



Conversations about Climate Change Adaptation

Usap-usapan tungkol sa pakikibagay sa panahon



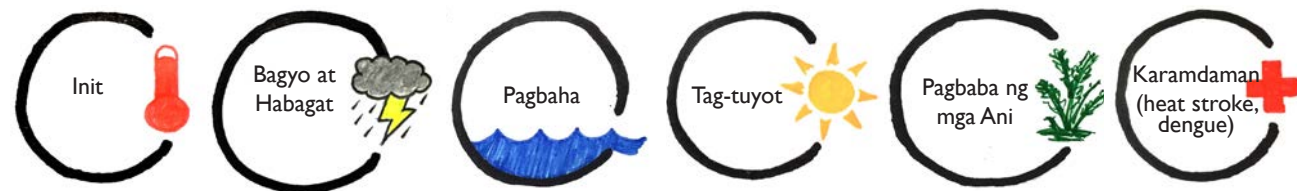
Usap-usapan tungkol sa pakikibagay sa panahon.

DAGDAG KAALAMAN SA MGA TAGA-BALIWAG

Ano ang Climate Change?

Ang pagbabago ng klima ay ang pabagu-bagong pagtaas at pagbaba ng temperatura, ulan at hangin na naganap sa loob ng mahabang panahon. Ito ay nagmumula sa mga “greenhouse gases” na tumatagos sa ating kalawahan na siyang sumisipsip at kumukulong sa sa init ng ating mundo.

Mga Bunga



Papaano Makakatugon ang Baliwag sa Hamon ng Climate Change?



Mitigasyon: Pagbawas ng Sanhi ng Pagbabago-bago ng Klima:

Ito any ang pagbabawas ng “greenhouses gases” sa ating kalawakan na siyang sanhi ng pagbagago-bago ng klima.



Adaptasyon: Pakikibagay sa Pagbabago ng Klima:

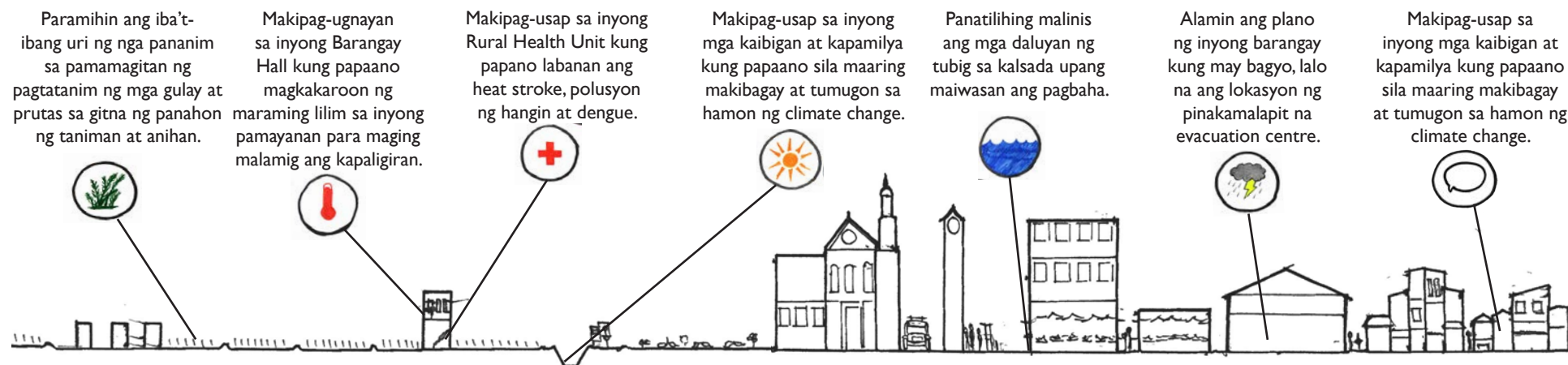
Ang pakikibagay ay ang ating tugon sa epekto ng pagbabago ng klima. Ito ay ang ating patuloy na pag- hahanda sa mga diinaasahang epekto ng pagbabago ng klima upang tayo ay makagawa ng naaakmang hakbang upang tayo ay maging matatag. Ang pakiki-bagay ay maaring magawa sa ating pamayanan at gayun din sa rehiyonal at pambansang antas.



Maliit lamang ang kontribusyon ng Pilipinas sa climate change pero ito ay naaapektuhan nang malaki ng pagbabago ng klima. Ang matatag na Baliwag ay kaillangang tumugon sa pakikibagay, hindi sa pagbawas ng sanhi ng climate change. aman.

Kailangang Makibagay sa Panahon ang Baliwag!

Pitong Paraan Para Makibagay sa Pagbabago ng Klima



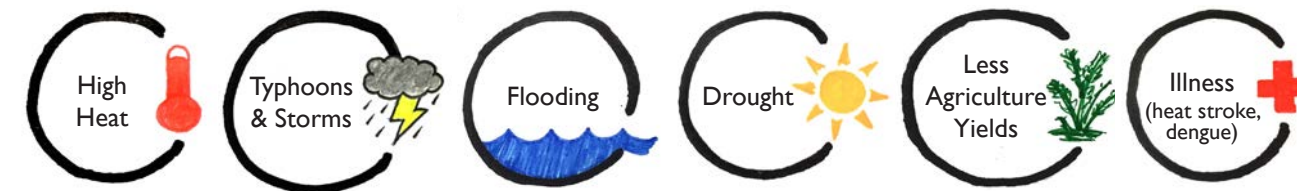
Conversations about climate change adaptation.

A RESOURCE FOR RESIDENTS OF BALIWAG

What is climate change?

Climate change refers to changes in weather (temperatures, precipitation, wind) over a long period. It is caused by greenhouse gases (GHGs) emitted into the atmosphere that absorb and trap heat.

What impacts will Baliwag face?



How can Baliwag respond?



Mitigation is about dealing with the *causes* of climate change. This means reducing the amount of GHGs emitted into the atmosphere. However, the Philippines is already a very low emitter of GHGs.



Adaptation is about coping with the *impacts* of climate change. This means making adjustments to increase resiliency. The Philippines faces increasingly destructive climate change impacts.



The Philippines is a very *minor cause* of climate change, but faces *major impacts* from climate change. A strong Baliwag must focus on *adapting* to the impacts of climate change, not on mitigation.

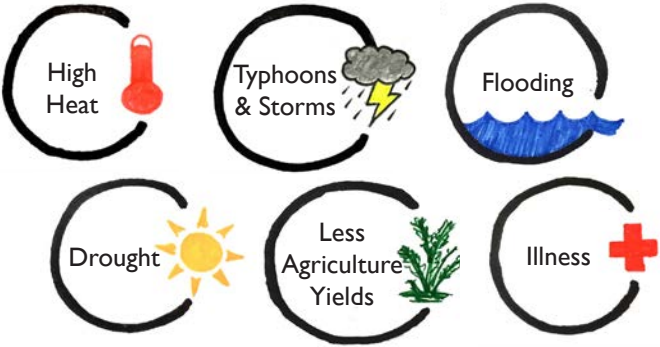
Baliwag must adapt!

7 Ways You Can Adapt to Climate Change



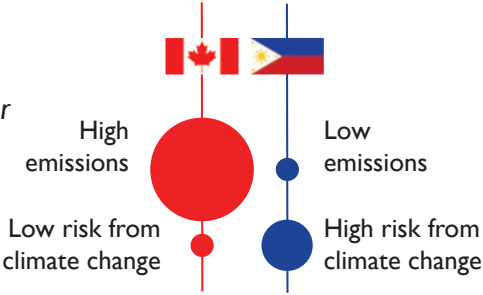
Executive Summary

Baliwag currently faces various impacts from climate change.



Baliwag should focus on adaptation in response to climate change.

The Philippines is a minor cause of climate change, but faces major impacts. Baliwag must focus on *adapting* to these impacts.



This report combines the voices of Baliwag citizens, the strengths of the community, and the authors’ outside perspective to produce locally relevant adaptation recommendations.

“People say that climate change has affected many. But for us, we must be flexible and try to make a solution to help our Mother Earth.”

Summary of Recommendations

<i>Human Health & Security</i>	<i>Food Security</i>	<i>Water Sufficiency</i>	<i>Infrastructure</i>	<i>Industry</i>	<i>Knowledge & Capacity Building</i>
Continue livelihood programs in resettlement areas	Upgrade and maintain irrigation canals	Improve water infrastructure maintenance through institutional coordination	Continue to prioritize upgrading stormwater drainage infrastructure	Train businesses, especially small and medium enterprises, and provide resources to be climate adaptive	Build staff and community knowledge on climate change
Plant local, non-invasive tree species on the sidewalks and roads for shade	Continue to implement educational programs for farmers	Pursue water conservation measures through jointly-created IECs	Identify and protect vulnerable infrastructure	Leverage new and existing corporate social responsibility policies for adaptation	Standardize and increase data collection
Host IECs on heat-related health issues	Establish a food systems plan and goals for creating food security		Decrease heat island effect through shade creation strategies		Increase institutional collaboration with a climate Technical Working Group

These recommended climate adaptations can be taken by all actors in Baliwag, from the municipal staff, to individual businesses. Baliwag is already adapting, and will only continue to become more resilient.

“We love our home town here in Baliwag. It is so good to live in one’s own country.”

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Conversations About Adaptation

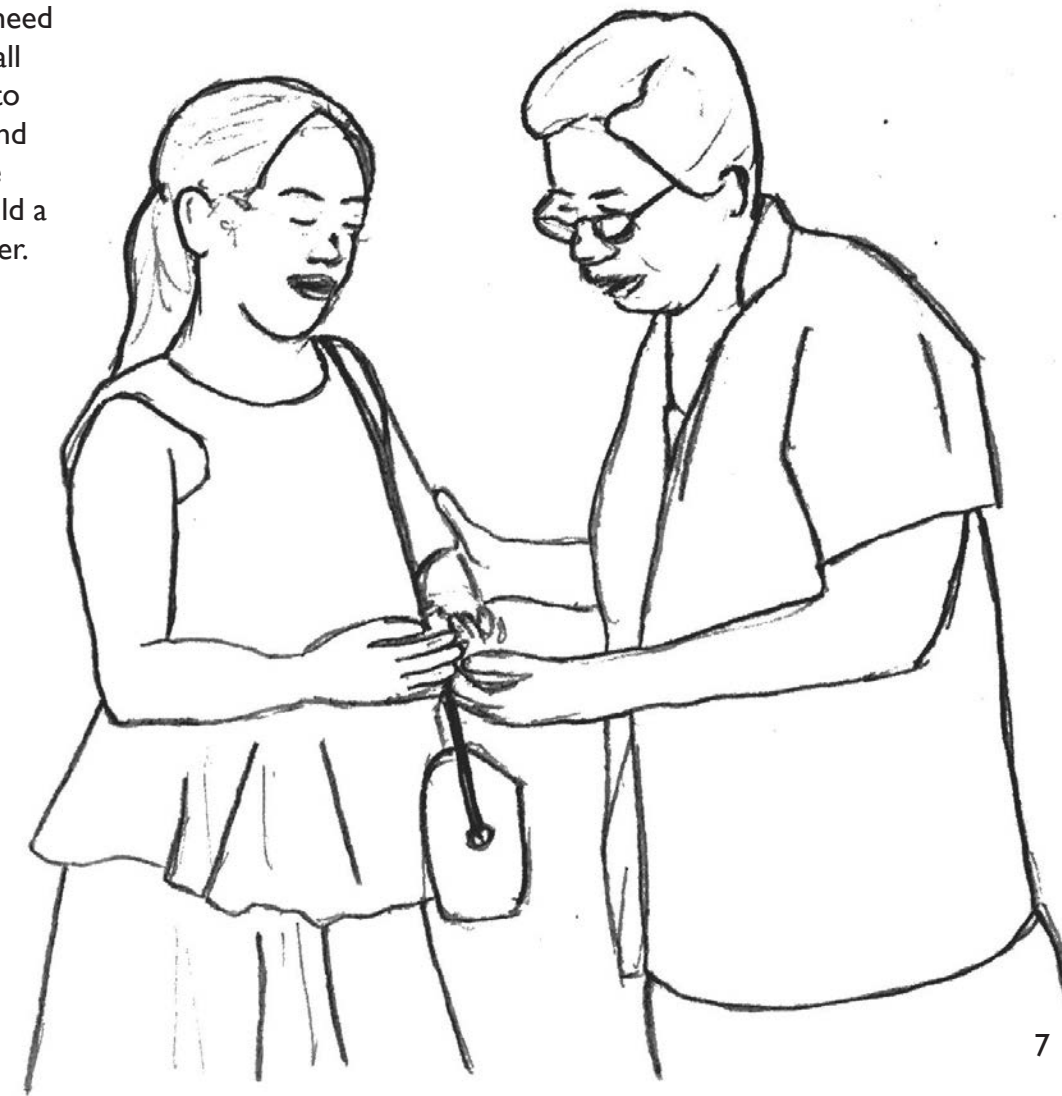
In Baliwag, we had conversations with community members from all walks of life. We learned about the strengths of the community and of the challenges that it faces.

Conversations are all about cooperation, building relationships, and a willingness to explore new ideas. In the spirit of conversation we learned a lot, from the best places to get food, to the on-going impacts of climate change on farmers in Piel and Barangka.

Conversations are central to our report; relationship-building and cooperation in conversations are some of our key values. The equal exchange of information in conversations served as a methodology. The conversations we had inform the report's content. Finally, conversations about climate change, and how to adapt, should be one of the report's major impacts.

What we heard while having these discussions is that people in Baliwag want to have more conversations about climate change. These conversations need to be in both the municipal hall and in our homes. By talking to our loved ones, our friends, and our community about climate change adaptation, we can build a more resilient Baliwag together.

Ngayon po pag - usapan natin ang climate change!





Guiding Values

Our approach is informed by four guiding values which help ensure a holistic approach to building resilience in Baliwag. It is only by bringing everybody into the conversation that we can successfully adapt to climate change together.



**Environment
Focused**



**Gender &
Social
Justice
Conscious**



**Strengths-
Based**



**Locally
Informed**

Authors' Introduction

We are six master's students from the School of Community and Regional Planning at the University of British Columbia in Vancouver, Canada. We were asked by Baliwag to do community outreach and provide recommendations on climate change adaptation.

We faced a number of limitations in writing this report. Our work was constrained to a one-month period. While we did our best to explore best practices in all related fields, as student planners, our own experience is still growing. Finally, as visitors, our knowledge of Baliwag's context is limited.

Toward an LCCAP

The purpose of this report is to provide observations and recommendations to the Municipality of Baliwag as they begin to prepare their Local Climate Change Action Plans (LCCAP), as mandated by the Climate Change Act (CCA) of 2009. Our hope is that our research will inform the creation of local climate change plans and ultimately assist with the building of adaptation and resilience in the municipality of Baliwag.

Specifically, the CCA mandates that "LGUs shall be the frontline agencies in the formulation,

planning, and implementation of climate change action plans" and that adaptation shall be "one of their regular functions." The resulting plans should include broad participation—including barangays, NGOs, and the business sector—and cover the full range of possible climate change impacts. The National Climate Change Action Plan (NCCAP) captures these impacts in seven priority areas, which require that Baliwag adopt a climate lens in all of its policies. The recommendations in this report are divided into themes reflecting five of the seven priority areas in the NCCAP. Reflective of community concerns, we have also added a sixth theme: infrastructure.

Our approach highlights our interdependence with the natural environment. We normally think about the environment as separate from human society, and as an unlimited resource. In this report, we acknowledge that everything we do depends on the well-being of the environment. Everything in our society—our livelihoods, our food, our economy, our health—is nested within a sustainable and functioning environment. With this in mind, it is crucial to always consider the environment in both policy and our daily lives.

By considering gender and social justice, we hope to support the goal of equity in the National Framework Strategy on Climate Change (NFSCC). The NFSCC states that the NCCAP should create adaptation measures with "special attention ...given to ensure equal and equitable protection of the poor; women, children and other vulnerable and disadvantaged sectors." Our research includes the voices of these vulnerable groups as they are often the most impacted by climate change.

We used a strength-based approach in order to highlight the existing resources and assets of the Baliwag community. In doing so, we will be better able to support and build on existing successes and continue to make meaningful change. Baliwag has many strengths both at a community level and at a municipal level and we want to highlight these!

For adaptation to be effective it must be specific to the local context, culture, and available resources. In our research we emphasize solutions and resources that are true to the local culture of Baliwag. Our suggestions also consider the existing resources available to Baliwag, such as available funding and equipment.



How We Collected Local Knowledge

Above all, we wanted this report to reflect the local knowledge and resiliency of the people of Baliwag. We hosted discussions with the diverse groups listed on the opposite page, to hear people's thoughts on climate change (refer to Appendix 3 for full list). This was accomplished through the following outreach initiatives:

- 9 Focus Groups, directly reaching 95 people
- 21 Informational Interviews
- Site visits and observations
- 35 Municipal Staff Surveys

How We Wrote This Report

1. We learned about how the municipality of Baliwag operated and reviewed all available documents and plans.
2. We conducted outreach in the community to hear people's thoughts.
3. We explored best practices from outside sources.
4. We combined our research to develop recommendations in each thematic area.

Community Conversations

Government Officials:

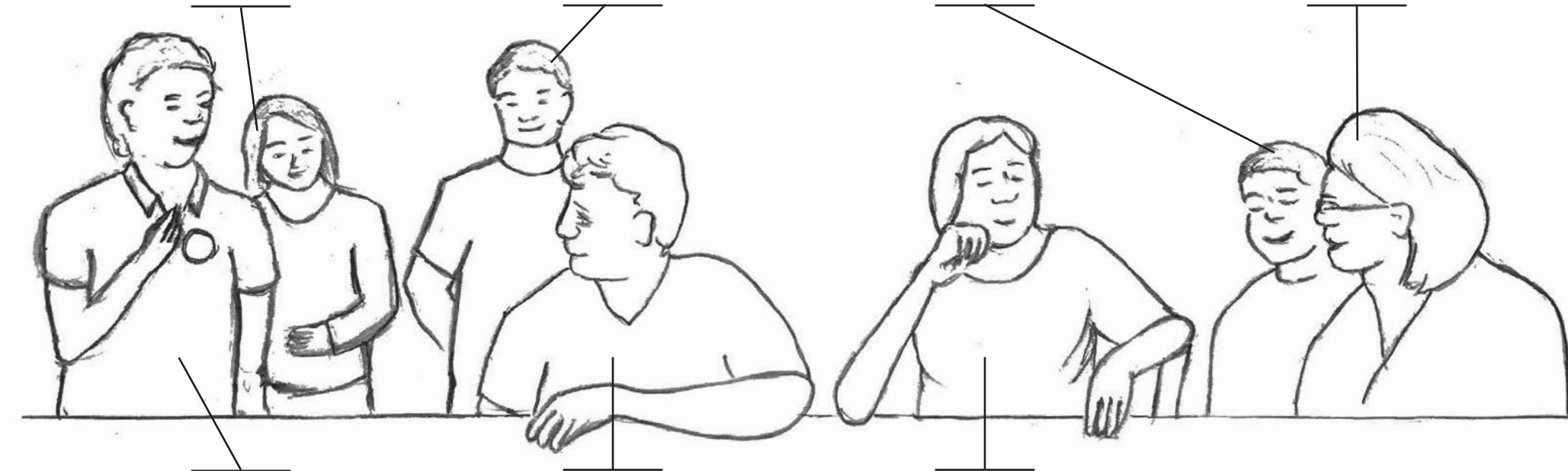
Municipal and water district staff are experts on existing services and programs in Baliwag. They also possess the power to further implement adaptation measures.

Business-People:

People told us that having good livelihoods was a key concern. We spoke to business leaders who told us how climate change will impact business across a variety of industries.

Youth: The voices of youth are not often heard in policy discussions. We wanted hear their unique perspectives both in how they experience climate change today, and how they see the future.

Seniors: Senior's possess historical memory of long-term changes in weather. Seniors also play a strong role as respected leaders in their community, and can be catalysts for social change.



Civil Society: Civil Society Organizations have connections to the community that city officials may not otherwise have. As a result, they have specialized knowledge with regards to the particular societal groups they work and partner with.

Farmers: Farmers have a unique understanding of the ways in which livelihoods are intertwined with changes in weather. In addition to forming a key part of local economic and food systems, farmers will be directly and heavily impacted by climate change.

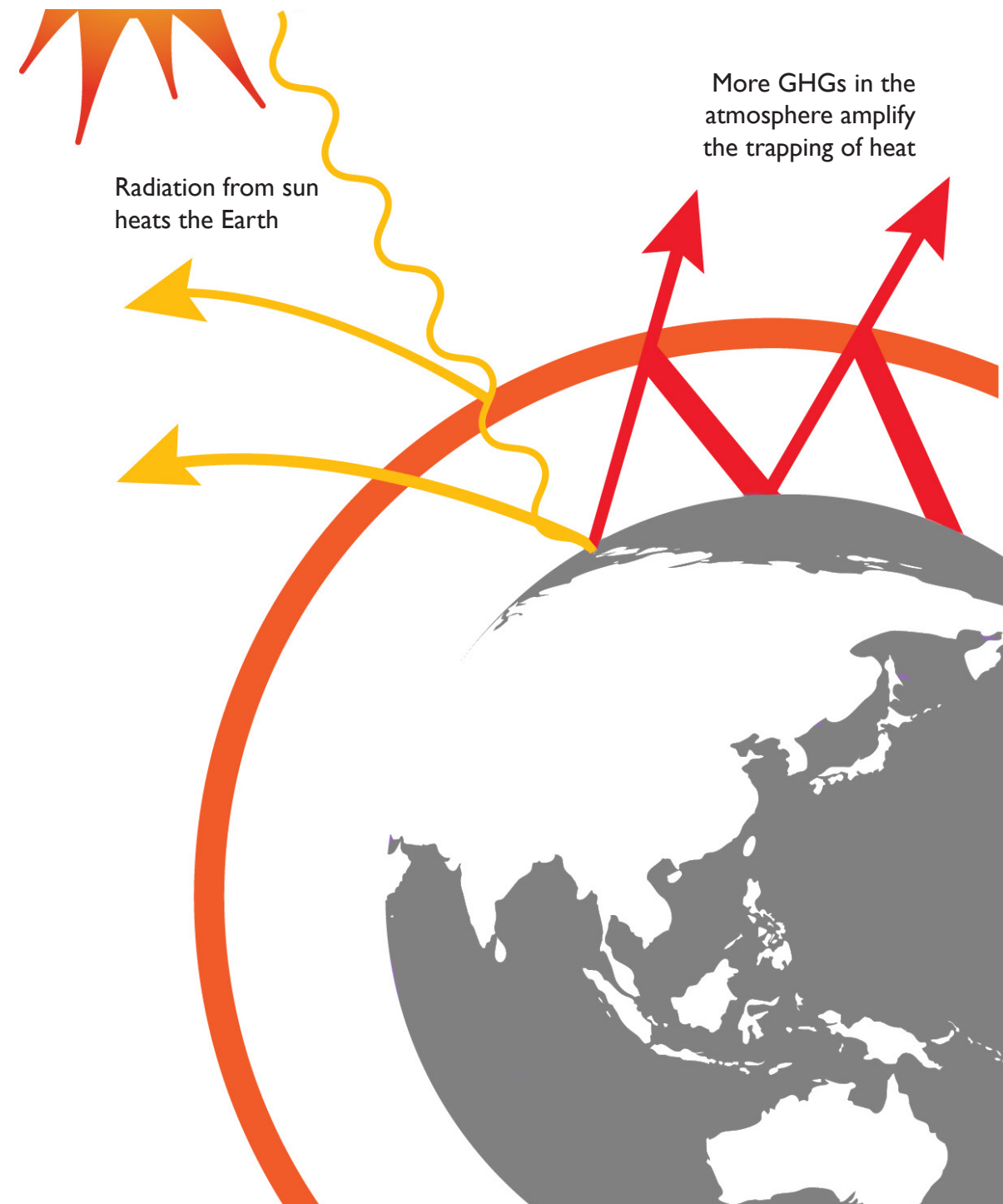
Women: Women are critically attuned to family and community life, but are often unrepresented in policy-making. Keeping with the NCCAP's goals of gender equity, we asked how climate change specifically affects women, their families, and their community.

Barangay Leaders: Barangay leaders understand the impacts that changing weather has on their specific neighbourhood. We heard from leaders from 15 of Baliwag's 27 barangays, ensuring that diverse geographical areas were represented in our report.

What is Climate Change?

Climate change is a significant change in the Earth's weather over a prolonged period of time, including changes in temperature, precipitation, and wind patterns.

In the Greenhouse Effect, heat from the sun is trapped in the atmosphere and reflected back to the Earth. Additional GHGs emissions increase the amount of heat trapped, leading to higher average global temperatures and changing climate conditions. These changes have been linked to GHG emissions from human activity.



How can we respond?

Mitigation vs. Adaptation

Mitigation is about addressing the *causes* of climate change. This means reducing the amount of GHGs emitted into the atmosphere. However, the Philippines is already a very low emitter of GHGs.

Examples of mitigation include:

- Reducing car use
- Reducing the burning of garbage
- Using renewable energy

Adaptation is about coping with the *impacts* of climate change. This means making adjustments to increase resiliency. The Philippines faces increasingly destructive climate change impacts, so adaptation is particularly important.

Examples of adaptation include:

- Clearing stormwater drains to reduce street flooding
- Providing shade in public places to prevent heat stroke
- Finding alternate sources of fresh water in case of drought

Baliwag Must Adapt

The Philippines is a *minor cause* of climate change, but faces *major impacts* from climate change. Baliwag must focus on adapting to these impacts from climate change, not on mitigation.

Many people we spoke to were very excited about mitigation measures to reduce emissions and keep the city clean. Any environmental program that engages the community is great. Our report focuses only on adaptation, which is the only way that Baliwag will be able to cope with drought, typhoons, high heat, and other climate change impacts. While mitigation is important, adaptation must be the priority for Baliwag in the long term.

Did you know?

This report focuses only on climate change adaptation. This means that several topics that community members were passionate about are not addressed, even though they are related to the environment. Here are three popular topics that might seem related to adaptation, but are not covered in this report:



Did you know... that waste segregation is not adaptive? It is good for the environment and keeps your community clean, but it does not help us cope with the impacts of climate change.

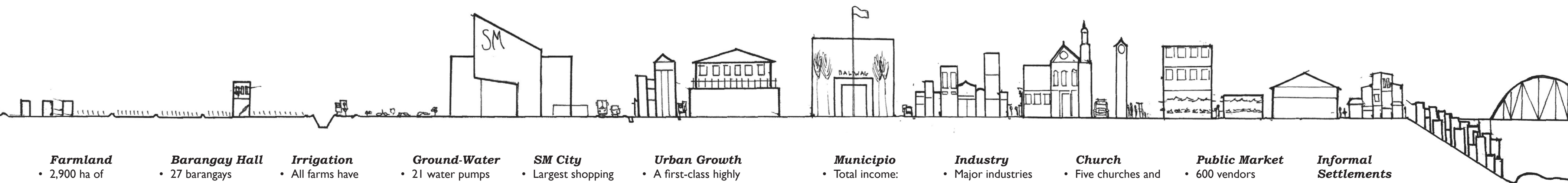


Did you know... that earthquakes are not related to climate change? It is important to prepare for them, but earthquakes are caused by tectonic plates moving, not by changes in the weather.



Did you know... that planting trees is only mitigation if you are planting a large forest? Planting trees to provide shade is good adaptation, but they aren't enough to significantly reduce greenhouse gas emissions.

Profile of Baliwag



Farmland

- 2,900 ha of farmland
- 1,800 farmers
- Average land holding of 1.25 ha per farmer

Barangay Hall

- 27 barangays
- Provides services and information
- Barangay Captains, Mother Leaders, and Rural Health Unit (RHU) staff based out of Barangay Halls

Irrigation

- All farms have access to the irrigation system
- Canals can become clogged with debris

Ground-Water

- 21 water pumps throughout Baliwag supply most of drinking water
- Subsidence is 2.54 cm per year due to increasing ground-water extraction

SM City

- Largest shopping mall in Baliwag
- 300+ stores
- Major employer
- Environmentally-focused CSR programs

Urban Growth

- A first-class highly urban municipality
- 143,500 inhabitants
- 25,000 households
- A major urban and economic centre of northern Bulacan

Municipio

- Total income: 320m pesos
- Received Financial Good Housekeeping award in 2014
- Recently created MDRMO

Industry

- Major industries include: furniture, garments, gifts, swine, and chicken production
- Traditional buntal hat industry
- Home of Baliwag Transit company

Church

- Five churches and 24 chapels
- Runs community programs, charity initiatives, and other services

Public Market

- 600 vendors
- 1,280 permanent establishments
- Located in Barangay Poblacion

Informal Settlements

- Common along Angat River
- Inter-governmental program relocating some settlers
- Two social housing sites in Baliwag

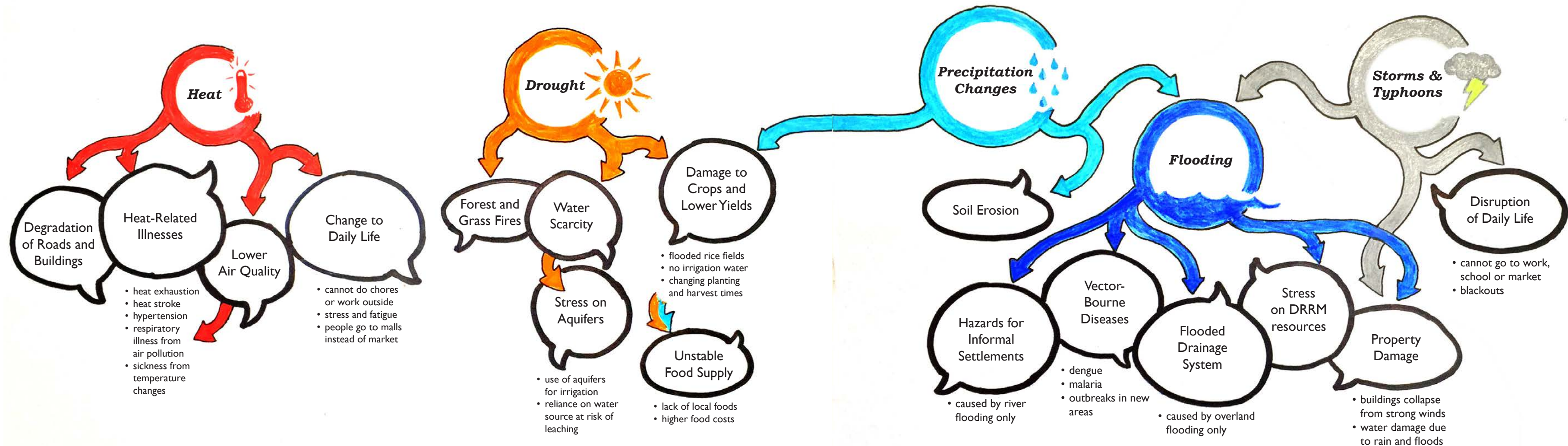
Angat River

- Part of the Angat River Basin
- Provides water for irrigation

Impacts of Climate Change in Baliwag

From our conversations with community members, we learned that the people of Baliwag are already feeling the impacts of climate change. This diagram summarizes what we heard, and reflects the diverse challenges presented by climate change.

The cascading nature of climate change means that there will be many indirect, far-reaching impacts not included here, such as pressure on the insurance industry, economic instability, and more. Some groups, such as farmers, may feel multiple effects.



A Farmer

“Climate change has affected our life in many ways. In the past, there are not too many health problems, but now people frequently acquire diseases. For example, heat stroke, - it is so common for people to have heat stroke. In the past, there were not so many deaths – very infrequent – but last year alone I know of 30 people who died of heat stroke. Somehow there is a domino effect, when one person dies, another will die.”

A Young Mother

“I feel irritated by the hot weather. Before it was okay, we would expect rain in June but now it’s even hotter after the rain. I have a four year-old with asthma and she gets asthma attacks with the weather changes. I don’t have air conditioning so the weather changes hurt her. Because of the heat, I can’t do all of my chores during the day. It’s too hot on the street to walk to the store or run errands, there is no shade.”

A Municipal Staff

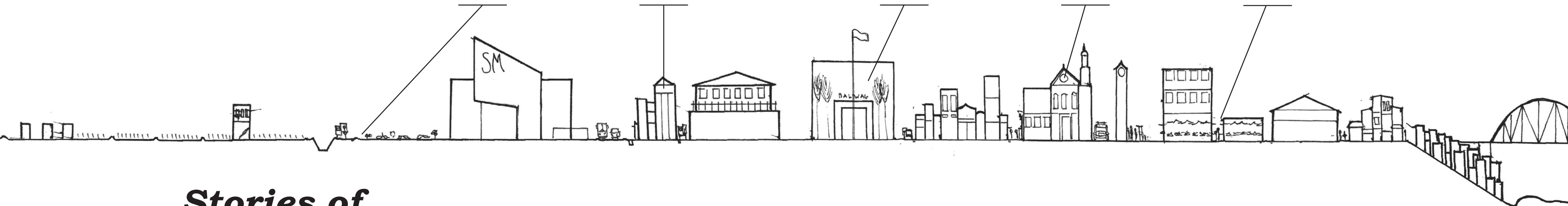
“I have noticed how climate change has affected us. We have heavier rains now, so we need better storm drains on the streets. The current drains were built many years ago, we need upgrades to accommodate the heavier rains. The asphalt on the roads is also deforming because of the heat, and from the weight of the trucks on the road. We are starting to use concrete now, although it has a higher rolling friction.”

A Catholic Priest

“It was about three years ago that people started thinking about climate change. It’s hard these days, the typhoons are terrible. Many die of heat stroke. During mass, it is very hot, so we have to improve the cooling system of the church. During rainy days we need to be ready to give help to the needy. It is God’s will for us to take care of ourselves, and part of ourselves is the environment. God created us, and He created the environment.”

A Public Market Vendor

“Now, the rainy season is longer and the sales go down because of the rain. During the typhoons, the sales go down even more. During the dry season, nobody wants to come to the market because of the heat. They prefer going to the malls because they are air-conditioned and covered. Here, it’s too big and costly to cool the public market. But that’s ok, the malls can provide convenience, but they can’t provide the variety and prices we do.”



Stories of Climate Change

*Human Health
& Security*

Food Security

Water Sufficiency

Infrastructure

Industry

*Knowledge &
Capacity Building*

Recommendations

These six themes illustrate the diverse sectors impacted by climate change in Baliwag. They contain a summary of what we heard from the community, the impacts of climate change on the sector, and the existing strengths in Baliwag. Each sector also has a set of key recommendations for priority implementation, as well as general recommendations.

These insights were drawn from conversations with the community and municipal staff, meaning that people are interested in these proposals and feel they can be feasibly implemented. They should be considered the start of an ongoing process of community engagement on this issue.

Specific adaptations have been labelled as “People’s Voice” recommendations, as they were consistently popular with community members. These are marked with a speech bubble.





Health

Numerous health impacts are provoked by climate change and often affect the most vulnerable populations, including seniors, women, and children. The NCCAP is concerned with the impacts of climate change on the health of individuals in the Philippines and states that municipalities should ensure “health and social protection delivery systems are responsive to climate change risks.” It is important to focus on developing stronger health and social programming in order to better adapt to climate change-related illnesses.

What We Heard

- There is a high concern in the community about the impacts of climate change on health.
- Community members have knowledge about preventative measures for heat-related illnesses such as heat exhaustion and heatstroke. For example, farmers at Piel mentioned the importance of eating healthy in helping to prevent hypertension.
- The municipality wants to focus on prevention of diseases rather than treatment.
- Climate change can affect livelihoods and cause people to be unemployed, which raises their risk of health issues.

Impacts

- Hotter temperatures increase the likelihood of heat exhaustion and heat stroke, especially among those working outdoors, such as farmers and construction workers.
- Elders are more vulnerable to heat-related illnesses.
- Stagnant water from increased precipitation can increase the prevalence of diseases carried by mosquitos, such as dengue and malaria.
- Hotter temperatures can intensify air pollution, exacerbating respiratory conditions such as asthma.

Existing Strengths

- Mother Leaders have a strong role in the community. As providers of social protection services, Mother Leaders are an important community resource and act as a liaison between the municipality and the community.
- RHUs conduct preventative educational programs (pap smears, health classes, immunizations), and incorporate information about climate change-related illnesses, such as dengue.
- Ongoing outreach programs enrol community members in PhilHealth, which will be key as the prevalence of climate change-related illnesses are projected to increase.

Key Recommendations for Health

People’s Voice

Recommendation	Justification	Implementer	Trade-offs
Plant local, non-invasive tree species on the sidewalks and roads.	Planting more trees in the city would increase shade in the city and would allow pedestrians to walk more comfortably.	Engineering Office, MPDO	It is expensive to plant trees, so other types of shade provision could be pursued, such as covered walkways.
Continue educating the community on the direct impacts of climate change for health, especially in relation to heat exhaustion.	May prevent deaths or illnesses related to climate change. For example, being aware of the signs and symptoms of heat stroke may help prevent a death from this illness.	RHU	Education programs require additional time and resources from municipal staff.
Provide training for Mother Leaders on climate change related-illnesses.	Since Mother Leaders have direct contact with Municipal Nutrition Office (MNO), they would be able to monitor and report incidents of climate change-related illnesses. They could also inform their communities on the prevention and treatment of climate change related-illnesses.	MNO	Education programs require additional time and resources from municipal staff and Mother Leaders. Monitoring programs may require additional support to implement.
Create drinking and showering stations at each Barangay Hall and at other public buildings to help prevent heat exhaustion.	May prevent deaths or illnesses related to climate change, such as heat strokes, dehydration, and heat exhaustion.	RHU, Barangay Leaders	Creating drinking stations may be too difficult or resource intensive. Barangay leaders could boil water to have available for all visitors. Creating showering stations may be more resource intensive.

Informal Settlements

The National Climate Change Action Plan states that it is a priority “to reduce risks of...vulnerable groups from climate and disasters”.

A city or municipality’s most vulnerable people can often be found living within informal settlements. Addressing climate change adaptation in informal settlements means addressing poverty, housing, infrastructure, environmental degradation, and health concerns. Physically, informal settlements tend to be built in exposed areas, including slopes, low-lying areas and ravines.

Informal settlements are designated as a national priority and require partnerships across municipal, provincial, and national levels of government. Baliwag has strategies in place to address the vulnerabilities of informal settlements, such as initiatives focused on the relocation of those within the community to safer, more secure housing.



What We Heard

- Barangay Captains, Mother Leaders and Barangay Health Workers are incredibly involved and engaged in their communities. They are in an excellent position to assist in supporting the informal settlements within different barangays.
- Individuals and families with a lack of resources are residing on land along the Angat River in Baliwag.
- Informal settlements along the Angat River in municipalities in Bulacan, including Baliwag, have been identified for resettlement to ensure safety.
- The land along the riverbanks is subject to easements and is government land. It is some of the only available land open for informal settlement.
- Though many have been relocated, some individuals and families choose to stay in the informal settlement locations.
- Staff from the MNO have identified informal settlements as having a high incidence of malnutrition.

Impacts

- Informal settlements in Baliwag are especially vulnerable to flooding from heavy rains due to a lack of proper stormwater drainage.
- High precipitation and extreme weather events have contributed to the need to relocate informal settlements.
- The relocation of informal settlements has meant that sometimes individuals and families are distanced from work, education, and community, making their transition to a new home difficult.

Existing Strengths

- Informal settlements are the responsibility of converging levels of government. For example, the National Housing Authority has provided Baliwag with around 1,000 homes for informal settlements.
- It is often up to the municipality to provide social programming for these communities. Employment for this population is a barrier.
- To ensure the safety of residents, barangays have ordinances that do not allow informal settlers to live in identified danger zones or vulnerable areas.
- Social housing projects in Baliwag, as well as in other places in Bulacan, are helping to reduce the number of people living in informal settlements.

- The social housing sites are: BDO Foundation-Red Cross Village in Barangay Hinukay and Gawad Kalinga in Barangay Piel.
- The Municipal Social Welfare and Development Office (MSWDO) works closely with relocation initiatives.

Baliwag also has the following capacity development interventions with the target group of informal settlers, as outlined in the ELA 2014-2016.

- Organize a Local Housing Board.
- Incorporate Chairmanship in Committee on Infrastructure.
- Formulation of a Local Shelter Plan.

Key Recommendations for Informal Settlements

People's Voice

Recommendation	Justification	Implementer	Trade-offs
Partner with social housing organizations to implement livelihood programs in relocation areas.	When informal settlers are relocated, they are often distanced from their sources of livelihood. To assist families in supporting themselves skills training programs, job matching programs, and other employment services may be of great service.	PESO	Jobs must be available for livelihood programs. Often low barrier jobs exist within an already saturated market, so new employment areas should be pursued where possible.
Community-specific asset and vulnerability assessments should be performed and shared.	Understanding land use, daily cultural practices and specific vulnerable populations within informal settlements could be very useful. When vulnerabilities and assets are well understood they can be better addressed and utilized to increase adaptation to climate change.	MSWDO, Barangay leaders, Community Groups working with informal settlements	A time intensive initiative. Social stratification often exists between marginalized groups and those in power. Trust must be built to learn about the challenges and assets that exist within informal settlement communities.
Take a participatory approach to relocation planning.	A bottom-up approach to the resettlement process involving the informal settlers will allow for better insight into the relocation process. Key outcomes would include identifying where and how people want to be moved during the relocation process.	Informal settlers, Barangay leaders	This could be a time-intensive initiative that requires the participation of informal settlers and municipal staff involved in resettlement process.
Expand educational outreach to children in informal settlements.	Existing outreach programs could focus on education to ensure children have access to school or daycare to reduce barriers in relocation. Outreach efforts can also provide information about small household projects that will create more resilience to climate change.	Mother Leaders, MSWDO, MNO, DRRMO	Outreach programs already exist in the community, adding on to such programs would require few additional resources.

General Recommendations for Informal Settlements

Recommendation	Justification	Implementer	Trade-offs
Provision of immediate or short-term infrastructure programs.	To ensure the short-term safety of those who continue to reside in informal settlements it may be useful to have programs in place to support improvements in infrastructure.	Engineering Office	Time involvement depends on the infrastructure that needs to be completed. If relocation is planned, short-term infrastructure projects may not be the best use of municipal finances. May be seen as encouraging informal settlers not to leave.
Planned land for informal settlements.	It is likely that informal settlers will continue to need land reside upon. The land available to informal settlers in Baliwag is also the land most susceptible to climate change. Designating safer land for informal settlements in the short-term may draw people away from residing along the Angat River.	MPDO	Short-term planning as opposed to long-term planning. May be difficult to secure valuable land.
Continue livelihood programs within informal settlements.	Informal settlements are often intertwined with other social and economic factors that present challenges to individuals and families. Livelihood programs can support families in securing land title in the long-term.	PESO	Supporting residents within the informal settlement may be perceived negatively when relocation is a priority. May be time-intensive.

Disaster Risk Reduction & Management

Baliwag faces numerous natural hazards risks that are projected to increase with climate change, including river flooding, high winds from tropical storms, and grass fires during drought periods. Additionally, there are vulnerable populations currently living in areas that are most at risk, such as in informal settlements along rivers that will not be structurally sound during floods or typhoons. Because climate change is projected to increase the frequency and intensity of weather-related natural disasters, knowledge about evacuation and response plans are essential for all community members.

Disaster and risk management efforts must incorporate the impacts of climate change into their preparedness and response planning to best support adaptation measures, particularly for weather-related disaster events. Baliwag’s DRRMO plays an important leadership role in local climate change adaptation, and can support infrastructure projects and IECs to improve the municipality’s ability to respond to these impacts.



What We Heard

- Baliwag has several evacuation centres across multiple barangays.
- Evacuation centres are located close to vulnerable populations, such as informal settlers in Tibag.
- The MDRRMO collaborates with adjacent municipalities and the provincial and national governments to improve regional disaster response coordination.
- People in Baliwag are concerned about major flooding events in their community.

Impacts

- Heavy rains can cause flash flooding along rivers and creeks in Baliwag, and may affect some barangays more than others.
- Streets may become flooded with increasing precipitation, making it difficult for the MDRRMO to service community members during disaster events.
- High winds from major storms or typhoons may uproot or knock over trees.
- Houses that are not structurally sound or do not have secure roofing may collapse during major storms or typhoons.
- Droughts increase the risk of grass fires.

Existing Strengths

- The MDRRMO in Baliwag is recognized as a leader in disaster risk management in Bulacan.
- The MDRRMO does extensive outreach in the community to educate the public about how to safely deal with disasters.
- Mother leaders and other community groups, such as SAVERS, work closely with the MDRRMO.
- MDRRMO is constantly looking to improve its operations. They want to establish an early-warning system in all 27 barangays for natural disasters.

Key Recommendations for Disaster Risk Reduction & Management

People's Voice

Recommendation	Justification	Implementer	Trade-offs
Implement the early warning system for disaster awareness, as developed by the DRRMO, across all barangays.	Climate change-related disasters require quick and effective response from the DRRMO across all barangays. An early warning system would greatly speed up response and evacuation efforts. Informal settlers would particularly benefit from this initiative since they are the most affected by climate change.	MDRRMO, MPDO, Engineering Office	Although it would be a low-cost project, implementing this system, would require time and resources from day-to-day operations and may cut into the operating budget. This should be weighed against potential savings in the future.
Expand IECs on disaster preparedness, evacuation, and include climate change adaptation.	Educational outreach has been a success for the MDRRMO with Mother Leaders and at schools. These seminars should be expanded across all the 27 barangays.	MDRRMO, Barangay leaders, Schools	IECs take time, planning, and resources to implement. The MDRRMO may not have enough staff available to expand the programming, especially during the rainy season.
Pursue partnerships with other municipal MDRRMOs to share resources for response and outreach.	The MDRRMO already supports disaster response in other municipalities, and should continue to take on leadership roles in regional adaptation initiatives in order to pool resources and decrease collective regional vulnerability.	NDRRMC, PDRRMC, MDRRMO Baliwag, MDRRM teams in other municipalities.	There may not be enough staff to manage additional projects, nor enough interest or funding from provincial or national governments to implement these partnerships.

General Recommendations for Disaster Risk Reduction & Management

Recommendation	Justification	Implementer	Trade-offs
Pursue funding opportunities with different levels of government, and with foreign sources to help expand climate change adaptation projects. Highlight the exemplary role of the MDRRMO in Baliwag and the region when applying for funding.	The MDRRMO can leverage its budget to support climate change adaptation projects, especially where they overlap with DRRM. Additional equipment and alert systems are a priority.	MDRRMO, NDRRMC, PDRRMC, DILG.	Using the MDRRMO budget for adaptation measures may not leave enough funding to respond to disasters not related to climate change.
Update flood hazard maps annually, for both riverine and overland flooding.	The locations, intensity, and frequency of major flood events will increase with climate change. Adapting to these impacts requires better knowledge of where flood risks are, both on riverbanks and in overland flooding (when stormwater drainage systems are over capacity).	MPDO, Engineering Office, MDRRMO.	Updating flood hazard maps, especially for overland flooding, can take time and be costly.
Evaluate the community's knowledge of and familiarity with the local DRRM and emergency response plans and actions.	It is important that the community is aware of the services available to them in case of a natural disaster, as well as the actions they need to take in order to be safe. Involving the community will generate a fuller picture of the threats baliwag faces.	MDRRMO, Barangay Captains, POPCOM.	Time-intensive, but a useful way to ensure that DRRM policies act as they are supposed to.



Food Production

Agriculture is an important industry in Baliwag, both for food consumption and for livelihood. Agricultural production is highly vulnerable to climate change impacts such as flooding, drought, and extreme weather events. These impacts compromise the ability of farmers to manage crops and increases the volatility of agricultural earnings for farmers. The NCCAP states that agriculture is key for food security, but that “a large proportion of damages from disasters... are borne by agriculture every year.” Baliwag should continue pursuing adaptive measures and focusing resources to support farmers.

What We Heard

- Despite the increase in heat and unpredictable weather, farmers continue to be resilient. They diversify their crops and continue to work in the heat.
- Unpredictable water levels in canals directly affect yields, as fields depend entirely on irrigation. Some farmers are now using groundwater instead of irrigation.
- Farmers experience health impacts from hotter weather, such as heat exhaustion and heat stroke, which has been deadly in recent years.
- Farmers are worried about the volatility of the agriculture sector and their livelihoods.

Impacts

- Rice cultivation depends on an ample and consistent supply of fresh water. Drought reduces the availability of fresh water, putting greater pressures on rice farmers.
- Hotter temperatures can cause health problems for farmers, especially heat exhaustion and heat stroke.
- Flooding from high precipitation can devastate agricultural crops. For example, nearly all strains of rice will not survive if flooded.
- High winds and heavy rains from typhoons and major storms can flood rice fields, and farmers cannot tend to crops during these extreme events.

Existing Strengths

- Baliwag provides nearly 100% of irrigation for farmers and the Water District works hard to ensure continued supply. Farmers are more resilient when they have access to a consistent water supply instead of relying on rainwater.
- The Municipal Agriculture Office (MAO) implements successful programs to assist farmers and support local agriculture, such as subsidized seedlings and liquid fertilizers, as well as rice seed distribution.
- The MAO hosts educational seminars about planting and harvesting, and has developed good relationships with farmers.

Key Recommendations for Food Production

People’s Voice

Recommendation		Justification	Implementer	Trade-offs
Maintain clear canals for water flow.		Water flows more easily in well-maintained canals that are clear of debris.	MPDO, Barangay Leaders	Additional staff may need to be hired to clean irrigation canals, requiring significant investment.
Upgrade irrigation canals.		Upgraded and larger canals will improve the reach and capacity of water servicing for irrigation.	BWD	The project would require large upfront investment, potentially compromising other services.
Increase access to rice and grain warehousing.		Many farmers are forced to sell their rice even when prices are low. Warehousing facilities allow farmers to store their rice during rainy seasons to reduce spoilage.	MAO, farming cooperatives	Warehouses would require large investments, potentially competing with other services and programs for funding.
Promote diversification of agricultural crops, such as rice strains and vegetables.		A diverse agricultural industry is more resilient, as some crops are better suited to certain climate conditions than others. Vegetables can be planted between rice seasons to ensure income sources for farmers if rice crops become damaged.	MAO	Existing local knowledge may be limited to certain crops and additional training may be required for farmers.
Continue to support subsidized seedling distribution to farmers.		Providing free or subsidized seedlings helps farmers skip the vulnerable germination period for seedlings and better predict the success of their crop.	MAO, IRRI (International Rice Research Institute)	MAO may not be able to expand this program without hiring new staff.
Work with PESO to diversify livelihood options for farmers transitioning out of agriculture through entrepreneurial and skills-training programs.		Some farmers may wish to acquire new employment or develop new skills outside of farming if the agricultural industry becomes too volatile. The municipality can support farmers in diversifying their skill set.	PESO, MAO	Training and capacity-building programs would require municipal resources and would need to certify farmers in their skills development.

General Recommendations for Food Production

Recommendation	Justification	Implementer	Trade-offs
Implement new water sourcing for agriculture, such as pumps to tap groundwater as opposed to relying on irrigation canals.	The Angat River does not provide sufficient water to meet Baliwag's irrigation needs. Farmers may need to access other water sources, such as groundwater, for agricultural purposes.	BWD, MPDO, Barangay Captain	The extent of the groundwater supply is unknown. The sustainable rate of extraction has been set at 24 Litres per second (LPS) by the BWD, so water conservation is a crucial part of this strategy. Farmers may require subsidized pumps.
Implement educational programs with the region's farmers to promote knowledge exchanges around CCA.	Farmers from across Bulacan and Luzon can benefit from learning about existing adaptation strategies that have been successful.	MAO, farming cooperatives, and community organizations	Learning exchanges take time to plan and resources to implement. Farmers would need to travel.
Improve and support new agricultural crops technologies.	This implies both new methods for planting and harvesting, as well as new strains of seeds (flood resistant seeds), in order to assist in adaptation.	MAO	Technological advancements take an uncertain amount of time to develop, and may require lengthy testing periods.
Provide information about innovative and low-barrier agricultural and farming insurance products that use weather-based indices, especially among cooperatives.	Farmers may require more comprehensive insurance products for increased frequency and intensity of climate-related events. See Philippine Crop Insurance Corp (PCIC) for more details.	MAO, farming credit unions, cooperatives	Insurance may not be accessible to everyone, particularly those in extreme poverty, as it requires investment.
Streamline methods for receiving PAGASA data on the likelihood of droughts and other climatic disruptions to get to farmers and other water users.	The MAO is very active in attempting to inform farmers about the weather situation, and if a more direct connection with PAGASA is made, the speed at which information can be shared is greater.	MAO	There are no immediate trade-offs.





Food Consumption

The NCCAP emphasizes the need to “...ensure availability, stability, accessibility, and affordability of safe and healthy food amidst climate change.” Climate change can directly compromise the production of food, leading to rising prices and decreased availability. In Baliwag, the proportion of people living in urban areas is increasing. If local agricultural production is negatively impacted by climate change, so is the accessibility and affordability of food. Access to healthy, safe, and affordable food is reliant on regional, national, and global conditions.

What We Heard

- The weather impacts individual choices about where to buy food. Large supermarkets offer protection from the rain, and air conditioned stores act as refuge from heat.
- The public market, despite its exposure to weather, offers a variety of foods at competitive prices.
- Farmers are transitioning from the agricultural industry to other sectors, which are perceived as more reliable employment options.

Impacts

- Changes in weather, including hot days and heavier rains, impact crop management and agricultural yields.
- The high cost of agricultural inputs for farmers makes it more difficult to provide communities with safe and affordable food.
- Heat and rain impact the types of food available at supermarkets and local food stalls.

Existing Strengths

- As outlined in the ELA 2014-2016, Baliwag has the goal to rehabilitate farm to market roads. This will encourage and facilitate the transport of food from agricultural areas to local markets.
- SM City Baliwag, through their SM Cares program, has a fruit and vegetable garden located on their property. They donate food grown to charity as well as make the food available for sale to their staff.
- The Baliwag Public Market offers a wide variety of affordable, local food choices.

Key Recommendations for Food Consumption

©People's Voice

Recommendation	Justification	Implementer	Trade-offs
Create partnerships between the municipality and barangays to promote urban gardens.	Promoting urban gardening on both private and publicly-owned land would encourage awareness of food systems, increase access to food, and promote greater food diversity.	Nutrition Office, MAO, Barangay Leaders	This would be time intensive at the barangay level, requires land and seeds and is water dependent. Once initiated it will require little time and resource at the municipal level.
Connect local farmers to local businesses, including grocers and restaurants.	Supporting farmers in selling their products to local restaurants and grocery stores will shorten the supply chain. This could mean creating a list of farmers and their products so they are easily accessible.	PESO, MAO	Time intensive for start-up. Masterlist would require regular updating.
Form a food security sub-committee to the Climate Change Technical Working Group (CCTWG) (to be created; see Knowledge and Capacity Building).	A CCTWG sub-committee on food could anticipate and plan for the likely impacts of climate change on food and promote actions to create food security.	Farmers, MAO, land-owners, cooperatives, BWD	Time intensive. Requires volunteer time from the community and leadership from the municipality.
Establish a food systems plan and establish goals for creating food security in Baliwag.	With a sub-committee on food convened, their primary task could be to develop (and integrate into policies) a plan to create food security.	Farmers, land-owner cooperatives, MAO, BWD	Time intensive. Requires volunteer time from the community and leadership from the municipality.



Water Sufficiency

Baliwag’s water sources will be stressed due to rising temperatures and the increased risk of droughts. The agricultural sector will be disproportionately impacted by water shortages in irrigation canals. The general population of Baliwag may also face water shortages and vulnerable populations are at risk of dehydration if they do not have access to alternative water supplies for consumption.

Acquiring new water sources and conserving the existing water supply reflect the NCCAP goal to radically restructure water management. These measures will ultimately help to ensure the provision of safe, accessible water for generations to come.

What We Heard

- Water supply is increasingly drawn from groundwater sources instead of irrigation canals, as farmers and other users look to set up pumps.
- Irrigation canals can be blocked by solid waste and debris, reducing water flow to farms.
- The Bulacan Bulk Water Supply Project promised new sources of irrigation water yet has still not arrive, disappointing many people in the municipality.
- Many community members feel that Manila continues to get an unfair share of the water from the Angat River.
- BWD has noted incidences of septic tanks leaching into the groundwater supply.

Impacts

- Changing patterns of precipitation may mean that water for irrigation and consumption is not consistently available.
- The increase of flash floods, typhoons, or major storms can interrupt the supply of water for irrigation and consumption.
- Droughts will increase water demand among agricultural and commercial sectors, and put greater strains on the underground water supply.
- Hotter temperatures may increase the risk of dehydration and increase water demand.

Existing Strengths

- The MPDO is working on a ten-year solid waste management plan, hoping to curb incidences of waste blocking irrigation canals.
- BWD is actively engaged in IECs around water conservation.
- BWD is aware of septic materials leaching into the ground-water and is actively working to combat this through a ten-year sanitation plan, supported by USAID.
- Baliwag consumers generally have low water consumption rates on a global scale.

Key Recommendations for Water Sufficiency

Recommendation	Justification	Implementer	Trade-offs
Form a water sub-committee within the Climate Change Technical Working Group (to be created, see Knowledge and Capacity Building) with the Municipality of Baliwag.	Coordination on water resources is imperative, particularly between the municipality’s departments, BWD, and other local actors. A sub-committee would be the ideal place to bring together these interests and set a vision.	BWD, MENRO, MAO, Mayor’s Office	This initiative can be time consuming, and it might require hiring new staff.
Provide additional resources for Barangay Officials to remove debris from irrigation canals, consider employment programs to hire canal maintenance workers.	Farmers identified that waste in their irrigation water was causing problems with flow and with the quality of water used for their crops. Cleaner canals would increase water flow.	MENRO, PESO	Proper equipment would be needed, which is expensive, and supervision from PESO and the barangays could be complicated.
Pursue rainwater harvesting as a strategy to reduce the use of groundwater and secure additional water supply.	Rain-harvested water can serve as a buffer against groundwater sources and act as a backup resource during droughts.	BWD	Rainwater storage equipment can be expensive. Rainwater harvesters that are not properly sealed can lead to the presence of dengue-carrying mosquitos.
Jointly develop IEC campaigns for residential users to reduce consumption.	A jointly-developed IEC by the Municipality and the BWD could broaden perspectives about water usage and would create more opportunities to distribute informational materials.	BWD, PESO, POPCOM, MENRO	Coordination would take time and involve jointly setting goals and priorities for water use in Baliwag.
Develop water stewardship guidelines for businesses and provide them as IEC materials when business licenses are registered.	Collaboration between the Municipality and the BWD can mean clearer standards and enhanced enforcement capacity when it comes to conservation and stewardship.	BWD, MENRO, Business Licensing Office	Water stewardship guidelines that feel too punitive may drive away businesses. Guidelines could aim to be inclusive and showcase opportunities for savings amongst businesses.

General Recommendations for Water Sufficiency

Recommendation	Justification	Implementer	Trade-offs
Pursue the development of watershed governance in Bulacan.	The Angat River basin continues to be a source of national difficulty due to inequitable divisions of power and resources. A regionally-focused governance system, with the municipalities collaborating with water districts, could mean fairer distribution of rights and uses.	Mayor of Baliwag, BWD, MENRO	This initiative would require time and effort from political leaders, who may need to overcome existing tensions. Though there are long-term benefits to this initiative, success may not be felt in the short-term.
Form regional partnerships to deal with waste in irrigation canals.	Many barangay leaders complain about the waste that moves through the irrigation canals from one barangay to another. A regional, watershed-based approach to managing the canals will make it easier to prevent large-scale waste blockages.	BWD, Barangay Captains	Long-term partnerships would require time commitments from Barangay Captains, and may draw away from other local projects.
Continue to monitor the status of groundwater resources, and determine a sustainable rate of withdrawal.	While the water district continues to monitor water withdrawals, it is unclear how long this can last with increased withdrawal rates.	BWD	There no short-term trade-offs as this program is currently implemented.



Infrastructure

Infrastructure provides important physical services that helps a community to function in everyday life, and includes systems such as roads, buildings, electricity, drainage, and water supply. Infrastructure systems can also be incredibly expensive to build and maintain, but can have a very long lifespan. It is crucial for Baliwag to build or upgrade parts of its infrastructure systems when possible and direct resources to infrastructure projects that can adapt to the impacts of climate change for many years to come. Prioritizing what to build or upgrade is a difficult task, and Baliwag has the strengths to accomplish it.

What We Heard

- Baliwag is prioritizing upgrades to its stormwater drainage system, which is unable to handle increasingly frequent and intense precipitation events, and is often clogged by debris.
- Stormwater drainage upgrades are done on a piece-by-piece basis due to limited funding.
- Funding is a challenge for major infrastructure projects, as they often require provincial and national resources.
- Sidewalks are not accessible to people with disabilities, streets are not shaded enough for pedestrians, and maintenance of roads and repair of holes is inconsistent.

Impacts

- Stormwater management and drainage systems are more frequently overloaded from more intense precipitation. Street flooding can cause damage to roads and buildings, increasing maintenance costs.
- Periods of drought will increase reliance on groundwater and can lead to water scarcity, especially in the agricultural sector.
- Hotter temperatures will increase the “heat island” effect, as urban infrastructure creates and traps heat.
- Building materials and facades will become damaged from heat and the increased intensity of precipitation.

Existing Strengths

- Upgrading the stormwater drainage system is already a top priority for the MPDO, and work on planning, funding, and implementing the project has already started.
- The Engineering Office is efficient at implementing and prioritizing projects.
- Some adaptation measures have already been implemented in the municipality, such as modifying road surfaces.
- Improving water supply sourcing has already begun with the Bulacan Bulk Water Supply Plan, which addresses water shortages from the Angat Dam supply.

Key Recommendations for Infrastructure

Recommendation	Justification	Implementer	Trade-offs
Continue prioritizing and finding funding for upgrading the stormwater drainage system.	 Upgraded stormwater drainage is required to increase capacity for more intense precipitation.	MPDO, Engineering Office	Lengthy and expensive process to retrofit.
Provide shade on roads and sidewalks using trees or other coverage methods.	 Shade will reduce the effect of heat and the heat island effect in urbanized areas on people, and allow people to walk comfortably outside when it is hot.	Engineering Office	May be difficult to find space. Some options require more maintenance (ex. tree leaves clogging drainage).
Continue to update a contingency plan to identify vulnerable areas/pinch points/cascade areas.	Infrastructure may have new points of failure, and it is important to know where these are in case of emergency.	MPDO, MDRRMO, Engineering Office	Analysis is time-consuming. Difficult to predict where these pinch points may be.
Promote the use of white materials or paint on rooftops of buildings and vehicles (ex. jeepneys, tricycles).	White rooftops will reflect light/heat more than other colours and allow for a cooler interior of the building or vehicle.	Engineering Office	Don’t have direct control over materials. Materials may be more expensive than common materials now. Paint requires maintenance.
Increase maintenance and cleaning of stormwater drainage systems.	 Unclogging the drainage systems will allow water to flow and allow faster drainage in extreme weather events.	Engineering Office, Barangay Captains	Should also treat the cause of the clogging, which will lessen the cost of maintenance over time.
Consider more dispersed production, treatment, and storage of key services, such as energy storage, backup generators, and water storage.	In case of emergency, having dispersed key services will allow for functioning of key activities if infrastructure systems fail.	MDRRMO, Engineering Office	May be expensive to provide storage. New infrastructure may be required.

General Recommendations for Infrastructure

Recommendation	Justification	Implementer	Trade-offs
Encourage use of building materials and styles (ex. natural cooling with large overhangs, tied-down roofs) that better withstand heat and precipitation.	Building materials become less effective more quickly with increased heat and precipitation, so using more resilient techniques will prolong the lifetime of buildings.	Engineering Office	Municipality has little direct control over this. Municipality can act as leader in implementing its own initiatives.
Identify any major infrastructure components at risk in extreme weather events, and plan to move it over time.	Some infrastructure may have to be relocated if is built in areas that are particularly vulnerable to climate change impacts.	Engineering Office, BWD	Expensive to move infrastructure.
Collect data on the changing uses of infrastructure due to climate change impacts (ex. changing transportation peak times, peak use of water).	Collecting data on changing use of infrastructure will inform new infrastructure investments and operations.	BWD, MPDO	May not have baseline data. Will have to prioritize important data to collect.
Where permeable surfaces are possible and appropriate, encourage their use.	Permeable surfaces increase the ability for the ground to absorb precipitation, decreasing the load on stormwater drainage systems.	Engineering Office, MPDO	Permeable surfaces often have lower load capacity and may be more expensive.
Use natural infrastructure where possible and cost-effective, such as planting bamboo and acacia trees on river banks to prevent soil erosion.	Natural infrastructure can be cheaper and more effective than “hard” infrastructure, and also provides ecological services.	Engineering Office	Natural infrastructure may not be sufficient. Some natural infrastructure may not work for various reasons (ex. mahogany trees are eaten by goats).
Consider more dispersed production, treatment, and storage of key services (ex. energy, water, food), such as energy storage, backup generators and water storage.	In case of emergency, having dispersed key services will allow for functioning of key activities if infrastructure systems fail.	DRRMO, Engineering Office.	May be expensive to provide storage. New infrastructure may be required.



Industry

For Baliwag to be resilient in the face of climate change, a strong business sector is essential. People across Baliwag have said that improving livelihoods and reducing poverty are key issues in their communities. By ensuring that businesses are prepared for the impacts of climate change, citizens of Baliwag will be better able to prosper moving into the future.

What We Heard

- Providing jobs and sustainable livelihoods is a key priority that has positive effects for health, resilience, and social mobility.
- The Province may classify the municipality as an industrial development area, which may increase the pressures Baliwag is already facing to industrialize.
- Baliwag’s employment is currently about 50% agricultural, but this is decreasing as farmers increasingly sell their land for subdivision development.
- Negative impacts from climate change are felt especially by farmers and small vendors in public markets.

Impacts

- The agricultural sector has been harmed by unpredictable weather. With lower yields, some farmers are shifting out of the agricultural sector and are selling their land for subdivision development. Finding new employment can be particularly difficult for those over 35.
- People are discouraged from going to the public market by typhoon rains or high heat, preferring air-conditioned, indoor malls instead. This hurts small market vendors.
- Small business operators and self-employed people are vulnerable to sudden changes in prices for crops, or supply chain disruptions by extreme weather.
- Individuals working outside may face disruption to their routine due to high heat.

Existing Strengths

- Businesses are attracted to Baliwag as an economic centre in Bulacan and people are proud of the city’s commerce.
- The MAO provides training to farmers so they can try to sell their food to grocery stores through co-operatives. Currently, farmers’ crops may not meet the quality standards that large grocery store chains employ.
- SM City, a major employer in Baliwag, has an interest in promoting sustainability through their corporate social responsibility programs, such as the recycling-focused Trash to Cash program. SM also contributes to disaster response by allowing individuals to leave their vehicles at the mall during floods.
- PESO provides career-readiness training to individuals, including specific training for climate-proof jobs such as call centre positions. Many job postings offered through PESO are not directly impacted by climate change, such as secretarial roles.
- A trade fair involving Baliwag’s farmers cooperatives is planned. where farmers can display and sell their agricultural products, is planned.

Key Recommendations for Industry

Recommendation	Justification	Implementer	Trade-offs
Provide IECs for businesses on climate adaptive practices.	Capacity building for small businesses on appropriate insurance products for extreme weather events, business continuity plans, rainwater harvesting and diversifying supply chains. will strengthen resilience in the business sector.	Business licensing office, PESO, BDO	Staff time will have to be devoted to researching relevant adaptive practices for local businesses.
Continue supporting cooperatives for self-employed individuals in PESO’s livelihood programme.	Continue to connecting individuals in PESO’s livelihood programs and supporting cooperatives will reduce individual vulnerability to climate change impacts.	PESO	It is uncertain to what degree cooperatives will be able to provide successful programs in all cases.
Improve access to reliable credit sources to small businesses.	Businesses generally require at least 50,000 pesos to buy goods to sell, but it is currently difficult to borrow more than 10,000 pesos. This may involve strengthening credit co-ops, or providing larger loans.	PESO	This could be a time-intensive initiative that requires the participation of informal settlers and municipal staff involved in resettlement process.
Promote shopping at the public market.	Highlight the benefits of buying from local food producers in a promotional campaign to encourage people to support local agriculture.	BDO, Tourism Office	Outreach programs already exist in the community, adding on to such programs would not require many additional resources.



Knowledge & Capacity Building

Knowledge and capacity building is a broad, cross-cutting theme. Policy makers must have “enough knowledge of the science, issues, and risks” of climate change to act effectively. Capacity refers to the ability of communities and institutions to implement adaptive measures. In an LCCAP, knowledge and capacity building encompasses municipal staff, sectoral leaders, and the general public. It also includes actions like training to IECs. Successful action means linking different actors and ways of knowing, from the young mother whose child is sick from the hotter days, to the meteorologist studying statistical data.

What We Heard

- There is much knowledge about climate change in the community, people see that it is happening each day.
- A survey of municipal staff showed significant conflation of adaptation with mitigation and with general practices of sustainability.
- Climate change has directly challenged the traditional agricultural knowledge of groups such as farmers.
- There is high demand for IECs to address climate change, including its impacts and potential adaptation measures.

Impacts

- Diverse sectors, from developers to farmers, rely on municipal information and guidance on topics such as water availability, flood risk, and expected crop yields.
- It will become increasingly difficult to predict weather patterns such as El Niño and La Niña, and to anticipate extreme weather events.
- Past climatic and weather information will no longer be as useful in helping to plan and predict future trends.
- Floods and other weather-related disaster may destroy documents and equipment in Barangay Halls, RHUs, or in other municipal buildings.

Existing Strengths

- Department heads attend seminars or trainings on climate-related topics.
- Certain city departments talk to other nearby municipalities about climate change.
- Baliwag regularly partners with local schools to educate children about climate change to increase awareness.
- At a community-level, there is a general understanding that climate change is happening. Many community members have noticed a change in weather patterns and the effect that this has on their lives.

Key Recommendations for Knowledge and Capacity Building

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Recommendation	Justification	Implementer	Trade-offs
Request local and state universities to collaborate on a monthly or quarterly ‘bulletin’ of summarized climate change research and impacts.	Request local and state universities to collaborate on a monthly or quarterly ‘bulletin’ of summarized climate change research and impacts.	MENRO, Municipal Administrator, POPCOM	Time needs to be spent developing a system to integrate data into departmental decisions.
Create a standardized database that is backed-up in the event of major disasters.	There are many techniques used by the municipal government to store its data but there is no comprehensive system for archiving. The Municipality could streamline this process and include naming systems, and should aim to digitize and back-up data.	Municipal Administrator	Time intensive, but potentially saves time and money later on by protecting important information.
Develop a master list of all climate change IECs.	A master list of all climate change IECs will create consistent messaging around general education, and around which adaptation practices are most relevant to different actors. This will also prevent duplication of efforts and allow previously developed materials to be used elsewhere.	MENRO, Municipal Administrator	Time consuming for the Municipal Administrator and MENRO.

General Recommendations for Knowledge and Capacity Building

Recommendation	Justification	Implementer	Trade-offs
Create a comprehensive information kit for Barangay leaders to discuss climate change with their community.	 Barangay leaders are often very connected to their community. They can disseminate information among their Barangays residents to reach a wide audience quickly.	Barangay leaders	If information materials are provided at regular barangay meetings it will cause minimal disruption to barangay capacity.
Collaborate with local universities to help train the municipal staff on climate change knowledge.	Collaboration with local universities will allow the municipality to draw on relevant information about climate change from a localized perspective.	Mayor's Office, Municipal Administrator, MENRO	Minimal time commitment from municipal staff to create, but it is important to target the right staff for these training sessions.
Create a catalogue of municipal programs that directly engages the public and incorporates relevant adaptation information.	Climate change requires that all sectors of society collaborate closely in order to increase their adaptive capacity. The municipality can take advantage of existing opportunities to engage with the community and discuss climate change adaptation.	All departments	Coordination takes time, but a complete list of all seminars and outreach programmes can streamline resilience efforts, avoid duplication, and conserve municipal resources.
Facilitate training on climate change topics for municipal employees.	It is important for staff to be knowledgeable on climate change science and the differences between mitigation, adaptation, and sustainability. Training might focus on climate change adaptation in the Philippines.	All departments, BWD	Training can be costly, but more knowledgeable staff can improve results both in the planning and implementation phases of climate change adaptation.
Look for opportunities to collaborate with other municipalities on immediate threats or opportunities around climate change adaptation (ex. creating maintenance schedules for irrigation canals between municipalities).	Regional collaboration can create opportunities to share resources and address climate change impacts that affect many municipalities. Sharing resources can have long-term benefits for all municipalities, including cost-savings.	Mayor's Office, MENRO, MPDO	This will be a time intensive undertaking, especially for departmental heads.



Next Steps Toward an LCCAP

The creation of a LCCAP is often a large undertaking for resource-strained LGUs. Though a standalone LCCAP document is desirable, the CCC has also encouraged LGUs to incorporate their LCCAPs into the CDPs and CLUPs in recognition LGUs’

limited resources. Integrating a climate change lens into a variety of documents can also foster resilience throughout the municipality’s work. Four potential products of a ‘climate lens’ are outlined below and are possible on their own or in any combination:

Option 1: A Formal, Standalone LCCAP

Develop a formal document which outlines the climate actions the Municipality of Baliwag intends to take, with specific actions for different actors, coordinated by a single agency, actor, or committee.

Trade-offs: A resource intensive process, requiring time spent away from other planning projects and processes. However it is a specific, actionable product that completely fulfills the NCCAP Framework’s mandate to LGUs.

Option 2: Integrate the LCCAP into the CLUP/CDP

Insert a specific climate section into the CLUP and the CDP, written by the MPDO, and try to approach planning issues in these documents while prioritizing climate change adaptation.

Trade-offs: Easier to create than a formal LCCAP. However, climate change impacts will affect many aspects of the municipality (more than just land-use), so a broader perspective on adaptation is desirable.

Option 3: Integrate LCCAP actions into all plans

Develop a series of climate change adaptation goals for all departments in the municipality. Departments are to formulate all future plans with these adaptation goals in mind.

Trade-offs: Easier to do, but monitoring and evaluation becomes splintered across many departments.

Option 4: Integrate LCCAP actions into all plans, and then catalogue these actions into an LCCAP

Develop a series of climate change adaptation goals for all departments. Catalogue all adaptation-related actions into a single, cross-cutting document, to be submitted to the national government as the LCCAP.

Trade-offs: More resource-intensive than simply allowing all actors to develop their own CCA actions, but provides an opportunity to look holistically at adaptation work done throughout Baliwag.

Turning Goals into Action

We recommend that a Climate Change Technical Working Group (CCTWG) be formed with major municipal stakeholders. The Iloilo LCCAP -- one of the first in the Philippines -- used the TWG structure to great effect during their planning process. We recommend that the following actors be included in this group, (other groups can be included in relevant sub-committees):

- *Municipality of Baliwag:* MPDO, MENRO, Engineering, PESO, POPCOM, MAO. Treasurer
- *Other institutions:* BWD, DILG

- *Civil Society Organizations:* cooperatives, church groups, and other CSOs

With a CCTWG in place, a strategic planning approach can be taken to ensure the continued participation of community stakeholders in identifying climate change adaptation measures. As stated by UN HABITAT in *Planning for Climate Change: A Strategic, Value-Based Approach for Urban Planners*, this strategy is a “community-based decision-making process that incorporates local objectives to help determine priorities and...achieve agreed-upon goals.”

Monitoring and Evaluation

Collecting information on the implementation and performance of a plan is crucial to knowing what progress is being made. It can also allow policy makers to make whatever adjustments are necessary based on feedback.

There are two relevant aspects to monitoring the implementation of a strategic plan:

- *Process Monitoring:* Have the planned projects and activities been implemented?
- *Outcome Monitoring:* What has been the impact of these projects and activities?

One type of locally-specific outcome monitoring would be Community-Based Monitoring System (CBMS). CBMS compiles the community’s local needs to better understand the impacts of municipal projects and activities, and is already in place in other municipalities in Bulacan.

Evaluation refers to critically examining the information gathered during the monitoring stage to assess whether adjustments or changes need to be made to the plan. For Baliwag, this means asking: has the capacity of the community to adapt to climate change increased?

Maraming Salamat Po!

Climate change will continue to cause uncertainties in Baliwag and around the world, but resiliency can be woven through the spirit of conversation. From the municipality's emphasis on community engagement, to the willingness of farmers to carry on in the face of immense challenges, the community has significant adaptive capacity. The conversations we have had in Baliwag serve as a strong foundation upon which to build an inclusive adaptation strategy.

The purpose of this report is to highlight the voices and existing strengths of the Baliwag community in order to suggest adaptations to build physical and social resilience. Many of the recommendations in this report came directly from citizens of Baliwag. It is by continuing these conversations that innovative new ideas will emerge.

Through investment in priority areas, the mobilization of existing community strengths, and the sharing of knowledge, Baliwag can keep adapting into the future. The pride that the people of Baliwag feel in their city will continue to shine through in every conversation.



***“People from
Baliwag are good
and loving.”***

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Silver Purpose Cooperative
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Baliwag Humanitarian Association
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have been possible without the
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of Professor Nora Angeles.



Appendix 1:
Acronyms

ACRONYMS	
BWD	Baliwag Water District
CCA	Climate Change Adaptation
CCA, 2009	(National) Climate Change Act, 2009
CCC	Climate Change Commission
CBMS	Community Based Monitoring System
CDP	Comprehensive Development Plan
CLUP	Comprehensive Land Use Plan
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DILG	Department of Interior and Local Government
DRRM	Disaster Risk, Reduction and Management
DRRMO	Disaster Risk, Reduction, and Management Office(er)
ELA	Executive Legislative Agenda
EPA	United States Environmental Protection Agency
GHGs	Greenhouse Gases

IEC	Information and Education Campaign
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
LCCAP	Local Climate Change Action Plan
LGU	Local Government Unit
MAO	Municipal Agriculture Office
MENRO	Municipal Environment and Natural Resources Office(r)
MON	Municipal Nutrition Officer
MPDO	Municipal Planning and Development Office
MSWD	Municipal Social Welfare Department
NCCAP	National Climate Change Action Plan
NDRRMC	National Disaster Risk, Reduction, and Management Council
NFSCC	National Framework Strategy on Climate Change
NGO	Non-Governmental Organization
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PDRRMC	Provincial Disaster Risk, Reduction, and Management Council
PESO	Public Employment Services Organization

POPCOM	Population Commission(er)
RA	Republic Act
RHU	Rural Health Unit
SCARP	School of Community and Regional Planning
SMEs	Small and Medium Enterprises
TWG	Technical Working Group
UBC	The University of British Columbia
UN	United Nations
UNEP	United Nations Environment Programme
UN HABITAT	UN Human Settlements Programme
WHO	World Health Organization

Appendix 2: Resources

Recommended Resources

Citation	Description
<i>Planning Processes and Toolkits</i>	
Adapting to Climate Change: Cities and the Urban Poor , International Housing Coalition (2011).	An exploration of climate change adaptations specific to low-income populations in cities. Provides an overview of vulnerabilities, challenges and opportunities for supporting adaptation within human settlements.
Assessing Climate Change Impacts, Vulnerability and Adaptation: The Case of Pantabangan-Carranglan Watershed , World Agroforestry Centre (2010).	An expansive coverage of different approaches to climate change adaptation, using the case study of Pantabangan Carranglan Watershed.
Basic Principles of Community-Based Monitoring , United Cities and Local Governments (n.d.)	Provides guidelines and toolkits on monitoring using a community-driven approach.
Climate Change Adaptation: Best Practices in the Philippines , Department of Environment and Natural Resources. (2011)	An exhaustive list of climate adaptation measures being taken in the Philippines by a wide variety of actors from all different sectors. An excellent compendium to consult in situations where examples are needed.
Guide to Climate Change Adaptation in Cities , The World Bank Group (2011).	A guide directed at the audience of municipal mayors and practitioners in developing countries. The guide offers practical suggestions on developing a plan for climate change adaptation, impacts and adaptation for informal settlements, the urban poor, and other vulnerable groups, sector specific adaptive responses and financing adaptation in cities.
Participatory Climate Change Assessments , City of Sorsogon. (2010)	A strong resource, developed in the Philippines, on how to engage in general climate planning while involving the community. Developed in partnership with UN HABITAT, easy to read, and with many examples.
Planning for Climate Change , UN HABITAT	A general overview of planning tools for climate change adaptation. Easy-to-use guide with an asset-based, participatory approach that focuses on creating context-specific

(2012)	climate adaptation policies.
<i>Social Adaptation and Community Engagement</i>	
Developing a National Informal Settlements Upgrading Strategy for the Philippines, ICF International (2014).	A document initiated by the Philippine Government as a response to rapid urbanization and climate change in the country. The plan offers strategies with regards to upgrading informal settlements in the country.
Kitchen Table Sustainability: Practical Recipes for Community Engagement with Sustainability. Wendy Sarkissian et al. (2008)	An extremely accessible guide to community engagement around sustainability issues, along with climate change.
<i>Food Security</i>	
City Climate Hazard Taxonomy: C40's Classification of City-specific hazards, C40 Cities. (n.d.)	Short, easy-to-read document detailing major threats to cities and how to conceptualize risk-perception as a city.
Climate Change And Food Security: A Framework Document, Food and Agriculture Organization of the United Nations (2008).	This report covers the effects that global warming and climate change could potentially have on food systems and security. It provides suggestions strategies for mitigating and adapting to climate change to support food security.
Food Security and Climate Change, Ma. Gloria SF. Carrillo, Provincial Agriculturist (n.d.)	Explanation of climate change's impacts on food and overview of types of actions that can be taken in pursuit of resilience. Case-studies specific to Bulacan.
Forest Ecosystem Valuation Study: Indonesia, UNEP. (2007)	Exploration of how forest ecosystems contribute to ecosystem services for different localities. Strong examples and good framing for how to consider measures such as payments for ecosystem services.
<i>Water Sufficiency and Ecosystems</i>	

Shifting Course: Climate Adaptations for Water Management Institutions, World Wildlife Foundation (2011)	Identifies a set of principles for climate-adaptive water institutions. The report includes five case studies from around the world that highlight different institutional responses to climate change and related challenges.
Integrating Urban Agriculture and Forestry into Climate Change Action Plans: Lessons from Sri Lanka, RAUF Foundation. (2014)	An excellent case-study of integrating urban agriculture and forestry in Sri Lanka.
<i>Infrastructure</i>	
Understanding and addressing risks of flooding in the city: the case of Barangay Potrero, Metro Manila, ACCORD, and Red Cross/Crescent Climate Centre. (2015)	Comprehensive, context-specific case-study of cooperation mechanisms and policy innovations in flood response and preparation in Metro Manila.
Infrastructure, Engineering and Climate Change Adaptation – ensuring services in an uncertain future, Royal Academy of Engineering. (2011)	This report sets out the engineering profession's views on how to adapt the infrastructure system to the long-term effects of climate change and the short-term shocks of extreme weather.

Appendix 3: Community Outreach

Sector/Demographic	Who	Why
Government Officials	• Municipal Staff from Major Departments • Water district staff • Rural Health Unit Workers	As city officials, municipal and water district staff are experts on the service and programs that exist with regards to climate change. As decision makers, they possess the power to further implement adaptation measures.
Business People	• Market Association • SM Baliwag • Small business owners	Business leaders possess the knowledge of how climate change will impact business across a variety of industries and sectors.
Barangay Leaders	• 15 leaders out of 27 barangays	Barangay leaders have a deep understanding of the specific impacts that climate change may have on individuals and families in their day-to-day lives.
Civil Society Organizations	• The Catholic Church • Daycare Teachers • SAVERS • Pag-asa Youth Association of the Philippines • Silver Multi-Purpose Co-op • Rotary Club of Metro-Baliwag • Baliwag Humanitarian	Civil Society Organizations have connections to the community that city officials may not otherwise have. As a result, they have specialized knowledge with regards to the particular societal groups they work and partner with.
Women	• Mother leaders • Young mothers	Often underrepresented in policies and projects, women are critically attuned to family and community life. We wanted to know how climate change specifically affects women, and the families they are often so vital in ensuring well-being of.
Farmers	• Farmers from Barangay Piel and	Farmers have a unique understanding of the ways in which
	Barangka	livelihood can be so intertwined with changes in weather.
Seniors & Youth	• Senior Citizen's Federation • High School Students	Senior's possess historical memory necessary to understanding long-term changes in weather and adaptations as well as years of local knowledge.

Appendix 4: Adaptation Measures Rankings

In four different focus groups, our team conducted ranking exercises with community members to see what their priorities were for adaptation measures. These exercises evolved over the course of the project, but followed a general format:

1. Introduction of ‘standard’ adaptation measures drawn from secondary literature
2. Soliciting suggestions from community members of what was missing
3. Engaging in ranking exercises through ‘dot-mocracy,’ where each participant was given multiple votes to distribute wherever they felt was most important
4. Discussion after the voting of why decisions were made and what next steps were.

Of the four discussion groups we performed this exercise at, the demographics were as follows:

Women Leaders (July 8th, 2015): 15 women, 1 man. Average Age: 47.5 years old.

Institutional Staff (July 14th, 2015): 11 women, 7 men. Average Age: 42.6 years old.
Actor's present: Baliwag Water District, DILG, Municipal Departments, including, Assessor, COMELEC, Local Civil Registry, MAO, MEEM, MPDO, MSWD, PNP, POFP, RHN, PESO, POPCOM.

Tibag Barangay Workers (July 15th, 2015): 9 women, 1 man. Average Age: 44.7 years old.
5 Barangay Health Workers, 4 Mother Leaders, 1 LLN.

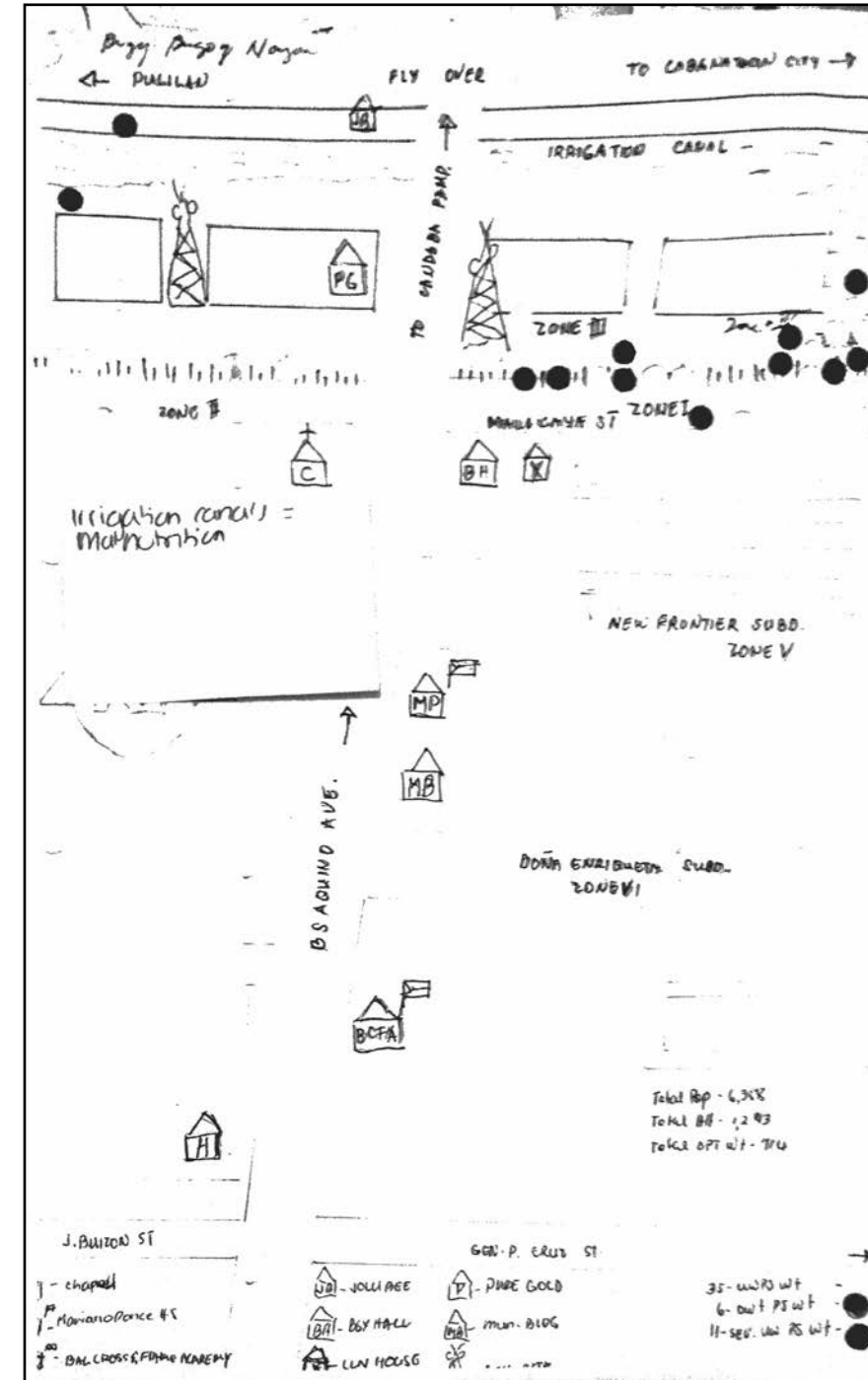
Multi-stakeholder Meeting (July 20th, 2015): 7 women, 5 men. Average age: 48.5 years old. Organizations covering services in 27 barangays: Baliwag Humanitarians (2,000 members), Day Care Teachers (31 members), PYAYP (50 members), Baliwag Rotary Club (20 members) SAVERS (45 members), Senior's Federation (500 members), Silver Multipurpose Co-op (1,500 members)

Rank (#dots)	Mother Leaders (16 participants)	Institutional Staff (18 participants)	Tibag Barangay Workers (10 participants)	Multi-stakeholder Community Focus Group (15 participants)		
	Overall Ranking	Overall Ranking	Overall Ranking	Ranked by Urgency	Ranked by Importance	Ranked by Ease
1	Family planning (12)	Discipline to eco-programs (18)	Family planning (12)	IEC on CC (11)	IEC on CC (10)	IEC on CC (14)
2	Energy conservation (10)	Education Information Campaign (14)	Livelihood programmes for Informal Settlements (9)	Clean drainage system (11)	IEC on health (9)	Tree-planting (10)
3	Improve tree planting (6)	Funding Requirements for Adaptation Projects (7)	Potential relocation (7)	Trees planting (11)	Clean drainage system (9)	Waste segregation to protect drains (9)
4	Waste segregation (6)	New Building Codes (5)	Recycling program for livelihood (5)	Reduce plastics to clear drains (9)	Trees planting (8)	Water conservation program (4)
5	Dog control program (4)	Build Partnerships / CSR (5)	Stronger relationships between barangays (5)	Waste segregation to protect drains (8)	Reduce plastics to clear drains (7)	IEC on health (4)
6	Bicycle riding program (4)	Upgrade Storm Water Management (4)	No to plasti and styro (5)	Early alert systems for disasters (8)	Water conservation program (6)	Livelihood programs in relocation areas (2)

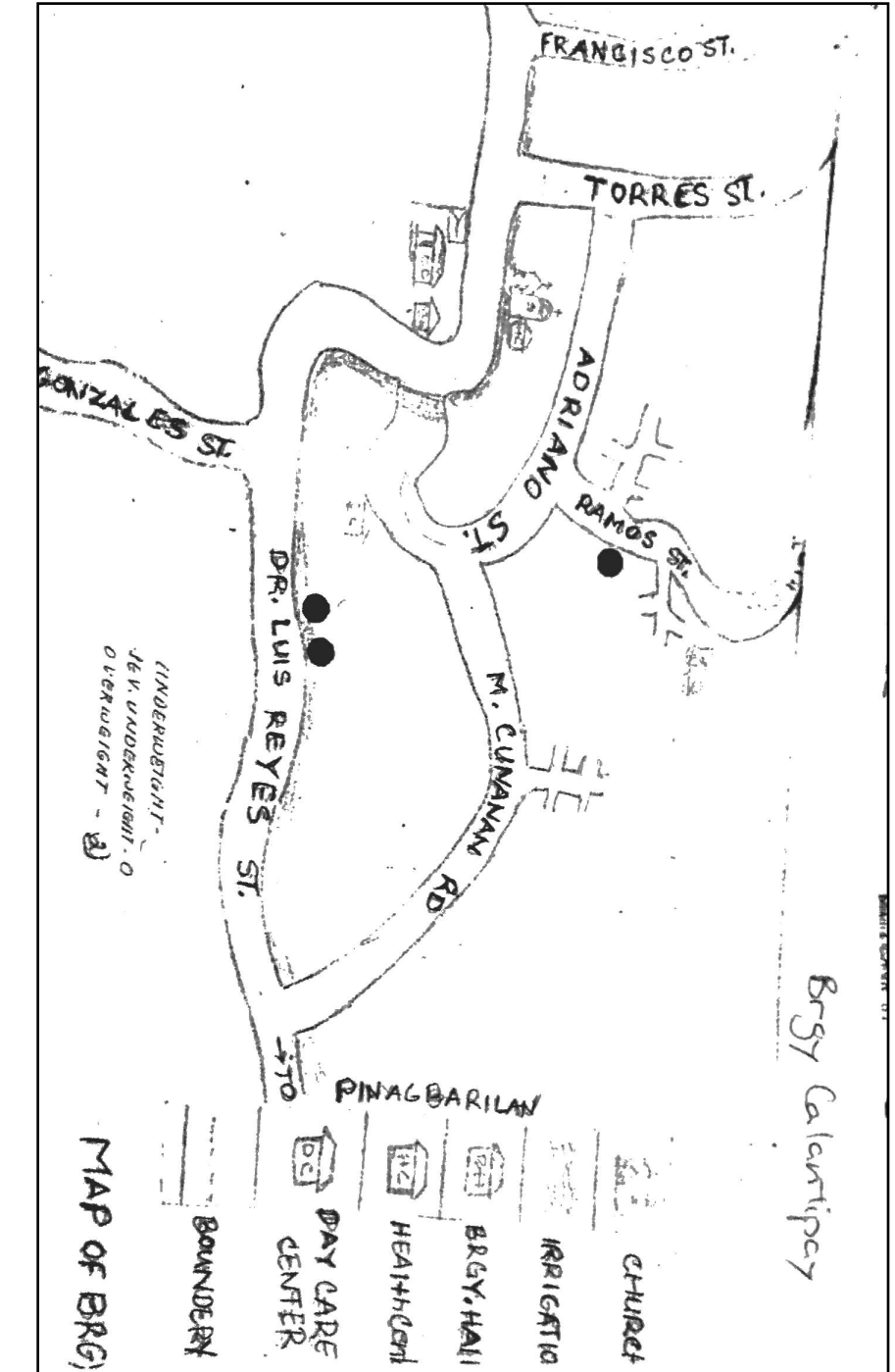
7	Prevention of teenage pregnancy (4)	Master Drainage Plan (1)	More health programs (5)	IEC on health (7)	Clean drainage system (3)	Active transportation (1)
8	Rainwater harvesting- (3)	Continuing Support and Training for Farmers (1)	Improving accessible sidewalks (3)	Water conservation program (4)	More support for farmers (3)	Reduce plastics to clear drains (1)
9	More secure fresh water (3)	New Technology for Farmers (1)	Shade on roads (3)	More support for farmers (3)	Livelihood programs in relocation areas (2)	Early alert systems for disasters (0)
10	No plastic and Styrofoam (3)	Designate 'flood strip' on Sidewalk (0)	Stormwater (2)	Livelihood programs in relocation areas (2)	Improve farm-to-market roads (1)	More support for farmers (0)
11	More health programs (3)	Water and Sanitation Safety Plan (0)	Improved tree planting (1)	Active transportation (2)	Early alert systems for disasters (0)	Painting rooftops white (0)
12	Shade on roads (1)	Banning Plastic to enhance storm-water protection (0)	Education (1)	Upgrade public market building (1)	Cover sidewalks for shade (0)	Cover sidewalks for shade (0)
13	Recycling program for livelihood (1)		Stronger communication (1)	Painting rooftops white (1)	Painting rooftops white (0)	Upgrade irrigation system (0)
14	Potential relocation (1)		More secure fresh water (0)	Upgrade irrigation system (1)	Active transportation (0)	Securing fresh water (0)
	Improving sidewalks (1)			Cover public spaces (1)	Incinerator (0)	Improve farm-to-market roads (0)
	Stronger relationships between barangays (1)			No smoking campaign (0)	No smoking campaign (0)	No smoking campaign (0)
				Improve farm-to-market roads (0)	Cover public spaces (0)	Cover public spaces (0)
				Securing fresh water (0)	Waste segregation to protect drains (0)	New insurance (0)
				New insurance (0)	New insurance (0)	Securing fresh water (0)
				Securing fresh water (0)	Securing fresh water (0)	Upgrade public market building (0)
				Incinerator (0)	Upgrade public market building (0)	Incinerator (0)

Appendix 5: Community Vulnerability Mapping

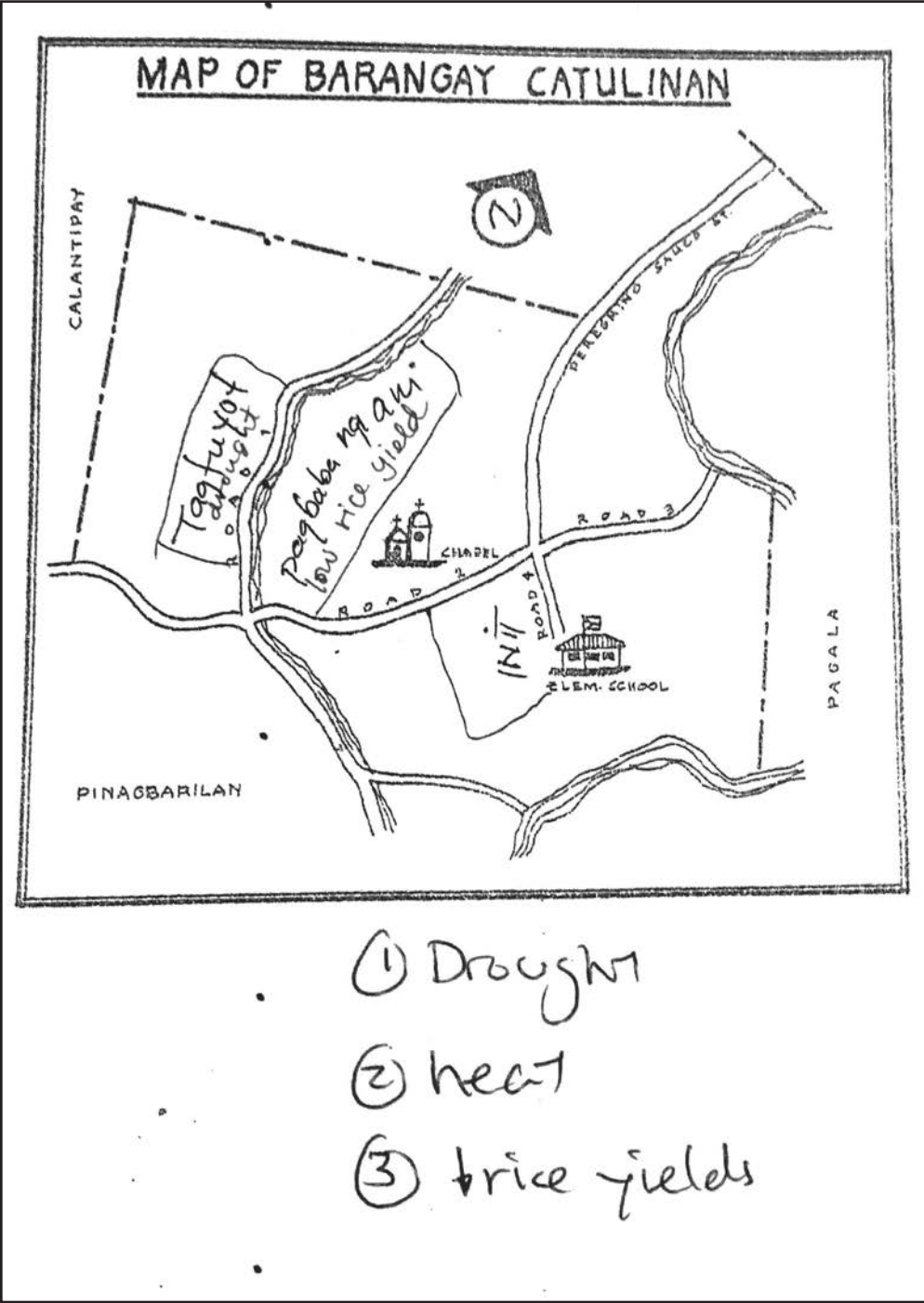
Barangay Busog Nayan



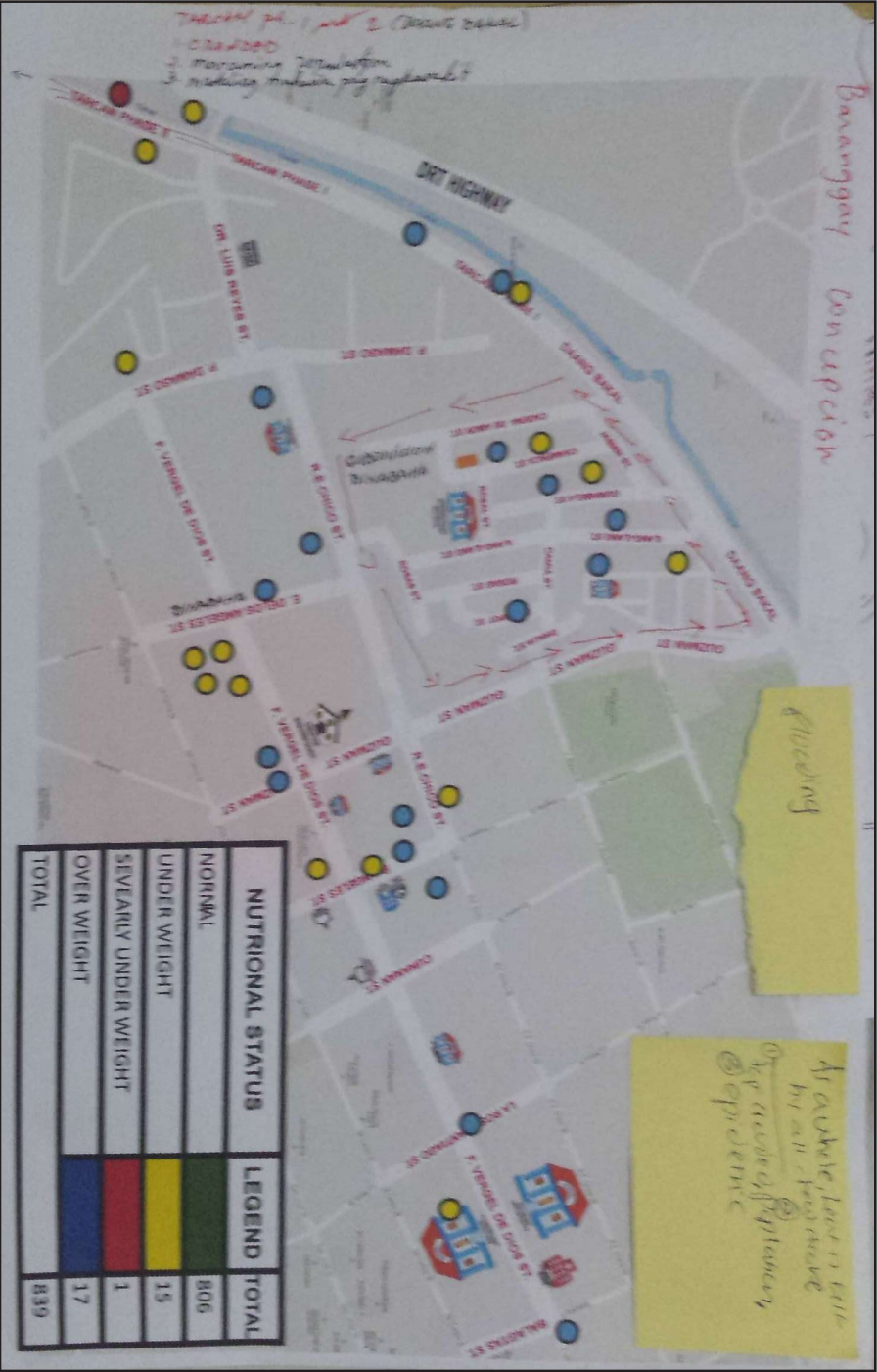
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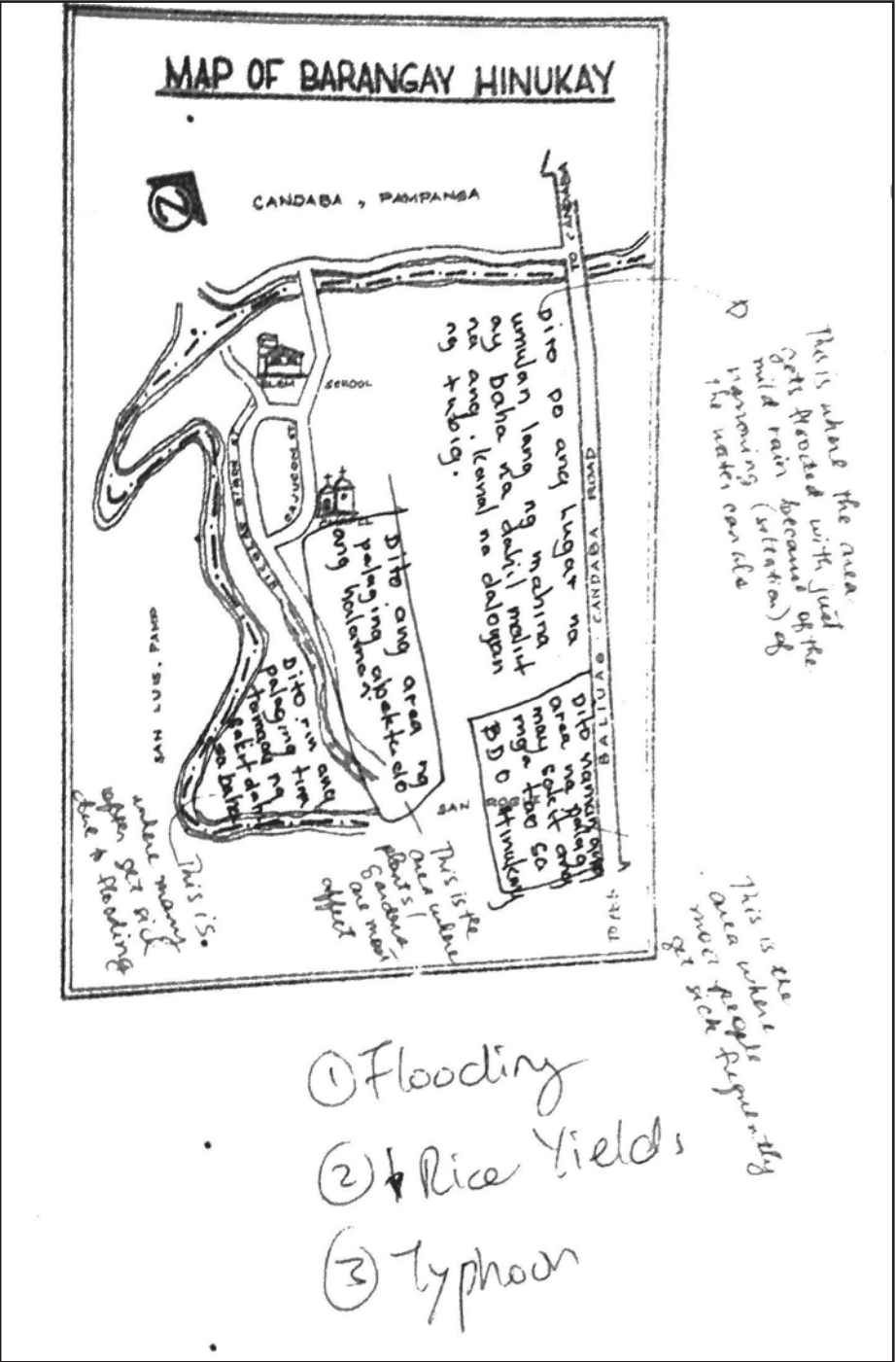
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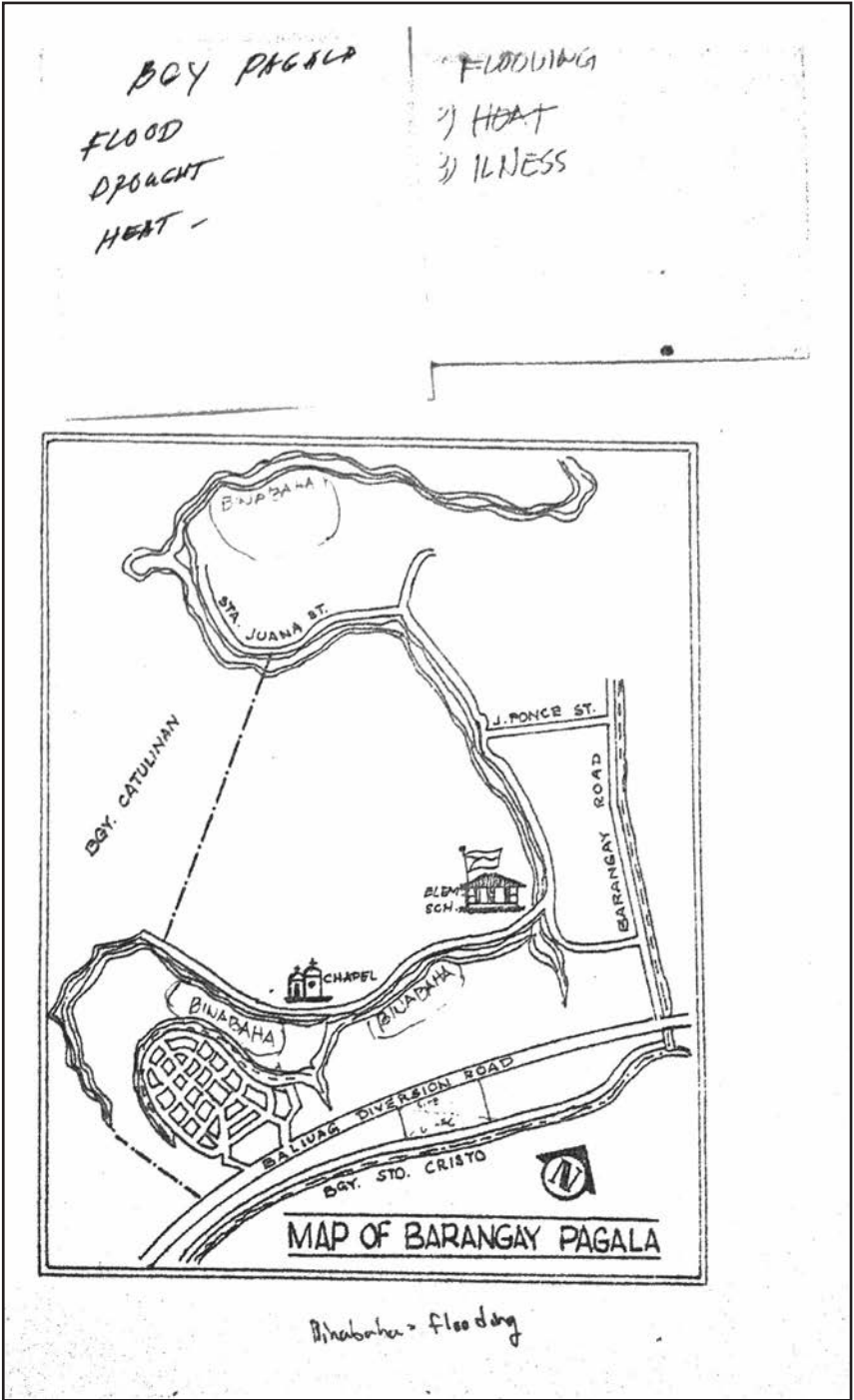
Barangay Concepcion



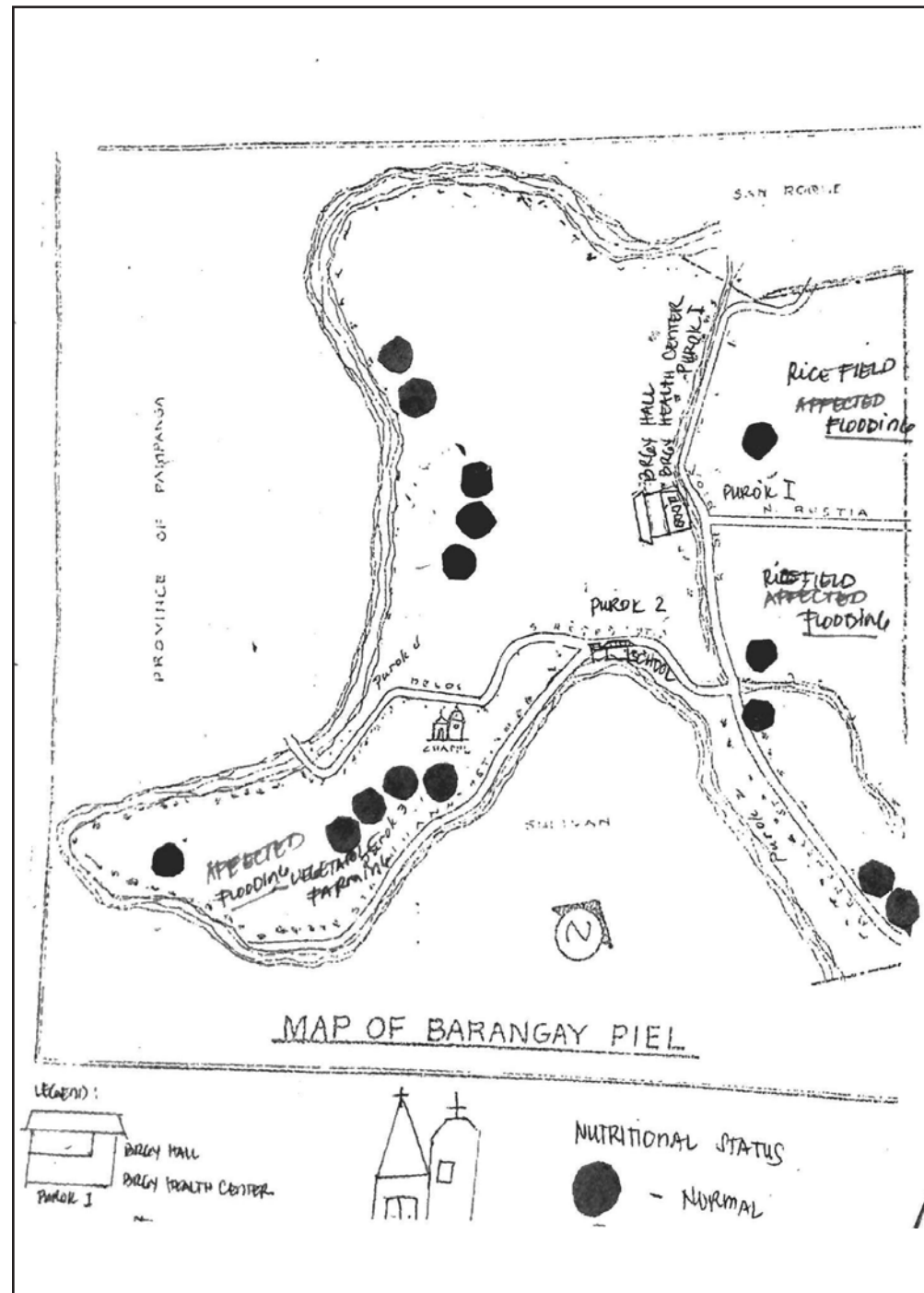
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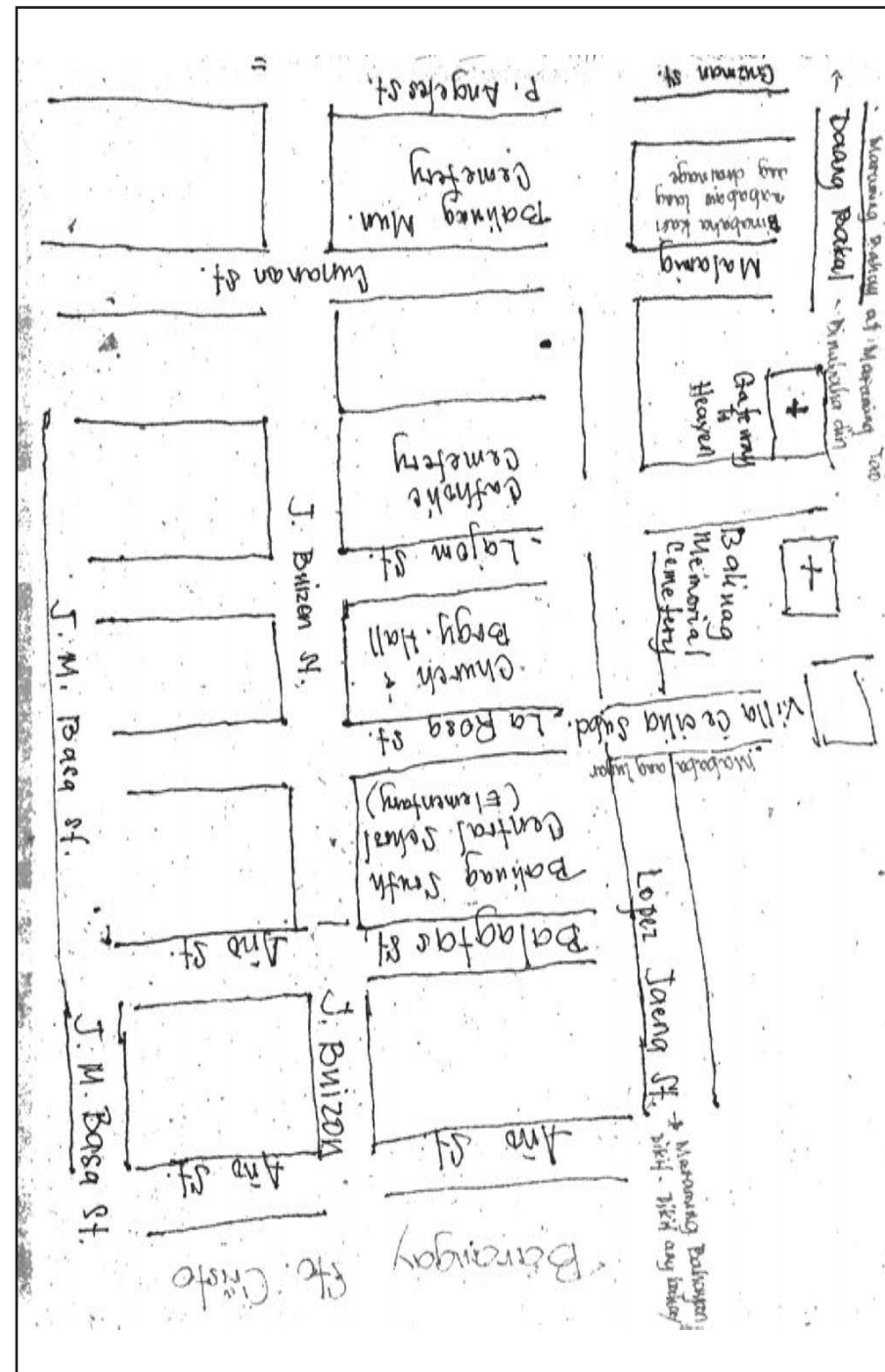
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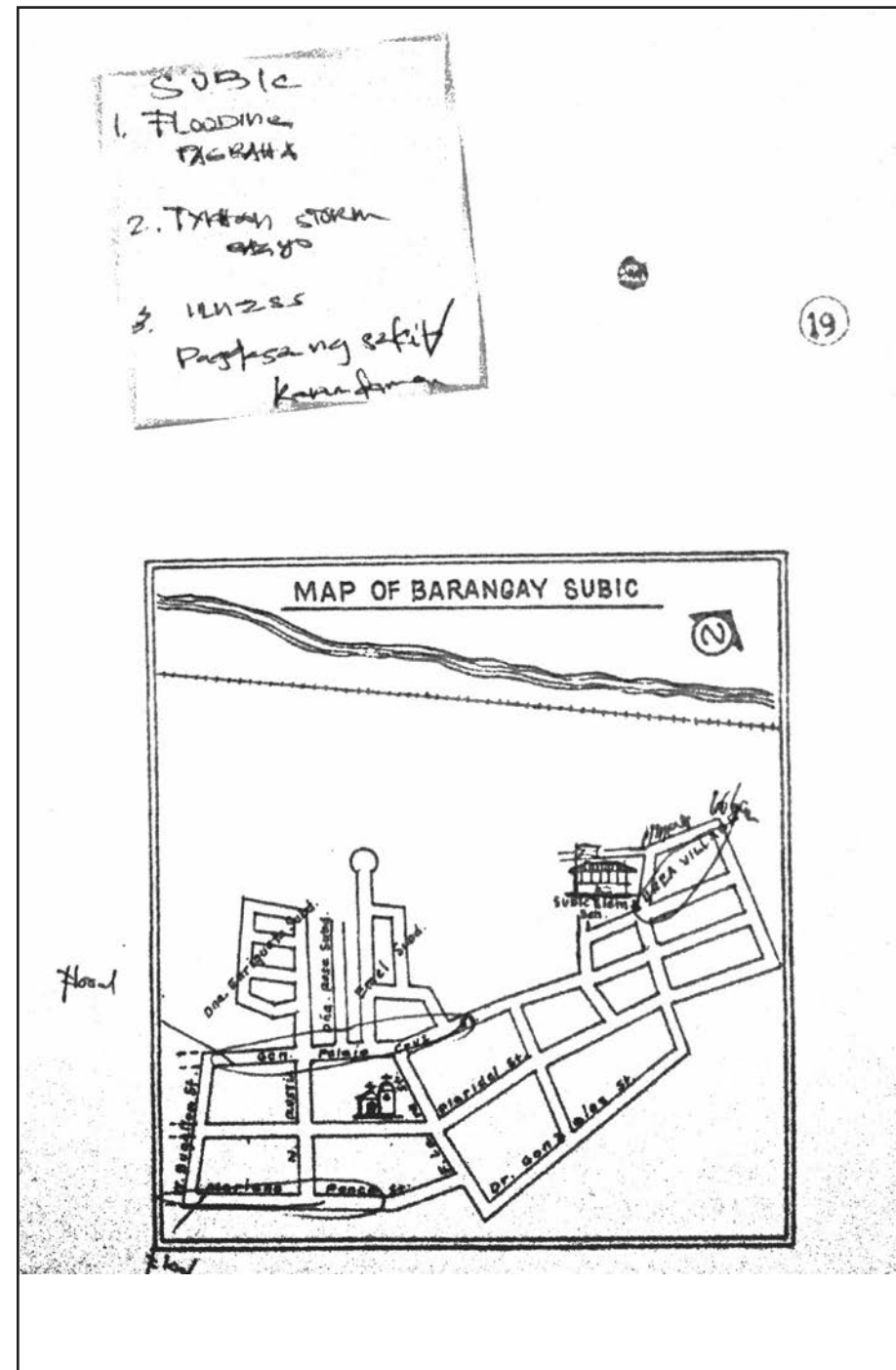
Barangay Piel



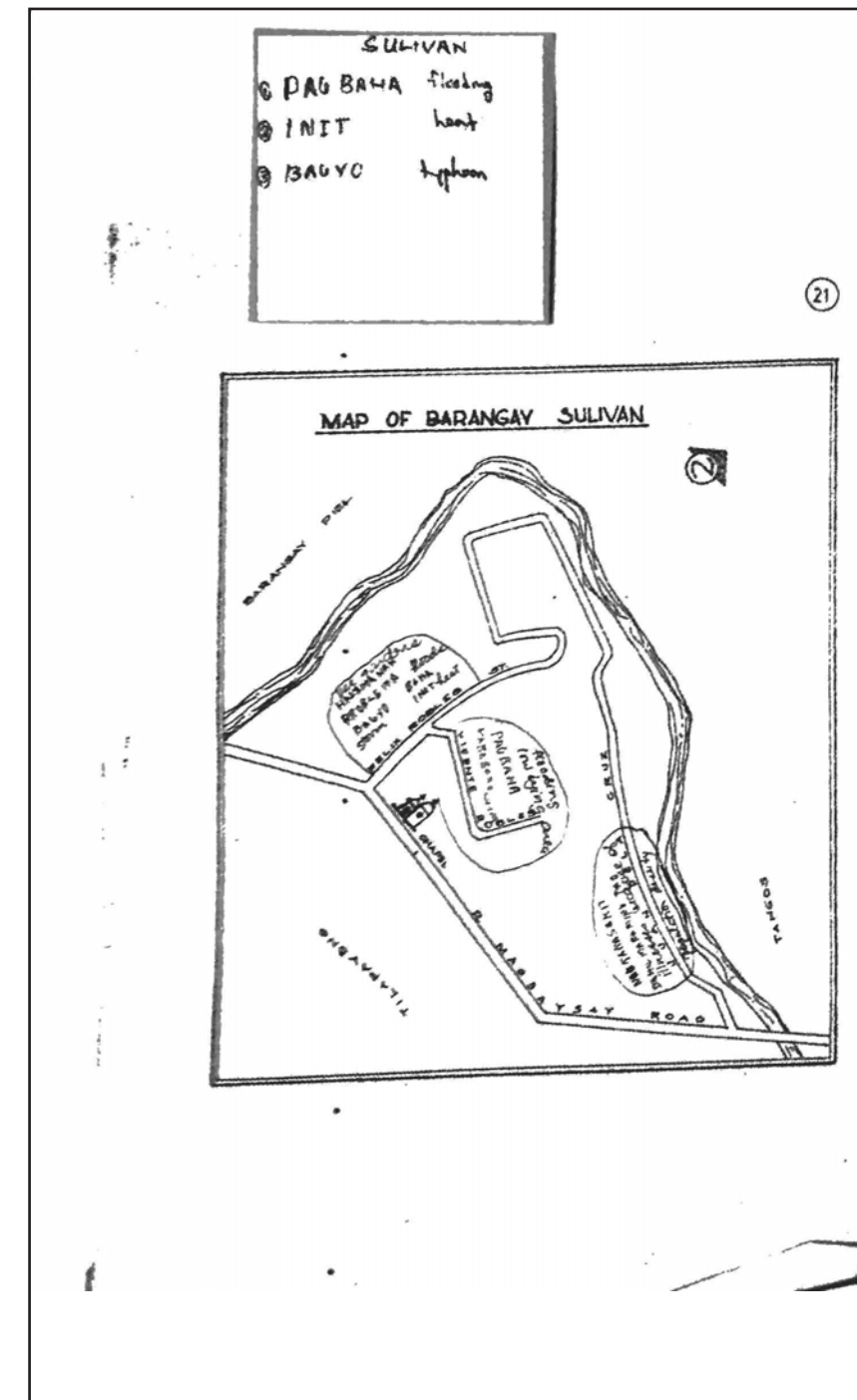
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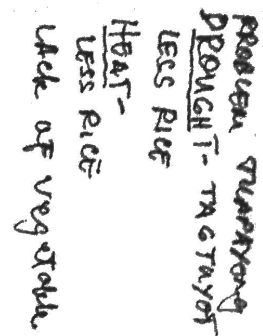
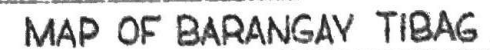
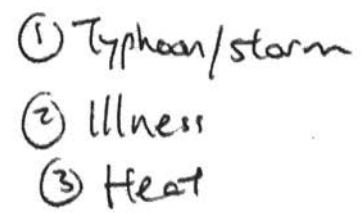


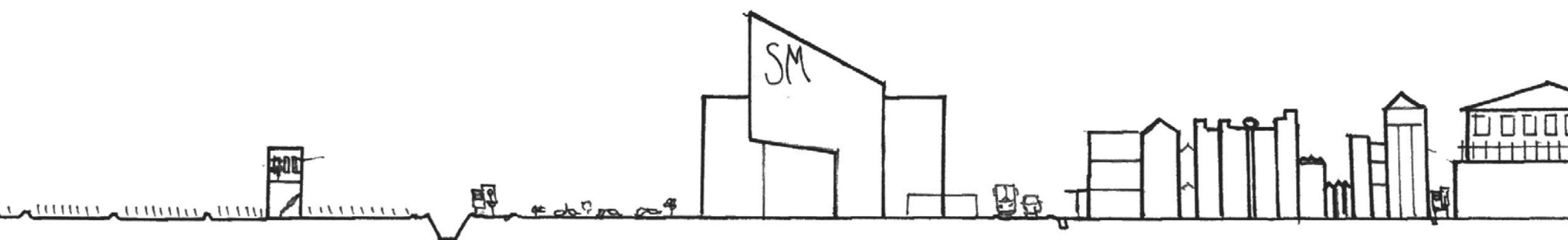
Barangay Subic



Barangay Sullivan







GUIGUINTO

TOWARDS A LOCAL CLIMATE CHANGE ACTION PLAN



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DISCLAIMER

The analysis, conclusions and recommendations of this publication do not necessarily reflect the views or opinions of The University of British Columbia, the School of Community and Regional Planning, the Municipality of Guiguinto, or the Provincial Government of Bulacan.

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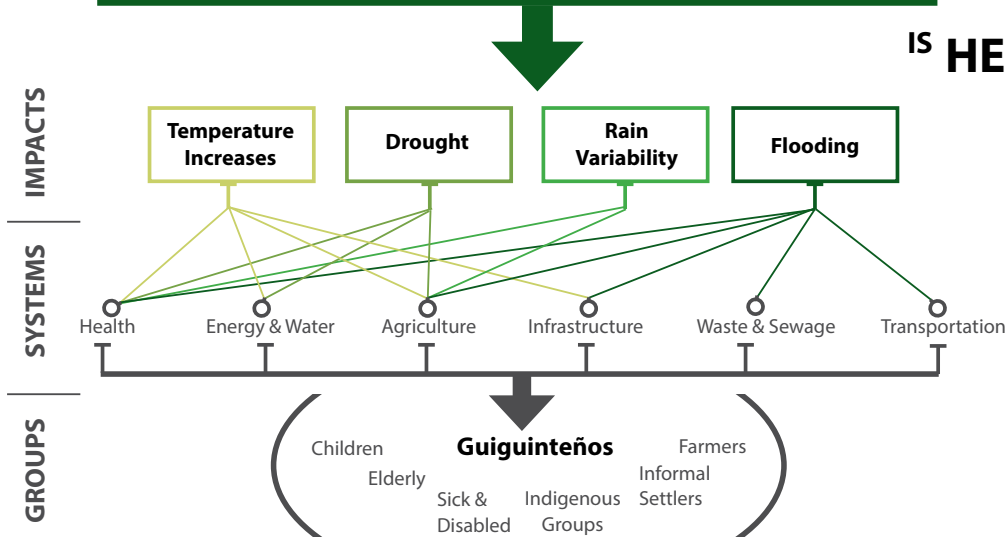
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CLIMATE CHANGE

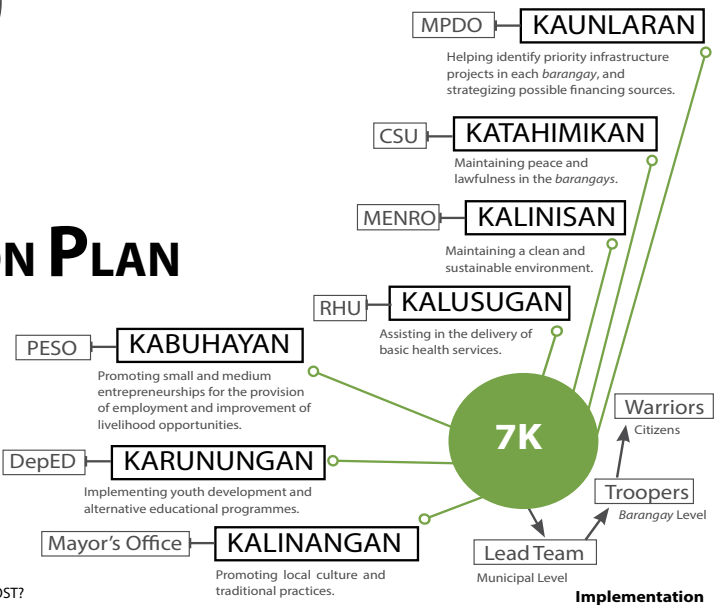
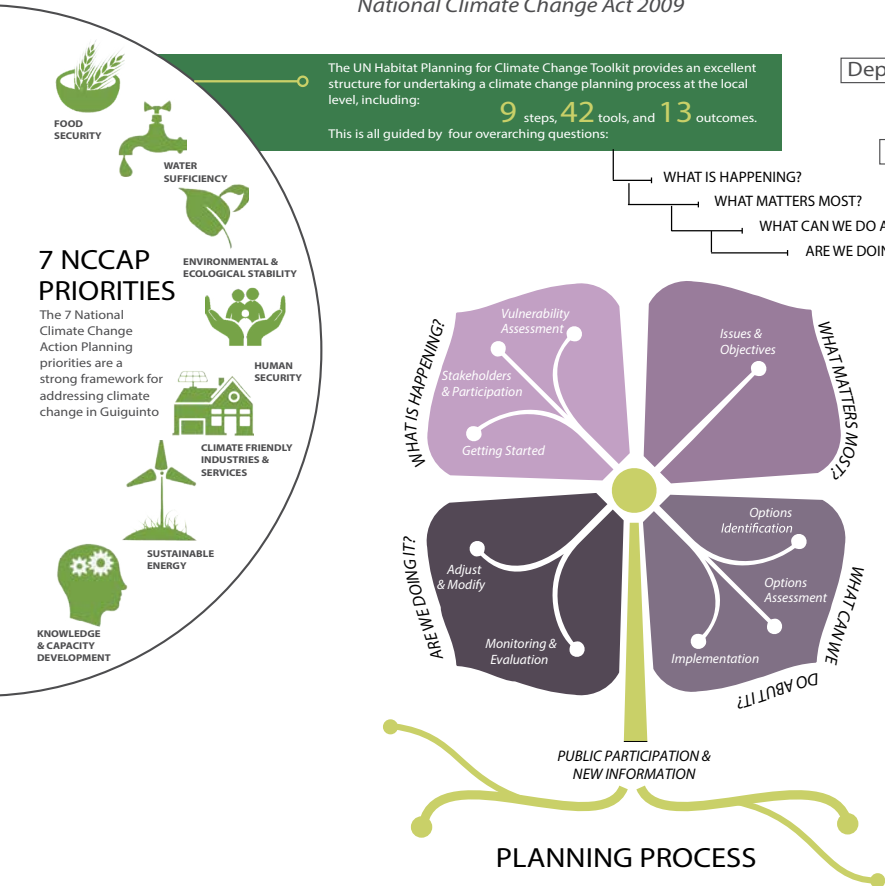


What can be done?

LOCAL CLIMATE CHANGE ACTION PLAN

“LGUs shall be the front line agencies in the formulation, planning, and implementation of climate change action plans...”

National Climate Change Act 2009



The 7K Program of the Municipality of Guiguinto is recognized as a community asset and an opportunity for implementing and mainstreaming climate change actions.

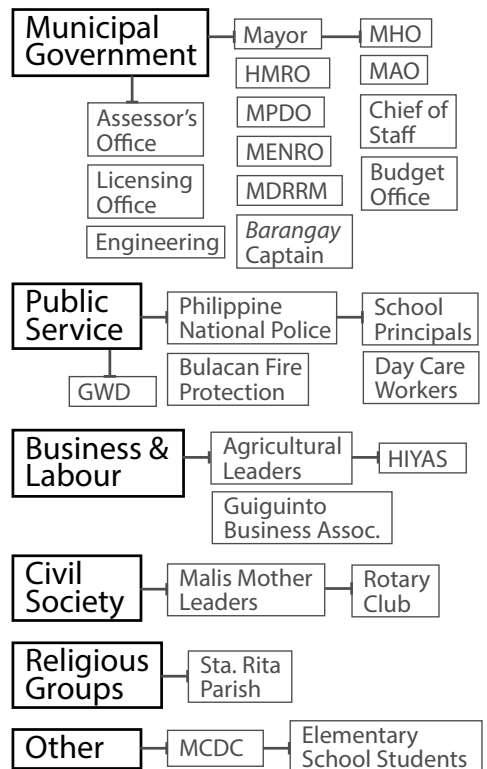
What did the Research Team do?

BACKGROUND RESEARCH 1

- Academic Literature Review
- Climate Change Planning Frameworks Assessment
- Municipal Documents & Policy Analysis
- Best Practices Research

Below is a visualization of the participants that were engaged during the process of the research project. Their inputs contributed to the Research Team's stakeholder identification, vulnerability assessment, and potential options for climate change action.

STAKEHOLDER ENGAGEMENT 2



LCCAP OPTIONS IDENTIFICATION 3

OPTION	NCCAP CATEGORY	7K PROGRAM
SHORT (1-2 Years)		
FUTURE RESEARCH		
Develop, test, introduce farming practices or techniques more resilient to climate change and variability in weather		Kalusugan, Kabuhayan
KNOWLEDGE & CAPACITY BUILDING		
Encourage school visits to the landfills/MRFs to provide an understanding of the full waste cycle		Kalinisan, Karunungan
Provide training on climate change to all employees and departments		Kaunlaran
ACTION		
Encourage cooling in buildings by painting roofs white, insulating gaps in building membrane with spray foam		Kaunlaran
MEDIUM (3-5 Years)		
KNOWLEDGE & CAPACITY BUILDING		
Conduct non-farming entrepreneurial courses for farmers		Kabuhayan
Collaborate with provincial government and engage with other municipalities and stakeholders for an integrated regional watershed management council		Kaunlaran, Kalinisan
ACTION		
Establish the Municipio as a strong example of best practices in climate change, water, energy and water management.		Kabuhayan
Plant street-side trees (or alternative structures) to protect pedestrians from extreme weather (sun, rain, etc.)		Kabuhayan
LONG (6+ Years)		
FUTURE RESEARCH		
Research the potential of incentives/penalties/enforcement mechanisms for businesses to reduce environmental degradation and promote safe work environments		Kabuhayan
ACTION		
Increase permeable surfaces for natural storm water drainage		Kaunlaran

THE GUIGUINTO RESEARCH TEAM:

Chris Karu • Jhon Mozo • Veronica Reiss • Emily Rosen • Daniel Ward



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ACRONYMS

CBMS	Community Based Monitoring System	MAO	Municipal Agriculture Office
CCA	Climate Change Adaptation	MCRO	Municipal Civil Registrar Office
CDP	Comprehensive Development Plan	MDRRMO	Municipal Disaster Risk Reduction and Management Office
CFIS	Climate Friendly Industries & Services	MENRO	Municipal Environmental and Natural Resources Office
CLUP	Comprehensive Land Use Plan	MPDO	Municipal Planning & Development Office
CSU	Civil Security Unit	MRF	Material Recovery Facility
DepED	Department of Education	MSWD	Municipal Social Welfare Department
DILG	Department of Interior and Local Governance	NCCAP	National Climate Change Action Plan
DJF	December, January, February	NSCB	National Statistics Coordination Board
DRRM	Disaster and Risk Reduction and Management	NFSCC	National Framework Strategy on Climate Change
EES	Environmental & Ecological Stability	NGO	Non-Governmental Organization
ELA	Executive Legislative Agenda	PAGASA	Philippine Atmospheric, Geophysical & Astronomical Service Administration
FS	Food Security	PESO	Public Employment Service Office
GBA	Guiguinto Business Association	PHP	Philippine Peso
GHG	Greenhouse Gases	RHU	Rural Health Unit
GWD	Guiguinto Water District	SCARP	School of Community and Regional Planning
HRMO	Human Resources & Management Office	SE	Sustainable Energy
HS	Human Security	SON	September, October, November
IPCC	Intergovernmental Panel on Climate Change	SWOT	Strengths, Weaknesses, Opportunities and Threats
JJA	June, July, August	UBC	University of British Columbia
KCD	Knowledge & Capacity Development	UNEP	United Nations Environment Programme
LCCAP	Local Climate Change Action Plan	WS	Water Sufficiency
LEED	Leadership in Energy & Environmental Design		
LGU	Local Government Unit		
MAM	March, April, May		

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"We were born into a clean and peaceful environment, and now we are polluting it and cutting down all of its trees. This needs to stop; if we are the problem, we are also the solution."

- MENRO Staff Member, Municipality of Guiguinto

"It is the policy of the State to afford full protection and the advancement of the right of people to a healthful ecology in accord with the rhythm and harmony of nature.... [The State has adopted a] framework which espouses sustainable development, to fulfill human needs while maintaining the quality of the natural environment for current and future generations."

- Republic Act No. 9729, Congress of the Philippines

1 INTRODUCTION

Climate Change Overview

The impacts of climate change are here.

Global changes in weather patterns caused by the rise in global mean ocean and land surface temperatures have been well observed and recognized as one of the greatest risks humanity has experienced to our ecological system and everything it underpins. The intergovernmental panel on climate change (IPCC)—the global scientific authority on the phenomenon—has reached overwhelming consensus that greenhouse gas emissions (GHG) resulting from human activities over the last 150 years are the predominant contributor to climate change, with the majority represented by the burning of fossil fuels. This is illustrated below (see **Figure 1**): emissions from fossil fuels began to climb slowly and steadily at the turn of the 20th Century as industrialization and resultant economic development required increasingly higher levels of energy inputs from fossil fuels. These emissions increased steadily and have climbed precipitously since World War II.

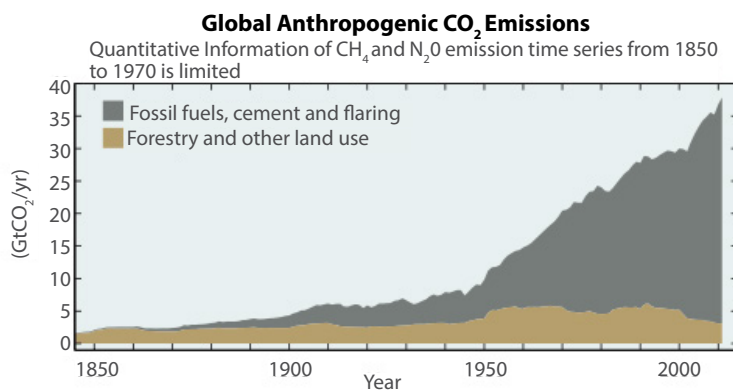


Fig.1. CO₂ Emission Trends from 1850 to 2000. Source: IPCC, 2013.

The IPCC has established several emission scenarios and estimated the resulting temperature increases associated with each. In each case, temperatures are poised to increase. In their 5th assessment, the IPCC reports to be “virtually certain” that temperatures will become more extreme, with colder and hotter temperatures, and that the frequency of heatwaves and cold snaps will be longer and more frequent.

The Philippines is unfortunately already experiencing the impacts of our changing climate. Prolonged periods of drought have impacted farmers and the

agricultural sector and intense heat waves have resulted in illness and death amongst vulnerable populations. Meanwhile, rapid population growth and deforestation are exacerbating the challenges brought by climate change. Reducing our environmental impact and our GHG emissions is important as a contribution to the global effort to slow human-induced climate change, and is also important for our health. However, due to the urgency and vulnerability of the Filipino population to the impacts of climate change, adaptation has been recognized as the critical policy response that the National government, regional governments and local government units (LGU's) must prioritize. While we cannot stop climate change, we can plan for the potential effects and thereby minimize the impacts.

Common Definitions

For the purpose of improving the legibility of this report, as well as promoting the understanding of standardized terminology as related to climate change, it has been deemed relevant to adopt the definitions of certain key terms as stated in the *Republic Act No. 9729*, passed by the Congress of the Philippines in 2009. This policy, also known as the Climate Change Act of 2009, represents an important source that informs further climate change related plans and ordinances.

» *Adaptation*: refers to the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

» *Adaptive Capacity*: refers to the ability of ecological, social or economic systems to adjust to climate change including climate variability and extremes, to moderate or offset potential damages and to take advantage of associated opportunities with changes in climate or to cope with the consequences thereof.

» *Climate Change*: refers to a change in climate that can be identified by changes in the mean and/or variability of its properties and that persists for an

extended period typically decades or longer, whether due to natural variability or as a result of human activity.

» *Disaster Risk Reduction*: refers to the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

» *Mitigation*: in the context of climate change, refers to human intervention to address anthropogenic emissions by sources and removals by sinks of all GHG, including ozone-depleting substances and their substitutes.

» *Vulnerability*: refers to the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Report Objective

This report is the result of a collaboration between the School of Community and Regional Planning at the University of British Columbia in Vancouver, Canada and the Municipality of Guiguinto, Philippines. It was developed under *Urbanizing Watersheds: Collaborative Governance of the Angat River Basin in the Philippines*, a project supported by the Social Sciences and Humanities Research Council of Canada. Under the guidance of Professor Dr. Leonora Angeles, this report was compiled by a research team consisting of five Master's students from SCARP at UBC (referred to from this point on as the Research Team).

The leading objective behind the research conducted by this team was to collect, analyze and synthesize data pertaining to climate change within the local context of the Municipality of Guiguinto. Through the collection of this data, the goal was to develop a general understanding of the community's adaptive capacity as

a means of providing recommendations to further enhance its resilience through the creation of a Local Climate Change Action Plan (LCCAP).

The present report constitutes the final deliverable from the Research Team, and is aimed at assisting the municipal government in the formulation of an LCCAP for the Municipality of Guiguinto. The intention is for this report to be used as a guiding resource in the drawing up of an LCCAP that is congruent with the guidelines and priorities of the Philippine's National Climate Change Action Plan (NCCAP), and to provide Guiguinto with a policy and administration framework that is resilient and adaptive to climate change.

Methodology

The Research Team followed two methodological approaches using mixed-methods research in the writing of this report, using both primary and secondary data. To collect secondary data, a thorough review of relevant literature on climate change adaptation at various scales was undertaken. This included analyzing relevant research conducted by international and academic bodies, various departments of the Philippine national government, the Province of Bulacan and its corresponding offices, as well as the key administrative documents, plans and reports of the Municipality of Guiguinto.

The second approach of the research method was the primary data collection of local knowledge through community engagement; this involved interviews with government officials and staff, focus groups with key stakeholders (or interest groups), and engagement activities with the wider community. These key interest groups were identified through a stakeholder identification exercise conducted by the Research Team with municipal staff.

During this exercise the municipal staff were asked to identify relevant interest groups; once these had been identified, the interest groups were ranked in order of their influence on climate change adaptation and then again in order of their vulnerability to the effects of climate change. Once the relevant interest groups had been identified, interviews and focus groups

were conducted. These engagement exercises were undertaken using a standard set of questions with the addition of actor-specific questions. The collected data was used by the Research Team to conduct an analysis of Guiguinto's strengths, weaknesses, opportunities and threats in terms of climate change adaptation capacity - otherwise known as a SWOT analysis.

The recommendations set out in this report were compiled by the Research Team using information gathered through a literature review and community engagement. Special attention has been paid to the suggestions provided by the Guiguinto community with the understanding that community members understand the problems they face and potential solutions in a much deeper way than actors unfamiliar with the local context.

Research Limitations

While this report is intended to be a useful guide for the Municipality of Guiguinto and its staff in writing an LCCAP, the limitations of the document and its authors must be understood. This report was drawn up by urban planning master's students. They cannot be considered professional planners. All research, community engagement, writing, and presentation for this project was organized and undertaken over the course of the 4 weeks the Research Team was in the Philippines. This short time frame limited the ability of the Research Team to conduct more extensive community engagement exercises and to gain a full understanding of the context and particular conditions of Guiguinto. The Research Team was also limited in its research ability by the fact that the Municipality of Guiguinto was undertaking significant development planning during the time this report was being completed. An updated CLUP was nearing completion, however, most other policy documents, including the Executive Legislative Agenda, the Local Poverty Reduction Action Plan, a Comprehensive Waste Management Strategy, and a Comprehensive Development Plan, were not available. For these reasons, all recommendations and suggestions contained within this report should be further modified to fit the specific needs of Guiguinto and the limitations of this report should be kept in mind.

A black and white photograph of a rural landscape. In the foreground, a dirt road or path runs diagonally from the bottom left towards the center. To the left of the path, there is a small, shallow, muddy puddle. Several chickens are visible on the ground near the puddle. To the right of the path, a small, three-wheeled vehicle with a canopy is parked. The background is filled with dense tropical vegetation, including several tall palm trees and banana plants. The sky is overcast.

*"It is difficult - but essential - to
remove the 'to each his own'
ideology we have in our community.
Together we can change that."*

- Barangay Captain, Malis

"It shall be the policy of the State to enjoin the participation of national and local governments, businesses, nongovernment organizations, local communities and the public to prevent and reduce the adverse impacts of climate change and, at the same time, maximize the benefits of climate change."

- Republic Act No. 9729, Congress of the Philippines

2 PLANNING CONTEXT

Before discussing the creation of an LCCAP in Guiguinto, the wider national and local institutional, geographic, and social contexts must be understood. These contexts are presented below and give a basic overview of important topics and conditions at the national, provincial and local levels as they relate to the Municipality of Guiguinto within the context of the Philippines (see **Figure 2**). These factors and contexts must be taken into account when climate change planning is undertaken, as they not only present the unique way climate change will affect Guiguinto, but also frame the way adaptation can most successfully be undertaken.



Fig.2. Map of the Philippines

“... the ultimate goal is to build the adaptive capacities of women and men in their communities, increase the resilience of vulnerable sectors and natural ecosystems to climate change, and optimize mitigation opportunities towards gender responsive and rights-based sustainable development.”

- National Climate Change Action Plan 2011-2028

NATIONAL CONTEXT: THE PHILIPPINES

As a tropical, archipelagic nation, climate change poses an urgent threat to the Philippines. Tropical environments are more prone to powerful weather-related events and sea-level rise presents serious long-term threats to the country. This risk is heightened by the fact that a significant percentage of the population resides in hazardous areas of the country. According to the World Bank (2008), 50.3% of the total land area and 81.3% of the population are vulnerable to natural disasters. Of this population, the poor, women and children are recognized as especially vulnerable to the consequences of climate change.

The Philippines' Experience With Climate Change

Due to these conditions and recent climate change induced calamities the national government has taken a lead on addressing the urgent threat posed by climate change. In 2009, the Philippines passed the *Republic Act 9729* (“The Climate Change Act”).

“It is the policy of the State to afford full protection and the advancement of the right of the people to a balanced and healthful ecology... to fulfill human needs while maintaining the quality of the natural environment for current and future generations.” (Republic Act 9729, sec. 2)

The following year, congress adopted the National Framework Strategy on Climate Change (NFSCC). The stated ultimate goal is:

“To build the adaptive capacities of women and men in their communities, increase the resilience of vulnerable sectors and natural ecosystems to climate change, and optimize mitigation opportunities towards gender-responsive and rights-based sustainable development.”

This Framework Strategy was used moving forward in climate change policy at the national level.

The NCCAP

The NFSCC paved the way for the creation of the National Climate Change Action Plan (NCCAP), creating a national adaptation and mitigation agenda from 2011 to 2028. Given the relatively small contribution of the Philippines to global climate change and the significant and immediate risk climate change poses to the country, the plan highlighted adaptation as the “anchoring” and priority policy response to climate change, incorporating mitigation strategies wherever possible.

Pursuant to the Climate Change Act (2009) and as required by the Department of Interior and Local Government (DILG), LGU’s are required to develop a Local Climate Change Plan (LCCAP) based on the road map provided by the NFSCC.

The NCCAP document recognizes seven priority areas for action as follows (see **Figure 3**):

» **FOOD SECURITY (FS):** The main objective of the national strategic priority on food security is to ensure availability, stability, accessibility, and affordability of safe and healthy food amidst climate change.

» **WATER SUFFICIENCY (WS):** In light of climate change, a comprehensive review and subsequent restructuring of the entire water sector governance is required. It is important as well to assess the resilience of major water resources and infrastructures, manage supply and demand, manage water quality, and promote conservation.

» **ENVIRONMENTAL & ECOLOGICAL STABILITY (EES):** Ecosystem resilience and environmental stability during the plan period is focused on achieving one immediate outcome: the protection and rehabilitation of critical ecosystems, and the restoration of ecological services.

» **HUMAN SECURITY (HS):** The objective of the human security agenda is to reduce the risks of women and men to climate change and disasters.

» **CLIMATE FRIENDLY INDUSTRIES & SERVICES (CFIS):** NCCAP prioritizes the creation of green and eco-jobs and sustainable consumption and production. It also focuses on the development of sustainable cities and municipalities.

» **SUSTAINABLE ENERGY (SE):** NCCAP prioritizes the promotion and expansion of energy efficiency and conservation; the development of sustainable and renewable energy; environmentally sustainable transport; and climate-proofing and rehabilitation of energy systems infrastructures.

» **KNOWLEDGE & CAPACITY DEVELOPMENT (KCD):** The NCCAP prioritizes: • Enhanced knowledge on the science of climate change; • Enhanced capacity for climate change adaptation, mitigation and disaster risk reduction at the local and community level; and • Established gendered climate change knowledge management accessible to all sectors at the national and local levels.



Fig.3. NCCAP Priorities

VISION: "A premier province with a vibrant economy, safe environment, and strong middle class as the core of the citizenry where the people have equal access to opportunities and services and are living models of its historical heritage and cultural excellence."

PROVINCIAL CONTEXT: BULACAN

The following data is sourced from the *Provincial Development and Physical Framework Plan 2010-2030*, unless stated otherwise.

investors to develop several industrial estates in the province.

Additionally, the province is part of the "W Growth Strategy of the Medium Term Development Plan of the Region." This plan defines Central Luzon's key growth areas as part of a strategic approach in promoting the region as an investment destination for tourism, industry and agriculture. The proposed W Growth Corridor is the spatial representation of the vision for Central Luzon which is to direct certain economic activities to strategic areas where they can be globally competitive.

Land Area

Bulacan has a total land area of 279,610 hectares. Doña Remedios Trinidad is the largest municipality covering 33.6% of the province's land area, while the Municipality of Guiguinto is the smallest, covering less than 1% of the land area of Bulacan.

Population

As of the 2010 census, Bulacan registered a total population of approximately 2,924,400, making it the largest province in terms of population in Central Luzon. Given the growth rate, the medium-sized municipalities of Pulilan, Guiguinto, and Balagtas are expected to attract an increasing population, through mass transportation access, good road access, and built-up areas.

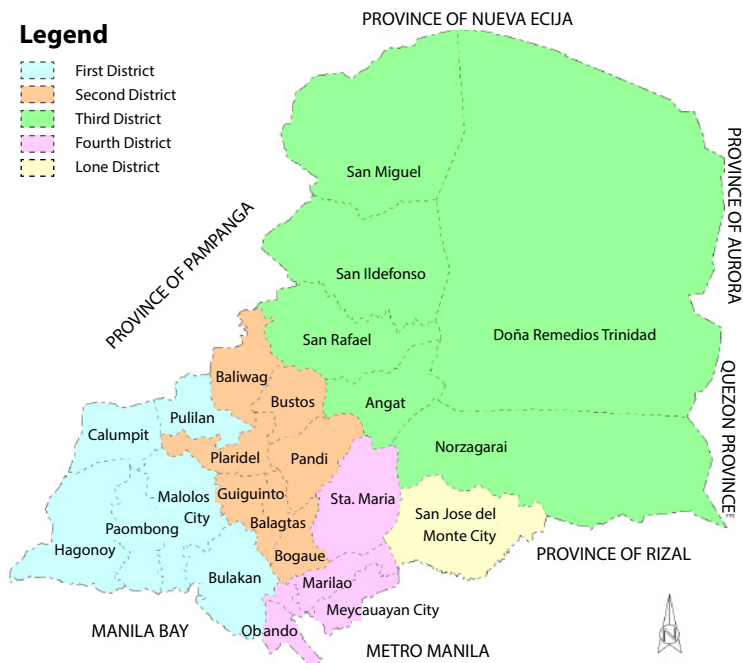


Fig.4. Administrative Map of the Province of Bulacan

Geographic Location

The Province of Bulacan is one of the first class provinces in the Philippines situated in Central Luzon (Region III). The province is dubbed as the "Northern Gateway from Manila" due to the presence of major roads enhancing the connectivity northeast and northwest. Such accessibility is a key factor that has prompted private

MISSION: "... Sustainable development - Protection and management of environment - Reducing disaster risks and increasing adaptive capacity to climate change - Food security..."

VISION: "The Garden Capital of the Philippines serving as the business gateway to the north, yet providing its empowered citizenry a diversified economy, well-planned and safe environment managed by a responsive and transparent local government unit under the guidance of the Almighty."

MUNICIPAL CONTEXT: GUIGUINTO

The following data is sourced from the *Municipality of Guiguinto's Comprehensive Land Use Plan 2014-2022*, unless stated otherwise.

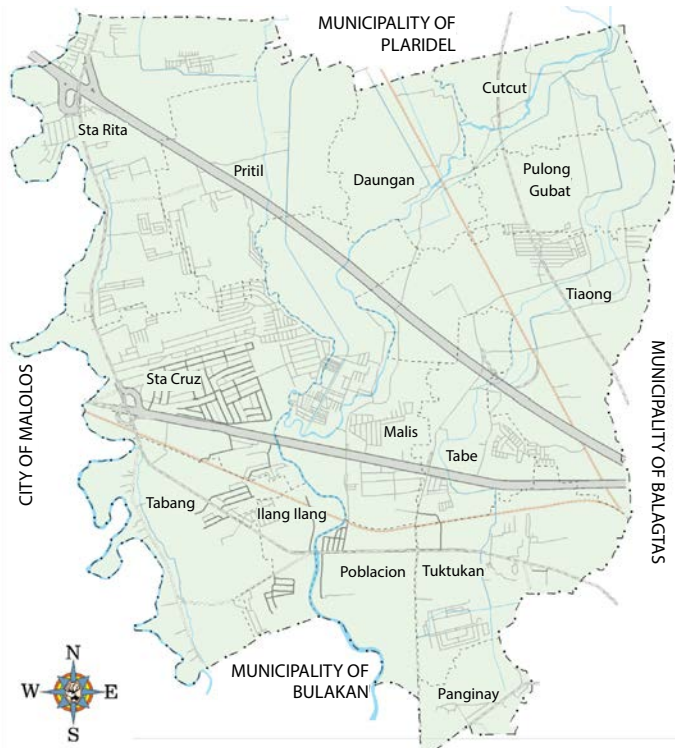


Fig.5. Administrative Map of the Municipality of Guiguinto

Geography

The Municipality of Guiguinto is located near the center of the Province of Bulacan, Philippines, approximately thirty-three kilometers north of Manila and eight kilometers east of the City of Malolos, the provincial capital. Based off land accounting and estimates using a Geographic Information System (GIS), the Municipality

of Guiguinto registered a total area of 2,221 hectares. The Guiguinto River is the only major water body and resource in the municipality, flowing downstream from north to south. This river covers about 9.6 hectares or 0.36% of the total land area of the Municipality of Guiguinto and plays a substantial socio-economic role.

Demographics

Guiguinto is classified as first-class municipality and is composed of fourteen *barangays*. As of the latest Census conducted in 2010, Guiguinto has a total of 90,507 inhabitants with average annual growth rate of 2.9 percent, higher than that of the Province of Bulacan at 2.7 percent. *Barangay* Malis has the greatest share of the total population at approximately 13,950 (15.4%), followed by Sta. Rita and Sta. Cruz at approximately 13,160 (14.5%) and approximately 11,640 (12.8%) respectively.

Land Use

Despite intense urbanization and land conversion pressures over the past number of years, the majority of land in Guiguinto remains agricultural, with 52% of total land area designated as such. Guiguinto's agricultural land is concentrated mostly in the northern areas of the municipality. Built up areas throughout the municipality constitute 47% of the land area and include a number of major transportation networks. Commercial and industrial areas are generally concentrated around these transport corridors, as well as *Barangay* Poblacion, the

administrative center of the municipality. Reinforced by several residential subdivisions, the urban core of Guiguinto is represented by *barangays* Poblacion, Tuktukan, Malis, Ilang-Ilang and Tabang. Industrial and commercial land uses provide the largest source of income for Guiguinto's residents. The final 1% of Guiguinto's land area is occupied by waterways.

Infrastructure

Guiguinto has a number of important infrastructure networks located within the municipality. Three major highways pass through Guiguinto. These are the North Luzon Expressway, Manila North Road/MacArthur Highway, and the Old Cagayan Valley Road. There are also two railroad lines running through Guiguinto, totaling approximately 142 kilometers.

Economic Overview

According to Guiguinto's *Annual Report 2014-2016*, the local economy is generally divided into three sectors with interrelated functions. Currently, Guiguinto is heavily dependent on its primary sector, which is predominantly made up agriculture, fishery, and livestock; however, the development of the horticultural industry through ornamental plants has increasingly begun to play an important role in this sector and forms the basis of the "Garden City" vision for the future. The secondary sector, composed of manufacturing, construction, and energy generation, is highly absent in the municipal economy. Guiguinto also has a very strong economy based in the tertiary sector, consisting of all service activities such as trade and commerce, real estate, personal and community services, and transportation and communications. Due to Guiguinto's strategic central location in the Province of Bulacan and relative proximity to Metro Manila, the municipality is fast developing into an industrial hub for light, medium, and heavy industries, attracting both local and foreign investment.

Socio-economic Profile

The Research Team would like to highlight that there was not sufficient data available to gain an understanding of the socio-economic context in Guiguinto. It is important that governments record information such as income, education and employment at the local level. Such factors are essential to analyzing and assessing vulnerable populations, particularly when planning for disaster risk reduction and mitigation (DRRM) and climate change adaptation (CCA).



Fig.6. Ornamental Plants at the Guiguinto Garden City Multi-purpose Cooperative

MISSION: "Continuously improve access to quality basic social service - Sustain economic growth - Maintain adequate infrastructure, clean and safe environment - Promote a community resilient to disaster and adaptive to climate change."

SUGOD GUIGUINTO

7K PROGRAM

The 7K Program is a municipal initiative that was co-created alongside residents of Guiguinto, through a public engagement process, in order to recognize key areas for the enhancement of the community. This process resulted in the creation of a program for establishing strategies to address each of these areas, as well as, for developing a multi-level governance framework for their implementation in the *barangays*.

The rationale behind this program is to empower the citizenry in the holistic development of the municipality of Guiguinto based on a 7-point Development Agenda that includes: *Kaunlaran* (Prosperity), *Katahimikan* (Lawfulness), *Kalinisan* (Environment), *Kalusugan* (Health), *Kabuhayan* (Livelihood), *Kabataan/Karunungan* (Youth/Education), and *Kalinangan* (Culture). The main structure of the program is shown through Fig. 4.

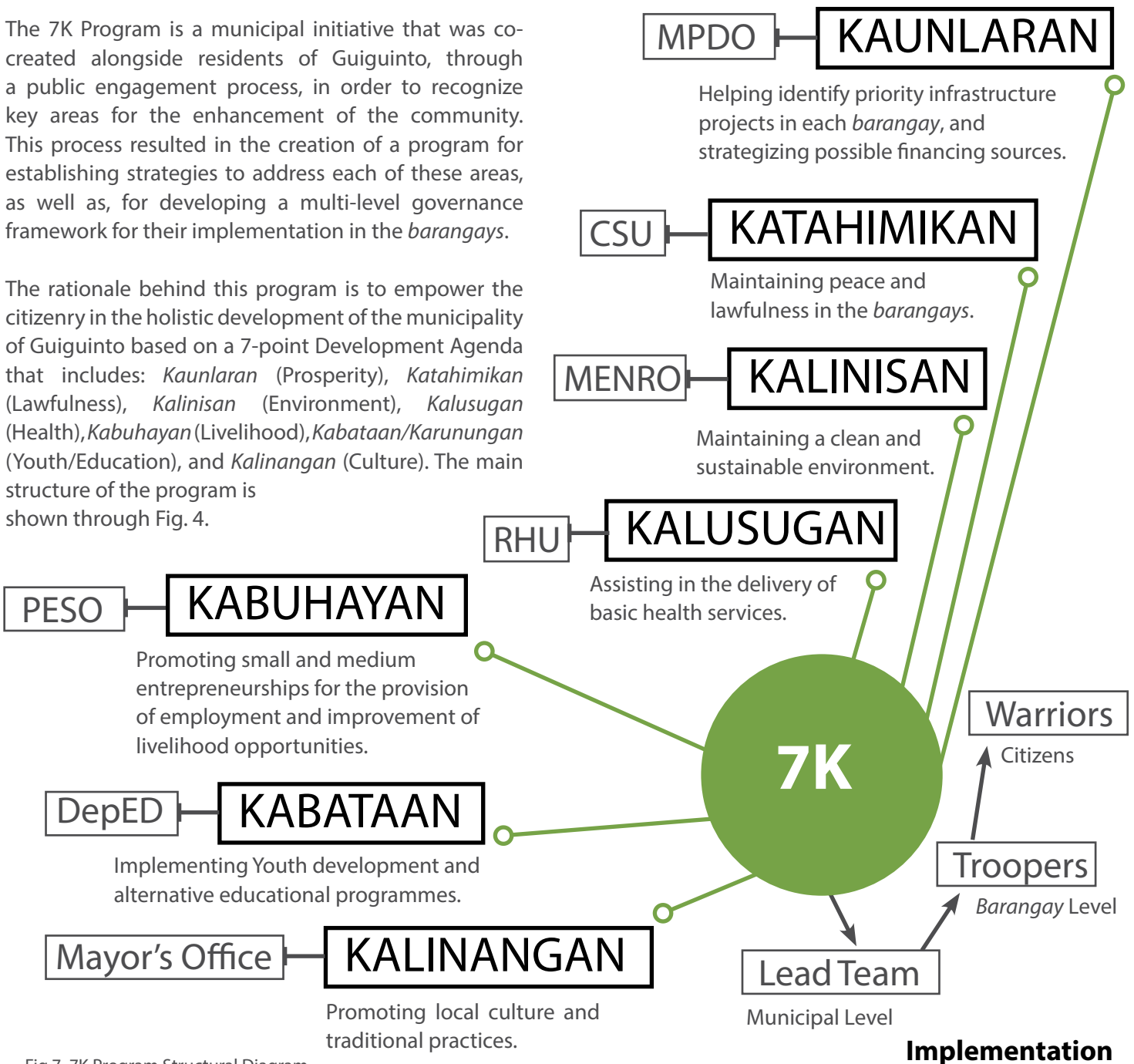


Fig.7. 7K Program Structural Diagram

Project's Objectives

The Sugod Guiguinto 7K Program's main objectives are:

- » Fast track the delivery of basic services to people in the community
- » Empower the citizenry as partners in the development of each *barangay*
- » Provide better opportunities for private-public partnership projects.

Governance

For the implementation of this program, a brigade was formed for each of the key areas (K's) consisting of: a 7K Lead Team at the municipal level represented by an office or department as shown in Fig. 4; 7K Troopers at the *Barangay* Level in charge of leading the drafting of the Warriors programme; and 7K Warriors at the citizen level, composed primarily of volunteers that supervise the implementation of the programme in every region of the *barangay*. Currently, there are approximately 200 volunteers taking part in this project, with each *barangay* being assigned a team that is diverse on each of the seven key action areas, thus assisting in disseminating information to the population at large.

Success & Acceptance

The 7K Program has received a significant level of acceptance by both the municipality and the community, and was identified as part of the assets of Guiguinto. As such, and given its strong consolidation as a channel for the deployment of initiatives, the Research Team has opted to highlight this project as a pioneer and model.

It is recognized that the degree of engagement of community members with the 7K project results in the empowerment of citizenry and in the appropriation of its initiatives; this characteristics are critical for the capacitation and implementation of climate change adaptive measures. Additionally, its multi-level implementation structure promotes communication and participation amongst diverse interest groups, from the municipal level down to the residents of

Guiguinto. Finally, the interdepartmental deployment of the seven Ks gives leadership to municipal offices based on their strengths, while encouraging cooperation; climate change is an overarching challenge that affects multiple facets of the community, thus requiring the involvement of multiple leaders.



Fig.8. Urban Garden at Guiguinto Central Elementary School



"I wish that all people would plant trees, plants, vegetables, and fruits."

- Grade 6 Student, Guiguinto Central Elementary School

I wish...
SANA...

- No more flood
(In country or school)
- Many trash cans everywhere
- All people will plant
TREES, PLANTS,
VEGETABLES, +
FRUITS

- No smoke belchers so the
pollution will stop

"Our alphabet is no longer long
enough to name all the typhoons
we now face."

- No more smoke + small cooking
from cigarettes
- Tree planting at school (less flooding)
- No one using dynamite for fishing
- No one using cigarettes

- PTA Member, Guiginto Central Elementary School

"If present trends continue, this century may well witness extraordinary change and an unprecedented destruction of ecosystems, with serious consequences for all of us."

– Pope Francis' Encyclical, June, 2015

3 CLIMATE CHANGE CONTEXT

As there is no climate-specific information available for the Municipality of Guiguinto, climate data and climate projections for the Province of Bulacan will be used as proxy. It is important that in the future more exact climatic data be collected for the Municipality of Guiguinto in order to assure accurate planning for climate change adaptation. The projections presented below are from PAGASA research and based on the IPCC medium range emissions scenario.

Temperature Projections

The Province of Bulacan is projected to experience increased temperatures over the next few decades. **Table 1** below shows projected temperature changes based on a 1971-2000 baseline temperature. By 2050 the mean temperature change for the whole year will be an increase by 1.8°C. The highest projected temperature changes will be experienced during the December to February (DJF) period.

Season	Baseline Temperature (°C)	Projected Mean Temperature (°C)		Projected Temperature Change (°C)	
	1971-2000	2020	2050	2020	2050
DJF	25.6	26.5	27.5	0.9	1.9
MAM	27.9	29.0	30.0	1.1	1.8
JJA	27.1	28.0	28.8	0.9	1.7
SON	26.7	27.7	28.6	1.0	1.7
Mean	26.8	27.8	28.7	1.0	1.8

Table1. 2020 and 2050 Temperature Projections for the Province of Bulacan. Source: PAGASA, 2011

Rainfall Projections

The projected changes in rainfall patterns in Bulacan signify that the province as a whole, including the Municipality of Guiguinto can expect more extreme variation in rainfall patterns. **Table 2** below shows that the period of March, April, and May will experience a significant decrease in rainfall, specifically a 36.4% decrease by 2050. On the other hand, the months of June, July, and August are projected to experience a significant increase in rainfall. Rainfall is projected to increase by 23.6% by the year 2050 during those months. All other seasons are projected to experience a decrease in rainfall.

Season	Baseline Rainfall (mm)	Projected Mean Rainfall (mm)		Projected Rainfall Change (%)	
	1971-2000	2020	2050	2020	2050
DJF	212.4	221.3	184.4	4.2	-13.2
MAM	288.9	222.5	183.7	-23.0	-36.4
JJA	1041.4	1174.7	1287.2	12.8	23.6
SON	842.1	817.7	814.3	-2.9	-3.3
Total	2384.8	2436.2	2469.58	2.1	3.4

Climate Change Impacts

The increase in mean temperatures and the changes in rainfall patterns will have many profound effects on the community of Guiguinto. The information presented in **Figure 9** below, highlights some of the socio-economic impacts of various climate change related phenomenon. It also highlights some of the populations most vulnerable to these impacts. The information presented is not exhaustive, but serves to highlight the interconnectedness of our social systems and their reliance on and vulnerability to the natural world.

Table 2. 2020 and 2050 Rainfall Projections for the Province of Bulacan. Source: PAGASA, 2011

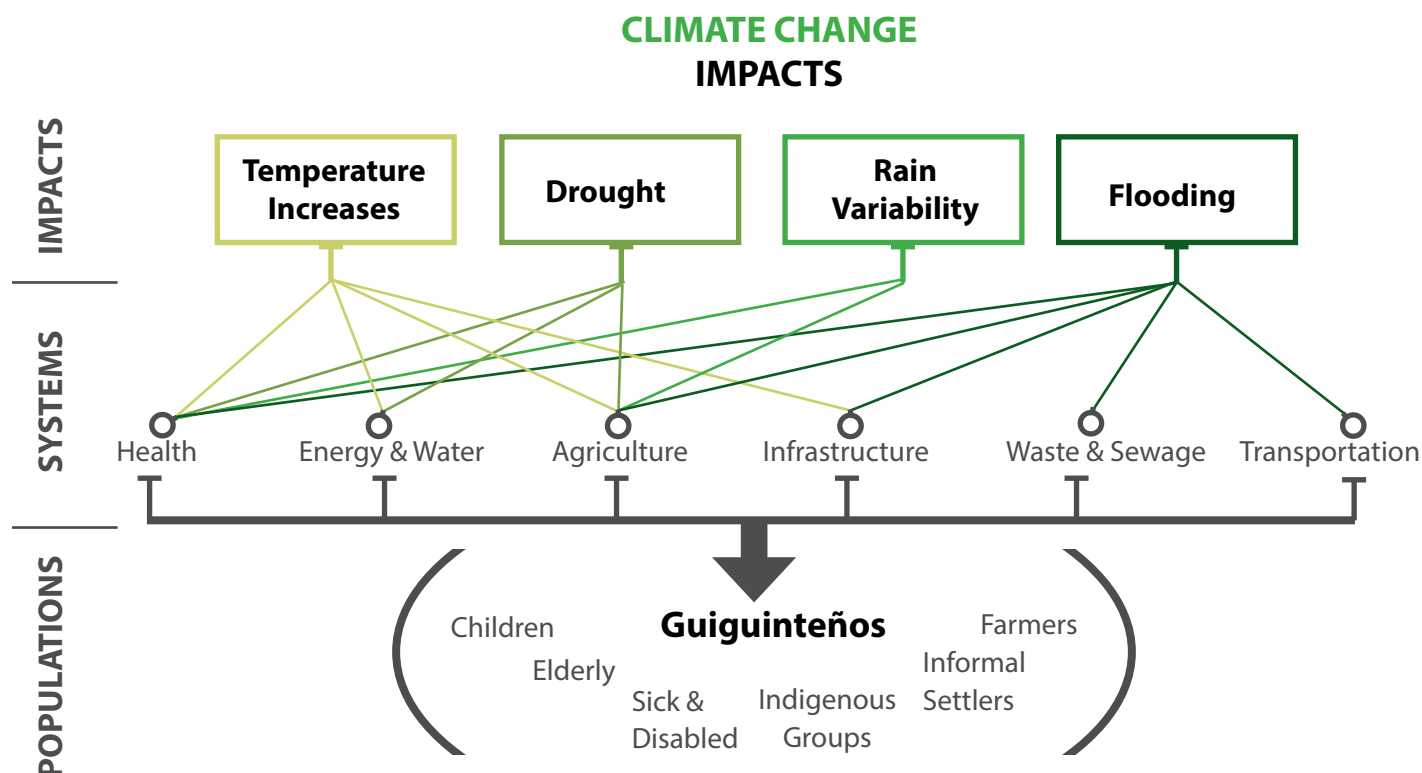


Fig. 9 Climate Change Impacts in Guiguinto

Natural Hazards

Climate change will alter and intensify the hazards that Guiguinto is already exposed to. Most notably, higher temperatures over time will lead to problems caused by drought and heatwaves. Changes in rain patterns and global climate changes will lead to problems caused by flooding, storms, and typhoons. Following are two maps (**Figure 10** and **Figure 11**) that depict hazard exposure in Guiguinto. The first map shows flood exposure in Guiguinto. This information is based off of the flood map for the Province of Bulacan. While there is an understandable deficit in specific hazard data for Guiguinto, the municipality would benefit from more accurate and local scale flood and hazard mapping in the future.

The second figure shows the composite hazard map which can be found in Guiguinto's CLUP. This map highlights Guiguinto's *barangays* based on how prone they are to experiencing hazards including flooding, landslides, storm surges, ground shaking, ground rupture, soil liquefaction, and tsunamis. The map show that the southern *barangays*, including Poblacion, Panginay, Tuktukan, Tabe, Malis, and parts of Tabang are most prone to hazards.

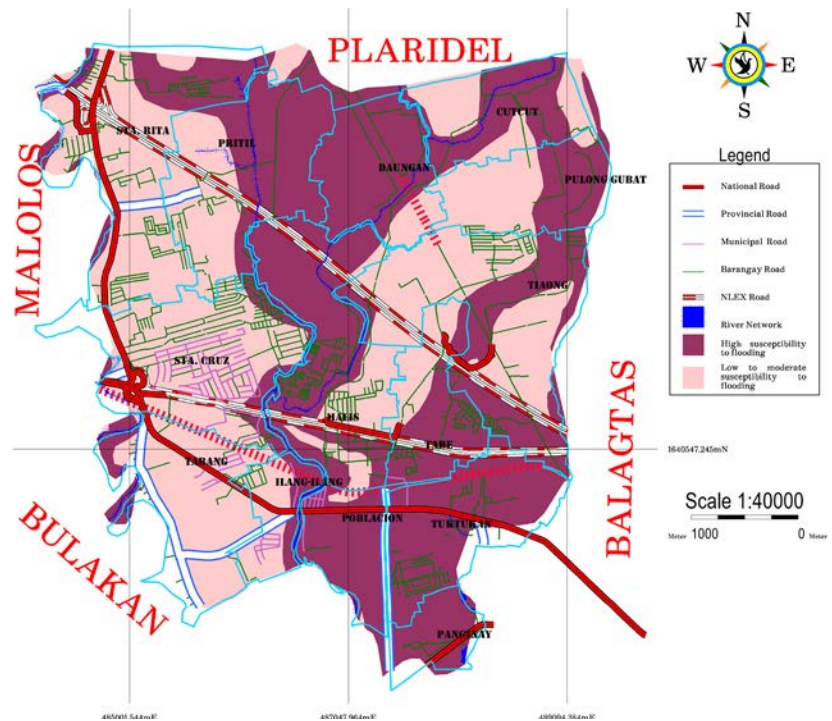


Fig. 10 Flood Exposure in Guiguinto. Source: Guiguinto MPDO

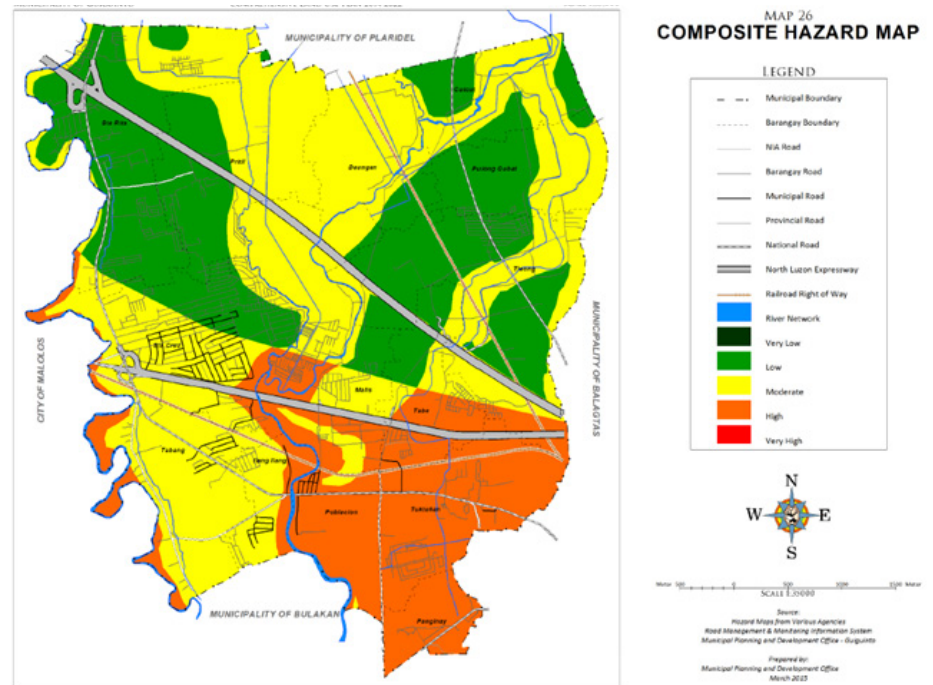


Fig. 11 Composite Hazard Map of Guiguinto. Source: Guiguinto CLUP, 2015

Adaptive Capacity SWOT Analysis

A SWOT is an important assessment tool used to look at the strengths, weaknesses, opportunities and threats of a particular area. The following analysis is a summary of what was derived from the Research Team's findings, based on interviews and focus groups with government and community interest groups. Each element of the SWOT concerns responses based on the theme of adaptive capacity. Given the technical nature of adaptive capacity, the Research Team has taken the liberty of emphasizing certain response themes based on their own assessment in relation to the academic literature on the topic. Finally, the results of the SWOT have also helped to inform the proceeding recommendations.

STRENGTHS

» **Economic Growth:** Guiguinto's strong economic growth and its First Class classification were recognized by many respondents as important features of the municipality. Economic growth is an essential feature for providing the tax revenue for governments to deploy adaptation policies and for increasing access to employment and amenities for local residents and visitors.

» **Localized Governance Capacity:** The existence of *barangay* level governance is seen as an infrastructure conducive to improving the skills, awareness and knowledge of community members regarding climate related impacts. In particular, the networks established through the 7K Program (warriors, troops, etc.) provide stronger networks and capacity that could be incorporated into a future action plan.

» **The 7K Program** was referenced numerous times. The program covers cleanliness, health, infrastructure, education, safety, livelihood and culture. Several of the areas the 7K Program addresses, namely, cleanliness (waste management), health, infrastructure and education, are directly related to improving a community's adaptation to climate change.

» **Ornamental Plant Industry:** The ornamental plant industry is a major source of employment

revenue generation for Guiguinto. Compared to other more land intensive sectors, this industry provides several ecological services. Some of these include: ground water infiltration due to permeable ground surfaces, mitigation of extreme temperatures, and the absorption of GHG emissions. The industry's low energy requirements make it relatively climate proofed.

WEAKNESSES

» **Administrative Fragmentation of Water Management:** Among the groups that the Research Team interviewed, it is apparent that significant knowledge gaps exist between the municipal government, the Water District, and Hiyas the primary water service provider. Information is not readily available and there is a lack of understanding regarding water supply levels.

» **Inadequate Stormwater Management and Infrastructure:** Despite Guiguinto's relatively advantageous geography, floods remains a concern for several community groups. Waste management challenges have exacerbated the impacts of heavy rains and the absence of a comprehensive waste water management plan.

» **Lack of Localized Geographic Information:** In order to improve knowledge and create accurate assessments of vulnerability in Guiguinto, it is important that the municipality produce local geographical materials, such as *barangay* level land area maps. Geographic expertise is needed to help produce and make available more maps that can be used by both municipal officers and *barangay* officials and thus improve the adaptive capacity of the community.

» **Climate Change Knowledge:** Climate change knowledge needs to be improved across all levels of government, especially at the *barangay* level. While climate change is relatively well understood in Guiguinto, the Research Team's findings demonstrate a major conflation between weather events and climate change. These areas are intimately linked, and for many this level of understanding is sufficient. However, improving this knowledge deficit within the civil service and for *barangay* officials is critical to strengthening the municipality's adaptive capacity.

OPPORTUNITIES

» **National Leadership on Climate Change:** Since the national government passed the *Climate Change Act in 2009*, climate change and adaptation oriented policies have been mainstreamed throughout government departments. The Climate Change Commission (CCC) and its related publications, such as the *NCCAP Implementation Guideline*, are excellent resources to draw upon as Guiguinto moves forward.

» **Funding Opportunities from the National and Regional Government:** Climate change actions and strategies can be costly. To support LGU's such as Guiguinto, the national government has funding that the municipality could capitalize on to support a climate change action plan. Two examples of national funds include: The Peoples Survival Fund and Project Twin Phoenix, both under the auspices of the CCC.

» **External NGO Resources:** Actions to mitigate and adapt to climate change at the local level is an area many international NGOs (eg. World Bank, UNEP, etc.) are prepared to provide technical and/or financial resources. This assistance could help Guiguinto fulfill its LCCAP obligations.

» **Mandated creation and Implementation of a Local Climate Change Action Plan:** Creating and implementing an LCCAP represents a positive step towards building adaptation into the LGU planning process.

THREATS

» **Water Supply for Ornamental Plant Industry:** Guiguinto ornamental plant business currently relies heavily on potable water provided by Hiyas. As population growth continues to stress water resources, the ornamental plant industry may be subject to increased water prices. However, attempts by MENRO to introduce rainwater harvesting is a promising program that could reduce the economic vulnerability of the ornamental plant industry.

» **Weak Institutionalization of Policies:** The current trend of policies and programs changing with each election cycle threatens the longterm success of any program—including a prospective action plan. The successful development and implementation of adaptation strategies is contingent on institutionalizing (in all areas of government) a prospective adaptation program. While the Mayors Office and legislative branch are critical to initializing such policies, their sustainability require they be institutionalized and carried forward outside of political offices.

» **Accumulation of Garbage in Drainage System:** Continuing to prioritize waste management as a means of improving the drainage systems is critical to adapting to the increased storm intensities that climate change brings.

» **Pollution and Lifestyle Related Illnesses:** Increasing levels of pollution are contributing to rising incidences of respiratory-related illness. This is a complex challenge, encompassing vehicle emissions (especially from *jeepneys*) and traffic management. Lifestyle related health issues, such as hypertension and malnutrition are also on the rise. Addressing these public health concerns will be an important step to improving adaptive capacity in Guiguinto.



Fig.12. MacArthur Highway in Guiguinto



“The creation of the Local Climate Change Action Plan is vital so that we know how to get from where we are to where we want to be.”

- MPDO Staff Member, Municipality of Guiguinto

"No city can be on a long-term path to more sustainable development without first addressing climate change. Without taking the impacts of climate change into consideration, today's development gains may be wiped out tomorrow."

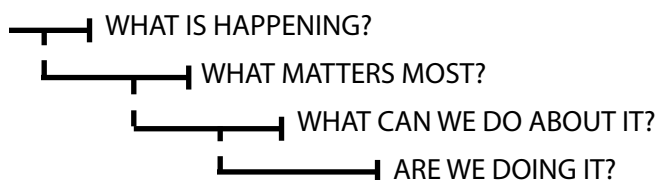
- Dr. Joan Clos, UN-Habitat

4 TOWARDS AN LCCAP

With the above outlined physical, social, and institutional contexts in mind, the following section of this report presents a detailed framework for creating an LCCAP. The Research Team, in reviewing academic literature and institutional reports, recommends that the Municipality of Guiguinto refer to the *UN Habitat's Planning for Climate Change: A Strategic Values-based Approach For Urban Planners* in the creation of its LCCAP. This report provides a participatory and community-based strategic methodology targeted at communities in low and middle-income countries to support a climate change planning process. It focuses particularly on understanding, assessing and taking action on climate change at the local level.

It is felt that this document is an exemplary outline for any municipality to follow in undertaking an LCCAP planning process, including Guiguinto. However, it is important to stress that this guideline is exactly that - a guide. The planning process should be flexible in determining which of the specific steps, tasks and tools Guiguinto will explore. These options will be dependent on the resources and capacities of the Municipality. In carrying out their work, the Research Team adjusted the framework to fit the needs and specificities of Guiguinto more closely. It is important that such adjustments be made throughout the LCCAP planning and writing process.

The UN Habitat Report is structured around four key strategic planning questions:



LCCAP Technical Working Group

The first step in creating an LCCAP is determining who will lead the effort. This step will determine which individuals will be involved, which departments will be engaged, and whether any outside agencies will be included in the process. Once decided, this team – generally called a Technical Working Group – will explore other important considerations such as anticipating constraints, identifying potential stakeholders, and determining a process and timeline. Once the Technical Working Group has been established and a general process and timeline is created, they are ready to undertake the LCCAP planning process.

The *Planning for Climate Change* report has been summarized into a succinct outline below. In an ideal scenario with ample time and resources the Research Team would have undertaken most if not all of the steps and tasks in this planning process to help the Municipality of Guiguinto develop their LCCAP. However, the Research Team undertook tasks from some of the steps in the process to provide examples of how they can be made effective in the Guiguinto context. These tasks were also completed to provide the Research Team with a better understanding of the context of Guiguinto in order to better complete its work. Given the limitations of time and resources in undertaking this research project, these should be considered as examples and potential starting points for the LCCAP Technical Working Group upon their undertaking of the entire process.

Planning for Climate Change Process

Figure 6. provides a good visual summary of the thematic areas and steps involved in creating an LCCAP. Central to the creation of an LCCAP process are public participation and research findings which inform every branch of the process, symbolized by the roots and stems at the bottom of the figure. It is highly important to note that once the LCCAP is in place it is crucial to review “Are we doing it?” to inform “What is happening?”, and continually reinforce the action planning for climate change.

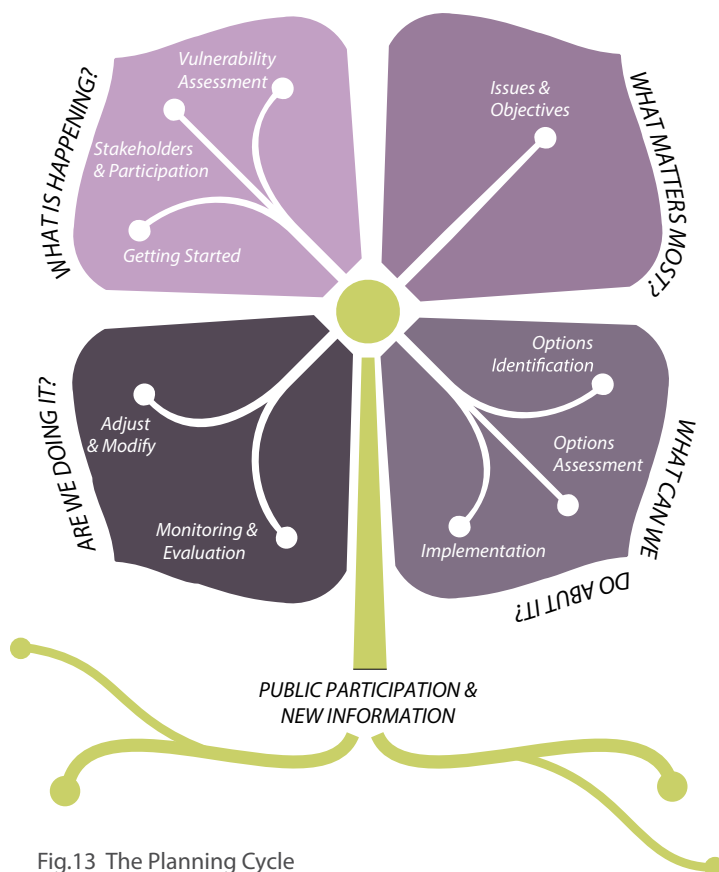


Fig.13 The Planning Cycle

Table 3 below provides an in-depth overview of each thematic area including the associated planning steps, the driving questions, and recommended outcomes. This is intended to give the Technical Working Group a better understanding of how this framework can be beneficial in determining an LCCAP in Guiguinto.

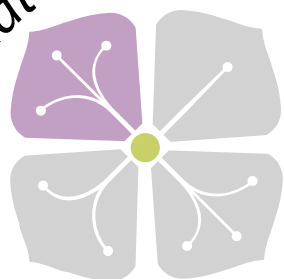
Thematic Area	Planning Step	Driving Questions	Outcomes
<i>What Is Happening?</i>	1. Getting Started	What needs to happen first?	1) Awareness of the need to address climate change in their city. 2) Knowledge of city, community and local stakeholders to involve 3) Creation of a Vulnerability Assessment to understand what is happening with climate change in the city
	2. Stakeholders & Participation	Who needs to be involved and how?	
	3. Vulnerability Assessment	How is your city exposed to climate change today and in the future? How sensitive are your city's people, places and institutions to this exposure? Who is most vulnerable and least able to adapt? What sectors are most impacted?	
<i>Module B: What Matters Most?</i>	4. Issues & Objectives	What does the community value? How do their objectives inform climate change adaptation options and priorities?	4) List of existing city development objectives (from other plans and strategies) 5) understanding of the local community issues and objectives and which ones matter most to the community 6) understanding which objectives are most affected by, and relevant to, climate change adaptation planning 7) Indicators to compare and measure the objectives to evaluate and prioritize adaptation options
<i>Module C: What Can We Do About It?</i>	5. Option Identification	What climate change adaptation options (projects, policies, programmes) can we undertake?	8) Identified, screened, assessed and prioritized climate change adaptation actions 9) Climate Change Action Plan with a clear implementation framework; and / or 10) Mainstreamed / integrated climate actions into existing policy instruments, plans and programmes
	6. Option Assessment	What options best support community objectives and priorities (e.g., poverty reduction)? How can options be integrated and coordinated with existing policy instruments and plans (i.e., mainstreaming)? Are there any "quick start" options that could be implemented first?	
	7. Implementation	What is the best way to organize the final Climate Change Action Plan and implement plan actions?	
<i>Module D: Are We Doing It?</i>	8. Monitoring & Evaluation	How should the Climate Change Action Plan be monitored and evaluated see how effective it is? What should be monitored and who should be responsible for evaluation?	11) Understanding of what monitoring and evaluation are and why they are critical to CCAP success 12) Monitoring and evaluation programme for the CCAP to monitor implementation progress 13) Timeline for formal Climate Change Action Plan reviews
	9. Adjust and Modify	How cities be sure the Climate Change Action Plan stays relevant and effective in the face of changing climate impacts and risks?	

Table 3. 7 The Planning Cycle

Thematic Area Toolkits

The following is an overview of the Planning for Climate Change Tool List from the document. This diagram serves as a catalogue of potential activities the Municipality of Guiguinto can undertake to in order to understand what is affected by climate change, what are high priority areas, how these priorities can be addressed, and how everything can be evaluated. It is recommended that the Technical Working Group ascertain which tools are best suited within the local context and appreciated capacities and resources available.

What is Happening?



2. Stakeholders & Participation

- » Stakeholder identification worksheet
- » Stakeholder analysis matrix
- » Stakeholder "Terms of Reference" worksheet

1. Getting Started

- » Framing the challenge questionnaire
- » Getting organized worksheet
- » External assistance assessment

3. Vulnerability Assessment

- » Weather and Climate Change summary
- » Climate Change influence diagram
- » Overview - exposed people, places, institutions & sectors
- » Hazard Mapping (exposure)
- » Sensitivity places mapping
- » Community-based sensitivity mapping
- » Socio-demographic sensitivity assessment
- » Sensitivity assessment summary
- » Climate threat plotting
- » General adaptive capacity assessment
- » Summary vulnerability rating matrix
- » Summary vulnerable population by sector
- » Vulnerability Assessment Report outline

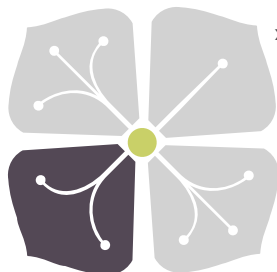
9. Adjust & Modify

- » Revise & update where needed

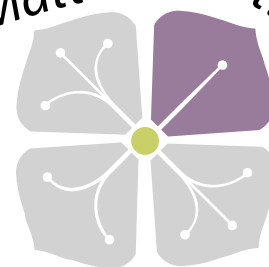
8. Monitoring & Evaluation

- » Indicator development worksheet
- » Monitoring framework worksheet
- » Evaluating actions against objectives worksheet
- » Evaluation questions

Are we doing it?



What Matters Most?



4. Issues & Objective

- » Issues Identification & Organization
- » Convert issues to objectives
- » Objectives analysis - relevance to CC
- » Identify objectives indicators

What can we do about it?



5. Option Identification

- » Option identification worksheet
- » Objectives to options worksheet
- » Organizing options worksheet
- » Screening & ranking options

6. Option Assessment

- » Direct ranking options
- » Technical ranking matrix
- » Objective ranking & weighting matrix
- » Weighted ranking matrix

7. Implementation

- » Institutional-governance checklist
- » Action plan worksheet
- » CCAP table of contents

Research Findings

The following section presents the Research Team's findings relating to some of the preliminary steps of the planning process in the UN Habitat report, including stakeholder identification, vulnerability assessment, issues and objectives, and option identification. These outputs are presented through the lens of the planning for a Local Climate Change Action Plan in Guiginto.

STAKEHOLDER IDENTIFICATION

Strong collaboration and coordination between governmental departments are prerequisites for successful climate change planning. Seemingly disparate groups, such as Engineering and Finance, need to share a baseline understanding around climate change. Furthermore, there are synergistic benefits to providing opportunities for interaction and knowledge exchange when addressing complicated problems such as climate change.

Given the integrated approach required to address climate change impacts, the Research Team conducted a stakeholder (or interest group) identification exercise. The goal was to better understand which stakeholders are critical to involve in addressing climate change action planning in Guiginto. In the days before the event, the Research Group Team approached all of the departments at the Municipal Hall and invited their participation in the event.

The following section outlines the process used in the stakeholder identification exercise:

» Step 1: The Research Team led all participants through a brief seminar on concepts relating to climate change. This included: a basic overview of the causes of climate change, and the current and projected impacts; the differences between **adaptation** and **mitigation**; and four critical factors towards adapting to climatic impacts as shown below.

ADAPTATION

Mainstreaming: Integrate adaptation policies into existing policies and programmes.

Coordination and Collaboration: enhance opportunity for interaction between governments at multiple scales.

Adaptive Capacity: Improve the communities, knowledge skills and resources.

Vulnerable Populations: Addressing and managing impacts of climate change on lower socioeconomic groups.

» Step 2: With participants all on the same page, they were then asked to keep this understanding of adaptation in the back of their mind while proceeding with the activity. Participants were encouraged to call out any stakeholder from different sectors of society that they thought would be relevant towards addressing climate change.

» Step 3: The participant-sourced stakeholders were then divided into three medium-sized working lists, in no particular order. The Research Team then divided participants into 3 groups and asked them to organize each list into five suggested sectors: *Pamahalaan* (Government), *Pang Sibiko* (Civic Groups), *Grupong Pang Simbahan* (Religious Groups), *Pang Nagoya at Paggawa* (Business and Labor), *Iba Pang Grupo* (Other Groups). The stakeholders' configuration into specific sectors were recorded on colored cards.

» Step 4: The Research Team then positioned a central focal point, a sun labeled "climate change", on the table. Participants were then instructed to organize their stakeholder cards within the sector categories by order of influence in addressing and implementing climate change adaptation relevant policies. The closer to the sun a stakeholder was placed, the greater their influence; and vice-versa, the further away from the sun a stakeholder was placed, the less influence it

possessed (see **Figure 12**). This step took the longest amount of time and involved a period of deliberation where participants debated and negotiated consensus to settle on the degree of influence each stakeholder had.

» Step 5: The final step was to examine the vulnerability of identified stakeholders to climate change. Based on the top three climate change-impacts to occur in Guiguinto, the Research Team placed “Flood”, “Drought” and “Increased Temperatures” on the table. Participants were then asked to place stakeholders under the headings in order of vulnerability. Stakeholders that placed closer to the top of the list were more vulnerable, while those placed closer to the bottom were less vulnerable to the specific climate change impact. Importantly, some stakeholders were represented in multiple categories, revealing that many sectors of society are affected by various climate change impacts.

The results of this event addressed several key questions:

- 1) WHO: who are the key stakeholders that should be considered in a prospective local climate change action plan?
- 2) INFLUENCE: What organizations hold the most influence with respect to climate change action planning and implementation?
- 3) VULNERABILITY: What are the major vulnerabilities posed to each stakeholder and which ones are most vulnerable?

Limitations and Recommendations

The activity captured the wisdom of the officers represented and will be helpful moving forward. However, the absence of input from the wider community limits the strength of this process, included in this report is a recommendation for a working group to lead the LCCAP process, made up of a diverse interests and skills sets in the community. If informed, conducting an activity similar to what has been described above would enrich Guiguinto’s understanding of key stakeholders, degrees of influence and vulnerabilities.

Participants:

Vilma Gonzales (HRMO), Sudan Carreon (MENRO), Emelda B San Agnostio (PESO), Prima Leal Chua (MHO), Peter John Vistan (MDRRMO), Lucina Punengbayan (MPDO), Eduardo Joje (DA), Yolanda Mendoza (BPD), Eduardo D Jon (MAO).

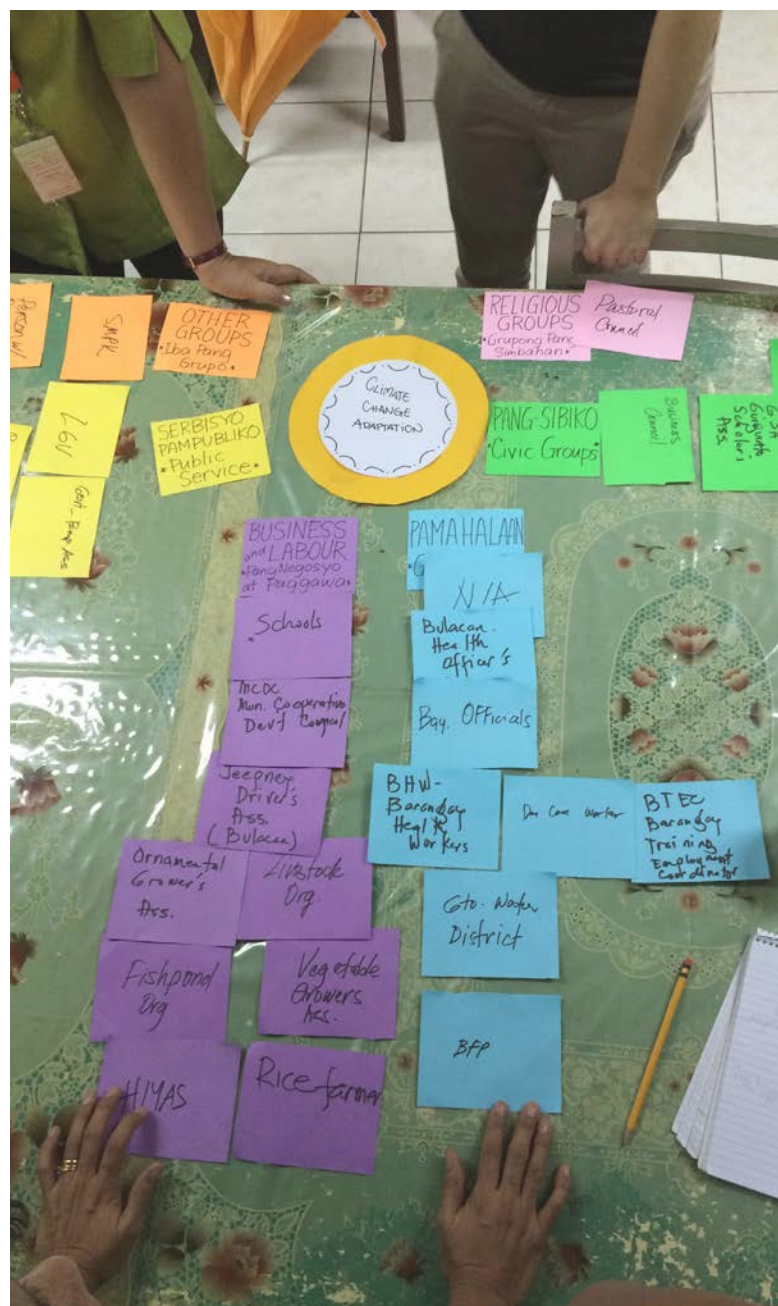


Fig.14 Stakeholder Identification Workshop

VULNERABILITY ASSESSMENT & ISSUES AND OBJECTIVES

The most important planning step for the Research Team in Guiguinto was the collection of primary data through interviews, focus groups, and engagement activities. Through this process, the Research Team was able to conduct not only a Vulnerability Assessment of the municipality, but also gain further insight into the Issues and Objectives of Guiguinto. The Research Team conducted interviews and focus groups with stakeholders based off those identified in the Stakeholder Identification Workshop with municipal staff (see **Figure 13**).

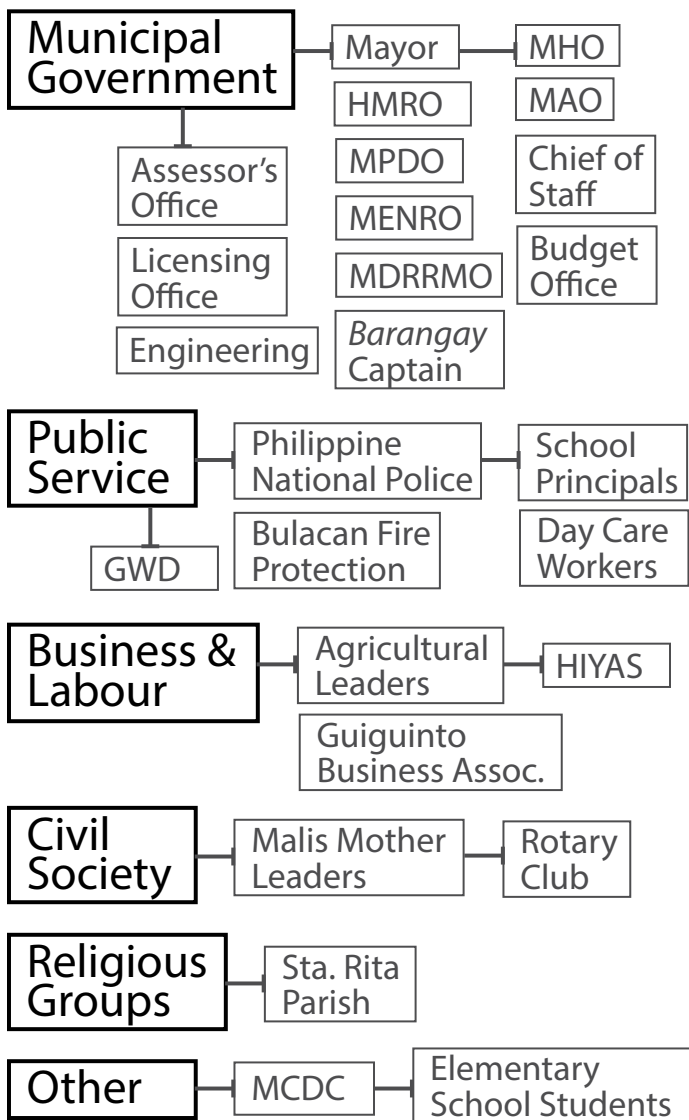


Fig.15 Diagram of Engaged Stakeholders

INTERVIEWS

The Research Team conducted interviews with the majority of Municipal Government department heads and staff in Guiguinto, a priest from the pastoral council, members of the Guiguinto Business Association, different public service staff including the Philippine National Police and the Bulacan Fire Protection, and a member of the Municipal Cooperative Development Council. In total, twenty-two (22) interviews were conducted.

While the interviews were crafted with some questions that were specific to its respondents, each interview consisted of a set of six consistent baseline questions:

1. What does climate change mean to you?
2. Have you noticed any changes in weather patterns in Guiguinto?
3. What are your current priorities?
4. What do you see as your future priorities?
5. What are you most proud of in your community?
6. How can you (your department/organization) contribute to climate change adaptation?

Through the answers to these questions, the Research Team was able to gauge the community's understanding of the concepts and impacts of climate change, as well as its engagement with Guiguinto's exposure to current and long-term climate conditions and hazards.

As depicted in these visual word cloud tools (see **Figure 14 and 15**), the main themes that emerged during these interviews highlight an understanding of the correlation between climate change and changes in weather in Guiguinto. The responses predominantly speak to the physical experiences of these individuals with changing weather patterns, rather than an academic or scientific approach to climate change. The Research Team concluded through these findings that climate change in Guiguinto is understood through the context of local weather patterns. While scientific data – available at the National, Regional and Provincial level and provided in the Guiguinto Comprehensive Land Use Plan – can quantitatively reveal changes in climate, the Research Team found it important to understand whether or not this scientific data corresponded to the

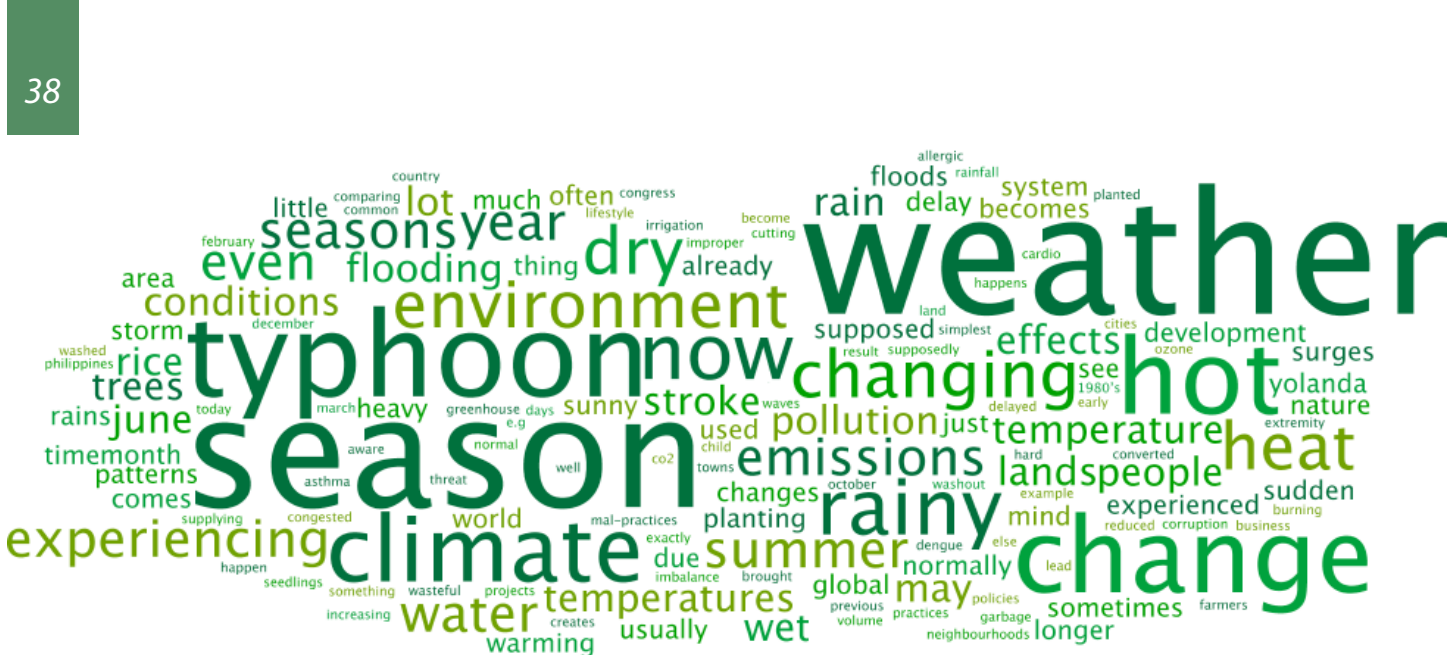


Fig.16 Word Cloud: "What Does Climate Change Mean to You?"

lived experiences of the community. The responses qualitatively expressed that changes in the climate of Guiguinto, affecting their daily lives and livelihoods, over the past several years include: increased temperatures, increased intensity and frequency of rainfall, and generally unpredictable weather patterns.

The Research Team's question regarding how individuals, departments or organizations can contribute to climate change adaptation was meant to elicit the different groups' adaptive capacity to current and future climate change impacts. Further, this question allowed different groups to provide suggestions on how the municipality can put climate change adaptation plans into action.

For any climate change action plan to be effective and achievable, it should be mainstreamed through existing municipal plans, strategies and processes. For this reason, the Research Team sought to identify potential areas to integrate such plans. The questions regarding priorities were used to identify potential avenues for mainstreaming and integrating climate change adaptation policies with existing plans, projects and initiatives. Further, understanding the main sources of pride in Guiguinto was also meant for this purpose, but was looking specifically for community assets and other areas to integrate climate change action plans outside of municipal structures. The visual word cloud below (see **Figure 15**) shows the themes that emerged through the discussion on pride in Guiguinto.

FOCUS GROUPS

The Research Team held four (4) focus groups with the Mother Leaders' of *Barangay* Malis, representatives of the agriculture sector, the Rotary Club of Guiguinto SUBURBS, and elementary school principals. Many of the basic interview questions were asked in the focus groups and participants were given the opportunities to respond in turn. However, the bulk of these focus groups typically consisted of several sector-specific questions followed by a candid roundtable discussion among participants. In most cases, the participants brought up topics that probed further discussion, and the Research Team recorded the information. These focus groups helped to ensure that important local community sectors (including women, farmers, the private sector and youth) were all involved in the planning process; this also generated a broader community understanding of, and support for, climate change adaptation.

ENGAGEMENT ACTIVITIES

Aside from the Stakeholder Identification exercise described above in the Stakeholder and Participation section of this report, two other engagement activities were conducted with community members: an asset mapping activity with representatives from the agricultural sector, and a workshop with a class of elementary schools students.

During a focus group with representatives from the agricultural sector, an asset mapping exercise was conducted to gather information on this community's assets and resources, drawn by the participants through cognitive mapping. This exercise illuminated the existing strengths and assets of this specific Guiguinto community and their existing adaptive capacities to climate change.

A knowledge exchange exercise was undertaken with a class of Grade 6 students at Guiguinto Central Elementary School. Members of the Research Team shared their understanding of climate change with the students, and in return the students shared some of their ideas and hopes for the future. Through this exercise the values and concerns of the students were better understood.

While the current plans and strategies for Guiguinto were apparent through secondary data such as the

CLUP and the ELA, the opinions of the local community form the foundation of participatory, values-based planning. An important step for the Research Team in the creation of this report was to identify these values and express them as objectives for Guiguinto in moving towards a Local Climate Change Action Plan. Given the limited time frame in Guiguinto, the Research Team was not able to meet with more community members, particularly those representing the most low-income and marginalized groups. However, considering that the municipality is currently in the process of creating several new plans and still lacks several important planning documents, there is potential for the government to begin to develop participatory plans through stakeholder and community engagement. This step will be critical to ensure that future plans, including the Local Climate Change Action Plan, are relevant to the local context of the wider community and will therefore be effectively implementable.



Fig.18 Focus Group with Agricultural Leaders

Option Identification

The following table represents the efforts of the Research Team in determining a “long list” of climate change adaptation options. Interviews with community and municipal stakeholders were undertaken to ascertain local knowledge of areas of concern and potential solutions. This was supplemented with a review of existing best practices in similar contexts by researching institutional resources such as the World Bank, Future Cities, and the UNEP (see resources). The list includes projects (e.g. rainwater harvesting), programmes (e.g. community awareness on waste segregation) and policies (e.g. creating a transportation plan).

This list is by no means exhaustive and should be further studied by the Municipality of Guiguinto. We did attempt to highlight how each recommendation falls under the NCCAP priorities as well as current initiatives of the Guiguinto Municipality. Nevertheless, in determining which projects, programs, and policies to undertake it is recommended that Guiguinto undertake a first level assessment of the relevance of the projects based on:

- » **Redundancy**
Avoiding duplication and/or overlapping with current and/or proposed initiatives
- » **Practicality**
Avoiding projects that do not conform to operating standards, capacity and feasibility of the government
- » **Desirability**
Avoid projects that pose negative side effects to the community or offend values and cultural beliefs
- » **Efficiency**
Avoid projects that are costly at a municipal level due to a lack of economy of scale

It is further advised that the recommendations identified by the Research Team are assessed to determine whether they conflict, complement or are comparable with municipal initiatives, current or planned.

The following table is a result of our research into identifying adaption options for the Municipality of Guiguinto. We have organized the table in to Short-term (1-2 years), Medium-term (3-5 years), and Long-term (6+ years) timelines for implementation, however this is based on our understanding and some recommendations could be implemented earlier. Under each time period, options were classified under “Further Research”, “Knowledge & Capacity Development”, and “Action” to distinguish between the type of recommendation for the municipality. We have also attempted to explain how each recommendation ties into the NCCAP 7 priority areas as noted in the 2nd column. Finally the Research Team also identified in the 3rd column the potential integration into the current 7K Program areas, which can also be understood as a suggestion for which department could be tasked with these policies, programs, or projects. Recognizing the existing strength of the 7K Program, climate change adaptation actions can certainly be mainstreamed through this program.

7Ks

Kaunlaran - Prosperity
Katahimikan - Lawfulness
Kalinisan - Environment
Kalusugan - Health
Kabuhayan Livelihood
Kabataan - Youth
Kalinangan - Culture

NCCAP PRIORITIES



Human
Security



Environmental &
Ecological
Stability



Sustainable
Energy



Water
Sufficiency



Climate Friendly
Industries & Services



Knowledge &
Capacitation



Food Security

OPTION	NCCAP CATEGORY	7K PROGRAM
SHORT (1-2 Years)		
FUTURE RESEARCH		
Acquire data on municipal food system (production, distribution, access, and waste management)		<i>Kalusugan, Kabuhayan</i>
Investigate feasibility options for recycling of materials (e.g. plastics, paper, metal, glass, etc.)		<i>Kalinisan</i>
Gather data (using CBSM or alternative sources) on: » Community awareness levels of waste segregation » Areas of concern with waste management » Barriers to improving waste segregation at household level » Number of households not receiving waste services		<i>Kalinisan</i>
Identify major sources of air pollution in Guiguinto		<i>Kalinisan</i>
Develop, test, and introduce farming practices or techniques more resilient to climate change and variability in weather		<i>Kalusugan, Kabuhayan</i>
KNOWLEDGE & CAPACITY BUILDING		
Increase coordination between municipal level and <i>barangay</i> level employees		<i>Kabuhayan</i>
Encourage waste reduction (using reusable water bottles and reusable shopping bags, and purchasing products with less plastic packaging)		<i>Kalinisan</i>
Encourage department stores and supermarkets to offer plastic bag alternatives (bag-less option, re-use of cardboard boxes from store)		<i>Kalinisan</i>
Encourage school visits to the landfills/MRFs to provide an understanding of full waste cycle		<i>Kalinisan, Kabataan</i>
Encourage waste segregation in businesses		<i>Kalinisan, Kabuhayan</i>
Investigate further options for early river flooding warning systems		<i>Kalusugan, Kaunlaran</i>
Promote cooling in buildings by painting roofs white, insulating gaps in building membrane with spray foam		<i>Kaunlaran</i>
Provide training on climate change to all employees and departments		<i>Kaunlaran</i>
ACTION		
Involve local businesses in community clean-ups		<i>Kalinisan</i>
Implement rainwater harvesting pilot project at the municipal hall		<i>Kabuhayan</i>

OPTION	NCCAP CATEGORY	7K PROGRAM
A Cleanest Schools Competition: Adopt-a-spot awareness creation project aimed at schools to keep a 100m zone around the school clean. The project runs during National clean-up week with municipal waste management staff giving a recycling demonstration. Bins and bags are provided and there is a prize for the school with the cleanest spot		<i>Kalinisan</i>
Implement a pilot project for waste segregation containers (organics, recycling, garbage) at the Municipal Hall		<i>Kalinisan</i>
Regulate and enforce vehicle anti-idling laws		<i>Kalinisan</i>
Provide emergency shower facilities for prevention of heat stroke		<i>Kalusugan</i>
MEDIUM (3-5 Years)		
FUTURE RESEARCH		
Study waste streams (quantity and composition analyses), recovery/recycling systems, markets for recyclables, potential for private partnerships and problems of existing practices to decide where there may be a facilitative/regulatory role for the municipal authority		<i>Kalinisan, Kabuhayan</i>
Research livelihood potential of waste management industries in Guiguinto		<i>Kalinisan, Kabuhayan</i>
KNOWLEDGE & CAPACITY BUILDING		
Establish climate change farming workshops to demonstrate best adaptation practices		<i>Karunungan</i>
Conduct non-farming entrepreneurial courses for farmers		<i>Karunungan, Kabuhayan</i>
Collaborating with provincial government and engage with other municipalities and stakeholders for an integrated regional watershed management council		<i>Kaunlaran, Kalinisan</i>
Facilitate workshops on livelihood opportunities in waste management		<i>Kalinisan, Kabuhayan, Karunungan</i>
Provide materials and education for the establishment of food gardens at various institutions (municipal hall, churches, schools, hospitals, etc.)		<i>Kalinisan, Karunungan</i>
Encourage rainwater harvesting at the residential, corporate, and institutional level		<i>Kaunlaran</i>
Encourage consumption patterns that reduce waste and maintain healthy nutrition		<i>Kalinisan, Kalusugan</i>

OPTION	NCCAP CATEGORY	7K PROGRAM
ACTION		
Establish the Municipal Hall as a strong example of best practices in: » Climate change (e.g. training for all departments on climate change, review facilities for coming changes such as flooding and temperature changes, clean vehicle fleet management including repairing and training on low-emission driving) » Waste (e.g. highly visible and well-identified segregated waste bins for each waste stream throughout the Municipal Hall) » Energy (e.g. paint roof white, insulate holes in building membrane, turn lights/computers/air conditioners off when not in use) » Water management (e.g. implement rain water catchment for non-potable uses, low flow toilets, water audits of existing facilities)	   	<i>Kabuhayan</i> <i>Kalinisan</i> <i>Kaunlaran</i> <i>Kaunlaran</i>
Regulate emissions from pollutant sources		<i>Kalinisan</i>
Establish disaster evacuation plans and procedures at the <i>barangay</i> level (conduct drills on a regular basis)		<i>Kalusugan, Kabuhayan</i>
Provide incentives and disincentives that support the reduction of plastic bags		<i>Kalinisan</i>
Pilot receptacles provision in public areas for waste (including a recycling component) to prevent pollution		<i>Kalinisan</i>
Rehabilitate the Guiguinto River and other riparian habitats (through clean-ups, planting of native vegetation, etc.) to reduce soil erosion and siltation and to improve ecosystem services		<i>Kalinisan</i>
Plant street-side trees (or alternative structures) to protect pedestrians from extreme weather (sun, rain, etc.)		<i>Kaunlaran</i>
Select 'preferred suppliers' for municipal inputs (paper, water, food, other) based on local businesses and sustainability principles		<i>Kabuhayan</i>
LONG (6+ Years)		
FUTURE RESEARCH		
Research new income generating opportunities utilizing natural resources and capacities of the shifting environmental and socio-economic landscape of Guiguinto		<i>Kabuhayan</i>
Research potential of incentives/penalties/enforcement mechanisms for businesses to reduce environmental degradation and promote safe work environments		<i>Kabuhayan</i>

OPTION	NCCAP CATEGORY	7K PROGRAM
KNOWLEDGE & CAPACITY BUILDING		
Ensure all new hires complete climate change awareness training, disaster preparedness training and other capacity building procedures		<i>Kabuhayan</i>
Promote international green building standards and certifications [such as Leadership in Energy and Environmental Design (LEED)]		<i>Kaunlaran</i>
Encourage urban greening through the creation of a network of green spaces and greenbelts throughout Guiguinto		<i>Kaunlaran</i>
Work with industry to promote climate preparedness and reducing emissions/pollution		<i>Kabuhayan, Kaunlaran</i>
ACTION		
Increase permeable surfaces for natural storm water drainage		<i>Kaunlaran</i>
Establish regulations for the construction of climate adaptive buildings and industries		<i>Kaunlaran</i>
Construct water impounding reservoirs, rainwater harvesting facilities for irrigation, and water storage systems to manage changes in climate variability		<i>Kaunlaran</i>
Incorporate stormwater design guidelines into the permitting process for commercial and industrial developments		<i>Kaunlaran</i>
Create a Transportation Plan that encourages and accommodates alternative modes of transportation (walking, cycling, etc.)		<i>Kaunlaran</i>
Provide and encourage the provision of public water infrastructure access (e.g. safe potable water)		<i>Kaunlaran</i>

In addition to this option list, the Research Team also recommends reviewing the Joint Memorandum Circular No. 2014-01 from the Filipino Department of Budget and Management, Climate Change Commission, and Department of the Interior and Local Government. Specifically, Annex A, which highlights numerous

policies, research areas, capacity building, and services for each of the 7 NCCAP priorities. This document can be found online on the website of the Climate Change Commission. Below are examples of the programs, projects, and activities of the Human Security section:

STRATEGIC PRIORITY 4 - HUMAN SECURITY
POLICY DEVELOPMENT AND GOVERNANCE
Develop guidelines on treatment of climate related health issues in newly exposed areas due to climate change and climate variability
Include climate related diseases in basic benefits of insurance policies Develop policy requiring integration of climate change and disaster risk reduction concepts and approaches in medical and allied health training courses
Develop and implement monitoring health infrastructure damage and rehabilitation plan

Develop and implement post disaster epidemic outbreak management and disease surveillance system (ex Water-borne disease and other health risks due to climate change)
Development of providing and taxing policies supporting implementation of adaptation measures
RESEARCH, DEVELOPMENT AND EXTENSION
Assess changes in risk, exposure or sensitivity to climate change and climate variability related diseases for vulnerable groups
Assess impact of climate change and climate variability on livelihoods and poverty with focus on vulnerable groups
Vulnerability and risk assessment for government infrastructure (e.g. hospitals, health centers and <i>barangay</i> health units)
Risk assessment for <i>barangays</i>
KNOWLEDGE SHARING AND CAPACITY BUILDING
Training and education of health personnel on treatment, monitoring and surveillance of climate change and climate variability related health issues
Training for health emergency preparedness and response
Strengthen health management information management
Incorporate climate related health risks into clinical practice guidelines and curricula for continuous medical education
SERVICE DELIVERY
Develop and introduce health surveillance and rapid response system that reduces the health impacts of climate change and climate variability (e.g. heat-watch)
Implement program for community health emergency preparedness and response
Development of social protection strategies to respond to climate change and climate variability
Develop food safety measures that take account of new conditions caused by climate change
Intervention that reduce air pollution (e.g. anti-smoke belching campaign)

As stated, these lists are by no means exhaustive and the Municipality of Guiguinto should take it upon themselves within their LCCAP process to follow the UN-Habitat guideline in order to understand their specific threats and vulnerabilities and decide which recommendations should be considered. This exercise by the Research Team is merely a starting point for further deliberation and would certainly be enhanced with further localized contexts and understanding.



“If we can do this together, we can progress and improve not only the community, but ourselves.”

- MENRO Staff Member, Municipality of Guiguinto

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RESOURCES

Description

Climate Change Adaptation Resources

UN Habitat Planning for Climate Change is the recommended structure for undertaking a LCCAP planning process. It was developed by city planners to better understand, assess and take action on climate change at the local level. Specifically targeted to the needs of planners and allied professionals in low and middle-income countries where the challenges of planning for climate change are particularly high.

Local Governments Championing Adaptation to Climate Change: A Primer for Decision Maker in Asian Cities. The document deals with the climate change policy management challenges faced by local governments and offers tools to assist local governments in moving forward with climate change adaptation.

The Philippines Climate Change Commission website offers numerous resources, including the above mentioned Joint Circular No. 2014-01 which lists numerous adaptive policies, programs and projects.

The Philippine Department of Environment and Natural Resources released a report on climate change adaption best practices in the Philippines. The 400+ page compendium of climate change measures and practices, initiatives and processes of coping with the variability and consequences of climate change. It is highly recommended.

Source

UN Habitat Planning for Climate Change website:
<http://unhabitat.org/books/planning-for-climate-change-toolkit/>

ICLEI- Local Governments for Sustainability or International Council for Local Environmental Initiatives. The resource is part of Asian Cities Adapt. Access online at: http://southasia.iclei.org/fileadmin/user_upload/documents/ACA-primer-final-www-06-06-2014.pdf

Climate Change Commission. Access online at:
<http://climate.gov.ph/index.php/cc-policies#memorandum-circulars>

Department of Environment and Natural Resources. Access online at:
http://climatechange.denr.gov.ph/index.php?option=com_content&view=article&id=147:climate-change-adaptation-best-practices-in-the-philippines&catid=8:press-releases

WeAdapt.org is a collaborative platform on adaptation. Case studies, presentations of tools and methods, online training etc. are available. This is a rich site that is demanding to explore.

WeAdapt website:
www.weadapt.org/

Adaptation Learning Mechanism is an initiative in knowledge management on projects and practices in adaptation, jointly built by UNCDF, UNDP, World Bank, UNFCCC, UNEP, FAO and several other international organisations. This site offers in particular vulnerability profiles by country (for example presenting the main themes of the PANAs) and a search engine dedicated to national adaptation projects which are ongoing (and led by the various UN agencies). This could be an interesting tool for checking the coherence of one's own projects with existing initiatives.

Adaptation Learning Mechanism. Access online at www.adaptationlearning.net

ClimatePrep site is hosted by the WWF but welcomes external contributions. At once an exchange platform on practices and a sort of "reflection blog" of the "perfect adapter", all done with plenty of humor.

ClimatePrep. Access online at:
www.climateprep.org

Climate Centre The content of this platform set up by the Red Cross/Red Crescent movements is oriented towards the reduction of risks associated with natural catastrophes.

Climate Centre. Access online at: www.climatecentre.org

Climate and Development Knowledge Network is a cooperation between several research institutes (in particular ODI) and NGOs. The site offers a "blog", scientific articles on different subjects linked to climate change.

Climate and Development Knowledge Network. Access online at:
www.cdkn.org

The Practical Action site provides numerous examples of adaptation and references to come to terms with climate change.

Practical Action website. Access online at:
www.practicalaction.org

The ELAN Ecosystems & Livelihoods adaptation network recently created by Care, IIED, IUCN and WWF promotes adaptation strategies based on the rehabilitation and conservation of ecosystems. The site is simply a shop window for the activities of ELAN and offers the possibility of becoming a member.

ELAN Ecosystems & Livelihoods Adaptation Network Access online at:
www.elanadapt.net

Asian and Pacific Climate change adaptation website provides resources, good practices, technologies and links to other similar websites. A thorough website with significant resources on adaptive practices.

Asian & Pacific Climate Change Adaptation. Access online at :<http://www.asiapacificadapt.net>

The World Bank climate portal is a central hub of information, data and reports about climate change around the world. Here you can query, map, compare, chart and summarize key climate and climate-related information.

World Bank climate portal, Access online at:
<http://sdwebx.worldbank.org/climateportal/>

Future Cities Adaptation Compass is a Macros enabled excel file that is based on the experiences of the Future Cities partners and provides vulnerability and adaptation options across multiple sectors. It is highly recommended.

World Bank Guide to Climate Change Adaptation in Cities provides cities in developing countries with practical insights on climate change adaptation.

Iloilo City's Local Climate Change Action Plan is a example of an LCCAP from a city in the Philippines, available online.

Participatory Vulnerability and Adaptation Assessment: A Toolkit Based on the Experience of Sorsogon City, Philippines was developed to be a guide and reference for local governments and other stakeholders for conducting climate change vulnerability and adaptation assessments.

Financing Climate Action

Climate Funds Update is an independent website that provides information on the growing number of international climate finance initiatives designed to help developing countries address the challenges of climate change. The site also addresses what funds are currently being proposed, the eligibility criteria, as well as what regions and for what type of actions funds are available for. Website is helpful for staying briefed on resources that local governments may apply for.

The fund was created in 2008 to help developing member countries effectively address the consequences of climate change. The primary resources provided through the fund is technical assistance and investment grants. The priority areas include: adaptation, clean energy/ sustainable transportation, reducing emissions caused by deforestation and improving land use management. Currently, only national governments may apply for this funding.

Future Cities Adaptation Compass,
Access online at:
<http://www.future-cities.eu/project/adaptation-compass/>

World Bank Guide to Climate Change Adaptation in Cities Access online at:
<http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1318995974398/GuideClimChangeAdaptCities.pdf>

Iloilo City's LCCAP. Access online at:
<http://iloilocity.gov.ph/images2013/LCCAPlan.pdf>

Participatory Vulnerability and Adaptation Assessment: A Toolkit Based on the Experience of Sorsogon City, Philippines. Access online at:
http://www.fukuoka.unhabitat.org/programmes/ccci/pdf/PHI1_Participatory_CC_Assessment.pdf

Climate Funds Update- The Latest Information on Climate Change Funds. Access online at: <http://www.climatefundsupdate.org/>

Climate Change Fund, a fund available through the Asian Development Bank. Access online at: <http://www.adb.org/site/funds/funds/climate-change-fund>

The document reviews the variety of financing options available for cities, from international development funds to public-private financing, and other emerging opportunities.

“International Climate Change Financing for City Climate Change Interventions”, a part of the Cites Development Initiative for Asia, and Policy Advice for Environment and Climate Change. Access online at: <http://cdia.asia/wp-content/uploads/2014/09/international-financing-options-for-city-climate-change-interventions.pdf>

Waste Management

The Council for Scientific and Industrial Research (CSIR) in South Africa is one of the leading scientific and technology research, development and implementation organizations in Africa. It undertakes directed research and development for socio-economic growth. It has a thorough waste management toolkit.

CSIR’ municipal waste management good practices toolkit website: http://www.csir.co.za/enews/2011_jun/02.html

Practical Action focuses on using technology to enable poor communities to build on their skills and knowledge to produce sustainable and practical solutions. Their website includes many resources including a “how to” of planning for waste management.

Practical Action’s Waste Management website: <http://answers.practicalaction.org/our-resources/community/waste-managemnet>

