info-graphics on biodiversity and promote eco-tours.
    - Promote experiential tourism by establishing hiking trails (Nabontolan, Malabsay, Baby falls, Secret falls)
3. CC adaptive agricultural extension services expanded
    - Improve farm plan by integrating CCA & DRR by farmers
    - Adopt reduced tillage in agriculture sector
    - Promote Sloping Agricultural Land Technique (SALT 1 to 4) in Farm diversification
    - Adopt a greenhouse reducing emission from rice production practice- System of Rice Intensification (SRI), Alternate Wetting and Drying (RI AWD)
    - Promote Organic farming with high value crops- flowers, herbs, vegetables
4. Innovative partnership support among farmers developed
    - Implement expansion the existing demo-farm cum agri-tourism site
    - Promote a small-farm agro & eco-tourism
    - Review current credit products and develop GREEN VALUE CHAIN FINANCE with Micro Finance Institutions (MFIs)

Reduced hazard through integrated water resource management practice established

1. Multi-functional rehabilitation of Mt. Isarog River Tributaries implemented
    - Conduct of Environment and Social Standard to design Detailed Engineering and Design
    - Establish bio-retention basin in selected sites: Seventh Day Adventist, Animas River, Langon River and Naga Ecology park
    - Rehabilitate Inarihan river, Panicuason River, Yabo River, Animas River, Langon River stabilization using bio-engineering and gaia dam
    - Implementing Susog Salog with CSO , private & academe sector
2. Ecological restoration of creeks implemented and sustained
    - Establish extended storm water retention basin in downtown Naga as flood control

- Implement slope & easement rehabilitation of sagop creek- Pili boundary up to Mabulo; Dacanan creek
- Strictly implement easement regulation program and drainage program
- Promote & implement eco-cultural awareness (murals & kayaking- San Francisco to Danlugan-Eurotel area)
- Provide equipment support to eco-police

3. CC adaptive management process of flood reduction and water systems facilitated
    - Guidelines for water conservation, allocation, recycling and reuse
    - Coordinate with NAWASA and identify alternative water resources
    - Monitor hydrologic trend analysis, forecasting, and detecting shifts and trends of precipitation and streamflow
    - Design a CC proof integrated flood management master plan
4. LID technology promoted at community level established
    - Technical support in the enactment of local green building code
    - Promote LID guidelines/toolkits partnership with UAP, PICE and academe sector
    - Orientation to HH/ Commercial establishment requesting permits on green architecture
    - Orient LID (green infra) to Brokers, development, PICE, UAP, IEEE, PSME, Master Plumber, Foremans
    - Establish LID info café & demo-center in partnership with private sector groups
5. Group water management and practice by various sectors improved
    - Establish monitoring stations to include water discharges water level and water quality (WAQMA)
    - Strengthen Naga City waterways management council and BSWM council
    - Pilot test 3 waste water treatment (DEWATS) for LGU facilities (abattoir, market, NC hospital)
    - Implement waste segregation at source and CC compliant disposal facilities
    - Enhance the biological treatment and phyto-remediation activities to improve water quality

Reduced risk of men and women worsening climate change impact and disasters (Human Security)

1. Procedures and capacity for CCA-DRRMO for various sectors enhanced
    - IEC & info-graphics on CC & DRR in Naga City
    - Develop safety initiatives for various sectors based on information (institutions, CE, PWD & etc.)
    - Improve equipment for disaster rehabilitation
    - Retrofit existing vehicles and rescue boat for inclusive emergency response (IER)
    - Implement CC resilient storm drainage program
2. Management for CCA-DRRM including IER and post disaster rehabilitation improved
    - Improved systems, procedures and protocols of the Barangay Contingency and Recovery plan
    - Enhanced existing protocols on households with PWDs and special needs
    - Improved support implementation of guidelines on climate proofing lifeline infrastructure
    - Revisit institutional mechanisms from design up to monitoring of recovery programs.

- Determine implementation capacity and identity surge capacity needs and potential sources

3. System for CC related health emergency and post disaster response updated
    - Develop local health plan which integrates CCA-DRRM
    - Revisit integration of CC & DRR in training of health personnel and community workers
    - Enhanced CB rehabilitation program (trauma counselors, physiological first aid, therapist)
    - Develop a program specific to PWDs or inclusive CBRP
4. CC proofed rehabilitation and resettlement areas adopted
    - Vulnerability map revisited in each barangay and implement a long term settlement adaption plan
    - Provide incentive based upgrade of urban poor resettlement area
    - Review IRF and capacitate NCUPF leaders on its role in collection, oversight and monitoring
    - Multi-pronged technical support and CC resilient financing access provided
5. Inclusive and gender responsive relocation and resettlement areas provided
    - Install accessibility signage on critical areas
    - Assess and mainstream gender friendly & PWD resettlement for climate change refugees
    - Gender retro-fit & water harvesting facilities (JMR, Pacol Sports center, Triangulo, Sabang, Tinago, Dayangdang)
    - PWDs and other special needs: Children's home, Tinago, Maramba School, Julian Meliton)

Climate change-resilient, eco-efficient entrepreneurs and green growth oriented city promoted

1. MSME's capacities for eco-efficient production and operation facilitated
    - Implement assessment for eco-efficient production and operations and provide subsidized loans
    - Award system: Eco-label award, sustainable tourism award, GREEN seal developed and implemented
    - Provide markers on accredited establishment (green key, etc) including marketing support
    - Pilot test disaster insurance to Micro and small enterprises in partnership with an MFI
2. Implement clean fleet program
    - Conduct IEC & capacity building program on clean fleet for public mass transport
    - Implement a clean fleet management program in the LGU, NGAs and private companies
    - Train volunteers on air quality monitoring
    - Set up air quality monitoring station
3. Multi-mode transport system promoted
    - Retrofit Bicol Terminal Station, JMR coliseum, Panganiban up to Mayon Avenue (LID and walk chain)
    - Expand implementation of E-trikes and new route
    - Pilot test green waiting sheds and parking space for bike lanes
    - Facilitate study on Metro wide multi-mode transport system based on existing infrastructure framework
    - Implement the Naga River and bike transport

4. Renewable energy and energy efficiency/conservation promoted
    - Develop multi-media IEC materials on EEC measures and technologies
    - Pilot test conduct of assessment in ICI's
    - Promote incentives on market driven demand-side management- residential, commercial, industrial, transport
    - Conduct business matching with MFI, RE service providers and service users

CAPACITY DEVELOPMENT

Capacity building needs

- To institute enabling conditions to encourage investments in DRR and CCA activities at the local level
- To develop gender disaggregated data for planning, monitoring and project implementation
- To conduct safety assessment of schools and other lifeline infrastructures such as hospital and clinics
- To prepare climate change resilient design of houses and buildings in vulnerable areas
- To issue policy and undertake actions to ensure the participation of women in LCCAP preparation
- To prepare training modules and undertake training courses on various aspects of CCA and DRRM
- To sustain the training program initiated by TA 8493
- To institutionalize an M&E system for CCA and DRRM involving various offices of the city
- To mainstream gender concerns in the planning and project implementation of CCA and DRRM
- To institute early warning system and reliable alert communication system
- To develop GHG data base and form trained GHG management team
- To improve skills on spatial planning and mapping. This includes best practice in urban planning.
- To improve skills in detailed engineering design in particular those related to low impact development and bio-engineering as the city wants to go GREEN.
- To improve technical M & E skills

Legislative Requirement

Regulatory Enforcement

Critical is the need to improve capacities for oversight of the eco-POLICE and other environment boards improved The need to coordinate with relevant government agencies and CSOs to conduct capacity building, There is also a need to provide equipment's for monitoring even to volunteers group.

The need to use the Citizen engagement (I-SERVE Initiative) through SMS with multi media data capability & on-line feedback expanded. Improve application and hardware for (online and SMS application) for # I-SUMBONG initiatives Campaign to use #I-Sumbong (establish billboards, TV & Radio advertisement) Hotline to track response/provide feedback to respondents. There is a need to Identify policies/initiatives

that needs thin approach (on-line feedback from various stakeholder. Develop multi-stakeholder internet public policy dialogue - online discussion boards, etc.

Local legislation on Water Management resources and Conservation reviewed, repealed, amended and/or enacted

Policies and incentives on various LID technologies to address improved surface water re-charge and quality developed. Ordinance on the underground installation of waste water treatment in commercial areas & subdivisions implemented. Ordinance on soak wells for households should be mandatory. Improve resource taxation policy at source and polluters pay principle. Implement time-limited groundwater abstraction licenses to provide flexibility to respond to changing climate conditions

Local legislation on ecosystem protection and food availability reviewed, repealed, amended and/or enacted

Policy on extractive and polluting industry expanded/updated. The need to update polluters pay principle for pollution management. The implement an ordinance banning intensive tillage and chemical farming in upland barangays. Designation of upland barangays as ECO-Barangay or low impact development pursued.

Local legislation supporting operations services to be eco-efficient and green economy enacted

Policies to encourage and retain climate-smart businesses and enterprises, energy efficiency, green building and others. Green Architecture/Infrastructure implemented. Integrate triple bottom line in user' fee. Implement selected materials ban. Implement economic incentives for the ISSWM framework.

Local legislation decreasing dependency on fossil fuels and low emission planning and development enacted

Design incentive system, from the Clean Air Act and Pollution Law, for mass transport and company fleet for clean fleet program. Building to designate bike parking, green walk, etc Green Building Code Implemented

Gender Mainstreaming

A rapid examination of the LGUs' latest Gender and Development (GAD) Plan and Budget (GPB) do not show programs/ projects/ activities targeting the mainstreaming of gender in CCA. A few are indicative of gender mainstreaming in DRRM. Key reasons for this limitation include the lack of awareness and understanding as to how to integrate gender into LGU-led initiatives that can be classified as CC response and DRRM. A major issue identified by the TWG is the availability of appropriate data – in this case – sex-disaggregated data at the very least to facilitate the planning for targeted constituents in the light of climate change adaptation (CCA) and disaster risk reduction and management (DRRM). Interventions in terms of trainings and seminars for LGU personnel were also suggested. Among those that were mentioned as necessary across the different LGUs are:

- Gender Literacy Training (GLT);
- Gender Sensitivity Training (GST); and,
- Gender-sensitive and responsive planning in general, and for CC and DRRM in particular
- Mainstreaming in VA, DRA, CCA and DRRM – although, there are initiatives for a women sensitive facility retro-fit including post-trauma counseling.

5.1 Results and Resources Framework

C1 Resilient communities through available improve food security & ecosystem ensured

EXPECTED RESULTS	TimeFrame ST	MT	LT	Performance Indicators	Offices Involved	Budgetary Requirement UM	Qty	Unit Cost	LGU	NGAs	Others
1.1 Rehabilitate and Protect Mt. Isarog											
1.1.1 Implement rehabilition and conversation project including wildfire buffer zones	X			*200 hectares reforested*	CeNRO	1	200	30,000.00	2,400,000.00	3,600,000.00	
1.1.2 Coordinate with MNDC to expand forest fire break (Calabanga & Pili)		X		*100 hectares reforested*	CeNRO with MNDC, DRRMO	1	100	30,000.00		3,000,000.00	
1.1.3 Linkage with MNDC on Mt. Isarog wide r protection			X	No. of LGUs strengthened	CeNRO with PAMB						
1.1.4 Naga City with MNDC to lobby for Mt. Isarog Wide CBRMP through PES			X	1 Watershed rehabilitation Plan for Mt. Isarog, 1 CADT provided	CeNRO, MNDC, DENR						
					Subtotal				2,400,000.00	6,600,000.00	-
1.2 Expand buffer zone and Protect KBA's											
1.2.1 Identify and delineate Cc adopted ecological management zones	X			*Ecological management zone delineated*	DENR						
1.2.3 Develop framework. Plan for low density development in upland barangays		X		*At least 2 barangays designated as eco-barangays*	CeNRO, CPDO, ACTO, CAgO, DENR	10	30	1,000.00			300,000.00
1.2.4 Develop Info-graphics on bio-diversity and promote in eco-tours		X		*No. of studies/trainings conducted*	AcTO, CeNRO						
1.2.5 Promote experiential tourism by establishing hiking trails (Nabontolan, Malabsay, Baby, Secret)		X	X	*Km of eco-trails established*	CACTO, CEO, CENRO	1	1	3,250,000.00	3,250,000.00		
					Subtotal				3,250,000.00	-	300,000.00
1.3 CC adaptive agricultural extension services expanded											
1.3.1 Improve farm plan by integrating CCA & DRR by farmers		X		*# of adjusted farms plans/new technologies*	CagO with DA						
1.3.2 Adopt reduced tillage in agriculture sector		X		*200 hectares of CCAA*	CagO with DA	1	400	15,000.00		1,200,000.00	4,800,000.00
1.3.3 Promote SALT (1 to 4) in Farm diversication		X		*No. of farmers adopting CCA*	CagO with DA	1	20	350,000.00		1,400,000.00	5,600,000.00
1.3.4 Adopt a greenhouse reducing emmission from rice production practice - SRI, RI AWD		X		*farming practice per type of technology(segregated by gender)*	CagO with DA	1	200	15,000.00		600,000.00	2,400,000.00
1.3.5 Promote Organic farming with high value crops - flowers, herbs, vegetables		X		*100 hectares converted to organic farming*	CagO with DA & MFI	1	100	25,000.00		500,000.00	2,000,000.00
					Subtotal					3,700,000.00	14,800,000.00

1.4 Innovative partnership support among farmers developed												
1.4.1	Implement expansion the existing demo-farm cum agri-tourism site		X		*No. of farmers trained on adaptation best practices*	CagO, ACTO with DA	1	1	2,000,000.00	2,000,000.00		
1.4.2	Promote a small-farm agro & eco-tourism		X		*10 small farms supported*	CagO, ACTO w/ DA	1	10	400,000.00			4,000,000.00
1.4.3	Review current credit products and develop GREEN VALUE CHAIN FINANCE with MFIs			X	*Quality and diversity of the financial services offered*	CAgO, Peso, MFIs	1	200	25,000.00			5,000,000.00
1.4.3	Facilitate partnership options with an MFI and conduct orientation with accredited MFIs			X	*No. of Micro-finance institutions providing a range of services*	CAgO, Peso, MFIs						
						Subtotal				2,000,000.00	-	9,000,000.00
						Total				7,650,000.00	10,300,000.00	24,100,000.00
									Grand Total	(PhP)		42,050,000.00

C2 Reduce hazard through integrated water resource management practice established

EXPECTED RESULTS		TimeFrame ST	MT	LT	Performance Indicators	Offices Involved	Budgetary Requirement UM	Qty	Unit Cost	LGU	NGAs	Others
2.1 Multi-functional rehabilitation of Mt. Isarog River Tributaries implemented												
2.1.1	Conduct of ESS to design DED		X		*ECC clearance provided*		1	1	3,500,000.00		3,500,000.00	
2.1.2	Establish bio-retention basin in selected sites: Seventh Day Adventist, Animas Rive, LangonRiver and Naga Ecology park		X		*100000 m3 of bio-rentension basin built*	CeO, CeNRO, DRRM0, CagO, Assesors, HSDO	2	50000	3,200.00	32,000,000.00		288,000,000.00
2.1.3	Rehabilitate Inarihan river, Panicuason River, yabo River, Animas River, Langon River Stabilization using bio-engineering and gaia dam		X		*50000 liner meters of river tributaries with ecological rehabilitation*		1	50000	2,225.00	11,125,000.00		100,125,000.00
2.1.4	Implement Susog Salog w/CSO, Private & Academe sector		X		*No. of campaigns strategy per sector conducted*	CeNRO, CEO, SWMO, CPDO						
						subtotal				43,125,000.00	3,500,000.00	388,125,000.00
2.2 Ecological restoration of creeks implemented and sustained												
2.2.1	Establish extended storm water retention basin in downtown naga as flood control		X		*10000 sq. m of storm water constructed wetland*	CeNRO, CEO, SWMO, CPDO, Assesors Office	2	50000	4,800.00	48,000,000.00	240,000,000.00	192,000,000.00
2.2.2	Implement slope & easement rehabilitation of sagop creek - Pili boundary up to Mabulo; dancanan creek		X		*79000 lm rehabilitated (hard and soft engineering)*		1	79000	2,189.00	17,293,100.00	86,465,500.00	69,172,400.00
2.2.3	Strictly implement easement regulation program and drainage program			X	*15000 linear meters of canals rehabilited/established*		1	15000	2,089.00	3,133,500.00	15,667,500.00	12,534,000.00
2.2.4	Promote & implement eco-cultural awareness (murals & kayaking - San Franscisco to Danlugan-Eurotel area)		X	X	*1000 LM of eco-cultral, 3 river kayaks*	Acto,CeNRO	1	1000	500.00	500,000.00		
2.2.5	Provide equipment support to eco-police		X	X	*Equipment support provide*	Acto,CeNRO	1	1	750,000.00	75,000.00	675,000.00	
						subtotal				69,001,600.00	342,808,000.00	273,706,400.00

2.3	**CC adaptive management pocesses of flood reduction and water systems facilitated**												
	2.3.1	Guidelines for water conservation, allocation, recycling and reuse		X		*IEC for WCARR conducted*	CeNRO, NaWASA, DENR						
	2.3.2	Coordinate with NAWASA and identify alternative water resources		X		*No. of*	CeNRO, NaWASA, DENR						
	2.3.3	Monitor hydrologic trend analysis, forecasting, and detecting shifts in trends of precipitation and streamflow.			X	*LCCAP of Nawasa integrated in CLUP*	DENR and DRRMO						
	2.3.4	Design a CC proof integrated flood management master plan	x			*1 integration flood management plan developed*	CeO, CeNRO, DRRMO	1	1	7,000,000.00	700,000.00	6,300,000.00	
							subtotal				700,000.00	6,300,000.00	-
2.4	**LID technology promoted at community level established**												
	2.4.1	Technical support in the enactment of local green building code		X		*1 policy drafted*	CeO, CPDO, CenRO						
	2.4.2	Promote LID guidelines/toolkits partnership with UAP, PICE and the academe sector		X		*No. of LID guidelines/toolkits developed;*	CeO, CPDO, CenRO	1	4	150,000.00	60,000.00		540,000.00
	2.4.3	Orientation to HH/Commercial establishment requesting permits on green architecture			X	*1000 HH/CE adopted LID at varying degree*	CEO						
	2.4.4	Orient LID (green infra) to Brokers, developmers, PICE, UAP, IEEE, PSME, Master Plumber, Foremans			X	*No. of green infrastructure training conducted*	CEO, CPDO	1	1000	150.00	15,000.00		
	2.4.5	Establish LID info café & demo-center in partnership with the private sector groups		X		*1 LID info cafe established, 2 demo-site established*	CeO	1	1	10,000,000.00	1,000,000.00		9,000,000.00
							subtotal				1,075,000.00	6,300,000.00	9,540,000.00
2.5	**Ground water management and practice by various sectors improved**												
	2.5.1	Establish monitoring stations to include water discharges, water level and water quality (WAQMA)		X		*No. of monitoring water quality conducted*	CENRO,	1	1	4,500,000.00			4,500,000.00
	2.5.2	Strengthen Naga City Waterways Management Council and BSWM Council	X			*Hydrolic Monitoring Station Established*	CENRO, SWMO						
	2.5.3	Pilot test 3 waste water treatement (DEWATS) for LGU facilities (abbotoir, market, NC hospital)		X		*No. of waste water treatement facilities established*	CeNRO, CEO, SWMO	1	1	8,000,000.00	5,600,000.00		2,400,000.00
	2.5.4	Implement waste segregation at source and CC compliant disposal Facities*		X		*No. of facilities installed, no. of households & iCi segregating waste*	CeNRO, CEO, SWMO						
	2.5.5	Enhance the biological treatment and phyto-remediation activities to improve water quality	X	X		*Km of water ways treated with bokashi balls, #/type of bio-*	CENRO, SWMO	1	1	2,000,000.00	200,000.00		1,800,000.00
							subtotal				5,800,000.00	-	8,700,000.00
		* included in SWMO plan					Total				119,701,600.00	358,908,000.00	680,071,400.00
										Grand Total	(PhP)		1,158,681,000.00

C3 Reduced risk of men and women to worsening climate change impact and disasters (Human Security)

	EXPECTED RESULTS	TimeFrame ST	MT	LT	Performance Indicators	Offices Involved	Budgetary Requirement UM	Qty	Unit Cost	LGU	NGAs	Others
3.1	**Procedures and capAcity for CCA-DRRMO for various sectors enhanced**											
3.1.1	IEC & info-graphics on CC & DRR in Naga City		X		*% HH aware CC-DRR protocols,*		1	142500	3.00	427,500.00		
3.1.2	Develop safety initiatives for various sectors based on information (institutions, CE, PWD & etc)		X		*# of drills conducted*	DRRMO-PSO, Liga ng Barangay						
3.1.3	Improve equipments for disaster rehabilitation		X		*# of equipments brought (including for fire/disaster SWMO)*	DRRMO	1	1	5,080,000.00	2,540,000.00		2,540,000.00
3.1.4	Retrofit existing vehicles and rescue boat for inclusive emergency response (IER)	X			*# of IER equipments brought/retrofit*	SWMO, PDAO	1	5	24,000.00	120,000.00		
3.1.5	Implement CC resilient storm drainage program	X			*No. of CC ready drainage established*	SWMO, CEO, CeNRO	1	1	100,000,000.00	20,000,000.00	80,000,000.00	
						subtotal				23,087,500.00	80,000,000.00	2,540,000.00
3.2	**Management for CCA-DRRM including IER and post disaster rehabilitation improved**											
3.2.1	Improved systems, procedures and protocols of the Barangay Contingency and Recovery plan	X			*No. of protocols developed for barangay use.*	CHO, CSSWD, SWMO	1	1	100,000.00	100,000.00		
3.2.2	Enhanced existing protocols on households with PWDs and special needs	X			*No. of protocols developed for IER*		3	81	200.00	48,600.00		
3.2.3	Improved Support implementation of guidelines on climate proofing lifeline infrastructure		X		*No. of assessment on building code compliance conducted*	DRRMO with TWG	1	1	750,000.00	750,000.00		
3.2.4	Revisit institutional mechanisms from the design up to monitoring of recovery programmes		X		*PDNA plans developed, VRA plans updated,*	DRRMO, Brgy. PEsO, CAGO, CeO, CHO						
3.2.5	Determine implementation capacity and identify surge capacity needs and potential sources		X		*# of assessment conducted*	DRRMO, Brgy PEsO, CAGO, CeO, CHO						
						subtotal				898,600.00		
3.3	**System for CC related health emergency and post disaster response updated**											
3.3.1	Develop Local Health Plan which integrates CCA-DRRM	X			*A community-based public health surveillance system implemented*	CHO, DSWD, Liga ng Brgy, DRRMO	1	1	100,000.00	100,000.00		
3.3.2	Revisit integration of CC & DRR in training of health personnel and community workers	X			*No. of orientation conducted*	CHO, DSWD, Liga ng Brgy, DRRMO						
3.3.3	Enahnced CB Monitoring, surveillance reporting system for early warning & timely response		X		*MIS System developed, texting*	CHO, DSWD, Liga ng Brgy, DRRMO	1	10000	15.00	150,000.00		
3.3.4	Establish CB Rehabilitation Program (trauma counsellors, physolocial first aid, theraphist)		X		*4 CBR centers established*	CHO, Liga ng Brgy, DRRMO	1	3	600,000.00	180,000.00		1,620,000.00
3.3.5	Develop a program specific to PWD's or inclusive CBRP		X		*135 BRW + 5 DRRMO personnel trained, no of toolkits developed*	CHO, PDaO	10	135	400.00	540,000.00		
						subtotal				970,000.00	-	1,620,000.00

3.4 CC proofed rehabilitation and resettlement areas adopted													
3.4.1	Vulnerability map revisited in each barangay and implement a long-term settlement adaption plan	X			*1 Comprehensive resettlement plan developed*	DRRMO, CPDO, CEO, HSDO	1	1	1,000,000.00	1,000,000.00		
3.4.2	Provide incentive based upgrade of urban poor resettlement areas including capacity			X	*% increase of households with cyclone-resistant housing*		1	5	5,000,000.00	2,500,000.00	22,500,000.00	
3.4.3	Implement incentive based housing loan in the New resettlement area			X	*600 HH resettled*		1	600	170,000.00	10,200,000.00		91,800,000.00
3.4.4	Review IRF and Capacitate NCUPF leaders on its role in collection, oversight and monitoring			X	*% increase in collection rate*		1	1	300,000.00	300,000.00		
3.4.5	Multi-pronged technical support and cc resilient financing access provied			X	*% increase in collection rate*		1	600	15,000.00	900,000.00	8,100,000.00	
						subtotal				14,000,000.00	22,500,000.00	93,420,000.00
3.5 inclusive and gender responsive relocation and resettlement areas provided												
3.5.1	Install accesibility signage on criticial areas		X		*% compliance to accesibility law*		3	5	15,000.00	225,000.00		
3.5.2	Assess and mainstream gender friendly & PWD resettlement for climate change refugees		X		*# of assessment conducted*	HSDO, Liga ng Brgy, NCPC, PesO, PDAO						
3.5.3	Gender retro-fit & water harvesting facilities (JMR, Pacol Sports Center, Triangulo, Sabang, Tinago, Dayandaang)		X		*# of gender retrofit*	DRRMO, CEO, Education Board	1	6	2,000,000.00	2,400,000.00		9,600,000.00
3.5.4	PWDs and other special needs: Childrens Home, Tinago, Maramba School, Julian Melton)		X		*# of evacuation center retrofitted for PWDs & others*		1	4	1,500,000.00	600,000.00	5,400,000.00	
						subtotal				3,000,000.00	5,400,000.00	9,600,000.00
						Total				41,956,100.00	107,900,000.00	9,600,000.00
									Grand Total	(PhP)		159,456,100.00

C4 Climate change-resilient, eco-efficient entrepreneurs and green growth oriented city promoted

EXPECTED RESULTS		TimeFrame			Performance Indicators	Offices Involved	Budgetary Requirement					
		ST	MT	LT			UM	Qty	Unit Cost	LGU	NGAs	Others
4.1 MSME's capacities for eco-efficient production and operations facilitated												
4.1.1	Implement assessment for eco-efficient production and operations and provide subsidized loans			X	*100 Commercial establishment assessed*	Led by DTI	1	20	50,000.00			1,000,000.00
4.1.2	Award system: Eco-Label award, sustainable tourism award, GREEN seal developed and implemented			X	*No. of livelihood opportunities and productive employment created*	DTI and Metro Peso						
4.1.3	Provide markers on accredited establishment (green key, etc) including marketing support			X	*No. of estabishment with green key*	DTI, DOT, Metro Peso, Acto	1	200	500.00	100,000.00		
4.1.4	Pilot test Disaster insurance to Micro and Small enterprises in partnership with an MFI			X	*200 of MSMEs covered*	DTI, Metro Peso	1	200	20,000.00			4,000,000.00
						subtotal				100,000.00	-	5,000,000.00

4.2 Implement clean fleet Program												
4.2.1	Conduct IEC & capacity building program on clean fleet for public mass transport		X	*No. of instiitutions oriented*	CeNRO, GSD	1	1000	150.00	150,000.00		
4.2.2	Implement a clean fleet management program in the LGU, NGAs, and private companies		X	*No. of fleets passing smoke belching test*	CeNRO						
4.2.3	Train volunteers on air quality monitoring		X	*No. of vehicles monitored*	CeNRO						
4.2.4	Set up air quality monitoring station		X	*No. of monitoring equipment*		1	1	525,000.00	525,000.00		
					subtotal				675,000.00	-	-
4.3 Multi-mode transport system promoted												
4.3.1	Retrofit Bicol Terminal Station, JMR Colleseum, Panganiban up to Mayon Avenue (LiD and Walk chain)		X	*KM of streetscape improvements (quality of walkways improved)*		1	1	10,000,000.00	5,000,000.00		5,000,000.00
4.3.2	Expand implementation of E-trikes and new route	X		*% increase of e-trikes, New routes identifed*							
4.3.3	Pilot test Green waiting sheds and parking space for bike lanes	X		*Non-motorize parking area established*		1	3	100,000.00	300,000.00		
4.3.4	Facilitate study on Metro Wide mult-mode transport System based on existing infrastructue framework		X	*No. of study conducted*		1	1	7,000,000.00	350,000.00		6,300,000.00
4.3.5	Implement the Naga river and bike transport	X		*No. of passengers*		1	15	46,000.00	345,000.00		345,000.00
					subtotal				5,995,000.00	-	11,645,000.00
4.4 Renewable renewable energy and energy efficency/conservation promoted												
4.4.1	Develop multi-media IEC materials on EEC measures and technologies		X	*# of ICIs provided with IECS*		1	3300	10.00	33,000.00		
4.4.2	Pilot test conduct of assessment in ICIs		X	*500 CE assessed*		1	2000	100.00	200,000.00		
4.4.3	Promote incentives on market driven demand-side management - residential, commercial, industrial, transport		X	*5000 HH & CE's adopting the design for environment concept*							
4.4.4	Conduct business matching with MFI, RE service providers and service users		X	*1000 residents using offgrid RE*							
					subtotal				233,000.00	-	-
					Total				7,003,000.00	-	16,645,000.00
								Grand Total	(PhP)		23,648,000.00
					Indicative Additional Funding Required				(PhP)		1,383,835,100.00

Table 18: NAGA CITY LCCAP RESULTS AND RESOURCES MATRIX

CHAPTER VI: MONITORING AND EVALUATION

MONITORING TEAM, PLANS AND TARGETS

The M&E Team will consist of representatives from the CPDO, CAgO, CENRO, DRRMO and CEO. An official order from the Local Chief Executive creating the Climate Change and Disaster Risk Monitoring and Evaluation. TWG will be issued to make the tasks required mandatory to those concerned offices. The CENRO will serve as Chair of the M&E TWG and will be responsible in consolidating the M&E reports of the other participating LGU offices. The roles and functions of the different LGU Offices to be mandated to perform M&E are as follows:

- CENRO – serves as Chair of the M&E TWG and keeps the M&E data base and ENRA records. It will consolidate all the inputs from the other concerned LGU offices and prepare the integrated report on M&E. It will also collect data for the indicators which were established to monitor environmental quality (land, air, water) and the state of natural resources such as forest, coastal and marine, minerals, and energy (if any) resources. The CENRO with TWG monitor and evaluate the climate change mitigation & adaptation projects being implemented
- CPDO – monitors, evaluates and records changes in land use and the implementation of the climate change sensitive CLUP (land use plan) and CDP, programs and projects including defined hazard zones. Update periodically changes in the land use account of ENRA.
- CAO – monitors and evaluates the impacts of climate change and natural disasters on agriculture, fishery and livestock and poultry and the performance of climate change mitigation and adaptation measures for the agriculture sector. Keep tab of the physical and economic accounts for agriculture, fisheries and poultry and livestock following the ENRA methods and procedures.
- DRRMO – monitors and evaluates the implementation of programs and projects on the mitigation of floods, landslides, soil liquefaction, ground movement, volcanic eruption, storm surges, tsunamis and other natural disasters. It will also keep an account for the impacts of natural disasters on life, property, physical and natural assets of the municipality.
- City Engineering Office (CEO) – monitors and evaluates the implementation of infrastructure projects to mitigate the impacts of natural disaster and climate change

City Information office shall consolidates the data for public information. EDP Office will develop the management information system. Depending on programs being implemented, other offices (HSDO, SWMO, ACTO, Metro PESO) be monitoring components/activities being assigned to them.

The indicators and system for M&E of LCCAP will follow the prescribed matrix by DILG as shown.. This M&E matrix will be filled-out by the LGUs during their implementation of LCCAP. The first column lists the LCCAP component; the second column on planned activities provides

the target activities, programs and projects; the third column provides the expected outputs and output verifiable indicators; the fourth column registers the actual accomplishments and the last column notes down the justification and comments on the results of the M&E. The Results and Resources Framework indicate performance indicators and target per activity level. The Results Matrix also provides Impact level indicators where baseline is currently available.

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