NATIONAL RESILIENCE COUNCIL

CDRA
CLIMATE AND DISASTER RISK ASSESSMENT

ASSESSING RISKS AND VULNERABILITIES , DETERMINING PRIORITY DECISION AREAS AND RISK MANAGEMENT AND ADAPTATION OPTIONS

CY 2023-2028

CITY GOVERNMENT OF ILIGAN
ILIGAN CITY DISASTER RISK REDUCTION & MANAGEMENT OFFICE

Climate and Disaster Risk Assessment (CDRA) for Iligan City

Year 2023 - 2028

Acknowledgment

The Iligan City Disaster Risk Reduction and Management Office, especially its committed Research and Planning Section, is immensely thankful to the following agencies and individuals for their dedication and contribution of time and resources that were immeasurable throughout the meticulous procedure in completing this assessment:

City Mayor Frederick W. Siao

Iligan City DRRM Council Members

City Planning and Development Office

City Social Welfare and Development Office

City Engineer's Office

City Veterinarian's Office

National Resilience Council

PILMICO Foods Corporation

Climate Change Commission

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Kim Emissary Magarin
Rylle Galvez
Fejaycris O. Pillodar

We extend our heartfelt gratitude for your unwavering support and indispensable collaboration.

May we all press on to a safer and more disaster resilient City of Iligan.

A MESSAGE FROM THE CHAIRMAN - DRRM COMMITTEE

SANGGUNIANG PANLUNGSOD

The Philippines is geographically located in the western Pacific Ocean, surrounded by naturally warm water. As the sea-surface temperatures continue to rise due to climate change, we Filipinos face more risks to climate-related disasters. Experts say that the additional heat in the ocean and air can lead to stronger and more frequent storms.

In the past, we are always proud that Iligan is a typhoon-free city. But all this changed when Severe Tropical Storm Washi or locally known as Sendong arrived, claiming more than 500 deaths and around 700 still missing until now, aside from the sweeping of bridges, houses and sources of living.

Our cry now is, "never again"!

But it is not just a garden of words. We need to act collectively. Let's make the lessons of the past be our call for an orderly and joint action among all stakeholders.

I support the Climate and Disaster Risk Assessment (CDRA) as a process that would be helpful for us to understand the climate change vulnerability assessment (CCVA) and disaster risk assessment (DRA).

The formulation of a Local Climate Change Action Plan (LCCAP) is worth upkeeping. I appreciate the need for a defined climate change adaptation and mitigation blueprint.

RAMIL C. EMBORONG
City Councilor
Chairman, DRRM
Sangguniang Panlungsod

Republika ng Pilipinas
LUNGSOD NG ILIGAN
Tanggapan ng Sangguniang Panlungsod

REGULAR SESSION HELD ON JUNE 4, 2024

PRESENT:

Bernard Y. Pacaña,	Acting City Vice Mayor, Presiding Officer
Simplicio N. Larrazabal, III,	Member
Michelle E. Sweet-Booc,	Member
Samuel P. Huertas,	Member
Providencio A. Abragan, Jr.,	Member
Jesse Ray N. Balanay,	Member
Rhandy Ryan Francis A. Ong,	Member
Marlene L. Young,	Member
Ramil C. Emborong,	Member
Betsy Maria PTV Zalsos-Uychiat,	Member
Nhicolle B. Capangpangan,	Member
Datu Kilala Lanelio T. Sangcoan,	Member
Trix Mikyla L. Caballero,	Member

ABSENT:

Marianito D. Alemania,	Acting City Mayor
Rosevi Queenie C. Belmonte,	Member, (On Leave)
Cesarve C. Siacor,	Member, (OB)

RESOLUTION NO. 24-405

RESOLUTION ADOPTING AND APPROVING THE ILIGAN CITY DISASTER RISK REDUCTION AND MANAGEMENT OFFICE CLIMATE AND DISASTER RISK ASSESSMENT (CDRA) 2023-2028

WHEREAS, presented to the body for deliberation was the 1st Indorsement dated May 28, 2024, from Member Ramil C. Emborong, Chairman of the Committee on Disaster Risk Reduction and Management (DRRM), which forwarded the draft resolution and approved Iligan City Disaster Risk Reduction and Management Council (ICDRRMC) Resolution No. 10, Series of 2023, entitled "Resolution Approving the City Disaster Risk Reduction and Management Office Climate and Disaster Risk Assessment 2023-2028," seeking a Sangguniang Panlungsod resolution approving the same assessment for 2023-2028;

WHEREAS, Republic Act No. 10121, otherwise known as the Philippine Disaster Risk and Reduction and Management Act of 2010, emphasizes the importance of comprehensive risk reduction assessment in disaster risk and management planning;

WHEREAS, the number of climate-related natural disasters has significantly increased, severely impacting resources and lives, with urban areas being particularly vulnerable due to their high concentration of population, properties, commercial activities, and public institutions;

WHEREAS, recognizing the need to address the challenges posed by climate change, the Iligan City Disaster Risk Reductions and Management Council reviewed and approved the ICDRRMC Resolution No. 10, Series of 2023, by conducting a comprehensive Climate and Disaster Risk Assessment (CDRA) 2023-2028 for the city;

WHEREAS, the CDRA 2023-2028 prioritizes actions to reduce vulnerability, enhance adaptive capacity, and integrate climate considerations into local development planning and decision-making processes, including formulating resilient vision statements, goals, and objectives for the Comprehensive Land Use Plan (CLUP), and analyzing the impacts of climate change and hazards on the social sector, economy, infrastructure, and utilities of the city or community.

WHEREAS, the CDRA 2023-2028 provides a detailed analysis of the city's vulnerabilities, risks, and capacities, and outlines strategic measures to mitigate, prepare for, respond to, and recover from disasters;

WHEREAS, the adoption and approval of the CDRA 2023-2028 will enhance the city's disaster risk reduction and management capabilities and contribute to sustainable development and resilience building;

WHEREFORE, on motion of Member Ramil C. Emborong, duly seconded by Members Jesse Ray N. Balanay and Betsy Maria PTV Zalsos-Uychiat;

BE IT RESOLVED, AS IT IS HEREBY RESOLVED, by the Sangguniang Panlungsod of Iligan City to **ADOPT and APPROVE**, as it hereby **ADOPTS and APPROVE**, the Iligan City Disaster Risk Reduction and Management Office Climate and Disaster Risk Assessment (CDRA) 2023-2028.

CARRIED.

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The undersigned hereby attest to the adoption of the foregoing resolution as verified by the Member-Author.

ATTY. ARTHUR LL. PADILLA
Secretary to the Sanggunian

VERIFIED:

RAMIL C. EMBORONG
Member-Author

CERTIFIED:

BERNARD Y. PACAÑA
Acting City Vice Mayor, Presiding Officer

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Acronyms

DENR-NAMRIA	Department of Environment and Natural Resources – National Mapping and Resource Information Authority
ICPDO	Iligan City Planning and Development
ICDRRMO	Iligan City Disaster Risk Reduction and Management Office
CLUP	Comprehensive Land Use Plan
CDRA	Climate and Disaster Risk Assessment
LCCAP	Local Climate Change Action Plan
CDP	Comprehensive Development Plan
DOST-PAGASA	Department of Science and Technology – Philippine Astronomical Services Administration
SEACLID/CORDEX-SEA	The Southeast Asia Regional Climate Downscaling/CORDEX – Southeast Asia
RCP	Representative Concentration Pathway
PHIVOLCS	Philippine Institute of Volcanology and Seismology
CCA	Climate Change Adaptation
GIS	Geographic Information System
BDRRM	Barangay Disaster Risk Reduction and Management
LDRRM	Local Disaster Risk Reduction and Management
NDRRM	National Disaster Risk Reduction and Management
IPCC	Intergovernmental Panel on Climate Change
PEIS	PHIVOLCS Earthquake Intensity Scale
CMDP	Comprehensive Master Development Plan
CEO	City Engineer’s Office
CSWD	City Social and Welfare Development

Executive Summary

The process of studying the risks and vulnerabilities of exposed elements, especially people, urban areas, agricultural, forestry and fisheries production areas, facilities at key points, and lifeline infrastructure during natural disasters and climate change, is known as "Climate and Disaster Risk Assessment" (CDRA).

The formulation of CDRA was based from the Housing and Land Use Regulatory Board (HLURB) Guidebook for mainstreaming Climate Change Adaptation and Disaster Risk Reduction in the Comprehensive Land Use Plan (CLUP) in 2015. The Department of Interior and Local Government (DILG) also encourages LGUs to conduct this assessment through memorandum no. 2015-77 wherein it elaborated the necessary requirements for completion of this assessment.

CDRA aids to improve resilience and lessen the effects of risks and hazards on people, infrastructure, and the environment, as it enables decision-makers to concentrate their efforts on solving the most urgent and significant problems. It provides direction for proactive efforts that lessen the effects of climate-related events and disasters, improve resilience, and advance sustainable development while safeguarding communities and ecosystems.

This document focuses on a comprehensive evaluation of critical elements, including the population, urban area, buildings, natural resources, lifeline utilities, and critical point facilities as they were exposed to existing and likely to occur hazards within the city, such as flooding, earthquake-induced landslides during both wet and dry seasons, rain-induced landslides, ground shaking, liquefaction, and the potential threat of storm surges. Moreover, the assessment includes climate change impacts specifically the projection of rising temperature, rising sea levels and drought.

The results are shown on the tables below. Table 1 summarizes the results for hazards such as flood, earthquake-induced landslide (wet and dry seasons), rain-induced landslide, and liquefaction. Table 2 summarizes the findings on storm surge advisory levels, and table 3 is the projection of sea level rise and its potential effects on the susceptible barangays.

Table 1. Summary of Hazards, Number of Barangays, and Potentially Affected Population

Hazard	Number of Barangays	Potentially Affected Population
Flood[1]	44	131,283

[1] Majority of the barangays are affected even the hinterlands including Rogongon, Panoroganan, and Bunawan. The potentially affected population for flood is elaborated per susceptibility level: Low flood – 1; Medium flood – 20,758; High flood – 34,365; and Very High flood – 76,159.

Earthquake-Induced Landslide **(EIL)** during **wet** season[2]	34	123,800
EIL during **dry** season[3]	15	29,516
Rain-Induced Landslide **(RIL)**[4]	37	220,894
Liquefaction[5]	39	268,802

Earthquake simulation using the highest earthquake magnitude 7.1 yields intensity of ground shaking using the PHIVOLCS Earthquake Intensity Scale (PEIS) shows a PEIS rating of 7.3 to 22 barangays, 14 barangays have 7 PEIS rating, and 7 barangays show 6.5 PEIS rating. Hence, the range of ground shaking that might likely affect the city is from 6 to 7 which indicate very strong to destructive intensity.

The table below also shows the number of affected barangays and potentially affected population on storm surge hazard per advisory level. The higher the advisory level, the larger number of populations is most likely to be affected.

Table 2. Storm Surge Advisory Levels, Number of Barangays, and Potentially Affected Population

Storm Surge Advisory Levels	Number of Barangays	Potentially Affected Population
Advisory Level 1	15	2,375
Advisory Level 2	18	8,433
Advisory Level 3	20	22,814
Advisory Level 4	23	67,143

Lastly, the table below shows susceptible barangays to sea level rise (SLR). Note that there is 63-year projection in every .25mm rise. This suggests vivid understanding to other exposed elements to SLR.

Table 3. Sea Level Rise (SLR) Projection, Number of Barangays, and Potentially Affected Population

Sea Level Rise (SLR)	Number of Barangays	Potentially Affected Population
.25mm	13	1,702
.50mm	15	3,780
.75mm	15	6,702
1.00mm	15	11,757

[2] The potentially affected population for EIL wet season is elaborated per susceptibility level: Low level – 72,433; and medium level – 51,367.

[3] The potentially affected population for EIL dry season is elaborated per susceptibility level: Low level – 28,500; and medium level – 1,016.

[4] The potentially affected population for RIL is elaborated per susceptibility level: Low level – 97,007; Medium level – 67,046; High level – 56,536; and Very High level – 305.

[5] The potentially affected population for liquefaction is elaborated per susceptibility level: Low – 144,045; and Medium – 124,757.

The most potentially affected population if the rise is at 0.75m and 1m is Tambacan with vulnerable 1,438 and 2,947 population, respectively.

The assessment process successfully discerned potential policies and interventions addressing both climatic and non-climatic impacts, which were collaboratively identified by diverse stakeholders during the CDRA workshop across five sectors: economic, environmental, social, institutional, and infrastructure. These findings are of significant importance for policy makers and executives, warranting serious consideration, as the assessment aligns with the Comprehensive Land Use Plan (CLUP) and Local Climate Change Action Plan (LCCAP).

As the incipient CDRA of Iligan City, the LGU of Iligan will continue to refine this assessment with the inclusion of significant data for barangay-level hazards maps, and detailed outlook on ecosystem within the identified sectors. This comprehensive assessment would augment the depth of the available data in the city to bolster its resiliency and create a sustainable future for the people of Iligan.

PART 1 Introduction

I. What is CDRA?

The CLUP Guidebook for the Supplemental Guidelines for Mainstreaming Climate Change and Disaster Risks in the Comprehensive Land Use Plan (2015) has defined Climate and Disaster Risk Assessment (CDRA) as a comprehensive process that involves evaluating and understanding the potential risks and vulnerabilities of climate change and various types of disasters in a particular region, community, or system. CDRA aims to inform decision-making, policy development, and planning to enhance resilience and reduce the impact of these risks on people, infrastructure, and the environment.

CDRA typically involves the following key steps:

Hazard Identification: Identifying and cataloging the various natural and human-induced hazards that could affect the area, such as floods, storms, earthquakes, tsunamis, droughts, and heatwaves.

Vulnerability Assessment: Assessing the vulnerabilities and sensitivities of the community or system to these hazards. This includes evaluating factors such as population density, infrastructure quality, land use patterns, socioeconomic conditions, and access to resources.

Risk Analysis: Combining information about hazards and vulnerabilities to quantify and prioritize risks. This involves assessing the likelihood and potential impact of specific events or scenarios, such as the likelihood of a flood occurring and the potential damage it could cause.

Adaptation and Mitigation Strategies: Develop strategies and measures to adapt to, reduce, or mitigate the identified risks. This could involve designing infrastructure to withstand potential disasters, improving early warning systems, promoting sustainable land use practices, and enhancing community preparedness and response.

Scenario Planning: Developing various future scenarios based on different climate and disaster projections. These scenarios help decision-makers understand how risks might evolve over time and how different strategies could influence outcomes.

Stakeholder Engagement: Involving local communities, government agencies, NGOs, and other relevant stakeholders in the assessment process. Their input helps ensure that assessments are contextually accurate and that resulting strategies are practical and acceptable.

CDRA is a multidisciplinary process that often requires collaboration between experts in climate science, disaster management, urban planning, economics, social sciences, and more. It is a crucial tool for building resilient

communities, improving disaster preparedness, and integrating climate considerations into development planning.

II. Purpose of CDRA

The primary purpose of Climate and Disaster Risk Assessment (CDRA) is to systematically evaluate the potential risks and vulnerabilities associated with climate change and various types of disasters in order to inform decision-making, policy development, and planning. CDRA serves several key purposes:

Risk Identification and Prioritization

CDRA helps identify and prioritize the most significant climate-related and disaster-related risks that a region, community, or system might face. This allows decision-makers to focus their efforts on addressing the most urgent and impactful challenges.

Informed Decision-Making

By providing accurate and comprehensive information about potential risks, CDRA empowers decision-makers to make informed choices about development projects, infrastructure investments, land use planning, and disaster preparedness measures.

Resilience Building

CDRA forms the foundation for building resilience within communities and systems. Resilience refers to the ability to anticipate, prepare for, respond to, and recover from shocks and stressors. CDRA helps identify measures that can enhance resilience against climate-related events and disasters.

Policy Development

CDRA findings often lead to the development of policies and strategies that integrate climate considerations and disaster preparedness into various sectors, such as urban planning, agriculture, water management, and public health.

Resource Allocation

CDRA assists in allocating resources effectively to address identified risks. It helps direct investments toward projects that have the greatest potential for reducing vulnerability and enhancing adaptive capacity.

Community Engagement

CDRA involves engaging with local communities and stakeholders, allowing their insights and experiences to be incorporated into risk assessment and mitigation

strategies. This participatory approach increases the likelihood of successful implementation and community buy-in.

Long-Term Planning

CDRA helps communities and organizations consider future scenarios and anticipate changing risks over time. This long-term perspective is crucial for sustainable development and avoiding short-sighted decisions that could exacerbate vulnerabilities.

Climate Adaptation and Mitigation

CDRA provides the foundation for developing strategies that mitigate the impacts of climate change and adapt to its effects. This might involve measures such as building resilient infrastructure, implementing early warning systems, and promoting sustainable land use.

Disaster Preparedness and Response

CDRA informs the development of disaster preparedness and response plans, ensuring that communities are equipped to effectively manage and recover from disasters when they occur.

Overall, the purpose of CDRA is to guide proactive actions that reduce the impact of climate-related events and disasters, enhance resilience, and promote sustainable development while safeguarding communities and ecosystems.

III. CDRA Process

The CDRA for Iligan City was conducted in accordance with the four steps listed as follows:

1. **Collect and organize climate change and hazard information**
   Involves the gathering of information, including projections and values of specific climatic parameters such as temperature, changes in rainfall, sea level rise and frequency of extreme climate events, among others, as well as identifying potential hazards that may affect the locality.

2. **Scope the potential impacts of hazards and climate change**
   Assessing expected impacts and identifying important sectors or locations that could be affected by natural disasters and climate change. The impact chain diagrams were created using the outcomes of a workshop with key stakeholders in Iligan City.

3. **Develop the exposure database**
   The exposure database displays the several vulnerability components (sensitivity, exposure, and adaptive capacity) for the numerous exposure areas in Iligan City, including the city's population, urban use, natural resource production, critical point facilities, and lifeline utilities.

4. **Climate and Disaster Risk Assessment**
   Identification of risk areas by analyzing hazard, exposure and vulnerabilities and then using this information to develop strategies for risk reduction and adaptation which can be incorporated into other plans like CLUP, Local Climate Change Action Plan (LCCAP), and Comprehensive Development Plan (CDP).

IV. Description of Iligan

Iligan City is a highly urbanized city located in the province of Lanao del Norte, Philippines but it is not under the jurisdiction of the provincial government of Lanao del Norte. Here is a general description of Iligan City:

Geography and Location:
Iligan City is situated on the northern coast of the island of Mindanao. It is bordered by the provinces of Lanao del Sur and Misamis Oriental (see Figure 1). The city is known for its picturesque landscape, surrounded by lush mountains and waterfalls.

Economy and Industry:
Historically, Iligan City has been a major industrial hub in the Philippines. It is used to be called the “Industrial City of the South”. The city is used to be the home of the largest steel mill in Southeast Asia namely the National Steel Corporation. The National Power Corporation's Agus Hydroelectric Complex in Iligan City generates a significant portion of Mindanao's power supply. Also, Iligan has varieties of factories and industries like Republic Cement and Building Materials, Inc., HOLCIM Philippines Incorporated Lugait Plant, PILMICO Foods Corporation, GRANEX Manufacturing Corporation, Lafarge Iligan, Inc., Petron Corporation, Iligan Light and Power, Inc., and the Mabuhay Vinyl Corporation.

Culture and Heritage:
Iligan City has a rich cultural heritage influenced by the indigenous people of the region, as well as by the diverse settlers and migrants who have contributed to its development. The city celebrates various cultural festivals and events, showcasing its unique blend of traditions.

Education and Institutions:
The city is home to several educational institutions, including universities, colleges, and schools that cater to both local and regional students specifically the city host the premiere university namely the Mindanao State University - Iligan Institute of Technology (MSU-IIT). These institutions play a vital role in shaping the educational landscape of the region.

Natural Attractions:
Iligan City is renowned for its stunning waterfalls, river systems, and cave networks which attract tourists and visitors. The city has 23 recorded waterfalls which include Maria Cristina Falls, which is the major source of hydropower supplying to almost half of the electricity and power need of the Mindanao Island. The other famous waterfalls include Tinago Falls, Mimbalot Falls, Dodiongan Falls, Pampam Falls, Hindang Falls, Dalipuga Falls, Bridal Veil Falls, Linanot Falls, etc., making the city known as the “City of Majestic Waterfalls”. Timoga Spring in Barangay Buru-un is famous throughout the Visayas and Mindanao for its naturally cool and running water. Ditucalan Spring also supplies drinking water for the city. Additionally, five mountain forests are considered as natural tourist attractions namely Mt. Gabunan and Mt. Malindang in Barangay Rogongon, Mt. Amulungan in Barangay Panoroganan, Sagada Peak in Kalilangan and Mt. Agad-Agad in Barangay Puga-an. Lastly, Sikyop Underground River Cave situated

in Sitio Lawlawon, Barangay Rogongon, that attracts tourists for its exciting and rigorous adventure. These natural attractions contribute to the city's popularity as a destination for eco-tourism and nature enthusiasts.

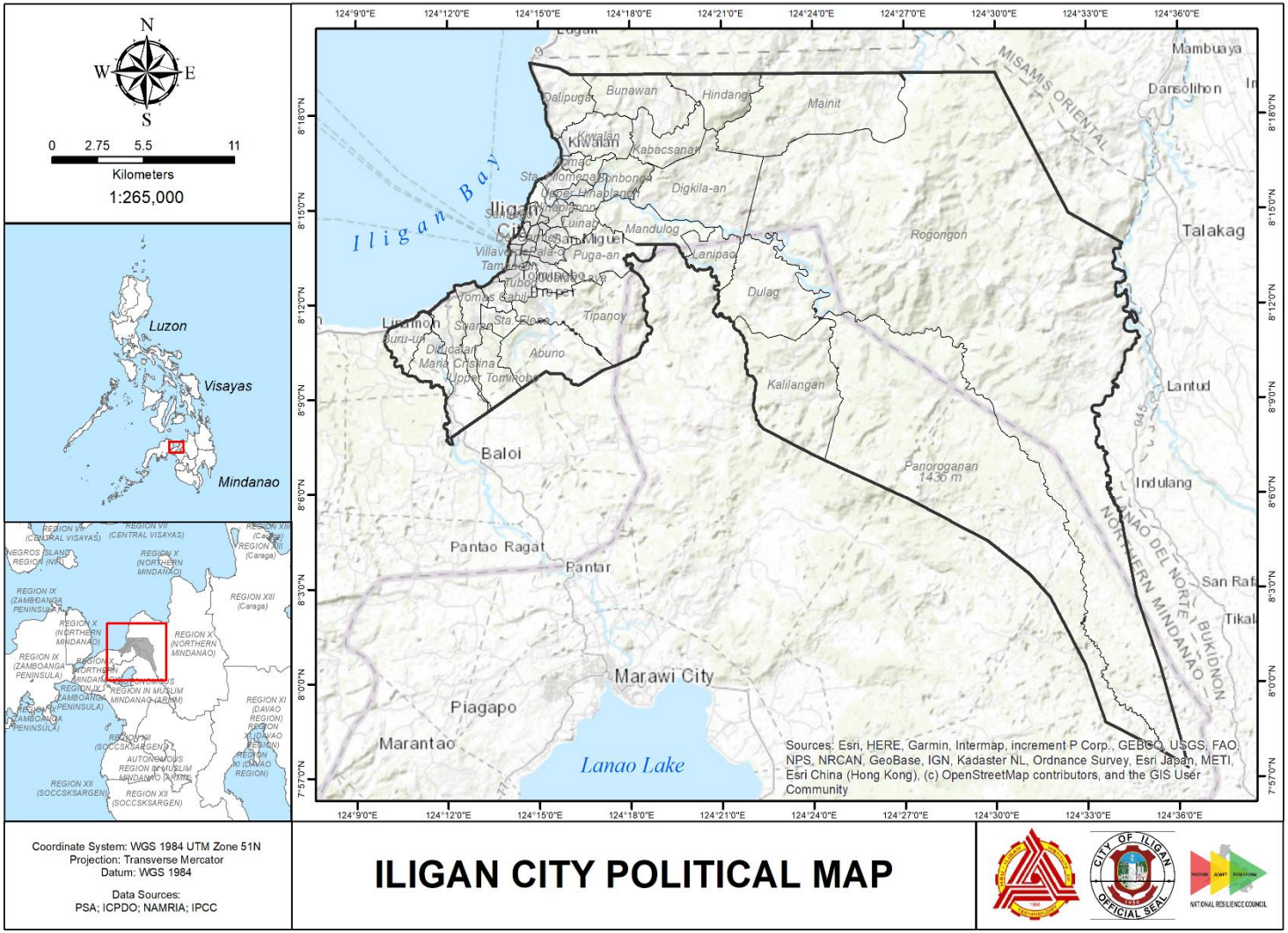


Figure 1. Iligan City Map

PART 2 Climate Change and Hazard Information

I. Local Climate Change Projections

This section will deal with the climate change projection in terms of temperature, rainfall and sea-level rise (SLR). Projection of local climate change is provided by the Philippine Atmospheric, Geophysical and Astronomical Services Administration of the Department of Science and Technology (DOST-PAGASA) on their 2018 report entitled "**Observed Climate Trends and Projected Climate Change in the Philippines**". Subsequently, a second series of climate patterns and anticipated climate extremes was formulated and created in collaboration with PAGASA, the Manila Observatory, and Ateneo de Manila University in 2020. This report, titled "**Philippine Climate Extremes Report 2020: Examining and Forecasting Climate Extremes in the Philippines to Facilitate Informed Choices Regarding Climate Change Adaptation and Risk Mitigation**", provided valuable insights. Both of these reports are essential as a reference for future climate change in the region.

The 2020 Philippine Climate Extremes Report is used as a reference. However, its climate projection resolution is at the provincial level particularly Lanao del Norte where it includes Iligan City.

The said report has three simulation experiments conducted for each of the 12 models in the group (which come from the climate modeling collaborated between DOST-PAGASA, the Manila Observatory and SEACLID/CORDEX-SEA), namely, HISTORICAL, RCP4.5 **medium** greenhouse gas emission, and RCP8.5 **high** greenhouse gas emission. The historical simulations covered the years 1971-2005, while simulations of future projections using RCP4.5 and RCP8.5, spanned 2006-2099.

To simplify the data, the long dataset was divided to create the baseline period (1986-2005), and the three future time periods namely: **early**-future (2020-2039), **mid**-future (2045-2065), and **late**-future (2080-2099).

To understand better results, Tables 4 and 5 provides definition of the climate change indices in terms of temperature and rainfall. These indices are categorized into three attributes namely **magnitude, frequency,** and **duration.**

Table 4. Temperature Climate Change Indices Code, Unit, and Definition

Name	**Unit**	**Definition**
Temperature Extremes Index		
Magnitude		
TNn	°C	Lowest nighttime temperature of the year. Averaged over a 20-year period, it indicates the expected temperature on the coldest night of the year
TNm	°C	Average nighttime temperature within the year
TNx	°C	Warmest nighttime temperature of the year
TXn	°C	Lowest daytime temperature of each year
TXm	°C	Average of daytime temperature
TXx	°C	Temperature on the hottest day of the year
DTR	°C	Difference between annual mean of the maximum and minimum temperatures. A decreasing DTR indicates a larger increase in the nighttime temperature due to an overall heat storage from the atmosphere
Frequency		
TN10p	%	The number of cold nights within the year. A night is considered cold when the minimum temperature falls below the 10th percentile threshold of the baseline.
TN90p	%	Indicates the frequency of occurrence of warm nights when the minimum temperature exceeds the 90th percentile threshold.
TX10p	%	Keeps track of the number of cool days, when the maximum temperature goes below the 10th percentile threshold of the baseline.
TX90p	%	Tracks the number of hot days, when the maximum temperature exceeds the 90th percentile.
Duration		
WSDI	days	Number of days contributing to warm periods. It occurs when the daily maximum temperature for six or more consecutive days exceeds the 90th percentile threshold of the baseline.

Source: PAGASA, 2020

Table 5. Precipitation Climate Change Indices Code, Unit, and Definition

Name	*Unit*	Description
Rainfall Extremes Index		
Magnitude		
PRCPTOT	mm	Total amount of rainfall received during wet days, when at least 1mm of daily rainfall is recorded within the year
SDII	mm/day	Average daily rainfall intensity and indicates the typical amount of rainfall during wet days.
Rx1day	mm	Maximum amount of rain that can fall in one day
Rx5day	mm	Maximum amount of rainfall that falls over a period five consecutive days. Increased 5-day consecutive rainfall may lead to widespread flooding and swelling of waterways.
P95	mm	It is the threshold for “very wet” days, defined as the 95th percentile of the baseline daily rainfall during wet days.
P99	mm	Indicates the amount of rainfall “extremely wet” days, defined as those exceeding 99th percentile threshold.
R95p	mm	Total amount of rain that falls on “very wet days”, or when daily rainfall exceeds the 95th percentile threshold of the base period.
R99p	mm	The total amount of rain that falls on “extremely wet” days, when rainfall exceeds the 99th percentile.
Frequency		
P95d	days	Number of very wet days when the daily rainfall is greater than the 95th percentile of the baseline daily rainfall.
P99d	days	Counts the number of days when rainfall exceeds 99th percentile. It is the number of extremely wet days in the past ranged from one to two days across the country.
Duration		
CWD	days	Number of consecutive wet days, when daily rainfall is at least 1mm. It denotes the longest stretch of wet days within the year. Increased CWD implies not inherent risk to flooding and landslide hazard.
CDD	days	Number of consecutive dry days, when rainfall is less than 1mm, denoting the longest stretch of dry days within the year.

Source: PAGASA, 2020

The tables 3 to 6 below will show the summarized projected change extremes for the province of Lanao del Norte. Tables 4 and 5 above has provided information on the climate indices, however, to further grasp the values from each extreme indices, note the four main parts of the table:

a. The information pertains to the Climate Extremes Index, encompassing its code, description, and the unit of measurement. There are two categories of indices, categorized by temperature and rainfall, and further classified by attributes, such as magnitude, duration, and frequency.
b. Baseline values from 1986-2005 SA-OBS observation data.
c. The projections under the moderate emission scenario (RCP4.5) are displayed in three columns representing different time frames: the early-future (2020-2039), mid-future (2046-2065), and late-future (2080-2099). Each column includes two values: (i) the projected value, presented in standard text, and (ii) the change in value, denoted in bold font within parentheses.
   The projected value is calculated as the sum of the baseline value and the change in value.
d. The projections for the high emission scenario (RCP8.5) follow a similar format to that described in (c).

Additionally, the color schemes for both all the tables below indicate the trend for each grouped index. As for tables 6 and 8, the color scheme that ranges from **blue** indicate towards cooler temperature, and **red**, which indicate towards warmer temperature. Meanwhile in tables 7 and 9, the color scheme that ranges from **dark brown** would indicate drier precipitation, to **dark green** which indicates wetter precipitation. On another note, the grey-filled boxes contain the amount of change ranging from +0.1 and -0.1, thus implying that in these years, there is no relative change in temperature. Temperature projection for Iligan City will experience trend of increasing temperature on both RCP4.5 and RCP8.5 from 2022 to 2099 (Table 6 and 8). For rainfall, most of the different rainfall indices are projected to be drier but there are some indices like SDII, Rx1day, P95, P99, R99p, P95d, and P99d that are wetter and even shift to wetter condition, for instance, RCP4.5 on **late**-future.

Now, the projected values from the figures are crucial for determining prevention and mitigation programs for Iligan City in terms of dealing with a hotter climate and dry conditions that may result to heat strokes and fire and also in dealing with wetter conditions that will result to floods and RIL. Sea level rise (SLR) is an accumulated effect of this climate condition which will be discussed later.

On another hand, the presence of factories and industrial infrastructures indicate that the city is one of the contributors to high emission of greenhouse gas. However, the city also has a large area of hinterlands, hence, for this assessment, both **RCP4.5** and **RCP8.5** will be used as reference for projections of the city. And the most appropriate timeline of projection for each emission will be the **mid**-future (2045-2065) for both scenarios and indices.

Table 6. Summarized RCP4.5 Projected Changes in Extremes on Temperature

TEMPERATURE INDEX					
	Baseline Values (1986-2005)	**Moderate Emission (RCP4.5 Scenario)** *The figures represent the change in value of each variable*			**Projected Changes in Extremes**
		***Early-* 2020-2039**	***Mid-* 2046-2065**	***Late-* 2080-2099**	
Magnitude					
TNn	18.5°C	0.7°C	**1.3°C**	1.6°C	The annual coldest temperature would increase to **19.8°C**.
TNm	21.2°C	0.7°C	**1.1°C**	1.5°C	The average night time temperature would increase to **22.3°C.**
TNx	23.8°C	0.6°C	**1.1°C**	1.3°C	The annual warmest temperature would increase to **24.9°C.**
TXn	25.0°C	0.7°C	**1.2°C**	1.4°C	Coolest annual day time temperature would increase to **26.2°C.**
TXm	30.0°C	0.5°C	**1.1°C**	1.5°C	Average day time temperature would increase to **31.1°C.**
TXx	33.2°C	0.6°C	**1.3°C**	1.6°C	Warmest day time temperature will also increase to **34.5°C.**
DTR	8.8°C	-0.1°C	**0.0°C**	0.0°C	There are **no relevant changes** in daily temperature range.
Frequency					
TN10p	11.5%	-8.3%	**-10.0%**	-10.5%	Cold nights will diminish to only **1 night** in the mid-future. Expect warmer nights.
TN90p	11.5%	23.2%	**48.0%**	62.1%	Events of warm nights will increase to **59 nights**. Nights will become warmer.
TX10p	11.4%	-6.8%	**-9.3%**	-10.0%	Cool days will diminish to **2 days** in the mid-future. Expect warmer days.
TX90p	11.6%	14.2%	**36.0%**	50.3%	Events of hot days will increase to **47 days.** Expect warmer days.
Duration					
WSDI	4.0 days	40.3 days	**177 days**	303.8 days	Duration of days contributing to warm period will **181 days** in the mid-future. Substantial longer warm days ahead.

Table 7. Summarized RCP4.5 Projected Changes in Extremes on Precipitation

PRECIPITATION INDEX					
	Baseline Values (1986-2005)	**Moderate Emission (RCP4.5 Scenario)** *The figures represent the change in value of each variable*			**Projected Changes in Extremes**
		***Early-* 2020-2039**	***Mid-* 2046-2065**	***Late-* 2080-2099**	
Magnitude					
PRCPTOT	1749.6mm	-87.2mm	**-60.7mm**	-37.2mm	Each time-period varies yet a relevant decrease would most likely happen projecting a reduce of **60.7mm** of annual wet-day rainfall.
SDII	8.7mm/day	-0.3mm/day	**-0.2mm/day**	0.1mm/day	There is **minimal** to **no change** of average daily rainfall intensity for each period.
Rx1day	46.4mm	-3.2mm	**-1.5mm**	0.2mm	There is minimal decrease of maximum 1-day rainfall total by **1.5mm** in the mid-future.
Rx5day	116.9mm	-4.8mm	**-3.9mm**	-3.4mm	Total 5-day maximum rainfall is expected to decrease down to **3.9mm** in the mid-future.
P95	24.5mm	-1.2mm	**-1.1mm**	0.3mm	A decrease by **1.1mm** of rainfall on very wet days by the mid-future.
P99	37.6mm	-2.1mm	**-1.2mm**	0.3mm	A decrease is also expected by **1.2mm** of rainfall on extremely wet days.
R95p	324.4mm	-35.0mm	**-17.2mm**	-4.1mm	A decrease of total rainfall from very wet days is expected by **17.2mm**.
R99p	93.6mm	-16.6mm	**-5.8mm**	2.2mm	Total rainfall from extremely wet days is expected to decrease by **5.8mm** in the mid-future.
Frequency					
P95d	9.8 days	-0.7 day	**-0.3 day**	0.5 day	There is **minimal change** in the number of very wet days
P99d	2.0 days	-0.4 day	**-0.1 day**	0.1 day	There is **minimal** to **no change** for the total number of extremely wet days.
Duration					
CWD	19.4 days	-2.1 day	**0.0 day**	-0.6 day	There is **minimal** to **no change** for the consecutive number of wet days.
CDD	17.8 days	1.4 day	**0.1 day**	0.2 day	There is **minimal** to **no change** for the consecutive number of dry days.

Table 8. Summarized RCP8.5 Projected Changes in Extremes on Temperature

TEMPERATURE INDEX					
	Baseline Values (1986-2005)	**High Emission (RCP8.5 Scenario)** *The figures represent the change in value of each variable*			**Projected Changes in Extremes**
		***Early-* 2020-2039**	***Mid-* 2046-2065**	***Late-* 2080-2099**	
Magnitude					
TNn	18.5°C	0.9°C	**1.9°C**	3.5°C	The annual coldest temperature would increase to **20.4°C**.
TNm	21.2°C	0.8°C	**1.7°C**	3.2°C	The average night time temperature would increase to **22.9°C.**
TNx	23.8°C	0.7°C	**1.5°C**	2.9°C	The annual warmest temperature would increase to **25.3°C.**
TXn	25.0°C	0.8°C	**1.6°C**	3.1°C	Coolest annual day time temperature would increase to **26.6°C.**
TXm	30.0°C	0.7°C	**1.6°C**	3.3°C	Average day time temperature would increase to **31.6°C.**
TXx	33.2°C	0.8°C	**1.8°C**	3.6°C	Warmest day time temperature will also increase to **35.0°C.**
DTR	8.8°C	0.0°C	**0.0°C**	0.0°C	There are no relevant changes in daily temperature range.
Frequency					
TN10p	11.5%	-9.1%	**-10.6%**	-10.8%	Cold nights will diminish to only **1 night** in the mid-future. Expect warmer nights.
TN90p	11.5%	29.5%	**66.5%**	87.2%	Events of warm nights will increase to **78 nights**. Nights will become warmer.
TX10p	11.4%	-7.8%	**-10.2%**	-10.8%	Cool days will diminish to **1-2 days** in the mid-future. Expect warmer days.
TX90p	11.6%	21.8%	**53.4%**	78.6%	Events of hot days will increase to **65 days.** Expect warmer days.
Duration					
WSDI	4.0 days	80.8 days	**333 days**	361 days	Duration of days contributing to warm period will **337 days** in the mid-future. Substantial longer warm days ahead.

Table 9. Summarized RCP8.5 Projected Changes in Extremes on Precipitation

PRECIPITATION INDEX					
	Baseline Values (1986-2005)	**High Emission (RCP8.5 Scenario)** *The figures represent the change in value of each variable*			**Projected Changes in Extremes**
		***Early-* 2020-2039**	***Mid-* 2046-2065**	***Late-* 2080-2099**	
Magnitude					
PRCPTOT	1749.6mm	-51.1mm	**-10.4mm**	-156.0mm	Each time-period varies yet a relevant decrease would most likely happen projecting a reduce of **10.4** of annual wet-day rainfall.
SDII	8.7mm/day	-0.1mm/day	**0.1mm/day**	-0.5mm/day	There is **minimal** to **no change** of average daily rainfall intensity for each period.
Rx1day	46.4mm	-1.0mm	**-0.7mm**	0.4mm	There is minimal decrease of maximum 1-day rainfall total by **0.7mm** in the mid-future.
Rx5day	116.9mm	-2.9mm	**-4.0mm**	-2.0mm	Total 5-day maximum rainfall is expected to decrease down to **4mm** in the mid-future.
P95	24.5mm	-0.6mm	**-0.6mm**	-1.9mm	A decrease by **0.6mm** of rainfall on very wet days by the mid-future.
P99	37.6mm	0.1mm	**-1.1mm**	-0.7mm	A decrease is also expected by **1.1mm** of rainfall on extremely wet days.
R95p	324.4mm	-18.1mm	**-14.1mm**	-33.5mm	A decrease of total rainfall from very wet days is expected by **14.1mm**.
R99p	93.6mm	-0.2mm	**-5.3mm**	1.1mm	Total rainfall from extremely wet days is expected to decrease by **5.3mm** in the mid-future.
Frequency					
P95d	9.8 days	-0.4 day	**-0.3 day**	-1.7 day	Number of very wet days will also decrease in the late-future by **1 day**, indicating higher number of warmer days.
P99d	2.0 days	-0.1 day	**-0.2 day**	-0.2 day	There is **minimal** to **no change** for the total number of extremely wet days.
Duration					
CWD	19.4 days	-0.6 day	**0.2 day**	-0.2 day	There is **minimal** to **no change** for the consecutive number of wet days.
CDD	17.8 days	-0.7 day	**-0.7 day**	0.1 day	There is **minimal** to **no change** for the consecutive number of dry days.

Further, sea level rise (SLR) is one of the distinct effects of climate change. As shown from the projected temperature and precipitation indices, Iligan City will likely experience warmer weather and less rainfall. With that, warmer weather heats up the ocean which results into seawater expansion because of taking up space in the ocean basin. This assessment projects a **63-year timeline for every 0.25mm increase** in SLR, starting from year **2085** and culminating in year **2300**. The ensuing table outlines the affected barangays and population for the initial year, 2085. As the year progress, the higher are number of barangays likely to be affected to SLR.

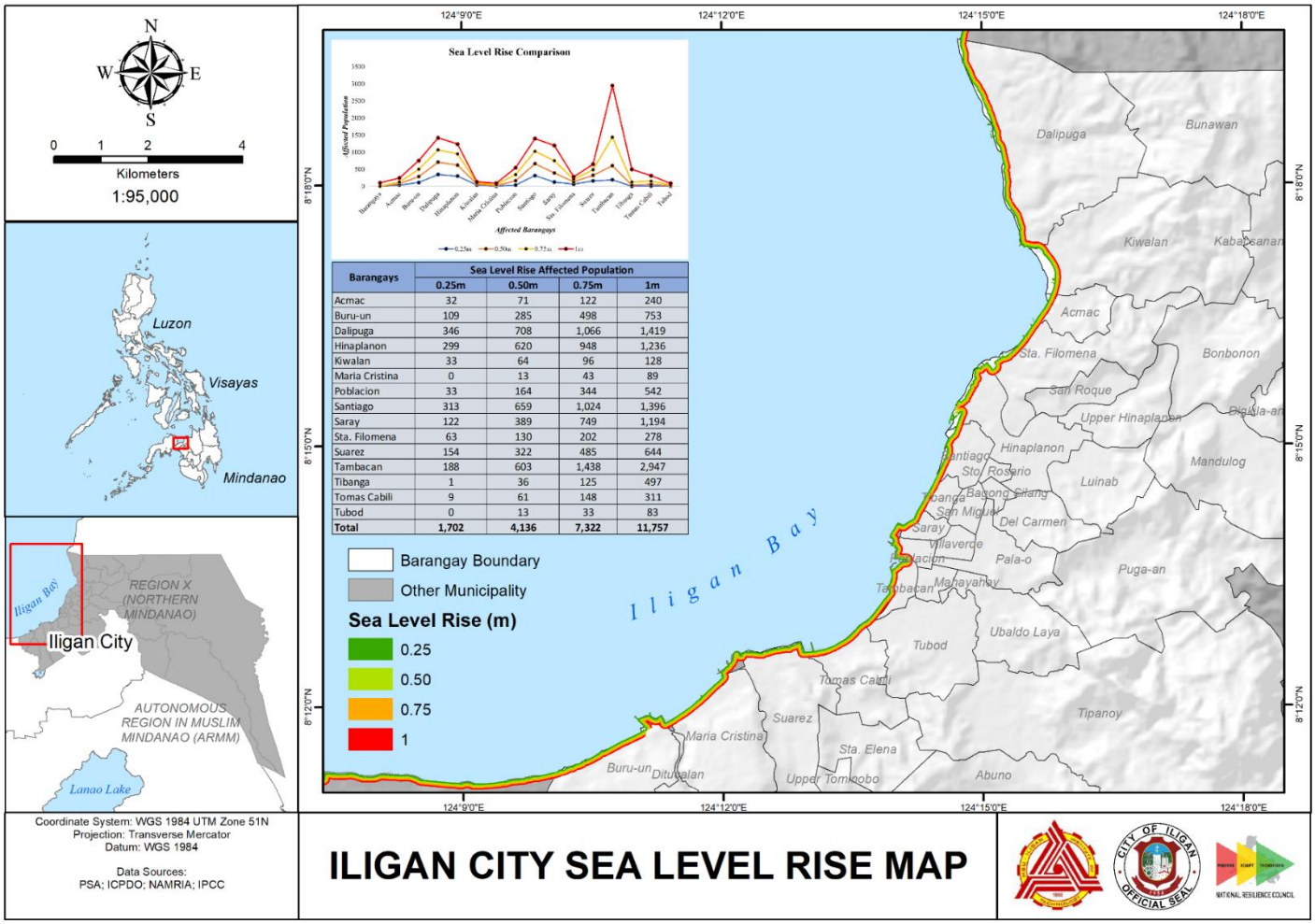
Table 10. Number of Barangays and Potentially Affected Population on SLR Projection

Year	Sea Level Rise (SLR)	Number of Barangays	Potentially Affected Population
2085	.25mm	13	1,702
2145	.50mm	15	3,780
2270	.75mm	15	6,702
2300	1.00mm	15	11,757

Initially, there are **13 barangays** that will likely be affected in year **2085** namely Barangay Acmac, Buru-un, Dalipuga, Hinaplanon, Kiwalan, Poblacion, Santiago, Saray, Sta. Filomena, Suarez, Tambacan, Tibanga, and Tomas Cabili. By year **2154** with SLR of **0.5mm**, Barangay Maria Cristina and Tubod will be included in the list until year **2300** with SLR of **1.00mm.** The table below also shows the susceptible barangays in this SLR projection with its affected area in hectares and affected population.

Table 11. Barangay Level Affected Area and Potentially Affected Population to SLR

Barangay	Sea Level Rise							
	0.25mm (year 2085)		0.5mm (year 2145)		0.75mm (year 2270)		1.00mm (year 2300)	
	Affected Area (ha)	*Potentially Affected Population*	*Affected Area (ha)*	*Potentially Affected Population*	*Affected Area (ha)*	*Potentially Affected Population*	*Affected Area (ha)*	*Potentially Affected Population*
Acmac	0.60	32	1.31	71	2.27	122	4.46	240
Buru-un	3.51	109	9.15	285	16.00	498	24.19	753
Dalipuga	15.93	346	32.60	708	49.08	1,066	65.32	1,419
Hinaplanon	6.03	299	12.51	620	19.15	948	24.97	1,236
Kiwalan	4.09	33	7.91	64	11.79	96	15.75	128
Poblacion	0.37	33	1.84	164	3.86	344	6.09	542
Santiago	3.37	313	7.84	659	12.18	1,024	16.62	84
Saray	0.58	122	1.85	389	3.56	749	5.67	1,194
Sta. Filomena	4.11	63	8.51	130	13.28	202	18.29	278
Suarez	5.08	154	10.59	322	15.96	485	21.19	644
Tambacan	0.46	188	1.46	603	3.49	1,438	7.15	2,947
Tomas Cabili	0.20	9	1.41	61	3.42	148	7.18	311
Tibanga	0.00	0.00	0.20	36	0.69	125	2.73	497
Maria Cristina	0.00	0.00	1.39	13	4.77	43	9.79	89
Tubod	0.00	0.00	0.15	13	0.39	33	0.99	83



Barangays	Sea Level Rise Affected Population			
	0.25m	0.50m	0.75m	1m
Acmac	32	71	122	240
Buru-un	109	285	498	753
Dalipuga	346	708	1,066	1,419
Hinaplanon	299	620	948	1,236
Kiwalan	33	64	96	128
Maria Cristina	0	13	43	89
Poblacion	33	164	344	542
Santiago	313	659	1,024	1,396
Saray	122	389	749	1,194
Sta. Filomena	63	130	202	278
Suarez	154	322	485	644
Tambacan	188	603	1,438	2,947
Tibanga	1	36	125	497
Tomas Cabili	9	61	148	311
Tubod	0	13	33	83
Total	**1,702**	**4,136**	**7,322**	**11,757**

Figure 2. **Projected Sea Level Rise** in Iligan City

II. Inventory of Hazards & its Characteristics

This section discusses the different hazards present in Iligan City with its characteristics and elaborative impacts which shows how important this assessment is in accumulating developments for the city's resilience. There are five recorded disasters that occurred in the city namely flood, landslide, earthquake, liquefaction, and storm surge.

Flood

Flood simply means an unusual and progressive increase in the elevation of the surface water level of a watercourse until it reaches a maximum elevation from which the water level gradually declines to normal levels. The sequence described takes place over a certain period of time. On another hand, excessive rainfall in a short period of time (less than 6 hours) is called **flash flood.** It can occur within minutes cause of the heavy rainfall or even without rain. Communities like homeless people that live under the bridges or even well-constructed houses that is near bodies of water are susceptible for this disaster. With history from *Tropical Storm Sendong*, the people of Iligan does not live under complacency anymore and are more updated on weather news since flooding can affect livelihood, security, even to natural resources, ang utilities that operates in the city. Flooding is a life-threatening disaster based from the flooding incident nationally and locally.
Source: DOST-PAGASA

Landslide

A landslide is the gravity-driven mass movement of rock, soil, and debris down a slope. It happens when the driving force goes above the resisting force. It is a natural occurrence on steep slopes. The movement can be slow at first and then increases in speed. It can have an impact on locations both near and far from the source. Landslides are driven by two factors: **earthquake**, for which it is then called earthquake-induced landslide (EIL), and **rain** – rain-induced landslide (RIL). EIL can also occur in wet and dry season hence there is a separate investigation for this.
Source: PHIVOLCS

Earthquake

An earthquake is a sudden and sometimes powerful shaking of the Earth's surface caused by the abrupt movement of geological elements beneath the Earth's crust. These seismic events are primarily triggered by the interactions of tectonic plates at their boundaries. The point within the Earth where the earthquake originates is known as the **focus** or hypocenter, while the **epicenter** is the location on the Earth's surface directly above the focus. Earthquake strength can be quantified in two main ways: ***magnitude*** and ***intensity***. *Magnitude* is a measure of the energy released at the focus

of an earthquake and is determined by data recorded by a device called a **seismograph**. It is expressed as Arabic numerals (e.g., 4.8, 9.0). *Intensity,* on the other hand, represents how an earthquake is perceived and felt by individuals in a specific area. It is a numerical rating based on the effects observed on people, objects, the environment, and structures in the vicinity. Intensity levels are generally higher closer to the epicenter and are denoted using Roman numerals (e.g., II, IV, IX). In the Philippines, earthquake intensity is assessed using the PHIVOLCS Earthquake Intensity Scale (PEIS).

Table 12. PEIS Intensity Rating

Intensity Scale	Description
I	*Scarcely Perceptible* – Perceptible to people under favorable circumstance.
II	*Slightly Felt* – Felt by few individuals at rest indoors.
III	*Weak* – Felt by many people indoors especially in upper floors of buildings.
IV	*Moderately Strong* – Felt generally by people indoors and by some people outdoors.
V	*Strong* – Generally felt by most people indoors and outdoors.
VI	*Very Strong* – Many people are frightened and many run outdoors.
VII	*Destructive* – Most people are frightened and run outdoors.
VIII	*Very Destructive* – People panicking. People find it difficult to stand even outdoors.
IX	*Devastating* – People are forcibly thrown to ground.
X	*Completely Devastating* – Practically all man-made structures are destroyed. Massive landslide and liquefaction are evident.

Source: DOST-PHIVOLCS, 2012

Liquefaction

Liquefaction is a phenomenon wherein sediments, especially near bodies of water, behave like liquid similar to a quicksand. This takes place when there's a loosely packed, water-logged sediments are/or near the ground surface. It becomes a hazard because the stiffness of the ground is weakened due to earthquake vibrations or ground shaking causes the ground to collapse and will likely affect lifeline utilities, buildings, and the community. The effects of liquefaction are sinking and/or tilting of structure above it, sand boil, and fissuring.

Source: PHIVOLCS

Storm Surge

A storm surge, referred to as "Daluyong ng Bagyo" in local terms, is an abnormal elevation in sea level that occurs during tropical cyclones or "bagyo." This phenomenon results from the combination of powerful winds and low atmospheric

pressure associated with tropical cyclones. As these cyclones approach the coastline, the force of the strong winds pushes seawater over low-lying coastal regions, often causing flooding. This renders storm surges highly perilous. The danger of a storm surge is amplified when it coincides with a high tide. In such cases, it can inundate areas that would otherwise remain dry and safe. In addition to the storm surge itself, the cyclone's potent winds also generate large and forceful waves, further contributing to the hazardous conditions. For instance, the **Super typhoon Yolanda** has caused severe damage to most parts of the Visayas region particularly in Leyte that struck in on 8 November 2013. More than 8,000 people lost their lives and over 14 million inhabitants, including 5.9 million workers, were affected in some way by the storm. Islands of Cebu, Coron, Leyte, Samar, and Panay were particularly damaged severely on its economy.

Source: PAGASA, International Labor Organization (ILO)

III. Historical Disaster Damage and Loss Data

This section displays the historical disaster damage and loss data of Iligan City from year 2011, Tropical Storm Sendong, and 2017 to 2023. It also includes the synopsis for drought in year 1992 and 2016.

The figure 4 below indicates the number of families affected under 32 barangays due to the havoc of the tropical storm “Sendong” with data retrieved from City Engineer’s Office. It shows that the most affected population of families with 3,052 recorded data was from Barangay Hinaplanon. Next to it were Barangay Tambacan, Tubod, Santiago, Mahayahay, San Roque, and Bagong Silang, which shows more than 1,000 recorded affected families. Whereas, areas that have less than 1,000 but not less than 500 affected families were barangays Ubaldo Laya, Upper Hinaplanon, Pala-o, Mandulog, Sta. Filomena, and Rogongon. Lastly, Barangay Luinab, Bonbonon, Digkilaan, Tibanga, San Miguel, Sto. Rosario, Kalilangan, Lunipao, Dulag, Mainit, Hindang, Panuroganan, Del Carmen, Puga-an, Villaverde, Tipanoy, Abuno, Dalipuga, and Bunawan, are barangays with less than 500 affected families.

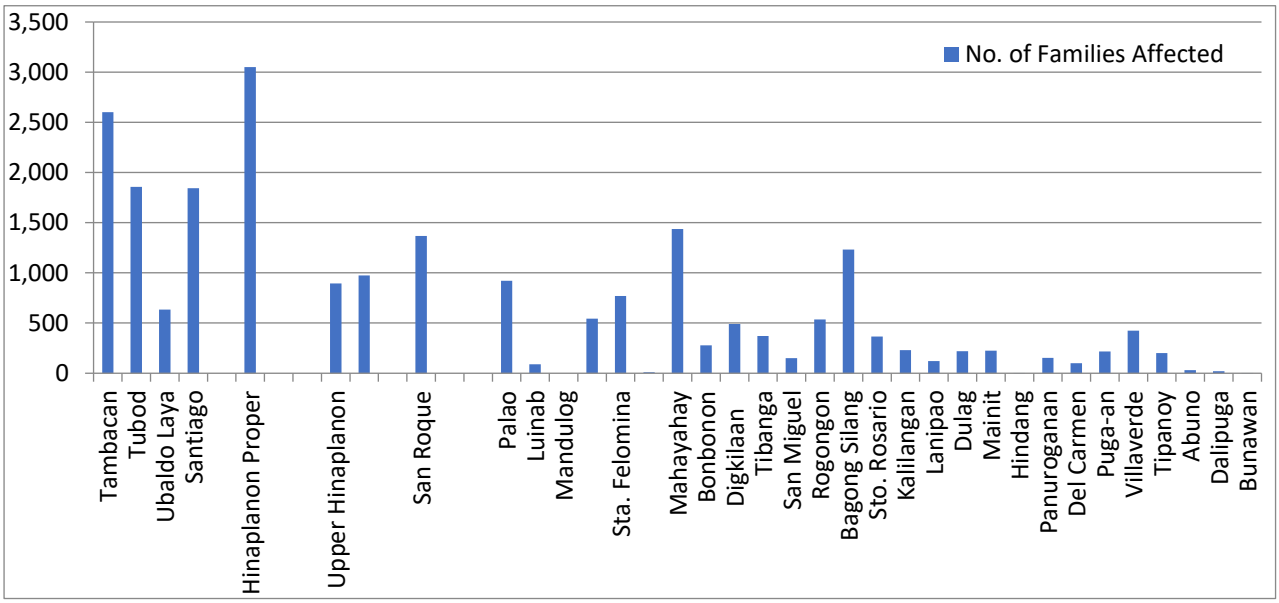


Figure 3. 2011 Sendong Affected Families

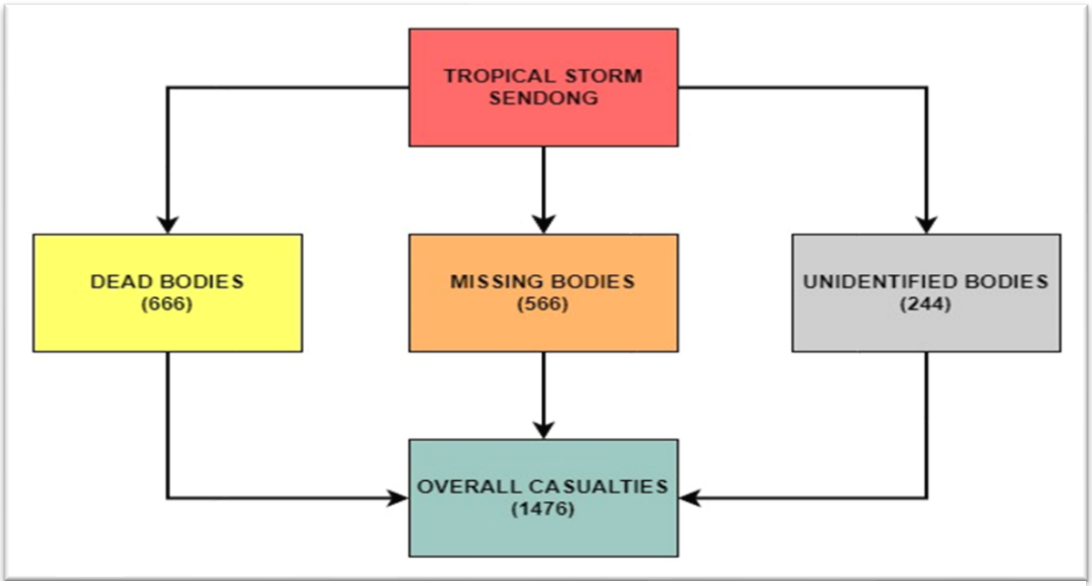


Figure 4. 2011 Sendong Total Casualties

Figure 5 shows the tropical storm Sendong and its overall impact in the city. After the havoc, the heavily affected 32 barangays tally an overall 666 dead bodies, 566 missing bodies and 244 unidentified dead bodies with the total of 1,476 casualties in Iligan City.

Meanwhile, the figure below shows the different types of disaster events and its total effect on families, individuals, and properties from year 2017 to April 2023. Evidently, the most significant disaster event from these periods is **Typhoon Vinta** in 2019 *(affecting a total of 3,294 families, 15,512 individuals, 282 house partially damaged, and 24 house totally damaged)* and **Typhoon Odette** in 2021 *(affecting a total of 2,479 families, 14,618 individuals, 13 houses partially damaged, and 8 houses totally damaged)*.

The disaster event **fire** also affected a total of 1,245 families, 4,465 individuals, 162 partially damaged houses, and 517 totally damaged houses, in the span of these years. It is very important to adhere to the city Bureau of Fire Protection's (BFP) fire drills and preventive measures to minimize such disaster. **Armed conflicts** also affected 2,428 individuals at Brgy. Rogongon last April 2023.

Heavy rain which results to **flood** and **landslides** are two frequent disasters present in Iligan City as well.

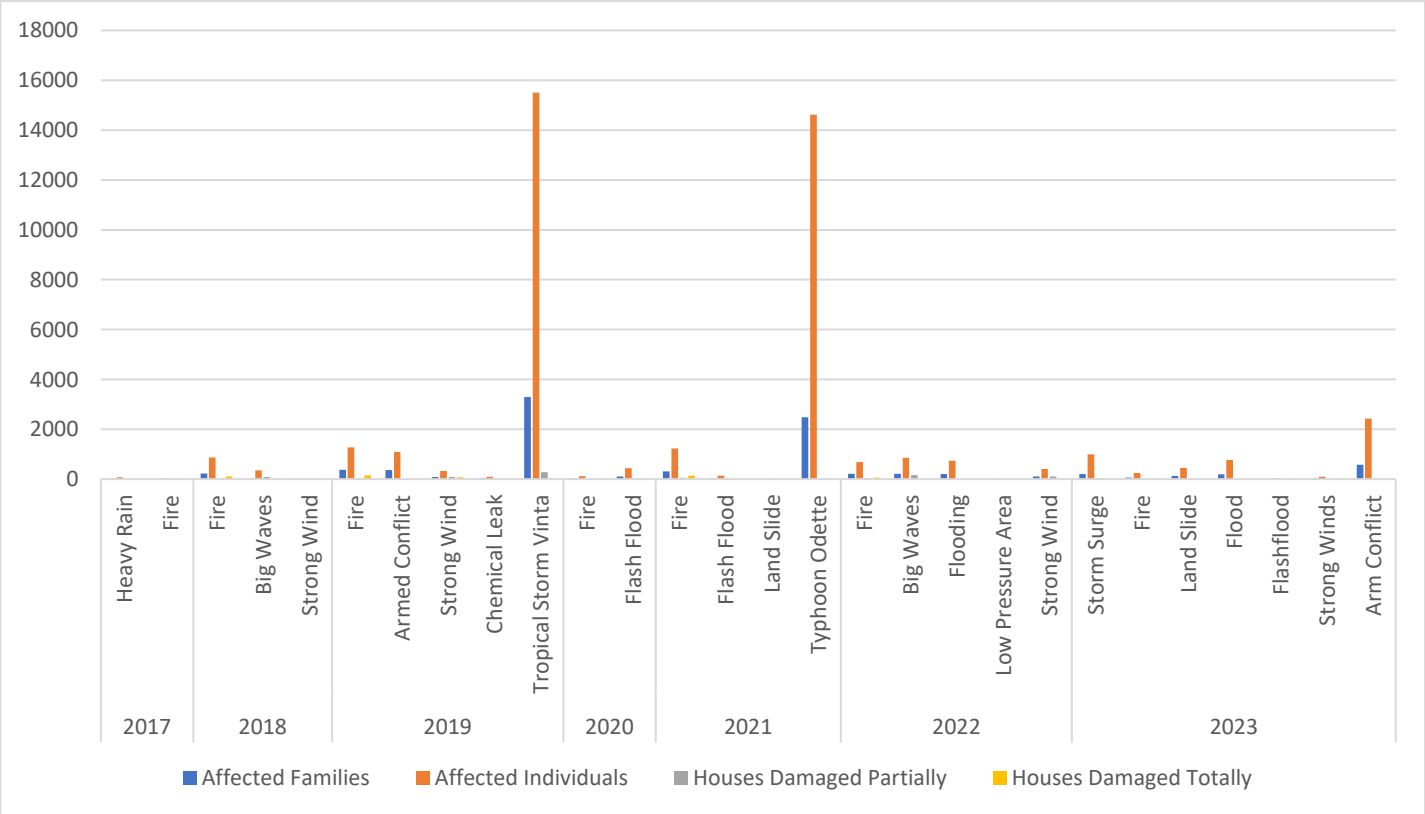


Figure 5. Historical Data of Hazards and Total Affected Families, Individuals, Houses Damaged Partially, and Houses Damaged Totally

In addition, CPDO provided the synopsis of resolutions regarding drought that mentioned nineteen (19) interior barangays who were adversely affected of the prolonged drought in year 1992, namely:

1. Rogongon
2. Mainit
3. Digkilaan
4. Bonbonon
5. Dulag
6. Lanipag
7. Bunawan
8. Kabacsanan
9. Upper Dalipuga
10. Upper Kiwalan
11. Upper Sta. Filomena
12. Mandulog
13. Dalamas/ Rurwanga areas
14. Taluntunan
15. Upper Mibolo
16. Mibala
17. Abuno
18. Upper Sta. Elena
19. Upper Tominobo

The barangays mentioned above were granted the 3rd endorsement dated on June 8, 1992 of the City Mayor, recommending the amount of Php190, 000.00 as requested by the City Agriculturist for the emergency purchase of improved corn seed varieties and will be dispersed to farmer beneficiaries of the nineteen (19) barangays. (Through **Resolution no. 292, series of 1992**).

Also, Iligan City was under the state of calamity in year 2016, due to the effects of the El Niño Phenomenon as recommended by the Iligan City Disaster Risk Reduction and Management Council (ICDRRMC) **Resolution No. 005 S. 2016**, without appropriation until such time that the ICDRRMC can submit a validated and corrected report of the amount needed with a complete list of rightful beneficiaries for calamity assistance.

Beneficiaries of the assistance to be given by the Iligan City Government to those affected by the El Niño Phenomenon were as follows:

1. Presence of dozens of residents
2. Portion of the thousands of farmers
3. Fishermen

Further, affected by the Long Dry Spell (prolonged period of dry weather) has recorded 6,103 farmers and 937 fisherfolks. It was recommended to declare the city under the State of Calamity and to allocate P16,042,992.00 chargeable against the 30% quick response of the city's calamity fund.

On June 2, 2016, the Punong Barangay Jesse Ray N. Balanay of Barangay Maria Cristina, endorsing their **Resolution No. 06405, s. 2016** "Requesting the Sangguniang Panlungsod of Iligan for the Declaration of State of Calamity Due to Severe Damages Caused by the El Niño Phenomenon" Thiis resolution is endorsed to the City Agriculturist's Office for appropriation action.

IV. Summary of Barangay Level Hazard Inventory Matrix

This section shows the kind of hazard present in the 44 barangays of Iligan City as show in the table below.

Table 13. Barangay Level Hazard Inventory Matrix

SUMMARY BARANGAY LEVEL HAZARD INVENTORY INDEX						
BARANGAY	FLOOD	EARTHQUAKE LANDSLIDE (EIL)		RAIN INDUCED LANDSLIDE (RIL)	STORM SURGE	SEA LEVEL RISE
		DRY	WET			
Abuno	High	Low	Medium	High	Normal	Normal
Acmac	High	Normal	Low	Medium	Affected	Affected
Bagong Silang	Very High	Normal	Normal	Normal	Normal	Normal
Bonbonon	Very High	Low	Low	High	Normal	Normal
Bunawan	High	Normal	Low	Medium	Normal	Normal
Buru-un	High	Normal	Low	Low	Affected	Affected
Dalipuga	High	Normal	Low	Medium	Affected	Affected
Del Carmen	High	Normal	Medium	Low	Normal	Normal
Digkilaan	High	Low	Low	High	Normal	Normal

BARANGAY	FLOOD	EARTHQUAKE LANDSLIDE (EIL)		RAIN INDUCED LANDSLIDE (RIL)	STORM SURGE	SEA LEVEL RISE
		DRY	WET			
Ditucalan	High	Normal	Low	High	Affected	Normal
Dulag	High	Low	Low	Medium	Normal	Normal
Hinaplanon	Very High	Normal	Normal	Low	Affected	Affected
Hindang	High	Normal	Low	Medium	Normal	Normal
Kabacsanan	High	Normal	Low	High	Normal	Normal
Kalilangan	High	Low	Medium	High	Normal	Normal
Kiwalan	High	Normal	Low	Medium	Affected	Affected
Lanipao	High	Low	Low	Medium	Normal	Normal
Luinab	Very High	Low	Medium	Low	Normal	Normal
Mahayahay	Very High	Low	Normal	Normal	Affected	Normal
Mainit	High	Normal	Low	Medium	Normal	Normal
Mandulog	Very High	Low	Medium	Medium	Normal	Normal

BARANGAY	FLOOD	EARTHQUAKE LANDSLIDE (EIL)		RAIN INDUCED LANDSLIDE (RIL)	STORM SURGE	SEA LEVEL RISE
		DRY	WET			
Maria Cristina	High	Normal	Low	Low	Affected	Affected
Palao	High	Normal	Medium	Low	Affected	Normal
Panoroganan	High	Low	Low	Medium	Normal	Normal
Poblacion	Very High	Normal	Normal	Normal	Affected	Affected
Puga-an	Medium	Normal	Medium	High	Normal	Normal
Rogongon	High	Low	Low	Normal	Normal	Normal
San Miguel	Very High	Normal	Normal	Normal	Affected	Normal
San Roque	Very High	Normal	Low	Medium	Affected	Normal
Sta. Elena	Very High	Normal	Medium	High	Normal	Normal
Sta. Filomena	Very High	Normal	Low	Medium	Affected	Normal
Santiago	High	Normal	Normal	Low	Affected	Affected
Sto. Rosario	Very High	Normal	Normal	Normal	Normal	Normal
Saray	Very High	Normal	Normal	Normal	Affected	Affected

BARANGAY	FLOOD	EARTHQUAKE LANDSLIDE (EIL)		RAIN INDUCED LANDSLIDE (RIL)	STORM SURGE	SEA LEVEL RISE
		DRY	WET			
Suarez	High	Normal	Low	Normal	Affected	Normal
Tambacan	High	Normal	Normal	Low	Affected	Affected
Tibinga	Very High	Normal	Normal	Low	Affected	Affected
Tipanoy	High	Low	Medium	High	Normal	Normal
Tomas L. Cabili	High	Normal	Medium	Low	Affected	Affected
Tubod	Medium	Low	Medium	Low	Affected	Affected
Ubaldo Laya	Very High	Low	Medium	High	Affected	Normal
Upper Hinaplanon	Very High	Normal	Medium	Low	Affected	Normal
Upper Tominobo	High	Normal	Low	High	Normal	Normal
Villa Verde	Medium	Normal	Normal	Low	Affected	Normal

Color Legend (Flood, EIL, and RIL)

VERY HIGH
HIGH
MEDIUM
LOW
NORMAL

Color Legend (Storm Surge and Sea Level Rise)

AFFECTED
NORMAL

PART 3 Potential Impacts of Hazards and Climate Change

I. Summary of Potential Climate Change Impacts and Potentially Exposed Units per Sector

This section shows the potential climate change impacts and its potentially exposed units per sector namely economic, environmental, social, institution, and infrastructure.

Table 14. Summary of Potential Impacts per Sector

SECTORS	POTENTIAL IMPACTS
Economic	Higher temperatures and altered precipitation patterns can have major economic impacts by disrupting business operations, damaging infrastructure, and destroying crops and property. Some of the potential economic impacts include: • Low-income generation • Lower revenue in taxes • Low production of crops • Higher poverty incidence • Loss of jobs • Economic losses
Environment	Based on the geographical position and physical features of Iligan City, effects of climate change worsened by increasing temperature and precipitation identifies a threat in the city's natural environment, especially in forest, marine and coastal ecosystem's flora and fauna. Some potential impacts of hazards and climate change on the environment sector are: • Loss of biodiversity/habitat • Rain induced landslides • Soil erosion and soil infertility • Reduced marine productivity • Carbon sequestration • Deforestation
Social	The social sector includes organizations and services focused on social welfare, such as education, healthcare, housing, employment assistance, and community support. Climate and hazard impacts on this sector could be wide-ranging which includes: • Widespread infectious disease at community level • Casualties and loss of lives • Rising costs of healthcare, housing, food and utilities • Food shortages • Disruption of services

Institution	The institutional sector, including organizations such as governments, schools, and religious institutions, faces diverse risk from climate change impacts and natural hazards which pose a threat to vital resources that enable institutions to meet the needs of the public and the institutional constitution. These are some of the potential impacts: • Damage and/or loss of properties and lives • Imbalanced allocation of assets • Increased collaterals and damages • Hamper the development of projects
Infrastructure	Critical infrastructure like transportation networks, buildings, utilities and communication systems are highly vulnerable to climate change impacts and natural hazards as it threatens the physical infrastructure assets underpinning modern society. Here are the potential impacts: • Damage to transportation infrastructure can hamper relief efforts, disrupts supply chain and connectivity • Loss of assets and properties • Economic loss • Loss of lives • Damage to lifelines • Increase fire risks • Interruption to communication

II. Impact Chain Diagrams per Sector

An impact chain analysis was conducted based on the ***risk assessment matrix*** to come up with infographics showcasing the identified change stimuli, hazards, and its direct and indirect adverse impacts on the environment (forest, coastal, and marine ecosystems) in Iligan City.

These diagrams will serve as a guide for the decision-makers and stakeholders concerned in identifying **key priority action areas** in each sector.

i. Economic Sector

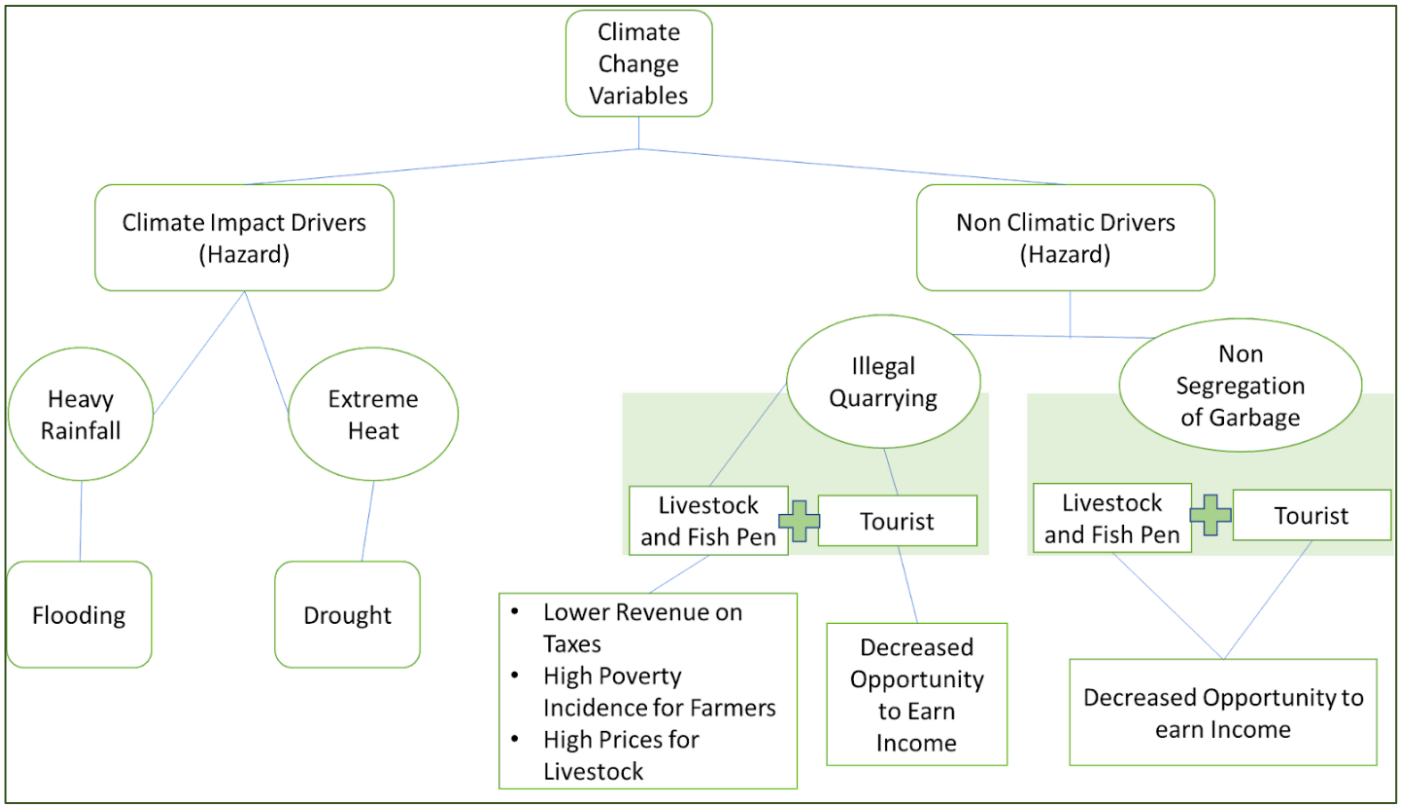


Figure 6. Climatic and Non-Climatic Impact Chain Diagram on the Economic Sector

In an era where the impacts of climate change are becoming ever more pronounced, heavy rainfall-induced flooding has emerged Iligan City as a formidable adversary to the economic sector. The consequences of these inundations are far from limited, stretching across multiple dimensions of economies and leaving an indelible mark on societies. As torrents of rain give rise to swelling waters, marketplaces, business stalls, and housing subdivisions stand exposed to the brunt of nature's force, setting in motion a chain reaction of economic repercussions. The aftermath of heavy rainfall-induced flooding reveals a trail of destruction that takes a toll on vital economic infrastructure. Farm-to-market roads, those lifelines connecting rural production hubs to urban markets, bear the full force of these watery onslaughts. The excessive water leads to erosion in some barangays of the city and structural damage, rendering these routes impassable and disrupting the seamless flow of goods. As these arteries of commerce falter, the economic engine sputters, hindering not only the efficient movement of agricultural products but also the overall connectivity between different economic nodes. At the heart of the city, the bustling markets and business stalls, typically hubs of economic activity, are subjected to an abrupt standstill due to flooding. The surge of water engulfs these critical spaces, forcing temporary closures and robbing entrepreneurs of their livelihoods. The ripple effect is swift and widespread, reverberating through supply chains and echoing in decreased revenues. This interruption in business operations not only hampers local economies but also disrupts the larger economic fabric.

Simultaneously, the agricultural sector, specifically in Mandulog, Abuno, Digkilaan, Rogongon, Mainit, Bonbonon, Lanipao, Digkilaan, Kabacsanan, and Hindang, the center for agricultural production, confronts the dual challenges of flooded fields and decreased productivity. Waterlogged lands lead to a loss of crops, depriving farmers of their yields and diminishing food production. The subsequent

scarcity reverberates through markets, triggering an inflationary pressure on food prices. The reduced agricultural output serves as a stark reminder of the vulnerability of economies to climate-induced shocks, as livelihoods crumble under the weight of disrupted food chains. As waters rise, housing subdivisions, often symbols of urban expansion and economic prosperity, succumb to flooding. Homes and properties become casualties of the relentless downpour, enduring structural damage and loss of value. This deterioration extends beyond individual homeowners to impact the real estate sector at large. Depreciating property values contribute to decreased revenue streams for local governments, diminishing their capacity to fund public services and essential infrastructure projects. This economic swamp further worsens the challenges faced by communities recovering from flooding.

On the other hand, the scorching heat deters consumers from engaging in traditional market activities, leading to reduced footfall and disrupted revenue streams for local businesses. Marketplaces, where commerce and exchange flourish, become stifling grounds that discourage outdoor activities. Moreover, housing subdivisions, where the essence of community thrives, transform into heat traps. Residents face not only discomfort but also potential health risks, compelling them to invest in cooling measures that strain household budgets and disrupt discretionary spending.

Extreme heat exerts stress on animals, stifling their growth and reproductive capabilities. Livestock, whether for meat or dairy, require comfortable conditions to thrive and reproduce efficiently. However, elevated temperatures lead to decreased feed intake, diminished weight gain, and even higher mortality rates. The economic repercussions are profound as livestock farmers grapple with reduced yields and compromised profits, impacting food supply and local economies alike.

Extreme heat also casts a shadow over agriculture, imperiling the very source of sustenance for communities. Fields that once yielded bountiful harvests now bear the scars of heat-induced stress. Crops, crucial for food security and livelihoods, endure reduced growth rates, withering foliage, and decreased yields. The once-vibrant tapestry of agriculture begins to fade, as the dependable rhythm of planting and harvesting falls out of sync. As agricultural productivity wanes, the threat of food shortages looms large, potentially leading to increased reliance on imports and driving up global food prices. The convergence of extreme heat and reduced agricultural production ignites a crisis of scarcity, triggering a surge in crop prices. Diminished yields lead to diminished supply, resulting in a demand-supply imbalance that tilts in favor of higher prices. Consumers are forced to bear the brunt of elevated food costs, impacting household budgets and altering consumption patterns. The economic implications reverberate across the food chain, influencing producers, distributors, and retailers, and creating a climate of economic uncertainty.

ii. Environment Sector

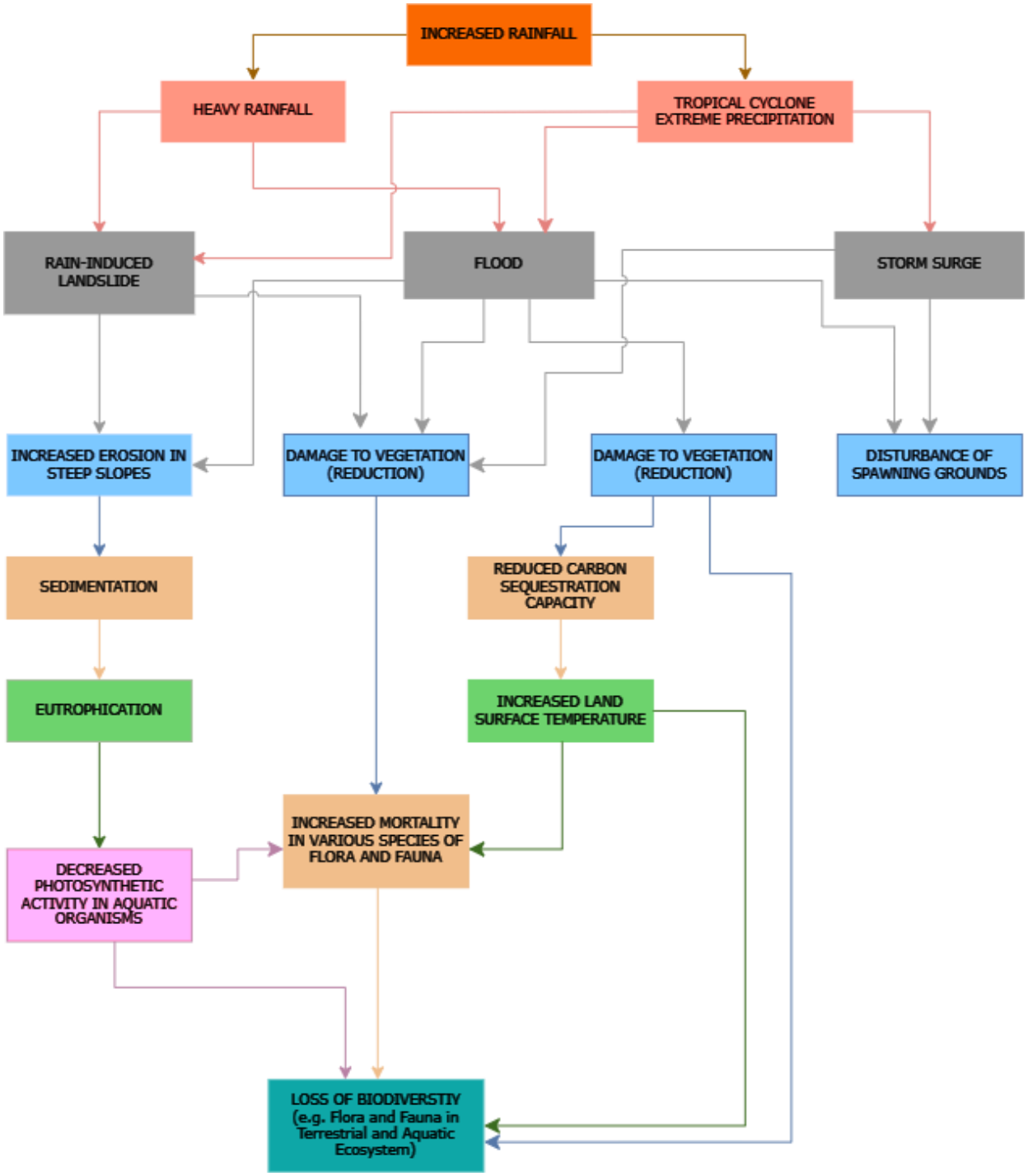


Figure 7. Increased Rainfall Impact Chain Diagram on Environmental Sector

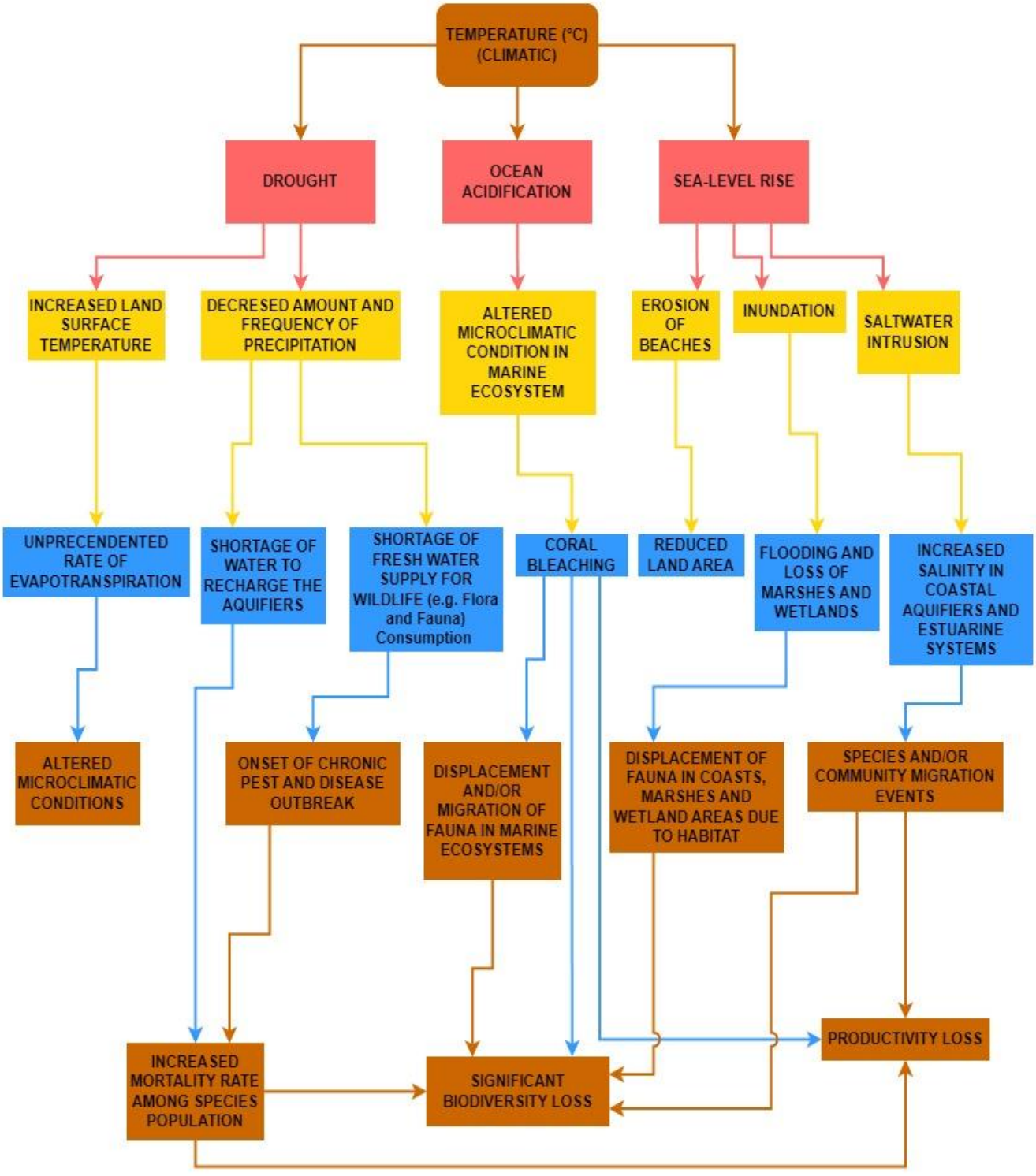


Figure 8. Increased Temperature (°C) Impact Chain Diagram on Environmental Sector

Non-climatic factors with the influence of **anthropogenic** and **seismic hazards** have varied impacts that produce environmental disturbances which pose the risk of degradation in land and water ecosystems resulting in damage to floral and faunal diversity. The Iligan City is at risk of forest degradation and destruction especially in upland areas because of its rich mineral soil (limestone) and the presence of endemic trees with high economical values while extraction activities in mining contribute to the destructive chain effect from its extracted land down to its affected natural ecosystems. Waste disposal, on the other hand, is one of the major problems the Iligan city is facing because capacitated disposal area has reached full capacity. Such condition will compromise will compromise the health of the surrounding communities affecting the important biochemical process in both flora and fauna. Considering that most of Iligan's terrain is steep, the occurrence of earthquake will induce massive landslides while earthquake cause buildings to tilt or collapse in the liquefaction areas found near bodies of water such as in the coast or rivers.

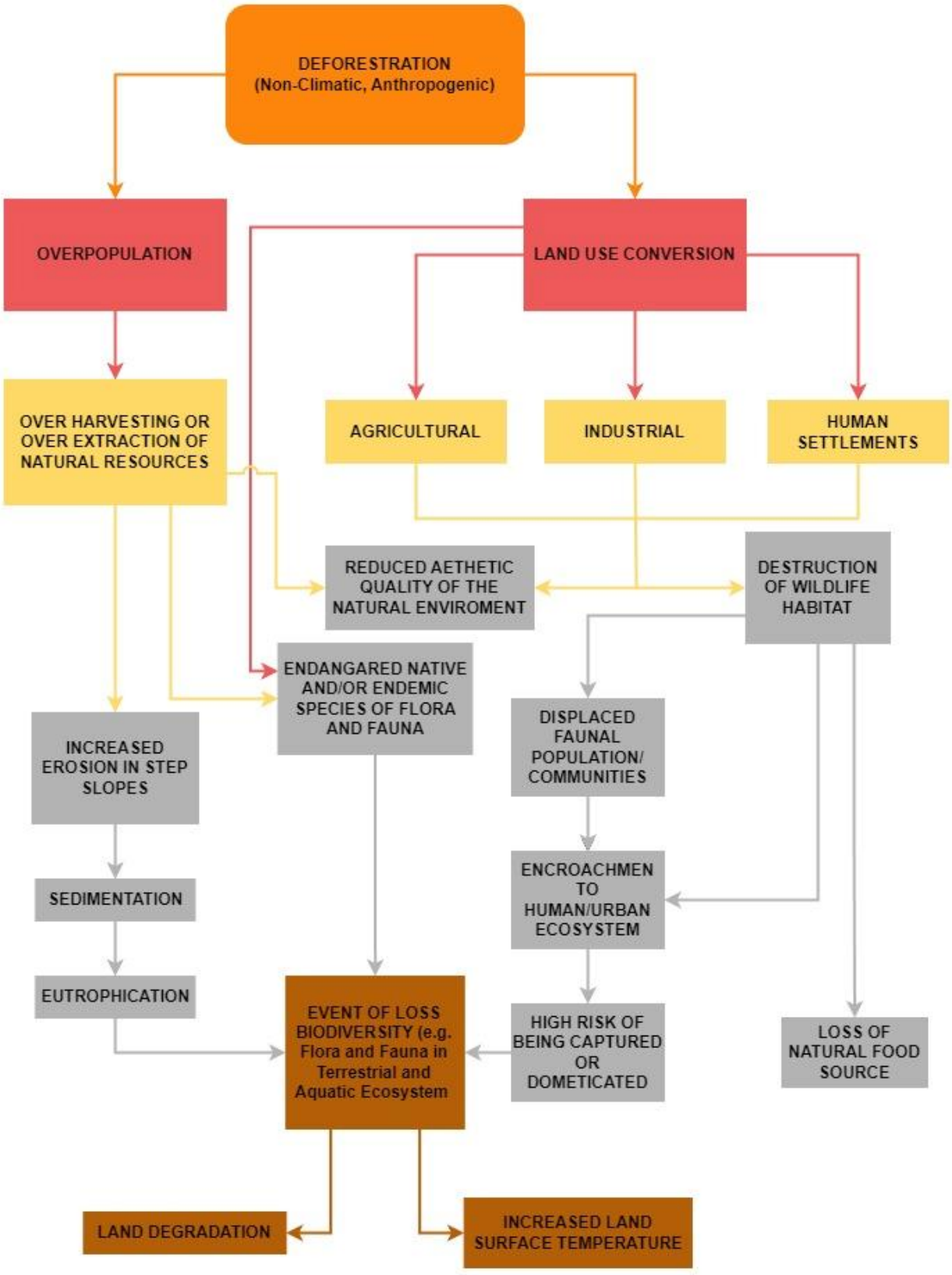


Figure 9. Deforestation (Anthropogenic Hazard) Impact Chain Diagram on Environmental Sector

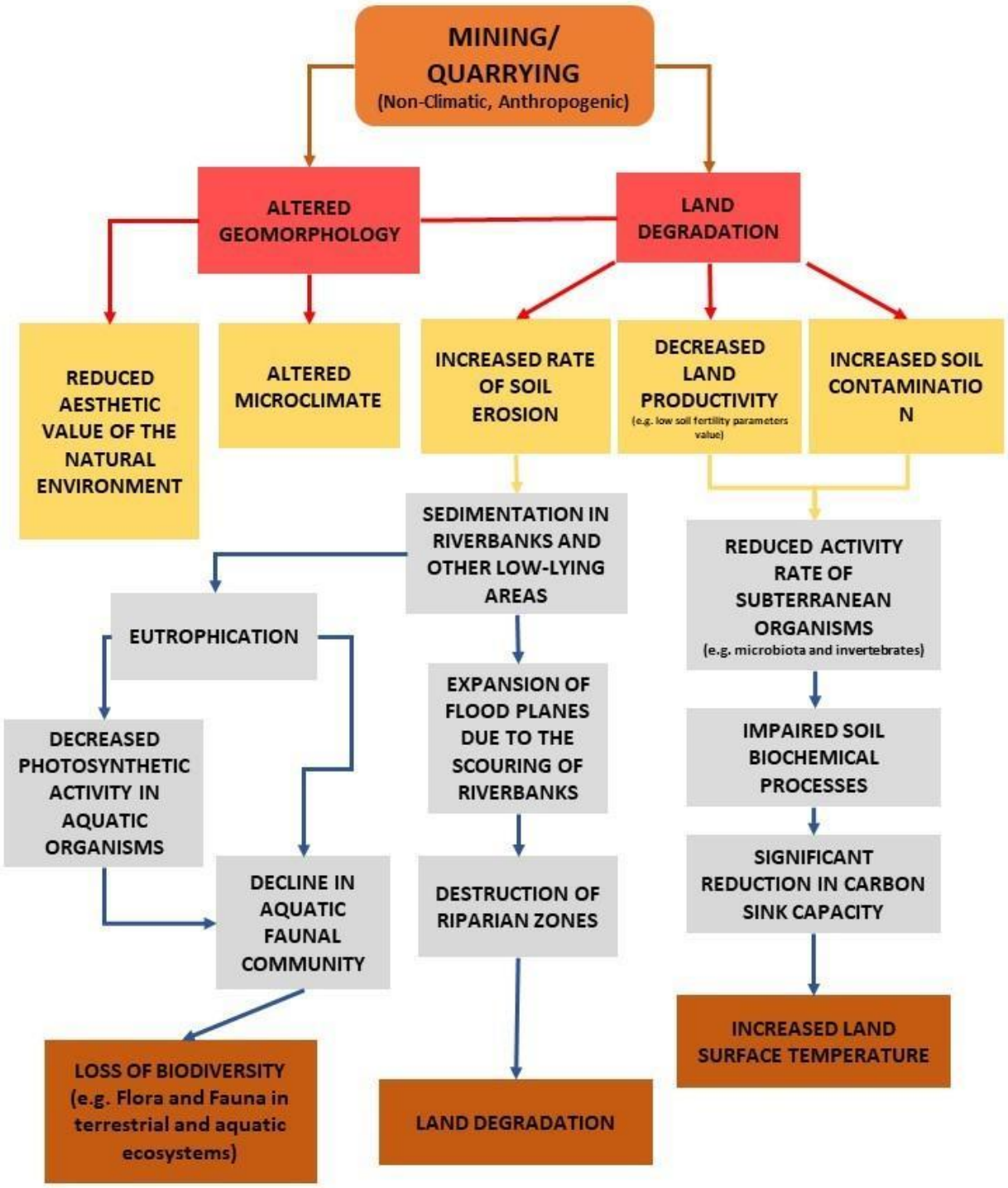


Figure 10. Mining (Anthropogenic Hazard) Impact Chain Diagram on Environmental Sector

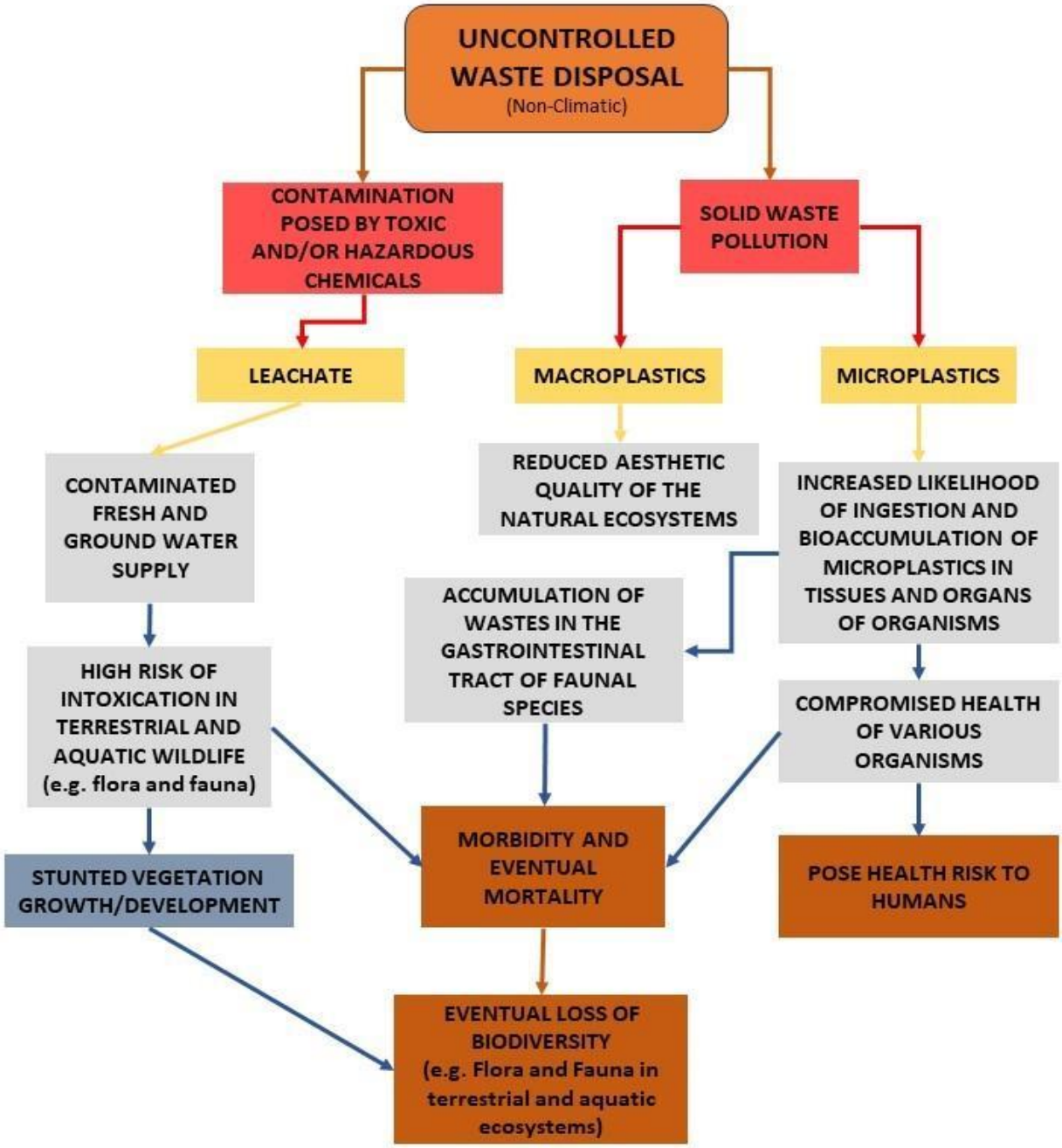


Figure 11. Uncontrolled Waste Disposal (Anthropogenic Hazard) Impact Chain Diagram on Environmental Sector

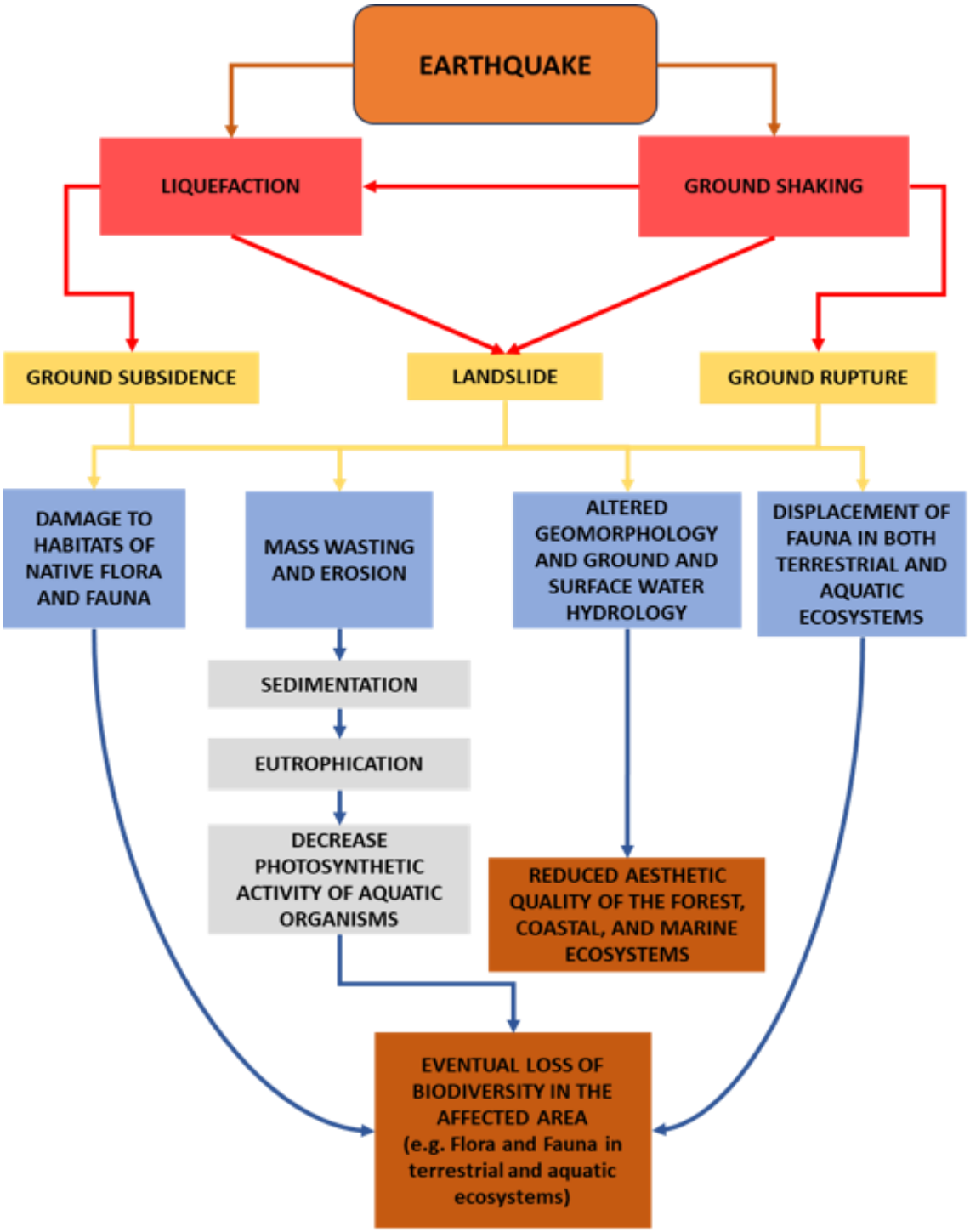


Figure 12. Earthquake (Seismic Hazard) Impact Chain on Environmental Sector

iii. Social Sector

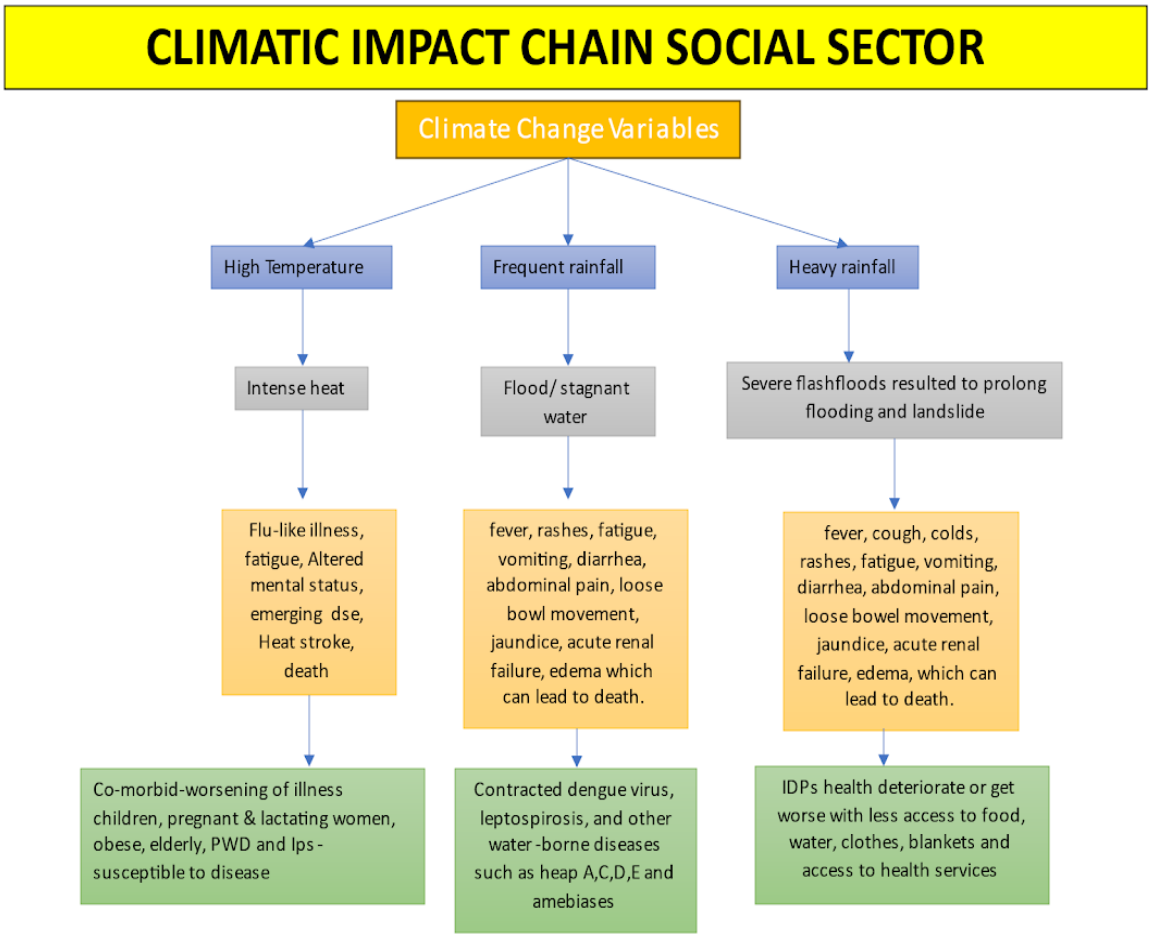


Figure 13. Climatic Impact Chain Diagram on Social Sector

The social sector is heavily impacted by climate change. This chain starts with climate change variables such as high temperatures and frequent and heavy rainfall. These variables can have significant consequences on human health and well-being.

High temperatures can lead to various health issues within the social sector. Individuals may experience illnesses such as heat exhaustion and heatstroke due to prolonged exposure to extreme heat. This can result in symptoms like fatigue, altered mental status, and even death in severe cases. Vulnerable populations, such as elderly, children and those with pre-existing health conditions, are particularly at risk.

Frequent and heavy rainfall, on the other hand, can contribute to the spread of waterborne diseases. Excessive rainfall can lead to flooding, which can contaminate water sources and increase the risk of illnesses like diarrhea, abdominal pain, loose bowel movement, jaundice, acute renal failure and sometimes death. These diseases can cause significant morbidity and mortality, particularly in areas with limited access to clean water and sanitation facilities.

Climate change can also lead to the emergence and spread of new diseases. Changes in temperature and precipitation patterns can impact the distribution and behavior disease-carrying vectors, such as mosquitoes and ticks. This can result in the expansion of vector-borne disease like malaria, dengue fever, and lyme disease, affecting the social sector's health and well-being.

Overall, the climatic impact chain in the social sector highlights the interconnectedness between climate change variables, human health, and societal well-being. It underscores the need for adaptation and mitigation strategies to minimize the adverse effects of climate change on the social sector and protect vulnerable populations from the health risks associated with high temperatures, heavy rainfall and emerging diseases.

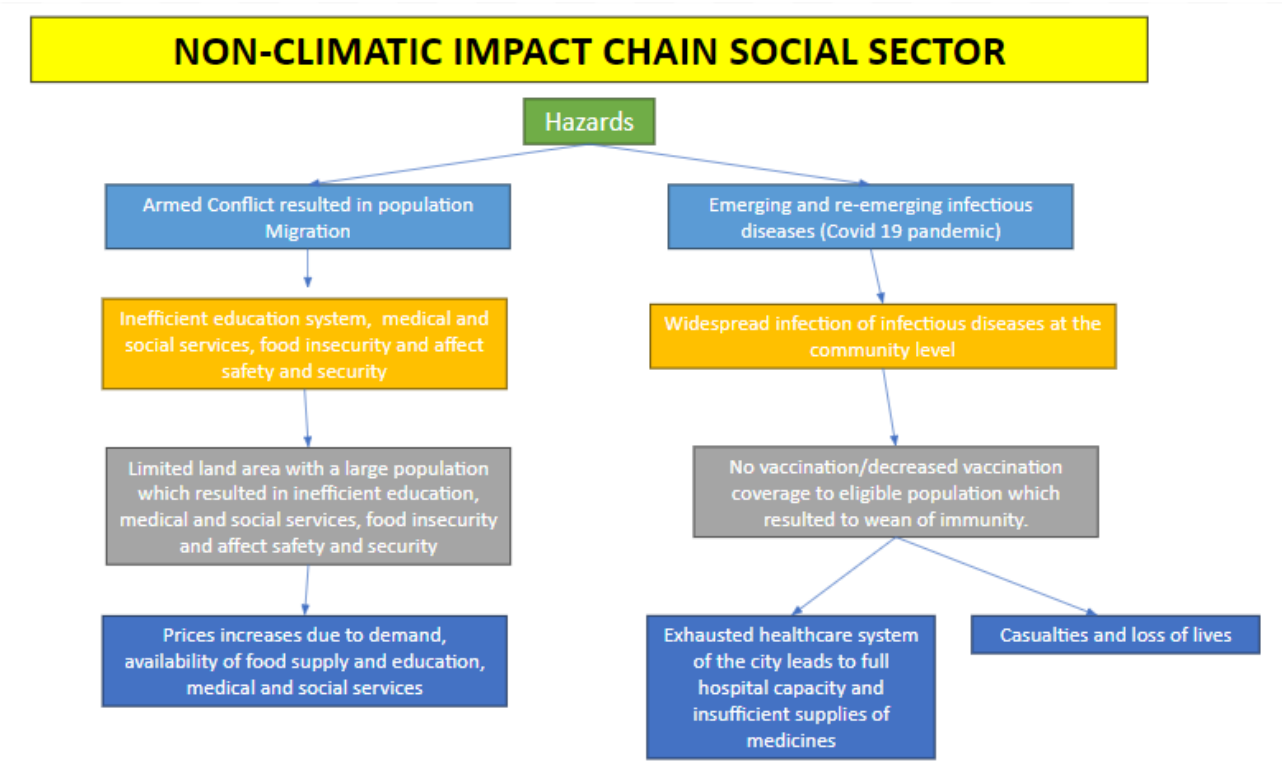


Figure 14. Non-climatic Impact Chain Diagram on Social Sector

The non-climatic impact chain in the social sector can be influenced by various hazards, including armed conflict and the emergence of infectious diseases like the Covid 19 pandemic. These hazards can be far-reaching consequences on different aspects of society, leading to an interconnected chain of impacts.

Armed conflict often results in population migration, as people are forced to flee their homes to seek safety and security. This mass movement of people can strain social systems and infrastructure in host communities, leading to overcrowding, inadequate housing, and limited access to essential services. The influx of displaced populations can also place a burden on education systems, healthcare facilities, and social services, making them inefficient and unable to meet the needs of the affected communities.

In addition to armed conflict, the emergence and re-emergence of infectious diseases like the Covid 19 pandemic can have profound impacts on the social sector. These diseases can spread rapidly within communities, leading to widespread infections and overwhelming healthcare systems. The need for quarantine measures and social distancing can disrupt education systems, with schools being closed or transitioning to remote learning, resulting in an inefficient education system and hindering students' access to quality education.

Furthermore, the impact of infectious diseases on the social sector extends beyond healthcare and education. The pandemic, for example, has caused widespread job losses and economic downturns, leading to increased poverty and food insecurity. Many individuals and families have faced financial hardships, struggling to meet their basic needs and access adequate food and nutrition. This in turn, can have long-term consequences on the overall well-being and safety of communities. On the other hand, this has exhausted the healthcare system which leads to full hospital capacity and insufficient supplies and medicines, that sometimes causes death.

The non-climatic impact chain in the social sector, influenced by hazards like armed conflict and infectious diseases highlights the interconnectedness of various societal systems. It underscores the need for comprehensive approaches that address not only the immediate impacts but also the underlying vulnerabilities and systemic issues. These systems, improving access to education and social services, enhancing food security measures, and promoting safety and security in affected communities.

iv. Institution Sector

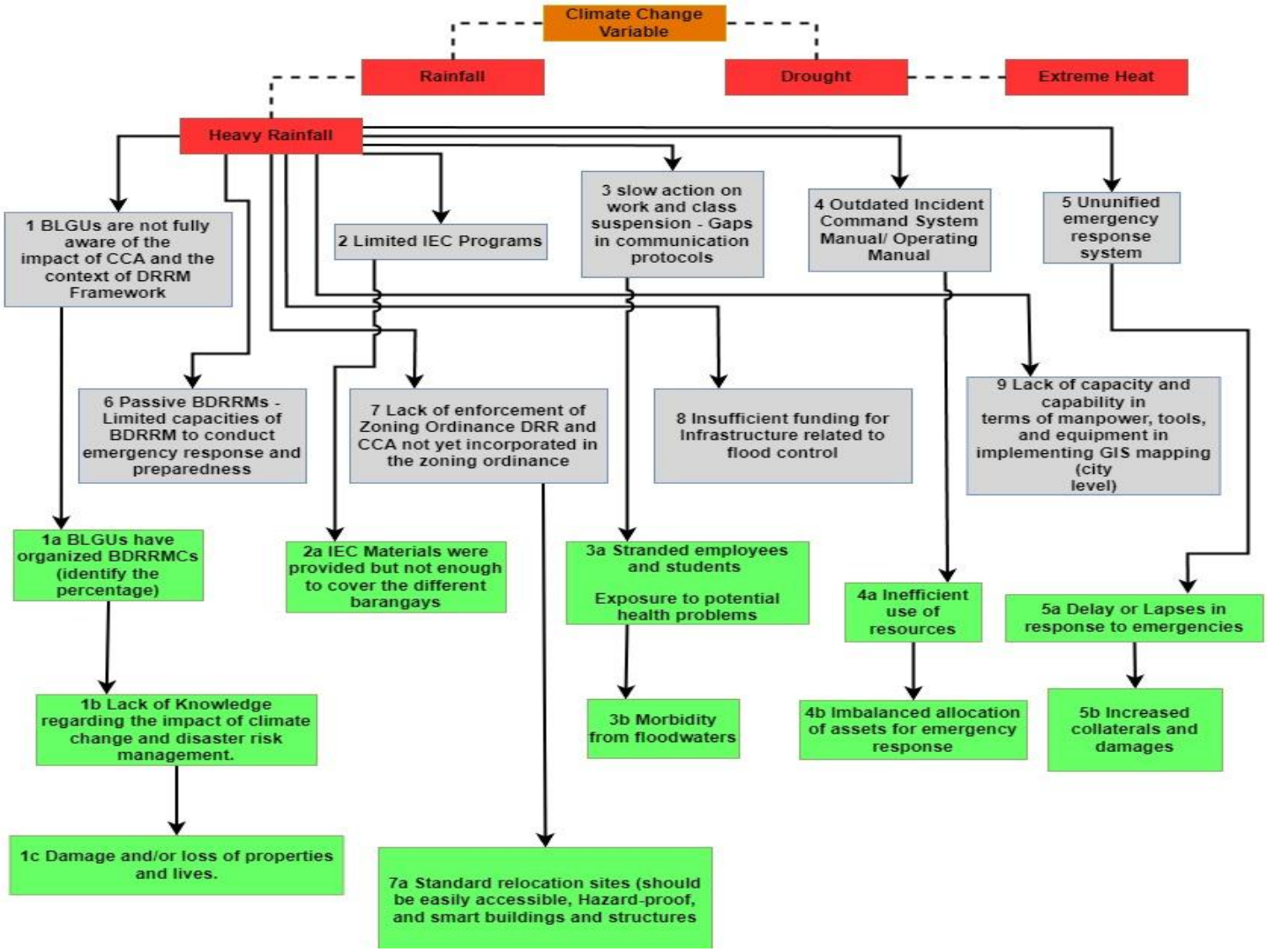


Figure 15. Climatic Impact Chain Diagram on Institution Sector

The climatic impact of heavy rainfall resulting in damages or loss of properties and lives is a significant hazard for institutions. This impact is exacerbated by a lack of knowledge regarding the impact of climate change and disaster risk reduction (DRR) within the institution. The Barangay Local Government Units (BLGUs) may not be fully aware of the importance of Climate Change Action in the context of the DRRM framework, leading to inadequate preparedness and response measures.

Insufficient dissemination of Information, Education, and Communication (IEC) materials further contributes to the problem. Although some IEC materials are provided, they are not enough to cover all barangays due to limited IEC programs. This lack of

awareness hinders the community's ability to effectively respond to and mitigate the impacts of heavy rainfall.

The morbidity of floodwaters poses a health risk, as employees and students may become stranded and face potential health problems due to slow action on work and class suspension, often with gaps in protocols. This delay in response further exacerbates the collaterals and damages caused by the heavy rainfall.

Furthermore, an imbalanced allocation of assets for emergency response and inefficient use of resources can be attributed to an outdated incident command system manual or operating manual. This outdated system leads to delays and confusion in emergency response efforts.

The lack of a unified emergency response system also contributes to increased collaterals and damages, as well as delays in responding to emergencies. Without a coordinated and unified approach, response efforts may be fragmented and less effective.

Passive Barangay Disaster Risk Reduction and Management (BDRRM) systems with limited capacities to conduct emergency response and preparedness further compound the problem. These limited capacities hinder the institution's ability to effectively respond to and mitigate the impacts of heavy rainfall.

The absence of a zoning ordinance that incorporates DRR and climate change adaptation (CCA) measures also contributes to the vulnerability of the institution. Without proper zoning regulations, the institution is at a higher risk of being affected by heavy rainfall and other hazards.

Insufficient funding for infrastructure related to flood control further exacerbates the impact of heavy rainfall. Without adequate infrastructure, the institution is more prone to damages and losses during heavy rainfall events.

Finally, there is a lack of capacity and capability in terms of manpower, tools, and equipment for implementing Geographic Information System (GIS) mapping at the city level. GIS mapping is crucial for effective planning, response, and mitigation efforts, but without the necessary resources, the institution may struggle to implement this important tool.

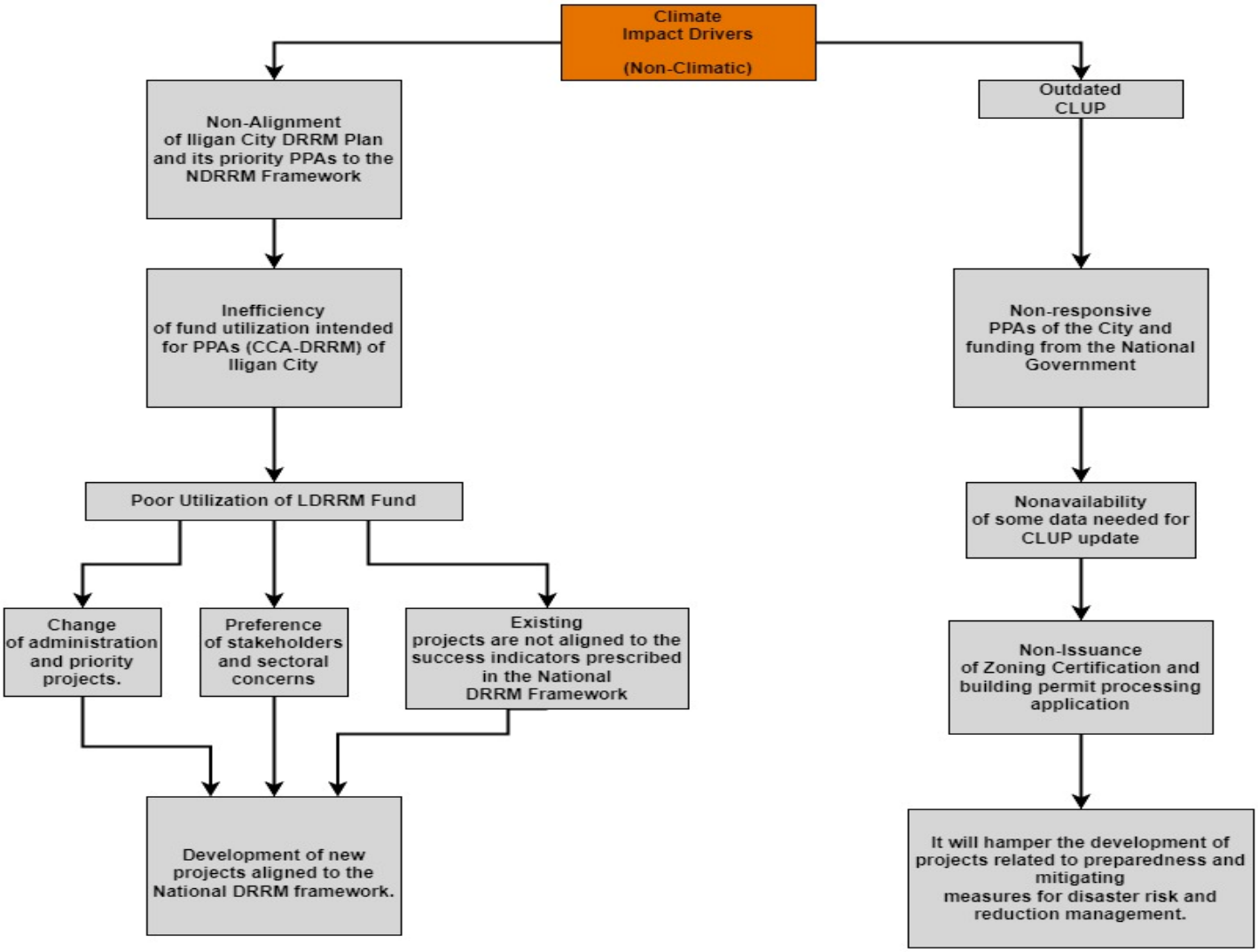


Figure 16. Non-climatic Impact Chain Diagram on Institution Sector

One non-climatic driver of hazards in Iligan City is the Non-alignment of the City's Disaster Risk Reduction and Management (DRRM) plan and its priority programs, plans, and activities to the National Disaster Risk Reduction and Management (NDRRM) Framework. This lack of alignment has resulted in the inefficient utilization of funds intended for DRRM programs in the city.

One reason for the poor utilization of Local Disaster Risk Reduction and Management (LDRRM) funds is the change of the previous administration and shifting of priority projects. When the previous administration takes over, their preferences and the concerns of different stakeholders and sectors may lead to a reallocation of funds away from existing projects that were aligned with the NDRRM Framework. This lack of continuity and alignment hindered the progress and effectiveness of DRRM efforts.

Thus, projects in Iligan City may not be aligned with the success indicators prescribed in the NDRRM Framework. This means that even if projects are being

implemented, they may not be contributing to the overall goals and objectives of the national framework for disaster risk reduction and management. This lack of alignment led to a fragmented approach to DRRM and hindered the development of new projects that are aligned with the NDRRM Framework.

Another non-climatic impact driver of hazards in Iligan City is the Outdated Comprehensive Land Use Plan (CLUP). The non-updated CLUP led to non-responsive Programs, Plans, and Activities (PPAs) in the city, as they do not aligned with the current needs and development goals of the city.

The outdated CLUP also affects the availability of data needed for the CLUP update. Without updated data, it becomes challenging to assess the sensitivity and susceptibility of exposed assets in the city. This lack of information hinders the identification and understanding of vulnerable areas and assets, such as physical infrastructure, environmental resources, economic establishments, social communities, and institutional facilities.

The non-issuance of zoning certification and building permit processing applications is a direct consequence of the outdated CLUP. Without an updated plan, it becomes difficult to determine appropriate zoning regulations and building standards, leading to delays and uncertainties in the permitting process. This can have immediate consequences for exposed and vulnerable assets, as they may not have the necessary safeguards and protections in place.

In summary, both the non-climatic impact drivers of hazards in Iligan City, the non-alignment of the city's DRRM plan and outdated Comprehensive Land Use Plan (CLUP) resulted to non-responsive PPAs, non-availability of data for the CLUP update, and sensitivity and susceptibility of exposed assets. The consequences include the non-issuance of zoning certifications and delays in building permit processing, which directly affect the safety and protection of exposed and vulnerable assets in the city. The non-alignment of DRRM fund led to the inefficient utilization of funds, as well as the preference of stakeholders and sectoral concerns over the projects. It also hindered the development of new projects that are aligned with the national framework for disaster risk reduction and management.

v. Infrastructure Sector

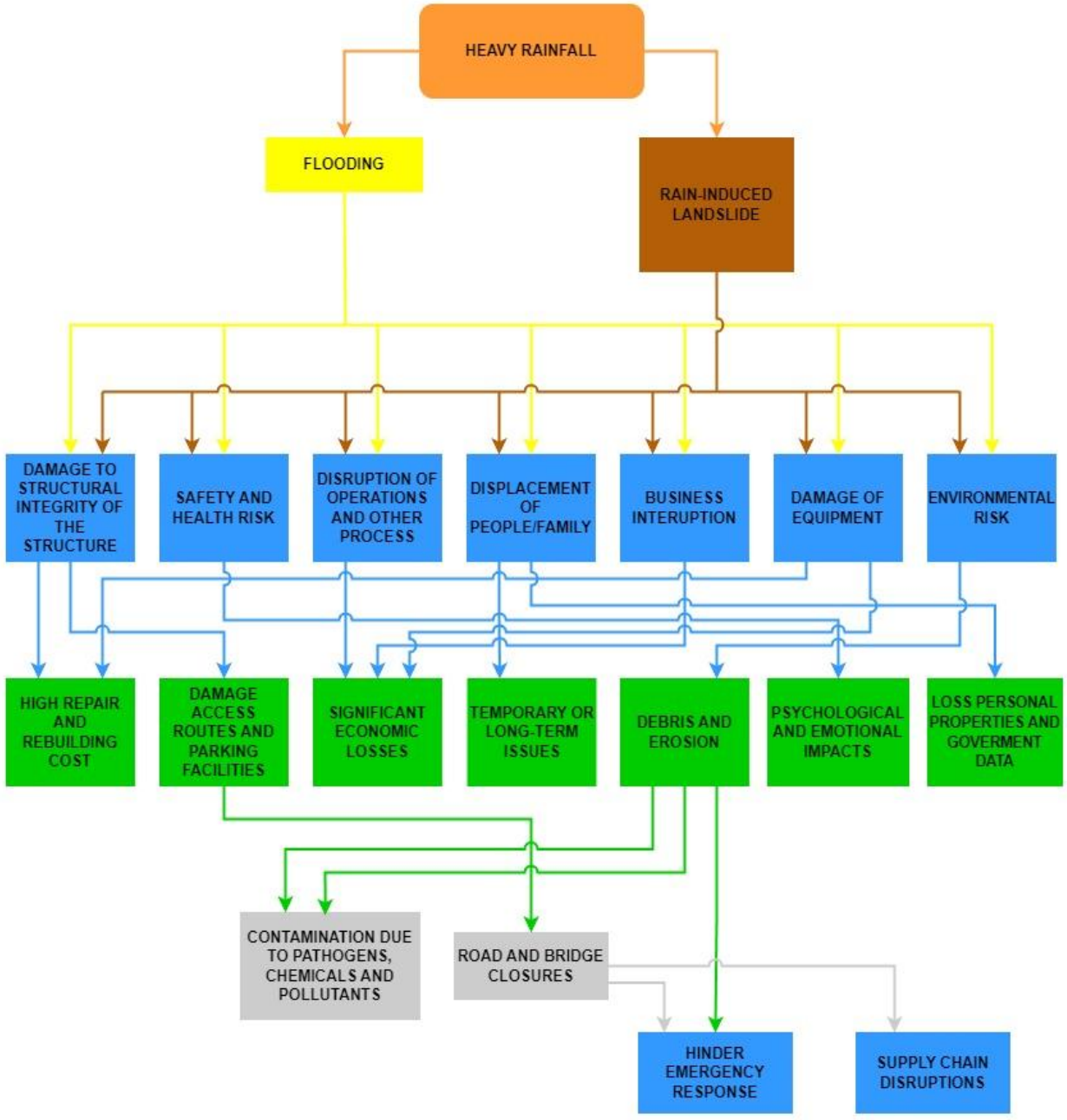


Figure 17. Climatic Impact Chain Diagram on Infrastructure Sector

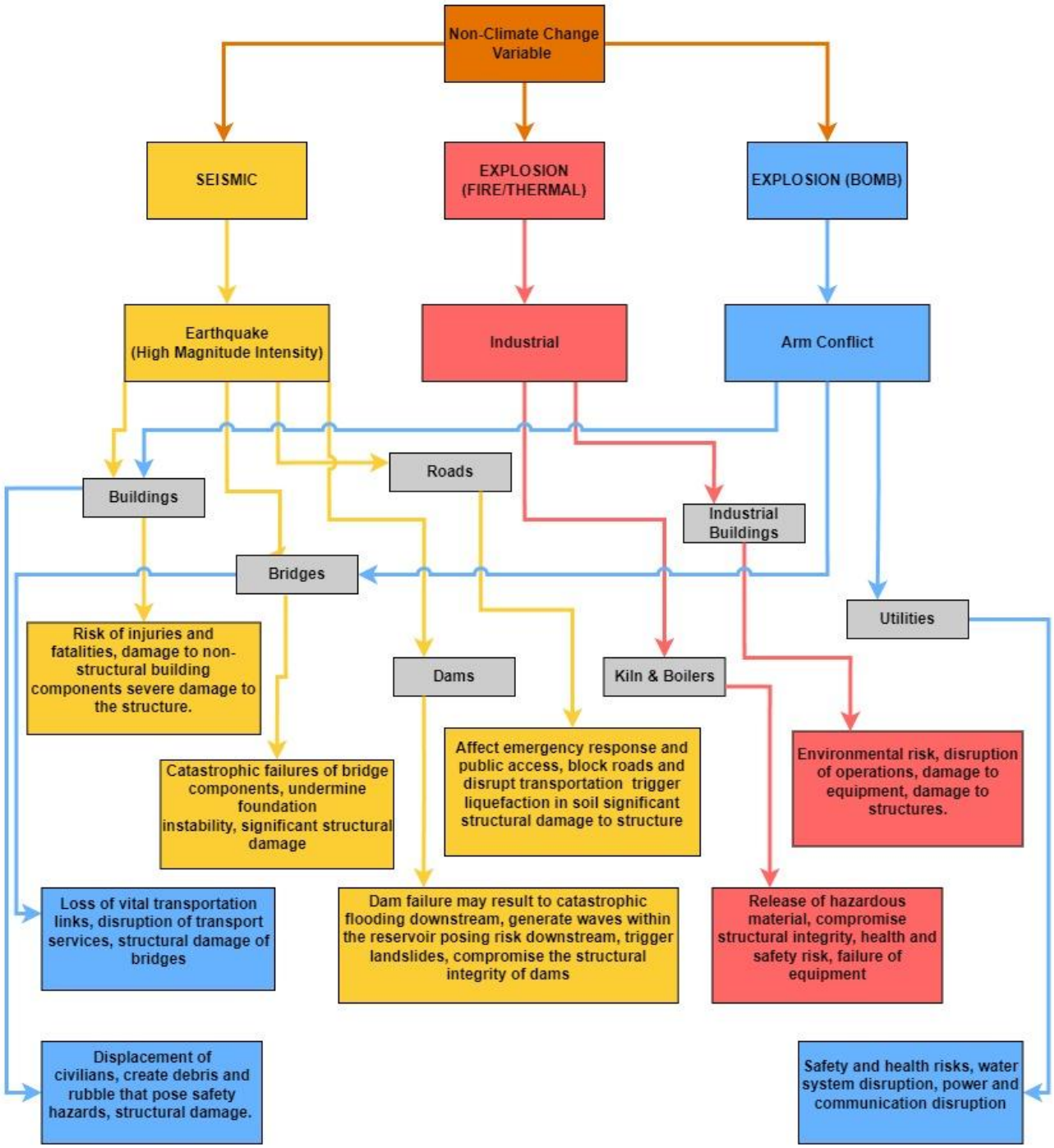


Figure 18. Non-climatic Impact Chain Diagram on Infrastructure Sector

PART 4 Exposure Database

I. Attribute Information on Exposure, Sensitivity, and Adaptive Capacity of Various Units per Sector

Intergovernmental Panel on Climate Change (2003) has defined exposure, sensitivity, and adaptive capacity, as follows:

Exposure is referred to "the nature and degree to which the system is exposed to significant climatic variations."

Sensitivity[6] is "the degree to which a system is affected, either adversely or beneficially, by climatic stimuli."

Adaptive Capacity[7] is "the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences."

This section delves into a comprehensive examination of the key elements at risk from the prevailing hazards within Iligan City. The discussion will provide an in-depth exploration of these elements, categorized by sector, with due consideration to both climatic and non-climatic hazard drivers. Each exposed element will undergo a thorough assessment that takes into account its vulnerability, sensitivity, and adaptive capacity when confronted with disaster events. It is essential to emphasize that the insights presented in this section are a culmination of the extensive Climate and CDRA workshop, offering a consolidated perspective on the city's resilience and preparedness in the face of a diverse range of hazards.

[6] Reports-Assessment Reports from Working Group II Box SPM-1. Climate Change Sensitivity, Adaptive Capacity, and Vulnerability from Intergovernmental Panel on Climate Change, Intergovernmental Panel on Climate Change. "IPCC - Intergovernmental Panel on Climate Change." *Archive.ipcc.ch*, archive.ipcc.ch/ipccreports/tar/wg2/index.php?idp=8.

[7] Reports-Assessment Reports from Working Group II Box SPM-1. Climate Change Sensitivity, Adaptive Capacity, and Vulnerability from Intergovernmental Panel on Climate Change, Intergovernmental Panel on Climate Change. "IPCC - Intergovernmental Panel on Climate Change." *Archive.ipcc.ch*, archive.ipcc.ch/ipccreports/tar/wg2/index.php?idp=8.

i. Economic Sector

Table 15. Economic Sector Climatic Exposure Database

CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Heavy rainfall	Market, businesses, stalls, housing, and subdivisions & Agricultural Industries	**Sensitivity to Exposed Elements (humans/flora and fauna):** The roads suffered from inadequate development due to poor planning and an insufficient drainage system. Also, for agricultural industries, there is no storage facility for crops, limited flood mitigation, and no agricultural insurance. **Adaptive Capacity of Exposed Elements:** There are insured establishments, adhering to geohazard risk compliance and zoning ordinances, As for agricultural sector, there is crop insurance and advanced crop technology. **Immediate Influence on Exposed Elements:** There will be damaged market roads and even highways that would delay business operations.
Drought	Water Supply System, Irrigation/Farming, Markets, and Agricultural Production	**Sensitivity to Exposed Elements (humans/flora and fauna):** The absence of water in the upland areas, coupled with a lack of adequate water distribution infrastructure and limited budget for developing water sources. **Adaptive Capacity of Exposed Elements:** Can get water source from springs, and water provision from firetrucks. **Immediate Influence on Exposed Elements (and humans):** Low livestock production, coupled with reduced agricultural product yields, will lead to high prices for crops.

Table 16. Economic Sector Non-Climatic Exposure Database

NON-CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Illegal Quarrying	Livestock	**Sensitivity to Exposed Elements (humans/flora and fauna):** Limited grazing area and soil quality **Adaptive Capacity of Exposed Elements:** Regulated by CENRO with existing Local Ordinances. **Immediate Influence on Exposed Elements:** The higher incidence of diseases among livestock can lead to low production and, subsequently, reduced income for farmers. Disease outbreaks can cause illness, decreased growth, and even mortality among the animals, negatively impacting both the quantity and quality of livestock products. This, in turn, affects the economic well-being of farmers who rely on the income generated from their livestock. Proper animal health management practices and disease prevention are crucial for sustaining livestock production and the livelihoods of farmers.
	Fish Pen	**Sensitivity to Exposed Elements (humans/flora and fauna):** Limited location for fish pen, limited capacity of farmers to relocate fish pen **Adaptive Capacity of Exposed Elements:** **Immediate Influence on Exposed Elements (and humans):** A higher incidence of diseases among fish can lead to lower fish production, which, in turn, can result in reduced income for fish farmers. Disease outbreaks can have significant economic impacts on aquaculture operations.
Non-Segregation of Garbage	Tourist, Industry	**Sensitivity to Exposed Elements (humans/flora and fauna):** Proximity to sanitary landfill and construction of sanitary landfill not fully operational (leachate treatment plant) **Adaptive Capacity of Exposed Elements:** Regulated by CENRO, having an existing local ordinance for segregation, central facilities **Immediate Influence on Exposed Elements:** A decrease in the water quality of tourist spots can result in a lower number of tourists visiting the area. Poor water quality can deter tourists and harm the reputation of the destination, leading to economic losses in the local tourism industry. Maintaining water quality is essential for the sustainability of tourist spots.

Emerging, Reemerging and transboundering animal disease	Tourist Spots	**Sensitivity to Exposed Elements (humans/flora and fauna):** Limited support to the management and development of the tourist spot (not managed by the city government). **Adaptive Capacity of Exposed Elements:** Regulated by CENRO **Immediate Influence on Exposed Elements:** A lower number of tourists visiting a tourist spot can limit the city's capacity to develop and manage the area, as it may reduce the revenue generated for improvements and maintenance. Additionally, a decrease in tourists can have economic impacts on local businesses and the community as a whole. Furthermore, a decrease in the number of tourists can also affect the spread of diseases in the area, as tourists may be exposed to diseases more easily in less crowded environments. Maintaining a balance between tourism and public health is crucial.

ii. Environmental Sector

Table 17. Environmental Sector Climatic Exposure Database

CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Heavy rainfall	Forest Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** The forest's vulnerability, along with its rich flora and fauna, is defined by the presence of very steep slopes and the precarious nature of loose and weathered rocks and soil. **Adaptive Capacity of Exposed Elements:** The tropical rainforest's resilience is owed to its multi-layered structure, soil macropores created by burrowing creatures, abundant organic matter from substantial litter fall, and an extensive root system. **Immediate Influence on Exposed Elements:** Deforestation, irresponsible mining, land conversion, armed conflict, unregulated wildlife hunting, and unsustainable slash-and-burn practices have an immediate and detrimental impact on both the forest ecosystem and human communities.
	Coastal Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Low salinity levels can greatly affect the sensitivity of certain aquatic species, impede the photosynthetic production of coastal plants, and increase the vulnerability of young mangrove seedlings to dislodgment by wave action. **Adaptive Capacity of Exposed Elements:** Mangroves provide a crucial filtering effect, defend against coastal flooding, and stabilize sediments, serving as a vital natural barrier along the shoreline. **Immediate Influence on Exposed Elements (and humans):** Overharvesting for ruminant feeding and fuelwood, displacement due to coastal infrastructure development, waste dumping, dynamite and cyanide fishing, and coral destruction for the aquarium trade.
	Marine Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Low salinity levels, leading to reduced photosynthetic production in phytoplankton, can affect the delicate balance of aquatic ecosystems. **Adaptive Capacity of Exposed Elements:** Wave action serves to uniformly distribute salt throughout the entire sea profile. **Immediate Influence on Exposed Elements (and humans):** The intrusion of foreign and local fishing vessels equipped with advanced fishing technology leads to the overharvesting of fish resources.

Drought	Forest Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Tropical rainforests necessitate consistently distributed, moderate rainfall, substantial water for transpiration, combustible forest litterfall, open stomates for gas exchange during water vapor uptake, and predominantly non-deciduous trees. **Adaptive Capacity of Exposed Elements:** Multi-story structures and heavy forest litter decrease evapotranspiration, while rich soil organic matter retains soil moisture, burrowing animals can move to lower ground to cool themselves, and they can partially close their stomata during water stress. **Immediate Influence on Exposed Elements:** Deforestation, irresponsible mining, land conversion, armed conflict, and unsustainable slash-and-burn practices have an immediate and detrimental impact on both the forest ecosystem and human communities.
	Coastal Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** The biotic communities in coastal ecosystems rely on a delicate balance between salt and freshwater, as excessive salinity can disrupt their physiological processes, impacting productivity and survival, while also necessitating specific temperature conditions for their optimal functioning. **Adaptive Capacity of Exposed Elements:** Biotic communities have higher water retention In the soils, and can close their stomates during water stress up to certain levels. **Immediate Influence on Exposed Elements:** Coastal ecosystem biotic communities depend on a delicate equilibrium between salt and freshwater to sustain their physiological functioning, with excessive salinity affecting productivity and life, while also necessitating specific temperature conditions for optimal functionality.
	Marine Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Marine ecosystem biotic communities require a delicate balance between salt and freshwater; and requires a certain temperature for optimal functioning of biotic communities of the marine ecosystem. **Adaptive Capacity of Exposed Elements:** Wave action to bring colder and oxygen rich water from the deep layers to replace warmer and oxygen depleted waters on the deeper layer. **Immediate Influence on Exposed Elements:** The intrusion of foreign and local fishing vessels equipped with advanced fishing technology leads to the overharvesting of fish resources.

Earthquake	Forest Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Has karst landscape, steep slopes, and highly weathered loose rocks. **Adaptive Capacity of Exposed Elements:** Extensive root system holds the soil and rocks from erosion and landslide. **Immediate Influence on Exposed Elements:** Deforestation, irresponsible mining, armed conflict, and unsustainable slash-and-burn practices have an immediate and detrimental impact on both the forest ecosystem and human communities.
	Coastal Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** There is a highly liquefaction area and karst landscapes. **Adaptive Capacity of Exposed Elements:** Mangrove trees have extensive root system that helps them stabilize from the ground/earth shaking. **Immediate Influence on Exposed Elements:** Overharvesting for ruminant feeding and fuelwood, displacement due to coastal infrastructure development, waste dumping, dynamite and cyanide fishing, and coral destruction for the aquarium trade.
	Marine Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** **Adaptive Capacity of Exposed Elements:** **Immediate Influence on Exposed Elements:** The intrusion of foreign and local fishing vessels equipped with advanced fishing technology leads to the overharvesting of fish resources.

Table 18. Environmental Sector Non-Climatic Exposure Database

NON-CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Deforestation	Forest Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** The forest's vulnerability, along with its rich flora and fauna, is defined by the presence of very steep slopes and the precarious nature of loose and weathered rocks and soil. **Adaptive Capacity of Exposed Elements:** The tropical rainforest's resilience is owed to its multi-layered structure, soil macropores created by burrowing creatures, abundant organic matter from substantial litter fall, and an extensive root system. **Immediate Influence on Exposed Elements:** Conventional farming, pasture grazing and tree plantation
	Coastal Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Mangrove seedlings in the early stages of planting can easily be dislodged by wave action. Additionally, naturally occurring faunal species in mangrove areas are sensitive to habitat changes, such as mangrove tree removal, which can result in a decrease in their population. Moreover, corals are highly sensitive to increases in water temperature. **Adaptive Capacity of Exposed Elements:** Mangroves provide a crucial filtering effect, defend against coastal flooding, and stabilize sediments, serving as a vital natural barrier along the shoreline. **Immediate Influence on Exposed Elements (and humans):** Land conversion such as establishment of coastal roads;
Uncontrollable Waste Disposal	Forest Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Inability to biodegrade plastic waste. **Adaptive Capacity of Exposed Elements:** Rich in microorganisms that degrade biodegradable waste, it can serve as a source of food for forest fauna. **Immediate Influence on Exposed Elements:** Forest seedlings covered with macro plastics may lead to the entry of microplastics into the food web chain.

	Coastal Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Inability to biodegrade plastic waste. **Adaptive Capacity of Exposed Elements:** Rich in microorganisms that degrade biodegradable waste, it can serve as a source of food for coastal fauna. **Immediate Influence on Exposed Elements:** The conversion of a coastal area into a sanitary landfill has resulted in the deposition of plastic waste, which in turn has led to seagrasses and corals becoming covered with macro plastics. As a consequence, microplastics have entered the coastal food chain.
	Marine Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** Inability to biodegrade plastic waste. **Adaptive Capacity of Exposed Elements:** Biodegradable waste can be a source of food to marine fauna. **Immediate Influence on Exposed Elements:** High solar exposure can lead to photodegradation, which in turn results in the generation of microplastics.
Earthquake	Forest Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** The area possesses a karst landscape characterized by steep slopes and highly weathered loose rocks. **Adaptive Capacity of Exposed Elements:** Extensive root system helps holds the soil and rocks from erosion and landslide. **Immediate Influence on Exposed Elements:** Deforestation, irresponsible mining, armed conflict, and unsustainable slash-and-burn practices have an immediate and detrimental impact on both the forest ecosystem and human communities.
	Coastal Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** There is a highly liquefaction area and karst landscapes. **Adaptive Capacity of Exposed Elements:** Mangrove trees have extensive root system that helps them stabilize from the ground/earth shaking. **Immediate Influence on Exposed Elements:** Overharvesting for ruminant feeding and fuelwood, displacement due to coastal infrastructure development, waste dumping, dynamite and cyanide fishing, and coral destruction for the aquarium trade.

	Marine Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** None. **Adaptive Capacity of Exposed Elements:** **Immediate Influence on Exposed Elements:** The intrusion of foreign and local fishing vessels equipped with advanced fishing technology leads to the overharvesting of fish resources.
Mining	Forest Ecosystem	**Sensitivity to Exposed Elements (humans/flora and fauna):** The forest's vulnerability, along with its rich flora and fauna, is defined by the presence of very steep slopes and the precarious nature of loose and weathered rocks and soil. **Adaptive Capacity of Exposed Elements:** Karst landscape allows infiltrated water to percolate for groundwater replenishment and thereby increases the time for soils to be super saturated with water **Immediate Influence on Exposed Elements:** Altered geomorphology

iii. Social Sector

Table 19. Social Sector Climatic Exposure Database

CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Intense heat	Vulnerable groups (co-morbid, Pregnant & lactating women, obese, children, elderly PWD, IPs)	**Sensitivity to Exposed Elements (humans/flora and fauna):** Illness, weak/low immune system, vulnerable health status, degenerative health, sensory impairments, lack adaptability. **Adaptive Capacity of Exposed Elements:** **Immediate Influence on Exposed Elements:** The worsening of an illness can makes an individual more susceptible to other diseases or health complications.
Flooding	Residents of 44 barangays spanning all age groups	**Sensitivity to Exposed Elements (humans/flora and fauna):** Unaware of pre-emptive evacuation procedures. Consequently, they may be evacuating to undesignated evacuation sites where they will be vulnerable to diseases and are lacking basic commodities. In such situations, it's crucial to establish clear and effective communication channels to inform residents about evacuation plans, designated safe locations, and to ensure they have access to necessary supplies and medical care during evacuations. **Adaptive Capacity of Exposed Elements:** Awareness through IEC is essential for preventing and controlling diseases related to environmental sanitation and the construction of proper drainage. It's important to encourage early consultations with health centers when feeling unwell and to request necessary medicines. Additionally, ensuring access to basic commodities such as food, water, clothes, blankets, and health services at evacuation sites is crucial. **Immediate Influence on Exposed Elements:** Individuals who have contracted the dengue virus, leptospirosis, and other water-borne diseases like HEPA A, C, D, and E, as well as amebiasis, are at risk of experiencing exacerbated health issues. Additionally, those with co-morbid health conditions may see a deterioration in their overall health. IDPs are also vulnerable to worsening health due to the non-conducive living conditions they may be experiencing.

Table 20. Social Sector Non-Climatic Exposure Database

NON-CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Armed Conflict resulted in population	All population affected residing in urban areas in Iligan City including transient individuals	**Sensitivity to Exposed Elements (humans/flora and fauna):** Limited land area with large population which resulted in inefficient education, medical and social services, food insecurity and affect safety and security. **Adaptive Capacity of Exposed Elements:** Urbanization outside urban areas **Immediate Influence on Exposed Elements:** Inefficient education system, medical, and social services, food insecurity and affect safety and security
Emerging and re-emerging infectious diseases (for example COVID-19 pandemic)	All population affected residing in Iligan City including transient individuals	**Sensitivity to Exposed Elements (humans/flora and fauna):** The absence of vaccination or a decrease in vaccination coverage among the eligible population has led to a decline in herd immunity. This situation is compounded by a lack of awareness and limited access to health programs and activities, making it even more challenging to protect the community from vaccine-preventable diseases **Adaptive Capacity of Exposed Elements:** Educational status, access to health programs/ activities, economic status **Immediate Influence on Exposed Elements:** Widespread infection of infectious diseases at community level.

iv. Institution Sector

Table 21. Institutional Sector Climatic Exposure Database

CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Heavy rainfall	BLGUs, Students, Men and Women, Marginalized Sector, Businesses, Schools, Residentials, Transport Groups	**Sensitivity to Exposed Elements (humans/flora and fauna):** LGUs are facing a range of challenges in disaster preparedness and response. These include a lack of full awareness among BLGUs regarding the impact of CCA and the context of the DRRM Framework, as well as insufficient IEC programs. Furthermore, there are issues related to slow response in making decisions about work and class suspensions, the use of outdated Incident Command System Manuals and Operating Manuals, and a lack of a unified emergency response system. Lastly, the limited capacities of the BDRRM teams in conducting emergency response and preparedness activities pose additional challenges for effective disaster management. **Adaptive Capacity of Exposed Elements:** BLGUs have taken proactive steps by establishing BDRRMCs to enhance local disaster preparedness. While IEC materials have been supplied, there remains a challenge in ensuring their availability across all barangays. Public advisories and declarations from the LCE are effectively disseminated during states of emergency, contributing to community awareness. The development of a standardized emergency response system is in progress, facilitating better coordination from the BDRRMCs at the barangay level to the city-level LGU. There's a collaborative effort towards optimizing the utilization and allocation of DRRM funds to bolster disaster resilience and response capabilities. **Immediate Influence on Exposed Elements:** A lack of knowledge regarding the implications of climate change and disaster risk management has led to various challenges. This includes the predicament of stranded employees during emergencies, which exposes them to potential health issues. Additionally, there have been delays and lapses in responding to emergencies, leading to an inefficient use of resources.

Table 22. Institutional Sector Non-Climatic Exposure Database

NON-CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Non-Alignment of Iligan City DRRM Plan and its priority PPAs to the NDRRM Framework	Inefficiency of fund utilization intended for PPAs (CCA-DRRM) of Iligan City	**Sensitivity to Exposed Elements (humans/flora and fauna):** Poor utilization of LDRRM fund **Adaptive Capacity of Exposed Elements:** The existing priority PPAs of the Iligan DRRM Plan are actively discussed during City Development Council meetings, where the DRRM team participates in endorsing these vital initiatives, ensuring that all CCA-DRRM projects are meticulously documented and reflected in the Climate Change Expenditure Tagging (CCET) system for transparency and accountability. **Immediate Influence on Exposed Elements:** The change of administration has brought about a shift in priority projects, with a focus on accommodating the preferences of various stakeholders and addressing sectoral concerns. However, it is important to note that some of the existing projects may not be aligned with the success indicators outlined in the National Disaster Risk Reduction and Management (DRRM) Framework.
Outdated CLUP	Non-responsive PPAs of the City and funding from the National Government	**Sensitivity to Exposed Elements (humans/flora and fauna):** The nonavailability of certain data poses a challenge for the Comprehensive Land Use Plan (CLUP) update. **Adaptive Capacity of Exposed Elements:** The ongoing Comprehensive Land Use Plan (CLUP) updates are being carried out in full compliance with existing ordinances, laws, policies, standards, and rules and regulations. **Immediate Influence on Exposed Elements:** The non-issuance of zoning certification and delays in processing building permit applications are causing significant challenges in the development process.

v. Infrastructure Sector

Table 23. Infrastructure Sector Climatic Exposure Database

CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
Flooding (Surface Overflow)	Low Rise Buildings, Roads, Bridges, Drainages, Flood Controls	**Sensitivity to Exposed Elements (humans/flora and fauna):** Substandard/Inappropriate materials, poor planning, and design (no. of storey), poor infrastructure maintenance, constructed using light materials, year of construction (some buildings are built beyond operating life) **Adaptive Capacity of Exposed Elements:** Strict implementation of no-build zones, efficient IEC thru socmed, availability of Early Warning System, availability of high-quality construction materials **Immediate Influence on Exposed Elements:** Slowdown of transportation due to road blockage, hampered the delivery of goods and services, slow down emergency responses
Rain-Induced Landslide	Roads, Residential Buildings, Drainages	**Sensitivity to Exposed Elements (humans/flora and fauna):** Lack/insufficient slope protection, poor drainage system **Adaptive Capacity of Exposed Elements:** Strict implementation of no-build zones, constant monitoring of road networks and drainages **Immediate Influence on Exposed Elements:** Slow down of transportation due to road blockage, hampered the delivery of goods and services, slow down emergency responses, clogging of drainages

Table 24. Infrastructure Sector Non-Climatic Exposure Database

NON-CLIMATE DRIVERS (HAZARD)	EXPOSED ELEMENTS	EXPOSURE DATABASE
EARTHQUAKE Ground Shaking	High Rise Buildings, Roads, Bridges, Drainages, Flood Controls	**Sensitivity to Exposed Elements (humans/flora and fauna):** Poor planning and design for high-magnitude earthquake **Adaptive Capacity of Exposed Elements:** Regular monitoring of structural integrity, access to latest building standards **Immediate Influence on Exposed Elements:** Slowdown of transportation due to road blockage, hampered the delivery of goods and services, slow down emergency responses
Industrial Hazard	Boilers, Buildings, Utilities, Kilns	**Sensitivity to Exposed Elements (humans/flora and fauna):** Poor safety protocols and standards, unsafe practices and conditions, delayed safety validation **Adaptive Capacity of Exposed Elements:** Compliant to DOLE standard and safety, required employees to take BOSH/COSH/LCM, monitoring of safety manhours **Immediate Influence on Exposed Elements:** Hampered operation, water power and communication interruption
Arm Conflict	Utilities, Buildings, Bridges	**Sensitivity to Exposed Elements (humans/flora and fauna):** Lack of security **Adaptive Capacity of Exposed Elements:** Trained personnel/bomb squads and K9 units, trained responders, in placed fire suppression system **Immediate Influence on Exposed Elements:** Hampered the delivery of goods and services, slow down emergency responses, water power and communication interruption.

II. Exposure Hazard Maps

As discussed above, each sector within Iligan City is susceptible to various hazards, potentially causing disruptions that require recovery time to restore normal operations. The Iligan City Disaster Risk Reduction and Management Office, in partnership with the Mindanao State University – Iligan Institute of Technology (MSU-IIT), has collaborated to compile the necessary data and assessments for CDRA. Consequently, the following graphs serve as visual representations, illustrating the vulnerabilities of Iligan City in different aspects, including urban land use, natural resources, lifeline utilities, and critical point facilities.

The **urban land use** comprises the buildings used by the residents and institutions, encompassing academic institutions, commercial establishments, government facilities, places of worship, industrial complexes, hospitals, residential areas, and unclassified structures.

Natural resources, essential for satisfying human needs and desires, include soil, ores, timber, and water resources. Iligan City's geographical landscape predominantly consists of mountains and hills, with only 20% of the land designated as urban. In this assessment, natural resources are categorized into agricultural land and forest land, with agricultural land being pivotal for the city's raw material production and forest land covering the hinterlands and mountainous regions.

Lifeline utilities encompass critical infrastructure such as communication satellites, power stations, water sources, and groundwater sources. These utilities are of paramount importance and must be safeguarded during disasters to ensure the continuity of vital services.

Critical point facilities encompass both public and private institutions that provide resources, programs, and services necessary for preserving lives, safeguarding property, and protecting the environment during emergencies. This category includes hospitals, fire stations, police stations, government offices, transportation systems, public markets, and industrial facilities.

Through a comprehensive understanding of these sectors and their vulnerabilities, this assessment aims to offer valuable insights into disaster risk reduction and management strategies, ultimately enhancing the resilience of the community and its capacity to respond effectively to various hazards.

i. Flood Exposure Maps in Iligan City

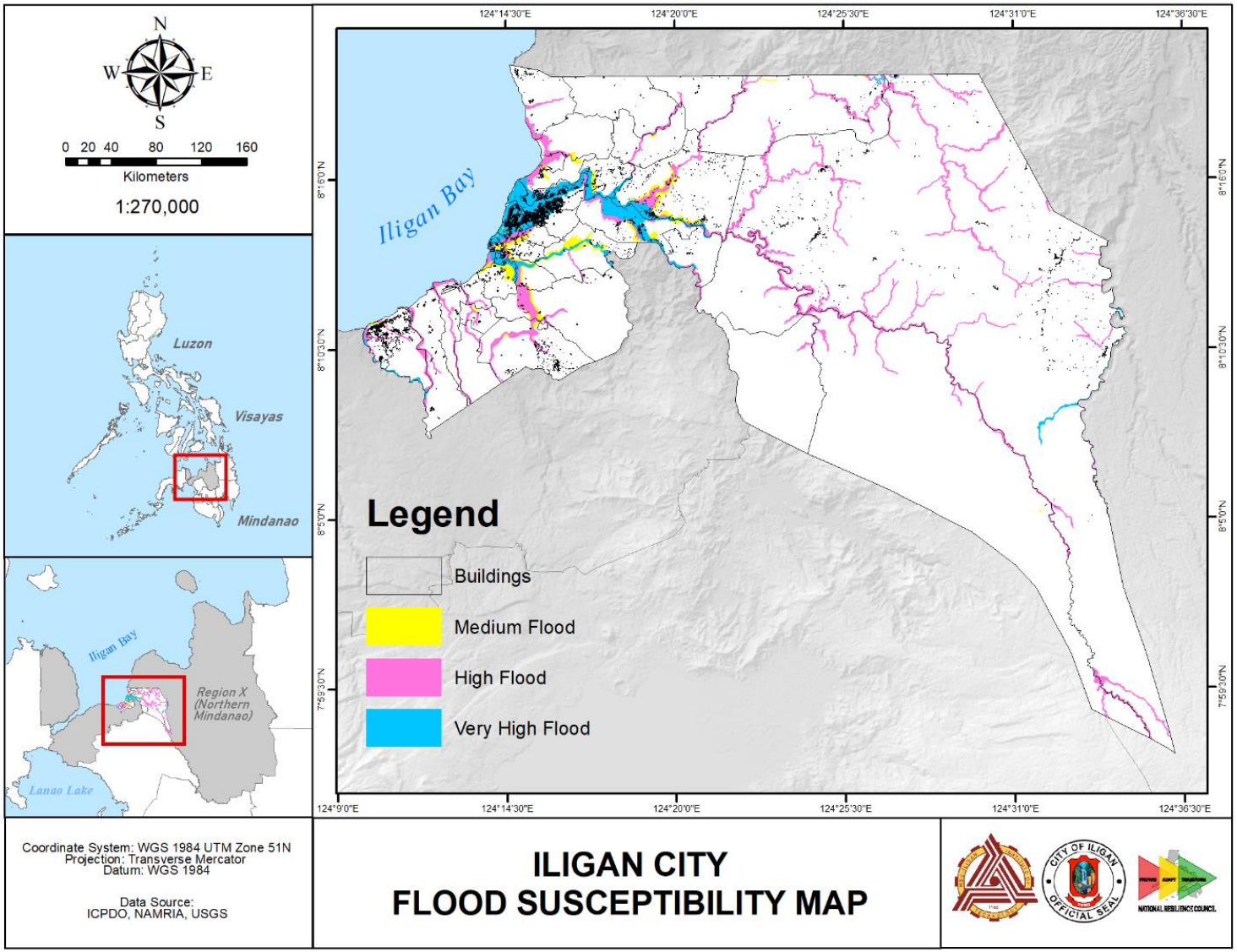


Figure 19. **Flood Susceptibility** on **Urban Use Areas** in Iligan City

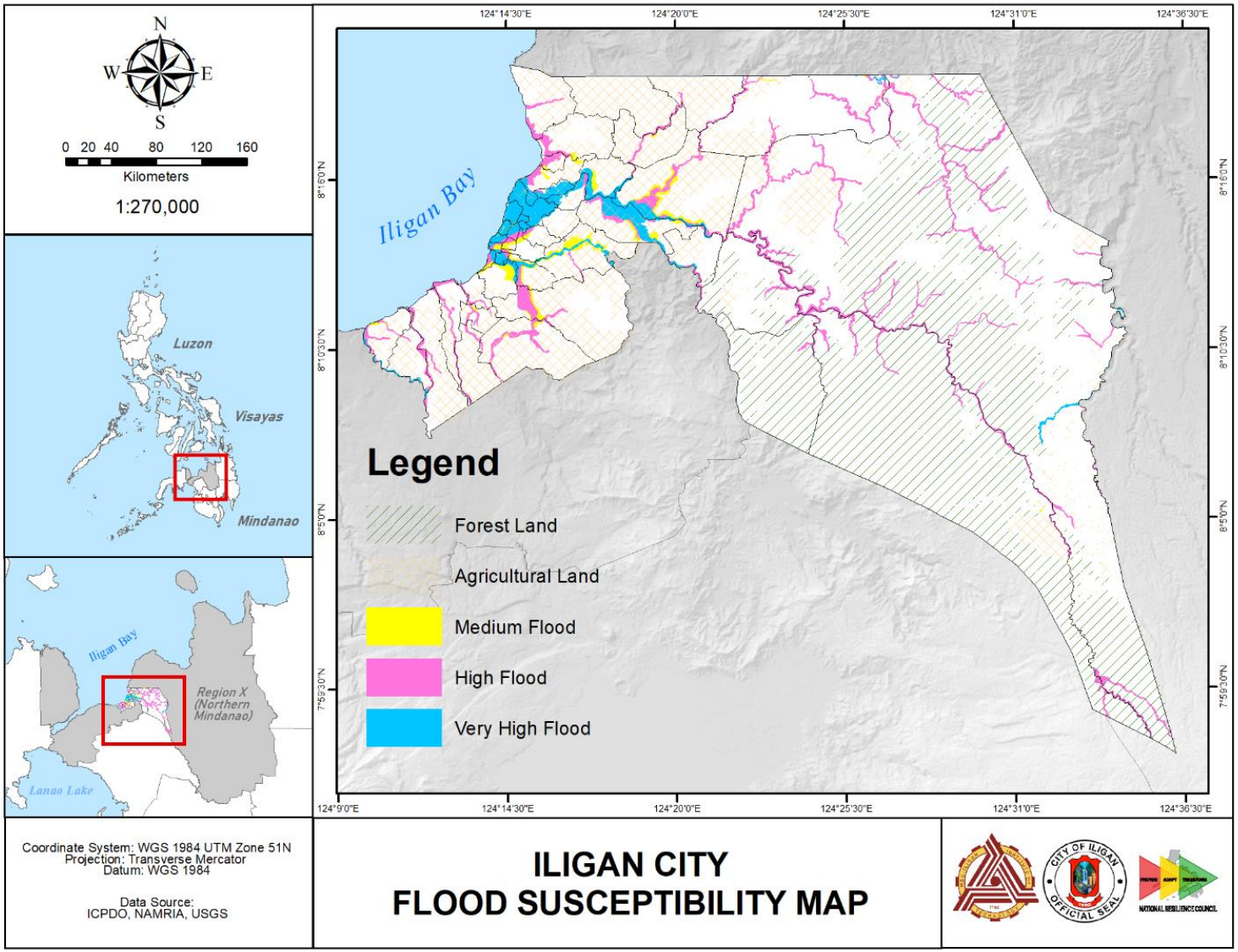


Figure 20. **Flood Susceptibility** on **Natural Resources** in Iligan City

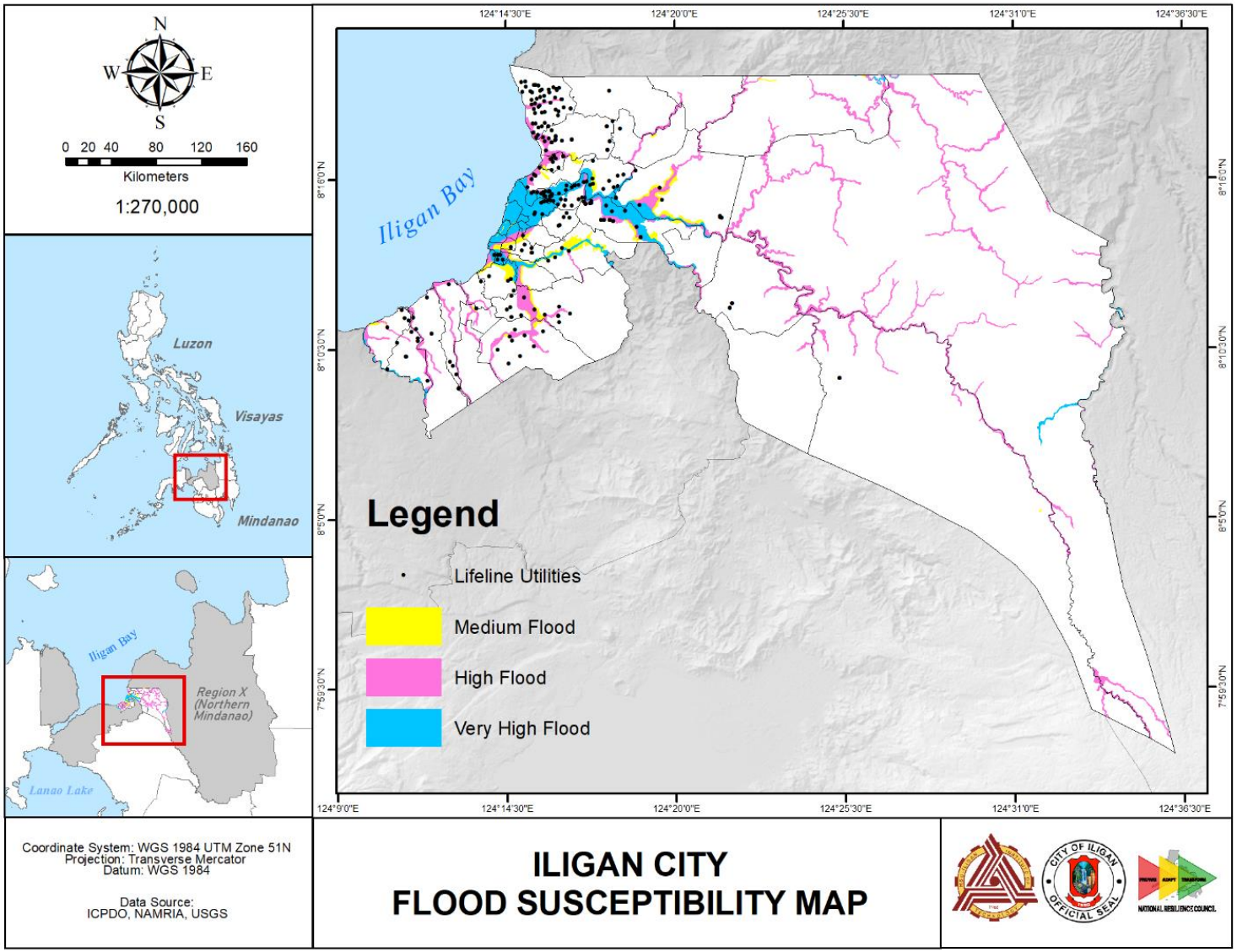


Figure 21. **Flood Susceptibility** on **Lifeline Utilities** in Iligan City

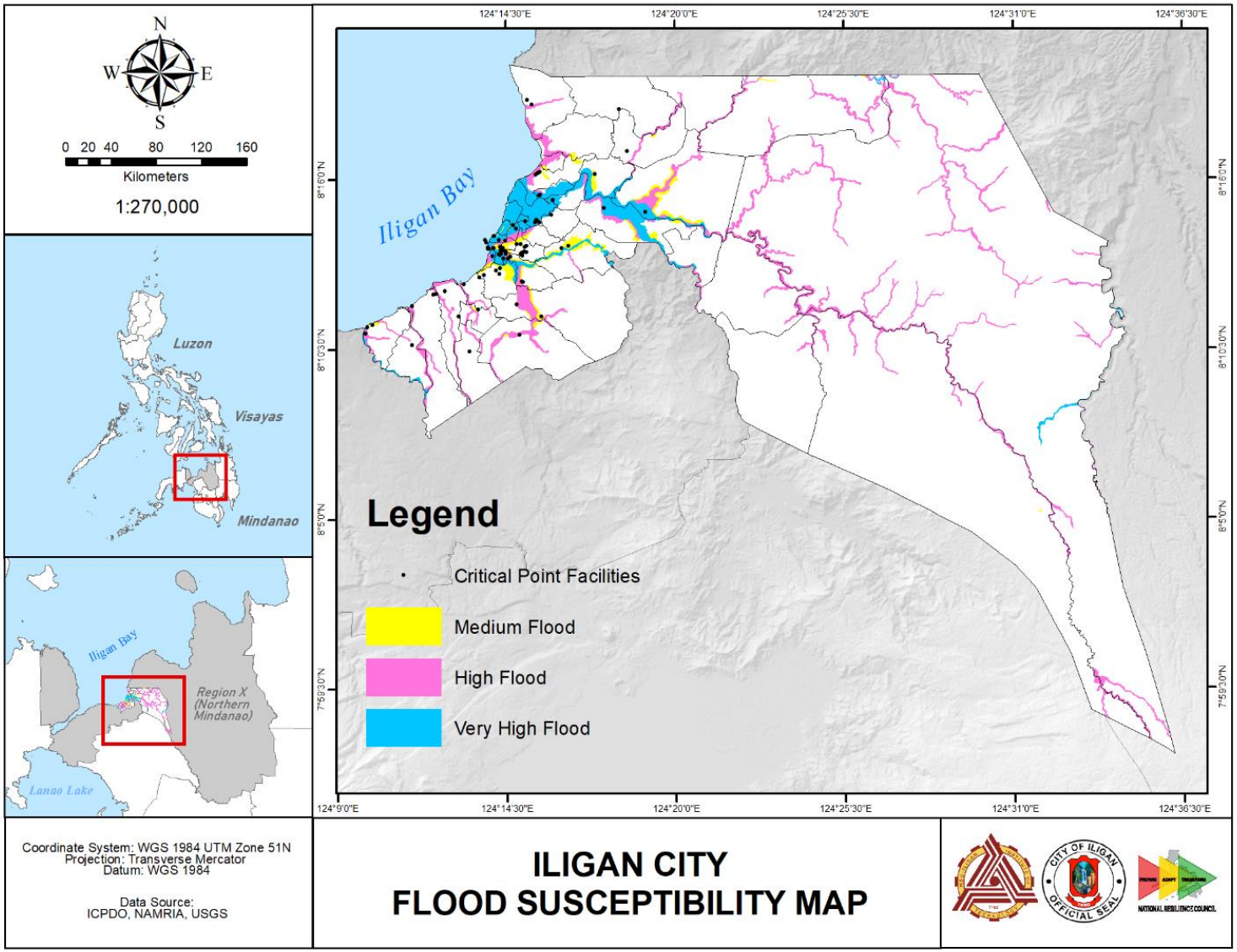


Figure 22. **Flood Susceptibility** on **Critical Point Facilities** in Iligan City

Flooding is a prevalent and recurring disaster in Iligan City due to its proximity to numerous rivers. During periods of heavy rainfall and tropical storms, there is a heightened risk of these rivers overflowing, resulting in floods that significantly impact the adjacent barangays.

A substantial number of barangays in Iligan City are vulnerable to flooding. The map above illustrates the extent of this vulnerability, using color-coded labels (yellow, pink, and blue) to indicate the severity of flooding in each barangay. Medium flood-prone areas are marked in yellow, high flood-prone areas in pink, and very high flood-prone areas in blue. Additionally, each exposure data for buildings, natural resources, lifeline utilities, and critical point facilities, are located on the lower left of each map for easy identification.

Medium-flood prone areas imply that the area is prone to flood but not too severe. Thus, the following barangays are medium-flood prone areas, elaborately: Barangay Kabacsanan, Digkila-an, Bonbonon, Mandulog, Sto. Rosario, San Miguel, Del Carmen, Pala-o, Villaverde, Mahayahay, Ubaldo Laya, Sta. Elena, Sta. Filomena, Santiago, Tibanga, Poblacion, Saray, Tomas Cabili, Buru-un, Tubod, Tamabcan, Puga-an, Tipanoy, Abuno, Maiinit, Kiwalan, Acmac, Panoroganan, Rogongon, Tipanoy, and Abuno.

High-flood prone areas imply that the area is prone to flood and has caused moderate damage to infrastructures and other sectors. Barangays that are prone to high-flooding are as follows: Kabacsanan, Digkilaan, Bonbonon, Upper Hinaplanon, San Roque, Mandulog, Bagong Silang, San Miguel, Del Carmern, Lanipao, Palao-o, Villaberde, Mahayahay, Ubaldo Laya, Sta. Elana, Ditucalan, Upper Tominobo, Dulag, Sta. Filomena, Hinaplanon, Poblacion, Saray, Tomas Cabili, Buru-un, Tubod, Tambacan, Puga-an, Dalipuga, Kalilangan, Tipanoy, Abuno, Bunawan, Maria Cristina, Maiinit, Kiwalan, Suarez, Panoroganan, Rogonogn, and Dulag.

Lastly, very high-flood prone areas are areas that caused major damage to all sectors involved those areas or even to the city as a whole. The barangays prone to very-high flooding are as follows: Digkila-an, Bonbonon, Upper Hinaplanon, San Roque, Mandulog, Luinab, Sto. Rosario, Bagong Silang, San Miguel, Del Carmen, Lanipao, Pala-o, Mahayahay, Ubaldo Laya, Ditucalan, Sta. Filomena, Hinaplanon, Santiago, Tibanga, Poblacion, Saray, Buru-un, Tubod, Tambacan, Puga-an, Tipanoy, Maria Cristina, Maiinit, and Rogongon.

Moreover, table 25 presents data on the total population affected in various barangays within Iligan City. It categorizes the data based on flood susceptibility levels and barangays. Notably, the table underscores that the barangay with the most severe flood susceptibility level is Hinaplanon, followed closely by San Roque and Saray. These three barangays stand out as the top three in Iligan City with the highest susceptibility to very severe flooding.

Table 25. Number of Affected Population on Vulnerable Barangays to Flood

(LF-Low Flood MF-Medium Flood HF-High Flood VHF-Very High Flood)

Barangay	Flood Susceptibility Level	Population Affected
Abuno	MF	34
Abuno	HF	467
Acmac	MF	216
Acmac	HF	2,751

Barangay	Flood Susceptibility Level	Population Affected
Bagong Silang	HF	664
Bagong Silang	VHF	5,531
Bonbonon	MF	123
Bonbonon	HF	21
Bonbonon	VHF	436
Bunawan	HF	36
Buru-un	MF	218
Buru-un	HF	1,617
Buru-un	VHF	342
Dalipuga	HF	1,259
Del Carmen	MF	372
Del Carmen	HF	850
Del Carmen	VHF	106
Digkila-an	MF	198
Digkila-an	HF	438
Digkila-an	VHF	315
Ditucalan	HF	317
Ditucalan	VHF	92
Dulag	HF	52
Hinaplanon	HF	0
Hinaplanon	VHF	14,749
Hindang	HF	20
Kabacsanan	MF	5
Kabacsanan	HF	91
Kalilangan	HF	10
Kiwalan	MF	73
Kiwalan	HF	520
Lanipao	HF	111
Lanipao	VHF	72
Luinab	VHF	350
Mahayahay	MF	163
Mahayahay	HF	1,464
Mahayahay	VHF	6,343
Mainit	LF	1
Mainit	MF	2
Mainit	HF	112
Mainit	VHF	10
Mandulog	MF	142
Mandulog	HF	342
Mandulog	VHF	1,121
Maria Cristina	HF	636
Maria Cristina	VHF	18
Pala-o	MF	874
Pala-o	HF	976
Pala-o	VHF	308
Panoroganan	MF	0
Panoroganan	HF	28

Barangay	Flood Susceptibility Level	Population Affected
Poblacion	MF	978
Poblacion	HF	1,334
Poblacion	VHF	1,334
Puga-an	MF	774
Puga-an	HF	69
Puga-an	VHF	404
Rogongon	MF	0
Rogongon	HF	243
Rogongon	VHF	10
San Miguel	MF	273
San Miguel	HF	1,295
San Miguel	VHF	2,249
San Roque	HF	227
San Roque	VHF	4,084
Santiago	MF	252
Santiago	VHF	8,482
Saray	MF	421
Saray	HF	1,685
Saray	VHF	7,371
Sta. Elena	MF	77
Sta. Elena	HF	1,079
Sta. Filomena	MF	289
Sta. Filomena	HF	654
Sta. Filomena	VHF	1,050
Sto. Rosario	MF	0
Sto. Rosario	VHF	1,830
Suarez	HF	2,248
Tambacan	MF	4,945
Tambacan	HF	7,005
Tambacan	VHF	7,005
Tibanga	MF	1,634
Tibanga	VHF	6,353
Tipanoy	MF	163
Tipanoy	HF	1,035
Tipanoy	VHF	0
Tomas Cabili	MF	0
Tomas Cabili	HF	866
Tubod	MF	5,296
Tubod	HF	0
Tubod	VHF	2,606
Ubaldo Laya	MF	1,163
Ubaldo Laya	HF	1,395
Ubaldo Laya	VHF	1,473
Upper Hinaplanon	HF	535
Upper Hinaplanon	VHF	2,115
Upper Tominobo	HF	186
Villaverde	MF	2,073
Villaverde	HF	1,727

Transitioning to the impact of flooding on buildings in Iligan City, table 26 showcases a breakdown of different barangays, alongside the number of buildings affected. This provides valuable insights into how flooding affects the city's infrastructure.

Table 26. Number of Affected Buildings on Vulnerable Barangay to Flood
(LF-Low Flood MF-Medium Flood HF-High Flood VHF-Very High Flood)

Barangay	Flood Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Abuno	MF	0	1	0	0	0	0	0	0
Abuno	HF	0	1	0	0	0	0	0	89
Acmac	MF	0	0	0	0	0	0	0	1
Acmac	HF	6	0	1	0	0	0	0	1
Bagong Silang	HF								
Bagong Silang	VHF	2	1	2	2	0	0	2	108
Bonbonon	MF	0	0	0	0	0	0	67	0
Bonbonon	HF								
Bonbonon	VHF	0	0	0	0	0	0	49	0
Bunawan	HF								
Buru-un	MF								
Buru-un	HF	18	0	0	0	0	0	22	49
Buru-un	VHF	0	0	0	0	0	0	2	0

Barangay	Flood Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Dalipuga	HF								
Del Carmen	MF	12	2	0	0	0	0	8	3
Del Carmen	HF								
Del Carmen	VHF								
Digkila-an	MF								
Digkila-an	HF	12	0	0	0	0	0	37	193
Digkila-an	VHF								
Ditucalan	HF	0	0	0	0	0	0	1	3
Ditucalan	VHF	26	0	1	26	0	0	29	354
Dulag	HF	0	0	0	0	0	0	7	0
Hinaplanon	HF	0	0	0	0	0	0	3	0
Hinaplanon	VHF	49	6	2	49	2	0	1740	675
Hindang	HF								
Kabacsanan	MF								
Kabacsanan	HF								
Kalilangan	HF								
Kiwalan	MF								

Barangay	Flood Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Kiwalan	HF	26	0	0	0	0	0	1	1
Lanipao	HF	0	0	0	0	0	0	0	5
Lanipao	VHF								
Luinab	VHF	4	0	0	4	0	0	63	58
Mahayahay	MF								
Mahayahay	HF	12	1	0	0	0	1	0	9
Mahayahay	VHF	14	0	1	14	0	0	0	44
Mainit	LF								
Mainit	MF								
Mainit	HF	1	0	0	0	0	0	33	46
Mainit	VHF								
Mandulog	MF								
Mandulog	HF	2	0	0	0	0	0	0	45
Mandulog	VHF	9	0	0	9	0	0	7	250
Maria Cristina	HF	0	0	1	0	1	0	0	4
Maria Cristina	VHF								
Pala-o	MF								

Barangay	Flood Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Pala-o	HF	8	5	1	1	0	0	2	36
Pala-o	VHF	1	0	0	1	0	0	1	5
Panoroganan	MF								
Panoroganan	HF								
Poblacion	MF								
Poblacion	HF								
Poblacion	VHF	0	0	0	0	0	0	0	17
Puga-an	MF								
Puga-an	HF								
Puga-an	VHF	0	0	1	0	0	0	0	33
Rogongon	MF								
Rogongon	HF								
Rogongon	VHF	0	0	0	0	0	0	0	2
San Miguel	MF								
San Miguel	HF								
San Miguel	VHF	12	6	1	12	0	2	2	152
San Roque	HF								

Barangay	Flood Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
San Roque	VHF	13	2	1	13	3	0	168	558
Santiago	MF								
Santiago	VHF	20	0	1	20	0	0	2	1196
Saray	MF								
Saray	HF								
Saray	VHF	25	0	1	25	0	0	0	8
Sta. Elena	MF								
Sta. Elena	HF								
Sta. Filomena	MF								
Sta. Filomena	HF								
Sta. Filomena	VHF	0	0	0	0	0	0	22	33
Sto. Rosario	MF								
Sto. Rosario	VHF	0	0	0	0	0	0	3	277
Suarez	HF								
Tambacan	MF								
Tambacan	HF								
Tambacan	VHF	0	5	1	0	0	0	0	1

Barangay	Flood Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Tibanga	MF								
Tibanga	VHF	5	1	1	5	0	0	3	171
Tipanoy	MF								
Tipanoy	HF								
Tipanoy	VHF								
Tomas Cabili	MF								
Tomas Cabili	HF								
Tubod	MF								
Tubod	HF								
Tubod	VHF	0	0	0	0	0	0	0	9
Ubaldo Laya	MF								
Ubaldo Laya	HF								
Ubaldo Laya	VHF	2	0	0	2	0	0	2	4
Upper Hinaplanon	HF								
Upper Hinaplanon	VHF	0	0	1	0	1	0	298	397
Upper Tominobo	HF								
Villaverde	MF								

Barangay	Flood Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Villaverde	HF								

Shifting to table 27, it shows the extent of affected agricultural and forest lands. These lands serve as vital sources of the city's natural resources, and this helps in understanding the impact of flooding on these critical assets.

Table 27. Number of Affected Natural Resources per Barangay due to Flood

(LF-Low Flood MF-Medium Flood HF-High Flood VHF-Very High Flood)

Barangay	Flood Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Abuno	MF	8	0
Abuno	HF	106	0
Acmac	MF	0	0
Acmac	HF	15	0
Bagong Silang	HF		
Bagong Silang	VHF	1	0
Bonbonon	MF	17	0
Bonbonon	HF	3	0
Bonbonon	VHF	46	0
Bunawan	HF	27	0
Buru-un	MF		
Buru-un	HF	24	0
Buru-un	VHF	2	0
Dalipuga	HF	20	0
Del Carmen	MF	1	0
Del Carmen	HF	2	0
Del Carmen	VHF	1	0
Digkila-an	MF	78	0
Digkila-an	HF	184	0
Digkila-an	VHF	86	0
Ditucalan	HF	22	0
Ditucalan	VHF	6	0
Dulag	HF	5	16
Hinaplanon	HF		

Barangay	Flood Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Hinaplanon	VHF	72	0
Hindang	HF	15	0
Kabacsanan	MF	2	0
Kabacsanan	HF	37	0
Kalilangan	HF	0	15
Kiwalan	MF	9	0
Kiwalan	HF	15	0
Lanipao	HF	7	0
Lanipao	VHF	7	0
Luinab	VHF	3	0
Mahayahay	MF		
Mahayahay	HF		
Mahayahay	VHF	2	0
Mainit	LF		
Mainit	MF	2	0
Mainit	HF	53	0
Mainit	VHF	2	0
Mandulog	MF	32	0
Mandulog	HF	69	0
Mandulog	VHF	160	0
Maria Cristina	HF	25	0
Maria Cristina	VHF		
Pala-o	MF		
Pala-o	HF		
Pala-o	VHF	2	0
Panoroganan	MF	0	1
Panoroganan	HF	8	152
Poblacion	MF		

Barangay	Flood Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Poblacion	HF		
Poblacion	VHF		
Puga-an	MF	96	0
Puga-an	HF	9	0
Puga-an	VHF	44	0
Rogongon	MF		
Rogongon	HF	132	507
Rogongon	VHF	5	3
San Miguel	MF		
San Miguel	HF		
San Miguel	VHF		
San Roque	HF	4	0
San Roque	VHF	69	0
Santiago	MF		
Santiago	VHF	2	0
Saray	MF		
Saray	HF		
Saray	VHF		
Sta. Elena	MF	2	0
Sta. Elena	HF	23	0
Sta. Filomena	MF	13	0
Sta. Filomena	HF	3	0
Sta. Filomena	VHF	28	0
Sto. Rosario	MF		
Sto. Rosario	VHF		
Suarez	HF	40	0
Tambacan	MF	1	0
Tambacan	HF		

Barangay	Flood Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Tambacan	VHF	1	0
Tibanga	MF		
Tibanga	VHF		
Tipanoy	MF	18	0
Tipanoy	HF	77	0
Tipanoy	VHF		
Tomas Cabili	MF		
Tomas Cabili	HF	13	0
Tubod	MF	2	0
Tubod	HF		
Tubod	VHF	6	0
Ubaldo Laya	MF	9	0
Ubaldo Laya	HF	10	0
Ubaldo Laya	VHF	10	0
Upper Hinaplanon	HF	9	0
Upper Hinaplanon	VHF	32	0
Upper Tominobo	HF	32	0
Villaverde	MF		
Villaverde	HF		

In table 28, the focus is on the affected lifeline utilities during flooding. This comprehensive graph details a total of 7 power stations, 1 communication facility, and water and groundwater sources located along with the 15 barangays indicated in the table.

Table 28. List of Affected Lifeline Utilities in Certain Barangays due to Flood

	Lifeline Utilities	Barangay
Communication	GSM	Hinaplanon
Power Station	ILICOCO-SMC	Sta. Filomena
	ILPI (M2)	Acmac
	Mindanao Portland Cement Corp.	Kiwalan
	Granexport Corp. of the Phils.	Kiwalan
	Granexport Corp. of the Phils.	Kiwalan
	Iligan Cement Corp.	Kiwalan
	PILMICO	Kiwalan
Water & Groundwater Sources		Buru-un
	Well	Abuno
	Well	Tipanoy
	Wells	Tubod
	Wells	Mahayhay
	Well	Tambacan
	Well	Puga-an
	Ground water pump and well	Hinaplanon
	Ground water pump, pumpstations, and well	Upper Hinaplanon
	Wells	San Roque
	Ground water pump and wells	Sta. Filomena
	Wells	Acmac
	Wells	Dalipuga
	Spring and well	Digkilaan
	Well	Mandulog

Lastly, the table 29 brings attention to critical point facilities in the city. It illustrates the impact of flooding on essential services and infrastructure, revealing that five hospitals, six fire stations, five police stations, seven government offices, eight industrial facilities, one bus terminal, and three public markets were affected by flood events. This data underscores the significance of safeguarding these facilities during flooding incidents.

Table 29. List of Affected Critical Point Facilities in Certain Barangays due to Flood

	Critical Point Facilities	Barangay
Hospitals	Dr. Uy Hospital, Inc.	Poblacion
	St. Marys Maternity Hospital	Villa Verde
	St Anthony Maternity Hospital	Poblacion
	E & R Hopital	Saray
	Mindanao Sanitarium & Hospital	San Miguel
Fire Station	NSC	Suarez
	Iligan City Fire Station	Poblacion
	Saray Fire Station	Saray

	Critical Point Facilities	Barangay
	Sta. Filomena Fire Station	Sta. Filomena
	Dalipuga Fire Station	Dalipuga
	Buru-un Fire Station	Buru-un
Police Station	Mobile Group	Tipanoy
	Police Station	Poblacion
	City Police Office	Poblacion
	Traffic Station	Hinaplanon
	Police Station	Sta. Filomena
Government Offices	Slaughter House	Ubaldo Laya
	CMO-Public Library	Mahayahay
	EEDMO	Mahayahay
	City Health Office	Palao
	City Social Welfare & Dev	Saray
	EEDMO-Supermarket	Palao
Industrial	AZKCON Metals-Iligan, Inc.	Tipanoy
	London Biscuit Co	Santiago
	SMC Iligan Coconut Oil Mill	Sta. Filomena
	CMI-PLant 20	Sta. Filomena
	Granexport Mfc Corp.	Kiwalan
	Mindanao Portland Cement Corp.	Kiwalan
	Iligan Cement Corp	Kiwalan
	PILMICO Foods Corp.	Dalipuga
Transportation	North Bound Terminal	Hinaplanon
Public Market	Palao Market	Palao
	Wet Market	Poblacion
	Central Market	Poblacion

ii. Landslide Exposure Maps of Iligan City

This section shows the exposed areas affected by landslides in Iligan City**.** Take note that landslides are classified into two types: (1) earthquake induced landslide **(EIL)** in both **wet** and **dry** seasons, and (2) rain-induced landslides **(RIL).**

*Earthquake-induced Landslide **(EIL) Wet Season***

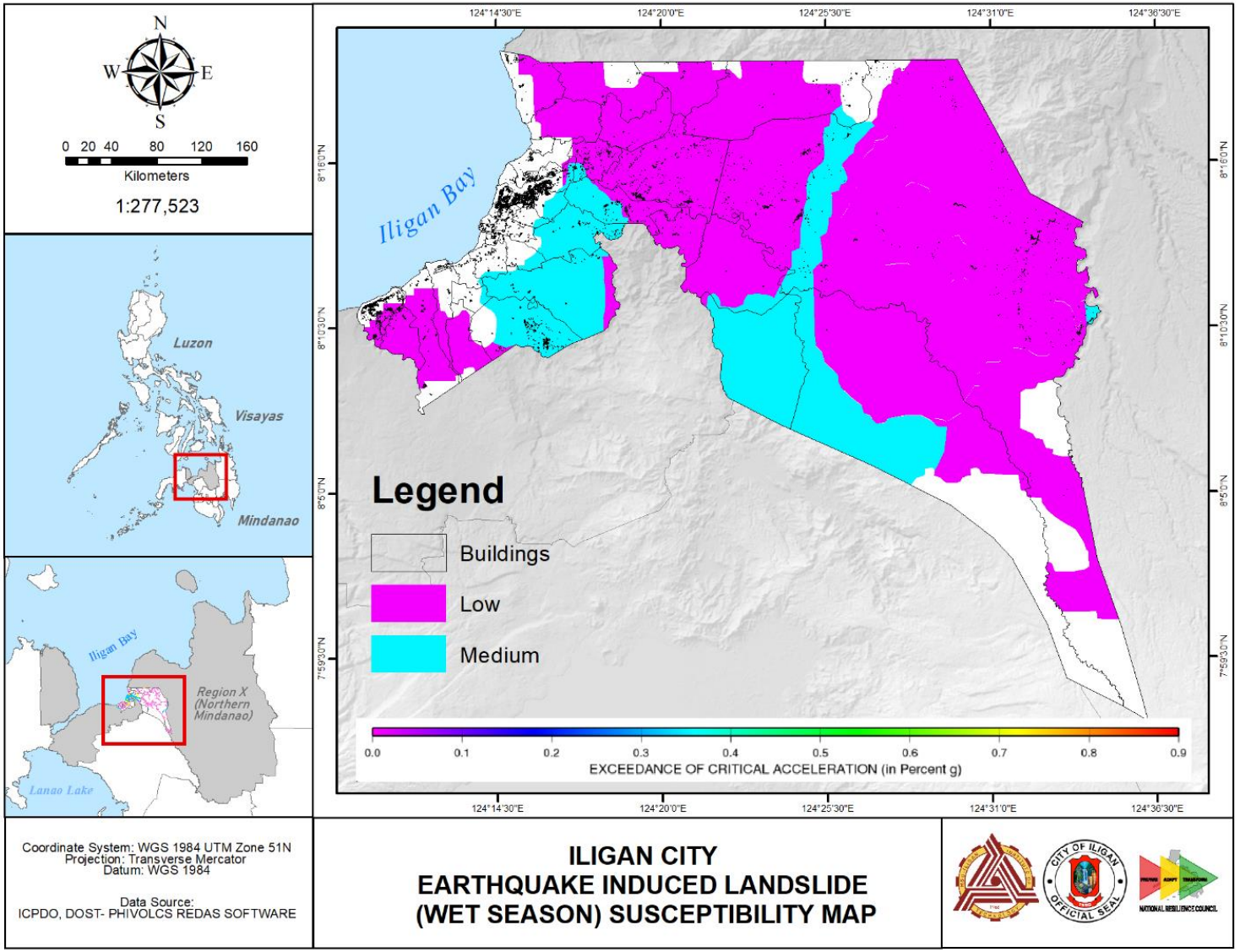


Figure 23. **Earthquake Induced Landslide Wet Season** Susceptibility on **Urban Use Areas** in Iligan City

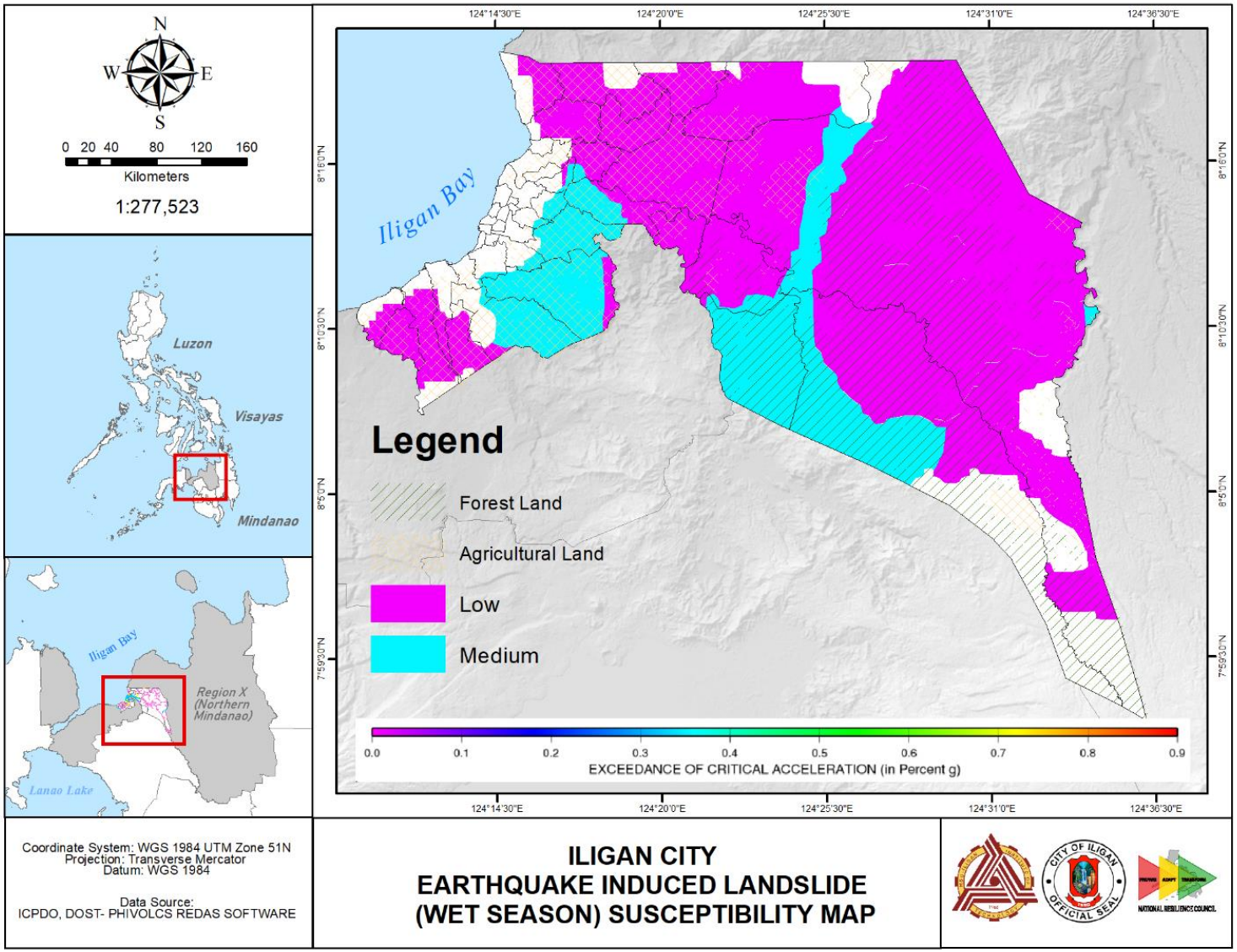


Figure 24. **Earthquake Induced Landslide Wet Season** Susceptibility on **Natural Resources** in Iligan City

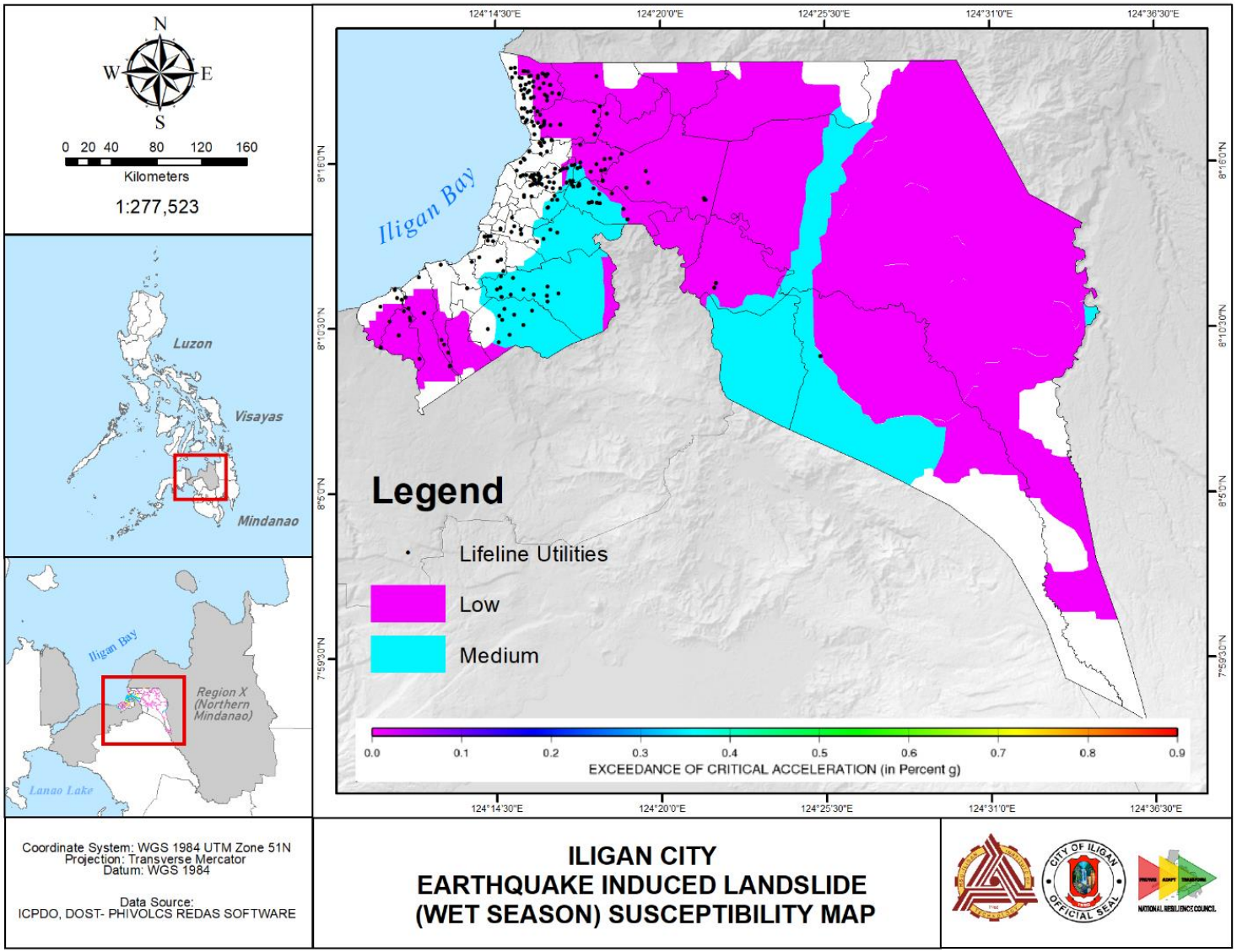


Figure 25. **Earthquake Induced Landslide Wet Season** Susceptibility on **Lifeline Utilities** in Iligan City

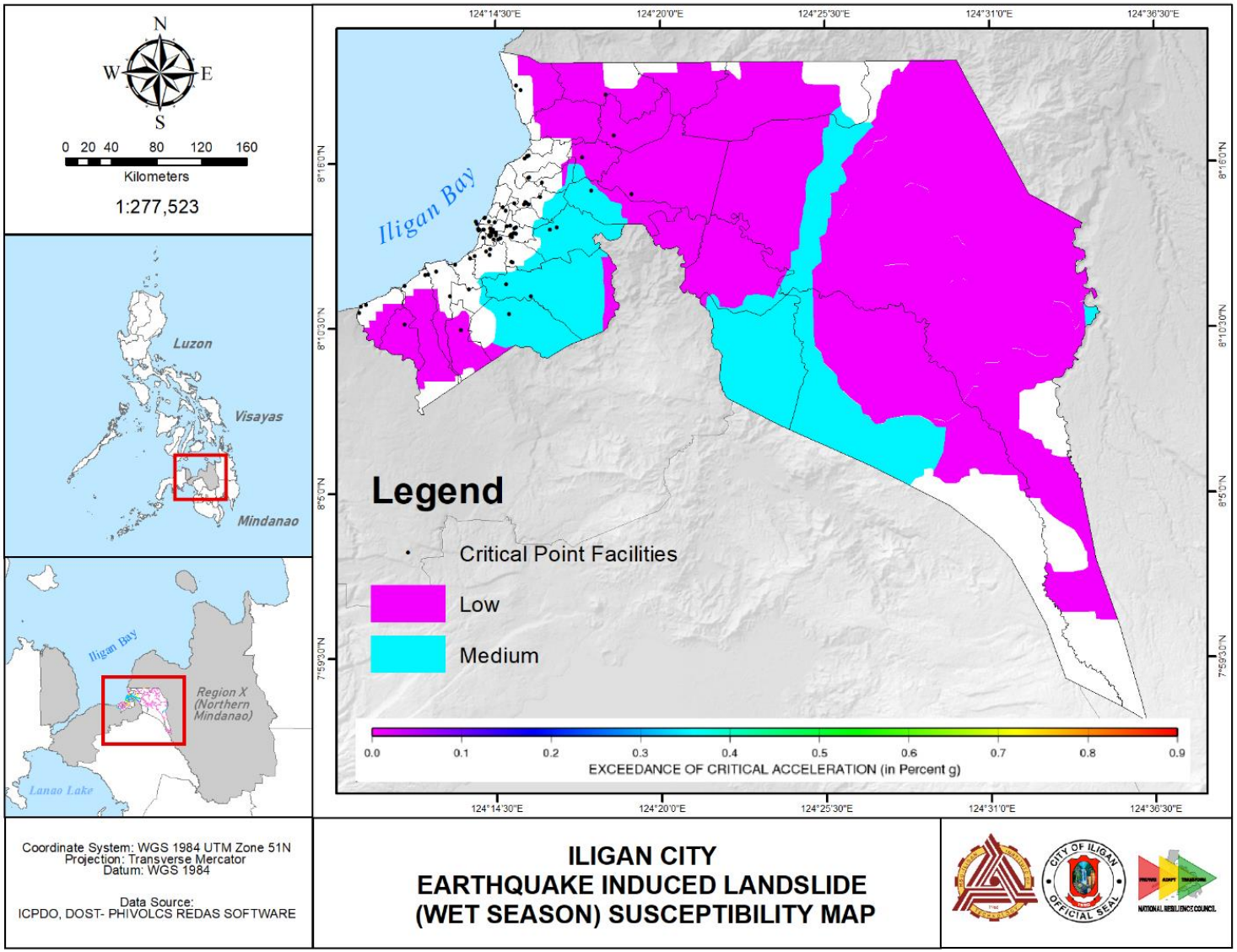


Figure 26. **Earthquake Induced Landslide Wet Season** Susceptibility on **Critical Point Facilities** in Iligan City

Landslides are evident hazards in Iligan City as well. It is categorized into two types (earthquake-induced and rain-induced). The maps presented above show primarily the susceptible areas of earthquake-induced landslides (EIL) that occur during wet season (rainy).

Figure 27 show the area of affected barangays based on its susceptibility level classified as low (indicated in purple) and medium (indicated in blue). A significant portion of Iligan City's land area covering a sum of 51,685 hectares are affected by EIL (wet season). This total consists of 36,478 hectares exhibiting a low susceptibility level and a notable portion of the city's map demonstrates 15,207 hectares affected areas to medium susceptibility level.

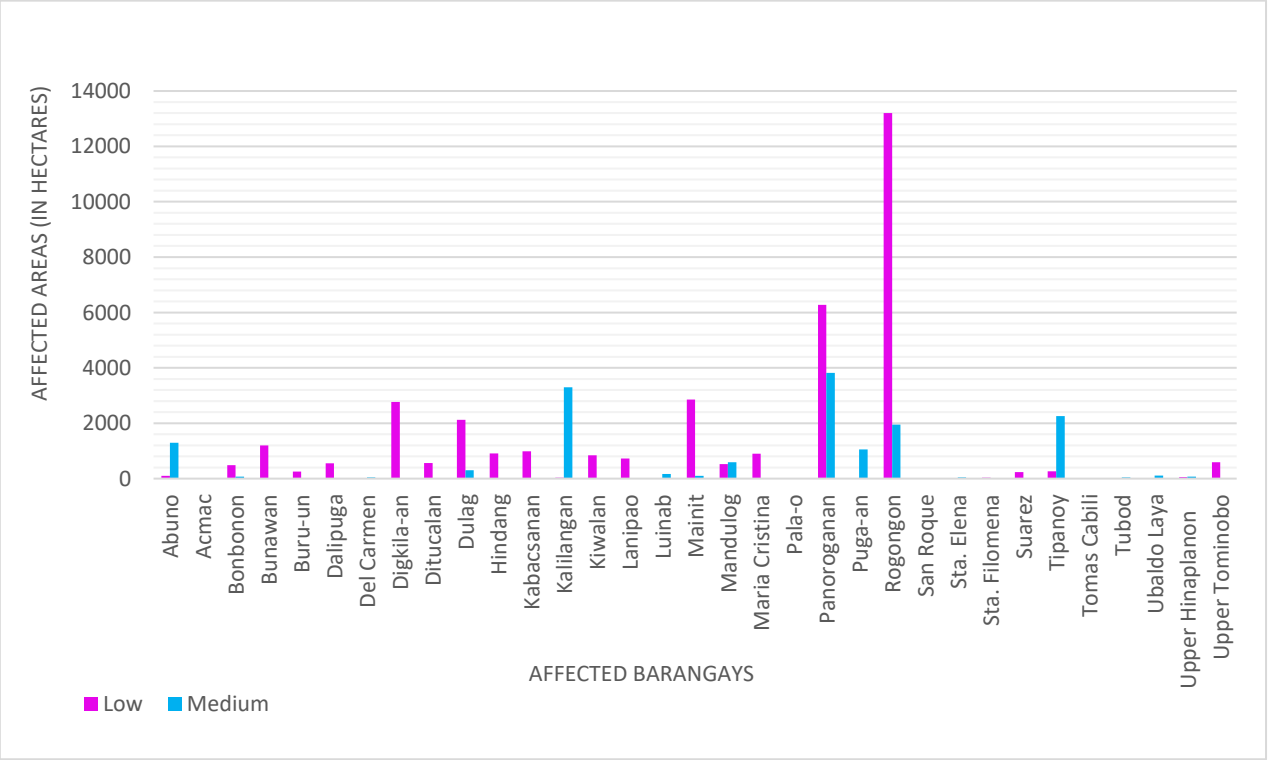


Figure 27. **Affected Area** to **EIL** Wet Season

Evidently, Barangay Rogongon, Panoroganan, Mainit, Digkila-an, Dulag, Bunawan, Kabacsanan, Hindang, Maria Cristina, Kiwalan, Lanipao, Upper Tominobo, Ditucalan, and Mandulog, are the baranagays with low susceptibility level of which affected areas are more than 500 hectares but does not exceed to 14,000 hectares. Meanwhile, Barangay Panoroganan, Kalilangan, Tipanoy, Rogongon, Abuno, Puga-an, and Mandulog, are barangays with medium susceptibility level of which affected areas are more than 500 hectares but does not exceed to 4,000 hectares.

The following table show the sum of population, sum of buildings, sum of agricultural and forest land, sum of lifeline utilities, and sum of critical point facilities for EIL (wet season). The population of each barangay is presented in table 30.

Table 30. Number of Affected Population on Vulnerable Barangays due to EIL (wet season)

Barangay	EIL (wet) Land Susceptibility Level	Population Affected
Abuno	Low	347
Abuno	Medium	4,448
Acmac	Low	162
Bonbonon	Low	2,048
Bonbonon	Medium	288
Bunawan	Low	1,592
Buru-un	Low	7,930
Dalipuga	Low	12,093
Del Carmen	Medium	2,072
Digkila-an	Low	5,764
Ditucalan	Low	3,992
Dulag	Low	1,039
Dulag	Medium	146
Hindang	Low	776
Kabacsanan	Low	2,361
Kalilangan	Low	15
Kalilangan	Medium	1,703
Kiwalan	Low	6,825
Lanipao	Low	2,892
Luinab	Medium	6,690
Mainit	Low	1,962
Mainit	Medium	67
Mandulog	Low	2,024
Mandulog	Medium	2,262
Maria Cristina	Low	3,456
Pala-o	Medium	154
Panoroganan	Low	730
Panoroganan	Medium	444

Barangay	EIL (wet) Land Susceptibility Level	Population Affected
Puga-an	Medium	7,190
Rogongon	Low	2,906
Rogongon	Medium	429
San Roque	Low	38
Sta. Elena	Medium	1,772
Sta. Filomena	Low	502
Suarez	Low	6,989
Tipanoy	Low	1,571
Tipanoy	Medium	13,604
Tomas Cabili	Medium	433
Tubod	Medium	3,699
Ubaldo Laya	Medium	4,146
Upper Hinaplanon	Low	1,365
Upper Hinaplanon	Medium	1,820
Upper Tominobo	Low	3,054

Table 31. Number of Affected Buildings on Vulnerable Barangays due to EIL (wet season)

Barangay	EIL (wet) Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Abuno	Low	4	0	0	0	0	0	0	86
Abuno	Medium	58	1	0	0	0	0	1	856
Acmac	Low								
Bonbonon	Low	11	0	0	0	0	0	307	49
Bonbonon	Medium	0	0	0	0	0	0	79	0
Bunawan	Low	40	0	0	0	0	0	2	9
Buru-un	Low	14	0	0	0	0	0	143	786
Dalipuga	Low	4	0	0	0	2	0	0	56
Del Carmen	Medium								
Digkila-an	Low	64	0	0	2	0	0	364	1018
Ditucalan	Low								
Dulag	Low	8	0	0	0	0	0	8	0
Dulag	Medium								
Hindang	Low	17	0	1	0	0	0	0	20
Kabacsanan	Low	33	0	1	0	0	0	27	6
Kalilangan	Low								

Barangay	EIL (wet) Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Kalilangan	Medium	0	0	0	0	0	0	0	1
Kiwalan	Low	9	0	0	0	0	0	0	2
Lanipao	Low	15	0	0	0	0	0	0	122
Luinab	Medium	3	0	0	0	0	0	2	0
Mainit	Low	21	0	0	0	0	0	50	40
Mainit	Medium								
Mandulog	Low	9	0	0	0	0	0	1	323
Mandulog	Medium	20	0	1	0	0	0	6	136
Maria Cristina	Low	29	0	1	1	2	0	4	34
Pala-o	Medium	5	0	0	0	0	0	0	4
Panoroganan	Low								
Panoroganan	Medium								
Puga-an	Medium	22	0	1	0	0	0	0	250
Rogongon	Low	48	0	1	2	0	0	608	1852
Rogongon	Medium	9	0	0	1	0	0	130	117
San Roque	Low	0	0	0	0	0	0	2	0

Barangay	EIL (wet) Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Sta. Elena	Medium								
Sta. Filomena	Low	0	0	0	0	0	0	4	0
Suarez	Low								
Tipanoy	Low								
Tipanoy	Medium	45	0	1	1	0	0	3	75
Tomas Cabili	Medium								
Tubod	Medium	0	0	0	0	0	0	0	1
Ubaldo Laya	Medium	0	0	0	0	0	0	86	2
Upper Hinaplanon	Low	0	0	0	0	0	0	47	36
Upper Hinaplanon	Medium								
Upper Tominobo	Low	9	0	0	0	0	0	0	0

Table 32. Number of Affected Natural Resources on Vulnerable Barangays due to EIL (wet season)

Barangay	EIL (wet) Land Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Abuno	Low	97	0
Abuno	Medium	1,120	0
Acmac	Low	2	0
Bonbonon	Low	392	0
Bonbonon	Medium	37	0
Bunawan	Low	1,140	0
Buru-un	Low	190	0
Dalipuga	Low	489	0
Del Carmen	Medium	35	0
Digkila-an	Low	2,240	0
Ditucalan	Low	412	0
Dulag	Low	158	653
Dulag	Medium	1	194
Hindang	Low	766	0
Kabacsanan	Low	951	0
Kalilangan	Low	0	21
Kalilangan	Medium	0	2,992
Kiwalan	Low	493	0
Lanipao	Low	312	24
Luinab	Medium	130	0
Mainit	Low	805	0
Mainit	Medium		
Mandulog	Low	327	0
Mandulog	Medium	548	0
Maria Cristina	Low	650	0
Pala-o	Medium	3	0
Panoroganan	Low	12	5,517

Barangay	EIL (wet) Land Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Panoroganan	Medium	0	3,577
Puga-an	Medium	997	0
Rogongon	Low	2,005	14,942
Rogongon	Medium	138	253
San Roque	Low	1	0
Sta. Elena	Medium	44	0
Sta. Filomena	Low	33	0
Suarez	Low	220	0
Tipanoy	Low	137	0
Tipanoy	Medium	1,633	0
Tomas Cabili	Medium	8	0
Tubod	Medium	26	0
Ubaldo Laya	Medium	107	0
Upper Hinaplanon	Low	32	0
Upper Hinaplanon	Medium	39	0
Upper Tominobo	Low	562	0

Table 33. List of Affected Lifeline Utilities on Certain Barangays due to EIL (wet season)

	Lifeline Utilities	Barangay
Power Station	Agus 5 Hydro Power Plant	Ditucalan
	Agus 6 Hydro power plant	Ditucalan
	Ma. Cristina Switchyard	Ditucalan
	Kiwalan TAP Station	Kiwalan
	Mapalad ABS	Dalipuga
	NMPC Diesel Plant	Dalipuga
Water & Groundwater Sources		Ditucalan
		Maria Cristina
		Suarez
		Abuno
		Tipanoy
		Puga-an
		Luinab

	Lifeline Utilities	Barangay
		Mandulog
		Upper Hinaplanon
		Bonbonon
		Digkila-an
		Dulag
		Panoroganan
		Kabacsanan
		Kiwalan
		Bunawan
		Dalipuga

Table 34. List of Affected Critical Point Facilities on Certain Barangays due to EIL (wet season)

	Critical Point Facilities	Barangay
Police Station	Mobile Group	Tipanoy
Industrial	AZKCON Metals-Iligan, Inc.	Tipanoy

Earthquake Induced Landslide ***(EIL) Dry Season***

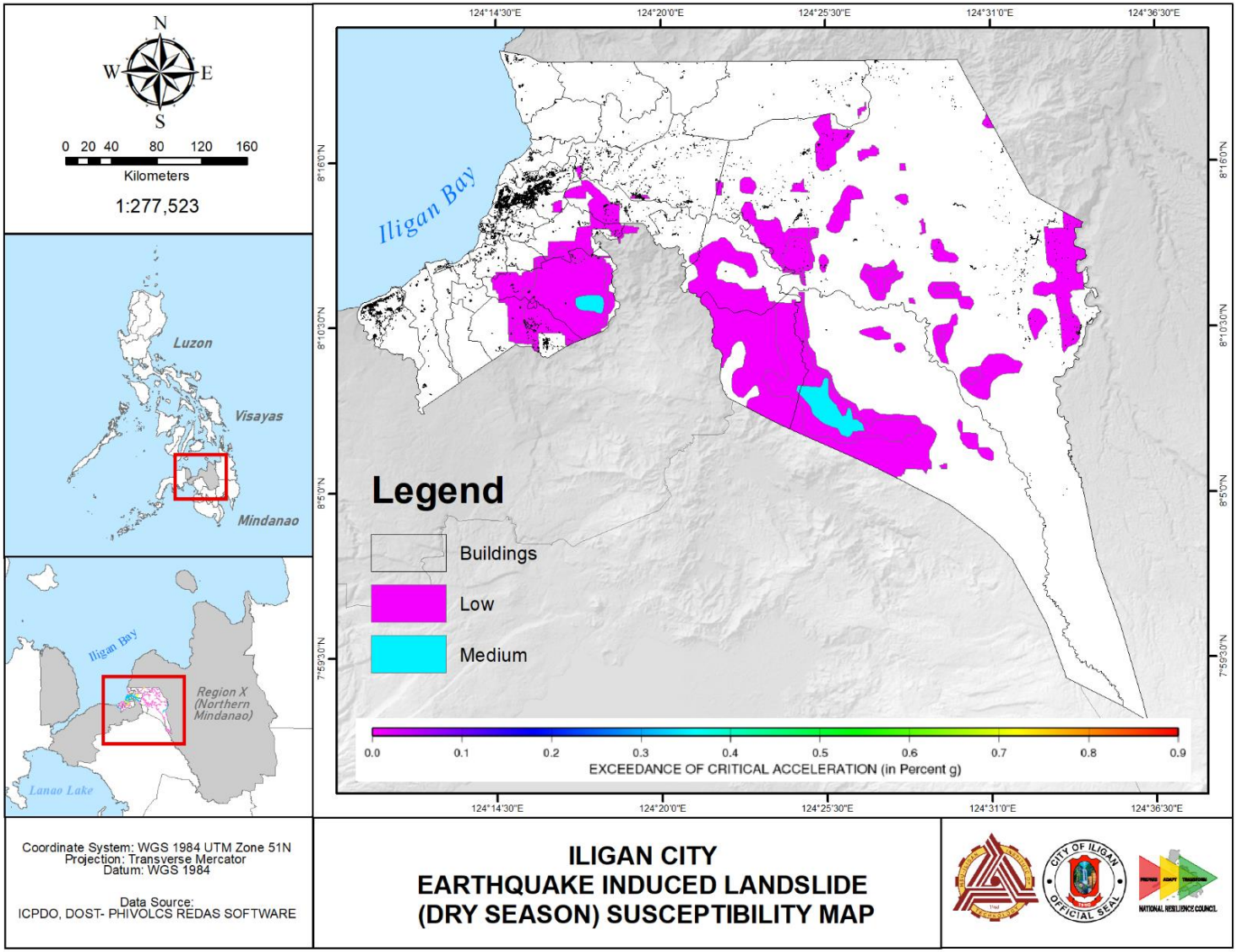


Figure 28. **Earthquake Induced Landslide Dry Season** Susceptibility on **Urban Use Areas** in Iligan City

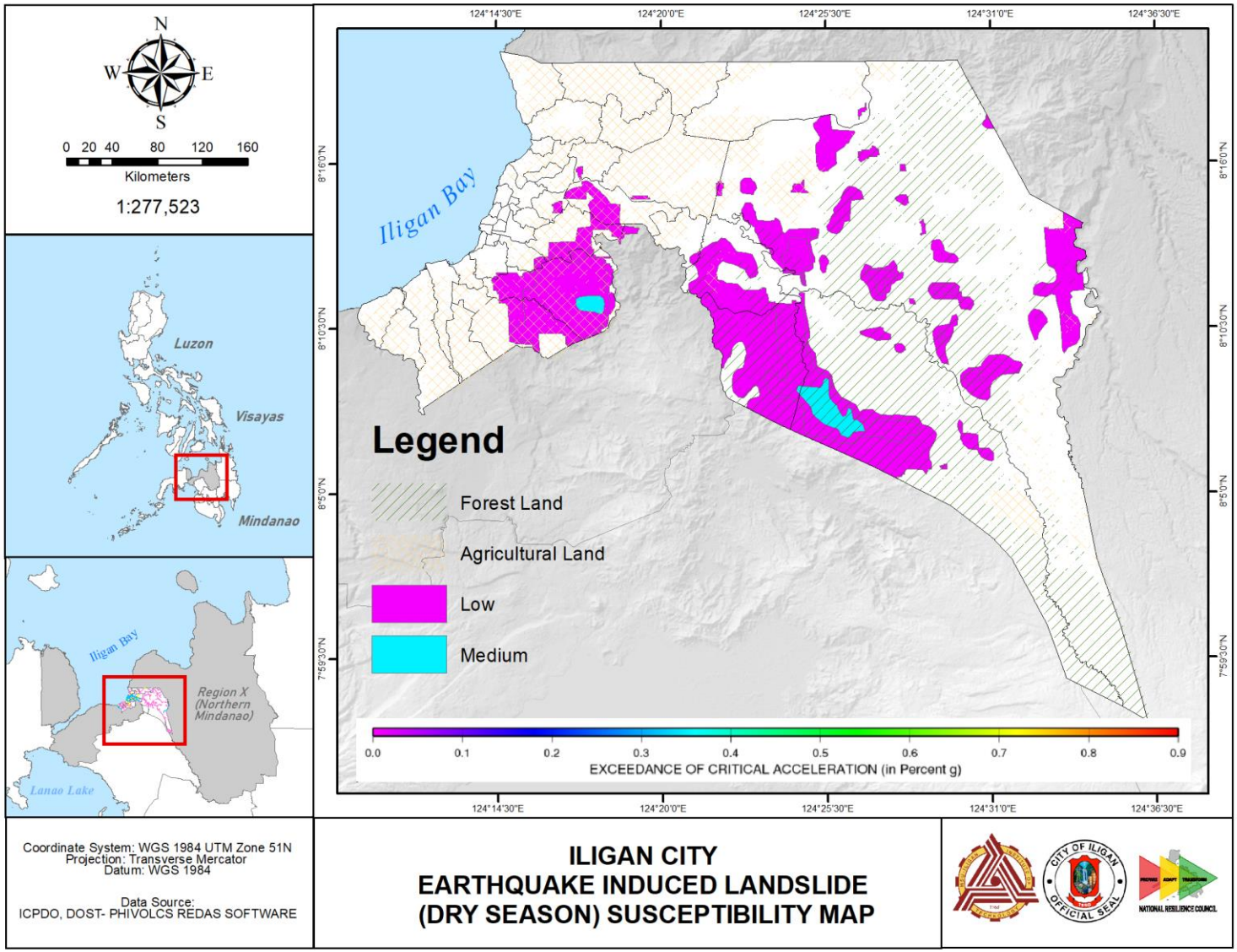


Figure 29. **Earthquake Induced Landslide Dry Season** Susceptibility on **Natural Resources** in Iligan City

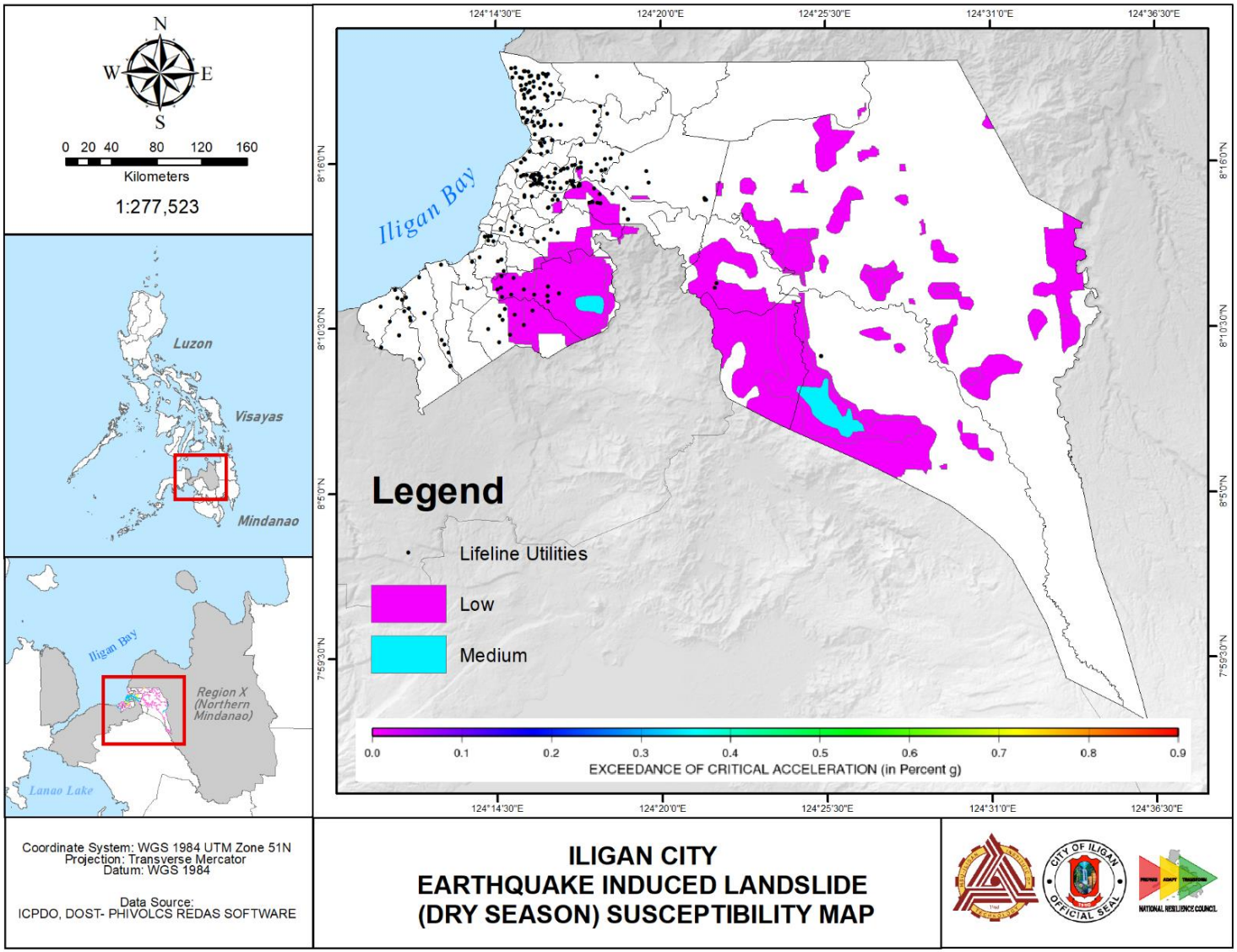


Figure 30. **Earthquake Induced Landslide Dry Season** Susceptibility on **Lifeline Utilities** in Iligan City

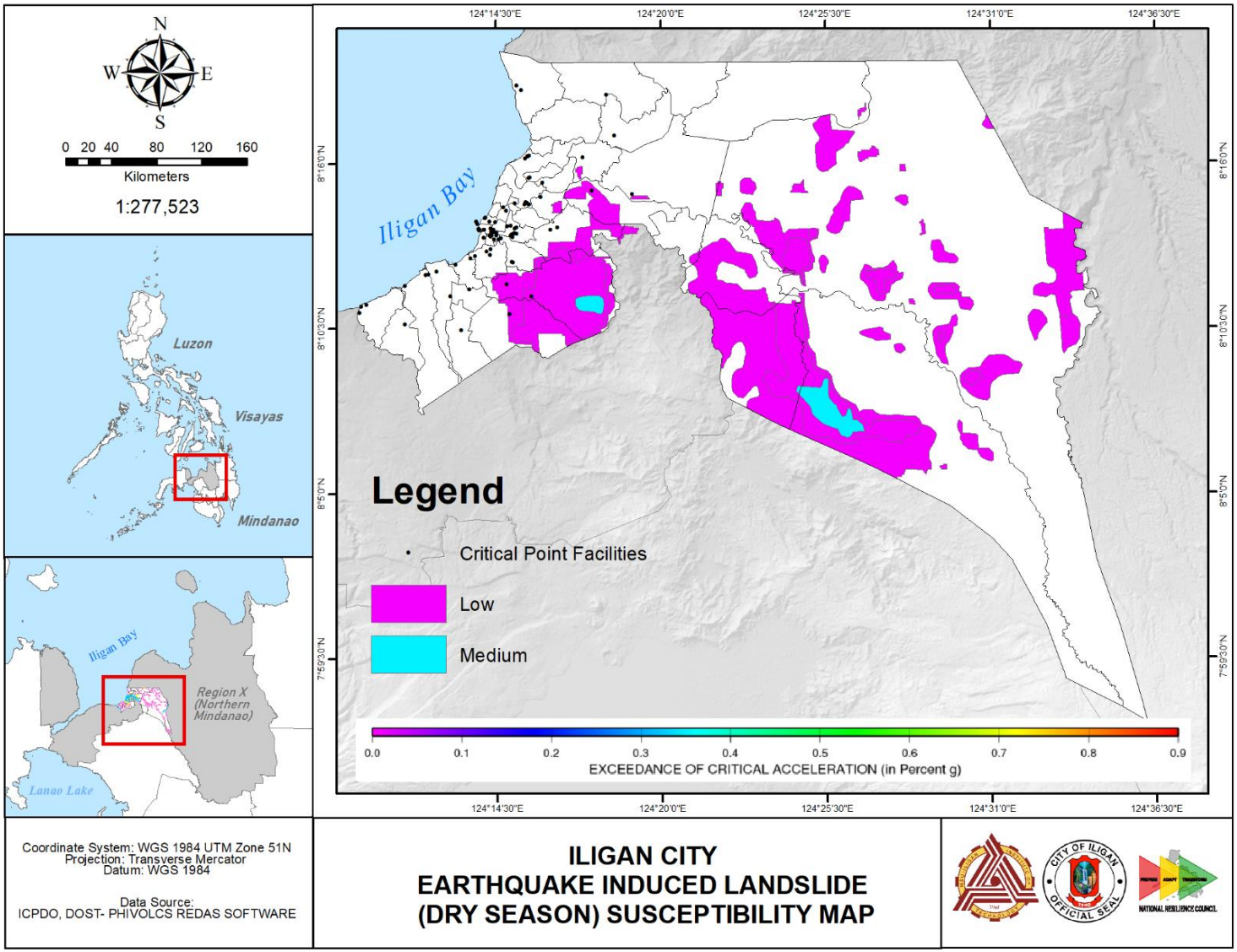


Figure 31. **Earthquake Induced Landslide Dry Season** Susceptibility on **Critical Point Facilities** in Iligan City

Figures 28 to 31, are the susceptible maps for earthquake-induced landslide during dry season. The maps show a relative decrease of affected areas compared to EIL on wet season. If the **total affected area** during wet season is 51,685 hectares, the EIL on dry season sums up to 16,900 hectares consisting to 16,182 hectares on **low** susceptibility level, and 718 hectares on **medium** susceptibility level. Low susceptibility level is still indicated in purple while medium susceptibility level is also indicated in blue.

The graph below depicts the susceptible barangays. Barangay Rogongon and Panoroganan are the areas greatly affected on **low** susceptibility level with 4,982 hectares and 3,034 hectares affected areas, respectively. Followed by Kalilangan, Tipanoy, Dulag and Abuno with affected areas of 2,910 hectares, 2,154 hectares, 1,252 hectares, and 808 hectares, respectively. Whereas in **medium** susceptibility level, only Barangay Panoroganan have a relatively high affected area of 552 hectares, followed then by Tipanoy with 158 hectares, and Kalilangan with 8 hectares affected areas.

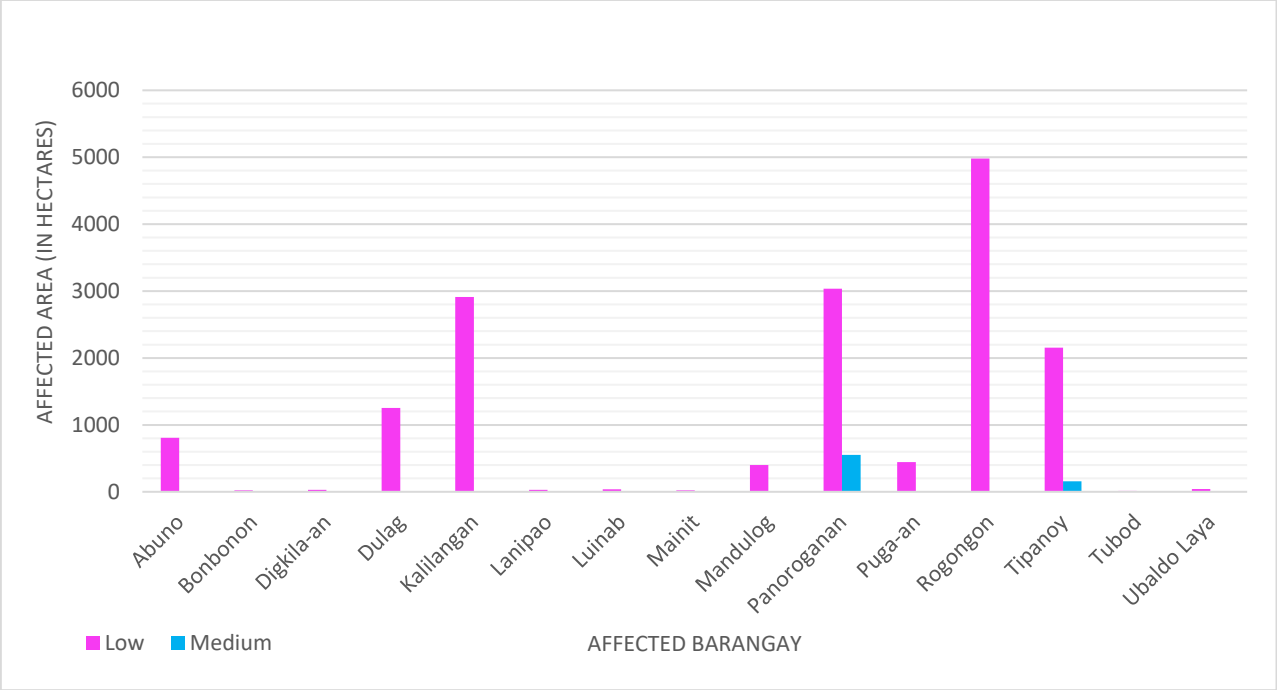


Figure 32. **Affected Area** to **EIL** Dry Season

The following tables show the sum of population, sum of buildings, sum of agricultural and forest land, sum of lifeline utilities, and sum of critical point facilities for EIL (dry season). The population of each barangay is presented in table 35.

Table 35. Number of Affected Population on Vulnerable Barangays due to EIL (dry season)

Barangay	EIL (dry) Land Susceptible Level	Population Affected
Abuno	Low	2,773
Bonbonon	Low	93
Digkila-an	Low	63
Dulag	Low	613
Kalilangan	Low	1,504
Kalilangan	Medium	4
Lanipao	Low	119
Luinab	Low	1,517
Mainit	Low	14
Mandulog	Low	1,540
Panoroganan	Low	353
Panoroganan	Medium	64
Puga-an	Low	3,043
Rogongon	Low	1,097
Tipanoy	Low	12,966
Tipanoy	Medium	951
Tubod	Low	1,177
Ubaldo Laya	Low	1,628

Table 36. Number of Affected Buildings on Vulnerable Barangays due to EIL (dry season)

Barangay	EIL (dry) Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Abuno	Low	30	1	0	0	0	0	1	30
Bonbonon	Low	0	0	0	0	0	0	31	0
Digkila-an	Low	25	0	0	0	0	0	26	302
Dulag	Low								
Kalilangan	Low								
Kalilangan	Medium								
Lanipao	Low								
Luinab	Low								
Mainit	Low								
Mandulog	Low	20	0	0	0	0	0	0	95
Panoroganan	Low								
Panoroganan	Medium								
Puga-an	Low	5	0	0	0	0	0	0	74
Rogongon	Low	4	0	0	1	0	0	182	271
Tipanoy	Low								

Barangay	EIL (dry) Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Tipanoy	Medium	41	0	1	1	0	0	3	82
Tubod	Low								
Ubaldo Laya	Low								

Table 37. Number of Affected Natural Resources on Vulnerable Barangays due to EIL (dry season)

Barangay	EIL (dry) Land Susceptible Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Abuno	Low	97	0
Bonbonon	Low	392	0
Digkila-an	Low	2,240	0
Dulag	Low	158	653
Kalilangan	Low	0	21
Kalilangan	Medium	0	2,992
Lanipao	Low	312	24
Luinab	Low		
Mainit	Low	805	0
Mandulog	Low	327	0
Panoroganan	Low	12	5,517
Panoroganan	Medium	0	3,577
Puga-an	Low		
Rogongon	Low	2,005	14,942
Tipanoy	Low	137	0
Tipanoy	Medium	1,633	0
Tubod	Low		
Ubaldo Laya	Low	107	0

Table 38. List of Affected Lifeline Utilities on Certain Barangays due to EIL (dry season)

	Lifeline Utilities	Barangay
Water & Groundwater Sources		Abuno
		Tipanoy
		Mandulog
		Bonbonon
		Dulag

Table 39. List of Affected Critical Point Facilities on Certain Barangays due to EIL (dry season)

	Critical Point Facilities	Barangay
Police Station	Mobile Group	Tipanoy
Government Offices	Slaughter House	Ubaldo Laya
	CMO-Public Library	Mahayahay
	EEDMO	Mahayahay
	City Health Office	Palao
	City Social Welfare & Dev	Saray
	EEDMO-Supermarket	Palao
Industrial	AZKCON Metals-Iligan, Inc.	Tipanoy

*Rain-Induced Landslide **(RIL)***

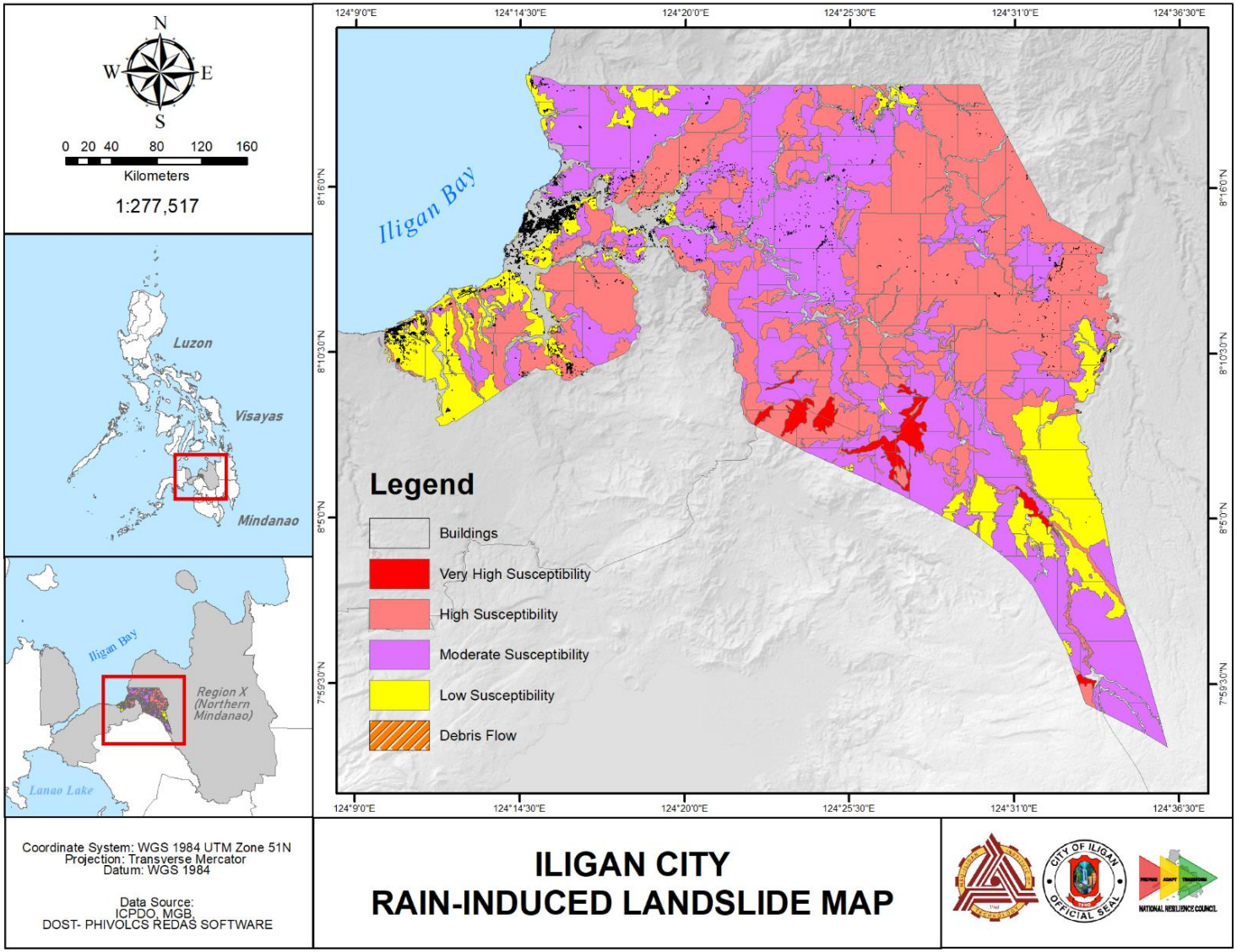


Figure 33. **Rain-Induced Landslide** Susceptibility on **Urban Use Areas** in Iligan City

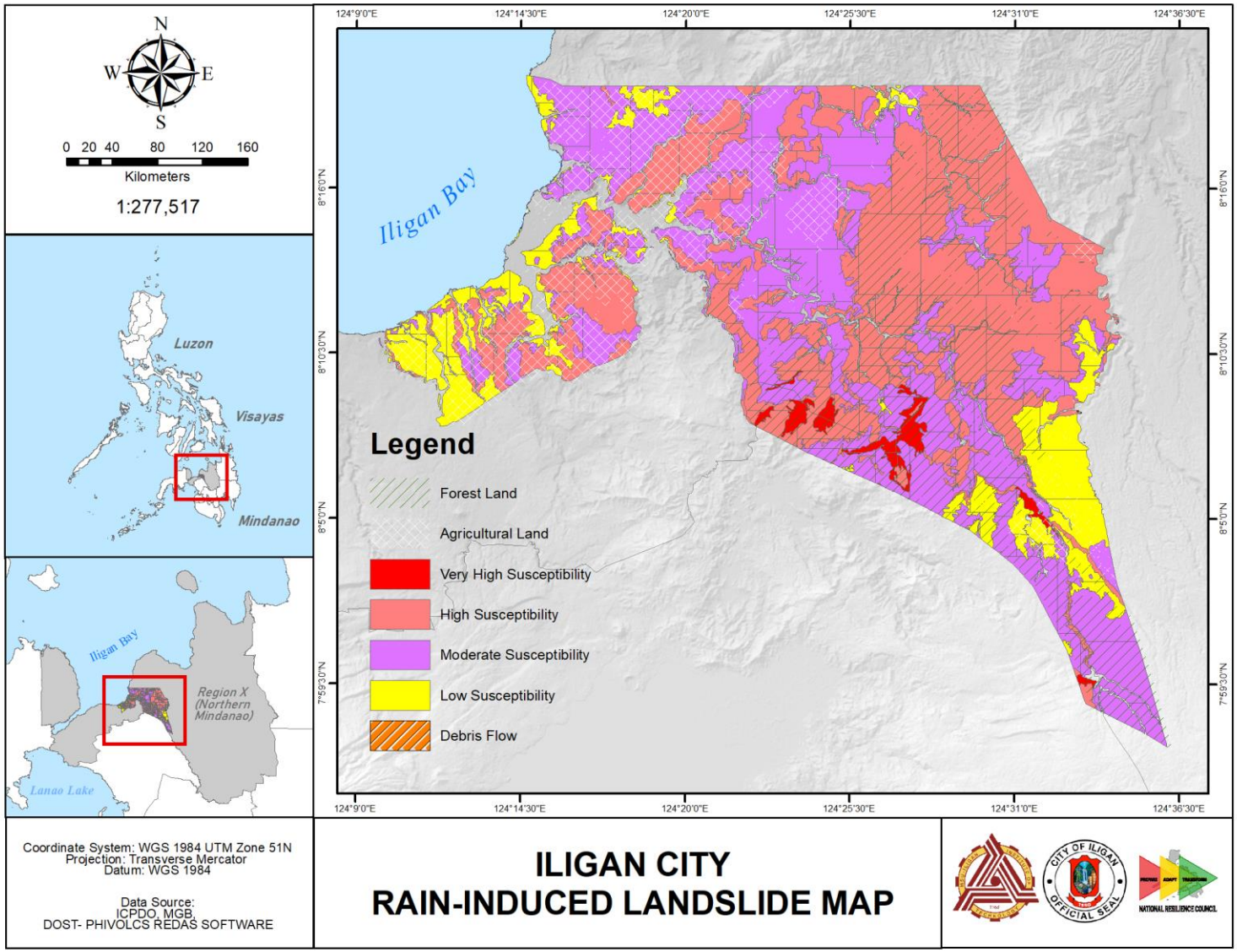


Figure 34. **Rain-Induced Landslide** Susceptibility on **Natural Resources** in Iligan City

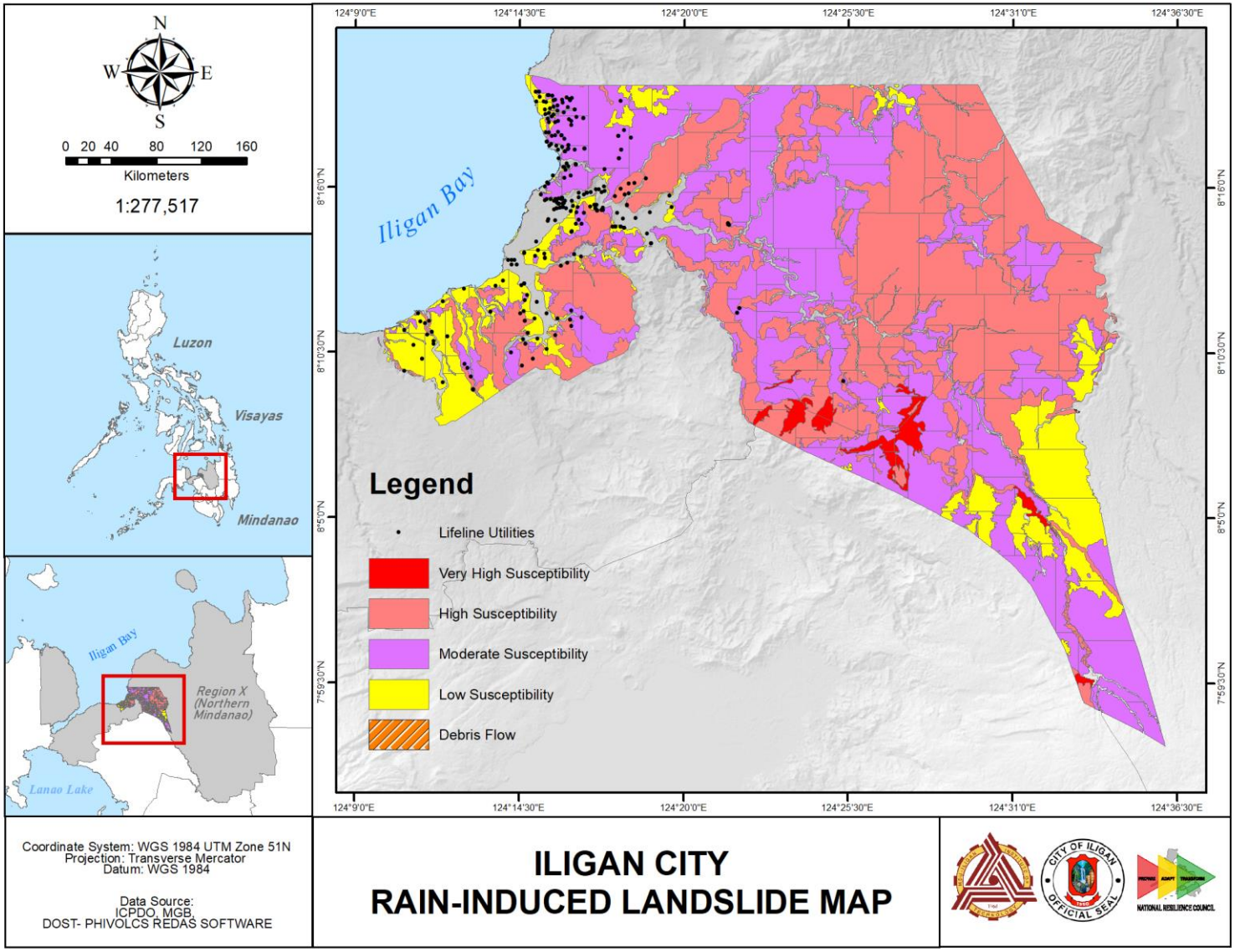


Figure 35. **Rain-Induced Landslide** Susceptibility on **Lifeline Utilities** in Iligan City

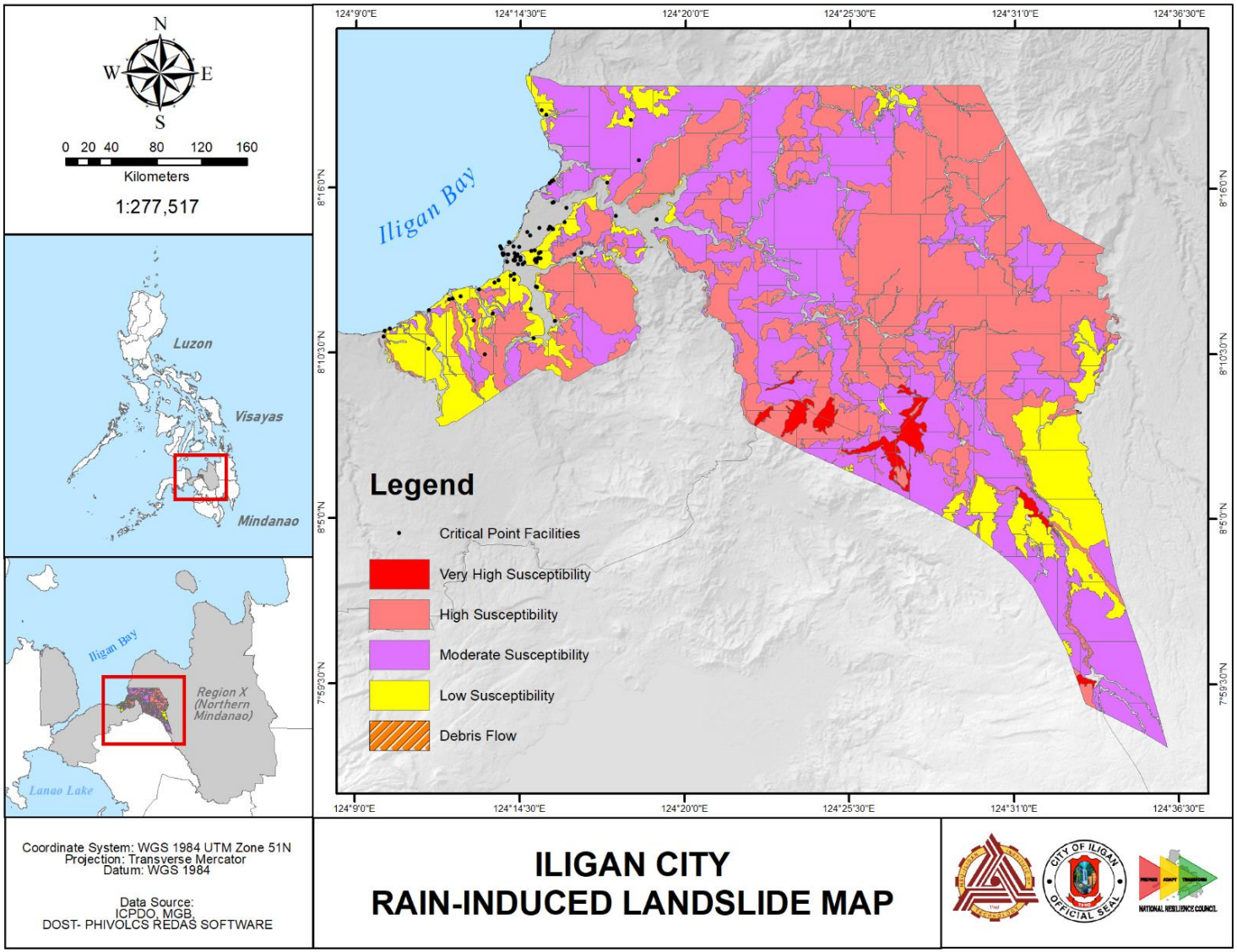


Figure 36. **Rain-Induced Landslide** Susceptibility on **Critical Point Facilities** in Iligan City

Rain-induced landslide or RIL is also one of the hazards caused by the changing climate. The exposure maps above depict the susceptible areas, natural resources, lifeline utilities, and critical point facilities. The legend renders the susceptibility level as very high (indicated in red), high (indicated in pink), moderate (indicated in purple), and low (yellow). There is also the debris flow represented with an orange slant line.

The graph below illustrates the extent of areas affected by RIL with a total of 39,727 hectares being identified as vulnerable to RIL. This total is further broken down into three susceptibility levels: 5,972 hectares exhibit low susceptibility, 19,394 hectares are at a medium susceptibility level, and 14,361 hectares face a high susceptibility level.

In the low susceptibility category, Barangay Panoroganan stands out as particularly vulnerable to RIL, affecting 1,249 hectares, followed closely by Maria Cristina with 988 hectares.

Within the medium susceptibility level, Barangay Panoroganan is most affected, impacting 7,233 hectares of land. This is followed by several other barangays, including Mainit, Dulag, Bunawan, and Kalilangan, each of which has affected areas exceeding 1,000 hectares.

Furthermore, in the high susceptibility level, Barangay Panoroganan maintains its position as the most vulnerable barangay during RIL events, affecting a substantial portion of land. Other barangays, such as Kalilangan, Tipanoy, Mainit, Digkila-an, Dulag, Abuno, and Puga-an, are also highly susceptible, with affected areas measuring no less than 500 hectares.

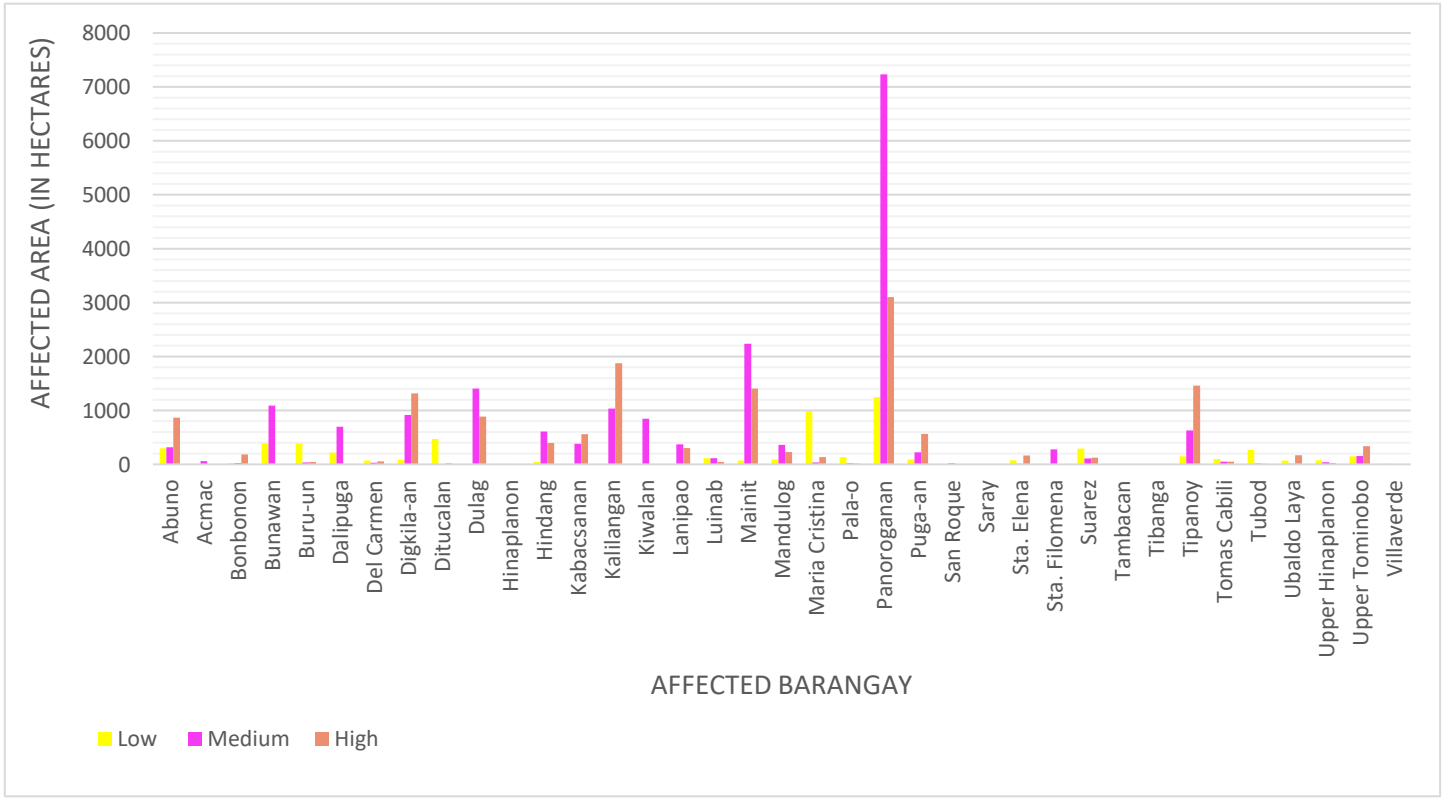


Figure 37. **Affected Areas** to **RIL**

Table 40. Number of Affected Population on Vulnerable Barangays due to RIL

Barangay	RIL Land Susceptibility Level	Population Affected
Abuno	LL	1,023
Abuno	ML	1,098
Abuno	HL	2,979
Acmac	LL	324
Acmac	ML	3,291
Bonbonon	LL	110
Bonbonon	ML	118
Bonbonon	HL	787
Bunawan	LL	511
Bunawan	ML	1,446
Bunawan	HL	0
Buru-un	LL	12,004
Buru-un	ML	1,151
Buru-un	HL	1,493
Dalipuga	LL	4,755
Dalipuga	ML	15,155
Del Carmen	LL	3,826
Del Carmen	ML	1,594
Del Carmen	HL	2,923
Digkila-an	LL	181
Digkila-an	ML	1,907
Digkila-an	HL	2,746
Ditucalan	LL	3,309
Ditucalan	HL	134
Dulag	ML	689
Dulag	HL	434
Hinaplanon	LL	445
Hindang	LL	38
Hindang	ML	519
Hindang	HL	339
Kabacsanan	LL	14
Kabacsanan	ML	919
Kabacsanan	HL	1,335
Kalilangan	ML	535
Kalilangan	HL	968
Kalilangan	VHL	190
Kiwalan	LL	73
Kiwalan	ML	6,890
Lanipao	ML	1,474
Lanipao	HL	1,212
Luinab	LL	4,473

LL – Low Level
ML – Medium Level
HL – High Level

Barangay	RIL Land Susceptibility Level	Population Affected
Luinab	ML	4,473
Luinab	HL	1,789
Mainit	LL	48
Mainit	ML	1,536
Mainit	HL	964
Mandulog	LL	349
Mandulog	ML	1,398
Mandulog	HL	876
Maria Cristina	LL	8,973
Maria Cristina	ML	345
Maria Cristina	HL	1,208
Pala-o	LL	6,835
Pala-o	ML	1,079
Pala-o	HL	771
Panoroganan	LL	145
Panoroganan	ML	841
Panoroganan	HL	361
Panoroganan	VHL	115
Puga-an	LL	624
Puga-an	ML	1,535
Puga-an	HL	3,879
San Roque	LL	189
San Roque	ML	832
San Roque	HL	0
Saray	LL	421
Sta. Elena	LL	2,850
Sta. Elena	ML	385
Sta. Elena	HL	6,317
Sta. Filomena	LL	152
Sta. Filomena	ML	4,259
Sta. Filomena	HL	91
Suarez	LL	8,903
Suarez	ML	3,373
Suarez	HL	3,768
Tambacan	LL	412
Tibanga	LL	1,089
Tipanoy	LL	885
Tipanoy	ML	3,798
Tipanoy	HL	8,789
Tomas Cabili	LL	4,416
Tomas Cabili	ML	2,208
Tomas Cabili	HL	2,252
Tubod	LL	22,530
Tubod	ML	1,513

Barangay	RIL Land Susceptibility Level	Population Affected
Tubod	HL	1,009
Ubaldo Laya	LL	2,674
Ubaldo Laya	ML	426
Ubaldo Laya	HL	6,627
Upper Hinaplanon	LL	2,034
Upper Hinaplanon	ML	1,097
Upper Hinaplanon	HL	749
Upper Tominobo	LL	780
Upper Tominobo	ML	801
Upper Tominobo	HL	1,736
Villaverde	LL	1,612

Table 41. Number of Affected Buildings on Vulnerable Barangays due to RIL

Barangay	RIL Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residentials	Unclassified
Abuno	LL								
Abuno	ML	6	2	0	0	0	0	1	21
Abuno	HL	46	2	0	0	0	0	0	475
Acmac	LL								
Acmac	ML	6	1	2	0	0	0	3	2
Bonbonon	LL	2	0	0	0	0	0	58	5
Bonbonon	ML	11	0	0	0	0	0	146	24
Bonbonon	HL	0	0	0	0	0	0	93	23
Bunawan	LL	11	0	0	0	0	0	1	14
Bunawan	ML	40	0	0	0	0	0	1	5
Bunawan	HL								
Buru-un	LL	25	0	1	0	0	0	282	1714
Buru-un	ML	0	0	0	0	0	0	60	360
Buru-un	HL	25	0	0	0	0	0	23	49
Dalipuga	LL	30	0	0	1	1	0	2	47

Barangay	RIL Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residentials	Unclassified
Dalipuga	ML	10	0	1	0	2	0	0	109
Del Carmen	LL	0	0	0	1	0	0	21	12
Del Carmen	ML	0	0	0	0	0	0	1	0
Del Carmen	HL	0	0	0	0	0	0	0	9
Digkila-an	LL	2	0	0	0	0	0	6	63
Digkila-an	ML	18	0	0	1	0	0	112	252
Digkila-an	HL	4	0	0	0	0	0	189	107
Ditucalan	LL	22	0	0	0	0	0	16	116
Ditucalan	HL	0	0	0	0	0	0	0	2
Dulag	ML	3	0	0	0	0	0	1	0
Dulag	HL	5	0	0	0	0	0	0	0
Hinaplanon	LL	0	1	0	0	0	0	92	8
Hindang	LL								
Hindang	ML	17	0	1	0	0	0	0	27
Hindang	HL	0	0	0	0	0	0	0	1
Kabacsanan	LL	0	0	1	0	0	0	0	0

Barangay	RIL Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residentials	Unclassified
Kabacsanan	ML	18	0	1	0	0	0	0	1
Kabacsanan	HL	15	0	0	0	0	0	27	5
Kalilangan	ML								
Kalilangan	HL	0	0	0	0	0	0	0	1
Kalilangan	VHL								
Kiwalan	LL								
Kiwalan	ML	9	0	0	0	0	0	0	2
Lanipao	ML	15	0	0	0	0	0	0	110
Lanipao	HL	0	0	0	0	0	0	0	9
Luinab	LL	12	0	1	0	1	0	257	219
Luinab	ML	0	0	0	0	0	0	5	1
Luinab	HL								
Mainit	LL	0	0	0	0	0	0	2	26
Mainit	ML	6	0	0	0	0	0	22	33
Mainit	HL	15	0	0	0	0	0	33	47
Mandulog	LL	18	0	1	0	0	0	0	36

Barangay	RIL Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residentials	Unclassified
Mandulog	ML	0	0	0	0	0	0	0	97
Mandulog	HL	0	0	0	0	0	0	0	29
Maria Cristina	LL	35	0	0	2	3	0	4	47
Maria Cristina	ML	26	0	1	0	0	0	1	5
Maria Cristina	HL	19	0	0	0	0	0	1	3
Pala-o	LL	1	2	1	1	0	1	3	38
Pala-o	ML	0	1	1	0	0	0	0	5
Pala-o	HL								
Panoroganan	LL								
Panoroganan	ML	0	0	0	0	0	0	0	4
Panoroganan	HL	5	0	0	0	0	0	0	0
Panoroganan	VHL								
Puga-an	LL	9	0	0	0	0	0	0	42
Puga-an	ML	8	0	0	0	0	0	0	80
Puga-an	HL	5	0	0	0	0	0	0	31
San Roque	LL	0	0	0	0	0	0	7	7

Barangay	RIL Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residentials	Unclassified
San Roque	ML	0	0	0	0	0	0	3	7
San Roque	HL								
Saray	LL								
Sta. Elena	LL	5	0	1	0	0	0	2	1
Sta. Elena	ML								
Sta. Elena	HL	18	0	1	2	0	0	0	1
Sta. Filomena	LL	8	0	0	0	0	0	0	8
Sta. Filomena	ML	44	0	1	0	0	0	2	21
Sta. Filomena	HL	0	0	0	0	0	0	1	1
Suarez	LL	9	0	0	0	0	0	2	12
Suarez	ML	13	0	0	0	0	0	0	0
Suarez	HL	11	0	0	0	0	0	0	1
Tambacan	LL								
Tibanga	LL	0	0	0	0	0	0	0	68
Tipanoy	LL	11	0	0	0	0	0	1	2
Tipanoy	ML	7	0	0	0	0	0	0	0

Barangay	RIL Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residentials	Unclassified
Tipanoy	HL	4	0	0	0	0	0	0	66
Tomas Cabili	LL	7	1	0	1	0	0	5	12
Tomas Cabili	ML	6	0	0	0	0	0	0	8
Tomas Cabili	HL	0	0	1	0	0	0	2	7
Tubod	LL	3	3	1	3	0	1	6	78
Tubod	ML								
Tubod	HL								
Ubaldo Laya	LL	12	1	1	0	1	0	0	22
Ubaldo Laya	ML	0	0	0	0	0	0	92	0
Ubaldo Laya	HL								
Upper Hinaplanon	LL	13	0	0	0	0	0	278	59
Upper Hinaplanon	ML								
Upper Hinaplanon	HL	0	0	0	0	0	0	2	1
Upper Tominobo	LL								
Upper Tominobo	ML								
Upper Tominobo	HL	9	0	0	0	0	0	0	0

Barangay	RIL Land Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residentials	Unclassified
Villaverde	LL	0	1	0	0	0	0	0	9

Table 42. Number of Affected Natural Resources on Vulnerable Barangays due to RIL

Barangay	RIL Land Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Abuno	LL	252	0
Abuno	ML	287	0
Abuno	HL	793	0
Acmac	LL	1	0
Acmac	ML	39	0
Bonbonon	LL	24	0
Bonbonon	ML	197	0
Bonbonon	HL	154	0
Bunawan	LL	363	0
Bunawan	ML	1,029	0
Bunawan	HL	19	0
Buru-un	LL	258	0
Buru-un	ML	14	0
Buru-un	HL	25	0
Dalipuga	LL	74	0
Dalipuga	ML	585	0
Del Carmen	LL	17	0
Del Carmen	ML	20	0
Del Carmen	HL	48	0
Digkila-an	LL	80	0
Digkila-an	ML	765	0
Digkila-an	HL	1,052	0
Ditucalan	LL	365	0
Ditucalan	HL	14	0
Dulag	ML	130	260

Barangay	RIL Land Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Dulag	HL	24	566
Hinaplanon	LL	3	0
Hindang	LL	37	0
Hindang	ML	548	0
Hindang	HL	315	0
Kabacsanan	LL	6	0
Kabacsanan	ML	370	0
Kabacsanan	HL	537	0
Kalilangan	ML	0	901
Kalilangan	HL	0	1,737
Kalilangan	VHL	0	345
Kiwalan	LL	6	0
Kiwalan	ML	496	0
Lanipao	ML	194	2
Lanipao	HL	102	22
Luinab	LL	39	0
Luinab	ML	89	0
Luinab	HL	42	0
Mainit	LL	23	0
Mainit	ML	690	0
Mainit	HL	148	0
Mandulog	LL	83	0
Mandulog	ML	317	0
Mandulog	HL	201	0
Maria Cristina	LL	696	0
Maria Cristina	ML	15	0
Maria Cristina	HL	98	0

Barangay	RIL Land Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Pala-o	LL	5	0
Pala-o	ML	6	0
Pala-o	HL	15	0
Panoroganan	LL	389	724
Panoroganan	ML	136	6,720
Panoroganan	HL	3	3,116
Panoroganan	VHL	31	889
Puga-an	LL	88	0
Puga-an	ML	220	0
Puga-an	HL	544	0
San Roque	LL	3	0
San Roque	ML	19	0
San Roque	HL		
Saray	LL		
Sta. Elena	LL	49	0
Sta. Elena	ML	7	0
Sta. Elena	HL	137	0
Sta. Filomena	LL	3	0
Sta. Filomena	ML	246	0
Sta. Filomena	HL	4	0
Suarez	LL	148	0
Suarez	ML	96	0
Suarez	HL	76	0
Tambacan	LL		
Tibanga	LL		
Tipanoy	LL	103	0
Tipanoy	ML	555	0

Barangay	RIL Land Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Tipanoy	HL	951	0
Tomas Cabili	LL	41	0
Tomas Cabili	ML	29	0
Tomas Cabili	HL	30	0
Tubod	LL	64	0
Tubod	ML	7	0
Tubod	HL	12	0
Ubaldo Laya	LL	26	0
Ubaldo Laya	ML	11	0
Ubaldo Laya	HL	151	0
Upper Hinaplanon	LL	37	0
Upper Hinaplanon	ML	17	0
Upper Hinaplanon	HL	23	0
Upper Tominobo	LL	140	0
Upper Tominobo	ML	153	0
Upper Tominobo	HL	314	0
Villaverde	LL		

Table 43. List of Affected Lifeline Utilities on Certain Barangays due to RIL

	Lifeline Utilities	Barangay
Power Station	Ma. Cristina Chemical Industrial	Buru-un
	Agus 7 Hydro Power Plant	Buru-un
	Mabuhay Vinyl Corporation	Buru-un
	Agus 5 Hydro Power Plant	Ditucalan
	Agus 6 Hydro power plant	Ditucalan
	Ma. Cristina Switchyard	Ditucalan
	Overton Substation	Maria Cristina
	National Steel Corp.	Suarez
	Pala-o ABS	Palao
	ILPI (M3)	Villa Verde
	Kiwalan TAP Station	Kiwalan

	Lifeline Utilities	Barangay
	Mapalad ABS	Dalipuga
	NMPC Diesel Plant	Dalipuga
	Refractories Corp. of the Phil	Dalipuga
Water & Groundwater Sources	Springs	Buru-un
	Springs	Ditucalan
	Ground water pump, spring, and deep well	Maria Cristina
	Springs	Suarez
	Wells	Abuno
	Pumpstation	Tomas Cabili
	Wells	Tipanoy
	Well	Tubod
	Wells	Puga-an
	Wells	Palao
	Well	Luinab
	Wells	Upper Hinaplanon
	Water sources	San Roque
	Water sources	Mandulog
	Springs	Dulag
	Springs	Panoroganan
	Communal water source, springs, wells	Digkila-an
	Communal water source, wells	Bonbonon
	Water source, deep well	Sta. Filomena
	Pumpstation, water source, wells	Acmac
	Springs and water sources	Kiwalan
	Spring and wells	Dalipuga
	Groundwater well	Bunawan
	Springs	Kabacsanan

Table 44. List of Affected Critical Point Facilities on Certain Barangays due to RIL

	Critical Point Facilities	Barangay
Hospitals	Mercy Community Hospital	Tubod
	Iligan Medical Center	Palao
	Gregorio T. Lluch Memorial Hos	Palao
Fire Station	Dalipuga Fire Station	Dalipuga
	Buru-un Fire Station	Buru-un
Police Station	Mobile Group	Tipanoy
	Police Station	Maria Cristina
	Police Station	Sta. Filomena
	Police Station	Tubod
Government Offices	Slaughter House	Ubaldo Laya
	City Veterinarian's Office	Ubaldo Laya
	City Engineer's Office	Palao
	ABC Hall	Palao
	Iligan City Waterworks	Palao

	Critical Point Facilities	Barangay
	City Assessors Building	Palao
	City Administrator-Tourism	Palao
	City Hall Building	Palao
	City Civil Registrar's Office	Palao
	City Agriculturist's Office	Hinaplanon
	Popcom Office	Hinaplanon
Industrial	Maria Cristina Chemical Indust	Buru-un
	Billet Steel Plant	Maria Cristina
	National Steel Corp	Suarez
	Filipinas Eslon Mfc	Sta. Filomena
	Refractories Corp. of the Phil	Dalipuga
	Petronas Energy	Dalipuga
	Northern Mindanao Power Corp.	Dalipuga
Transportation	South Bound Terminal	Tubod

iii. Ground Shaking Exposure Maps in Iligan City

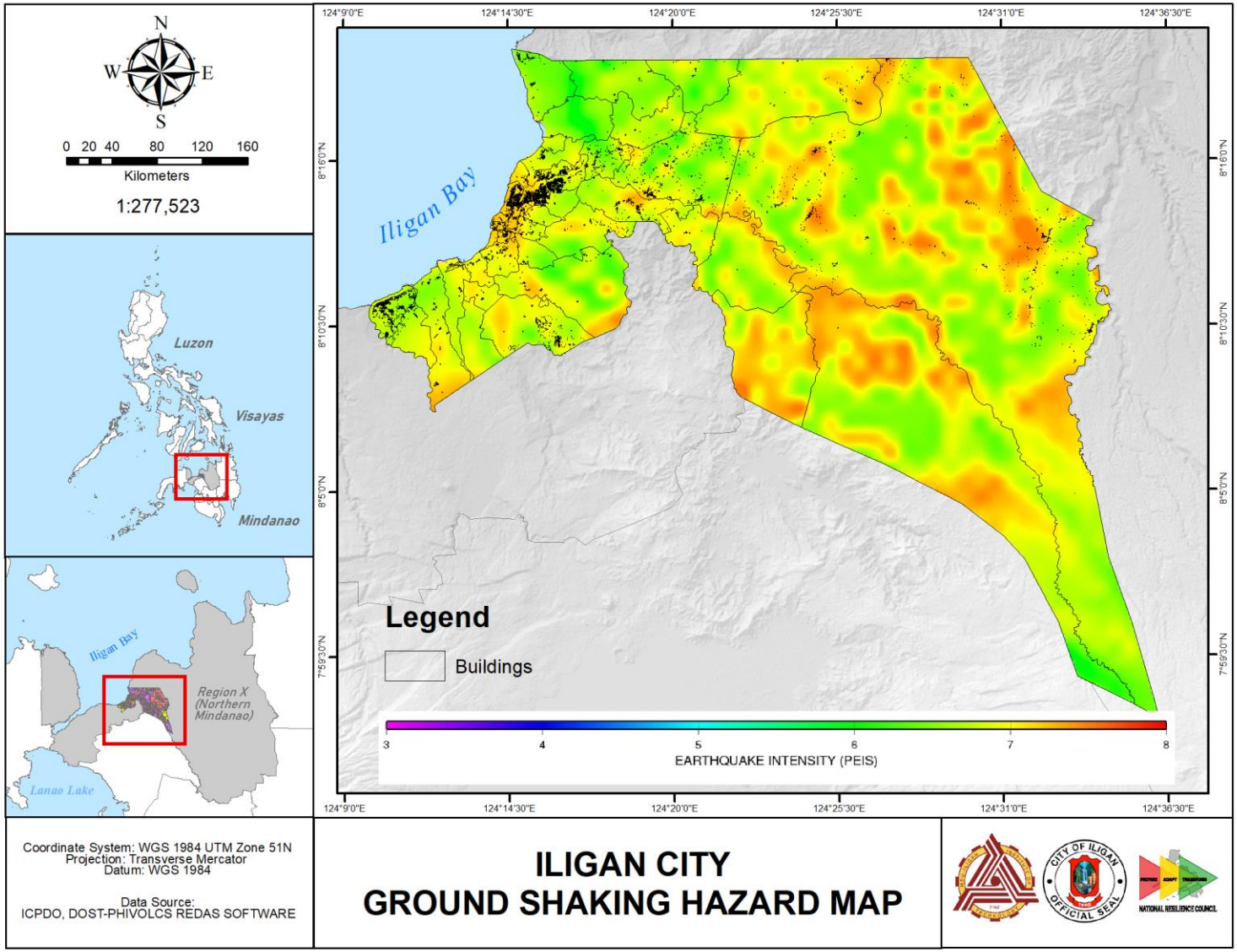


Figure 38. **Ground Shaking** Susceptibility on **Urban Use Areas** in Iligan City

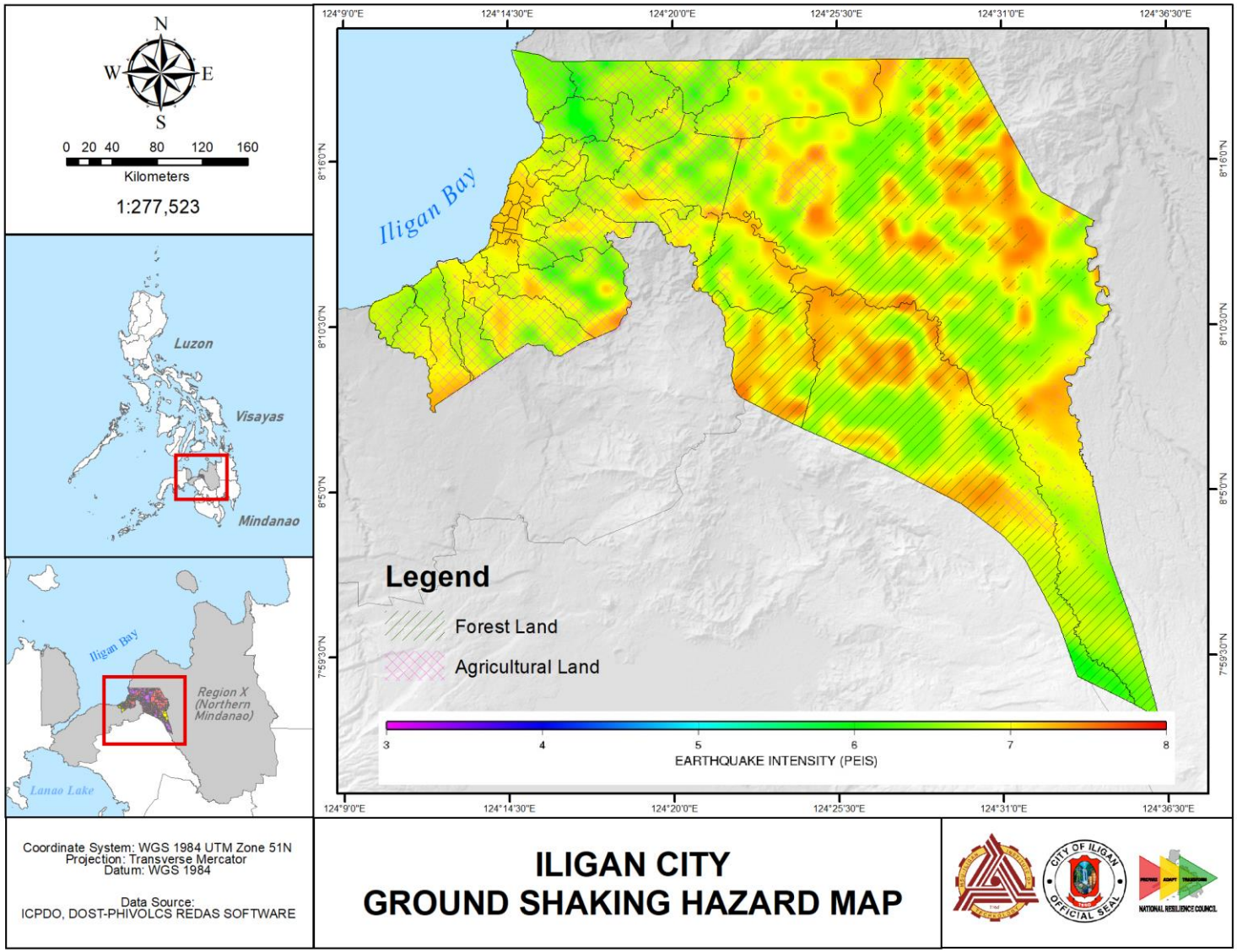


Figure 39. **Ground Shaking** Susceptibility on **Natural Resources** in Iligan City

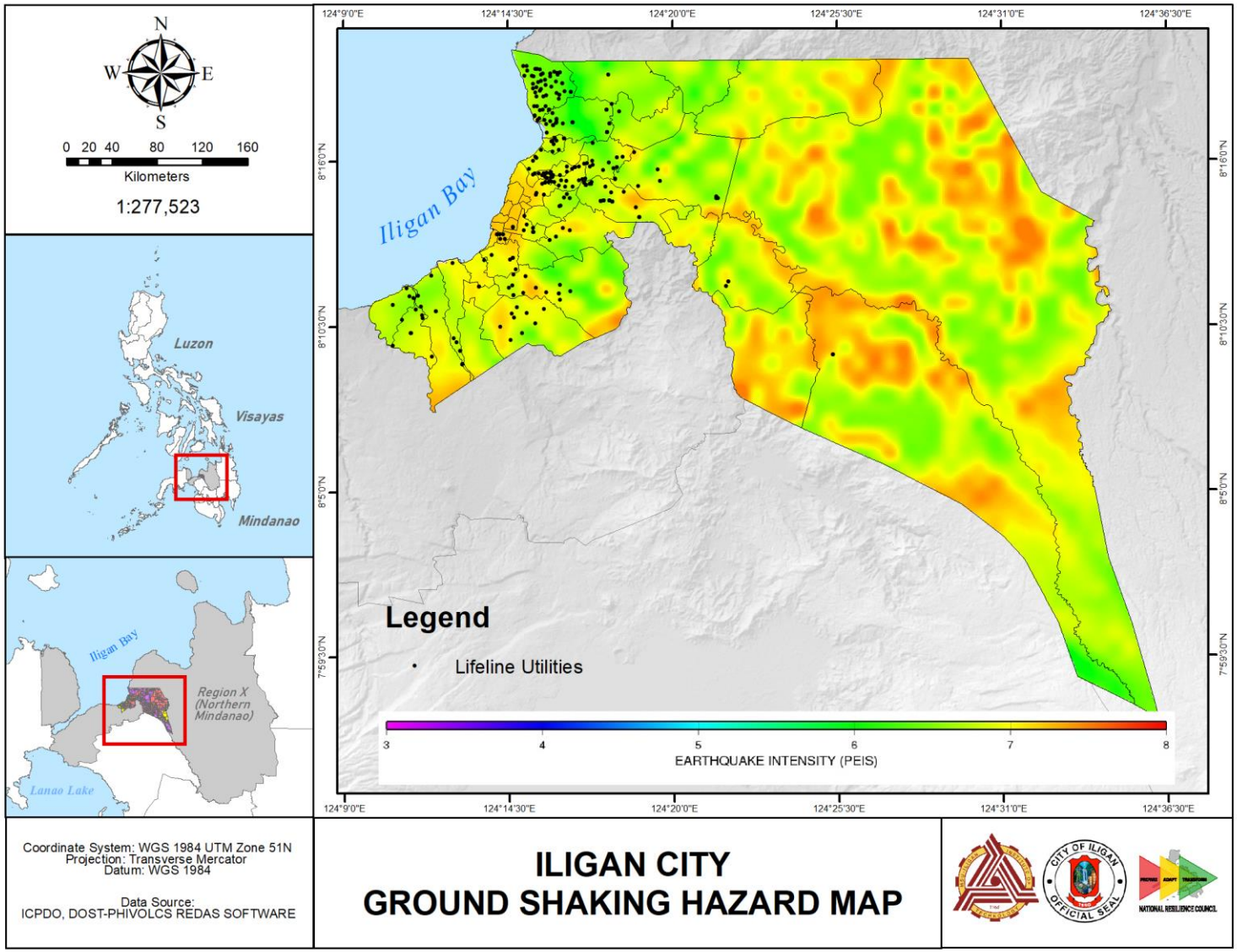


Figure 40. **Ground Shaking** Susceptibility on **Lifeline Utilities** in Iligan City

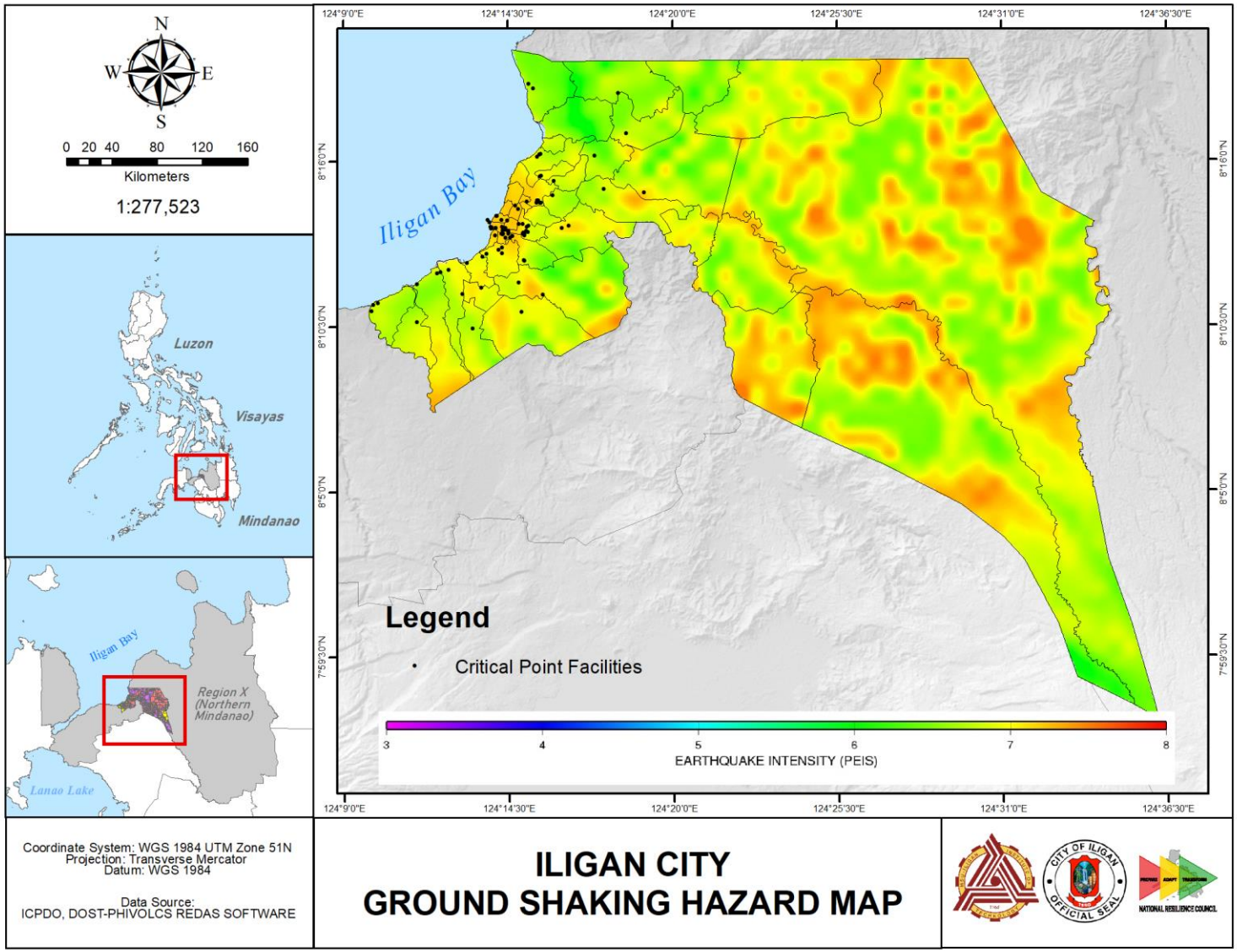


Figure 41. **Ground Shaking** Susceptibility on **Critical Point Facilities** in Iligan City

The maps illustrated above are the hazard maps for ground shaking that is most likely to happen in Iligan, but several of these were small magnitude of which its occurrence are minor except in the earthquake recorded in the 1955 that led to an immense damage in Northern Mindanao, including Iligan City. These exposure maps will guide policy makers, land use planners and engineers on how to mitigate the impacts of earthquake. The intensity measured in PEIS is manifested by the map to be in the range of 6 and 7, which means very strong to destructive intensity.

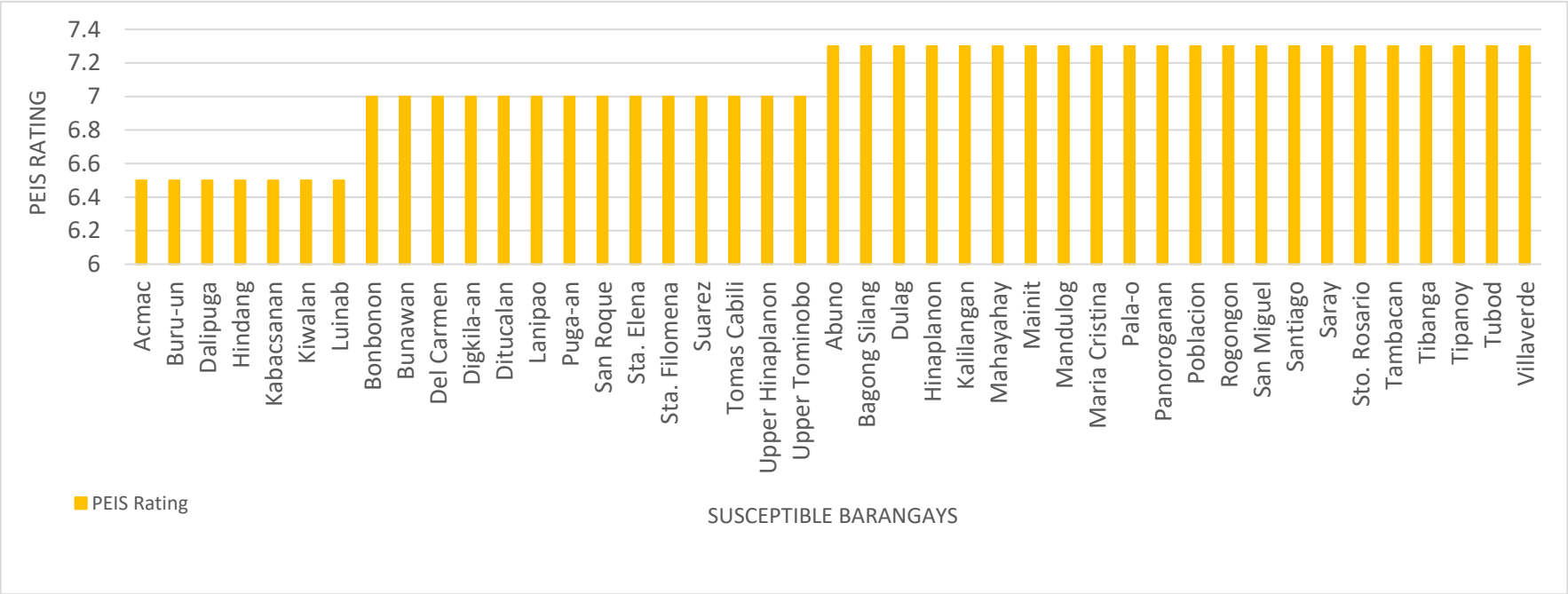


Figure 42. **PEIS Rating** on **Susceptible Barangays** to Ground Shaking

The graph above depicts the susceptible barangays along with their corresponding PEIS rating. Among the 44 barangays, 22 barangays show a PEIS rating of 7.3, 14 barangays have 7 PEIS rating, and 7 barangays show 6.5 PEIS rating.

iv. **Liquefaction** Exposure Maps in Iligan City

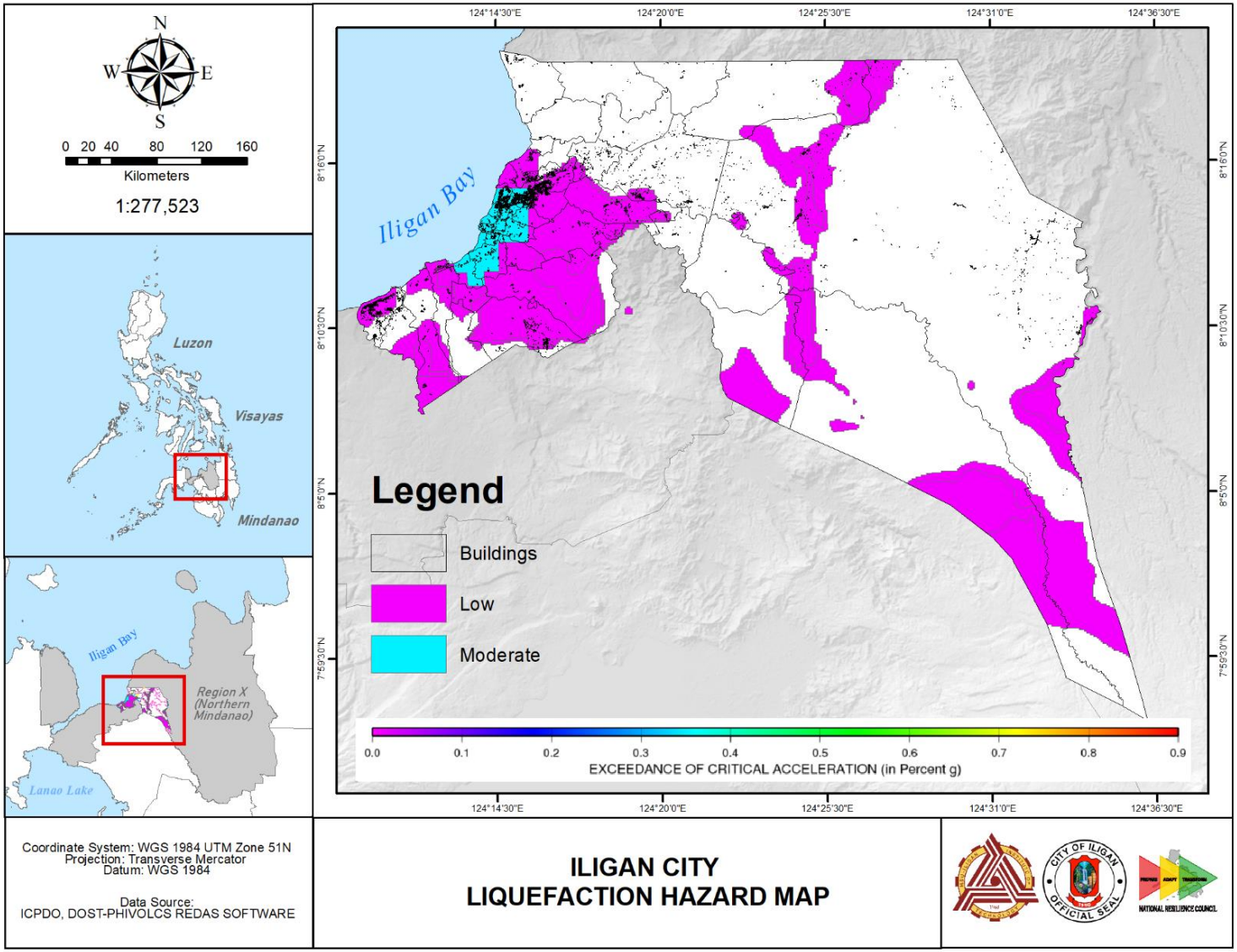


Figure 43. **Liquefaction** Susceptibility on **Urban Use Areas** in Iligan City

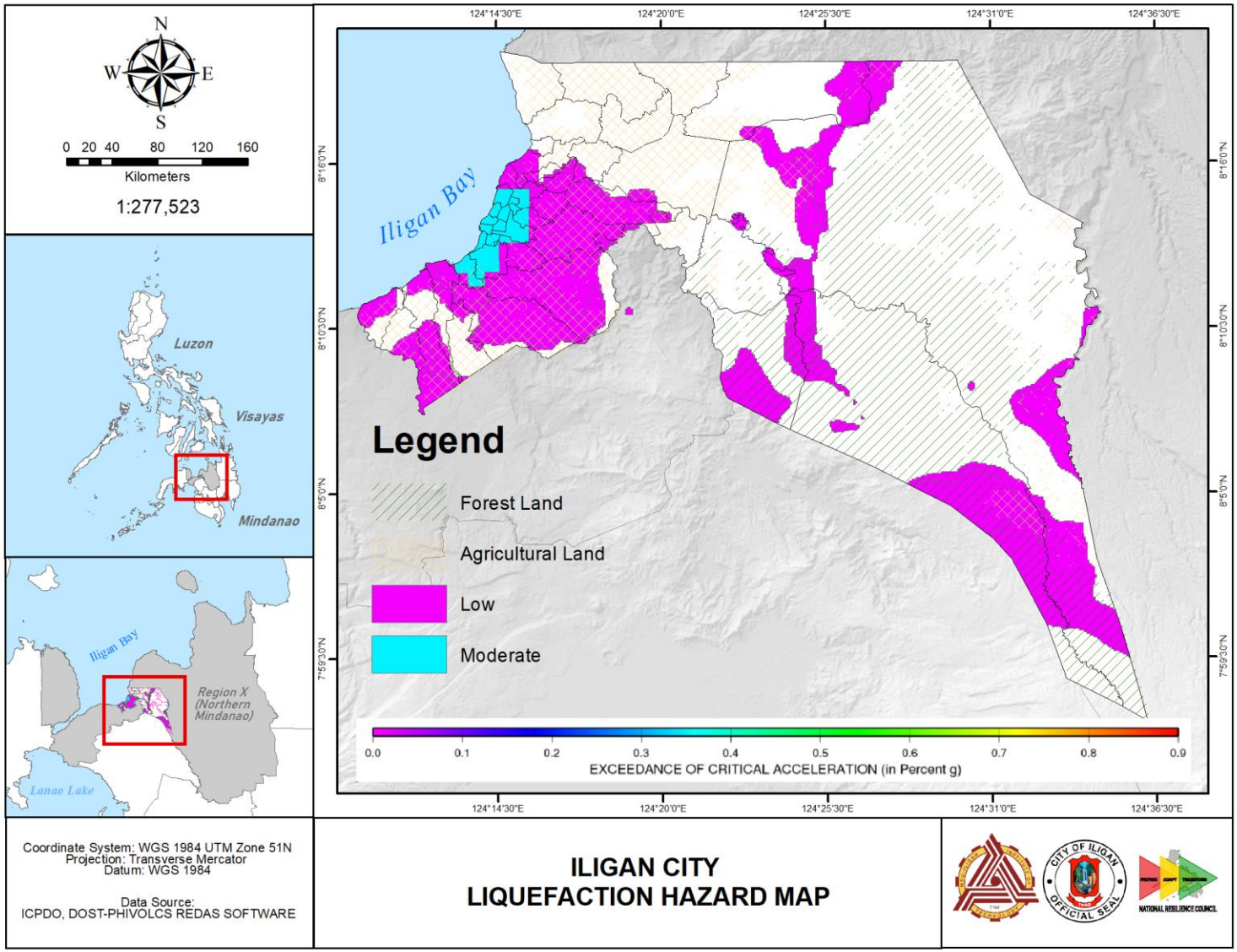


Figure 44. **Liquefaction** Susceptibility on **Natural Resources** in Iligan City

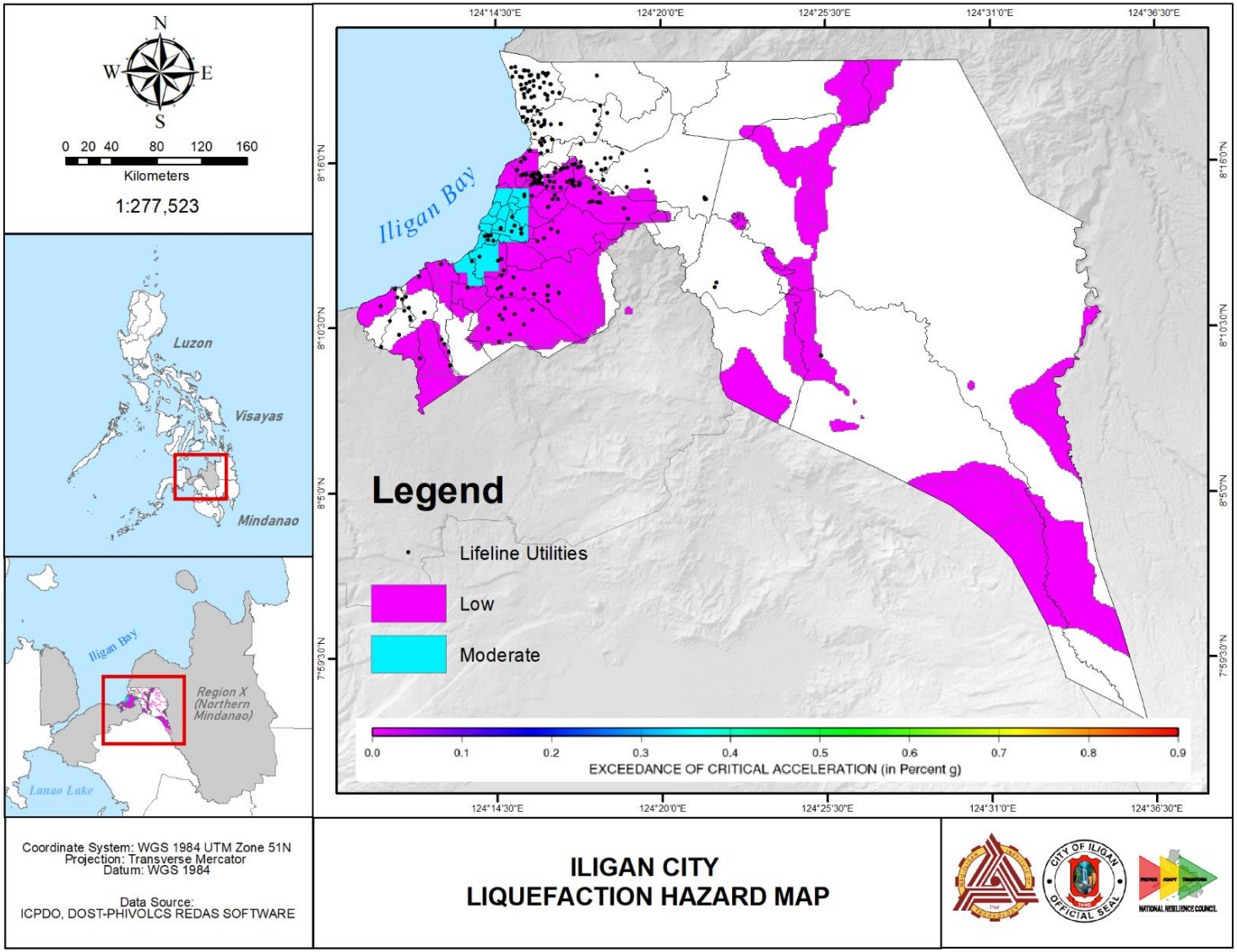


Figure 45. **Liquefaction** Susceptibility on **Lifeline Utilities** in Iligan City

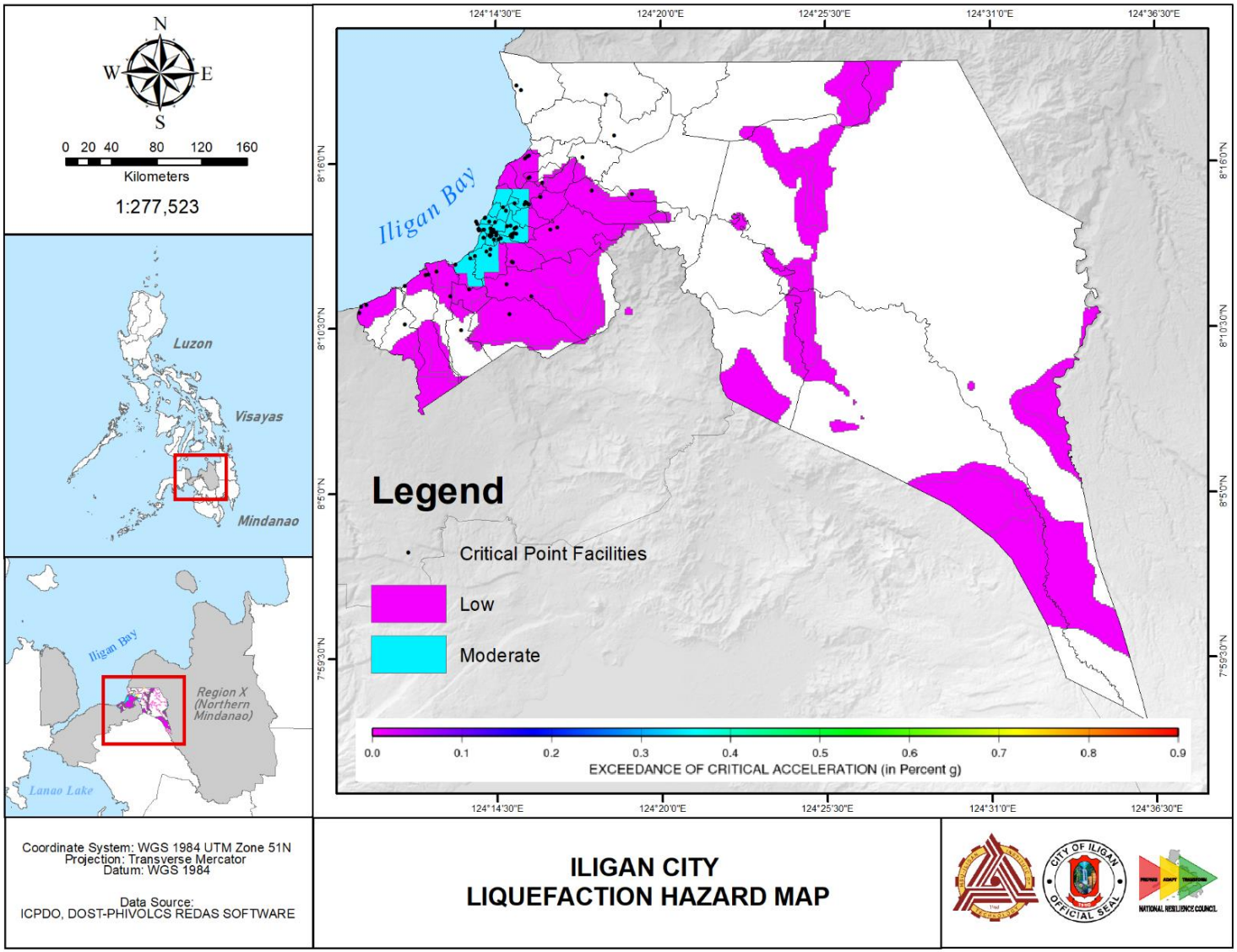


Figure 46. **Liquefaction** Susceptibility on **Critical Point Facilities** in Iligan City

Liquefaction is another undesirable geological event whose type of soil and geology softens up when ground shaking occurs. Based on Comprehensive Land Use Plan (CLUP), the history of Iligan City indicates the occurrence of liquefaction in Barangay Tambacan near the mouth of Iligan River. And the Comprehensive Master Development Plan (CMDP) in 1995, recorded 28 barangays found to be susceptible to liquefaction. However, 39 barangays found to be susceptible to liquefaction from the recent data collected. A total of 23,853 hectares are shown to have been affected which consists of 22,517 hectares of affected area on low susceptibility level, while 1,336 hectares with medium susceptibility level.

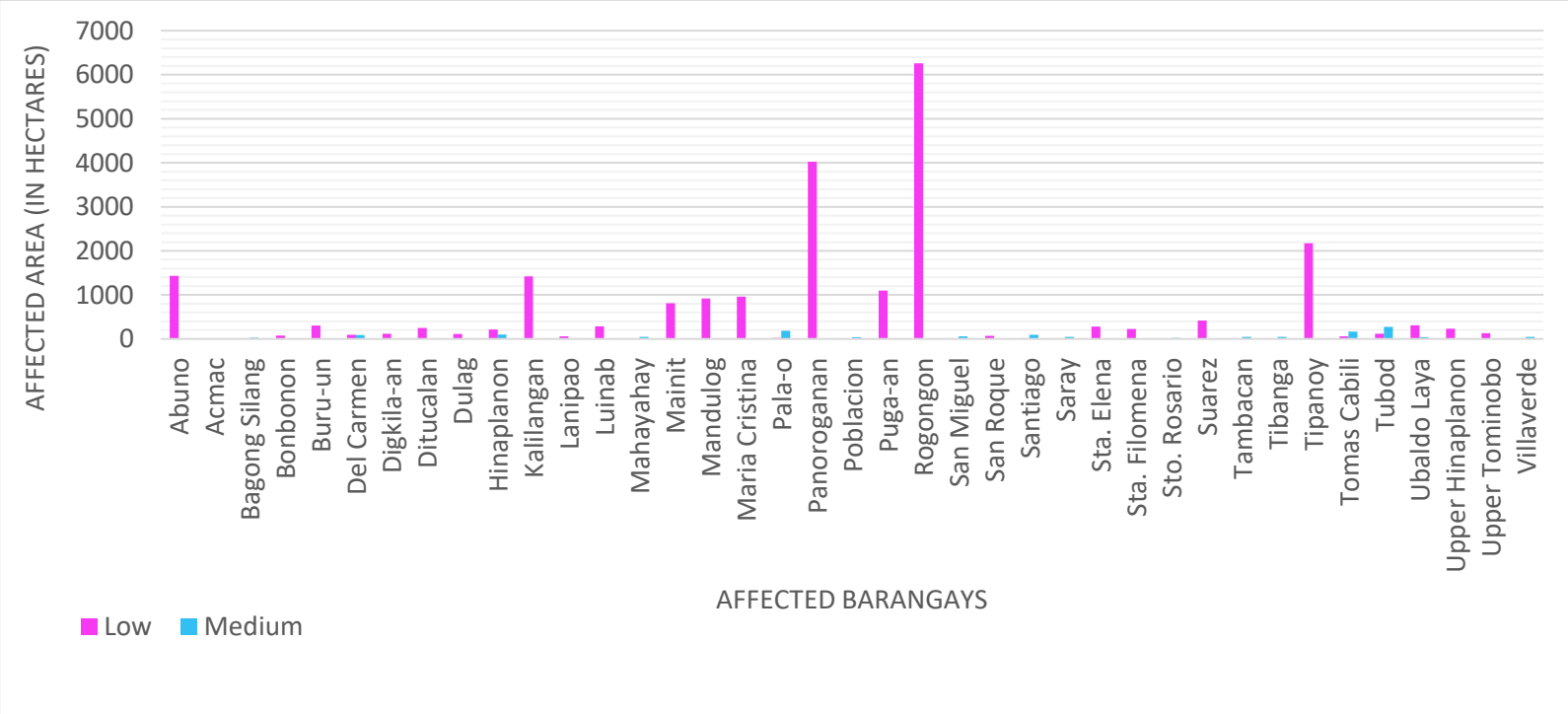


Figure 47. **Affected Areas** to **Liquefaction**

Moreover, on **low** susceptibility level, Barangay Rogongon exhibits large affected area of 6,260 hectares, followed by Panoroganan (4,023 hectares), Tipanoy (2,173 hectares), Abuno (1,435 hectares), Kalilangan (1,420 hectares), and Puga-an (1,101 hectares). Anyhow on **medium** susceptibility level, only 18 barangays show vulnerability on liquefaction. These barangays include: Tubod, Pala-o, Tomas Cabili, Hinaplanon,

Santiago, Del Carmen, San Miguel, Mahayahay, Villaverde, Tambacan, Tibanga, Saray, Poblacion, Ubaldo Laya, Bagong Silang, Sto. Rosario, Tipanoy, and Puga-an.

Table 45. Number of Affected Population on Vulnerable Barangays due to Liquefaction

Barangay	Liquefaction Susceptibility Level	Population Affected
Abuno	Low	4,925
Acmac	Low	378
Bagong Silang	Moderate	6,195
Bonbonon	Low	326
Buru-un	Low	9,454
Del Carmen	Low	4,942
Del Carmen	Moderate	4,676
Digkila-an	Low	248
Ditucalan	Low	1,767
Dulag	Low	55
Hinaplanon	Low	10,542
Hinaplanon	Moderate	4,900
Kalilangan	Low	734
Lanipao	Low	242
Luinab	Low	11,125
Mahayahay	Moderate	7,970
Mainit	Low	555
Mandulog	Low	3,529
Maria Cristina	Low	8,737
Pala-o	Low	1,285
Pala-o	Moderate	9,507
Panoroganan	Low	468
Poblacion	Moderate	3,647
Puga-an	Low	7,546
Puga-an	Moderate	7
Rogongon	Low	1,378
San Miguel	Moderate	3,816
San Roque	Low	2,760
Santiago	Low	1,512
Santiago	Moderate	7,726
Saray	Moderate	9,477
Sta. Elena	Low	10,708
Sta. Elena	Moderate	0
Sta. Filomena	Low	3,453
Sta. Filomena	Moderate	0
Sto. Rosario	Moderate	1,830
Suarez	Low	12,701
Suarez	Moderate	0

Barangay	Liquefaction Susceptibility Level	Population Affected
Tambacan	Moderate	19,366
Tibanga	Moderate	8,169
Tipanoy	Low	13,081
Tipanoy	Moderate	42
Tomas Cabili	Low	2,511
Tomas Cabili	Moderate	7,188
Tubod	Low	10,088
Tubod	Moderate	23,203
Ubaldo Laya	Low	12,091
Ubaldo Laya	Moderate	1,511
Upper Hinaplanon	Low	6,237
Upper Tominobo	Low	667
Villaverde	Moderate	5,527

Table 46. Number of Affected Buildings on Vulnerable Barangays due to Liquefaction

Barangay	Liquefaction Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Abuno	Low	4	0	0	0	0	0	0	86
Acmac	Low								
Bagong Silang	Moderate								
Bonbonon	Low	11	0	0	0	0	0	307	49
Buru-un	Low	14	0	0	0	0	0	143	786
Del Carmen	Low								
Del Carmen	Moderate								
Digkila-an	Low	64	0	1	2	0	0	364	1018
Ditucalan	Low	22	0	0	0	0	0	17	115
Dulag	Low	8	0	0	0	0	0	8	0
Hinaplanon	Low								
Hinaplanon	Moderate								
Kalilangan	Low								
Lanipao	Low	15	0	0	0	0	0	0	122
Luinab	Low								

Barangay	Liquefaction Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Mahayahay	Moderate								
Mainit	Low	21	0	0	0	0	0	50	40
Mandulog	Low	9	0	0	0	0	0	1	323
Maria Cristina	Low	29	0	1	1	2	0	4	34
Pala-o	Low								
Pala-o	Moderate								
Panoroganan	Low	5	0	0	0	0	0	0	4
Poblacion	Moderate								
Puga-an	Low								
Puga-an	Moderate	22	0	1	0	0	0	0	250
Rogongon	Low	48	0	1	2	0	0	608	1852
San Miguel	Moderate								
San Roque	Low	0	0	0	0	0	0	2	0
Santiago	Low								
Santiago	Moderate								
Saray	Moderate								

Barangay	Liquefaction Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Sta. Elena	Low								
Sta. Elena	Moderate								
Sta. Filomena	Low	0	0	0	0	0	0	4	0
Sta. Filomena	Moderate								
Sto. Rosario	Moderate								
Suarez	Low								
Suarez	Moderate								
Tambacan	Moderate								
Tibanga	Moderate								
Tipanoy	Low								
Tipanoy	Moderate	45	0	1	1	0	0	3	75
Tomas Cabili	Low								
Tomas Cabili	Moderate								
Tubod	Low								
Tubod	Moderate	0	0	0	0	0	0	0	1
Ubaldo Laya	Low								

Barangay	Liquefaction Susceptibility Level	Buildings							
		Academic Institutions	Commercial	Government	Religious Institutions	Industrial	Hospitals	Residential	Unclassified
Ubaldo Laya	Moderate								
Upper Hinaplanon	Low	0	0	0	0	0	0	47	36
Upper Tominobo	Low	9	0	0	0	0	0	0	0
Villaverde	Moderate								

Table 47. Number of Affected Natural Resources on Vulnerable Barangays due to Liquefaction

Barangay	Liquefaction Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
Abuno	Low	1,257	0
Acmac	Low		
Bagong Silang	Moderate	1	0
Bonbonon	Low	43	0
Buru-un	Low	164	0
Del Carmen	Low	68	0
Del Carmen	Moderate	21	0
Digkila-an	Low	90	0
Ditucalan	Low	168	0
Dulag	Low	2	1
Hinaplanon	Low	57	0
Hinaplanon	Moderate	18	0
Kalilangan	Low	0	1,319
Lanipao	Low	46	0
Luinab	Low	174	0
Mahayahay	Moderate	2	0
Mainit	Low	144	0
Mandulog	Low	766	0
Maria Cristina	Low	647	0
Pala-o	Low	21	0
Pala-o	Moderate	7	0
Panoroganan	Low	575	2,852
Poblacion	Moderate		
Puga-an	Low	1,035	0
Puga-an	Moderate		
Rogongon	Low	1,004	1,765

Barangay	Liquefaction Susceptibility Level	Natural Resources (has.)	
		Agricultural Land	Forest Land
San Miguel	Moderate		
San Roque	Low	39	0
Santiago	Low	1	0
Santiago	Moderate	1	0
Saray	Moderate		
Sta. Elena	Low	219	0
Sta. Elena	Moderate		
Sta. Filomena	Low	79	0
Sta. Filomena	Moderate		
Sto. Rosario	Moderate		
Suarez	Low	185	0
Suarez	Moderate		
Tambacan	Moderate	2	0
Tibanga	Moderate		
Tipanoy	Low	1,545	0
Tipanoy	Moderate	7	0
Tomas Cabili	Low	41	0
Tomas Cabili	Moderate	70	0
Tubod	Low	29	0
Tubod	Moderate	60	0
Ubaldo Laya	Low	213	0
Ubaldo Laya	Moderate	6	0
Upper Hinaplanon	Low	119	0
Upper Tominobo	Low	116	0
Villaverde	Moderate		

Table 48. List of Affected Lifeline Utilities to Liquefaction

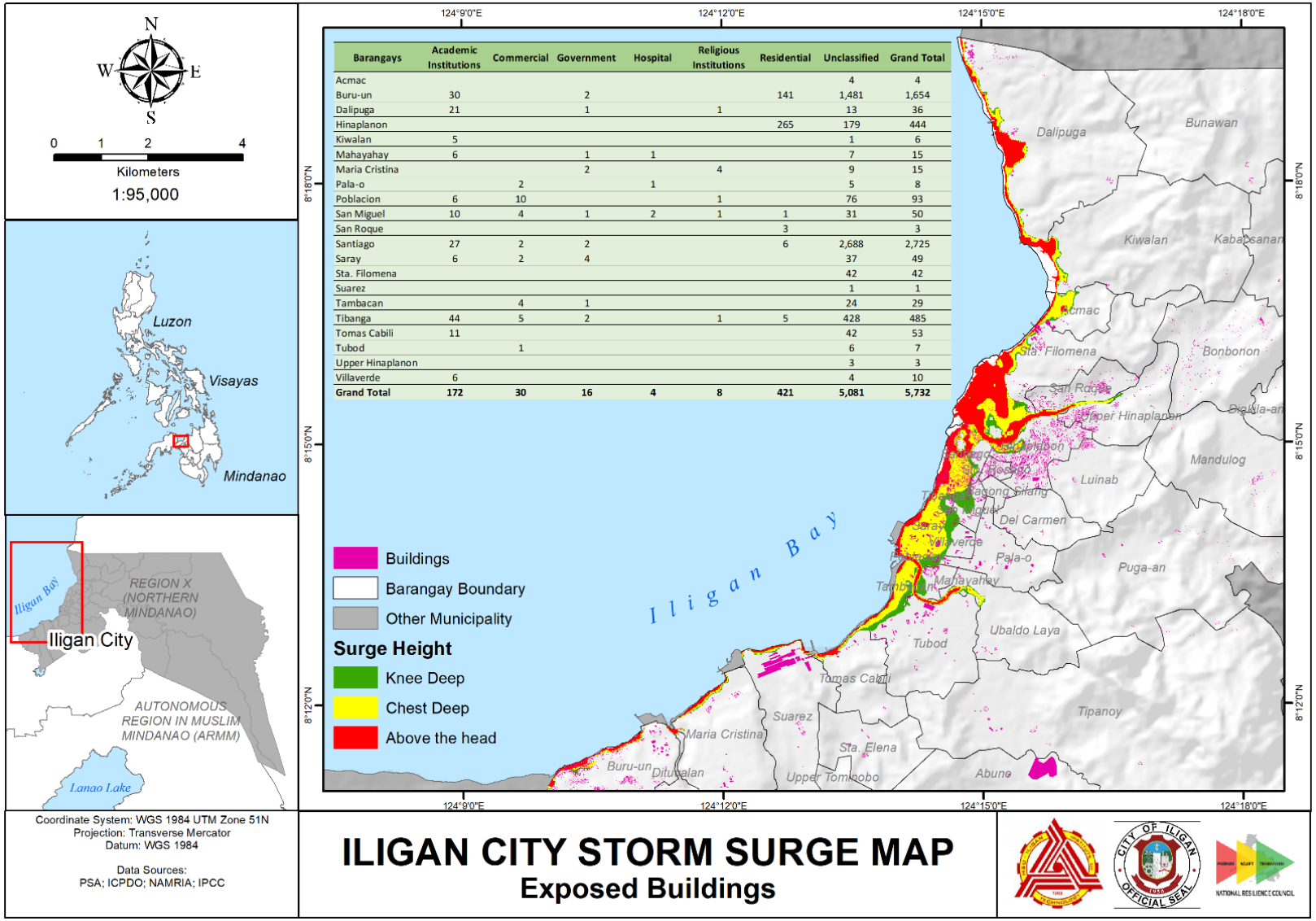
	Lifeline Utilities	Barangay
Communication	GSM	Hinaplanon
Power Station	Ma. Cristina Chemical Industrial	Buru-un
	Agus 5 Hydro Power Plant	Ditucalan
	National Steel Corp.	Suarez
	Overton Substation	Maria Cristina
	Pala-o ABS	Palao
	ILPI (M3)	Villa Verde
	ILICOCO-SMC	Sta. Filomena
Water & Groundwater Sources	Spring	Buru-un
	Wells	Abuno
	Wells	Tipanoy
	Pump station	Tomas Cabili
	Wells	Tubod
	Wells	Mahayhay
	Well	Tambacan
	Wells	Puga-an
	Wells	Palao
	Del Carmen In-line pump	Del Carmen
	Groundwater pump and wells	Luinab
	Groundwater pump and wells	Hinaplanon
		Upper Hinaplanon
	NMPC Pumping Station, water sources, and wells	San Roque
	Wells	Sta. Filomena
		Acmac
	Water sources and wells	Mandulog
	Springs	Panoroganan

Table 49. List of Affected Critical Point Facilities to Liquefaction

	Critical Point Facilities	Barangay
Hospitals	Dr. Uy Hospital, Inc.	Poblacion
	St. Marys Maternity Hospital	Villa Verde
	St Anthony Maternity Hospital	Poblacion
	Mercy Community Hospital	Tubod
	Iligan Medical Center	Palao
	Gregorio T. Lluch Memorial Hos	Palao
	E & R Hopital	Saray
	Mindanao Sanitarium & Hospital	San Miguel
Fire Station	Iligan City Fire Station	Poblacion
	Saray Fire Station	Saray
	Sta. Filomena Fire Station	Sta. Filomena
	Buru-un Fire Station	Buru-un
Police Station	Mobile Group	Tipanoy

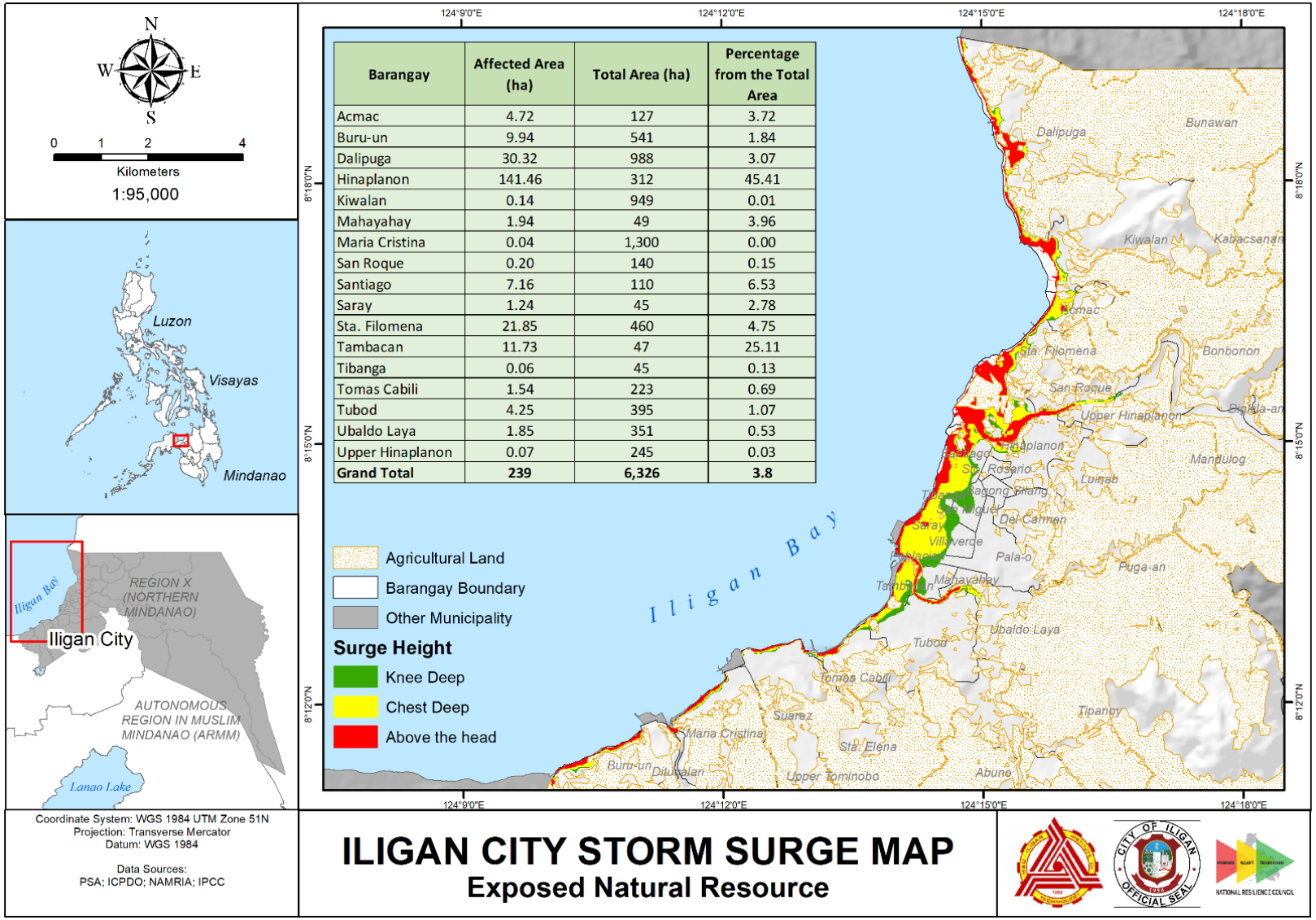
	Critical Point Facilities	Barangay
	Police Station	Maria Cristina
	Police Station	Tubod
	Police Station	Poblacion
	City Police Office	Poblacion
	Traffic Station	Hinaplanon
	Police Station	Sta. Filomena
Government Offices	Slaughter House	Ubaldo Laya
	City Veterinarian's Office	Ubaldo Laya
	CMO-Public Library	Mahayahay
	EEDMO	Mahayahay
	City Health Office	Palao
	EEDMO-Supermarket	Palao
	City Engineer's Office	Palao
	ABC Hall	Palao
	Iligan City Waterworks	Palao
	City Assessors Building	Palao
	City Administrator-Tourism	Palao
	City Hall Building	Palao
	City Civil Registrar's Office	Palao
	City Social Welfare & Dev	Saray
	City Agriculturist's Office	Hinaplanon
	Popcom Office	Hinaplanon
Industrial	AZKCON Metals-Iligan, Inc.	Tipanoy
	London Biscuit Co	Santiago
	SMC Iligan Coconut Oil Mill	Sta. Filomena
	CMI-PLant 20	Sta. Filomena
	National Steel Corp	Suarez
	Billet Steel Plant	Maria Cristina
	Maria Cristina Chemical Indust	Buru-un
Transportation	North Bound Terminal	Hinaplanon
	South Bound Terminal	Tubod
Public Market	Palao Market	Palao
	Tambo Public Market	Hinaplanon
	Wet Market	Poblacion
	Central Market	Poblacion

v. Storm Surge Exposure Map in Iligan City



Barangays	Academic Institutions	Commercial	Government	Hospital	Religious Institutions	Residential	Unclassified	Grand Total
Acmac							4	4
Buru-un	30		2			141	1,481	1,654
Dalipuga	21		1		1		13	36
Hinaplanon						265	179	444
Kiwalan	5						1	6
Mahayahay	6		1	1			7	15
Maria Cristina			2		4		9	15
Pala-o		2		1			5	8
Poblacion	6	10			1		76	93
San Miguel	10	4	1	2	1	1	31	50
San Roque						3		3
Santiago	27	2	2			6	2,688	2,725
Saray	6	2	4				37	49
Sta. Filomena							42	42
Suarez							1	1
Tambacan		4	1				24	29
Tibanga	44	5	2		1	5	428	485
Tomas Cabili	11						42	53
Tubod		1					6	7
Upper Hinaplanon							3	3
Villaverde	6						4	10
Grand Total	**172**	**30**	**16**	**4**	**8**	**421**	**5,081**	**5,732**

Figure 48. **Storm Surge** Exposure Map on **Urban Use Areas** in Iligan City



Barangay	Affected Area (ha)	Total Area (ha)	Percentage from the Total Area
Acmac	4.72	127	3.72
Buru-un	9.94	541	1.84
Dalipuga	30.32	988	3.07
Hinaplanon	141.46	312	45.41
Kiwalan	0.14	949	0.01
Mahayahay	1.94	49	3.96
Maria Cristina	0.04	1,300	0.00
San Roque	0.20	140	0.15
Santiago	7.16	110	6.53
Saray	1.24	45	2.78
Sta. Filomena	21.85	460	4.75
Tambacan	11.73	47	25.11
Tibanga	0.06	45	0.13
Tomas Cabili	1.54	223	0.69
Tubod	4.25	395	1.07
Ubaldo Laya	1.85	351	0.53
Upper Hinaplanon	0.07	245	0.03
Grand Total	**239**	**6,326**	**3.8**

Coordinate System: WGS 1984 UTM Zone 51N
Projection: Transverse Mercator
Datum: WGS 1984

Data Sources:
PSA; ICPDO; NAMRIA; IPCC

ILIGAN CITY STORM SURGE MAP
Exposed Natural Resource

Figure 49. **Storm Surge** Exposure Map on **Natural Resources** in Iligan City

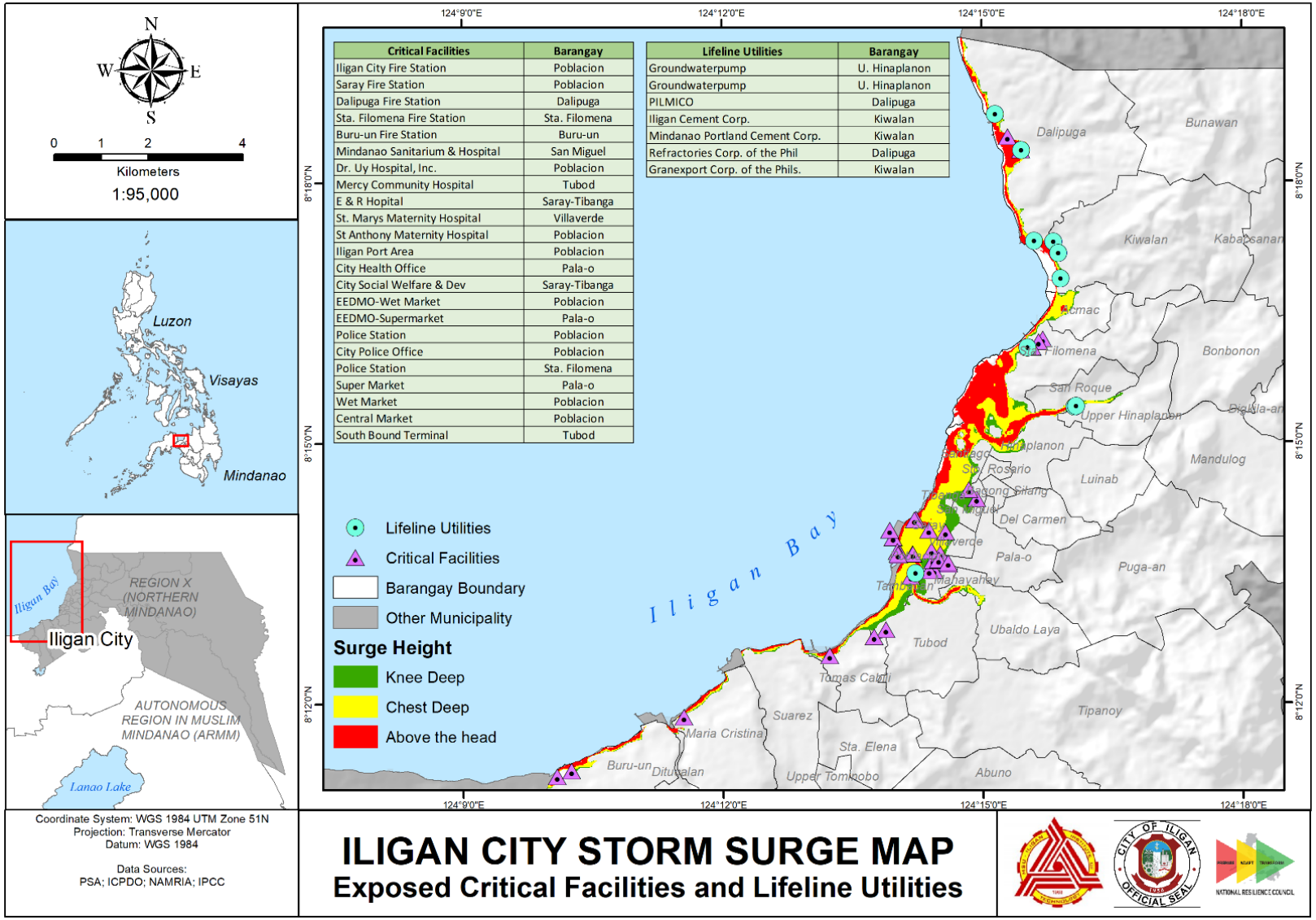
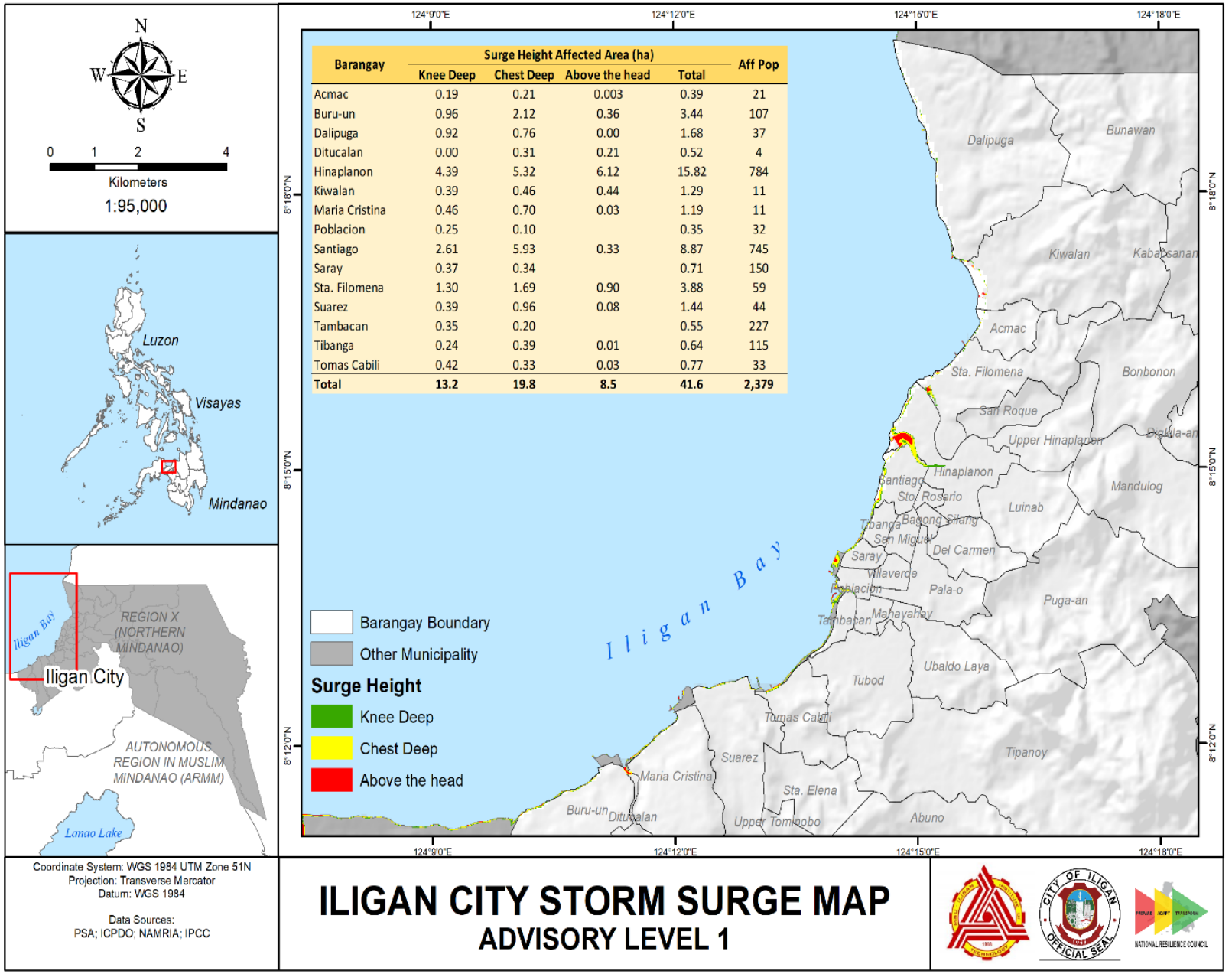
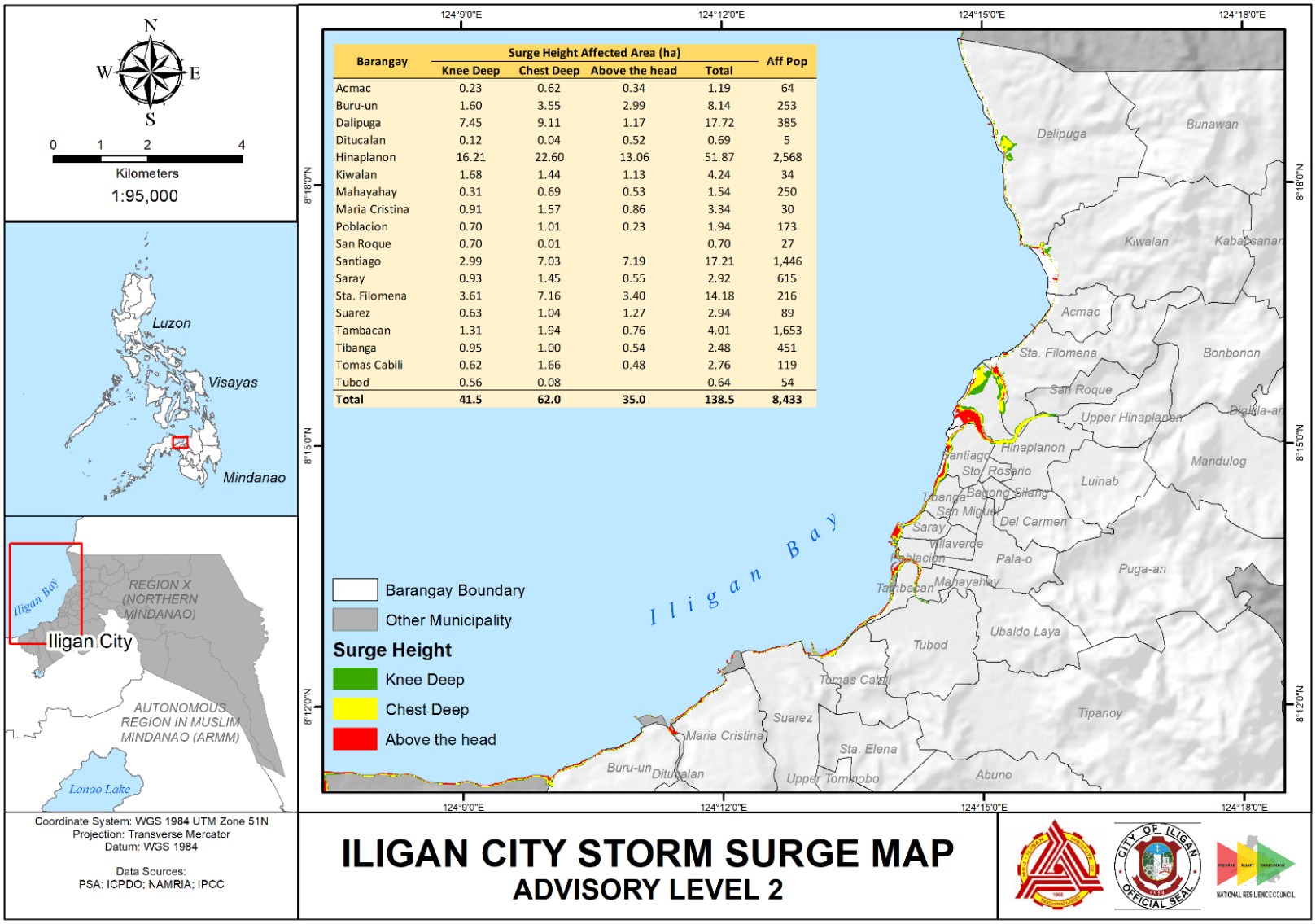


Figure 50. **Storm Surge** Exposure Map
on **Critical Point Facilities** and **Lifeline Utilities** in Iligan City



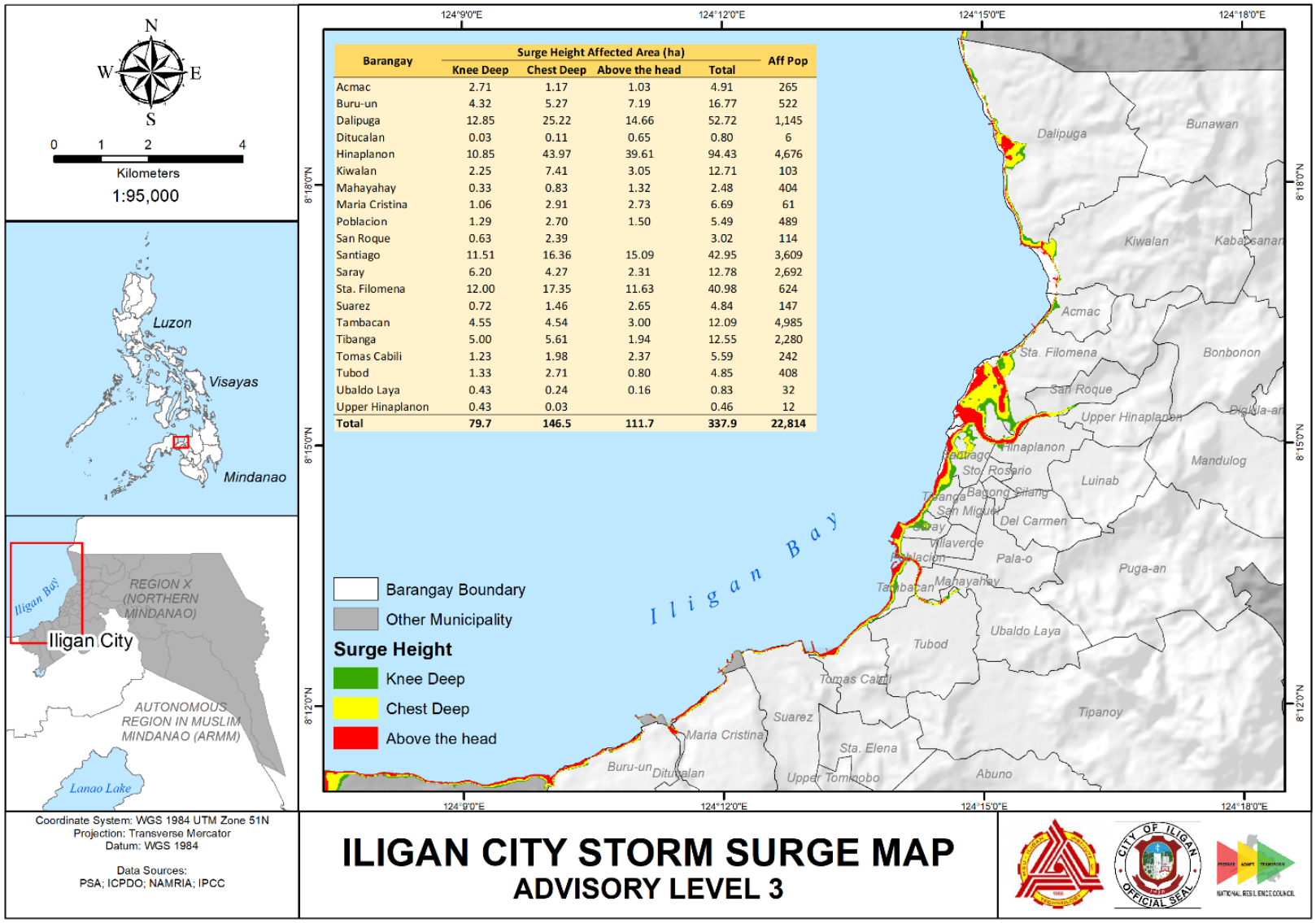
Barangay	Surge Height Affected Area (ha)				Aff Pop
	Knee Deep	Chest Deep	Above the head	Total	
Acmac	0.19	0.21	0.003	0.39	21
Buru-un	0.96	2.12	0.36	3.44	107
Dalipuga	0.92	0.76	0.00	1.68	37
Ditucalan	0.00	0.31	0.21	0.52	4
Hinaplanon	4.39	5.32	6.12	15.82	784
Kiwalan	0.39	0.46	0.44	1.29	11
Maria Cristina	0.46	0.70	0.03	1.19	11
Poblacion	0.25	0.10		0.35	32
Santiago	2.61	5.93	0.33	8.87	745
Saray	0.37	0.34		0.71	150
Sta. Filomena	1.30	1.69	0.90	3.88	59
Suarez	0.39	0.96	0.08	1.44	44
Tambacan	0.35	0.20		0.55	227
Tibanga	0.24	0.39	0.01	0.64	115
Tomas Cabili	0.42	0.33	0.03	0.77	33
Total	**13.2**	**19.8**	**8.5**	**41.6**	**2,379**

Figure 51. **Storm Surge Advisory Level 1** Exposure Map on Affected Barangays in Iligan City



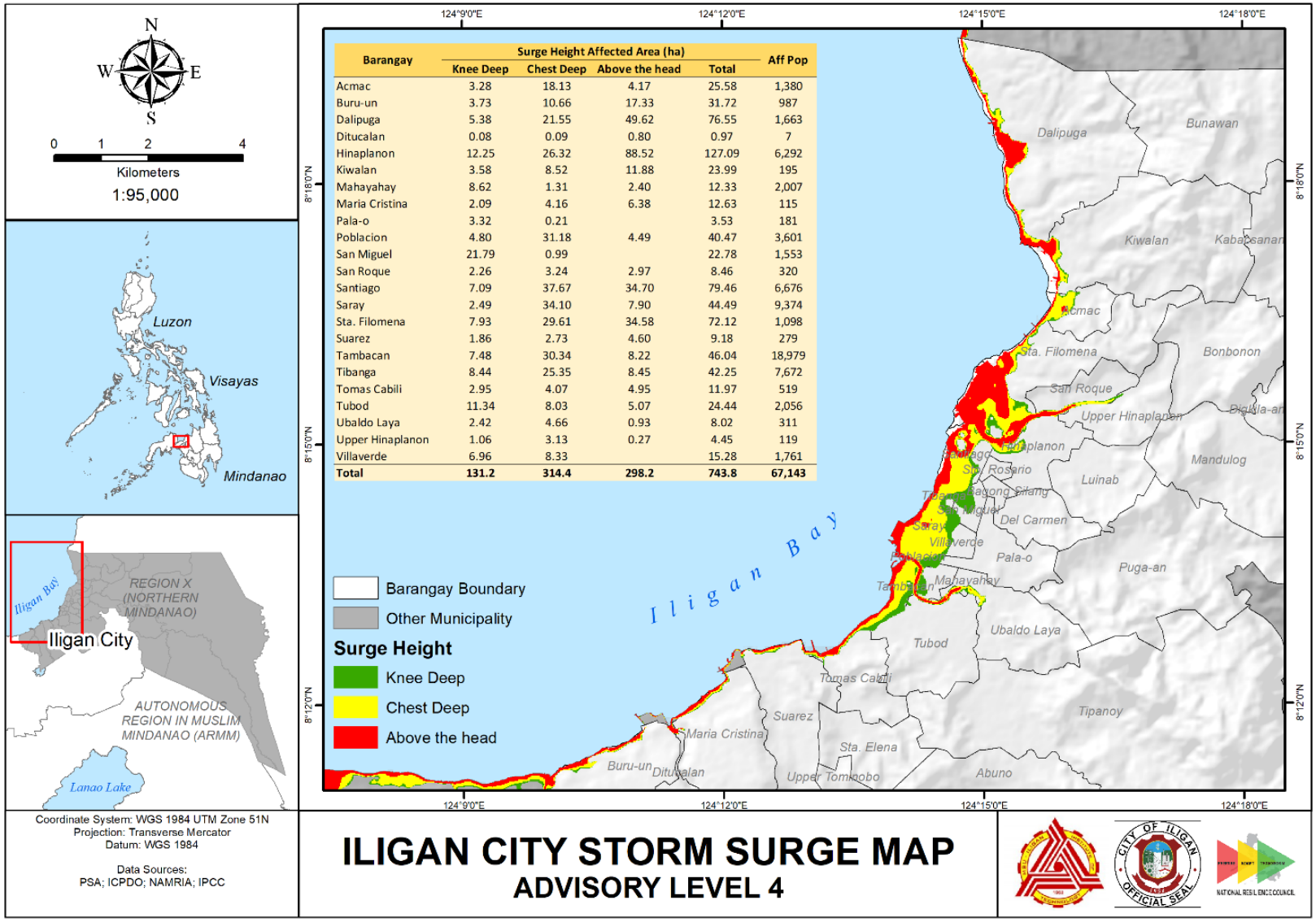
Barangay	Surge Height Affected Area (ha)				Aff Pop
	Knee Deep	Chest Deep	Above the head	Total	
Acmac	0.23	0.62	0.34	1.19	64
Buru-un	1.60	3.55	2.99	8.14	253
Dalipuga	7.45	9.11	1.17	17.72	385
Ditucalan	0.12	0.04	0.52	0.69	5
Hinaplanon	16.21	22.60	13.06	51.87	2,568
Kiwalan	1.68	1.44	1.13	4.24	34
Mahayahay	0.31	0.69	0.53	1.54	250
Maria Cristina	0.91	1.57	0.86	3.34	30
Poblacion	0.70	1.01	0.23	1.94	173
San Roque	0.70	0.01		0.70	27
Santiago	2.99	7.03	7.19	17.21	1,446
Saray	0.93	1.45	0.55	2.92	615
Sta. Filomena	3.61	7.16	3.40	14.18	216
Suarez	0.63	1.04	1.27	2.94	89
Tambacan	1.31	1.94	0.76	4.01	1,653
Tibanga	0.95	1.00	0.54	2.48	451
Tomas Cabili	0.62	1.66	0.48	2.76	119
Tubod	0.56	0.08		0.64	54
Total	**41.5**	**62.0**	**35.0**	**138.5**	**8,433**

Figure 52. **Storm Surge Advisory Level 2** Exposure Map on Affected Barangay Areas in Iligan City



Barangay	Surge Height Affected Area (ha)				Aff Pop
	Knee Deep	Chest Deep	Above the head	Total	
Acmac	2.71	1.17	1.03	4.91	265
Buru-un	4.32	5.27	7.19	16.77	522
Dalipuga	12.85	25.22	14.66	52.72	1,145
Ditucalan	0.03	0.11	0.65	0.80	6
Hinaplanon	10.85	43.97	39.61	94.43	4,676
Kiwalan	2.25	7.41	3.05	12.71	103
Mahayahay	0.33	0.83	1.32	2.48	404
Maria Cristina	1.06	2.91	2.73	6.69	61
Poblacion	1.29	2.70	1.50	5.49	489
San Roque	0.63	2.39		3.02	114
Santiago	11.51	16.36	15.09	42.95	3,609
Saray	6.20	4.27	2.31	12.78	2,692
Sta. Filomena	12.00	17.35	11.63	40.98	624
Suarez	0.72	1.46	2.65	4.84	147
Tambacan	4.55	4.54	3.00	12.09	4,985
Tibanga	5.00	5.61	1.94	12.55	2,280
Tomas Cabili	1.23	1.98	2.37	5.59	242
Tubod	1.33	2.71	0.80	4.85	408
Ubaldo Laya	0.43	0.24	0.16	0.83	32
Upper Hinaplanon	0.43	0.03		0.46	12
Total	**79.7**	**146.5**	**111.7**	**337.9**	**22,814**

Figure 53. **Storm Surge Advisory Level 3** Exposure Map on Affected Barangays in Iligan City



Barangay	Surge Height Affected Area (ha)				Aff Pop
	Knee Deep	Chest Deep	Above the head	Total	
Acmac	3.28	18.13	4.17	25.58	1,380
Buru-un	3.73	10.66	17.33	31.72	987
Dalipuga	5.38	21.55	49.62	76.55	1,663
Ditucalan	0.08	0.09	0.80	0.97	7
Hinaplanon	12.25	26.32	88.52	127.09	6,292
Kiwalan	3.58	8.52	11.88	23.99	195
Mahayahay	8.62	1.31	2.40	12.33	2,007
Maria Cristina	2.09	4.16	6.38	12.63	115
Pala-o	3.32	0.21		3.53	181
Poblacion	4.80	31.18	4.49	40.47	3,601
San Miguel	21.79	0.99		22.78	1,553
San Roque	2.26	3.24	2.97	8.46	320
Santiago	7.09	37.67	34.70	79.46	6,676
Saray	2.49	34.10	7.90	44.49	9,374
Sta. Filomena	7.93	29.61	34.58	72.12	1,098
Suarez	1.86	2.73	4.60	9.18	279
Tambacan	7.48	30.34	8.22	46.04	18,979
Tibanga	8.44	25.35	8.45	42.25	7,672
Tomas Cabili	2.95	4.07	4.95	11.97	519
Tubod	11.34	8.03	5.07	24.44	2,056
Ubaldo Laya	2.42	4.66	0.93	8.02	311
Upper Hinaplanon	1.06	3.13	0.27	4.45	119
Villaverde	6.96	8.33		15.28	1,761
Total	**131.2**	**314.4**	**298.2**	**743.8**	**67,143**

Figure 54. **Storm Surge Advisory Level 4** Exposure Map on Affected Barangay Areas in Iligan City

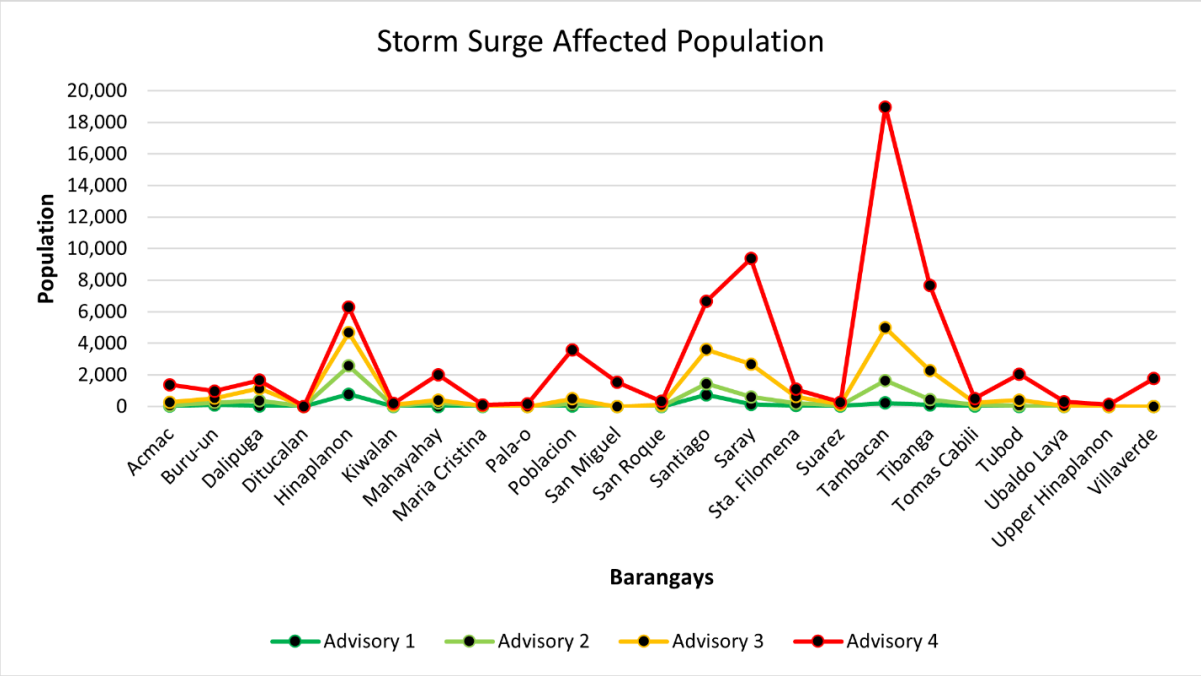


Figure 55. **Storm Surge Advisory 1-4 Affected Population** (per barangay)

From figures 51 to 55, it shows the exposed areas from storm surge advisory levels which has a widespread effect in Iligan City.

Advisory level 1 has 15 exposed barangays and the most exposed barangays are Barangay Hinaplanon, Santiago, Tambacan, Saray, Tibanga, and Buru-un with 784, 745, 227, 150, 115, and 107 affected population, respectively.

For **advisory level 2**, 18 barangays are exposed and the most exposed barangays are Barangay Hinaplanon, Tambacan, Santiago, Saray, Tibanga, Dalipuga, Buru-un, Mahayahay, Sta. Filomena, and Poblacion, with 2 568, 1 653, 1 446, 615, 451, 385, 253, 250, 216, and 173 affected population.

At **advisory level 3**, the most affected barangays are Barangay Tambacan, Hinaplanon, Santiago, Saray, Tibanga, Dalipuga, Sta. Filomena, and Buru-un with more than 500 affected population.

And at **advisory level 4**, the most exposed barangays having more than 1 000 affected population are Barangays Tambacan, Saray, Tibanga, Santiago, Hinaplanon, Poblacion, Tubod, Mahayahay, Villaverde, Dalipuga, San Miguel, Acmac, and Sta. Filomena.

With these recorded barangays potentially exposed and will be likely affected with large number of populations, it is important to conduct research, regulate and conduct mitigation measures on these exposed elements.

PART 5 Climate and Disaster Risk Assessment

This section discusses the assessment consolidated from the CDRA workshop up to the comprehensive exposure hazard maps with No land susceptibility on each likely affected barangay. The table below depicts the No Susceptibility land area in percentage of each barangay to each hazard. This will guide policy makers and involved agencies

Table 50. Summarized **No Susceptibility Percentage** (%) to each Barangay Land Area

Barangay	Flood	Earthquake-Induced Landslide		Rain-Induced Landslide	Liquefaction
		Wet	Dry		
Abuno	91.42	17.91	52.52	12.68	15.68
Acmac	56.73	97.64	-	47.28	94.49
Bagong Silang	0.00	-	-	-	0.00
Bonbonon	75.67	1.89	96.09	57.34	86.31
Bunawan	98.23	21.40	-	3.39	-
Buru-un	87.07	52.89	-	12.99	43.84
Dalipuga	94.13	43.67	-	7.27	-
Del Carmen	86.25	78.55	-	13.65	0.45
Digkilaan	83.51	0.00	98.92	16.13	95.70
Ditucalan	89.89	1.17	-	14.77	56.25
Dulag	95.59	0.00	48.26	5.28	95.33
Hinaplanon	4.38	-	-	97.11	0.00
Hindang	97.85	18.61	-	6.07	-
Kabacsanan	95.95	0.03	-	3.98	-
Kalilangan	99.40	0.00	12.24	1.45	57.29
Kiwalan	92.31	11.48	-	9.69	-
Lanipao	93.68	0.00	95.88	7.11	91.62
Luinab	96.85	39.77	86.34	3.35	0.00
Mahayahay	0.00	-	-	-	0.00
Mainit	95.40	24.86	99.49	5.65	79.44
Mandulog	62.52	0.00	64.04	38.76	17.60
Maria Cristina	94.46	30.79	-	10.88	26.02
Palao	79.98	98.57	-	19.42	0.00
Panoroganan	98.23	26.01	73.71	7.85	70.51
Poblacion	0.00	-	-	-	0.00
Puga-an	83.49	4.84	59.72	20.08	0.03
Rogongon	96.66	56.07	85.55	-	81.85
San Miguel	0.00	-	-	-	0.00

Barangay	Flood	Earthquake-Induced Landslide		Rain-Induced Landslide	Liquefaction
		Wet	Dry		
San Roque	18.55	99.29	-	80.71	47.84
Santiago	5.19	-	-	-	0.00
Saray	0.00	-	-	95.51	0.00
Sta. Elena	89.27	83.55	-	11.31	0.58
Sta. Filomena	71.55	92.83	-	35.72	50.71
Sto. Rosario	0.49	-	-	-	0.49
Suarez	87.94	62.52	-	13.97	31.89
Tambacan	1.59	-	-	97.86	0.00
Tibanga	1.26	-	-	86.54	0.00
Tipanoy	92.16	0.73	8.96	11.87	14.16
Tomas L. Cabili	91.05	95.53	-	8.27	0.00
Tubod	76.03	88.87	96.46	24.64	0.00
Ubaldo Laya	70.42	69.57	88.06	28.62	0.18
Upper Hinaplanon	59.55	51.38	-	40.76	4.80
Upper Tominobo	94.97	17.50	-	10.38	81.99
Villa Verde	31.09	-	-	70.76	0.00

This numbers indicate that the lesser the no susceptibility land area percentage, the higher is the susceptible land area percentage of the barangay. This was calculated by subtracting 100 percent to the land susceptibility of the barangay. For instance, Barangay Abuno has 91.42% no susceptibility land area percentage to flooding, which means that 91.42% of the land area is not susceptible to flooding.

The following are the barangays that has less than 10% no susceptibility land area to each hazard:

Flood – Bagong Silang, Hinaplanon, Mahayahay, Poblacion, San Miguel, Santiago, Saray, Sto. Rosario, Tambacan, and Tibanga;

EIL (wet) – Bonbonon, Digkilaan, Ditucalan, Dulag, Kabacsanan, Kalilangan, Lanipao, Mandulog, Puga-an, and Tipanoy;

EIL (dry) – Tipanoy

RIL – Bunawan, Dalipuga, Dulag, Hindang, Kabacsanan, Kalilangan, Kiwalan, Lanipao, Luinab, Mainit, Panoroganan, and Tomas Cabili; and

Liquefaction – Bagong Silang, Del Carmen, Hinaplanon, Luinab, Mahayahay, Palao, Poblacion, Puga-an, San Miguel, Santiago, Saray, Sta. Elena, Sto. Rosario, Tambacan, Tibanga, Tomas Cabili, Tubod, Ubaldo Laya, and Villaverde.

The table below also shows the barangays that are likely to be affected by storm surge. Included with it is the affected area in hectares and its No Susceptibility land area in percentage. Note that this assessment is per storm surge advisory levels thus the No Susceptibility percentage varies per advisory. The higher the advisory levels, the lower is its No susceptibility area percentage per susceptible barangays.

Table 51. Storm Surge Advisory Levels and its Affected Area (ha) and **No Susceptibility Percentage** (%) to each Barangay Land Areasss

Barangay	Storm Surge							
	Advisory 1		Advisory 2		Advisory 3		Advisory 4	
	Affected Area (ha)	***No Susceptibility (%)***	*Affected Area (ha)*	***No Susceptibility (%)***	*Affected Area (ha)*	*No Susceptibility (%)*	*Affected Area (ha)*	*No Susceptibility (%)*
Acmac	0.39	**99.70**	1.19	**99.06**	4.91	**96.14**	25.58	**79.87**
Buru-un	3.44	**99.36**	8.14	**98.5**	16.77	**96.9**	31.72	**94.14**
Dalipuga	1.68	**99.83**	17.72	**98.21**	52.72	**94.67**	76.55	**92.26**
Ditucalan	0.52	**99.90**	0.69	**99.88**	0.80	**99.86**	0.97	**99.83**
Hinaplanon	15.82	**94.92**	51.87	**83.35**	94.43	**69.69**	127.09	**59.2**
Kiwalan	1.29	**99.86**	4.24	**99.55**	12.71	**98.66**	23.99	**97.47**
Mahayahay	0	**100**	1.54	**96.85**	2.48	**94.93**	12.33	**74.81**
Maria Cristina	1.19	**99.91**	3.34	**99.74**	6.69	**99.49**	12.63	**99.03**
Palao	0.35	**99.83**	0.00	**100**	0.00	**100**	3.53	**98.32**
Poblacion	0.00	**100**	1.94	**95.22**	5.49	**86.48**	40.47	**0.326**
San Miguel	0.00	**100**	0.00	**100**	0.00	**100**	22.78	**59.14**
San Roque	0.00	**100**	0.70	**99.5**	3.02	**97.84**	8.46	**93.95**
Santiago	0.00	**100**	17.21	**84.3**	42.95	**60.83**	79.46	**27.53**
Saray	0.71	**98.41**	2.92	**93.45**	12.78	**71.31**	44.49	**0.13**
Sta. Filomena	3.88	**99.16**	14.18	**96.92**	40.98	**91.1**	72.12	**84.33**
Suarez	1.44	**99.76**	2.94	**99.52**	4.84	**99.21**	9.18	**98.5**
Tambacan	0.55	**98.82**	4.01	**91.42**	12.09	**74.12**	46.04	**1.464**
Tibanga	0.64	**98.56**	2.48	**94.43**	12.55	**71.82**	42.25	**5.147**
Tomas L. Cabili	0.77	**99.66**	2.76	**98.76**	5.59	**97.5**	11.97	**94.64**
Tubod	0.00	**100**	0.64	**99.84**	4.85	**98.77**	24.44	**93.82**
Ubaldo Laya	0.00	**100**	0.00	**100**	0.83	**99.76**	8.02	**97.72**
Upper Hinaplanon	0.00	**100**	0.00	**100**	0.46	**99.81**	4.45	**98.18**
Villa Verde	0.00	**100**	0.00	**100**	0.00	**100**	15.28	**68.08**

Moreover, in completion to the hazard exposed maps, the following are the specified assessments on each sector.

I. Economic Sector

Table 52. Climate and Disaster Risk Assessment on Economic Sector

Climatic & Non-Climatic Impact Drivers (Hazards)	Exposed Elements	Location Specify Exact Location	Reason/s for Vulnerability of the Exposed Elements	Capacities of Exposed and Vulnerable Elements	Immediate Influence on Exposed Human/Asset	IMPACT	Interventions	Policy
FLOODING	Market, businesses, stalls, housing, and subdivisions & Agricultural Industries	**DEL CARMEN BAYUG ISLAND BRGY. HINAPLANON BAGONG SILANG SAN MIGUEL SANTIAGO MAHAYAHAY TAMBACAN LUINAB UPPER HINAPLANON**	The roads suffered from inadequate development due to poor planning and an insufficient drainage system. Also, for agricultural industries, there is no storage facility for crops, limited flood mitigation, and no agricultural insurance.	There are insured establishments, adhering to geohazard risk compliance and zoning ordinances. As for agricultural sector, there is crop insurance and advanced crop technology.	There will be damaged market roads and even highways that would delay business operations.	**LOW INCOME GENERATION**	Construction of effective drainage system. Regular dredging of canals. Establish flood control system.	**SP Resolution for a massive reconstruction of the drainage system in Iligan.**
ILLEGAL QUARRYING	Livestock	**MANDULOG RIVER BONBONON DIGKILAAN**	Limited grazing area and soil quality	Regulated by CENRO with existing local ordinances	There will be higher incident of livestock diseases, low livestock production, and low income for farmers.	**LOWER TAX REVENUE HIGHER POVERTY INCIDENCE FOR FARMERS HIGHER PRICES FOR LIVESTOCK LOW FARMER INCOME**	Coordination with barangay officials for the strict implementation of the law. Checkpoints must be conducted.	**SP Resolution to prevent illegal quarrying.**
	Fish pen	**TAMBACAN BURU-UN SANTIAGO**	There is limited location for fish pens, and limited capacity to relocate fish pen.	NONE	Higher incidence for fish diseases, low production of fish, and low farmer income.			**Shift to sustainable fisheries production consistent with mangrove and wetland type of habitats.**
NON-SEGREGATION OF GARBAGE	Tourist Industry	**DODIONGAN FALLS BONBONON**	Proximity to sanitary landfill, and the construction of sanitary	Regulated by CENRO with existing local	There will be a decrease water quality of tourist	**DECREASED OPPORTUNITY TO EARN INCOME**	Coordination with barangay officials to strictly	**Strengthen the RA 9003 Solid Waste Management Act**

		BURU-UN SPRINGS ROGONGON AND OTHER TOURIST SPOTS	landfills not being fully functional.	ordinances and central facilities.	spots, and reduced tourist visitors.		implement solid waste management	

ii. Environment Sector

Table 53. Climate and Disaster Risk Assessment on Environment Sector

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
Flooding	Forest ecosystem flora and fauna	**Rogongon Panoroganan Kalilangan Mt. Agad-agad (Pugaan) Maria Cristina Ditucalan**	The forest's vulnerability, along with its rich flora and fauna, is defined by the presence of very steep slopes and the precarious nature of loose and weathered rocks and soil.	The tropical rainforest's resilience is owed to its multi-layered structure, soil macropores created by burrowing creatures, abundant organic matter from substantial litter fall, and an extensive root system.	Deforestation, irresponsible mining, land conversion, armed conflict, unregulated wildlife hunting, and unsustainable slash-and-burn practices have an immediate and detrimental impact on both the forest ecosystem and human communities.	**Super-saturated soil leads to a cascade of environmental consequences, including heightened surface runoff, increased soil erosion, rain-induced landslides, loss of biodiversity and habitat, exposed soils, amplified lowland sedimentation, reduced freshwater productivity from silted rivers, and decreased photosynthetic production in terrestrial plants.**	Installation of rain gauges and hydrological sensors at appropriate size; Generate policy for the establishment of Protected Area; Crafting of the Ancestral Domain Sustainable development and Protection Plan (ADSDPP) and forest land use plan; Sustainable finance forest guards for sustained monitoring. Establish for payment for ecosystems services; Establish and strengthen partnerships with private organizations, NGOs, and local government to	**Crafting of the Ancestral Domain Sustainable Development and Protection Plan (ADSDPP);** **Forest Land Use Plan;** **City ordinance for the deputizing, funding, training, and equipping of forest guards;** **City ordinance for the establishment of the payment for ecosystem services**

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
							strengthen forest protection.	
	Coastal ecosystem flora and fauna	**Santiago, Tambacan, Saray, Buruun, Bayug island (Hinaplanon), Maria Cristina**	Low salinity levels can greatly affect the sensitivity of certain aquatic species, impede the photosynthetic production of coastal plants, and increase the vulnerability of young mangrove seedlings to dislodgment by wave action.	Mangroves provide a crucial filtering effect, defend against coastal flooding, and stabilize sediments, serving as a vital natural barrier along the shoreline.	Overharvesting for ruminant feeding and fuelwood, displacement due to coastal infrastructure development, waste dumping, dynamite and cyanide fishing, and coral destruction for the aquarium trade.	**The effects of increased sedimentation and siltation of corals, eutrophication, reduced fish and crustacean coastal productivity, weakening and death of mangrove trees, and the deprivation of migratory birds of their seasonal winter habitat collectively impact the coastal ecosystem.**	Come up with the Coastal used plan with corresponding coastal zoning ordinances, PPAs, and LIBs; Establish for payment for ecosystems services; Establish and strengthens partnerships with private organizations, NGOs, and local government for coastal protection; Installation of hydrological sensor for early flood warning system;	**MOA signing between private, government, and civil society sectors.**
	Marine ecosystem flora and fauna	**Dalipuga, Maria Christina, Buruun**	Low salinity levels, leading to reduced photosynthetic production in phytoplankton, can affect the delicate balance of aquatic ecosystems.	Wave action serves to uniformly distribute salt throughout the entire sea profile.	The intrusion of foreign and local fishing vessels equipped with advanced fishing technology leads to the overharvesting of fish resources.	**The disturbance of spawning grounds, coupled with overfishing and insufficient phytoplankton, results in reduced natural fish stock**	Crafting and enactment of local marine ordinances; Establish and maintain the mechanism for the	**Crafting and ratification of city ordinances on the marine protection**

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
						replenishment and lower fish yield in the ecosystem.	Payment for Ecosystems Services.	
Earthquake	Forest ecosystem flora and fauna	**Rogongon, Panoroganan, Kalilangan, Mt. Agad-agad (Pugaan), Maria Christina, Ditucalan**	Has karst landscape, steep slopes, and highly weathered loose rocks.	Extensive root system holds the soil and rocks from erosion and landslide.	Deforestation, irresponsible mining, armed conflict, and unsustainable slash-and-burn practices have an immediate and detrimental impact on both the forest ecosystem and human communities.	**Increases the generation of sinkholes and earthquake-induced landslide.**	Ensure the quality of the various soil and water conservation structures so as to prevent or reduce the impact of earthquake reduced landslide.	**None**
	Coastal ecosystem flora and fauna	**Santiago, Tambacan, Saray, Buruun, Bayug island (Hinaplanon), Maria Christina**	There is a highly liquefaction area and karst landscapes.	Mangrove trees have extensive root system that helps them stabilize from the ground/earth shaking.	Overharvesting for ruminant feeding and fuelwood, displacement due to coastal infrastructure development, waste dumping, dynamite and cyanide fishing, and coral destruction for the aquarium trade.	**Weakening of mangrove trees from disturbances results to mangrove tree fell thereby disrupts the habitat of coastal fauna and results to loss of coastal biodiversity; The highly disturbed and/or displaced mangrove sub ecosystem increases sediment deposition to seagrasses and coral reefs thereby**	Manage coastal ecosystems for a resilient defense against tsunamis, ensuring the health of mangroves, seagrasses, and corals; Protect the coast ecosystem from overharvesting of leaves and and fuelwood from the mangroves, dynamite fishing; cyanide	**None**

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
						affecting coastal productivity.	fishing; destruction of corals to collect aquarium fishes.	
	Marine ecosystem flora and fauna	**Municipal waters**			Intrusion of foreign and local fishing vessel with high-tech fishing equipped resulting to overharvesting of fish.	**Lowered replenishment of marine fish stocks due to the destruction of spawning grounds**	Regulate fishing	**None**
Deforestation	Forest ecosystems flora and fauna	**Rogongon Panoroganan Kalilangan Mt. Agad-agad (Pugaan) Maria Cristina Ditucalan**	Very steep slopes and loose, weathered rocks and soil	Karst landscape allows infiltrated water to percolate for groundwater replenishment and thereby increases time for soils to be super saturated with water.	Conventional farming, pasture grazing, and tree plantation	**Destruction of forest habitat resulting to loss of biodiversity;** **Conventional farming increases soil erosion;** **Pasture grazing compacts the soil which reduces infiltration and increases surface runoff.**	Craft and ratify city ordinances that will strongly penalize deforestation and that will empower forest guards in terms of training, equipment and compensation; Delineating and demarcating forest land use zone especially key critical habitats; Selection, deputization, training, equipping and compensation of forest guards	**None**

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
	Coastal ecosystem flora and fauna	**Santiago Tambacan Saray Buru-un Bayug Island (Hinaplanon) Maria Cristina**	Mangrove seedlings in early stages of planting can easily be dislodged by wave action; Naturally occurring faunal species in mangrove areas are sensitive to habitat change (mangrove tree removal) resulting to decrease in its population; Corals are sensitive to increase in water temperature	Muddy surfaces and venomous reptiles make the area impenetrable; Filtering effect of the mangroves reduces the deposition of sediment to the coral reefs defense in coastal flooding	Land conversion such as establishment of coastal roads	**Increased sedimentation and siltation of corals; eutrophication; reduced fish and crustacean coastal productivity; weakening and death of mangrove trees; deprive migratory birds of their temporal habitat for winter**	Craft and ratify city ordinances that will strongly penalize and that will empower bantay dagat in terms of training, equipment and compensation; Delineating and demarcating coastal land use zone especially key critical habitats; Selection, deputization, training, equipping and compensation of bantay dagat; Establish and strengthens partnerships with private organizations, NGOs, and local government for coastal protection; Craft and ratify integrated coastal management plan	**None**

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
Mining	Forest ecosystem flora and fauna	**Rogongon Panoroganan Kalilangan Mt. Agad-agad (Pugaan) Maria Cristina Ditucalan**	Very steep slopes; loose and weathered rocks and soil	Karst landscape allows infiltrated water to percolate for groundwater replenishment and thereby increases the time for soils to be super saturated with water	Altered geomorphology	**Soil Erosion;** **Contamination of soil, air and water;** **Mined tailings;** **Silted rivers;** **Reduced aquatic productivity;** **Affected corals and seagrasses**	Mining companies should comply and followed the policies and regulation provided in the law in minimizing the impact of its activities and establishing rehabilitation measures to its mined-out areas.	**None**
Uncontrolled Waste Disposal	Forest ecosystem flora and fauna	**Rogongon Panoroganan Kalilangan Mt. Agad-agad (Pugaan) Maria Cristina Ditucalan**	Inability to biodegrade plastic waste	Rich in microorganisms that degrades biodegradable wastes; Biodegradable wastes can be a source of food for forest fauna	Forest seedlings covered with microplastic; Entry of microplastic in to food web chain.	**Contaminated water bodies, leachate generated from the waste enters groundwater which poses a risk in water supply to communities.**	Deputize *bantay kalikasan* guard in clean up drives.	**Strengthen the RA 9003 Solid Waste Management Act**
	Coastal ecosystem flora and fauna	**Santiago Tambacan Saray Buru-un Bayug Island (Hinaplanon) Maria Cristina**		Rich in microorganisms that degrades biodegradable wastes; Biodegradable wastes can be a	Conversion of coastal area into sanitary landfills; Deposition of plastic wastes;	**Contaminated bodies of water due to leachate**	Deputize bantay dagat in clean up drives; Establish and strengthen partnerships with private organizations,	**Strengthen the RA 9003 Solid Waste Management Act**

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
				source of food for coastal fauna	Seagrasses and corals are covered with macroplastics; Microplastics enter the food web chain.		NGOs, and local government to strengthen coastal protection by conducting seminars and awareness with the involvement of communities residing in coastal areas in proper waste disposal; Ensure sustained proper waste management; Upcycling plastic wastes	
	Marine ecosystem flora and fauna	**Dalipuga Maria Cristina Buru-un**	Inability to biodegrade plastic waste	Biodegradable waste can be source of marine fauna	High solar leads to photodegration which then generate microplastics	Entry of microplastic marine food chain; Marine fauna suffocated and/or strangulated by microplastics	Establish and strengthen partnerships with private organizations, NGOs, and local government to strengthen marine protection by conducting seminars and awareness with the involvement of community in proper waste disposal; Ensure IEC drive for fisher folks and other	**Strengthen the RA 9003 Solid Waste Management Act**

Climatic & Non-Climatic Impacts (Hazards)	Exposed Elements	Location Specify exact location	Reason/s for Vulnerability of the Exposed Elements	Capacities of exposed and vulnerable elements	Immediate Influence on Exposed Human/Asset	Impact	Interventions	Policy
							vessels on the proper disposal of their waste; Conduct clean-up drive	

iii. Social Sector

Table 54. Climate and Disaster Risk Assessment on Social Sector

Climatic & Non-Climatic Impact Drivers (Hazards)	Exposed Elements	Location Specify Exact Location	Reason/s for Vulnerability of the Exposed Elements	Capacities of Exposed and Vulnerable Elements	Immediate Influence on Exposed Human/Asset	IMPACT	Interventions	Policy
Flooding	Residents of 44 barangays spanning all age groups	**44 barangays that have uncleaned surroundings were the presence of stagnant water, low-lying areas during prolonged floods**	Unaware of pre-emptive evacuation procedures. Consequently, they may be evacuating to undesignated evacuation sites where they will be vulnerable to diseases and are lacking basic commodities. In such situations, it's crucial to establish clear and effective communication channels to inform residents about evacuation plans, designated safe locations, and to ensure they have access to necessary supplies and medical care during evacuations.	Awareness through IEC is essential for preventing and controlling diseases related to environmental sanitation and the construction of proper drainage. It's important to encourage early consultations with health centers when feeling unwell and to request necessary medicines. Additionally, ensuring access to basic commodities such as food, water, clothes, blankets, and health services at evacuation sites is crucial.	Individuals who have contracted the dengue virus, leptospirosis, and other water-borne diseases like HEPA A, C, D, and E, as well as amebiasis, are at risk of experiencing exacerbated health issues. Additionally, those with co-morbid health conditions may see a deterioration in their overall health. IDPs are also vulnerable to worsening health due to the non-conducive living conditions they may be experiencing.	**Manifest illness to affected individuals such as fever, rashes, fatigue, vomiting, diarrhea, abdominal pain, loose bowl movement, jaundice, acute renal failure, edema which can lead to death.**	Environmental sanitation such as frequent cleaning of surroundings and drained stagnant water (breedings sites mosquitoes); Construct drainage to prevent floods and proper maintenance for it	**Reinforce the implementation of Aksyon barangay Kontra Dengue (ABKD). Full implementation of BDRRMO;** **SP Resolution for a massive reconstruction of the drainage system in Iligan.**

Climatic & Non-Climatic Impact Drivers (Hazards)	Exposed Elements	Location Specify Exact Location	Reason/s for Vulnerability of the Exposed Elements	Capacities of Exposed and Vulnerable Elements	Immediate Influence on Exposed Human/Asset	IMPACT	Interventions	Policy
Armed Conflict – Population Migration	All populations residing in urban areas including transient individuals	**Saray Tambacan Santiago Tibanga Poblacion Tubod Bagong Silang Palao Ubaldo Laya Del Carmen Hinaplanon Dalipuga Suarez Buru-un**	Constrained areas with large population that hinders education, healthcare, social services, and food security, impacting safety	Urbanization outside urban areas	Inefficient education system, medical and social services. Insecurity of food and safety.	**Price increases due to demand, availability of food supply and education, medical and social services**	Monitor the influx of migrants to determine the severity of hazard to make drastic measures	**Inclusion of urban expansion areas in the Land Use Plan and Zoning Map**
Emerging and Re-emerging infectious diseases (e.g. pandemics)	All population including transient individuals	**44 barangays**	No vaccination or decreased vaccination coverage to the eligible population which resulted to wean off immunity. Lack of awareness, inaccessible to health programs /activities because of economic status – unemployment.	Educational status, access to health programs/ activities, economic status - employment	Widespread infection of infectious diseases at the community level.	**The exhausted healthcare system of the city leads to full hospital capacity and insufficient supplies of medicines. It resulted in casualties and loss of lives.**	Institutionalization of City Epidemiology Surveillance Unit in conducting active and passive disease surveillance to Emerging and re-emerging infectious diseases to reduce/prevent the disease from spreading.	**Propose A.O. for Institutionalization of City Epidemiology Surveillance Unit with plantilla human resouce and sufficient materials and equipments for surviellance and response.**

iv. Institution Sector

Table 55. Climate and Disaster Risk Assessment on Institutional Sector

Climatic & Non-Climatic Impact Drivers (Hazards)	Exposed Elements	Location Specify Exact Location	Reason/s for Vulnerability of the Exposed Elements	Capacities of Exposed and Vulnerable Elements	Immediate Influence on Exposed Human/Asset	IMPACT	Interventions	Policy
Heavy Rainfall (Flood Inundation)	BLGUs, Students, Men and Women, Marginalized Sector, Businesses, Schools, Residentials, Transport Groups	**Santiago, San Miguel, Hinaplanon, Tibanga, Saray, Mahayahay, Tambacan Tubod, Ubaldo Laya, Palao, San Roque, Upper Hinaplanon, Mandulog, Digkilaan, Abuno, Tipanoy Villaverde**	LGUs are facing a range of challenges in disaster preparedness and response. These include a lack of full awareness among BLGUs regarding the impact of CCA and the context of the DRRM Framework, as well as insufficient IEC programs. Furthermore, there are issues related to slow response in making decisions about work and class suspensions, the use of outdated Incident Command System Manuals and Operating Manuals, and a lack of a unified emergency response system.	BLGUs have taken proactive steps by establishing BDRRMCs to enhance local disaster preparedness. While IEC materials have been supplied, there remains a challenge in ensuring their availability across all barangays. Public advisories and declarations from the LCE are effectively disseminated during states of emergency, contributing to community awareness. The development of a standardized emergency response system is in progress, facilitating better coordination from the BDRRMCs at the barangay level	A lack of knowledge regarding the implications of climate change and disaster risk management has led to various challenges. This includes the predicament of stranded employees during emergencies, which exposes them to potential health issues. Additionally, there have been delays and lapses in responding to emergencies, leading to an inefficient use of resources.	**Damage and/or loss of properties and lives.**	Implement a comprehensive emergency response strategy involves the revision of the Incident Command System Manual, installation of early warning equipment, and training personnel to proficiently monitor, interpret, and track historical data from the early warning system.	**Develop and implement a comprehensive disaster risk reduction and management strategy, including the establishment of clear communication protocols for public advisories by local chief executives, strengthening early warning systems, providing guidance to schools and workplaces on contingency plans, conducting regular drills, enhancing coordination among various stakeholders, and institutionalizing Barangay ICS as approved by LGU-Iligan for effective preparedness and response during emergencies.**

			Lastly, the limited capacities of the BDRRM teams in conducting emergency response and preparedness activities pose additional challenges for effective disaster management.	to the city-level LGU. There's a collaborative effort towards optimizing the utilization and allocation of DRRM funds to bolster disaster resilience and response capabilities.				
Non-alignment of Iligan City DRRM Plan and its priority PPAs to the NDRRM Framework	Inefficiency of fund utilization intended for PPAs (CCA-DRRM) of Iligan City.	**Iligan City**	Poor Utilization of LDRRM Fund	Existing priority PPAs of Iligan DRRM Plan DRRM actively participate during City Development Council in endorsing Priority PPAs All CCA-DRRM projects are reflected in the Climate Change Expenditure Tagging (CCET).	Change of administration and priority projects. Preference of stakeholders and sectoral concerns Existing projects are not aligned to the success indicators prescribed in the National DRRM Framework	**Delayed development of projects aligned to the National DRRM framework.**	Come up with a new list of priority projects (CCA-DRRM) with reference to CDRA and LCCAP.	**EO to review and update the CDRRM Plan to align with the NDRRM Framework**
Outdated CLUP	Non-responsive PPAs of the City and funding from the National Government	**Iligan City**	Unavailability of some required data for CLUP update	Ongoing CLUP Updates Compliant with existing ordinances, laws, policies, standards and rules and regulations	Non-Issuance of Zoning Certification and building permit processing application	**It will hamper the development of projects related to preparedness and mitigating measures for disaster risk and reduction management.**	Enhanced Iligan City CLUP for year 2024-2033	**None**

v. Infrastructure Sector

Table 56. Climate and Disaster Risk Assessment on Infrastructure Sector

Climatic & Non-Climatic Impact Drivers (Hazards)	Exposed Elements	Location Specify Exact Location	Reason/s for Vulnerability of the Exposed Elements	Capacities of Exposed and Vulnerable Elements	Immediate Influence on Exposed Human/Asset	IMPACT	Interventions	Policy
Flooding (Surface Overflow)	Low Rise Buildings, Roads, Bridges, Drainages, Flood Controls	**DEL CARMEN HINAPLANON BAGONG SILANG SAN MIGUEL SANTIAGO MAHAYAHAY TAMBACAN UPPER HINAPLANON MANDULOG SAN ROQUE SARAY TIBANGA-VH SANTO ROSARIO KIWALAN ACMAC STA. FELOMINA**	Substandard/Inappropriate materials, poor planning, and design (no. of storey), poor infrastructure maintenance, constructed using light materials, year of construction (some buildings are built beyond operating life)	Strict implementation of no-build zones, efficient IEC thru socmed, availability of Early Warning System, availability of high-quality construction materials	Slowdown of transportation due to road blockage, hampered the delivery of goods and services, slow down emergency responses	**Loss of assets and properties, loss of lives, damage to lifelines, loss of livelihood, high cost of maintenance**	Improvement of drainage and irrigation, Bldgs on fill/stilts, using flood-barriers, improved design of bridges (considering the highest recorded flood height)	**Low rise bldgs** - Zoning Ordinances pertaining to Low rise buildings, Provision of ordinance on buildings located on flood prone areas, Adaption of Ressetlement and Relocation Action Plan (RRAP), Institutionalization of CLUP, LCCAP, etc. **Bridges** & **Roads**
Rain-induced Landslide	Roads, Residential Buildings, Drainages	**DALIPUGA KIWLAN ROGONGON STA. FELOMINA**	Lack/insufficient slope protection, poor drainage system.	Strict implementation of no-build zones, constant monitoring of road networks and drainages.	Slowdown of transportation due to road blockage, hampered the delivery of goods and services, slow down emergency responses, clogging of drainages.		Improvement of drainage and irrigation, construction of slope protection on landslide-prone areas	

Climatic & Non-Climatic Impact Drivers (Hazards)	Exposed Elements	Location Specify Exact Location	Reason/s for Vulnerability of the Exposed Elements	Capacities of Exposed and Vulnerable Elements	Immediate Influence on Exposed Human/Asset	IMPACT	Interventions	Policy
Earthquake Ground shaking	**High rise buildings, bridges, roads**	**Tibanga Poblacion Palao Tubod**	Poor planning and design for high-magnitude earthquake	Regular monitoring of structural integrity, access to latest building standards	Slowdown of transportation due to road blockage, hampered the delivery of goods and services, slow down emergency responses, clogging of drainages	**Loss of assets and properties, loss of lives, damage to lifelines,**	Build earthquake-proof structures, providing education on earthquake safety, demolishing dilapidated structures	**High rise bldgs** - Zoning Ordinances pertaining to High rise buildings, Provision of ordinance on buildings located near faultline areas, Institutionalization of CLUP, LCCAP, etc.
Industrial Hazard	**Boilers Buildings Lifeline Utilities Kiln**	**Kiwalan Maria Cristina Ditucalan**	Poor safety protocols and standards, unsafe practices and conditions, delayed safety validation	Compliant to DOLE standard for safety (docs), required employees to take BOSH/COSH/LCM, monitoring of safety manhours	Hampered operation, water, power, and communication interruption	**Economic loss, Loss of assets and properties, loss of lives**	Comply DOLE safety standards, provide BOSH/COSH/LCM to personnel, Follow safety protocols and standards	**Boilers/Kiln** - Zoning Ordinances pertaining to Industries, Institutionalization of CLUP, LCCAP, etc. **Utilities** -
Armed Conflict	**Lifeline Utilities Buildings**	**Maria Cristina Rogongon Poblacion Ditucalan Abuno**	Lack of Security	Trained personnel/ bomb squads and K9 units, trained responders, in placed fire suppression system	hampered the delivery of goods and services, slow down emergency responses, water, power, and communication interruption	**Economic loss, loss of lives, loss of assets and properties**	Provide security, establish connections with local leaders, improve police and army visibility, Provide government services to insurgent-prone area like infrastructures (health centers, schools, FMRs,	**Utilities, Buildings & Bridges -** Provision of local peace process ordinance

							etc.), education and livelihood,	

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