

GREEN Mindanao-HIPPE-HIPADA

SCIENTIFIC STUDY TECHNICAL REPORT



HINATUAN PASSAGE DEVELOPMENT ALLIANCE’S COASTAL CLUSTER 3 SCIENTIFIC STUDY TECHNICAL REPORT

(GREEN Mindanao-HIPPE-HIPADA)

This report is submitted in fulfillment of Green Mindanao’s contract with HIPADA to supply the Alliance with scientific data and analysis thereof for the dominant ecosystems (Beach Forest, River Deltas, Brackish Water, Shoreline and Beaches, Mangrove Swamps, and Coral Reefs), their environmental issues, present condition (pressures and threats), the LGU’s responses undertaken, and Green Mindanao’s (GMAI) recommendations of three municipalities in their Cluster 3, namely Placer, San Francisco and Malimono.

The report is split into 6 sections, the first one describing the [Ecosystems and their resources](#), the second their [Utilization](#) the third the [Management Mechanism and Policies](#), the fourth outlining the [Risks](#) they are exposed to, the fifth showing the [Climate Change Predictions](#) and finally the sixth a list of [Recommendations](#).

1. Dominant Ecosystems and their resources:

A. Municipality of Placer Coastal Resources

Based on the field survey and on-site assessment, the survey team observed that the municipality of Placer has three dominant and distinct coastal ecosystems which are biologically and ecologically interconnected. 1. The mangrove forests - nipa swamps & their adjoining brackish water river deltas, 2. the coral reefs and their nearby seagrass and algal beds and that of the 3. beach forests located along the seacoasts within the mainland and that along the coastlines of Masapelid Island and of other small islands and islets that are within the geopolitical bound of Placer municipality. They were all noted as equally rich in their natural resources and biologically diverse in their floral and faunal composition from ridge to reef ecosystems and are equally important life support systems that continually render socioeconomic benefits and ecological services to the people of the nearby localities and of the entire municipality of Placer. It has been observed that these ecosystems are threatened by climate change occurrence and subjected to various anthropogenic activities in the said ecosystems that greatly contribute to the degradation of their natural balance. This is because of over-exploitation of their natural resources resulting to the decline and extinction of some native species, pollution, habitat loss caused by deforestation, marine ecosystem degradation caused among others by (illegal) mining. All factors are identified as the drivers of biodiversity loss and are deemed counterproductive to the governments’ targets for their constituency’s improved health and the avoidance of natural disasters.

Results of the field assessment conducted in designated sampling areas of the approximately three hundred thirty six (336) hectares total area estimate for Placer’s mangrove forests, river deltas and nipa swamps natural stands that are specifically located and naturally thriving within seven (7) areas of which

five (5) are in the mainland coastal barangays of Magsaysay, Panhutongan, Tagbongabong, Amoslog and Pananay-an and of the two (2) island barangays of Sanisani and Lakandula on Masapelid Island, the survey team have identified and recorded a total of nine (9) mangrove species belonging to seven (7) genera of the plant (PLANTAE) kingdom wherein seven (7) of these are true mangroves while the remaining two (2) are being classified and considered as mangrove associates. These true mangrove species are the Red Mangroves or Bakauan babae (*Rhizophora mucronata*) and Bakauan lalake (*Rhizophora apiculata*), Tabigi (*Xylocarpus granatum*), Pidada /Pirara (*Sonneratia caseolaris*), Tinduktindukan/Sagingsaging (*Aegiceras corneculatum*), Bantigi (*Pemphis acidula*) and the Black Mangrove or Apiapi/Piyaping Itum (*Avicennia lanata*). The two mangrove associates identified are the Diliwariw (*Acanthus illicifolius*) of the fern family (PTERIDOPHYTA) and the Nipa (*Nypa fruticans*) from the palm family (PALMAE) which are observed as the most dominant floral species within the entire range of the brackish wetland areas. Faunal assemblages observed associated with the mangrove forests, nipa swamplands and in their adjoining river deltas of Placer municipality includes among others, some rare and threatened species of wild animals specifically that of the avifauna which include both the indigenous and migratory waders and water birds species using these wetland areas as their roosting sites and feeding grounds.

Major Benthic Life Forms

Overall result shows that the coral reef area of the Municipality of Placer was in fair condition based on the categorization of Licuanan et al. (BMB Technical Bulletin 2017-05). This condition was mainly contributed by relatively high average cover of dead corals (56.72%). Per sampling site, dead corals were recorded to be highest on the outside reef (68%) of Brgy. Ella Peral followed by Balibayon reef (59%) on the same barangay. This may probably be due to the illegal fishing that still exists in the areas according to the residents during the assessment. To be able to save the remaining live hard corals (21.6%) of Balibayon, the barangay local government proposed it to become a Marine Protected Area. Generally, the coral reef areas of the municipality were composed of three major benthic life forms, the dead corals, live hard corals, and abiotic component.

Sub-Category of Benthic Life Forms

Live hard coral are composed of Acropora and Non-Acropora. Acropora and non-Acropora were highest at Lakandula MPA and Sani-Sani MPA, respectively. These types of corals served as buffers against storm surges and violent waves. Their complex body structure provides spaces for the marine micro-organisms to live and hide for survival. Generally, fish species that inhabit these coral reefs were the Epinephelus ongus or commonly known as grouper (Normani et al., 2013); and, families of Labridae, Pomacentridae, Scaridae, Acanthuridae, Cheatodontidae, Siganidae and Serranidae (Florest et al., 2016). Loss of these Acropora and non-Acropora species would have significant implication for the recruitment and survival of certain fishes.

Seagrass Beds

Based on the previous studies conducted in Brgy. Panhutungan on the mainland and of Barangays Lakandula, and Sani-sani of Masapiled Island, seagrass beds were found 10-20 meters away from its shorelines. Barangay Panhutongan coastal area has a fine sandy type of substrate with a depth of 2-3 meters while Barangays Sanisani and Lakandula has a coarse sandy-silty coralline areas. Some glass and plastic bottles and other non-biodegradable plastic litters were observed in both sampling sites.

Out of 13 species found in Philippine waters (Calumpang and Meñez, 1997), there were four or 30.78% species of seagrass found in Barangay Panhutungan namely the Serrated Leaf Ribbon Grass (*Cymodocea serrulata*), Eel Grass (*Enhalus acoroides*), Larged Leaf Spoon Grass (*Halophila ovalis*) and Fine Ribbon Grass (*Halodule uninervis*). These species were found in the area of Panhutongan because of its substrate characteristics, which are suitable for these species to thrive on. Recent coastal assessment in September 2021 in Barangay Sani-Sani, Lakandula by the GREEN Mindanao Field Team indicated the presence of single sea grass species the Eel Grass (*Enhalus acoroides*) that thrives in Masapelid Island particularly within the coastal areas of Barangay Lakandula and Sani-Sani. Survey results also indicated that their coastal areas are currently silted and polluted affecting their sea grass bed density and possibly survival in the near future thus affecting the present fish productivity in the shallow coastal area of Placer.

Coral Reefs

Previous water quality studies in Placer, Surigao del Norte were all within the range for good propagation of marine lives, that corresponds to the standard value (DAO- 1990-34), that means that pH value of the municipal water was 8.28 which is still considered normal and safe for marine lives especially in the coral reefs. If the pH decreases, the water becomes more acidic, if it increases, it became more basic. This only implied that marine water acidity in the municipality was favorable to those thriving organisms that rely on the carbonate-based shells and skeleton, organisms sensitive to acidity, and animals that feed on theses sensitive organism. Further, the effect of higher standard value of pH can cause bleaching, and impacted the productivity process of the coral reef (Anthony etal., 2008).

The result of dissolved oxygen was 7.1mg/l which is higher than the standard value of 5 mg/l for an optimum range. Unless dissolved oxygen value would decreases to 3.5 mg/l all marine species can thrive. Lastly, water temperature and salinity of the municipality was within the normal range for coral reefs to thrive on. Overall result for water parameters implied possible good growth of coral reef and higher production yield of marine lives in the municipality.

However, the water quality within the shallow coasts of Placer is presently affected by major and minor gold mining activities and of other land moving activities such as the on-going major road constructions undertaken in the area of nearby municipalities, and on the Island of Masapelid that are considered as equally environmentally critical projects.

Mangroves

Mangrove forests are presently existing along the coastal areas of Barangays Magsaysay, Amoslog, Panhutongan, Tagbongabong, Pananay-an, and in Masapelid Island particularly in Barangay Sani-Sani and Lakandula. These are Red Mangroves or Bakauan babae (*Rhizophora mucronata*) and Bakauan lalake (*Rhizophora apiculata*), Tabigi (*Xylocarpus granatum*), Pidada /Pirara (*Sonneratia caseolaris*), Tinduktindukan/Sagingsaging (*Aegiceras corniculatum*), Bantigi (*Pemphis acidula*) and the Black Mangrove or Apiapi/Piyaping Itum (*Avicennia lanata*). The most abundant species are the Nipa (*Nypa fruticans*) which are considered as a mangrove associate. Mangrove condition is categorized from fair to good. The decline in the number of mangrove species is indicative of the degree of conversion of mangrove area into fishpond particularly in barangays Panhutongan, Tagbongabong, and Pananay-an.

Beaches

Beaches presently used by local residents and neighboring municipalities include the 2km length in Cagbantoy beach, barangay Amoslog, 1 km length in barangay Panhutongan, 500 linear meters length in sitio Borongkot, barangay Magsaysay, 500 linear meters length in Bangkay island barangay Sani-sani and islets at barangay Ellaperal.

B. San Francisco Coastal Resources

Its Municipal waters as the second most important source of income of the people cover 280 square kilometers. San Francisco has rich marine resource evidenced by the fisherfolk households who are surviving on fishing alone. These households are settled predominantly in Barangay Jubgan, Amontay, Linogganan, Balite, Banbanon and Oslao. The wide range seawaters of San Francisco dwells deep sea fish species specially 'dirty squid' or 'nokos bulingit' (in local term) which produces millions of tons in the past decade according to local sources.

Coral Reefs

San Francisco's eight (8) coastal barangays' municipal fishing grounds facing the Bohol Sea which cover two hundred eighty (280) square kilometers (28,000 hectares) are blessed with fringing reefs that harbors both rich bottom dwelling (demersal) and pelagic finfishes and other edible marine resources (mollusks, crustaceans, echinoderms and seaweeds in the shallow and deeper portion). These municipal fishing grounds being utilized by more or less four hundred fifty (450) marginal/ artisanal fishermen of San Francisco regularly engaged in deep sea and shallow coast's fishing activities the whole year round which translates to an aggregate annual fishery production of thirty six (36) metric tons of marketable marine species. The fringing coral reef's vital role to marine ecology is that it provides a suitable habitat for marine organisms and creates a favorable coastal environment by buffering waves and storm surges. It also contributes greatly to the municipality's local economy through fisheries activity. Despite these ecological and socio-economic benefits, the coral reefs within the area are under threats either resulting from

anthropogenic or natural causes. These are due to destructive fishing activities like overfishing and the use of illegal fishing gears, and unsustainable land use practices which cause sedimentation, siltation and nutrient pollution. Other threats are ocean acidification and coral bleaching due to increasing ocean temperature as a result of climate change.

Results of the rapid underwater assessments conducted within the immediate coastal areas of Barangays Banbanon, Oslao, Jubgan, Diaz and Poblacion indicate a generally fair coral cover of the fringing coral reef ecosystem. The reef flats are predominantly composed of live hard corals, soft corals, and other biotic components. Recent scientific studies conclude that one square kilometer of relatively healthy coral reefs can yield up to twenty (20) tons of fish¹. Furthermore, the assessment results indicate that Banbanon MPA is predominated by soft corals in the shallower portion indicating that freshwater springs are present in the immediate substratum mixing with the saline sea water. There are four (4) ahermatypic or non-reef building soft corals species identified common in the marine protected area, these are the Deadman's Fingers (*Dendronephthya*), Lobophyton, *Efflanutaria* and of *Nephtya* species.

San Francisco's shallow coastal underwater bottom is generally composed of silty dirty-white colored sandy substrate with the presence of benthic community dominated by hard corals. The dominant massive type live hard coral cover are of the Pore coral group (*Porites lobata* / *Porites lutea*) of Genus *Poritidae*, followed by the Double star coral (*Diploastrea heliopora*), while the associated branching type corals identified are of the staghorn corals to wit: *Acropora hyacinthus* and *Acropora splendida* of Genus *Acroporidae*, the non-*Acropora* are the Series coral (*Seriatopora hystrix*), the Fire coral (*Mellipora sp*), and the branching type *Porites* species. Encrusting corals are represented by *Mycedeum elephantotum*, and *Montipora*, the sub-massive type of coral that belongs to the staghorn *Acropora paucidentata* are noted to be present also in these areas.

Reef associated fishes identified and recorded during the underwater assessments using the fish visual census methodology are predominantly composed of economically important demersal species such as snappers (*Lutjanidae*, *Fusiliers Caesionidae*), groupers (*Serranidae*), rabbitfishes (*Siganidae*), parrotfishes (*Scaridae*), surgeonfishes (*Acanthuridae*), goatfishes (*Mullidae*) and trevallies (*Carangidae*) while the most dominant are the Sargeant majors (*Abudefduf sixfasciatus*) of the Genus *Pomacentridae*.

Rich natural coral reefs can be found in Barangay Jubgan, Amontay, Linongganan, Balite, Oslao and Banbanon. These areas are known to be producers of high value fish species. The first Marine Protected Area established in San Francisco is in Barangay Banbanon. The MPA establishment was assisted by Philippine-Australia Community Assistance Program (PACAP).

Beach Forest Ecosystem

Approximately 15 kilometers in length stretching along the coastline of the municipality and specifically located within the 20-40meter wide timberland area classified by NAMMRIA as public domain and designated as buffer and or salvage zone starting from shoreline's highest tidal point to landward.

¹ <https://reefs.com/forum/industry/251696-good-coral-reefs-yield-abundant-fish-catch-philippines-1.html>

Within its Beach Forest Ecosystem are the associated fauna that dwell in its vegetative cover that place a vital role in maintaining the natural environmental processes, and at the same time serves as an indigenous early warning system from incoming hazards. Associated fauna observed during the conduct of the assessment are as follows:

Avifauna: A total of twenty seven (27) bird species were inventoried / accounted during the field surveys within the beach forest ecosystem in the coastal areas of the municipality of San Francisco in which twenty one (21) species are Philippine endemics: Philippine Glossy Starling (*Aplonis panayensis*), Large-billed Crow (*Corvus macrorhynchus*), Lovely Sunbird (*Nectarinia jugularis*), White-breasted woodswallow (*Artamus leucorhynchus*), White-collared Kingfisher (*Halcyon chloris*), White-eared brown fruit dove (*Paphitreron leucotis*), Chestnut mannikin (*Lonchura mallaca*), Yellow-vented Bulbul (*Pycnonotus guavier*), White-rumped Swiftlet (*Collocalia trigodolotis*), Barred Rail (*Rallus torquatus*), Flowerpecker (*Daeceum trigonostigma*), Brahminy Kite (*Haliastur indus*), Philippine Bulbul (*Hypsipetes philippinus*), Philippine Serpent Eagle (*Spilornis holospilus*), Philippine Hanging Parakeet (*Loriculus philippenensis*) Shach Shrike (*Lanius shach*), Bee-Eater (*Merops philippinus*), Flycatcher (*Musicapa sp*), Malaysian Fantail (*Rhipidura javanica*), Grass Owl (*Tyto capensis*) and the *Black-nape Oriole*. Two (2) species are considered as migrant residents : Cattle Egret (*Bubulcus ibis*) and Eurasian Tree Sparrow (*Passer montanus*); and four (4) are migratory species: Japanese Buzzard (*Butastur indicus*), Blue rockthrush (*Monticola solitarius*), Pacific Swallow (*Hirundo tahitica*) and Barn Swallow (*Hirundo rustica*).

Reptiles: Eight (8) species (6 lizards and 2 snake species): Monitor Lizard (*Varanus salvator*), Mindanao Flying Lizard (*Draco mindanensis*), Spotted Gecko (*Gecko gecko*), Brown Skink (*Sphenomorphus sp.*), Green Skink (*Mabuya sp*), Common House Lizard (*Certodactylus*), Reticulated Python (*Phyton reticulatus*) and Philippine Cobra (*Naja naja*). The Reticulated python (*Phyton reticulatus*) is classified as an endangered species (RA9147).

Mammals: Seven (7) mammalian species were accounted for of which four (4) are predators, two (2) frugivorous and one (1) nectar feeding flying bat. Common Field Rat (*Rattus rattus*), Field Mouse (*Mus musculus*), Common Ground Shrew (*Suncus murinus*), Palm Civet Cat (*Paradoxorus hermaproditus*), Fruit Bat (*Pteropus pumilus*), Insect Eating Bat (*Microchiroptera*), Pippestrile bat (*Pippestrillus sp*), Long tonque nectar feeding bat (*Macroglossus lagochilus*)

Amphibians: Three (3) species, Giant Toad (*Buffo marinus*), Kaloula picta and Tree Frog (*Rhacophorus sp*)

Crustaceans: Four (4) terrestrial crab species: Coconut rubber crab (*Virgo latrus*), Ghost Crab, Hermit Crab (*Pagurus sp*), Red Crab.

Mollusks: Two (2) species: Tree snail and Japanese snail belonging to Class Gastropoda.

Insects: Twenty six (26) species- Bumble Bee (*Bambula sp*), Praying mantis, Common Fly (*Muscas sp*), Mosquitoes (*Anophilis sp*), (*Aedes sp.*), Cricket (*Grylus sp*), Moths, Butterflies (*Lepidoptera*), Spiders

(*Arachnids*), Ground Cockroach (*Blatula sp.*), Honey Bees (*Apis sp.*), Dragonflies, Wings, Cicadas, Lady Bug, Rhinoceros Beetle, Assassin Bug, Fireflies, Grasshopper, Termites, Walking Sticks, Red Ants (*Formica sp.*), Black Ants, Katydid, Millipede and Centipede.

Annelids: Flatworm, Roundworm and Earthworm

San Francisco’s Anao-aon River Delta and its Brackish Inland Wetland Area Ecosystem

The municipality’s eight (8) lowland coastal barangays (Poblacion, Diaz, Banbanon, Oslao , Balite , Linongganan , Amontay and Jubgan) natural waterways catering municipality’s freshwater surface run-offs emanating from Mount Tendido’s “San Francisco Ridge” directly empty into the coastal waters through its meandering freshwater tributaries that flow into small brooks, creeks and rivers. A total of ten (10) tributaries were accounted by the Green Mindanao’s field assessment team within the coastal barangays of the municipality. Noteworthy river systems are the Anao-aon, Jubgan and the Balite rivers. Of these, the Anao-aon River which is located in Barangay Poblacion possessed a distinct river delta noted to harbor a diverse natural brackish water wetland ecosystem that harbors relatively rich biological diversity but susceptible to some environmental issues and present threats.

Anao-aon River Delta’s Brackish Inland Wetland Ecosystem’s Resources:

Floral Composition

Downstream Nipa swamp approximately less than 1 hectare in size of not very healthy natural stand of Nipa (*Nypa fruticans*) palms as the dominant plant species thriving along the muddy and murky brackish wetland area. Associated intermixed floral assemblage include a few natural stand of native beach forest species population in the upstream riverbank area such as the Malabago, Rain Tree (*Samania saman*), Bani/Bawok bawok (*Pongamia quadresitifolia*), Talisay Dagat (*Terminalia cattapa*), Alagaw (*Primna odorata*) and Lambayong (*Ipoemia friscopri*) vine, beach pandan (*Pandanus frescynnetii*), and coconut palm trees (*Cocos nucifera*) with diminishing local population of few mangrove associates such as diliwariw (*Acrosticum aureum*), Buta-buta (*Exocaria agalocha*) and Tabau (*Lumnitzera*).

Associated Fauna

A. Avifauna: Wild faunal assemblage sighted and recorded in the Anao-aon wetland include some endemic water birds which are considered rare and threatened and endangered bird species in the Philippines according to the international convention (RAMSAR Convention) of which the Philippines is a signatory, and specified under Republic Act 9147 commonly known as the Wildlife Resources Conservation and Protection Act. These endemic bird species are the Wandering Whistling Tree Duck (*Dendrocygna arcuata*) and the Philippine Mallard (*Anas luzonica*) of the duck family (*Anatidae*) which uses Anao-aon River delta and its upstream riverine waters as feeding, breeding and roosting site. Migratory water bird and seabird species uses the area as feeding and roosting site. These include among others the plovers, sandpipers, terns, egrets, pond herons, wild ducks, raptors and rails as part of the

migrant visitors' East Asian – Australasian flyway in which Philippines' wetland areas are valued and duly recognized as important wintering grounds to complete their northward and southward migration routes.

B. Reptiles: Globally important and the most critically endangered marine turtle species among the 7 occurring worldwide, as categorized under the International Union For the Conservation of Nature and Natural Resources' (IUCN) Red List, the trans-migratory Hawksbill Turtle (*Eretmochelys imbricata*) are seasonally using Anao-aon River mouth's sandy area and its wide and un-inundated peripheral sandy shoreline stretches as its preferred nesting area in addition to Barangays Banbanon and Oslao's secluded transboundary coastlines. Other reptilian species recorded to be present in the Anao-aon river delta includes the Philippine Sailfin Lizard (*Hydrosaurus postulatus*) an agamid species and the varanid monitor lizard (*Varanus salvator*).

C. Crustaceans: The survey revealed the presence of Ghost Crab, Fiddler crab (*Uca* sp.), Penaeid shrimp (*Penaeus monodon*), Macrobrachium sp., mud crab and Hermit Crab (*Pagurus* sp.).

D. Fishes: Anadromous and catadromous migratory species and brackish water finfish species: Gobies (*Glossogobius* sp.), Burod (*Ophiocaraceporos*), (Family Gobiidae), Kikilo (*Scatophagus argus*), Mottled Eel/Kasili (*Anguila philippensis*), (*A. marmorata*), Mullet (*Mugil cephalus*), Mud Skipper, Chevron snakehead (*Chana striata*), Mole (*Engraulis* sp.), Puyo/Gourami (*Anabas testudineus*), Carpa (*Cyprinus carpio*) and Glassfish (*Ambassis* sp.).

Beaches

San Francisco beaches and its shallow water area are an ideal place and have big potential for the introduction and development of tourism activities such as open sea kayaking, skim boarding, canoeing, banana boat riding, glass bottom boat riding and underwater viewing. They are also ideal for yachting, scuba diving and free diving. Being a major migratory path of a variety of trans-migratory marine species of cetaceans (whales, dolphins, porpoises) and whale sharks (*Rhincodon typus*), the municipal waters are also ideal for marine wildlife watching activities. With their captivating scenic views of the beaches and shoreline itself, these could possibly be promoted as an outdoor photography and outdoor painting enthusiast's mecca. Outdoor open camping events along the beachfront in a post pandemic era are also a big possibility to help the people build back better through nature based solutions such as ecotourism development program.

Wild Floral and Faunal Resources Field Inventory Report

As inventoried its floral resources are composed of nineteen (19) tree species, three species of Palms (*Palmae*), five lianas/vines, ten (10) grasses (*Graminae*), and three (3) shrubs. These are the following to wit:

Endemic/native trees: Talisay dagat (*Terminalia cattapa*), Butong (*Barringtonia quadresitifolia*), Malapapaya (*Polysias nodosa*), Alagaw (*Primna odorata*), Balok-balok/Bani (*Pongamia* sp), Mabolo (*Diospyros philippinensis*), Ipil (*Intsia bijuga*), Apatotot/Noni/Bangkuro (*Morinda quadresitifolia*), Bitaoag

(*Calophyllum inophyllum*), Dongonlate (*Hereteira littoralis*), Duhat (*Zyzigium jambolanum*), Dapdap (*Trema orientalis*), Latong (*Cerbera manghas*), Ipil-ipil (*Leucaenna glauca*), Narra (*Pterocarpus indicus*), Molave (*Vitex parviflora*), Bayanti (*Aglaia philippinensis*), Alangilan (*Canangga odorata*), Antipolo (*Arctocarpus blancoi*);

Palms: Coconut (*Cocos nucifera*), Cycad (*Cycas sp.*), Rattan (*Calamus spp*);

Vines: Lambayong (*Ipoemea frescapri*), *Tetrastigma sp.*, *Mikanda chordata*, Nito and Panyawan;

Grasses: Bamboos (*Bambusa fimbritica*), (*Bambusa striatica*), False Sugarcane/Tigbao (*Saccharum spontaneum*), cogon (*Imperata cylindrica*), Pandan (*Pandanus freycynetti*), Makahiya (*Mimosa pudica*)

Brushes: Kanding-kanding (*Lantana camarra*), Bitibiti, Hagonoy (*Chromolaena odorata*), Malabuyo (*Piper adduncum*)

Shrub: Wild Banana (*Musa paradisica*, *Musa sapendida*, *Musa sapentum*)

Four (4) endemic floral species inventoried within the coastal areas of the municipality of San Francisco are categorized as premium, rare and are in the lists of threatened floral species of the Philippines and are protected as mandated under the Philippine Wildlife Conservation and Protection Act (Republic Act 9147). These are the Philippine Ebony Tree /Mabolo (*Diospyrus philippinensis*), Cycad (*Cycas sp*), Narra (*Pterocarpus indicus*) and Molave (*Vitex parviflora*).

Municipality of Malimono Coastal Resources

For a coastal town like Malimono, its coastal land provide inclusive socio-economic benefits to the constituents. The coastal land of the municipality has an aggregate size of about 25 square kilometers and presently occupied by urban and rural settlements making up 13 out of 14 of the town's barangays. Coastal households are 3,326 or 96 percent of the total households in the municipality.

Coral Reefs

In Malimono, rich natural coral reefs can be found in Barangay Cagtinae, Cantapoy, Can-aga, Pili and Karihatag. These areas are known to be producers of high value fish species sourced from the reefs. Coral reef assessment was conducted in Punta Agata and Sitio Taytay Reefs of Barangay Cagtinae using transect-quadrant method by GIZ-SUNGCOD with assistance from the DENR. The assessment reveals that hard corals commonly observed comprise of *Acropora*, *Porites*, *Montipora*, *Fungia* and *Coeloseresis* species. Soft corals such as *Nephtya*, *Lobophytum* and *Sarcophyton* were also identified.

Sea Grass

Malimono has limited sea grass areas which can be found only along Barangay Cagtinae and Karihatag coastlines. There was no assessment as to the type of seagrass species available in the area. These seagrasses are now affected by continued siltation from upland due to mining activities in Barangay Masgad, and soil erosions due to forest cover degradation.

Tidal Flat

The tidal profile of the coastal zone of the municipality is rolling to the deep. This means that waves when dropped to the edge of the foreshore will only travel a short range and easily drained back to the sea. As observed, during heavy storms the range of the waves will travel to more than 50 meters and will reach to the edge of the beach which caused soil erosion of the agricultural lands along the coast.

Estuaries

Since the municipality has significant number of rivers, river mouths are distinct and small fishes in the shallow water are observed. However, some of these are already contaminated by heavy siltation. Small bays in between coned-shape Rock Mountains along the shore called “Punta” are present. This is one of the natural landmarks that added to the beauty of the municipality.

Summary of Species in the Upland Ecosystem:

Floral and Faunal Field Survey	Municipality		
	San Francisco	Malimono	Placer
<i>1. WILD FLORA</i>			
Beach forest type Tree	19	24	29
Palm (PALMAE)	3	5	7
Vine/Liana	5	8	8
Grass (GRAMINAE)	10	12	14
Shrub	3	5	5
<i>2. WILD FAUNA</i>			
Avifauna /Bird	27	33	56
Reptile	8	9	10
Mammal	7	9	8
Amphibian	3	4	6
Crustacean	4	4	6
Mollusk	2	3	3
Insect	26	29	33

Summary of Species in the Coral Reef Ecosystem:

Flora and Fauna In Coral Reef Ecosystem in Sampled Target Barangays:	Municipality		
	San Francisco	Malimono	Placer
MARINE FLORAL AND FAUNAL SPECIES FIELD ASSESSMENTS SUMMARY RECORD:			
1. Flora			
SEAGRASS	0	n/a	5
GREEN ALGAE	2	2	2
BROWN ALGAE	3	3	3
2. Fauna			
CORALS:			
HARD CORAL	13	17	16
SOFT CORAL	4	4	4
MOLLUSKS	7	5	8
CRUSTACEAN	5	4	7
ECHINODERMS	5	7	9
FISHES (DEMERSAL AND PELAGIC)	31 SPP,17 FAMILIES	30 SPP, 22FAMILIES	34 PP ,18 FAMILIES

2. Resource Utilization

In the Municipality of San Francisco, its municipal waters is the second source of income of the people covers 280 square kilometers. San Francisco has rich marine resource evidenced by the surviving fisherfolk households who are fishery dependent population in San Francisco. These households are settled predominantly in Barangay Jubgan, Amontay, Linogganan, Balite, Banbanon and Oslao and some in other barangays. The wide range seawaters of San Francisco dwells deep sea fish species and of the cephalopod's- 'dirty squid' or 'nokos bulingit' species (*Loligo spp*) which produces millions of tons in the past decade.

Thirty eight percent (38%) of the total populations are farmers and another thirty eight percent (38%) are also fishermen. The farmers are classified as crop farmers. Farming and fishing are the major occupation of the municipality's population. Fishermen are classified into inland and coastal water fishermen who go through deep-sea fishing but for purposes of classification they are name as such. Besides these are fishermen who do not own motorized bancas and other fishing gadgets for deep-sea fishing. Twenty percent of fishermen's populations are inland and coastal waters fishermen while 80% are deep-sea fishermen. (Sources: *Ecological Profile of San Francisco*)

Municipal waters of Malimono are covering a marine area 375 square kilometers and are representing the secondary source of livelihood and income of the people. Its wide fishing area is habitat to various

marine species including the famous yellow fin tuna, the giant squid and ‘dirty squid’ or ‘nokos bulingit’ among others. Many of Malimono’s fishing families have enjoyed income from these fishery products. The town’s coastal area and marine environment also produced other volume of fish species like Bullet Tuna, Frigate Tuna, Kawa-kawa, Big Reef Squid, Big-eyed Scad, Indian Scad, Flying Fish, Malapeña, Diwit, Samaral, Spotted Sardinella and other fish species. The most notable fishing ground of the municipality is the deeper portion of the municipal water. This deep area had produce large volume of fish annually compared to the shallow part of the seawater. Local communities with identified fishing ground from 5 to 20 fathoms include Cagtinae, Tinago, Cantapoy, Can-aga.

The Municipality of Placer as well is rich in fishery products. Placer is rated in the province as an excellent fishing area. Banga Island, Placer Bay, Bucas Grande and Hinatuan Passage are the major fishing grounds. Fishery resources are still sufficient and have surplus harvest in terms of production. The municipality has also a productive inland fishing resource. In inland fishing, milkfish, prawn and crabs are produced. There are 104.42 hectares of fishponds operated in the municipality, with big areas found in Panhutungan, Pananay-an, Tagbongabong and Amoslog. Its produce are sold to its local market, nearby municipalities, and even nearby provinces.

The Placer Fish Port is located at Barangay Magsaysay. It serves as a facility in loading and unloading of fishery products for the local fishermen. The Placer Golden Ice Plant supplies the ice requirements of the fishermen and businessmen. It is located within the premises of the port. Placer Port is proposed to have an extension amounting to P 28.4 Million. The port serves all sea crafts within the municipality and from the neighboring islands and towns.

3. Management Mechanism and Policies:

At current two (2) Barangays in the Municipality of San Francisco are actively protecting their coastal marine resources by delineating them as fish sanctuary under Section 81 of Republic Act 8550 or the Philippine Fisheries Code of 1998, namely Barangay Oslao (8.60 hectares), and Banbanon (22 hectares).

There are plenty of marine habitat in the Municipality of Malimono, three of which were formally delineated as marine protected area in 2013 with management plans. These MPAs are strategically located in the following areas: (1) Cagtinae MPA in the northernmost part of the coast with 3 hectares core zone and 7 hectares buffer zone; (2) Cantapoy MPA in the middle containing a core zone of 10 hectares and 100 meters radius buffer zone; and (3) Karihatag MPA in the southernmost part of the coast with 3.8 hectares core zone and 50 meters radius buffer zone. Actually, five barangays of the municipality were declared a Marine Protected Areas (MPA). Cantapoy MPA was the first Marine Protected Area in the mainland of Surigao established sometime in 1997 with the assistance from the Canadian International Development Agency (CIDA). This MPA was left unattended in several years, however reinstallation have been worked in 2013 with the assistance from the Surigao NGO Coalition for Development (SUNGCOD) and the German Development Cooperation (GIZ). Karihatag Marine Protected Area was also established

in 2009 with support from AusAID through the Philippine-Australia Community Assistance Program and its management was strengthened through the help of SUNGCOD and GIZ. The partnership of MLGU-SUNGCOD-GIZ had pursued delineation of Cagtinae, Cayawan and Tinago Marine Sanctuaries in the later years. It has also enacted ordinances declaring the “Malimono Fisheries Code of 2017” that promotes conservation, and ensure sustainable, and equitable utilization of its coastal areas and resources in conformity with Republic Act 8550. *(Sources: Ecological Profile of Malimono; Office of the Sanguniang Bayan)*

In the Municipality of Placer, an existing Marine Protected Area (MPA) of 15 hectares was established in 2001 under the Provincial Government and 12 hectares established by the HIPADA program, located at Barangay Panhutongan and 10 hectares at barangay Sani-sani. They are now being maintained by both the barangay and municipal governments. Other coastal management strategies implemented was the installation of and establishment of fish sanctuary in Barangay Ellapiral (70 hectares) Lakandula (79.4 hectares), and Amoslog (30 hectares), Capability Enhancement Training for fisherfolk as well as community participatory resource assessment were conducted. *(Sources: Placer Ecological Profile).*

Gaps and Discrepancies

The conditions of the coastal areas of San Francisco, Malimono, and Placer are at current compromised due to escalating social impacts such as increase of population, and migration of fishermen from neighboring municipalities, and provinces, thus resulting to an increase of people involved in resource extraction like fishing. For the years to come it is likely that populations along the coast will multiply, and so would those engaged in fishing activities. Built up areas near coastal easements, and human settlements will continue to increase and expand which will ultimately affect the natural environmental processes in the coastal ecosystems and will lead to a variety of issues and problems such as loss of biodiversity, pollution, and erosion/siltation.

In areas covered during the assessment on September 2021 (San Francisco, Barangays of Banbanon, Oslao, Diaz, Poblacion, Jubgan; Malimono, Barangays of Cantapoy, Karihatag, Cagtinae; Placer, Barangays of Panhutongan, Magsaysay, Lakandula, Sani-sani, Amoslog) numerous interactions with fisher folks and settlers revealed that they observe the occurrence of Sea Level Rise (SLR) due to climate change. Sea Level Rise in the Philippines started way back in the 1940's and for each decade a Sea Level Rise of 0.15 meters is expected. This Sea Level Rise (SLR) aggravates Rapid Onset Extreme Events like Super Typhoons making them even more catastrophic.

Though coastal conservation strategies and management mechanism have been installed in selective areas of the 3 municipalities, and current enforcement regulations implemented, challenges in terms of its management must be holistically addressed at the grassroots level that will encompass all sectoral groups within the municipality, and the neighboring areas. Loose enforcement of the fish sanctuaries protection regulations would result in the decline of the natural resource stocks of these designated conservation areas.

During the recent field assessment and immersions as well as actual field interactions within the communities conducted on September 2021, it was observed that some MPAs are yet to be covered with supporting ordinances and resolutions to be crafted by the respective local government units. Other

Jubgan								
Linongganan								
Oslao								
Poblacion								
2. Municipality of Malimono Coastal Barangay								
Cagtinae								
Binocaran								
San Isidro								
Cayanan								
Bunyanan								
Hanagdong								
Cansayong								
Masgad								
Cantapoy								
Can-aga								
Pili								
Karihatag								
3. Municipality of Placer 7 Coastal Barangays and 3 Island Barangays								
Amoslog								
Central								
Ellaperal								
Ipil								
Magsaysay								
Pananay-an								
Panhutongan								
Sani-sani								
Tagbongabong								
Lakandula								

The color code legend means, red is under **Rapid Onset Events** – Category 1; and yellow is for the **Slow Onset Events** – Category 2. Brown indicates anthropogenic factors.

Climate Vulnerability Profile Per Municipality:

Due to the Municipality's exposures to a variety of climate stimuli such as Extreme Events or Rapid Onset Events (Typhoons, Extreme Flooding) and Slow Onset Events (Sea Level Rise - Dry Spell - rain-induced Landslide) its degree of impacts to coastal areas varies. Each sector of the Social, Environmental, Physical, Economic, and Institutional are impacted in a variety of degrees. Like Super Typhoon Odette it has impacted almost all sectors in Surigao Del Norte.

Incidence of Rapid Onset Event or Extreme Onset Event are likely to occur on all of the coastal barangays of these municipalities. Varying degree of occurrence like Extreme Flooding due to heavy rainfall are experience once in every 4-10 years during November until February. Most of these coastal barangays are also exposed to Typhoons that occurs every 10-30 years. Considering that the advent of global climate change effects are persistently at a scale making coastal communities at a higher risk.

Climate Vulnerability Profile:**Climate Vulnerability Profile of Municipality of San Francisco****A. Exposures: Climate Stimuli and Hazards**

1. Extreme Events - Typhoons - Extreme Flooding
2. Slow Onset Events - Sea Level Rise - Dry Spell - rain-induced Landslide

B. Sensitivity: Degree of impacts

1. **Extreme Flooding** - 8 out 11 barangays - 4-10 years
 - High impact - Economic & Physical - 379 hectares of food production
 - Damage cost - Php13.2 million - 1,618 Farmers/Fisher folks
2. **SOE-Dry Spell** -4 out 11 barangays - Every year during dry season
 - Medium Impact - all sectors - 389 hectares of food production
 - Damage cost - Php 11.6 million - 200 farmers/fishpond operator affected
3. **SOE – Sea Level Rise** -5 out 10 barangays - Every year during dry & wet period
 - High Impact - Economics, Physical - 70 hectares of agri-lands
 - Damage cost - Php 5 million - 107 Farmers affected

C. Climate Change Risk and Climate Variability

Projection (PAG-ASA) average of Mid to High emission scenario

- Precipitation: Surigao Del Norte will have projected changes by an increase of 30% by 4th quarter (Oct – Dec)
- Temperature with 20% increase by a third quarter (July- Sept) by 2036 to 2065.
- Increase of severity of impacts of Extreme Event

Varying climate parameters with multiple hazards has its unique varying degree of risk, and intensity could make high vulnerable communities from its climate impact on the scale of damages in all barangays, thus a potential impact that would affect mostly all sectors of the Municipality.

HIGH Degree of Vulnerabilities under Economic and Physical interrelated to Environment

Climate Vulnerability Profile of Municipality of Malimono

A. Exposures : Climate Stimuli and Hazards

1. Extreme Onset Event: Typhoons, and Extreme flooding
2. Slow Onset Event : Sea Level Rise (SLR), Annual flooding , Dry Spell, and Landslide

B. Sensitivity : Degree of impacts

- | | | |
|----------------------------------|------------------------------------|--|
| 1.1 Typhoon | - 14 out of 14 barangays | - every 15-20 years |
| - Medium impact | - Social, Environment, Physical, | - 11,248 Individuals, 50 ha of Rice fields & 489 hectares of upland forest, critical and lifeline utilities, 1,318 farmers & 1,840 fisher folks for Economics, Institutional |
| -Damage cost | - Php 10.5 million | - 1,318 farmers & 1,840 fisher folk |
| 1.2 Extreme Flooding | - 7 out 14 barangays | - every 10-15 years |
| -Medium Impact | - Social & Institutional | - 2,374 individuals, policies and programs |
| 2.1 SOE-Sea Level Rise | - 12 out of 14 barangays | - Yearly |
| -Medium Impact | - Social, Physical & Institutional | - 1,052 Fisher Folks, State College Building and Facilities, Marine Protected Areas, sea wall, Policies and Programs |
| 2.2 SOE – Annual Flooding | - 7 out 14 barangays | - Every year during rainy season |
| -Medium | - Social, Physical, Institutional | -6,175 individuals, 1 Barangay Gym, 1 District Hospital, 5 Churches, 1 Daycare and 1 health center, 1 ES, 485 houses, Fiscal Management & Legislative Output |
| -Damage cost | - Php 2.28 million | -785 farmers |
| 2.3 SOE – Dry Spell | - 10 out 14 barangays | - Every year during dry period |
| -High Impact to | - Economics | - 76.03 ha of rice land, 489 ha of upland ecosystem and 7 major river system |
| -Damage cost | - Php 29 million | -1,683 Farmers affected |

C. Climate Change Risk and Climate Variability

Projection (PAG-ASA) average of Mid to High emission scenario

- Precipitation: SDN will have projected changes by an increase of 30% by 4th quarter (Oct – Dec)
- Temperature with 20% increase by a third quarter (July Setp) by 2036 to 2065.
- Increase of severity of impacts of Extreme Event

Varying climate parameters with multiple hazards has its unique varying degree of risk, and intensity could make high vulnerable communities from its climate impact on the scale of damages in all barangays, thus a potential impact that would affect mostly all sectors of the Municipality.

HIGH Degree of Vulnerabilities under Economic Physical interrelated to Environment

Climate Vulnerability Profile of Municipality of Placer

A. Exposures: Climate Stimuli and Hazards

1. Extreme Events - Typhoons - Extreme Flooding
2. Slow Onset Events - Annual Flooding - Dry Spell - Sea Level Rise - rain-induced Landslide

B. Sensitivity: Degree of impacts

1. **Extreme Flooding** - 5 out 10 barangays - 1-3 years
 - High impact - Economic & Environment - 226 hectares of Food production
 - Damage cost - Php 5.8 million - 150 Farmers/Fisher folks
2. **SOE – Annual Flooding** - 4 out 10 barangays - Every year during rainy season
 - High Impact - Envi, Physical, Econ - 80.5 hectares of food production
 - Damage cost - Php 2.9 million - 206 farmers/fishpond operator affected
3. **SOE – Dry Spell** - 4 out 10 barangays - Every year during dry period
 - High Impact - Economics, environment - 195.5 hectares of riceland
 - Damage cost - Php 5.8 million - 131 Farmers affected

C. Climate Change Risk and Climate Variability

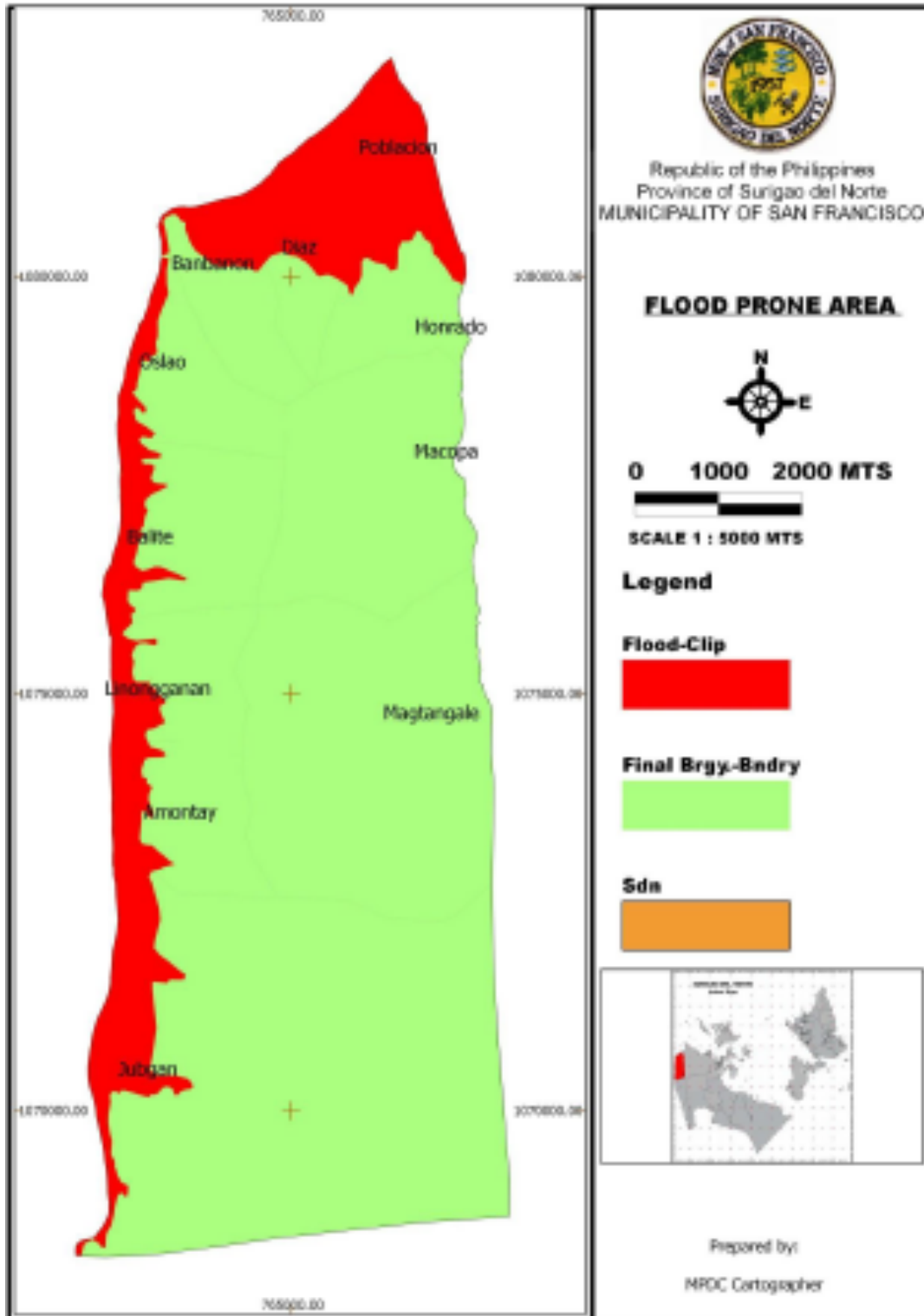
Projection (PAG-ASA) average of Mid to High emission scenario

- Precipitation: Surigao Del Norte will have projected changes by an increase of 30% by 4th quarter (Oct – Dec)
- Temperature with 20% increase by a third quarter (July- Sept) by 2036 to 2065.
- Increase of severity of impacts of Extreme Event

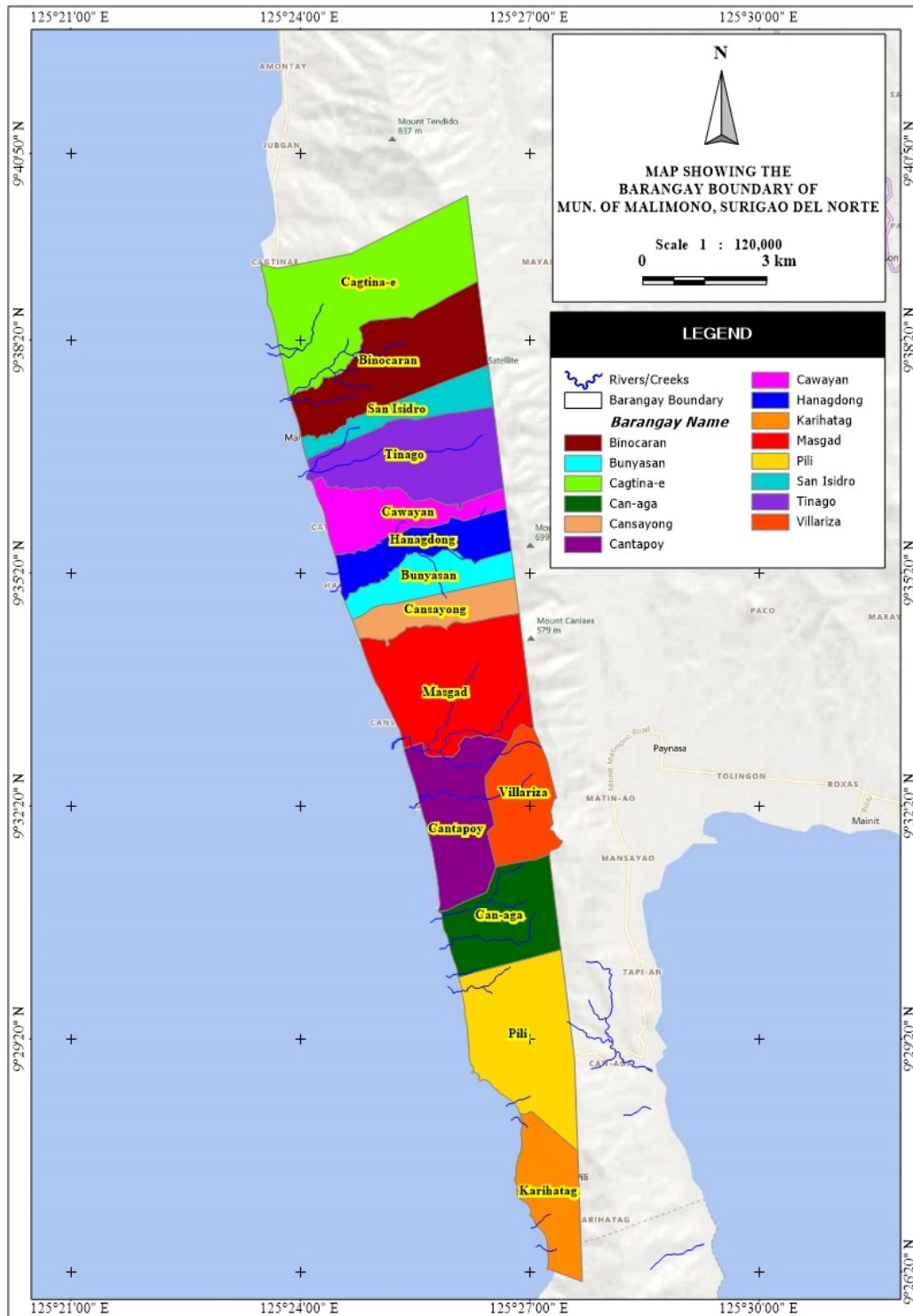
Varying climate parameters with multiple hazards has its unique varying degree of risk, and intensity could make high vulnerable communities from its climate impact on the scale of damages in all barangays, thus a potential impact that would affect mostly all sectors of the Municipality.

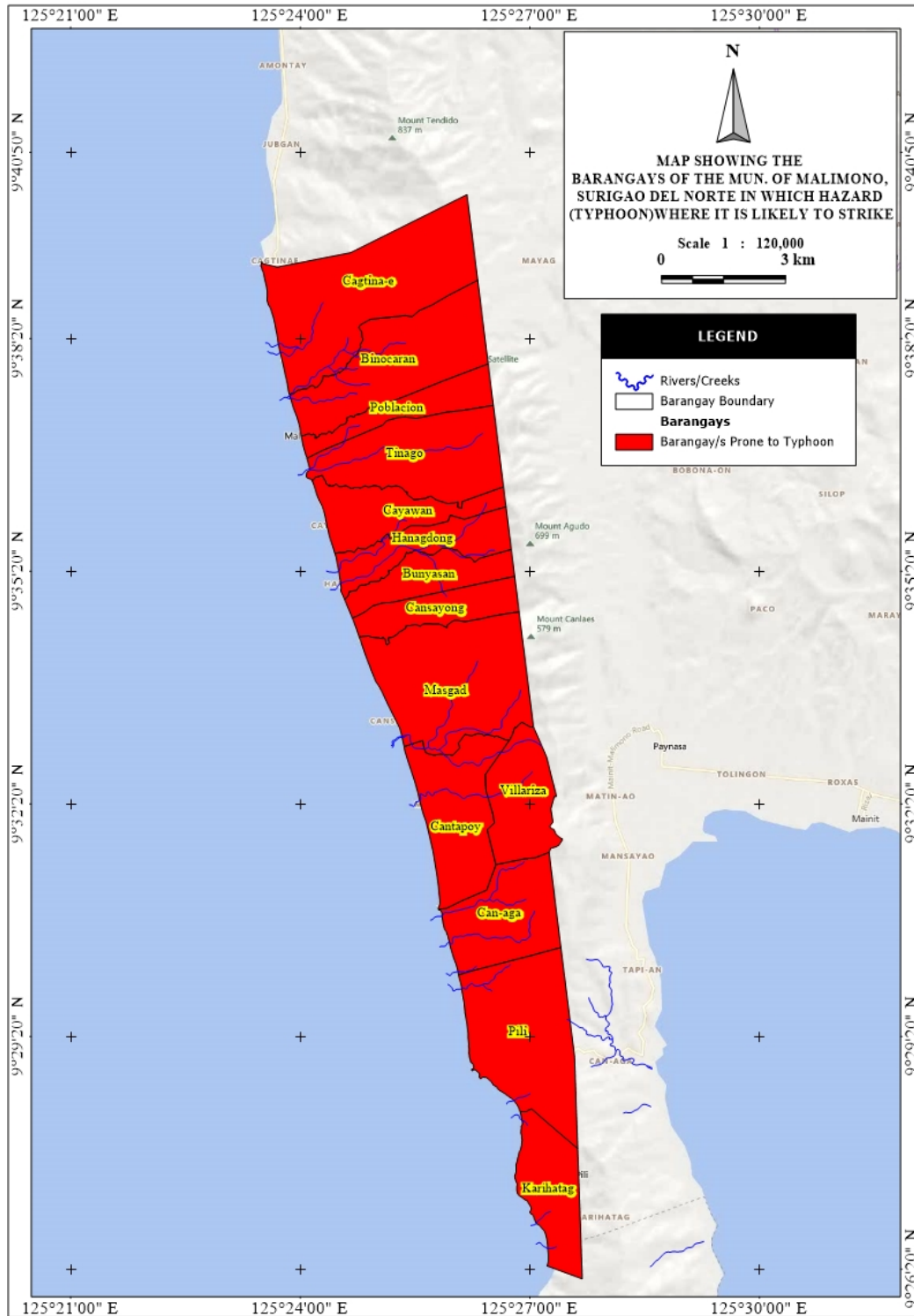
HIGH Degree of Vulnerabilities under Economic and Environment interrelated to Physical

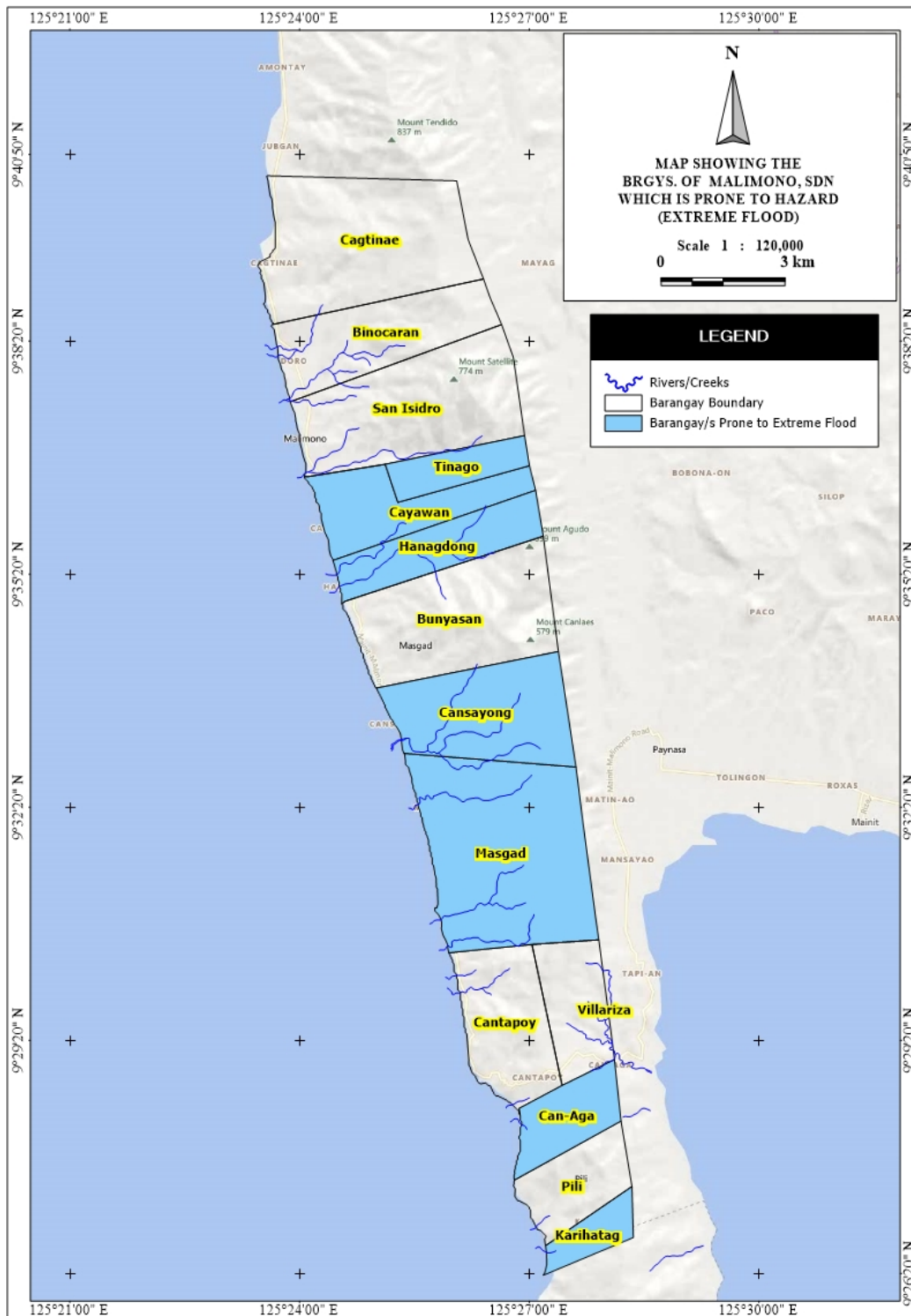
(Source: Municipal Climate Risk Profile)

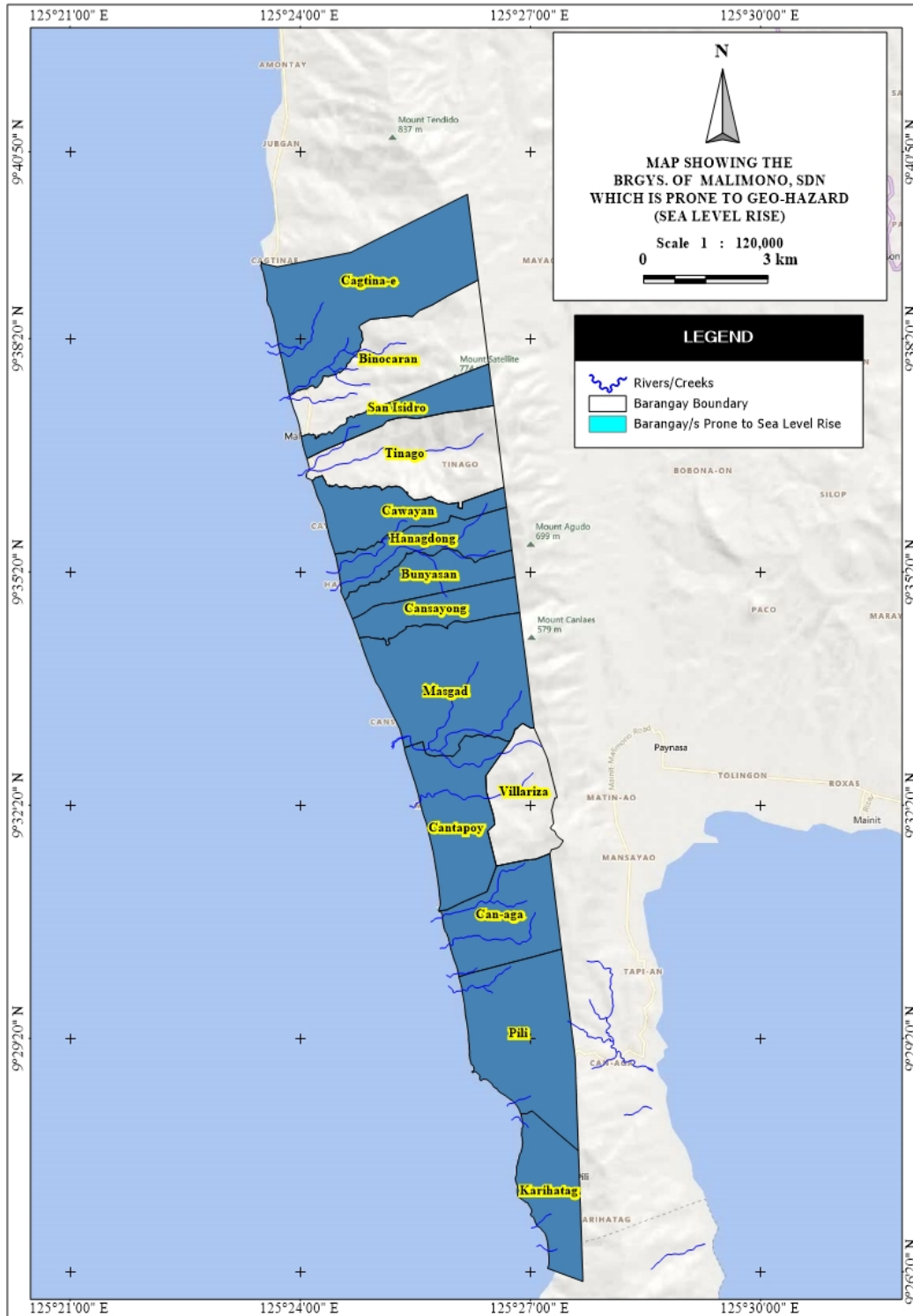


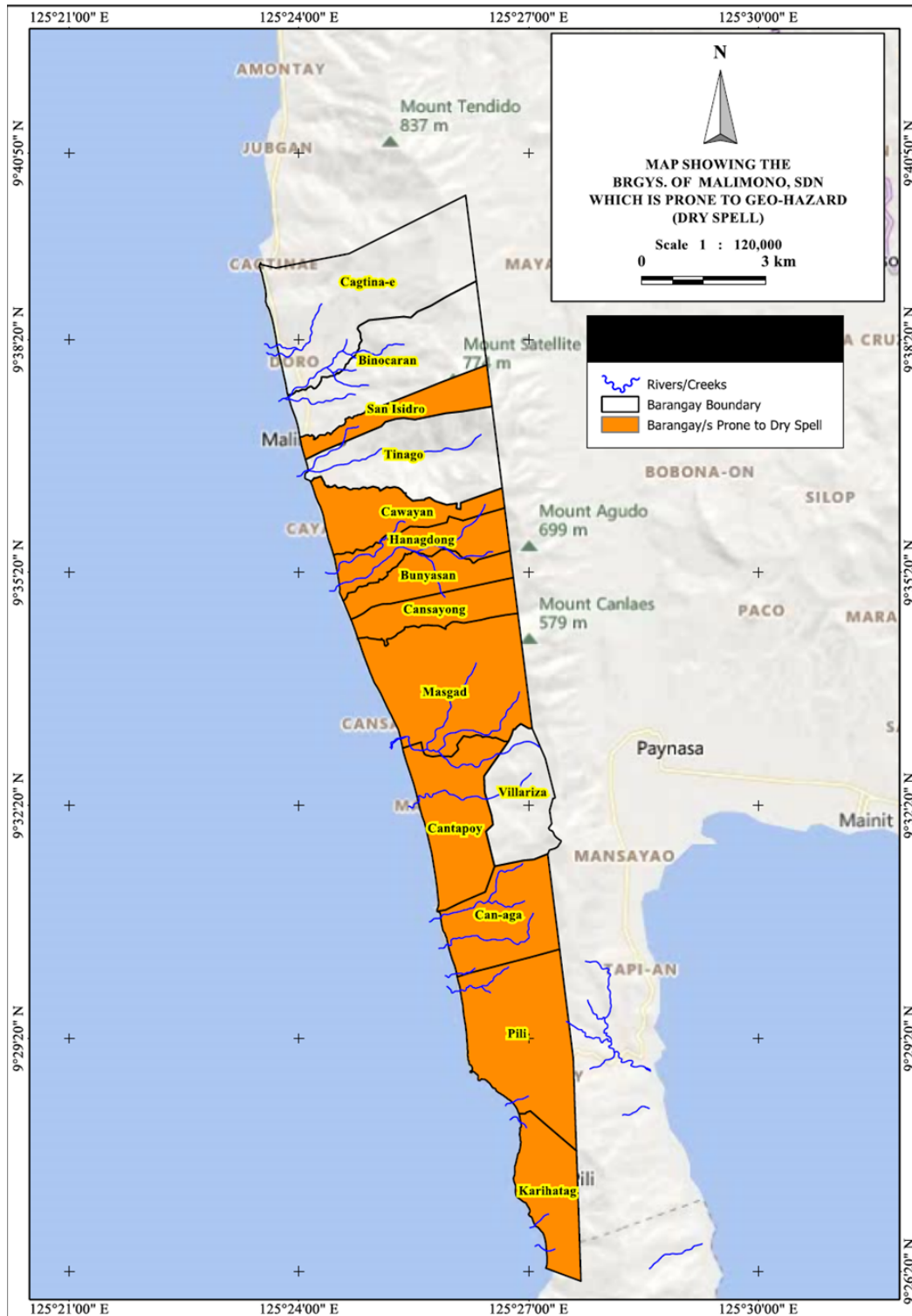
B. Municipality of Malimono

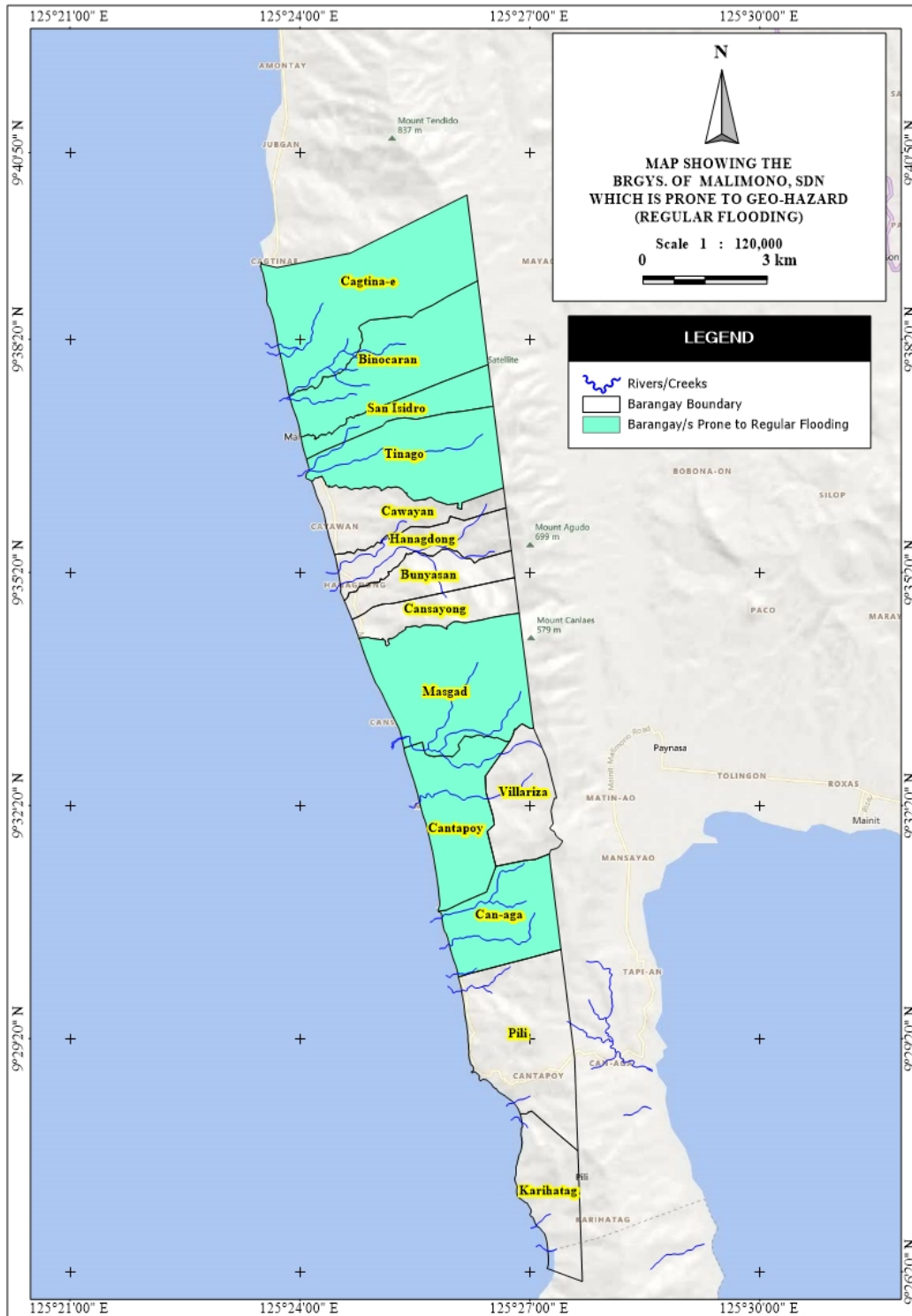


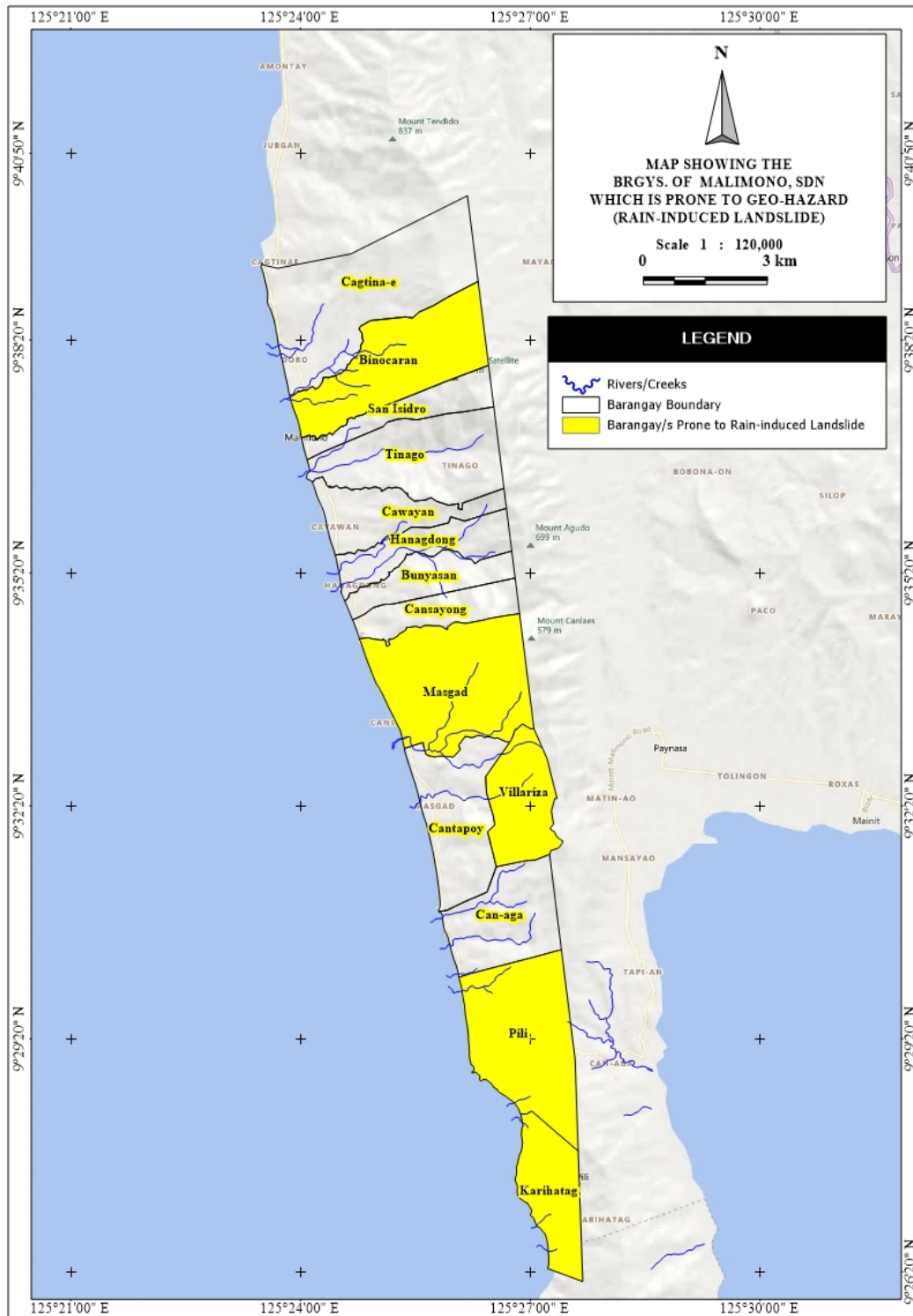












C. Municipality of Placer

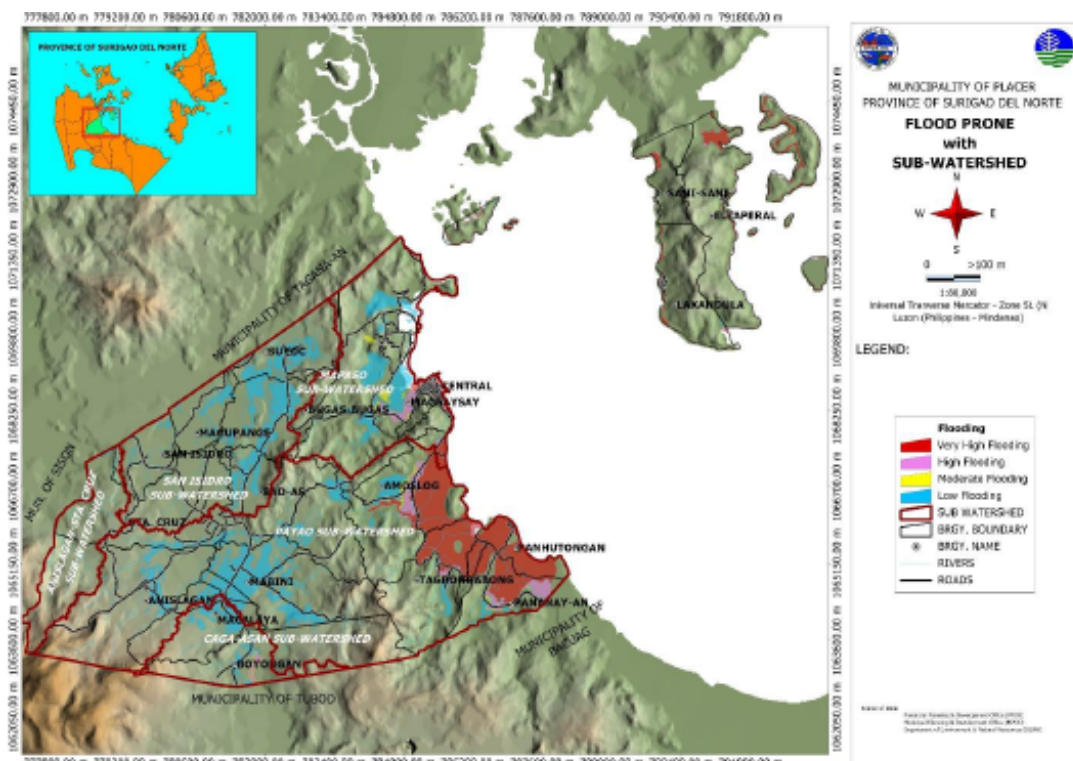
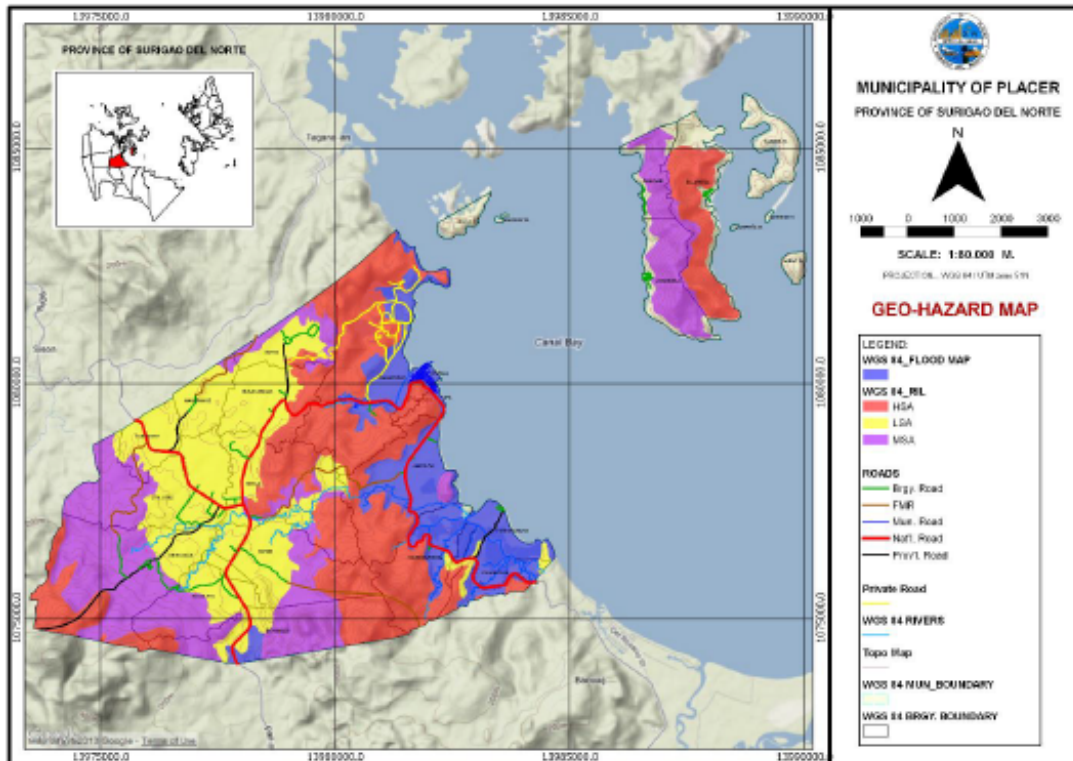


Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Caraga

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
CARAGA												
AGUSAN DEL NORTE	26.2	27.6	27.8	27.4	1.0	1.2	1.3	1.1	1.9	2.3	2.5	2.2
AGUSAN DEL SUR	25.9	27.1	27.2	26.9	0.9	1.1	1.1	1.1	1.9	2.2	2.4	2.1
SURIGAO DEL NORTE	26.3	27.6	28.2	27.7	0.9	1.1	1.3	1.1	1.7	2.2	2.6	2.0
SURIGAO DEL SUR	26.4	27.4	27.9	27.4	0.9	1.0	1.1	1.1	1.7	2.0	2.3	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Caraga

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
CARAGA												
AGUSAN DEL NORTE	875.7	441.9	460.0	628.9	-0.8	-24.4	-7.9	5.0	13.8	-36.5	-8.3	0.6
AGUSAN DEL SUR	963.3	586.4	593.4	694.8	4.0	-13.1	0.0	-6.0	-2.9	-26.1	-3.4	-5.9
SURIGAO DEL NORTE	1412.0	639.6	448.0	837.3	2.1	-11.7	-3.3	4.2	3.2	-33.2	-8.7	9.6
SURIGAO DEL SUR	1394.0	746.9	534.6	842.5	5.8	-11.7	-2.2	-4.8	4.0	-29.1	-7.9	-3.7

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Caraga

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >300mm		
		OBS	2020	2050	OBS	2020	2050	OBS	2020	2050
AGUSAN DEL NORTE	Butuan	324	2855	4767	4997	6300	6804	0	10	10
SURIGAO DEL NORTE	Surigao	86	225	1333	5286	6054	5975	1	2	14
SURIGAO DEL SUR	Hinatuan	157	1635	3024	5667	2715	3080	1	1	6

Projected Rainfall Changes based from average data of RCP 4.5 to 8.5 scenarios

Seasons Rainfall Baseline 1971	DJF 1,412.0 mm	MAM 639.6 mm	JJA 448. mm	SON 837.3. mm
Wettest (+) Upper bound	36.9% Range (34% to 38.9%) mm +521 mm / 1,933mm	10.1% 64.1 mm	10.1% Range (7.1 to 13.1% mm) 45.3 mm	11.6% Range (8 to 15% mm) 97.2 mm
Average (Most likely) Median bound	+5.9%		-1.9%mm Range(-4.5 – 0.7% mm)	-12.7% Range(-14.1 – 12.2% mm)
Driest Lower Bound	-16% Range (-12.2 to - 19.7%) -225 mm / 1,187 mm	-6.2% -39.6 mm	- 13.4% Range (-11.3% - 15.5%mm) -60 mm / 387.9 mm	-20.8% Range (-19% to - 22% mm) -173.8mm / 663.5mm
Summary	20.9% increase		3.4% decrease	9.4% decrease

Source: PAG-ASA Climate Projection and Trends

Note: The Projection is combined average data of 4.5 to 8.5 RCP, from mid to high emission scenario

Projected Seasonal Temperature (Med – High scenarios)

TEMPERATURE (baseline 1971)	DJF 26.3 °C	MAM 27.6 °C	JJA 28.8 °C	SON 27.7 °C
Med to High emission scenarios. (RCP 4.5 to 8.5)				
Warmest possible temperature *UPPER Bound	1.7 to 2.0°C	1.6 to 2.1°C	1.7 to 2.1°C	1.8 to 2.2°C
	1.9 °C	1.9 °C	1.9 °C	2.0 °C
	28.2 °C	29.5 °C	30.1 °C	29.9 °C
Coolest possible period *Lower Bound	1.0 to 1.3°C	1.0 to 1.4°C	0.9 to 1.2°C	1.0 to 1.3°C
	1.2 °C	1.2 °C	1.1 °C	1.2 °C
	27.5 °C	28.8 °C	29.3 °C	28.9 °C
			Increase	Increase

Surigao Del Norte profile of climate and weather classified as type 2 with pronouncing no dry season with a very pronounced maximum rain period from December to February. There is not a single dry month. Minimum monthly rainfall occurs during the period from March to May.

6. Recommendations

Issues and Concerns Municipalities of Placer, Malimono, San Francisco	Mitigation Strategies and Actions	Response Strategies and Actions	Rehabilitation Strategies and Actions	Adaptation Measures	Management Policies
Highly disturbed area by anthropogenic activities.	Undertake tree planting activities in areas along the coastlines to enhance its vegetative cover and improve its aesthetic value.	Planting of mangrove or beach forest type trees.	Planting and tree growing by multi-sectoral groups to include monitoring and replacement of dead seedlings, weeding, brushing, staking	Promulgation of municipal/BLGU ordinances for mandatory tree growing activities for all as prerequisite for issuance of permits (like cedula, business permit, etc)	Integrated Coastal Resource Management; Expanded National Greening Program; DRR Plan.
<p>Natural forest cover reduction caused by both anthropogenic activities and natural causes.</p> <p>Siltation and land area impoverishment caused by the ongoing earth moving and mineral resource extractions activities in the hinterlands.</p> <p>Rapid loss and degradation of wildlife's</p>	Replenishment of lost resources through Re-greening program	<p>Law enforcement and massive implementation of Information Education Campaign</p> <p>Updating of the municipality's Comprehensive Land Use Plan.</p>	Application of agro-reforestation, rain forestation principles and methods in degraded or denuded areas	Institutionalize greening program in all concerned areas	Updating of the municipality's Comprehensive Land Use Plan; LGU Malimono have already crafted its Integrated Coastal Management (ICM) Plan for the municipality's ridge to reef conservation program implementation; Expanded National Greening Program;

<p>natural habitat causing the reduction of local wildlife population and species.</p> <p>Informal settlers occupying illegally easement areas and unsustainably exploiting the natural resources therein, thereby greatly contributing to its area degradation.</p>		<p>Enforcement of zoning laws and preparation of alternative settlements.</p>			<p>Enhance Comprehensive Land Use Plan; Republic Act 9147; RA 11038 and 7586, Local Government Code (RA 9160)</p>
<p>Placer’s beach forest cover within the mainland and its small islands and islets are currently threatened by deforestation due to illegal tree cutting and illegal occupation within beach forestlands and of adverse effects of natural events (storm surges and periodic flooding).</p> <p>Area clearing, wildlife hunting /poaching and collection of wild plants reduces biodiversity richness in the area.</p> <p>Storm surges, flashfloods eroded beach forest lands of the municipality.</p>	<p>Coordinated and massive reforestation efforts along the threatened coastline’s beach forest ecosystem thereby enhancing its present vegetative cover.</p> <p>Establish communal nurseries to grow beach forest type species as source of ready to use seedlings for beach forest’s enhancement program.</p> <p>Require every coastal barangay LGUs to establish and develop their respective barangay tree park within degraded beach forest areas to</p>	<p>Strict law enforcement action to prevent illegal activities.</p>	<p>Re-greening activities (tree planting and growing)</p>	<p>Establishment of greenbelts within municipalities and barangays and designation and enhancement of tree parks and terrestrial protected areas establishment</p>	<p>ICM, ENGP, RA 9147, RA 9160,</p>

<p>Presence of non-biodegradable wastes particularly plastics, bottles, discarded cellophane bags and wrappers.</p>	<p>rehabilitate these beach lands and promote nature conservation.</p> <p>Install regulatory and interpretive signage/ billboards in strategic areas relative to the importance of preserving and protecting coastal ecosystems.</p> <p>In coordination with DENR, DA & DILG, conduct massive community education and public awareness (CEPA) campaign along coastal communities.</p> <p>Intensify nature conservation related law enforcement activities, along the coastlines and to include the beach forest ecosystem’s resources protection and preservation.</p>				
<p>Silt laden water existing within the downstream natural waterway.</p>	<p>Strict implementation of soil and water conservation measures</p>	<p>Regulatory measures in place and implemented at the ground level</p>	<p>Re-greening, dredging/de-clogging activities within the river system</p>	<p>Institutionalizing clean ups, water quality monitoring and bio-physical</p>	<p>RA 9003, Integrated Watershed Management, Clean Water Act, Responsible Mining Act (RA 7942)</p>

<p>Clogged-up river mouth of Anao- aon River due to storm surge’s beach rubbles, trashes, pebbles and sand deposition and of the siltation from the upstream at the river mouth.</p> <p>Riverbanks’ expansion and eventual widening due to the gradual collapse of river embankments and occurrence of landslides along</p> <p>Inland fisheries ‘natural breeding grounds within the river system’s substrates are physically disturbed and adversely affected by the present condition and quality of the inland water which is greatly affected by water pollution and related biophysical disturbances</p>	<p>Conducted upstream river dredging activities at Anao-aon River as part of the municipality’s flood control program.</p> <p>MLGU San Francisco with concerned BLGUs conducts riverbanks’ tree planting /growing activities.</p> <p>Quarry sites’ periodic monitoring and evaluation at Anao-aon River upstream area of Barangays Honrado, Magtangale and Macopa by Municipal Environment & Natural Resources Office (MENRO) personnel with the Multi -sectoral Monitoring Team (MMT).</p> <p>Implemented regulatory laws pertaining to nature conservation and natural resources rationalization.</p>			<p>parameter assessment</p>	
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<p>Gold Mining activities in the hinterland areas especially in upper areas of Barangays Masgad of Malimono and Sani-sani of Placer including other earth moving activities and ground surface alteration and destruction, resulting to surface run offs, siltation and soil erosion that are carried downstream into river deltas which eventually end up in the sea.</p> <p>Water pollutants discarded into water tributaries such as of chemicals (cyanide and mercury) and fossil fuel used and discarded in the mining operations and of other chemicals used the in intensive rice farming and other agricultural activities using inorganic fertilizers, herbicides, fungicides, and insecticides affects river deltas and wetland areas of barangays causing biodiversity loss and</p>	<p>Implementation of Responsible Mining activities in affected areas.</p>	<p>Strict law enforcement, innovative regulatory measures implementation at the ground level</p>	<p>Re-greening program/ degraded area rehabilitation,</p>	<p>Mining effluents discharges monitoring; mandatory water settling ponds establishments</p>	<p>Philippine Mining Act, National Clean Water Act, Watershed Management Policy, Local Government Code, ICM</p>
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<p>decline of wildlife’s local populations.</p> <p>Illegal cuttings and illegal occupation threatens natural habitat and decimate vegetative cover.</p>					
<p>Deforestation and illegal mining activities in the adjacent hinterland areas cause soil erosion that increase river siltation.</p> <p>Surface runoffs carried eroded soil particles from nearby areas through connecting tributaries from elevated areas ends up at the mouth of Sabang River.</p> <p>Agricultural surface run offs carrying agricultural chemical and fertilizer residues from rice fields and upland agricultural areas pollute tributaries, river deltas and shallow coastal areas.</p>	<p>Agro-forestation, agroforestry, rain-forestation, mining law enforcement</p>	<p>Existing regulatory measures implementation</p>	<p>Re-greening program within deforested mining areas</p>	<p>Sloping Agricultural Land Technology (SALT) strategy implementation in mining/deforested affected areas</p>	<p>Mining Act, Clean Water Act, Forestry reform code, ECLUP, IPRA</p>
<p>Presence of non-biodegradable garbage /trashes especially plastics, plastic bottles,</p>	<p>Implementation of “Garbage In-Garbage Out” Policy to minimize if not eradicate garbage disposal</p>	<p>Enforcement of regulatory measures at the ground level</p>	<p>Institutionalizing tree growing and re-greening program along</p>	<p>Allot safe relocation sites for built-up areas along the coast.</p>	<p>ICM, Climate Change Act (RA 9729 of 2009), DRRM Act RA 10121 of 2010, Ecological Solid</p>

<p>cellophane bags and wrappers.</p> <p>Developing beach resorts along the coastline must secure Foreshore Lease Agreement (FLA) and an Environmental Compliance Certificate (ECC) or a Certificate of Non-Coverage (CNC) prior to its business operation as mandated by law.</p> <p>Fishponds constructed along the coasts and situated in a public domain must be required with Fish Pond Lease Agreement (FLA) tenure instrument as required by law.</p> <p>Constant scouring of the shorelines and the beachfronts that destroyed infrastructures along /near the beaches</p>	<p>problem along the shoreline and beachfronts. This will cover all beach users, bathers, beach tourists in line with the implementation of Ecological Solid Waste Management Act (Republic Act 9003) through the Office of the Municipal Environment and Natural Resources in coordination with the Sangguniang Bayan Committee Chair on Natural Resources and of the Barangay LGUs.</p> <p>Total ban on extraction of beach and shoreline’s natural resources (sand, pebbles, stones, gravel, and rock boulders), for being an environmentally critical area.</p> <p>Linkage with the Department of Tourism’s national and regional offices for a municipal tourism project portfolio</p>		<p>the coast line thereby increasing beach tree forests.</p> <p>Installation of substrate hugging designed Artificial reefs to buffer or stabilized, cushion wave actions, and minimize</p>	<p>Placement of concrete infrastructure to complement the existing and natural buffers (Beach trees, coconut)</p>	<p>Waste Management Act (RA 9003), Clean Water Act (RA 9275), New fisheries reform code (RA 8550), CLUP, Tourism Policy, Environmental Impact System Policy, Land Conversion Policy</p>
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	<p>proposal& feasibility study for the coastal tourism potentials.</p> <p>Partnership with the Environmental Management Bureau of DENR Region 13 on joint water quality monitoring of coastal areas and tributaries.</p> <p>Conduct of massive tree planting and tree growing activities along the coasts as an enhancement of coastal vegetation as climate change mitigation strategy.</p> <p>Massive education and information campaigns at barangay level.</p> <p>Putting up of regulatory and interpretive signage along strategic areas within coastal areas.</p> <p>Organize and deputize multi - sectoral law enforcement volunteer groups at barangay level to implement ordinances</p>		<p>scouring of the substratum.</p>		
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	<p>for coastal areas conservation and protection.</p> <p>Linkage with DA-BFAR, DENR, EMB, MGB, DOST and DOT for a multifaceted nature conservation and ecotourism development and climate change adaptation and to develop coastal communities resiliency strategies.</p> <p>Networking with NGOs, POs, and CSOs for coastal communities’ knowledge and capacity development program on climate change adaptation.</p>				
Shrinking swampland areas caused by land conversions and expansion of built up areas along the coasts and of the decline of its vegetative cover that eventually resulted to biodiversity loss.	Strict implementation of existing conservation laws	Regulatory measures to be undertaken religiously in affected areas	Re-greening program implementation, IEC	Advocacy promotion and innovative conservation measures crafting by LGUs	RAMSAR Convention (Wetland Conservation Program), ICM, ECLUP, CBD, Convention on Migratory Species (CMS),
Fish resources decline	Strengthen law enforcement activities				Fisheries Law (RA 8550), Clean Water Act,

<p>Illegal fishing activities: intrusion of commercial fishing vessels in the municipal fishing grounds, Biodiversity loss Pollution</p>	<p>against illegal fishing activities within Hinatuan Passage area.</p> <p>Increase the number and sizes of existing MPAs to include the nesting areas of critically endangered trans migratory Hawksbill marine turtle and the flyways and roosting sites of migratory water birds.</p> <p>Apply new flexible, innovative management strategies/approaches for MPA management , enhance reef productivity through new environment friendly and climate adaptive designed artificial reef modules to augment and increase coral recruitments and cover in the shallow coastal area. Conduct periodic water quality checks and monitoring. Implement more environment friendly ecotourism program activities in the coastal areas to ease fishing pressures within the</p>				<p>Ecological Solid Waste Management Act</p>
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	<p>municipal fishing grounds and to increase fishing communities alternative livelihoods and income as one of the build back better strategies employing nature based solutions during pandemic and or post pandemic period.</p>				
<p>Depleted mangrove swamps’ vegetative cover Highly disturbed habitats caused by current mining and quarrying activities in the hinterlands. Decline in mangrove forest cover (illegal cutting, area clearing ,illegal occupation)`</p>	<p>Declare area as a critical habitat under RA9147. Initiate additional mangrove and nipa conservation, protection and enhancement projects for more carbon capture and storage as one of LGU’s initiatives for the localities’ Climate Change mitigation and adaptation measure Reversion and revegetation of abandoned areas to make them more productive and climate resilient. Revisit and upscale mangrove swamp protection and conservation strategies. With DENR and DA-BFAR MAO & MENRO, conduct joint in situ inspections</p>	<p>Re-greening and re-planting of appropriate mangrove species and associates</p>	<p>Rehabilitation of degraded areas and apply assisted natural regeneration strategy</p>	<p>Declare rehabilitated areas as integral expansion part of MPAs</p>	<p>ICM, RA9147, RA 8850, ENGP, RAMSAR Convention</p>

	<p>and reevaluation of the whole mangrove swamp ecosystem to further improve its conservation and management .</p> <p>Conduct regular periodic site inspections and monitoring of the small islands and islets ecosystems to include site inspections and monitoring of mining areas of Masapelid Island to further its protection and conservation and to check the current ecological and the overall environmental health status of the said areas.</p>				
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Other recommendations and Opportunities:

- Strengthen MPAs' management; introduce innovative and science-based conservation intervention methods (closed/open seasons strategy, coordinated fishing regulations implementation to the ground level across sectors, strengthening of MPAs' management councils);
- Enhancement of MPAs' resources protection, and conservation, and networking/partnership with other sectors outside LGU (quantity/ quality/ connectivity);
- Expansion of MPA sizes to the maximum to include nesting sites, foraging area of globally threatened Hawksbill marine turtle as an access to funding support, strengthening of management municipal waters / HIPADA Bays;
- Investments on mangrove restoration, seagrass conservation and coral reef/fishing, and increase beach forests vegetative cover by planting more climate change resilient species (Ex. Coconut tree being a salt water tolerant species), hinterland forests vegetation protection, and conservation as mitigation for optimum carbon storage within HIPADA AOR's;
- Inventory of carbon capture potential of mangroves to access carbon credit markets as revenue generating measure;
- Conservation of watershed/water sources, wetland areas, tributaries, river deltas under ridge-riverine to reef conservation principle/concept;
- Livelihood investments, and technology assistance to address scarcity of fishery resources;
- Strengthen enforcement of local legislations and ordinances;
- Provision of incentives to Bantay Dagat/ Barangay Tanod (equipment, insurance, allowance and livelihood support);
- Capacity building towards practical local climate actions, mitigations, and adaptation practices within hinterlands, and coastal communities applying both indigenous, and scientific based knowledge;
- Design innovative and environment friendly artificial reef modules to be introduced in shallow sandy bottom substrates outside MPAs as Climate Change mitigation, and adaptation measures to improve live coral cover through more coral and fish recruitments to increase fishery productivity & as fish aggregating devices to ensure food security within coastal communities, and to help stabilize, and protect fragile, and sensitive marine organisms in shallow underwater habitats.