



TUGON:

RESPONDING TO NATURAL DISASTERS IN THE PHILIPPINES

// Angela Lazarte

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RESPONDING TO NATURAL
DISASTERS IN THE
PHILIPPINES**

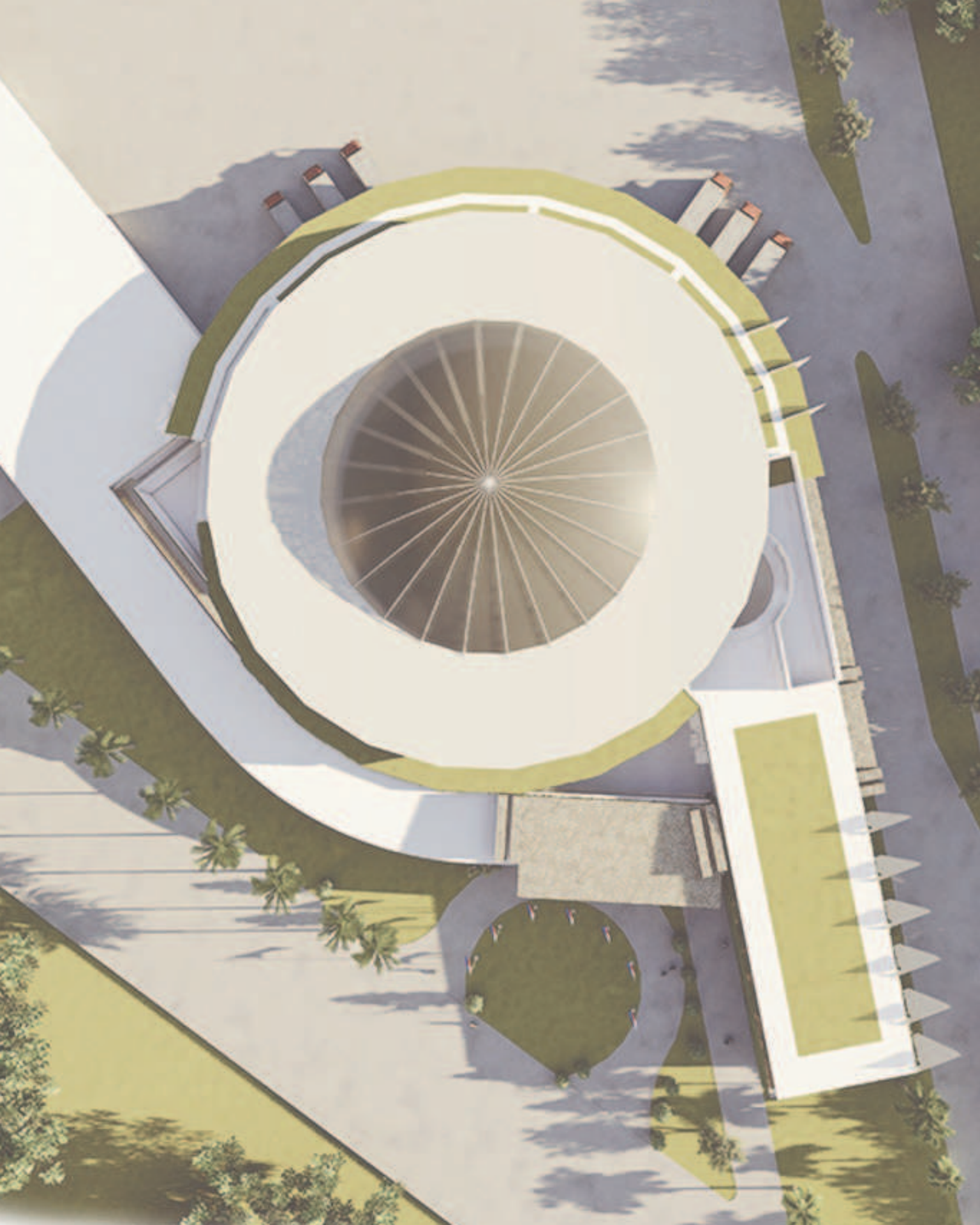
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University of Detroit Mercy School of Architecture
2021 Master of Architecture Thesis
Professor Fuchs

SPECIAL THANKS TO:

Wladek Fuchs
Thesis Studio Professor

AR. Maricel Modesto
External Advisor

My mom, my aunts,
and my little sister



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// **ABSTRACT**

The Philippines is a country that experiences natural disasters frequently and has a high number of casualties throughout the year. This study will explore the different ways that the government and the people solve these problems through public-private response. The main goal of this study is to create a “Disaster Response Center” that is resilient and can handle natural disasters that can achieve the goal of the government and to develop a system of disaster response that protects the people from these disasters.

The Philippines is a country that experiences natural disasters frequently and faces destruction and casualties throughout the year. This thesis hopes to explore the different ways architecture can aid with these problems through planning, prevention, and response. The main goal is to design a "Command Center" that is resilient against all types of natural disasters that can achieve the goals of this research and develop a system and building that will help the people from these unstoppable disasters.

1

COMMAND CENTER

// 1.1

// COMMAND CENTER

The Command Center hopes to become the bridge between national and local government to aid the people during times of natural disasters.

A Command Center is a building facility that connects the National Government to the Local Government with many functions that helps the community prevent catastrophic damages during any natural disasters. The Command Center houses its broadcasting station to communicate any news, alerts, and warnings when any disaster is on its way. The Command Center also has its medical facility, a secondary health facility from the hospitals in the city. It has an urban garden, garage space for big vehicles that can transport goods and equipment to clean up debris. The Command Center hopes to become the beacon of light that the community seeks out during hard times. It becomes the distribution center that gets its commands from the national government and distributes these goods and services to the local governments. It is the bridge that fills in the gaps and connects the people during their time of need.

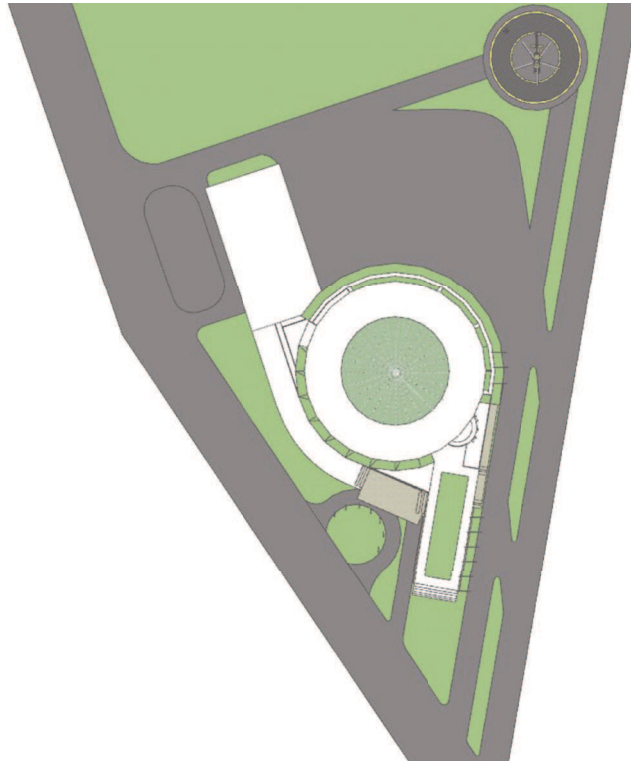


Image 1. Tacloban City Command Center, bird's eye view



Image 2. Tacloban City Command Center

// 1.2

// COMMAND CENTER GUIDELINES

CRISES DURING DISASTERS

The Command Center hopes to answer the city's needs to prevent catastrophic damage and casualties during natural disasters. These crises are: power or electricity, communication, food, health, transportation, and safety.

POWER

Crucial to making sure that facilities are running and providing the necessary steps into responding during disasters. The Command Center includes communication, electricity for medical facilities, electricity for homes, electricity for evacuation centers, and other places to offer any assistance during disasters.

COMMUNICATION

In order to efficiently restore order, communication is very important for all levels of the government, as well as communication with each other during disasters. Having communication ensures that the needs of the people are being reported, and it also lets people who are affected know that help is coming their way. Personal communication within family and friends puts people at ease. It helps them transition from panic and survival mode to a more calm and collected way that helps respond more efficiently.

FOOD

During times of disaster, food is one of the primary necessities that people are after. There needs to be enough available food and water to cater to those affected by the disaster. Previous disasters show that the lack of preparedness with food and water encourages people to loot and other acts that are not safe and illegal for survival. Providing food at the earliest stage of response ensures that people will not need to fight for survival and that help is coming.

HEALTH

In the event of a disaster, medical facilities are one of the places affected by weather hazards or caused by other problems such as lack of power and communication. Medical facilities are needed to provide health care and help those that require medical attention. Because these buildings and the people who work for these facilities are also affected by the disaster, outside help is most likely needed to get everyone back up on their feet and run the facilities again.

TRANSPORTATION

To ensure that all goods and services are being delivered, transportation is essential for responding to disasters. Because of the limited infrastructure of the Philippines, there are fewer ways to get to the disaster sites when roads are damaged or blocked, caused by debris from the destruction of the disaster. Ensuring that there are ways to clear roads and get access to all of the affected areas as quickly as possible is crucial.

SAFETY

With concerns over the people's safety against natural hazards, some threats arise from the lack of organization and authority over the affected areas. This causes lootings, riots, and other instances where people fear for their lives and safety and solely focus on their survival. Establishing authority during disasters ensures the people that help is on their way and that the situation is under control.

RESPONSE GUIDELINES

The following guidelines are what gives out hope to the people for safety, organization, and relief for before, during, and after a disaster strikes. This facility emphasizes four qualities that are needed when disaster strikes.

DISASTER PREVENTION

Emphasizes the importance of early warning systems and clear evacuation points for people to take the proper measures before the disaster strikes.

DISASTER PREPAREDNESS

Prepares pre-positioned aid and rescue teams to be ready for worst-case scenarios for the aftermath of the disaster.

DISASTER RESPONSE

Responds to requests of assistance from the Local Government Units and other members in the city. This includes services and the distribution of goods.

DISASTER REHABILITATION

Assists in restoring the government back to its full capacity and aids the police to maintain peace and restore order back to the city.

// 1.3

// COMMAND CENTER SPACES

The Command Center hopes to respond to the crises that arise when natural disaster strikes the city. The building needs to be equipped with spaces and equipment that respond to the different types of crises and aid the city when the time of need comes.

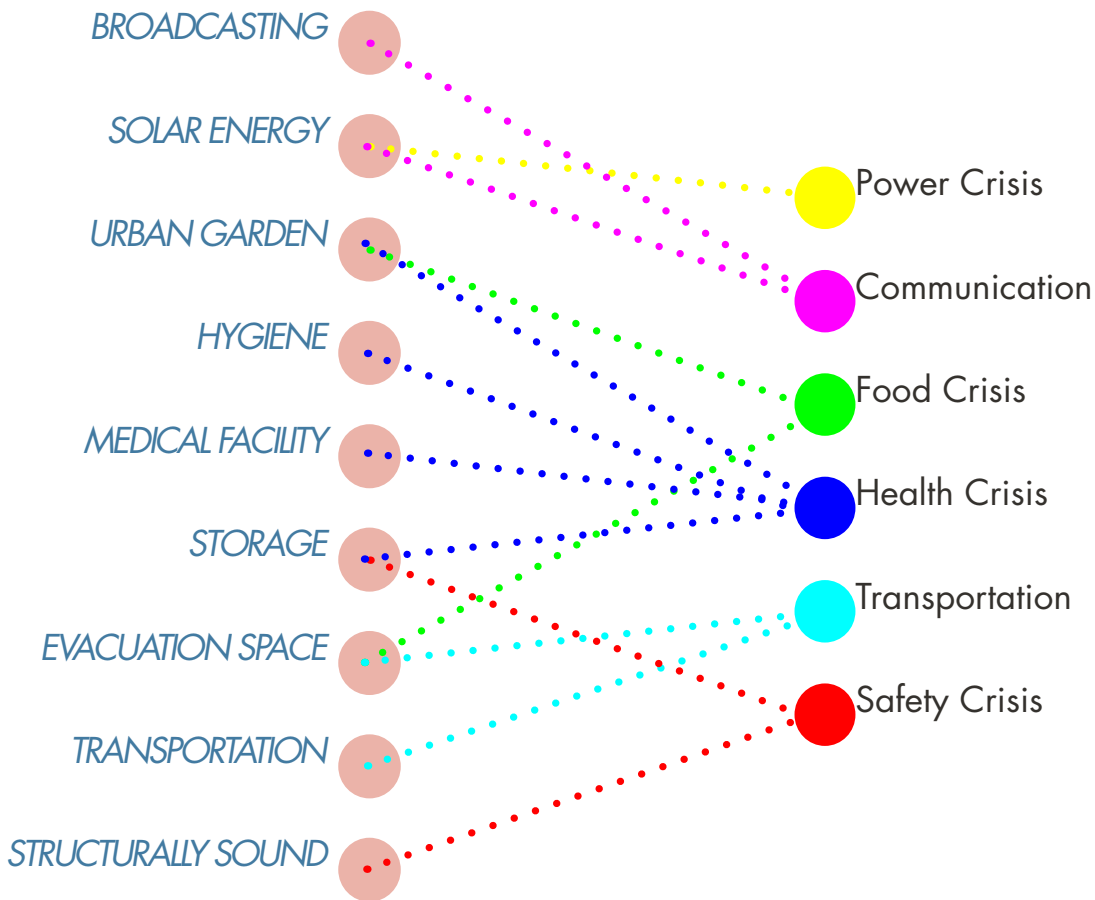


Figure 1. Command Center Spaces and the Crises they Solve



BROADCASTING

The broadcasting room will ensure there is communication to and from the command center.



SOLAR ENERGY

Having solar energy will make sure there is power to use when electricity goes out during a disaster.



URBAN GARDEN

The garden will provide food that can be used to distribute to those in need during disasters.



HYGIENE

Making sure there are available clean and sanitary areas to ensure the wellbeing of the people.



MEDICAL FACILITY

This facility will be used as back up when hospitals get affected by the disaster.



STORAGE

Storage space needed to store food, water, generators, and emergency equipments.



EVACUATION SPACE

The evacuation space is needed for multi-purpose functions during normal times and emergency.



TRANSPORTATION

Having transportation to get through fallen debris and respond to emergencies when disaster strikes.



STRUCTURALLY SOUND

The building needs to be able to withstand the natural disasters and be resilient to show hope during disasters.



RESEARCH FACILITY

During normal times, the building will be used as a research facility to further understand and prevent disasters.

2

PHILIPPINES

// 2.1

// PHILIPPINES

To begin the exploration of how to respond to natural disasters, we must first learn and understand the place where it occurs.



Map 1. The Philippines



Map 2. The Philippines on the globe

// 2.2

// PHILIPPINES BACKGROUND

OVERVIEW

The Philippines is an island country in Southeast Asia along the Pacific Ocean. Its landscape is a mountainous archipelago, with the country made up of 7,107 islands. Officially named the Republic of the Philippines, it is divided into three main geographical island groups from the north to the south: Luzon, Visayas, and Mindanao. Manila, the country's capital city, is located in the Luzon region, which is the largest and most densely populated. The Philippines is the 8th most populated country in Asia and the 12th most populated country in the world, with 109,524,677 people according to the National Population clock in December 2020. It is a culturally diverse country because of its archipelagic nature and is considered one of the world's mega biodiversity countries due to its unique flora and fauna. Its location along the Western Pacific has made it the melting pot of Asia.

CULTURE

The Philippines has a culture that is a mixture of many cultures and influences. Because of the early colonization by Spain and the United States, the country displays historical influences embedded in their culture. Filipino culture is rich in traditions and beliefs of the native people; however, Filipino culture has struggled to find its national identity. The culture bears a resemblance to and is comparable to various cultures such as Spanish, American, and many other Asian countries. The country is driven by community acceptance and education that is deeply rooted in the culture because it provides vast opportunities for an improved life.

DEMOGRAPHICS

The Philippines' origins are of South Asian heritage; however, there are other contributions from other countries that make up the multiethnic background of the country, such as Chinese, American, Indian, and other nationalities. The Filipino population is a complex society, where approximately 80 major ethnolinguistic groups, with many subclasses making up the country. Each of these multiple ethnicities and cultures is found throughout the islands, each practicing distinct beliefs and customs.

LANGUAGE

The national language of the Philippines is Filipino, based on Tagalog. The following widely spoken language in the country is English. There are approximately 80 language groups with more than 500 dialects.

RELIGION

The Philippines is one of the most predominant Christian nations in Asia. Approximately 86 percent of the population identifies as Roman Catholic. The Chinese minority in the Philippines has influenced Filipinos with various beliefs and practices of Buddhism, Taoism, and Confucianism. Six percent belong to Christian cults, and two percent belong to an estimated 100 Protestant denominations. There is four percent of the population that is Muslim in the Philippines, primarily located in the Southern islands. The rest of the two percent identify with non-Western, indigenous beliefs and practices located in isolated, rugged regions.

VULNERABLE GROUPS

Women:

Women and children are more vulnerable during emergencies and disasters. Natural disasters and conflicts tend to displace millions of women and have worsened gender abuse. Women require more needs and are at higher risk during disasters, especially pregnant and lactating mothers. They require prenatal and postpartum healthcare as well as specific and nutrition and hygiene needs.

The Poor:

In the Philippines, people at the lower end of the economic status live in rural areas and work mainly in farming and fishing. They are vulnerable to financial shocks and natural disasters and are disproportionately affected by these disasters. The increase in frequency and intensity of natural disasters, inadequate natural resource management, inadequate education and health services, weak governance, and other factors are among the developmental challenges that have added to extreme poverty in the country.

Children:

Approximately 10 million children in the Philippines suffer from deprivations, particularly in education, health, and living standards. According to a report from the Philippine Institute for Developmental Studies, these living standards include safe shelter, safe water, and sanitary toilet facilities. A 'double vulnerability' is created for these children with the combination of poverty and disasters when they occur. An epidemic and significant risk are created by the prevalence of street children, where children live and reside in the streets. Children are the most vulnerable when disasters occur, especially the street children who are forced to endure a lack of food, extreme weather conditions, illnesses, exploitation, and corruption.

GEOGRAPHY

The Philippines has a land area of roughly 115,830 sq. miles (300,000 sq. kilometers), of which 1137 sq. miles is water area. As an archipelago, the Philippines comprises 7,107 islands, where 2,000 islands are occupied and 11 islands holding 95 percent of the entire country's land area. The Philippines has one of the longest shorelines globally because it is scattered and separated by the sea topographically. This also means that the Philippines has no land borders, surrounded only by the South China Sea to the west, the Philippines Sea to the east, the Sulu Sea and the Celebes Sea to the South, and the Bashi Channel north. The Philippines is part of the 'Pacific Ring of Fire' with many active volcanoes throughout the islands and a high frequency of earthquakes.

CLIMATE

The climate in the Philippines is tropical rainforest throughout the country due to its geographical location. The main characteristics are high temperatures and high humidity, which are present all year long. Another characteristic of the Philippines' climate is strong typhoons from the months of June through November. Rainfall is highly likely every month and differs throughout the year. Between June through October, heavy rain is expected, while hardly any rainfall occurs from December to May.

CLIMATE CHANGE

The Philippines is vulnerable to the impacts of climate change. Its effects are expected to increase the occurrence of stronger typhoons, sea-level rise, and high storm surges in coastal regions. The intensified storm surges are predicted to affect more than 40 percent of coastal populations. In turn, the Philippines' Congress has passed the Climate Change Act in 2009, which provides a policy framework that addresses rising threats to the environment. The Climate Change Commission (CCC) was created because of this act to develop policies and coordinate government programs on climate change. The CCC developed the National Climate Change Action Plan (NCCAP) 2011-2018 that acts as a road map for all climate change programs in the Philippines. This plan prioritizes food security, water sufficiency, ecosystem, and environmental stability, human stability, and sustainable energy.

3

NATURAL DISASTERS

// 3.1

// NATURAL DISASTERS

Defining what these disasters mean and their impacts is crucial to understanding how to prevent and respond to these disasters.



Map 3. The Pacific Ring of Fire

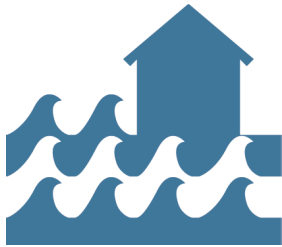
The Philippines is an archipelago with over 7,000 islands that are located in the Pacific Ring of Fire. It intersects two tectonic plates—the Eurasian and the Pacific plates. Its proximity to the Ring of Fire makes the Philippines susceptible to all kinds of natural disasters like typhoon, flood, storm surge, earthquake, and volcano eruptions.



TYPHOON



FLOOD



STORM SURGE



EARTHQUAKE



VOLCANO
ERUPTION

// 3.2

// TYPHOONS

Typhoons in the Philippines are the most frequent and most destructive natural disaster. Like the hurricane in the United States, a typhoon can heavily damage anything on its path with high winds. Historically, the Philippines have been vulnerable to extreme weather. From 1947 to 2014, ten of the deadliest typhoons to ever be recorded were: Haiyan, Thelma, Ike, Fengshen, Washi, Durian, Bopha, Trix, Amy, and Nina. In 2013, Typhoon Haiyan resulted in more than 6,300 lives lost, over 4 million were displaced from their homes and around \$2 billion in damages. Annually, there is an average of twenty typhoons enters the waters surrounding the Philippines. Around 8 or 9 typhoons end up making landfall and cause loss of life and extreme damages. Over the past ten years, the Philippines have had typhoons become more frequent and more severe due to climate change. The Philippines lack natural barriers, and there is practically nothing buffering the Philippine islands and the sea, causing the typhoon to become more intensified.



// 3.21

// TYPHOON CATEGORIES

HISTORICAL BACKGROUND

The Philippine Weather Bureau, now known as Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), established the Tropical Cyclone Warning System (TCWS).

Back in the 1950s, the TCWS had ten warning levels that were designed for mariners at sea: Public Storm Warning Signal (PSWS) #1 to PSWS #10. Visual warning signs were hoisted on masts in ports to signal the mariners using the form of cones and cylinders. In the 1970's the number of warning levels was reduced from 10 to 3, using three tropical cyclone categories as a basis. Then, in 1997, it upgraded the warning levels to 4.

It wasn't until after the devastating effect of the powerful Typhoon Haiyan in November 2013 that another modification was made to the TCWS. The two primary modifications were:

1. The adoption of 5 classifications or categories of tropical cyclones. (Table 1)
2. The expansion of warning level PSWS #1-4 to PSWS #1-5. (Table 2)

CLASSIFICATION	INTENSITY	
	Miles per hour (mph)	Nautical miles per hour [knots] (kt)
1. Tropical Depression (TD)	37 or less	33 or less
2. Tropical Storm (TS)	38 - 54	34 - 47
3. Severe Tropical Storm (STS)	55 - 73	48 - 63
4. Typhoon (TY)	74 - 137	64 - 120
5. Super Typhoon (STY)	more than 138	more than 120

Table 1. Updated Tropical Cyclone Classification

PSWS	LEAD TIME (HRS)	WINDS (MPH)	IMPACTS OF THE WIND
#1	36	20 - 37	No damage to very light damage
#2	24	38 - 73	Light to moderate damage
#3	18	74 - 105	Moderate to heavy damage
#4	12	106 - 138	Heavy to very heavy damage
#5	12	>138	Very heavy to widespread damage

Table 2. Modified Public Storm Warning Levels



CATEGORY 1

WINDS:

20-37mph
expected in at least 36 hours

DAMAGE TO STRUCTURE:

very light or no damage to high risk structures

slight damage to some houses of light materials or makeshift structures in exposed communities



CATEGORY 2

WINDS:

38-73mph
expected in at least 24 hours

DAMAGE TO STRUCTURE:

light to moderate damage to high risk
structures

no damage to low risk structures

some wooden, old electric posts tilted or
downed



CATEGORY 3

WINDS:

74-105mph
expected in at least 18 hours

DAMAGE TO STRUCTURE:

heavy damage to high risk structures

moderate damage to medium risk
structures

light damage to low risk structures

houses of medium strength materials
unroofed



CATEGORY 4

WINDS:

106-137mph
expected in at least 12 hours

DAMAGE TO STRUCTURE:

very heavy damage to high risk structures

heavy damage to medium risk structures

moderate damage to low risk structures

many houses of medium-built materials
unroofed with collapsed walls



CATEGORY 5

WINDS:

>138mph
expected in at least 12 hours

DAMAGE TO STRUCTURE:

wide spread damage to high risk structures

very heavy damage to medium risk structures

heavy damage to low risk structures

complete roof failure on many residences and industrial buildings

severe and extensive window and door damage

electrical power distribution and communication services severely disrupted



// 3.3

// FLOODS

Floods can be very damaging to the low-lying, marginally developed areas in the Philippines. Total annual rainfall is expected to be in the range of 3.28 feet to 13.2 feet. However, strong typhoons have increased the cause of flooding and urban developments that impede traditional drainage channels and create flooding hazards in urban areas. This is also increased with a high risk of sea-level rise along the coast.





// 3.4

// TSUNAMIS AND STORM SURGE

TSUNAMIS

Tsunamis are an elevated risk in the Philippines because it is an island nation with significant seismic activity. The coastlines are at the highest risk of tsunami impacts, and most of the coastal areas have endured minimal impacts of a tsunami. The country has not endured any substantial tsunami-related economic impacts and does not deem tsunamis a high-risk hazard.

STORM SURGES

Storm Surges are the abnormal rise in sea level that occurs during a typhoon. It is caused by strong winds and low atmospheric pressures produced by tropical cyclones. As the tropical cyclone approaches the coast, strong winds push the ocean water over the low-lying coastal areas, leading to flooding. This makes storm surges very dangerous.



// 3.5

// EARTHQUAKES AND LANDSLIDE

EARTHQUAKES

The Philippines is located within the "Pacific Ring of Fire," where it intersects between two tectonic plates—the Eurasian and the Pacific plates—which move continually, causing the country to have around 20 earthquakes a day. These daily earthquakes measure 4.5 or less and do not cause infrastructure damage or loss of life. However, strong earthquakes still pose a severe risk. There has been a record of 12 destructive earthquakes from 1968-2017.

LANDSLIDES

Landslides are often initiated by other significant weather events like earthquakes, volcano eruptions, typhoons, or increased rainfall. Landslide hazards are most common in the mountainous and inland regions of the islands and tend to impact rural populations most heavily.



// 3.6

// VOLCANO ERUPTIONS

The Philippines is unique for its high level of exposure to volcanic hazards because of its location in the "Pacific Ring of Fire." The country is located within the intersection of two tectonic plates—the Eurasian and Pacific plates. These two plates frequently move, causing volcanic events and earthquakes. The Philippines is home to about 300 volcanoes, with around 22 classified as active and five classified as highly active: Taal, Mayon, Bulusan, Kanloan, and Hibok-Hibok.





4

**SUPER TYPHOON
HAIYAN**

// 4.1

// SUPER TYPHOON HAIYAN

Learning from the past and working towards how to make the future better.

On November 8th, 2013, the Philippines experienced one of its most devastating catastrophes ever recorded.

Known locally as Yolanda, Typhoon Haiyan came in the early morning of Friday, November 8th, 2013, as one of the strongest typhoons to strike land, slamming into the central Visayas region. Within the 16 hours of the super typhoon, equivalent to that of a category five hurricane and storm clouds that covered almost all of the country, Haiyan directly swept through six provinces in the Philippines, affected more than ten percent of the country's population. The estimated wind speeds of the typhoon were 195 mph at the peak and 155 mph as it weakened and moved west, with wind gusts of up to 235 mph.

Several hundred thousand of the people affected by the super typhoon were able to flee their homes in advance of Haiyan's arrival. Many of those that were displaced were moved to evacuation centers. This disaster quickly created a humanitarian crisis within the most affected areas and communities,

especially those in the Leyte province and the southern tip of Eastern Samar.

The storm created many problems during and after, which made the response harder. It knocked out power, telecommunications, and water supplies. Other obstacles were the general lack of transportation, extremely limited communications systems, damaged infrastructure, and seriously disrupted government services. Two and a half months after the typhoon struck, United Nations (U.N.) agencies reported that 14.1 million people had been affected, with more than 4.1 million people displaced from their homes. The number of estimated people that were killed went up to 6,201, with more than 1,785 missing. An estimated 1.1 million houses were damaged or destroyed, and around 5.6 million people needing food assistance.

Advanced warning and the storm's speed could have prevented more significant flooding and may have been able to save many lives. However, in those areas that were affected most, particularly the coastal communities in eastern and western Leyte and the southernmost tip of Eastern Samar, there was little defense against the wrath of the typhoon. Between two-thirds and 90% of the structures were heavily damaged or destroyed, including medical facilities. The roads were blocked due to downed trees and other debris, making it hard for any transportation within the communities and cities. Airports, vital to the country that links the islands together, were damaged.

Furthermore, the government stopped functioning in the hard-hit areas with a decentralized government authority, a shortage of available government workers, lootings in stores, and heavy rains delayed a lot of the relief efforts.

The city of Tacloban, capital of Leyte, with a population of around 220,000, was one of the hardest-hit places and the scene of the most concentrated destruction and death. Thousands of Tacloban residents reportedly drowned in a "two-story-high" storm surge, with many others that were killed by flying debris.





// 4.2

// PROBLEMS DURING HAIYAN

PROBLEMS

Problems that rose during Super Typhoon Haiyan were the lack of information, having a new category of disaster, and the storm surge.

LACK OF INFORMATION

The government failed to warn the people how catastrophic the typhoon was going to be.

People there are used to disasters, so the lack of urgency to evacuate and move inland caused people to stay where they were.

Others that evacuated moved to hotels that were near the water, where the worst of the storm surge happened, causing many people to die.

NEW CATEGORY OF DISASTER

Typhoon Haiyan was the deadliest natural disaster the Philippines has ever faced.

It forced the Philippines to develop a new tropical warning system, creating a new category, SUPER TYPHOON.



STORM SURGE

The people in the middle of the typhoon were not aware of a “storm surge”.

The lack of information and explanation of what it meant caused the most deaths from the disaster.

Most casualties were the result of people drowning and getting washed away by the water.

// 4.3

// RELIEF & RECOVERY EFFORTS

Relief operations were divided into several phases: search and rescue, treatment and survival, relocation and rehabilitation, early recovery, and long-term reconstruction. Because of the size of the disaster that has many moving parts, relief efforts can sometimes take days and weeks because of complications, such as delays in transportation and congestion, lack of transportation infrastructure, bureaucratic problems, and lack of access to all can cause bottlenecks at key points in the system. Timing is critical to saving lives. A relief effort of this size requires the coordination of assessments and appropriate responses with the government, local communities, and the international community to function efficiently.

MORE EVACUATION CENTERS

After Typhoon Haiyan, many evacuation centers were planned and set up in smaller neighborhoods. Evacuation plans were made to make sure small, and big neighborhoods in the city had their own designated evacuation centers. These centers were planned/built to withstand disasters. Some of these centers include schools, gymnasiums, neighborhood centers.



INFORMATION DISSEMINATION

The government has set up better broadcasting and distribution of information when disasters are occurring. The information is explained thoroughly and in a way that everyone can understand: in English, Tagalog, and the main dialect of the city/town. A better system is set up, so everyone gets the same information and a timely manner to better prepare against the disaster.

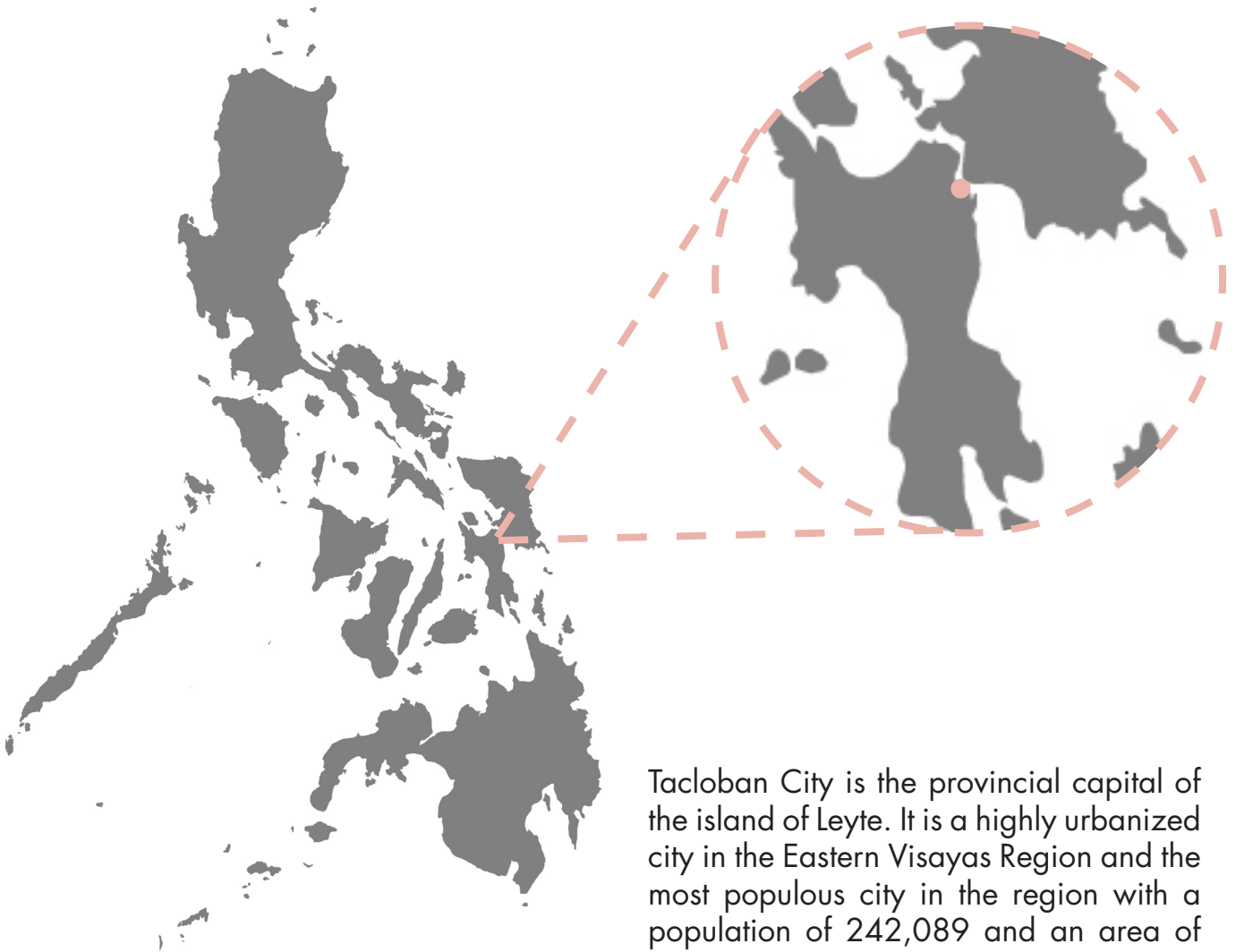
5

TACLOBAN CITY

// 5.1

// TACLOBAN CITY

Learning about the city is crucial to designing a site specific Command Center that caters towards the people from that city.



Tacloban City is the provincial capital of the island of Leyte. It is a highly urbanized city in the Eastern Visayas Region and the most populous city in the region with a population of 242,089 and an area of 78 sq. miles.

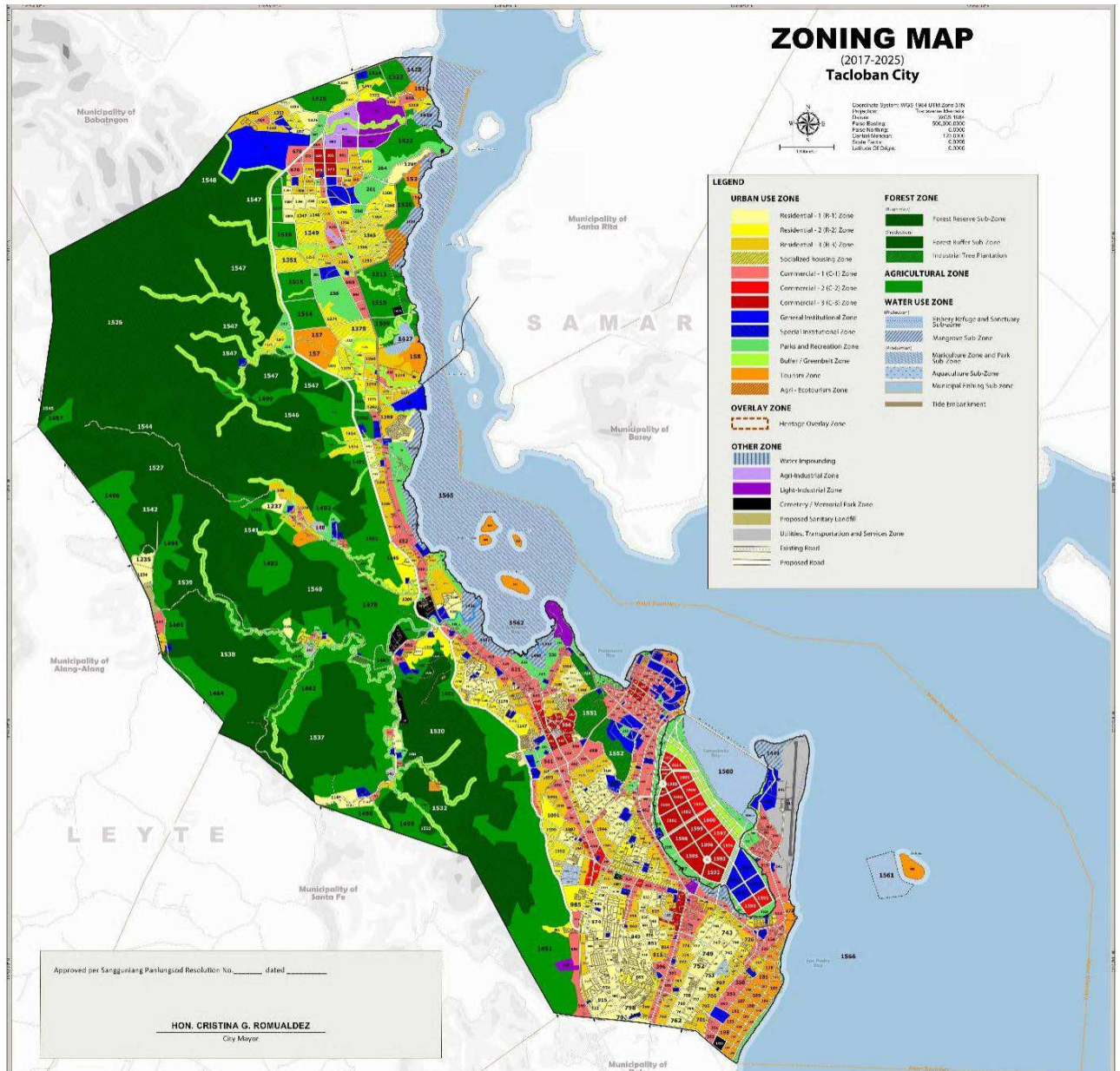
Map 4. The Philippines and Tacloban City



// 5.2

// TACLOBAN CITY MAPS

The maps of Tacloban City are shown to give more context of the city and how people are situated along the coast. The maps also show the different types of hazards and how much damage each hazard could bring to the area. It is critical to learn about the maps and the city itself in order to make safe and sound decisions when choosing a site for the Tacloban City Command Center. Knowing the area where most people live, the commercial district, etc., is essential to gather information on where there are people. When a disaster strikes, they would know how to counteract catastrophes and send help. These maps also show where the evacuation centers are already placed within the city. People in those respective areas can go to the centers when typhoons or other disasters are happening. It is crucial to know where to go and have a plan to get there to ensure the safety of the people and minimize casualties and damages.



LEGEND



Residential



Commercial



Institutional

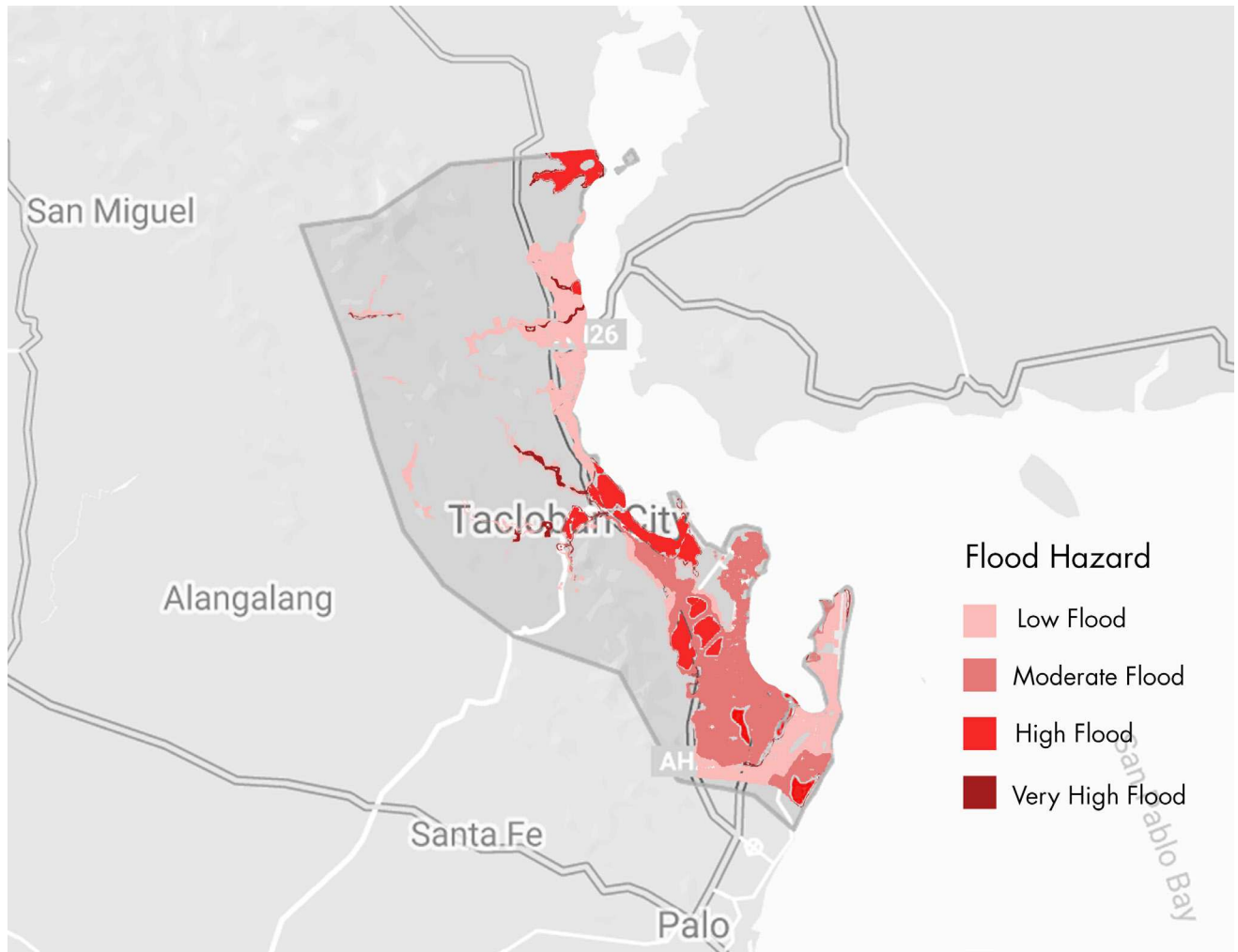


Forest/Mountain

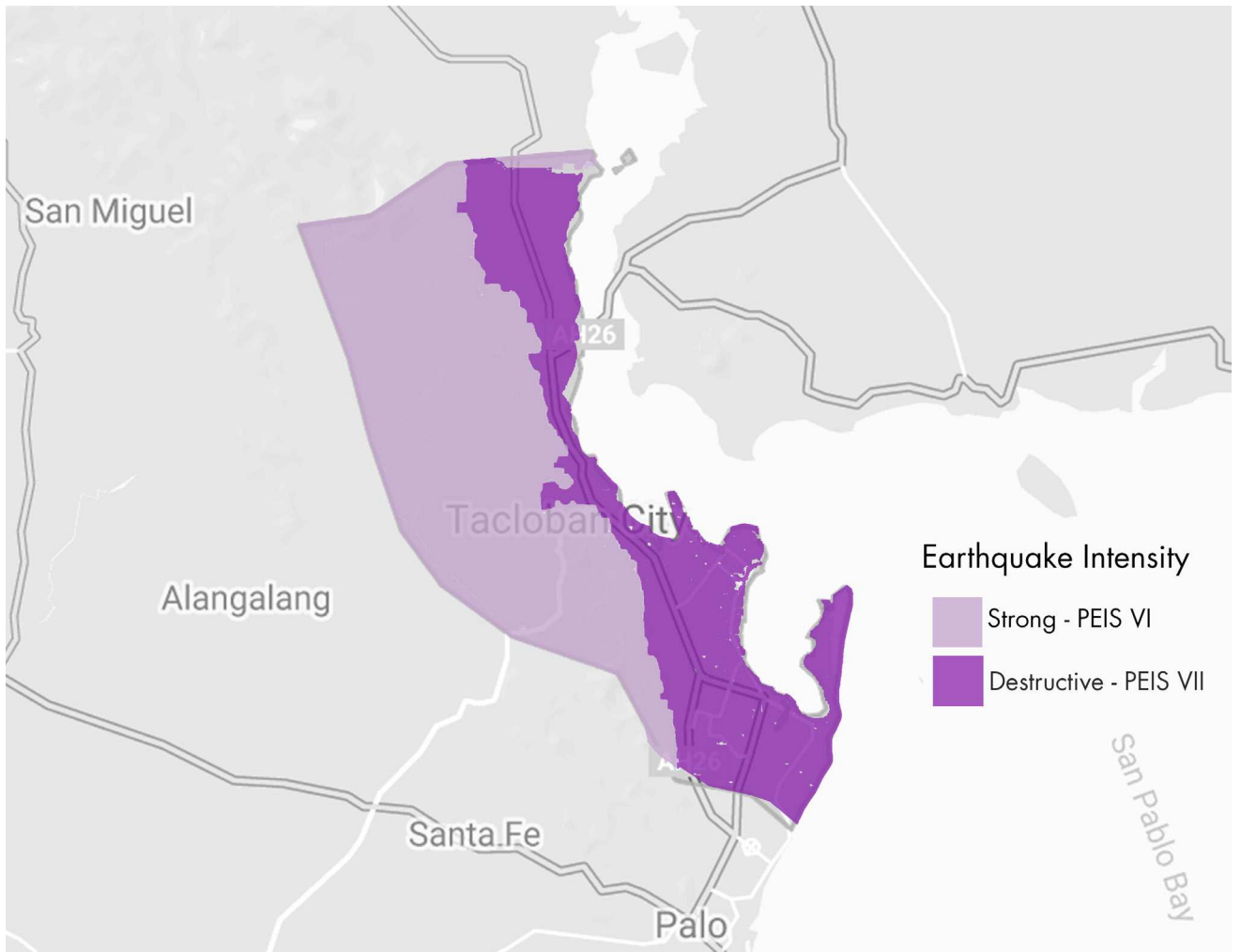


Agricultural

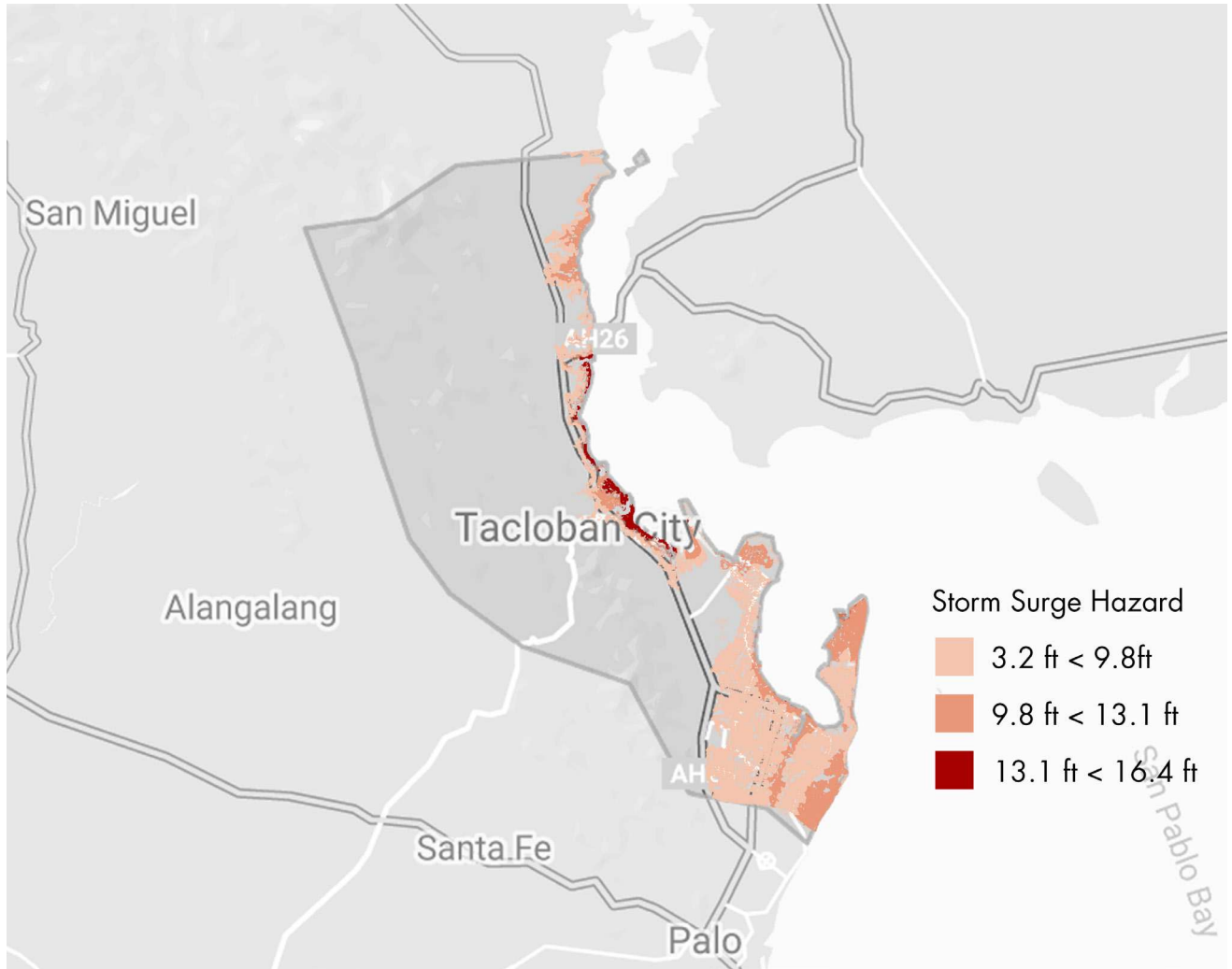
Map 5. Zoning Map of Tacloban City



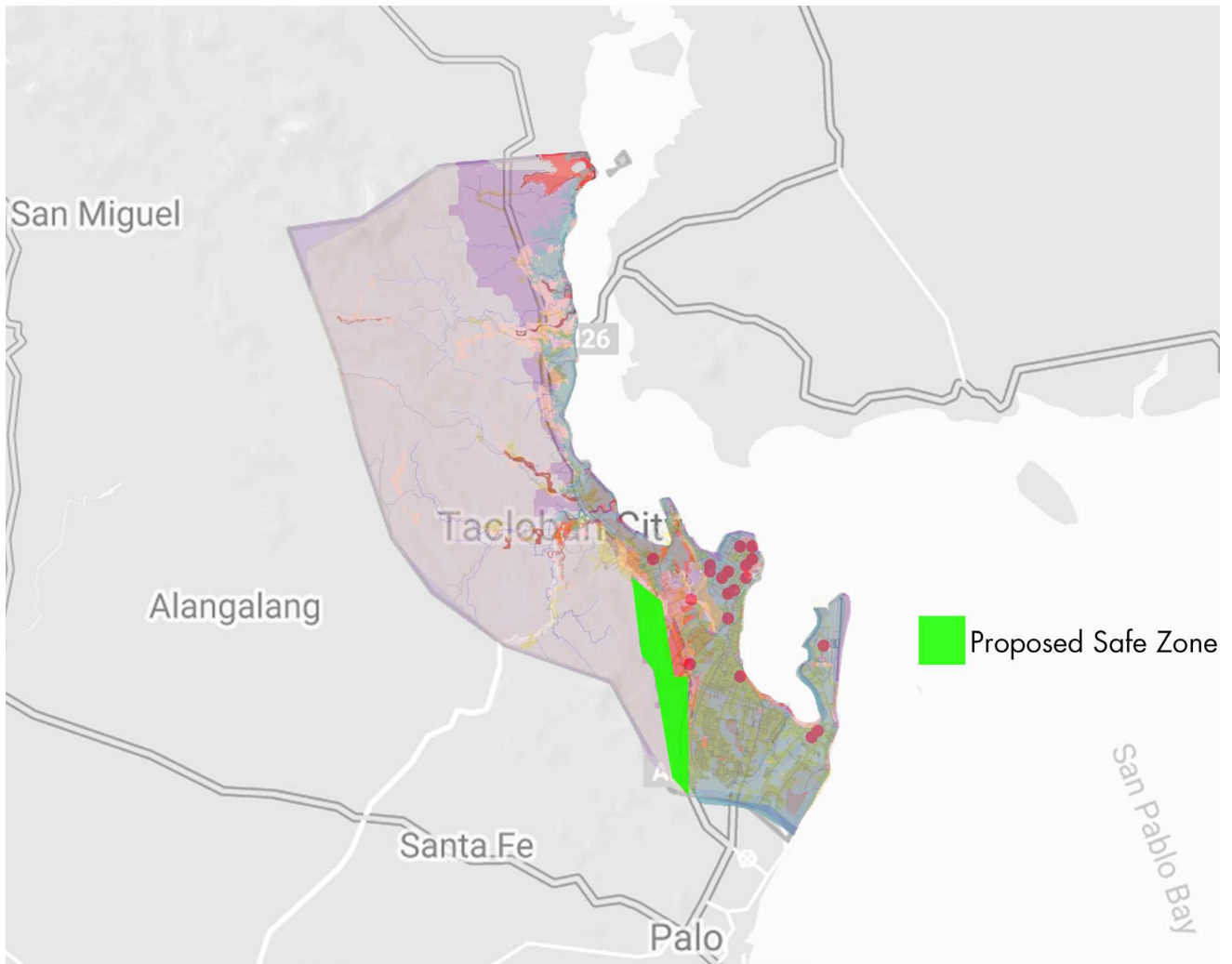
Map 6. Flood Hazard Map



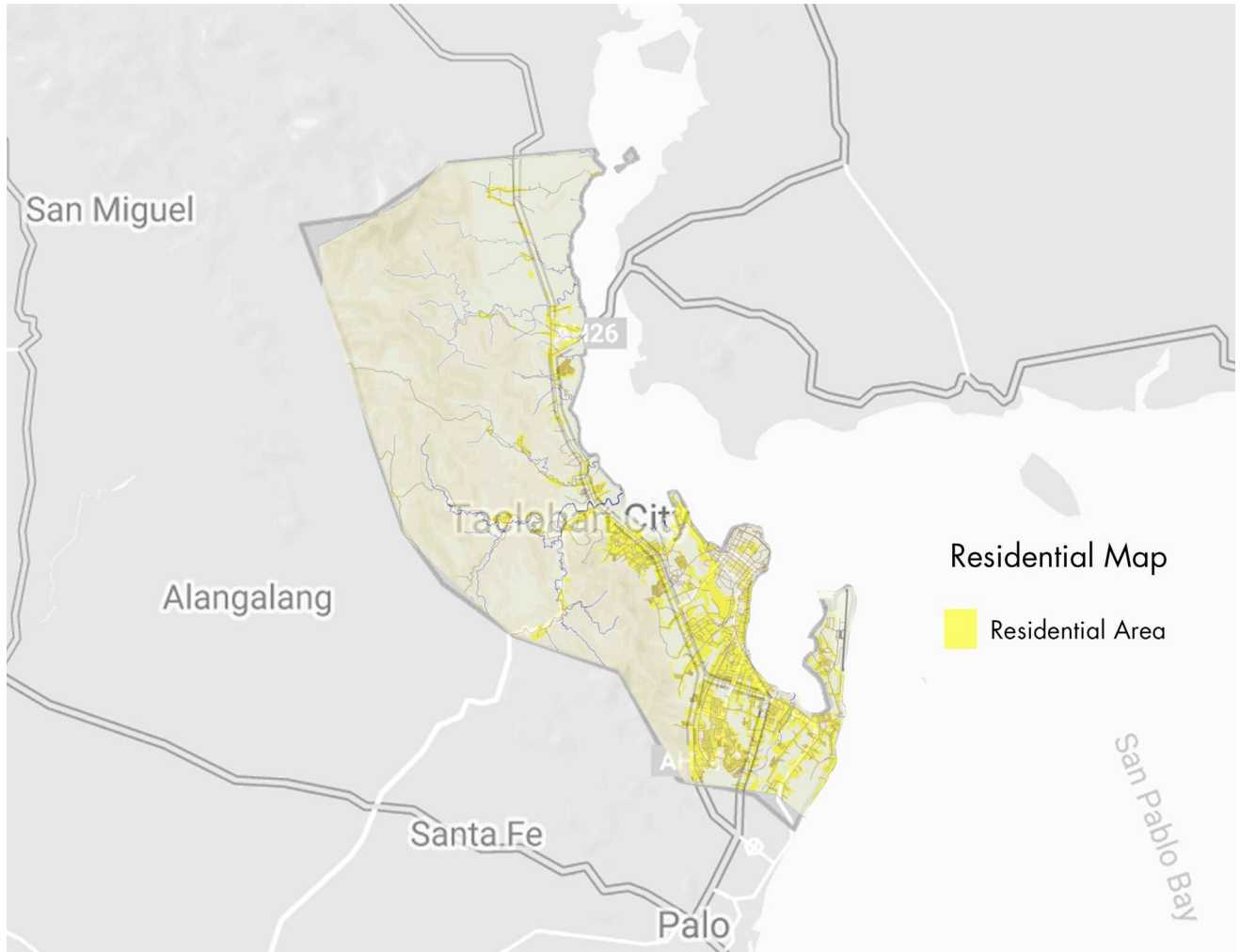
Map 7. Earthquake Hazard Map



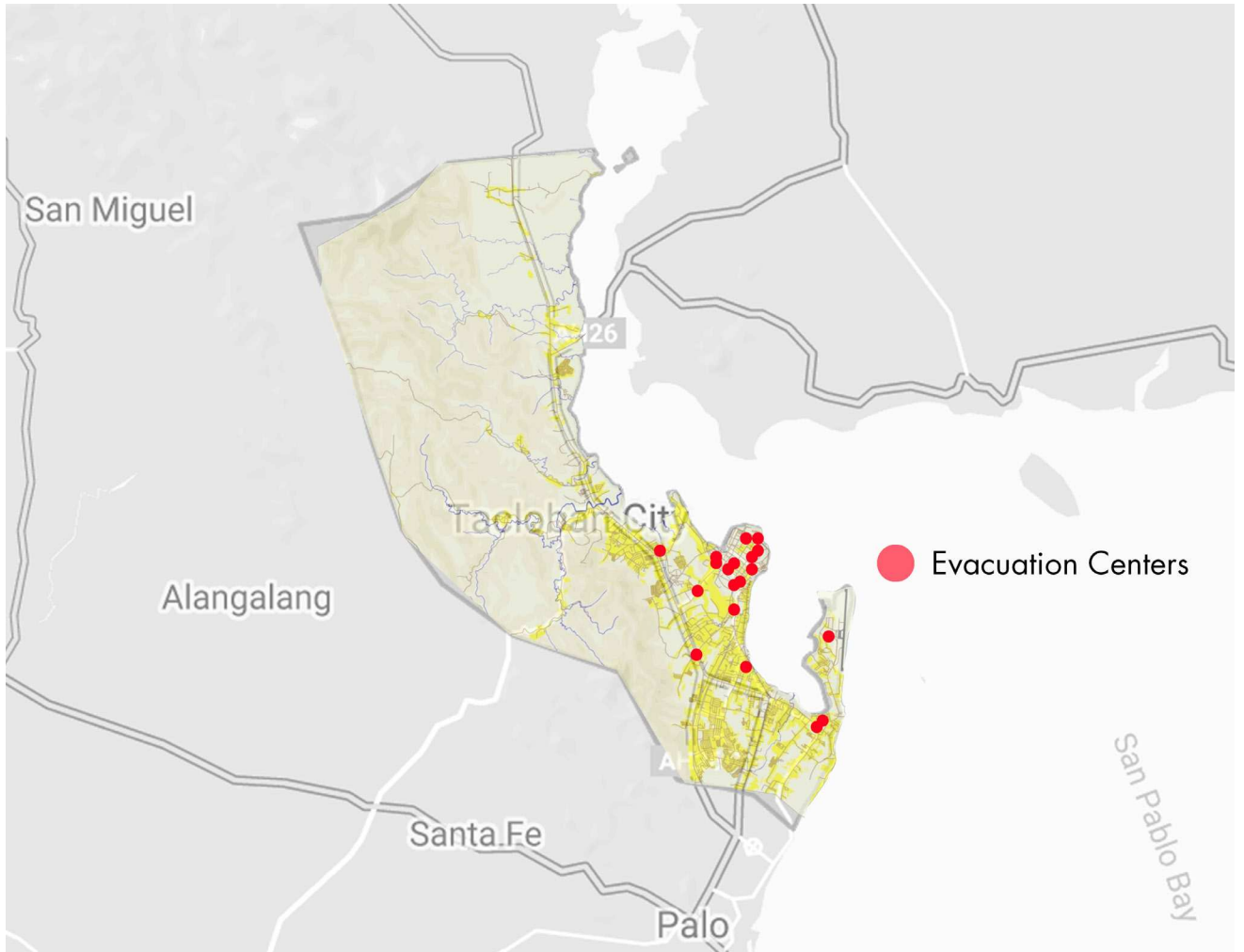
Map 8. Storm Surge Hazard Map



Map 9. Safe Zone Map



Map 10. Residential Map



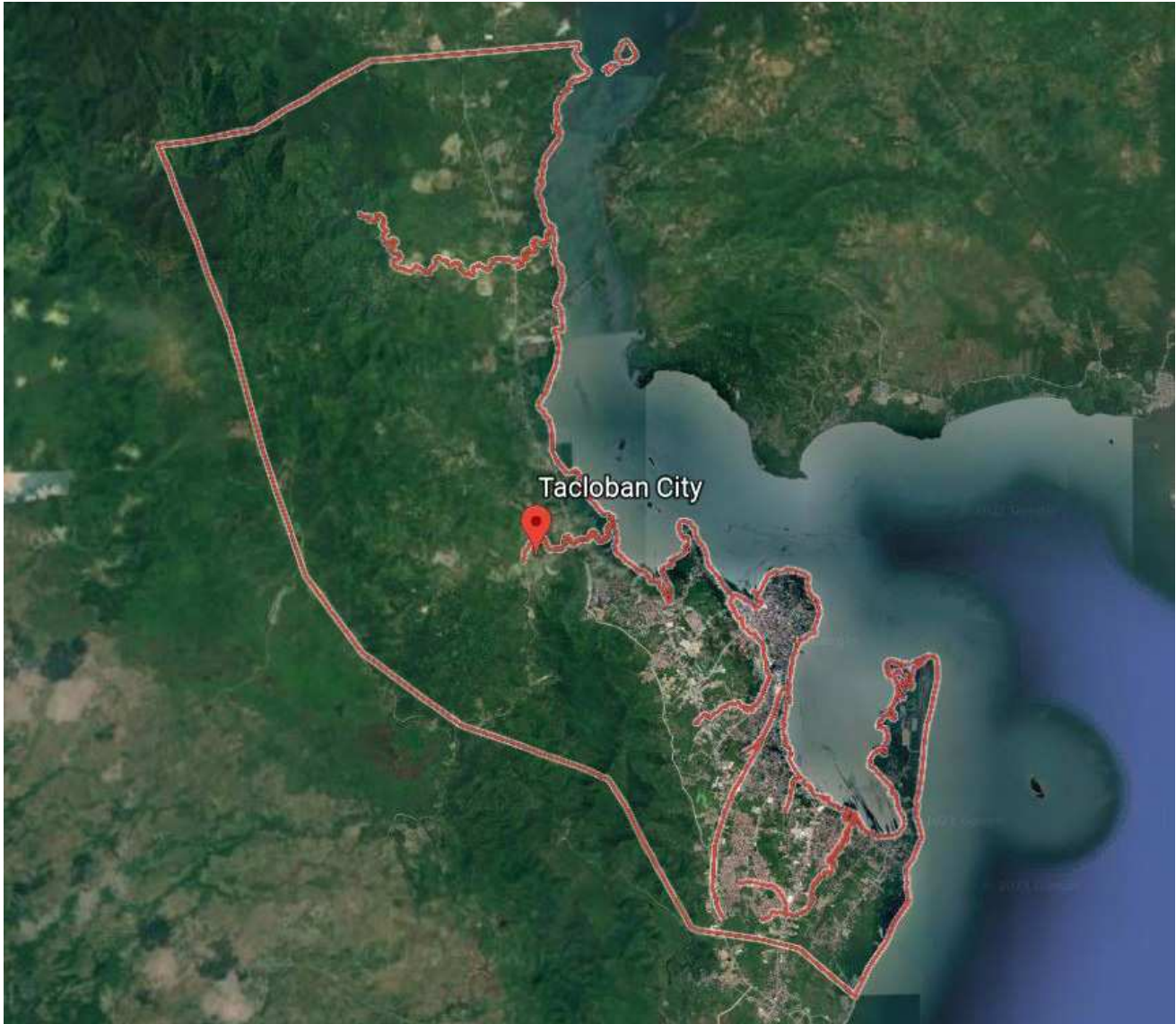
Map 11. Evacuation Centers Map

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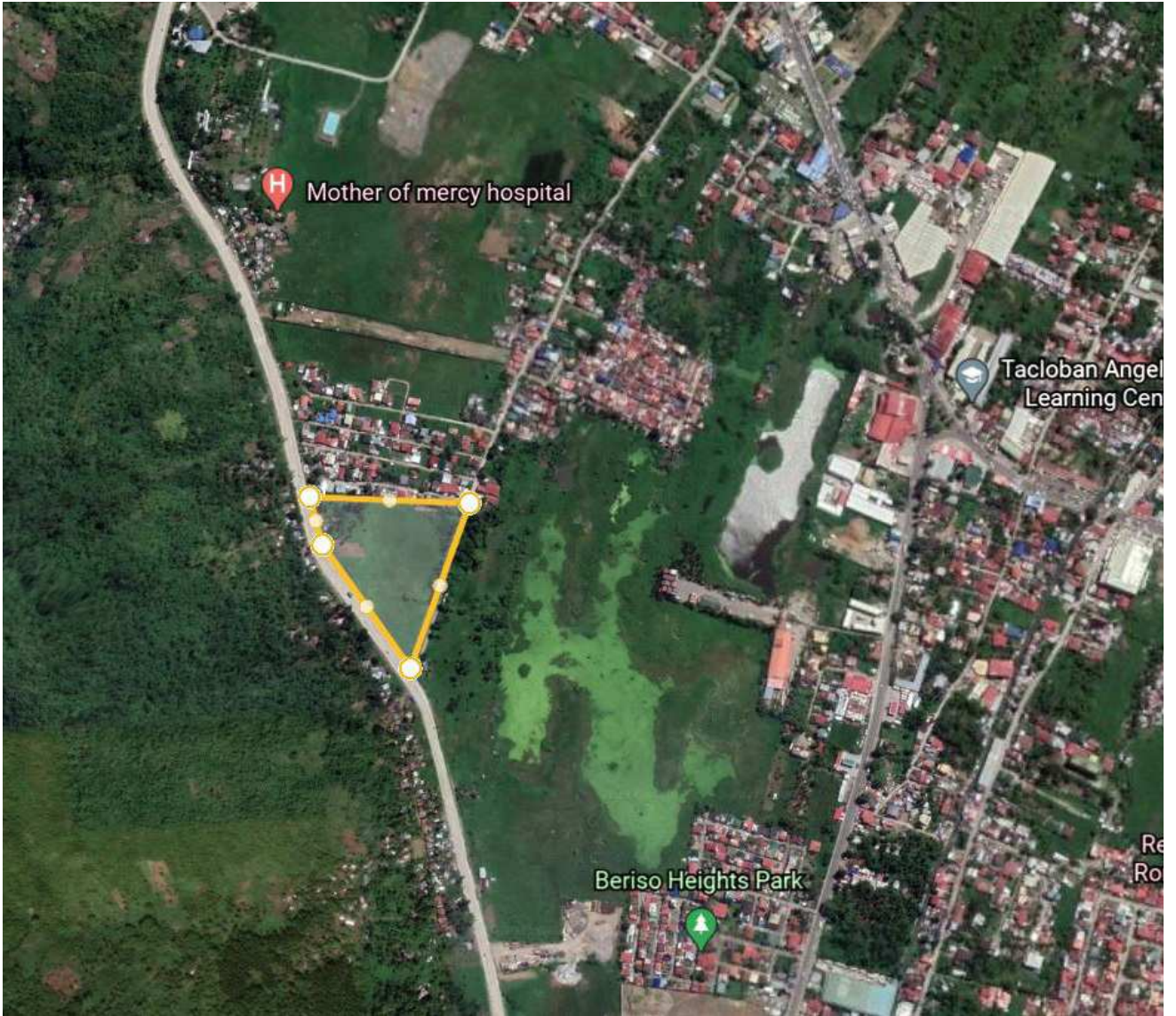
**TACLOBAN CITY
COMMAND CENTER**

// 6.1

// SITE ANALYSIS



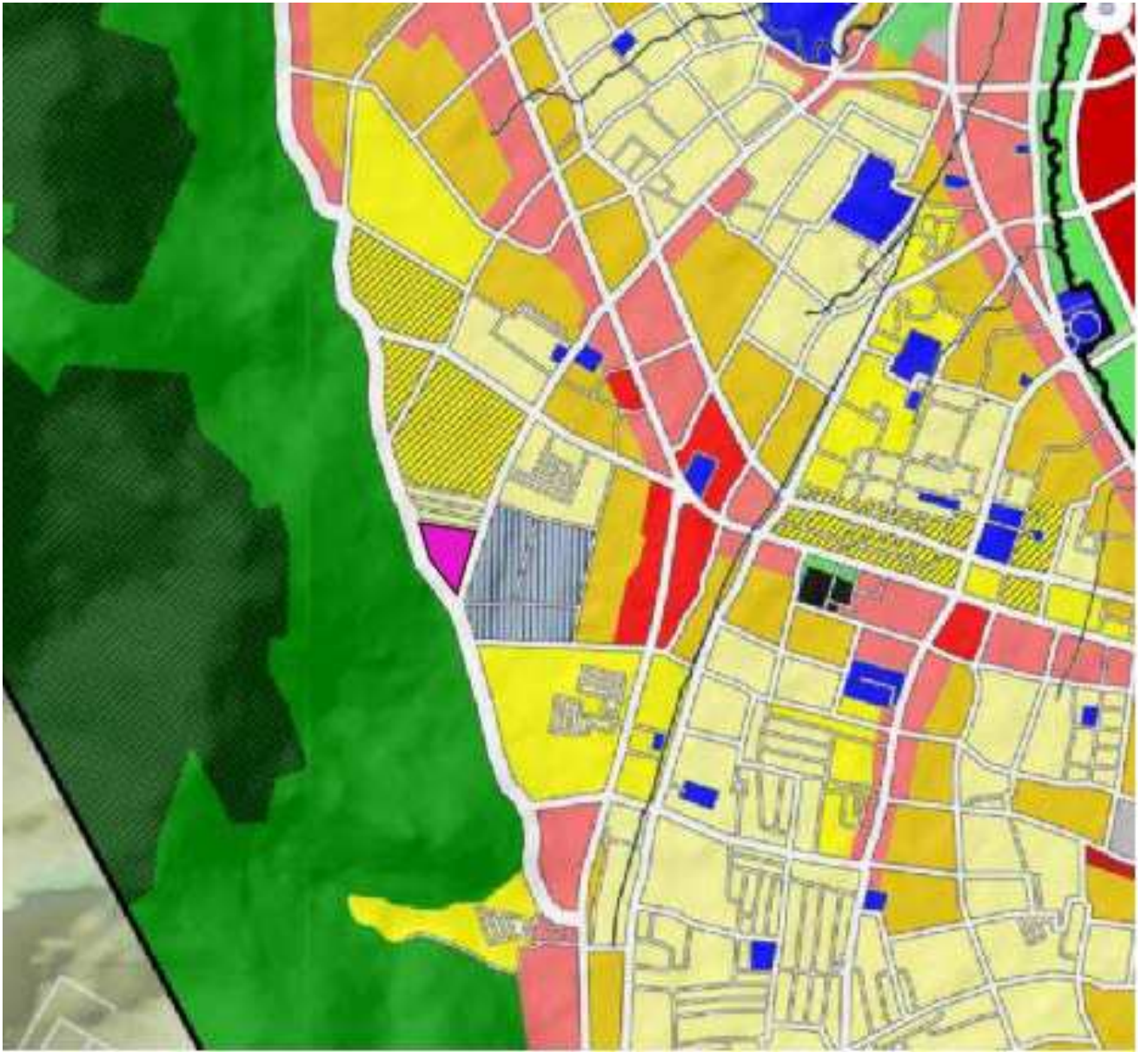
Map 12. Tacloban City Boundary



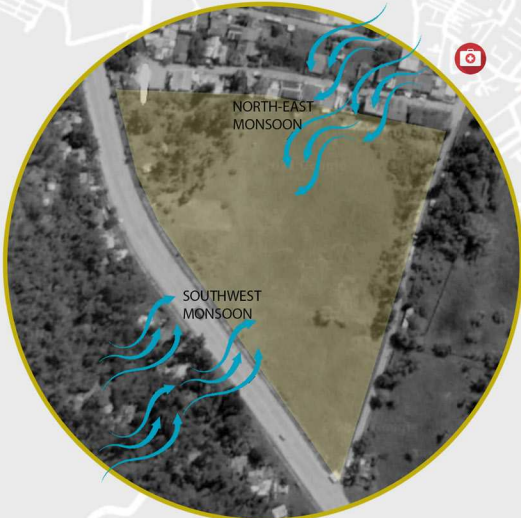
Map 13. Command Center Site Boundary.



Map 14. Surrounding Area of Site



Map 15. Zoning Surrounding Area of Site



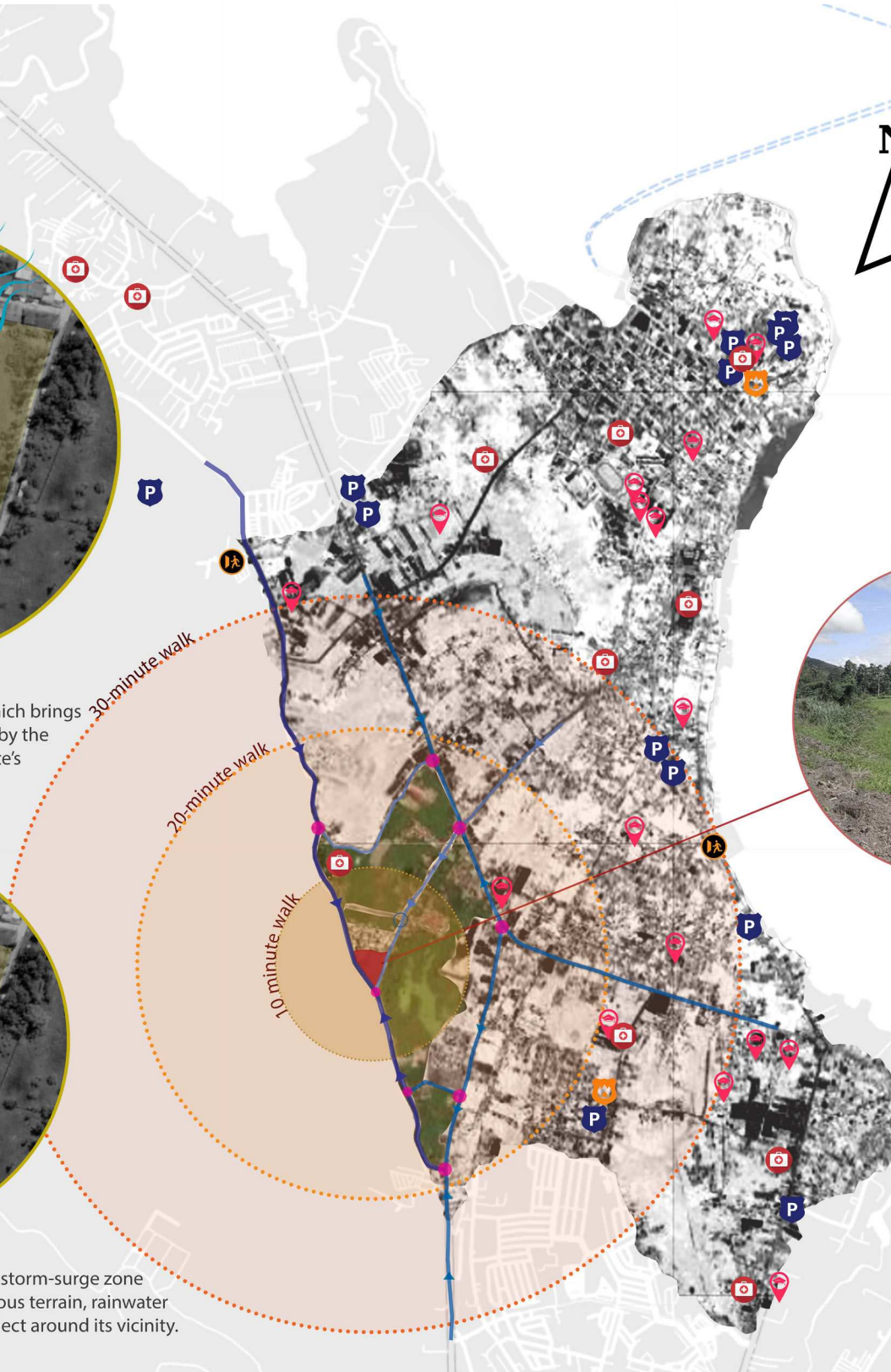
PREVAILING WIND PATH

The southwest monsoon's effects which brings on heavy rains and wind is reduced by the mountains across it. Although, the site's open vicinity is an advantage that maximizes the northeast monsoon's cool winds



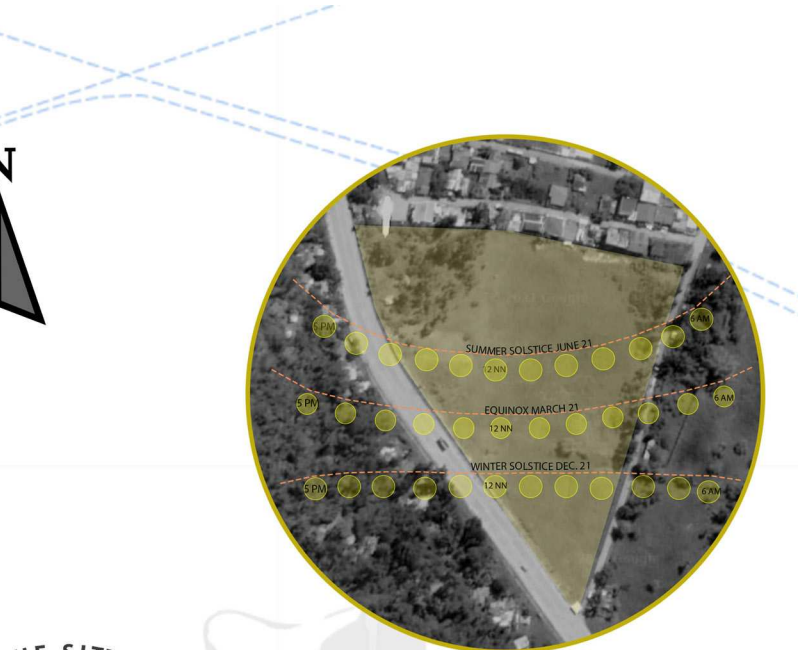
WATER RUN-OFF

The site's location is far from the city's storm-surge zone but due to it being close to mountainous terrain, rainwater run-off and debris is expected to collect around its vicinity.



The site analysis was conducted to be able to inform the viability of the site for the Command Center. It follows a checklist that gives the site the green light to be able to become the Command Center. First, it has to have proximity to the home site of vulnerable communities. The community needs to have safe access to the route towards the Command Center when disasters happen. It also needs to be accessible to people, especially those with special needs: children, pregnant women, elderly, persons with disability, etc. The site needs to be free from secondary hazards such as floods, landslides, erosion, and earthquakes. It also needs to be feasible for income and generate opportunities to support the building for maintenance costs.

The following images show what the Command Center's site currently has, which is just an open field as of right now.

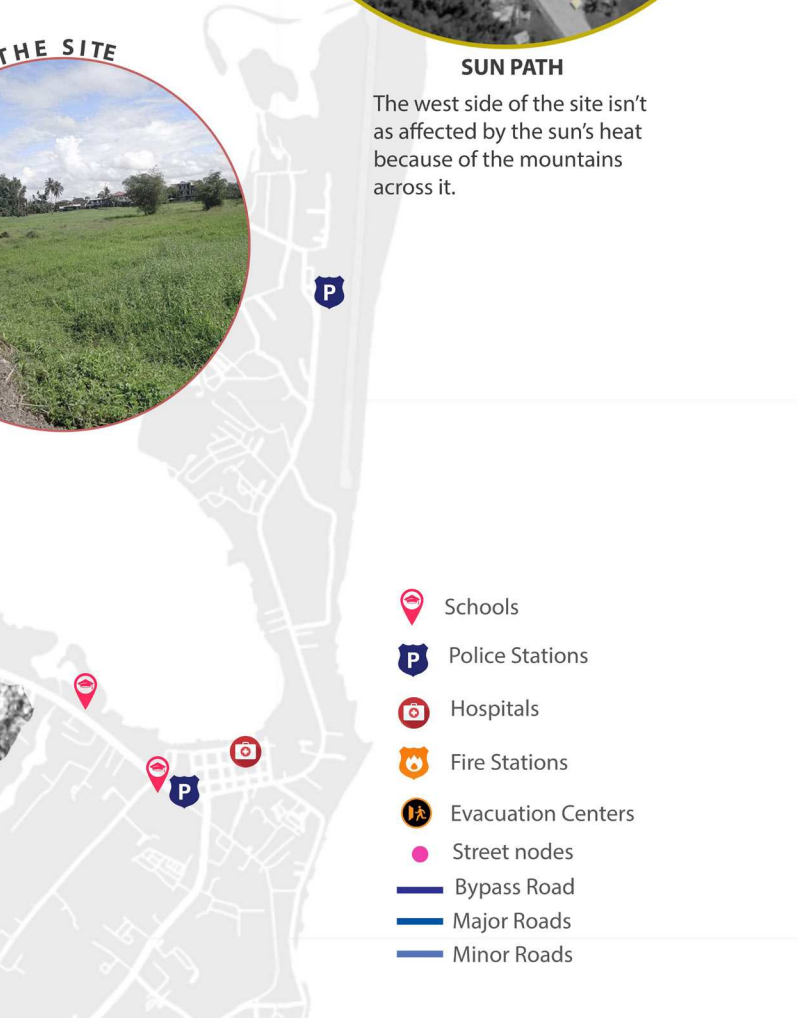











SUN PATH

The west side of the site isn't as affected by the sun's heat because of the mountains across it.



THE SITE



-  Schools
-  Police Stations
-  Hospitals
-  Fire Stations
-  Evacuation Centers
-  Street nodes
-  Bypass Road
-  Major Roads
-  Minor Roads

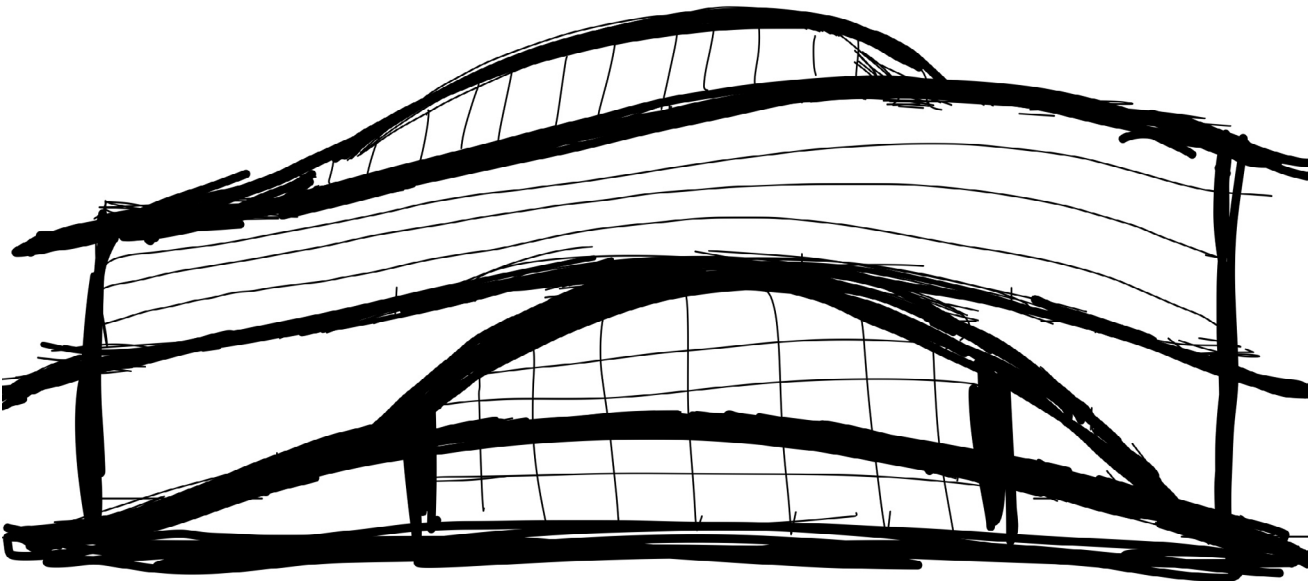
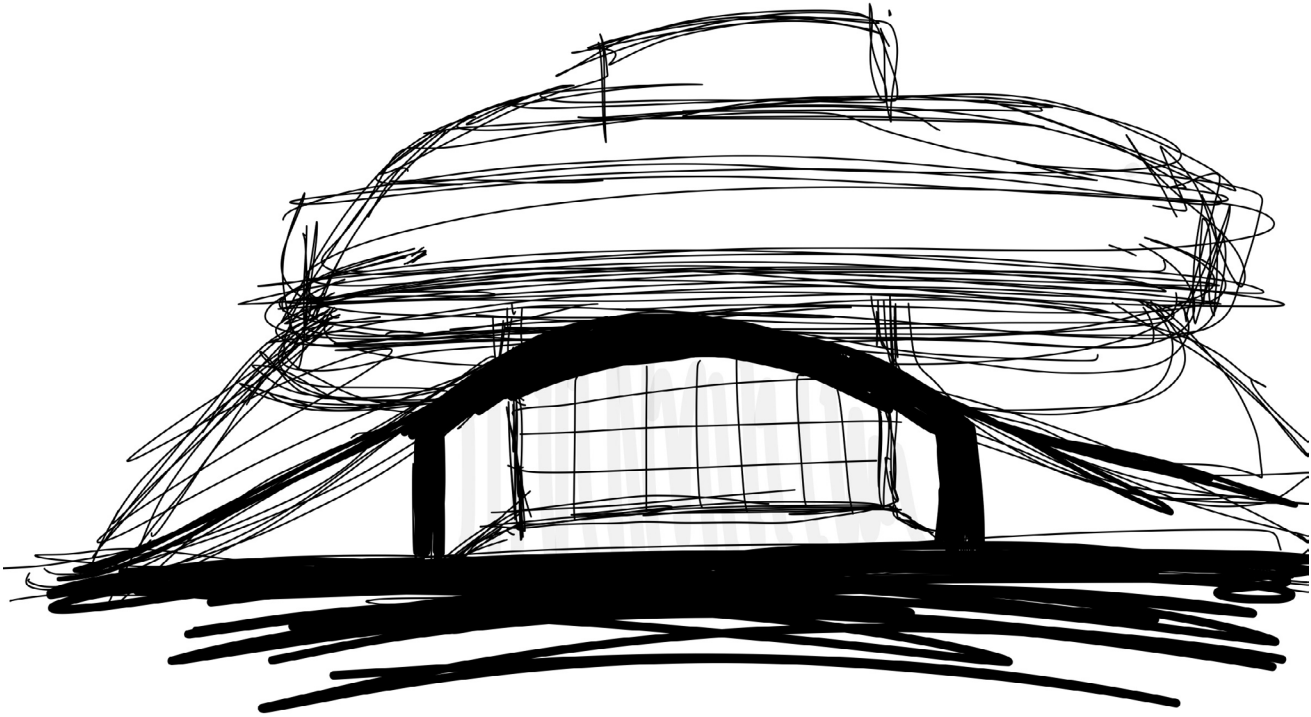


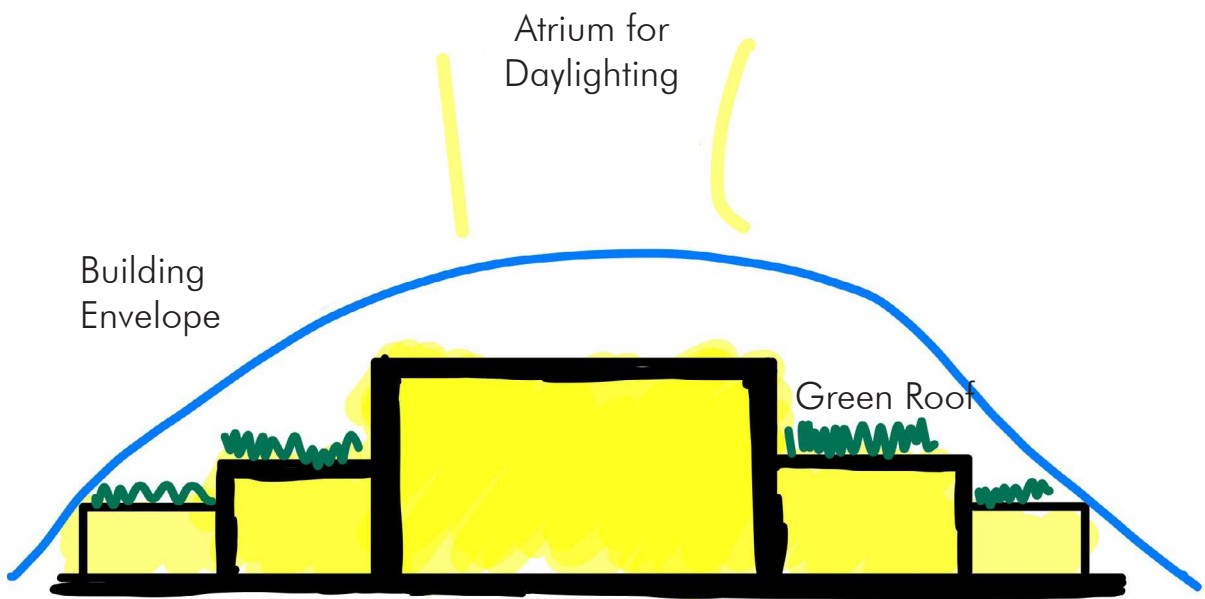


// 6.2

// DESIGN CONCEPTS

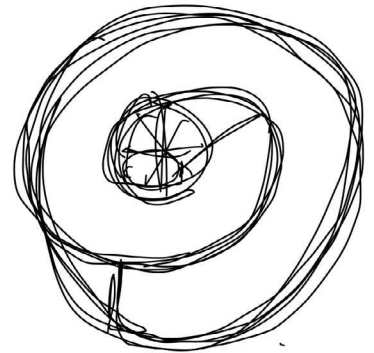
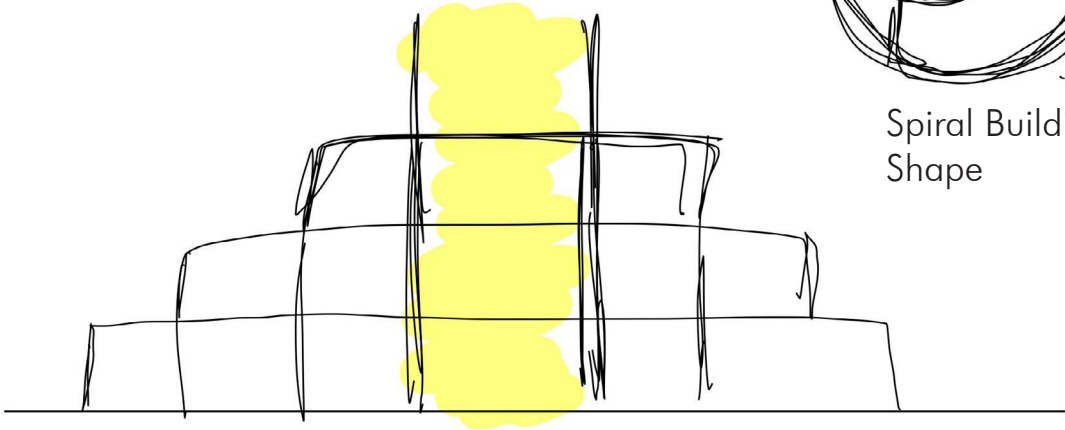
The early initial designs for the Command Center were thought of as shell shapes that embodied the feeling of safety and home. The spiraling shell shape was thought of to make the center feel the safest. Its outer shell and layers become the protective shield needed to combat the natural disasters happening outside of the shell. It intended to become a beacon of light that showed the people of Tacloban City that there is hope and light in the midst of the disaster happening around them.





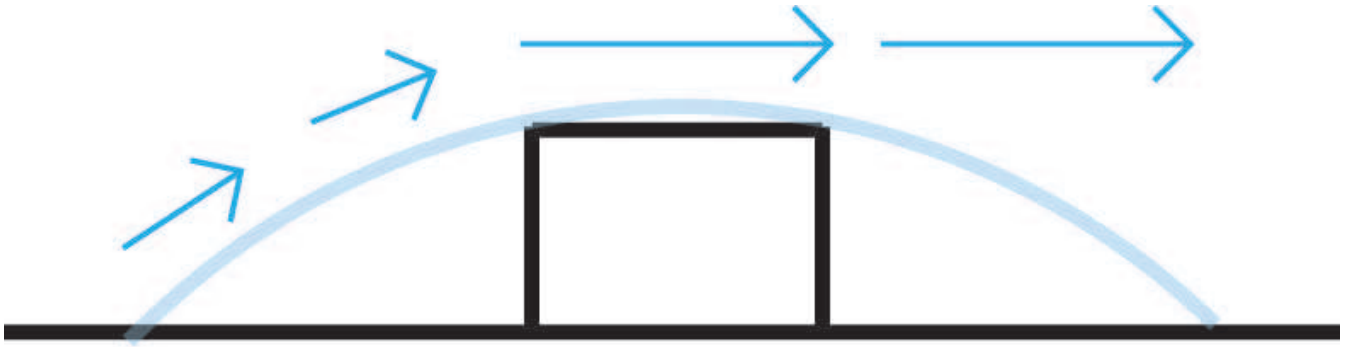
This design concept shows the need for natural daylighting within the building through the access of an atrium as well as having green roofs to make sure that there would be food production happening from the building itself. Creating an urban garden was one of the many spaces issued for the Command Center to make sure that they would have the means to feed people during disasters.

Beacon of
Light /
Lighthouse



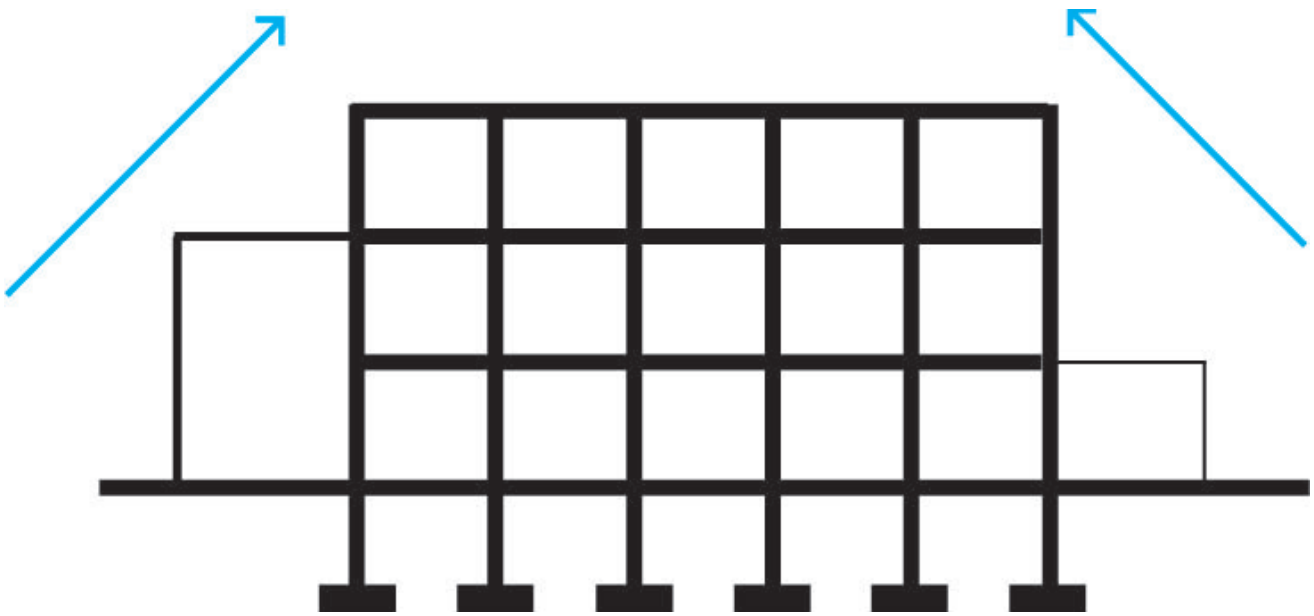
Spiral Building
Shape

With this concept, the early thought was creating a lighthouse to showcase the Command Center during times of disaster. It can shine the light all across the city to let the people know that they are there to support everyone.



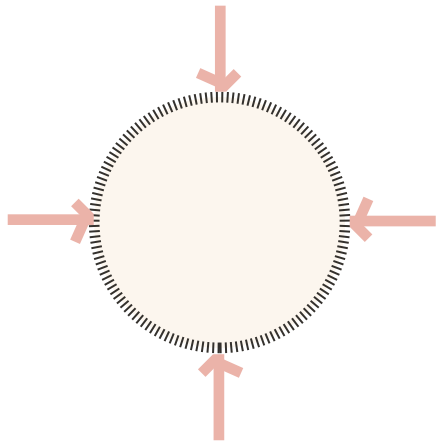
BUILDING ENVELOPE

The building envelope design and aerodynamic shape reduces the impact of strong wind uplift and flying debris. The symmetrical building shape mitigates the impact of seismic activity.



STRUCTURE

The building design adheres to best practices and the Philippine National Structure Code Standard. It is typhoon and earthquake resistant and flood-proof with an elevated ground floor to mitigate the impact of rain-induced flooding.



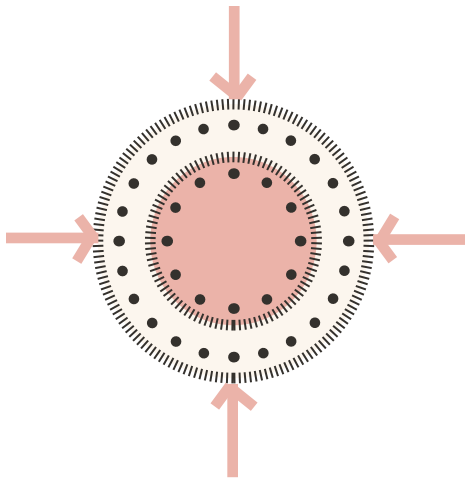
SITE SPECIFIC

→ **Entry points**

— — — **Mirror**

↻ **Rotate**

The building orientation helps enhance the presence of the command center at the main pedestrian entry and maximizes access to natural daylighting and ventilation. The foundations are engineered specifically to the condition of the site.



DOUBLE FACADE / CIRCULATION

→ **Entry points**

• • • • • **Circulation**

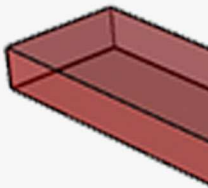
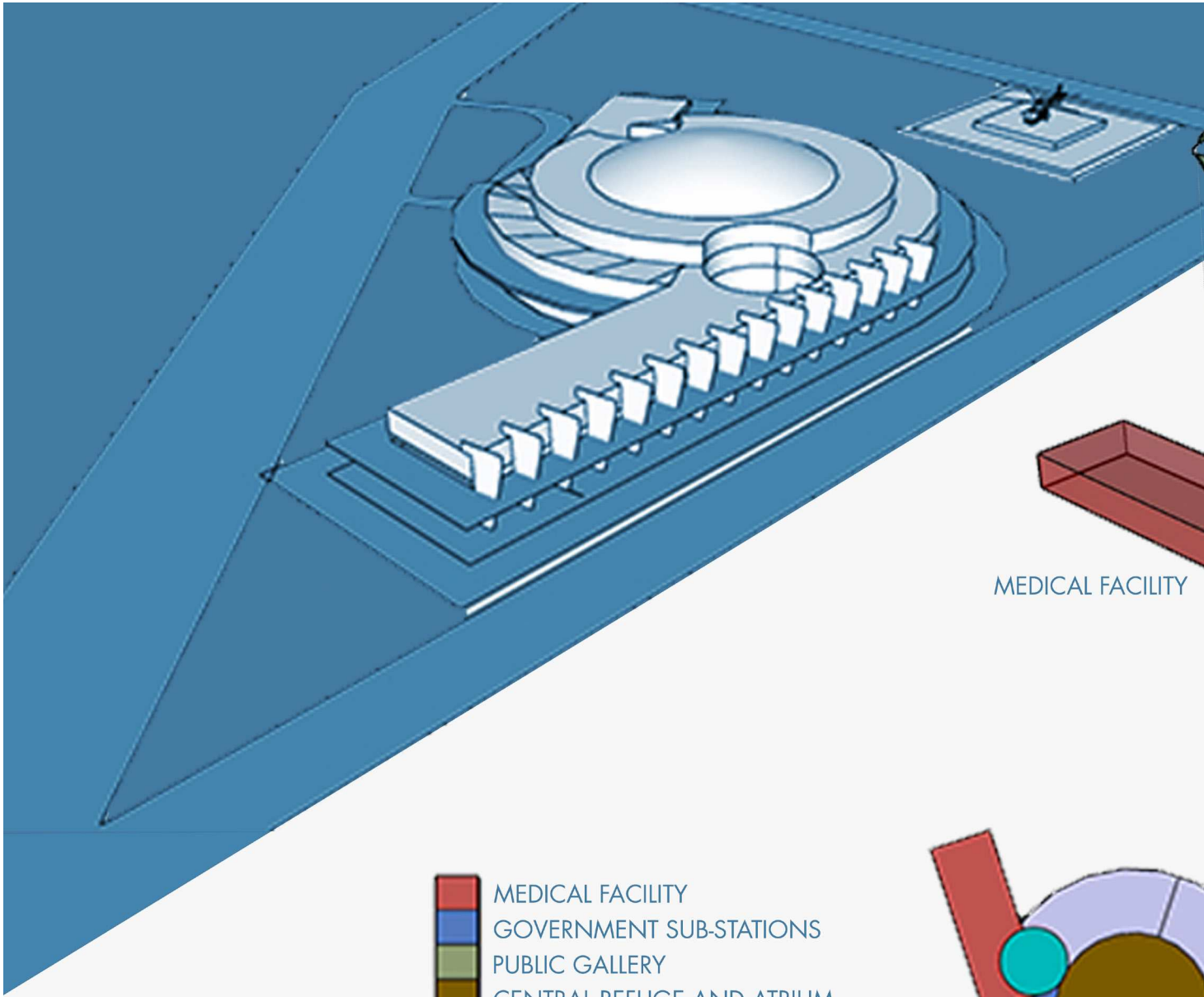
Having a double facade provides a buffer from wind and rain and protects the interior where people will congregate. The perimeter and multiple entry points will allow many people to rapidly enter and exit the building and provide access for people with disabilities.

// 6.3










// TACLOBAN CITY
COMMAND CENTER



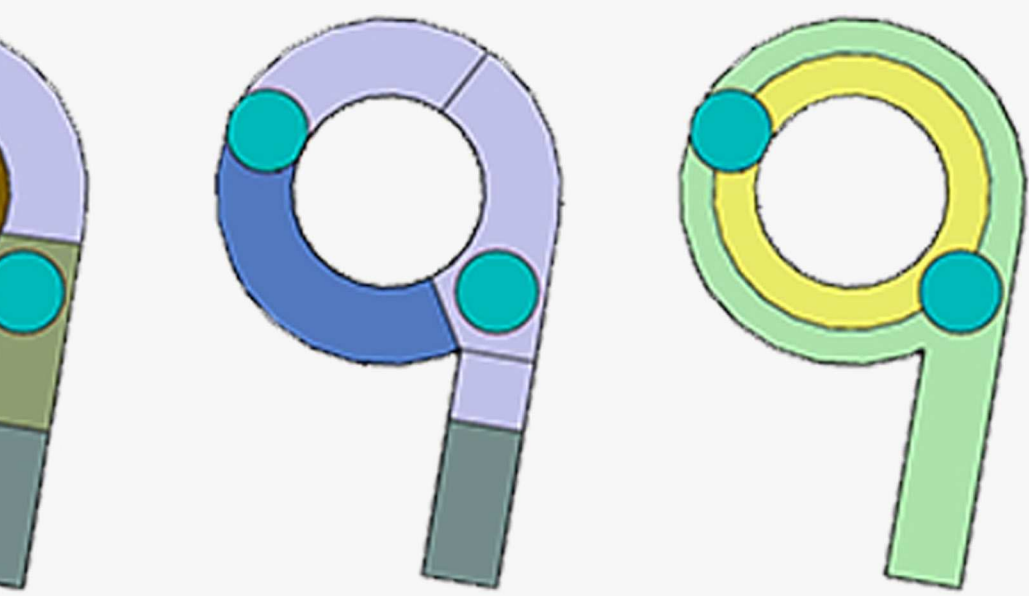
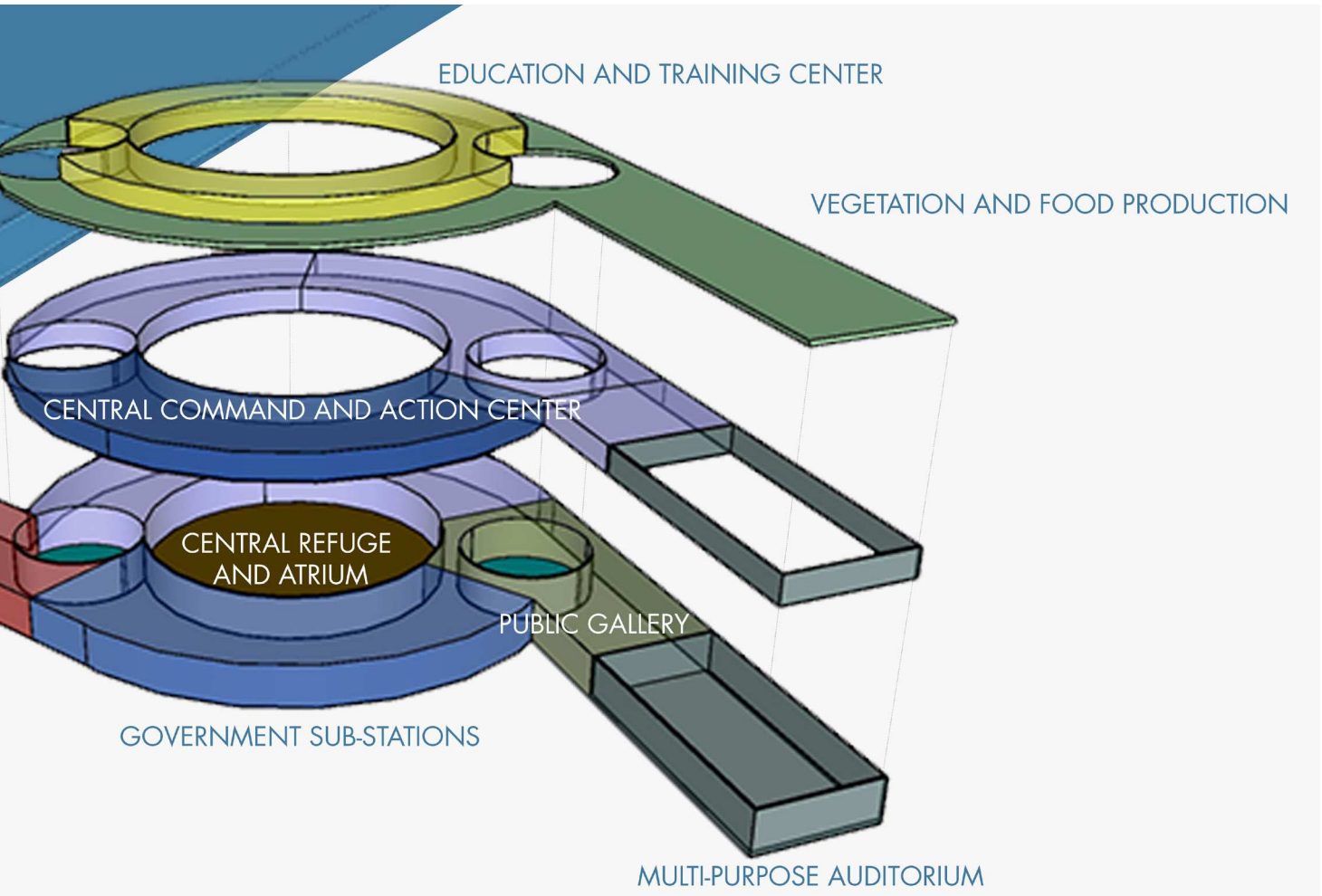


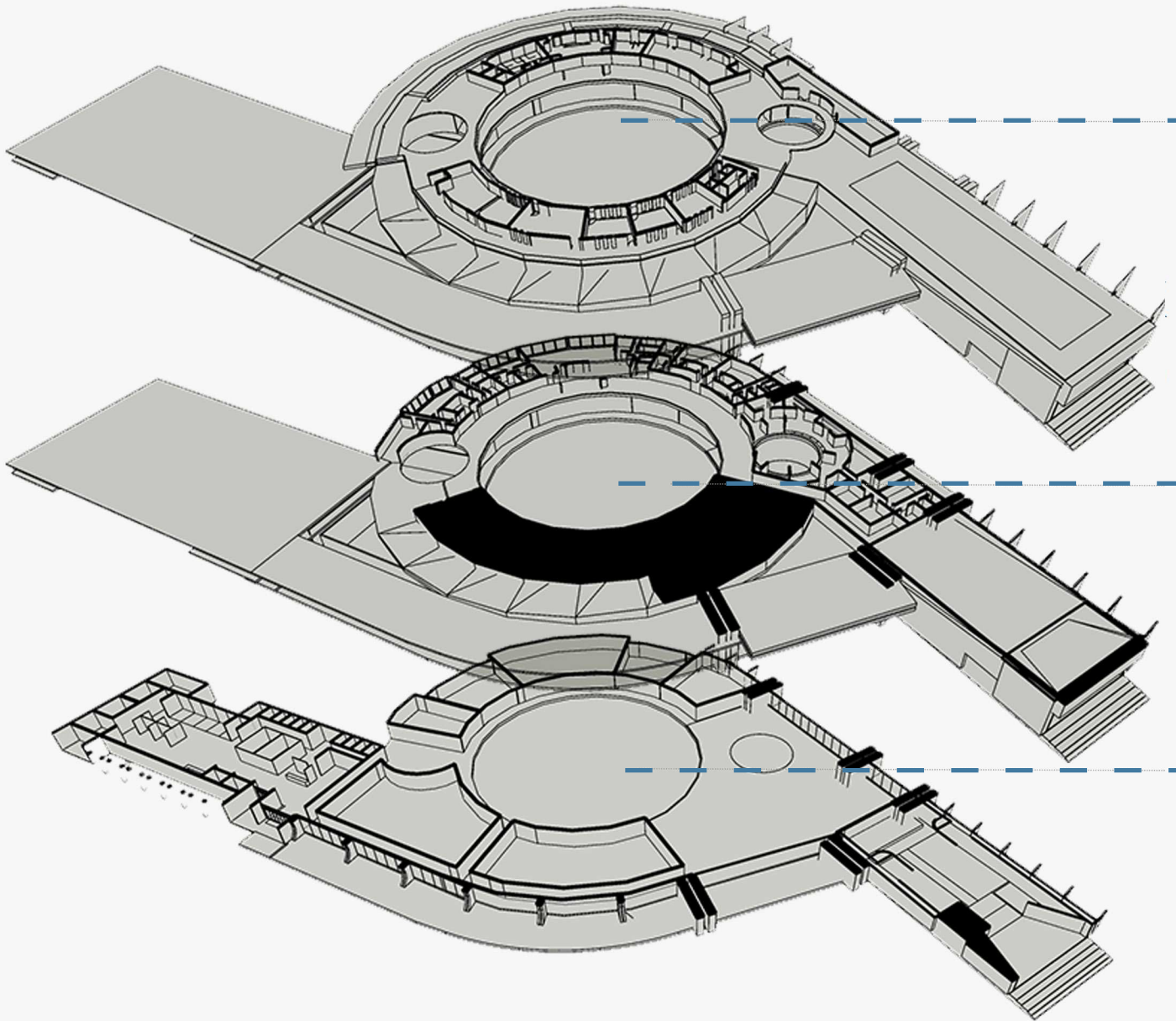


MEDICAL FACILITY

-  MEDICAL FACILITY
-  GOVERNMENT SUB-STATIONS
-  PUBLIC GALLERY
-  CENTRAL REFUGE AND ATRIUM
-  CENTRAL COMMAND AND ACTION CENTER
-  MULTI-PURPOSE AUDITORIUM
-  VEGETATION AND FOOD PRODUCTION
-  EDUCATION AND TRAINING CENTER
-  VERTICAL ACCESS



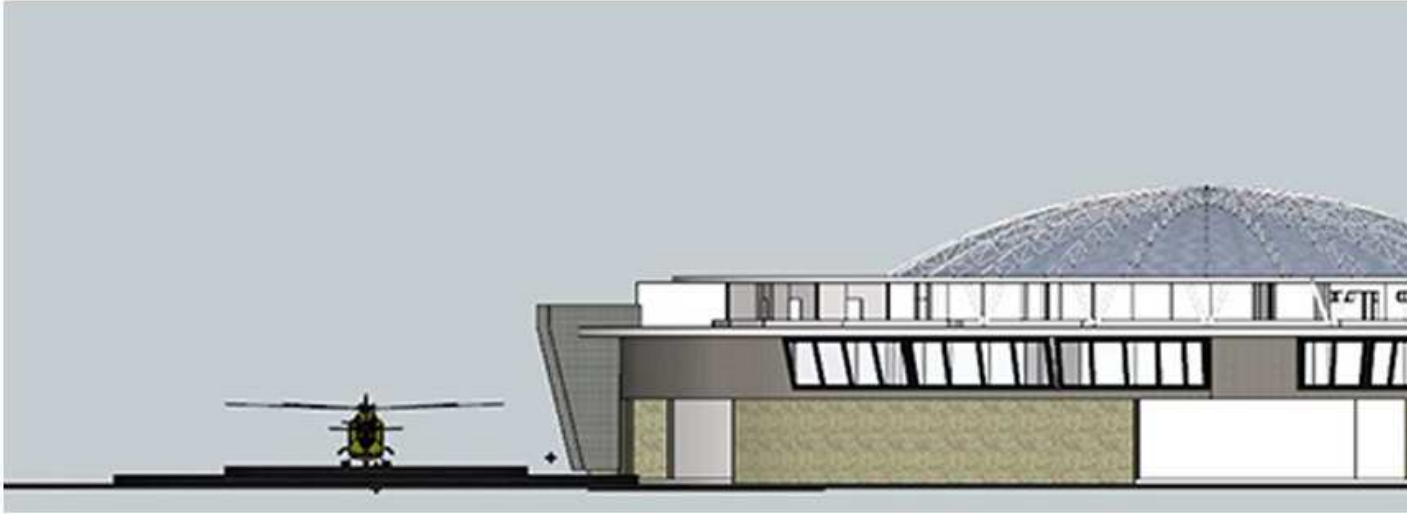




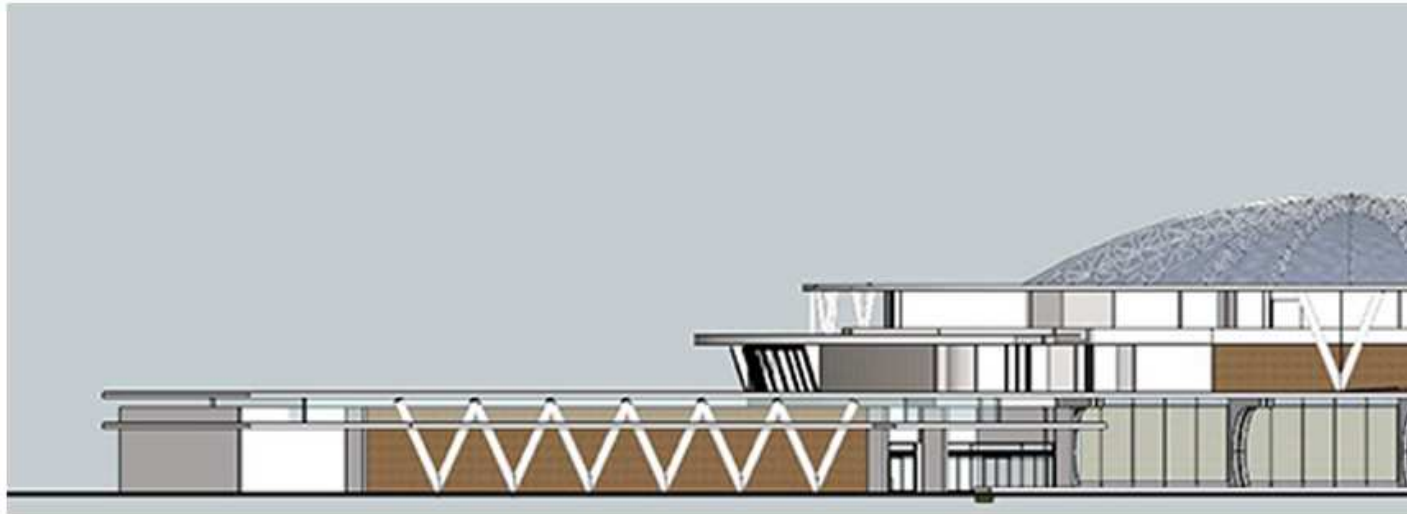
EDUCATION AND TRAINING CENTER

**BROADCASTING STATION
EMERGENCY COMMAND CENTER
PHIVLOCS SUB-STATION
PAGASA SUB-STATION**

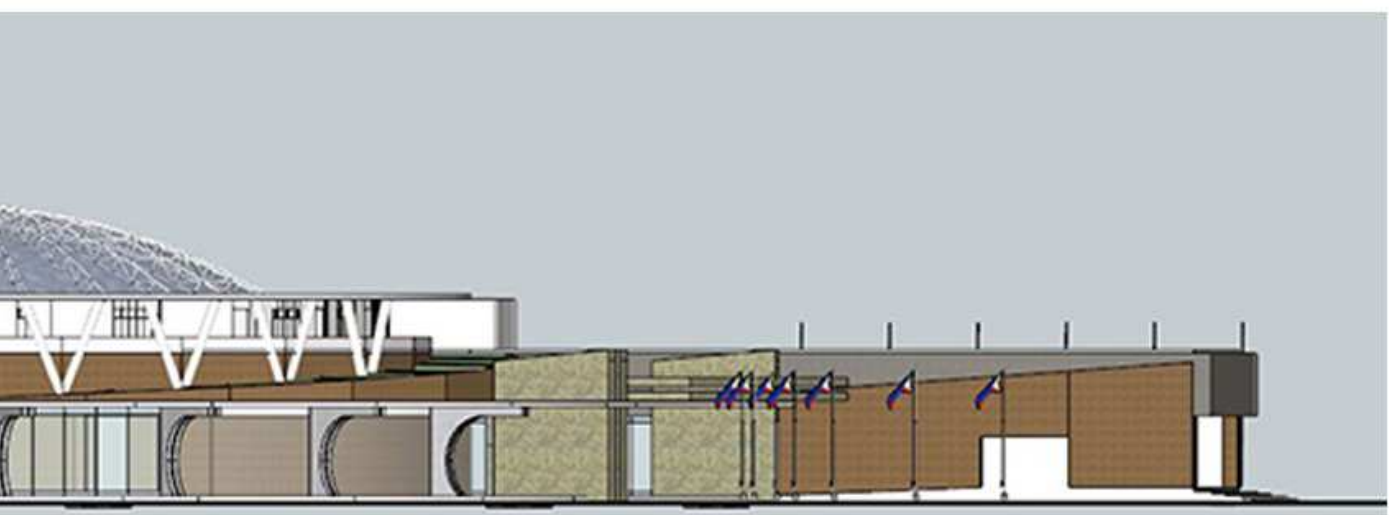
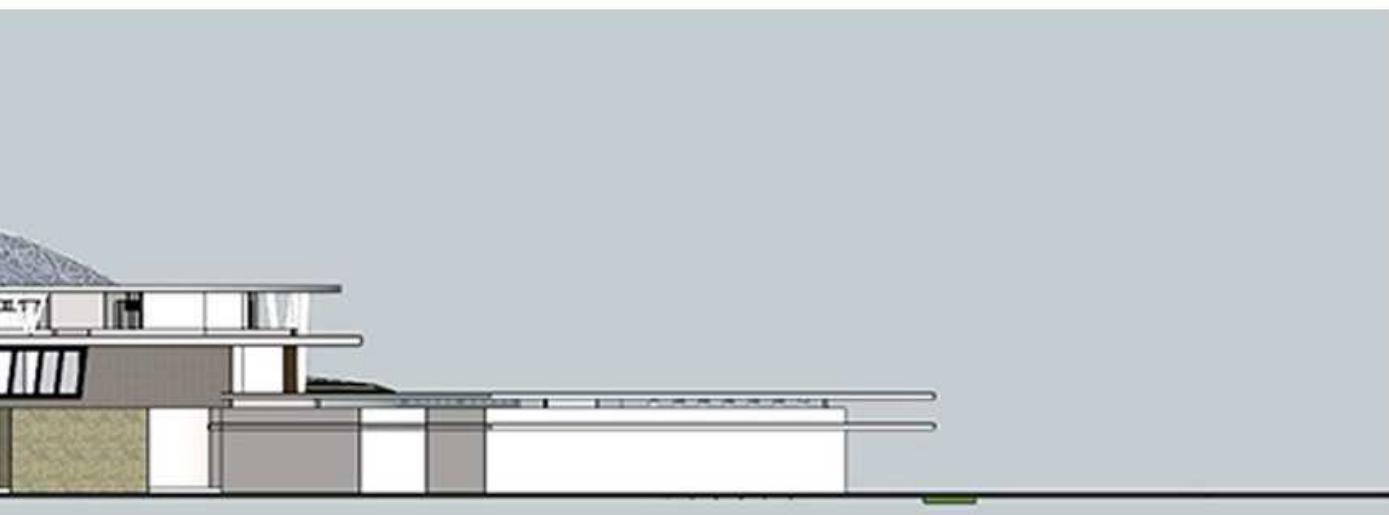
**MEDICAL FACILITY
RELIEF SUPPLY FACILITY
SUB-OFFICE OF CIVIL DEFENSE
SUB-OFFICE OF REGIONAL DISASTER RISK
REDUCTION AND MANAGEMENT COUNCIL**

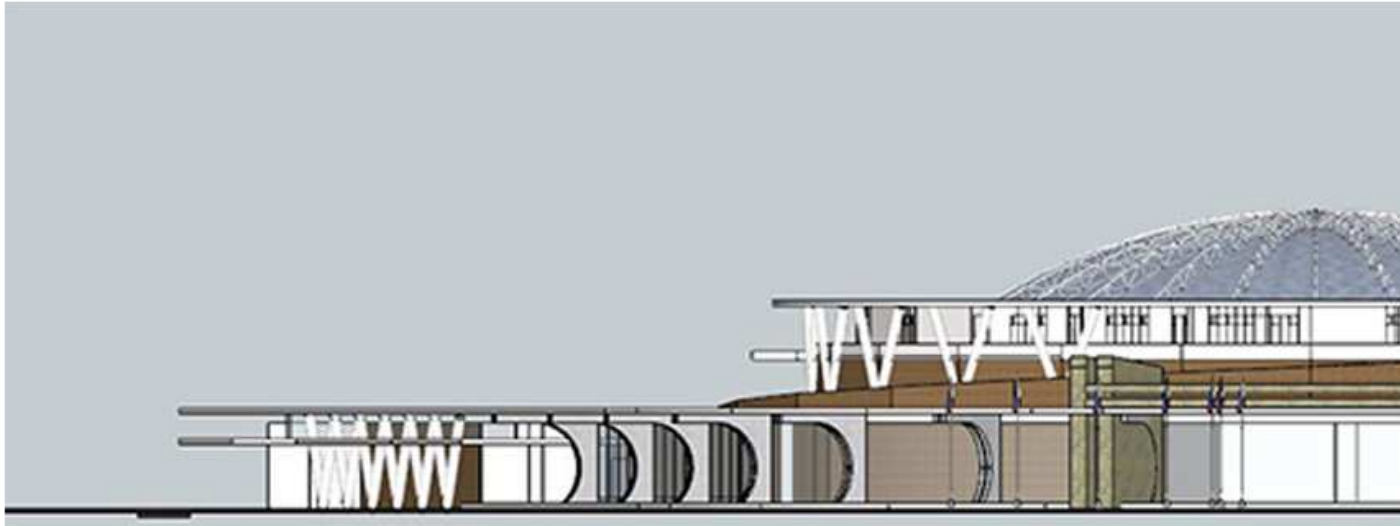


NORTH ELEVATION



WEST ELEVATION

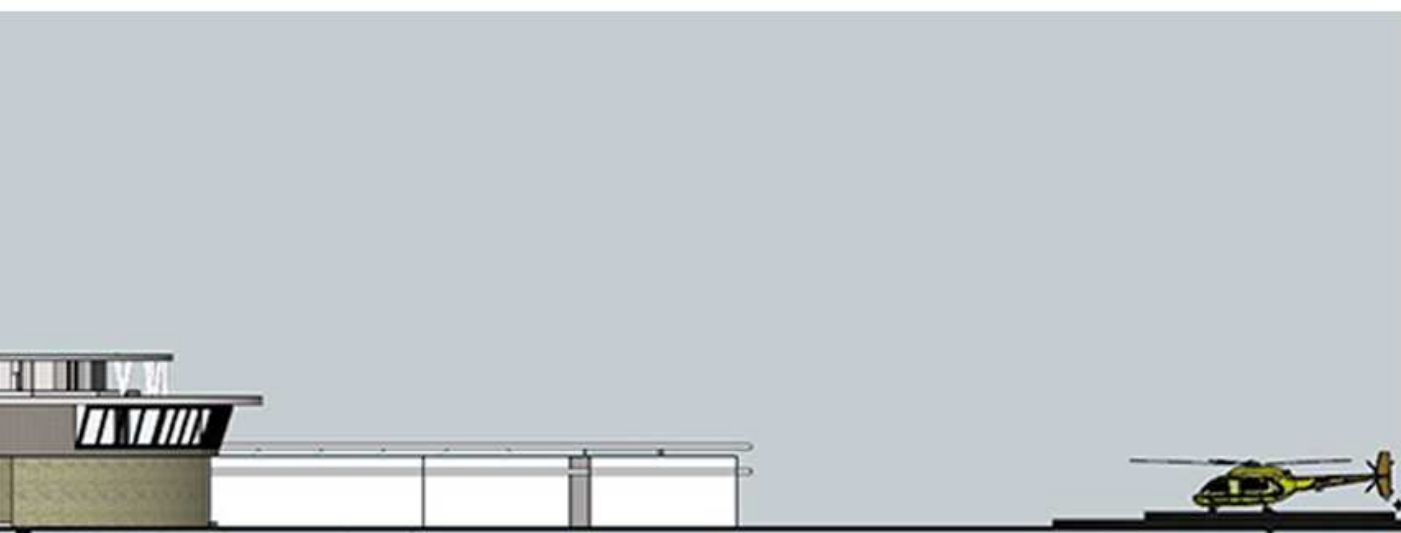
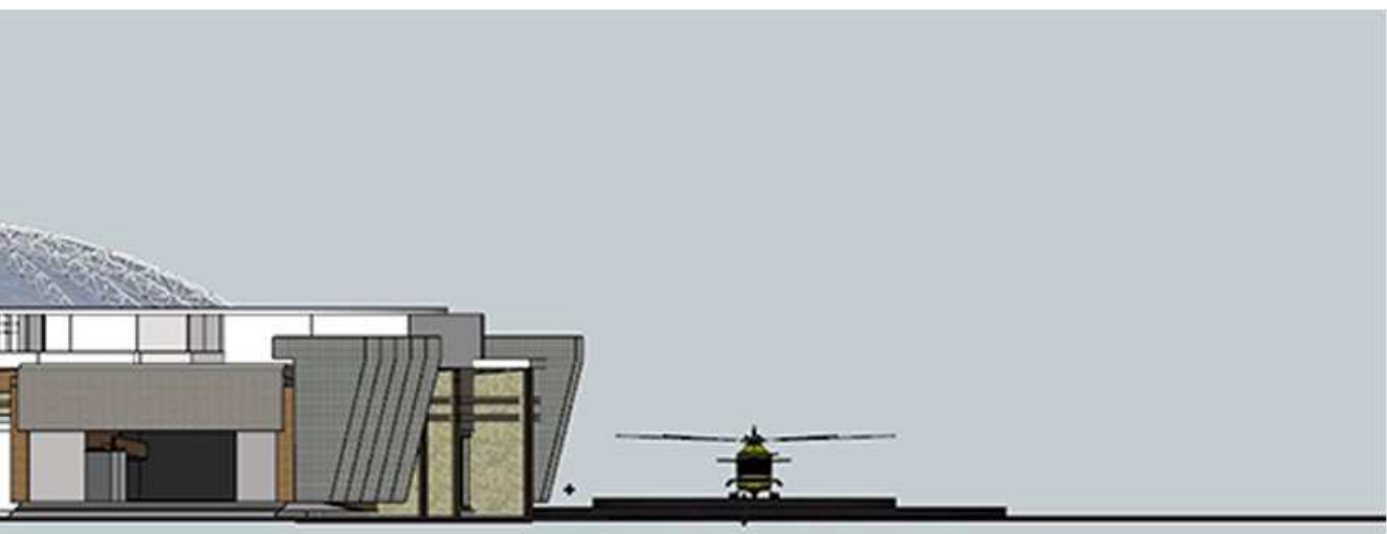


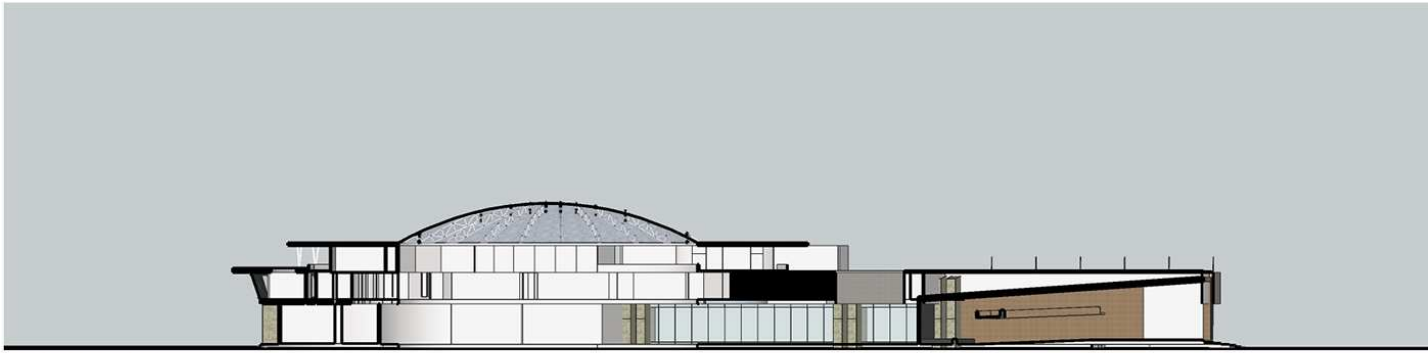


SOUTH ELEVATION

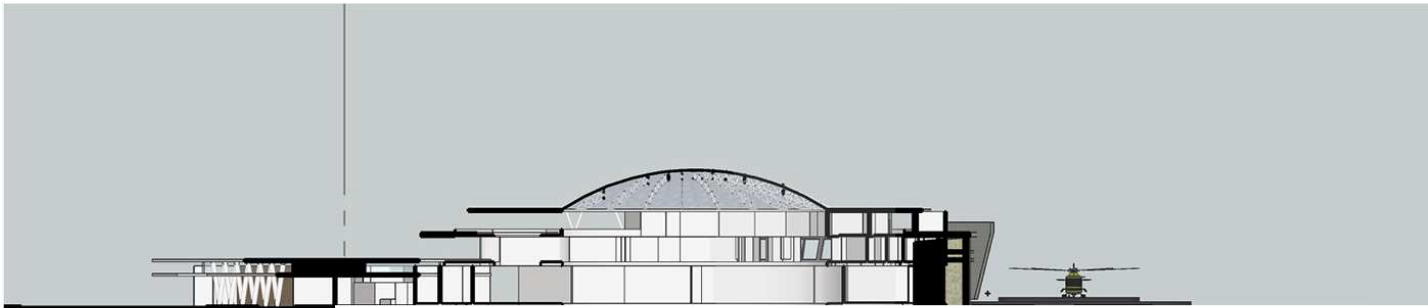


EAST ELEVATION

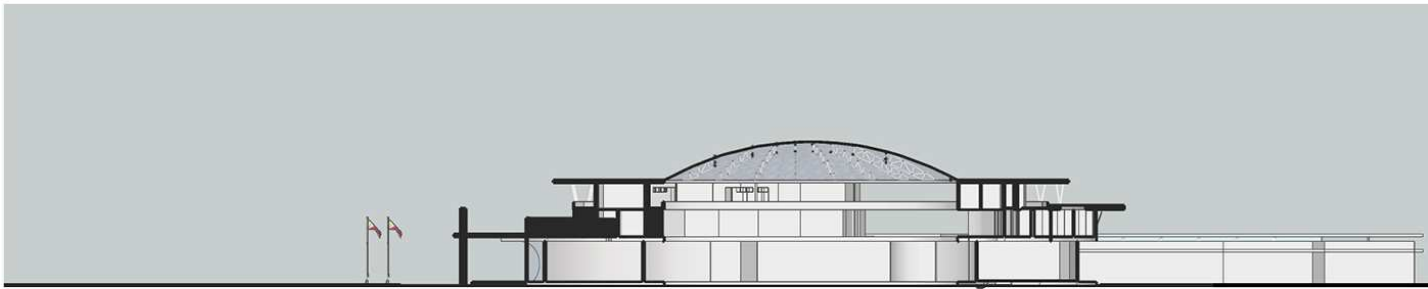




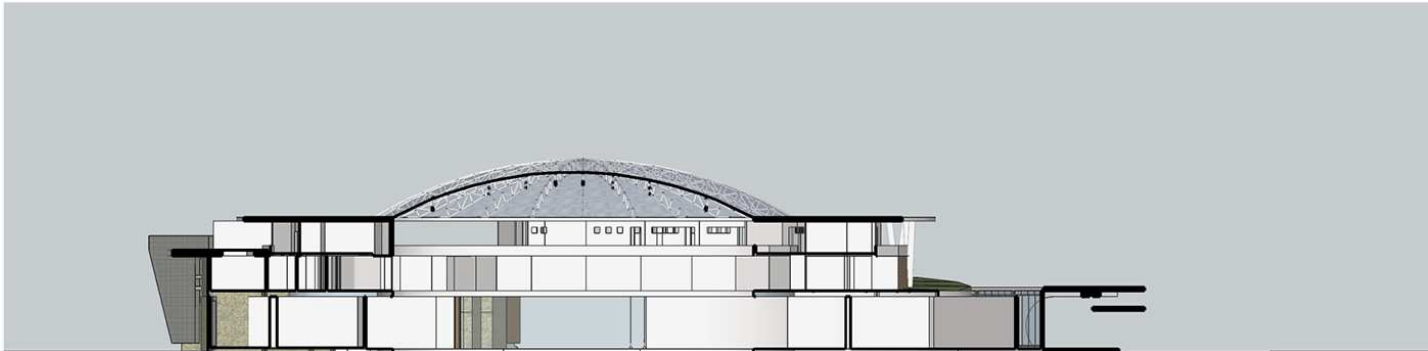
SECTION A



SECTION B



SECTION C



SECTION D



Central Atrium Space



Reception Area



Medical Facility Emergency Entrance



Exterior View



Broadcast Room



Broadcast Room



Radio Station



Radio Station



Command Center Office



Command Center Office



Offices



Offices



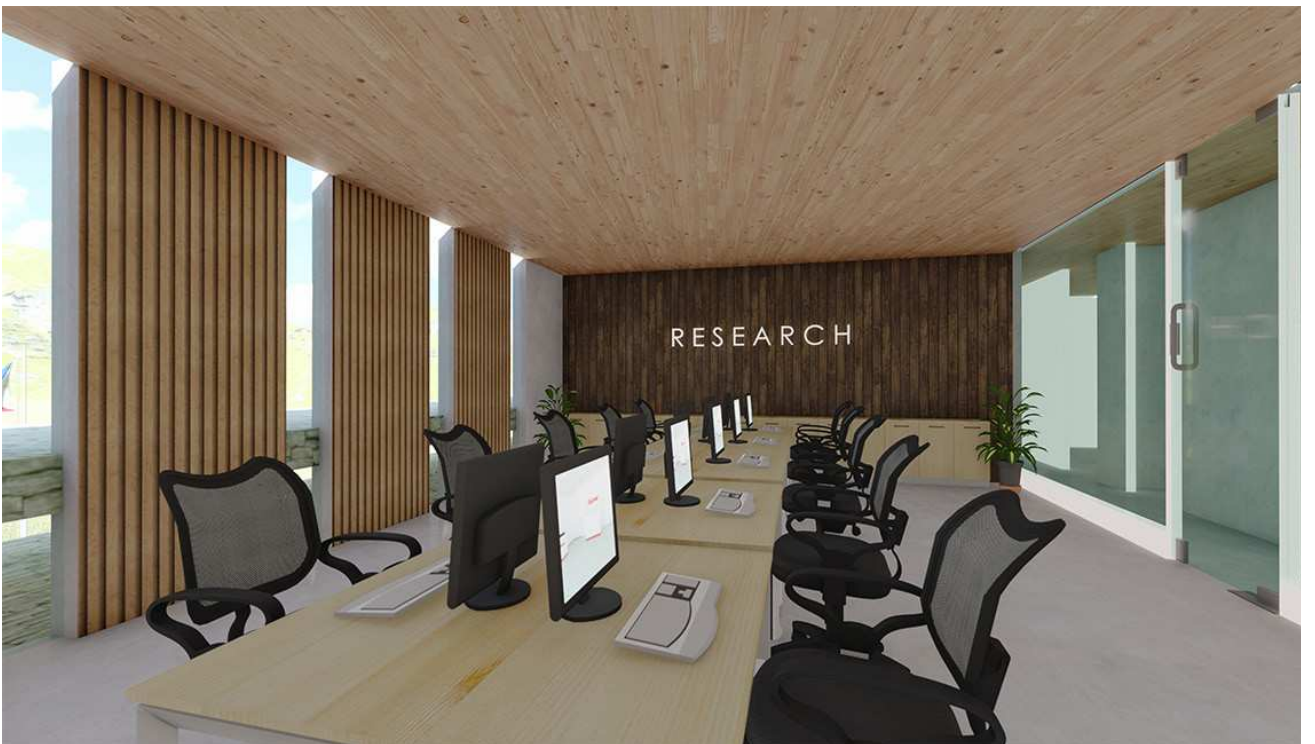
Seminar Room



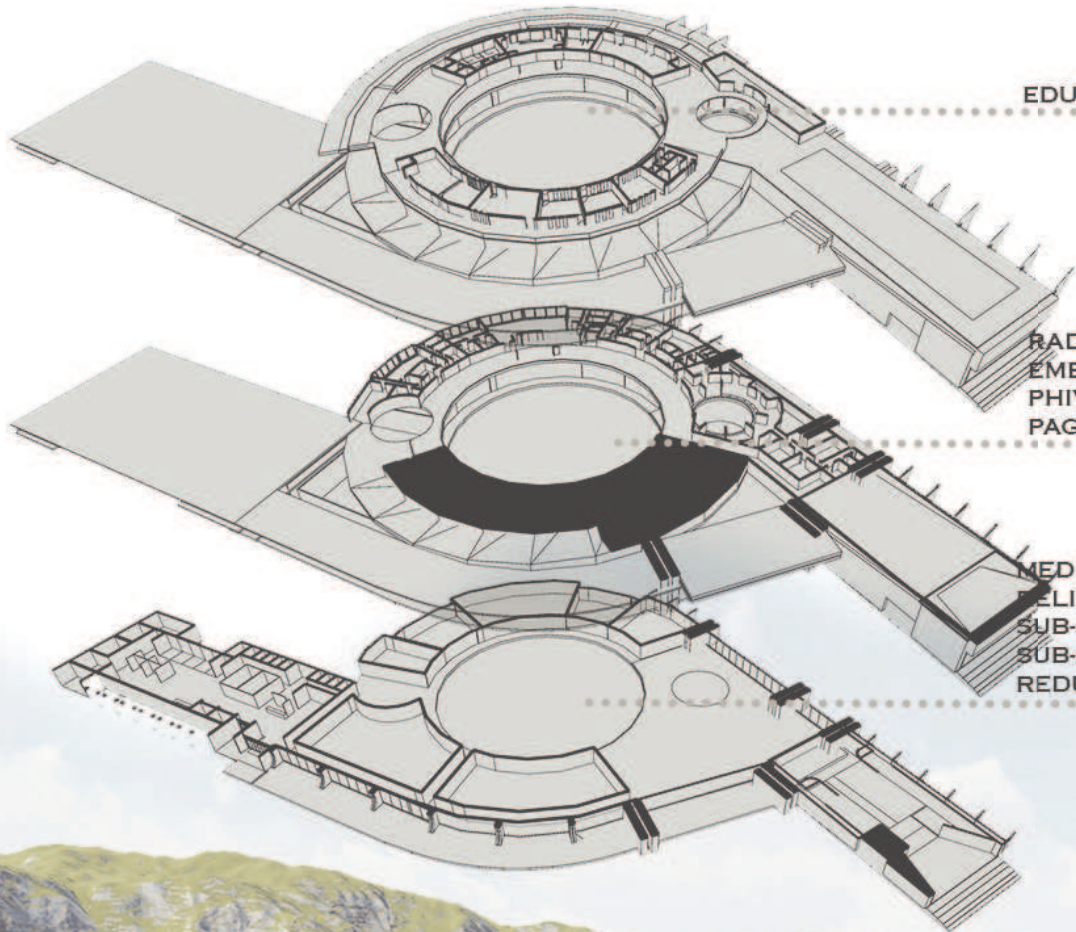
Lobby



Research Center



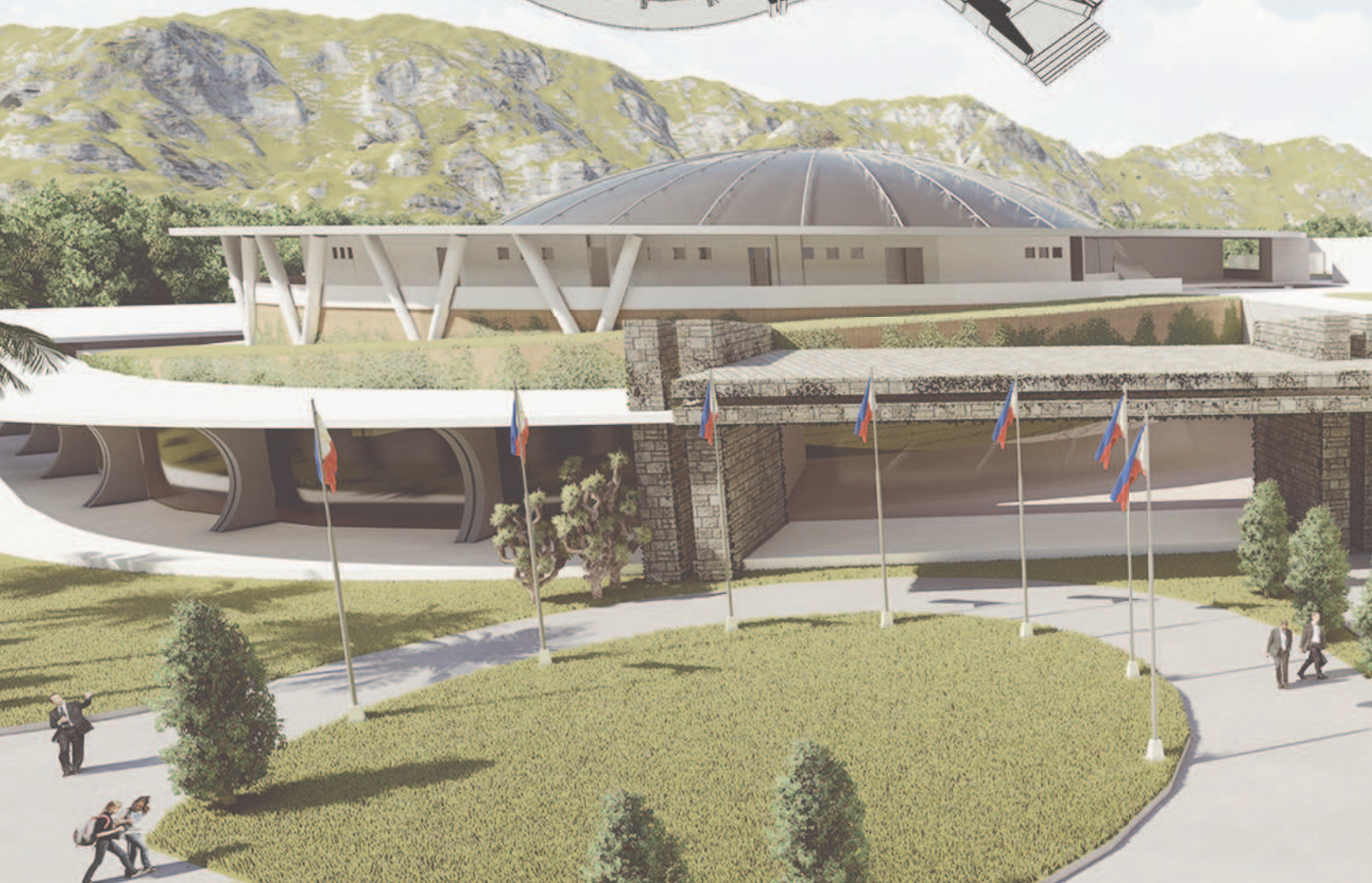
Research Center



EDUCATION AND TRAINING

RADIO STATION
EMERGENCY COMMAND CENTER
PHIVLOCS SUB-STATION
PAGASA SUB-STATION

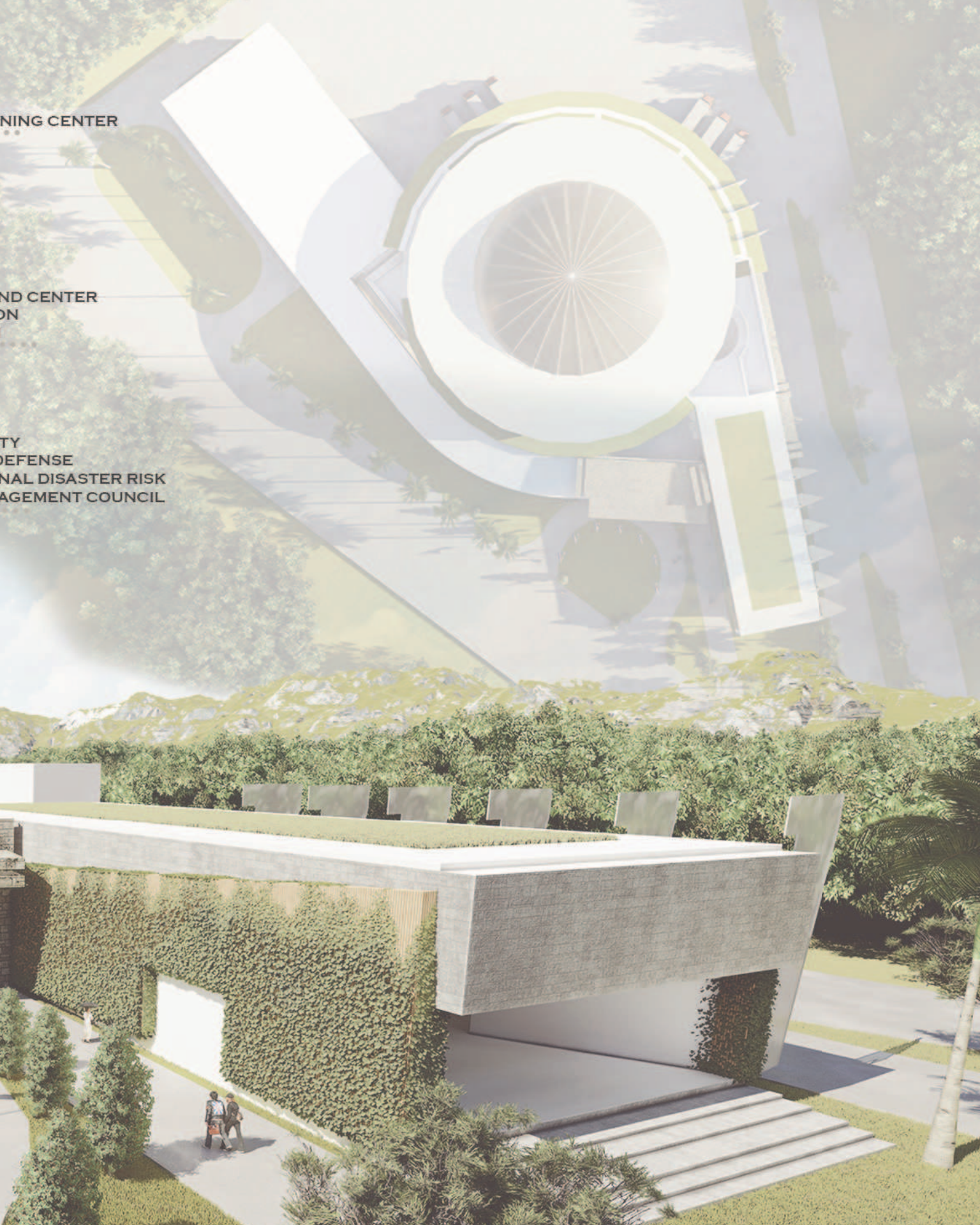
MEDICAL FACILITY
RELIEF SUPPLY FACILITY
SUB-OFFICE OF CIVIL DEFENSE
SUB-OFFICE OF REGIONAL DEVELOPMENT
REDUCTION AND MANAGEMENT



NING CENTER

ND CENTER
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TY
DEFENSE
NAL DISASTER RISK
AGEMENT COUNCIL



7

BIBLIOGRAPHY

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// REFERENCES

Buchanan, L., Fairfield, H., Parlapiano, A., Pecanha, S., Wallace, T., Watkins, D., & Yourish, K. (2013, November 11). Mapping the Destruction of Typhoon Haiyan. Retrieved September 04, 2020, from <https://archive.nytimes.com/www.nytimes.com/interactive/2013/11/11/world/asia/typhoon-haiyan-map.html>

CFE-DMHA. (2018.) Philippines: Disaster Management Reference Handbook. Retrieved August 29, 2020, from <https://reliefweb.int/report/philippines/philippines-disaster-management-reference-handbook-march-2018>.

Donovan, J. (2013). Designing to Heal : Planning and Urban Design Response to Disaster and Conflict. CSIRO PUBLISHING.

GOVPH., DILG. (2017). Tacloban City: Comprehensive Land Use Plan 2017-2025. Volume 1.

GOVPH., DILG. (2017). Tacloban City: Comprehensive Land Use Plan 2017-2025. Volume 2.

IOM., UNICEF. (2018). BUILDING SAFE SPACES FOR THE COMMUNITY: A Practical Guide for Constructing Disaster-Resilient Community Evacuation Centres in the Philippines. Retrieved September 01, 2020, from <https://www.unicef.org/philippines/reports/building-safe-spaces-community>.

Israel, D. C., & Briones, R. M. (2013). Impacts of natural disasters on agriculture, food security, and natural resources and environment in the Philippines. St. Louis: Federal Reserve Bank of St Louis.

JICA. Building Safer City Approach. (2016).

Leoncio A. Amadore, "Comprehensive Risk Assessment of Physical, Social and Economic Impacts of Tropical Cyclones", Part V, Typhoon Damage Scale. National Research Council of the Philippines (NRC) Project.

Lum, T., & Margesson, R. (2014). TYPHOON HAIYAN (YOLANDA): U.S. AND INTERNATIONAL RESPONSE TO PHILIPPINES DISASTER*. Current Politics and Economics of South, Southeastern, and Central Asia, 23(2), 209-246.

Masterson, J. H., Peacock, W. G., Zandt, S. S. V., Grover, H., Schwarz, L. F., & Cooper, J. T. (2014). Planning for Community Resilience : A Handbook for Reducing Vulnerability to Disasters. Island Press.

