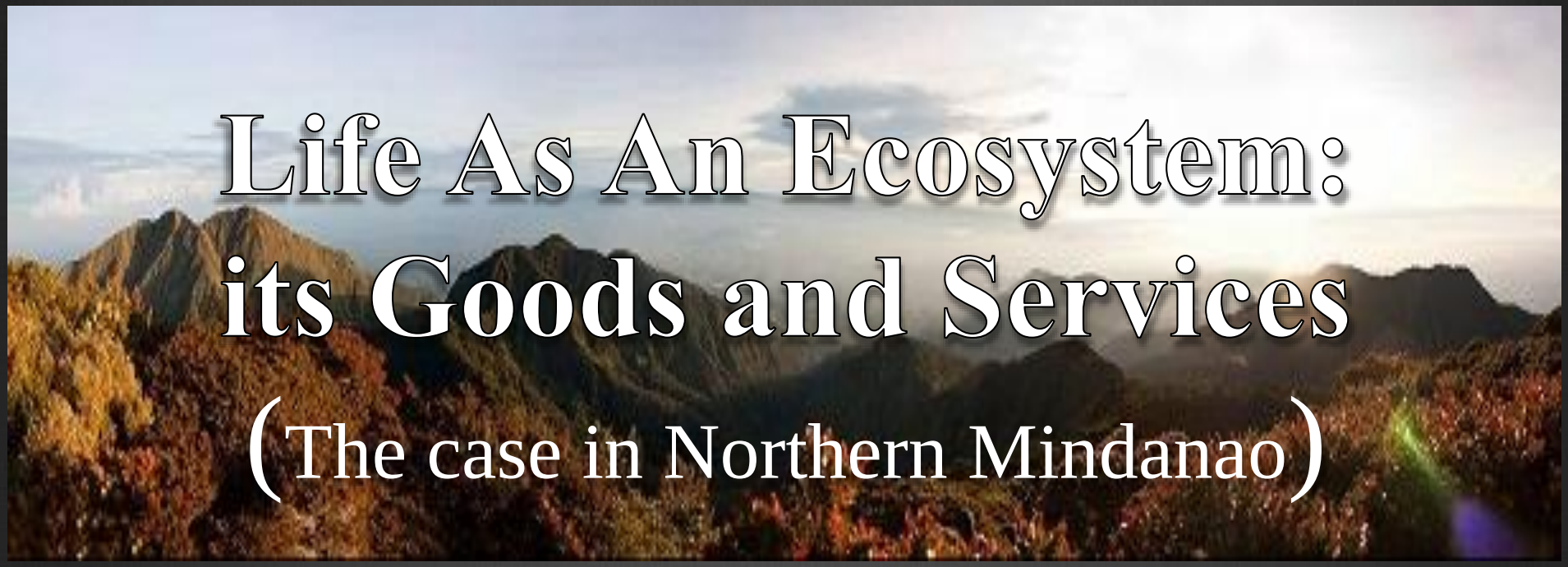


Life As An Ecosystem: its Goods and Services

(The case in Northern Mindanao)

Hilly Ann Roa-Quiaoit, PhD
Cagayan de Oro River Basin Management Council
Macajalar Bay Development Alliance
The Samdhana Institute

What are Ecosystem SERVICES?

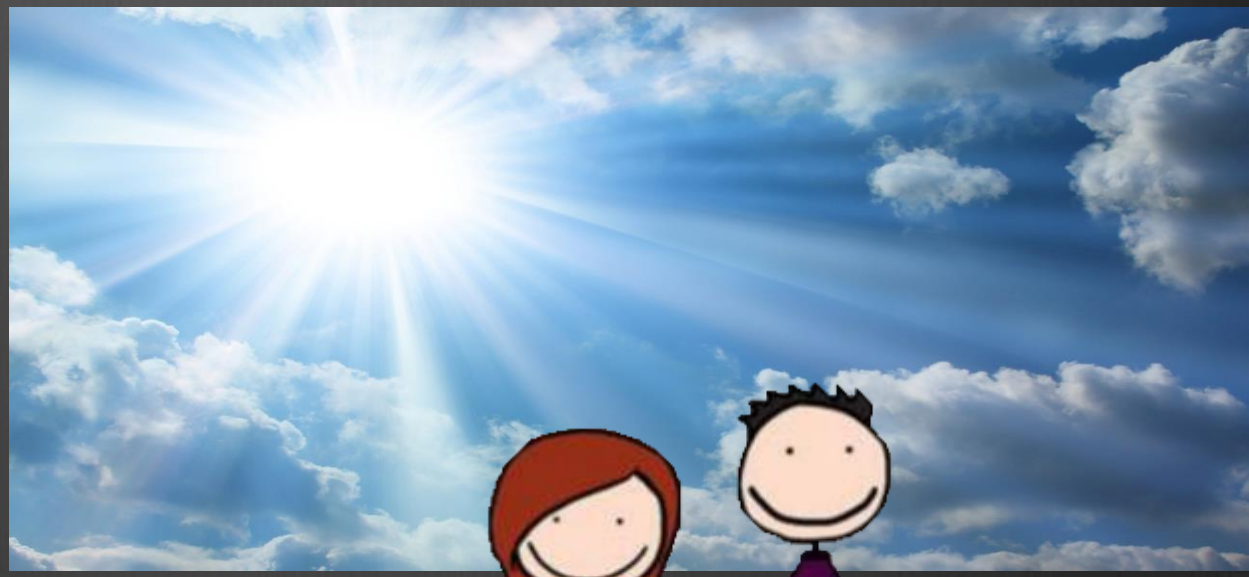
"The direct and indirect contributions of ecosystem to human well-being."

"Ang mga direkta ug indirekta nga mga tampo sa ekosistema para sa kaayuhan sa katawhan."

The Economics of Ecosystem and Biodiversity
www.teebweb.org

Why on ES?

Preserving ES will improve quality of LIFE



Why do we focus on Ecosystem SERVICES?

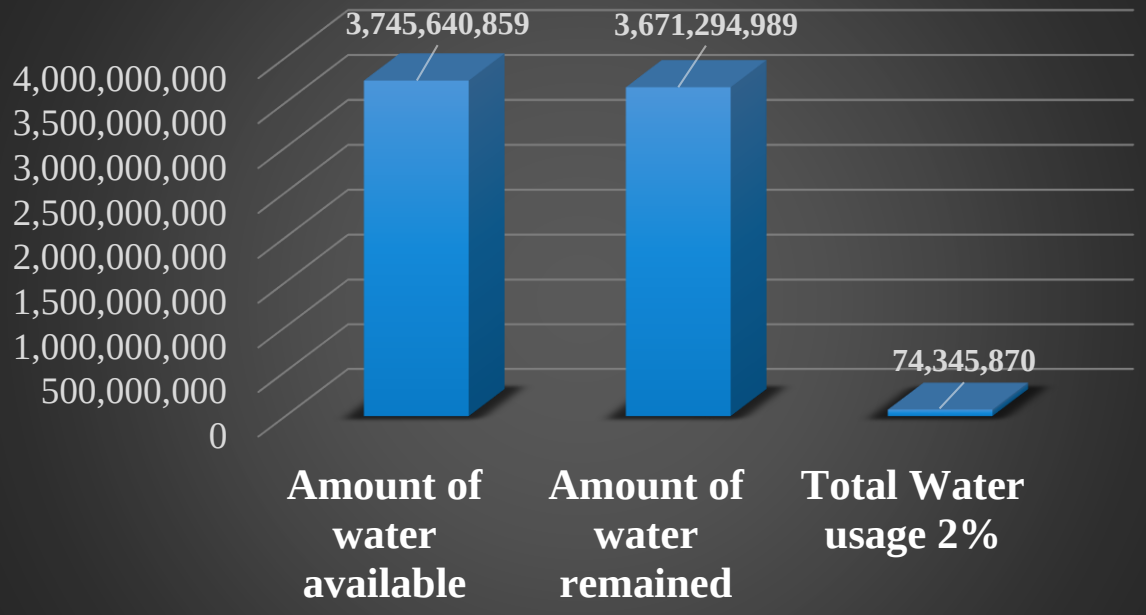

Provisioning
Regulating
Cultural
Supporting

Provisioning Services

These are **PRODUCTS** obtained from the ecosystem

WATER Provisioning

Water Balance based on Rainfall



CDORB

TRB

DENR-INREMP

Water Use Challenges in Cagayan de Oro Riverbasin

Hilly Ann Roa-Quiaoit PhD
Xavier University
March 20, 2012
Netherlands

Water ACCESS

CARETONS IN THE PHILIPPINES

Water Supply

More expensive water

- Bottled water 100x expensive
- Surface water
  processing is more expensive

Bulk water supplier:
Ban ground water abstraction
- for 10 years
- to recover stressed aquifers

AGRICULTURE

Conflicts in Water Use

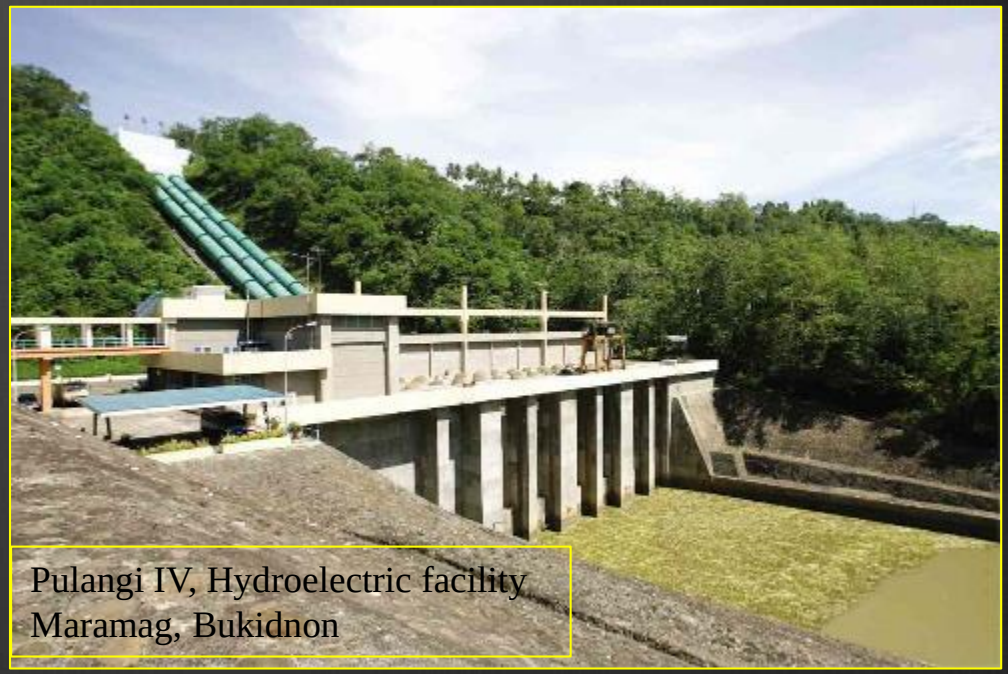
Food security Upscaling of Agriculture (Del Monte, Dole)

POWER

Conflicts in Water Use

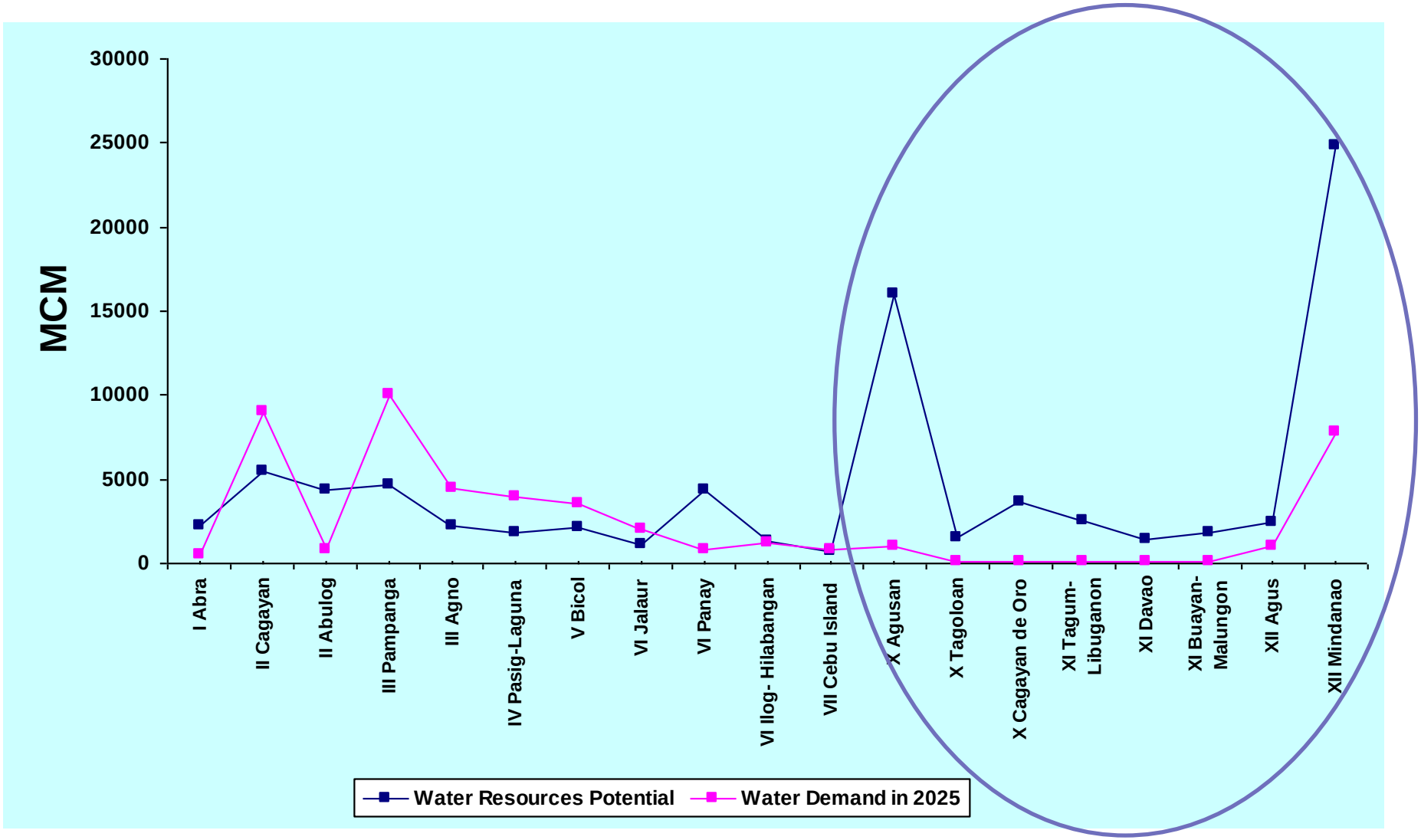
- Renewable energy
- Energy source
- Industries
- Development & Investment

Manolo Fortich Hydroelectric Plant
Under construction

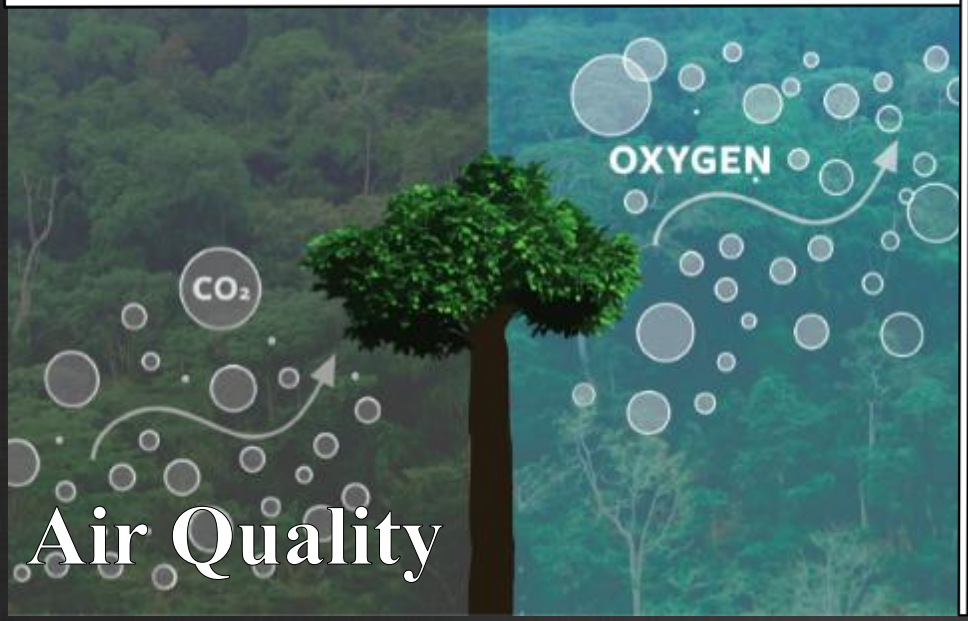


Pulangi IV, Hydroelectric facility
Maramag, Bukidnon

Water Potential and Demand by River Basin



Source: JICA Master Plan Study on Water Resources Management in the Philippines (1998). Low economic growth scenario, 80 percent surface water availability



Regulating Services

are **BENEFITS** obtained from the regulation of ecosystem processes

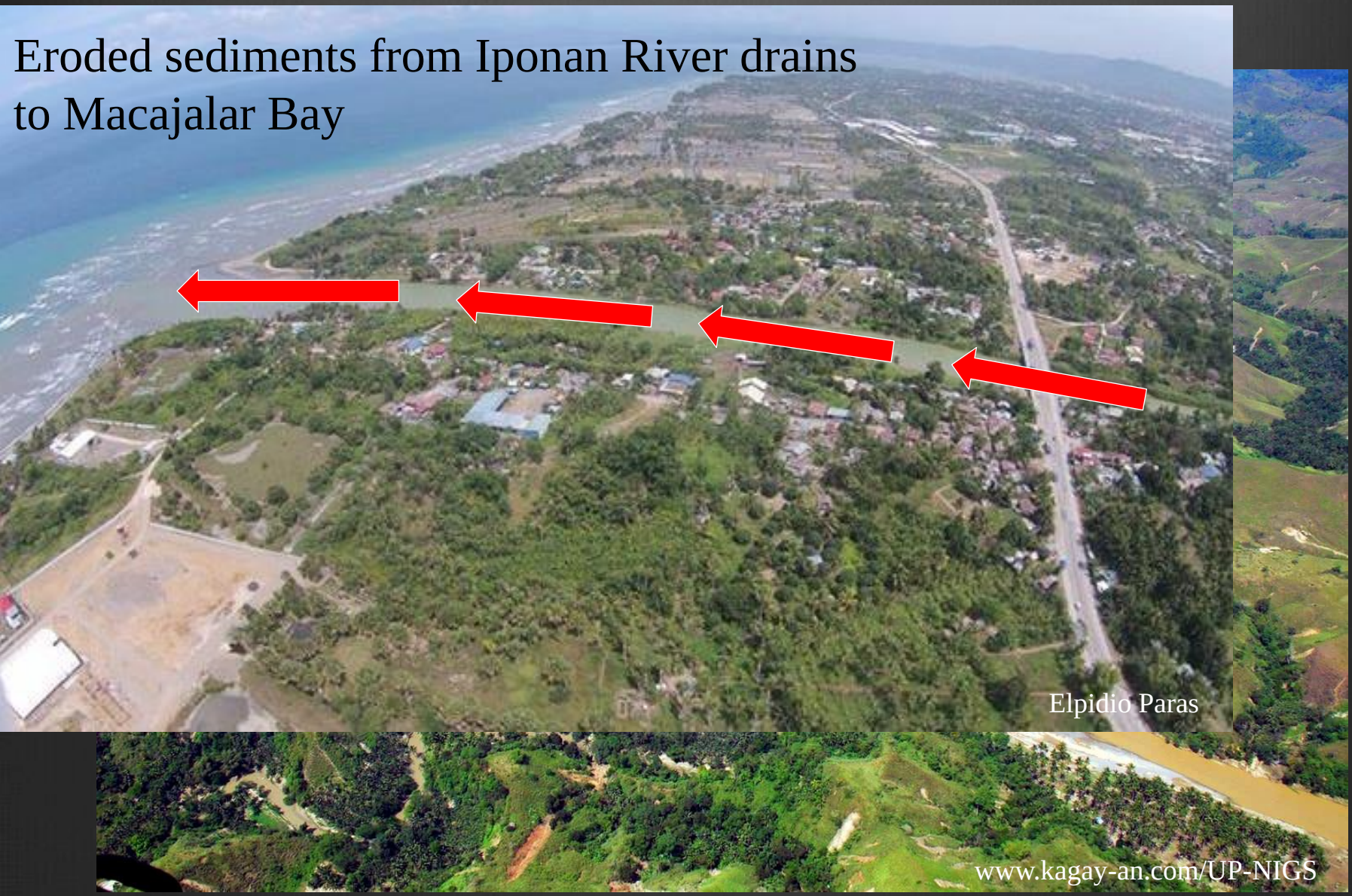
REGULATING FLOOD

Regulating FLOOD and **EROSION**

Erosion on hills

Varied Upland Activities

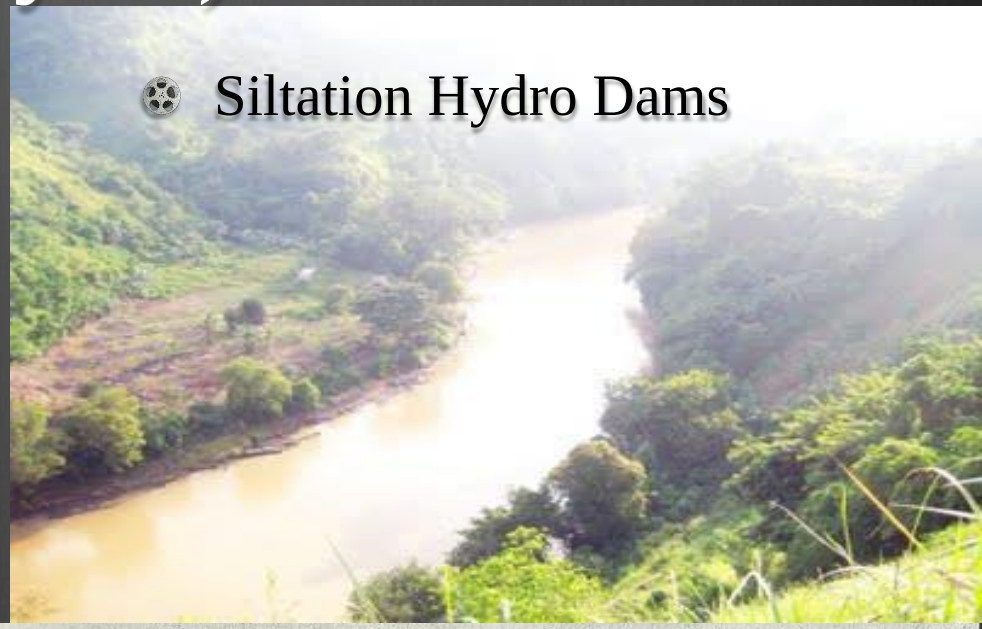
Flow of Sediments



Soil EROSION
(Pag-anas sa yuta)

- Siltation Rivers

- Siltation Hydro Dams



Mindanao loses power reserves, NGCP claims

THE National Grid Corp. of the Philippines (NGCP) implemen-ted a power load curtailment in Mindanao yesterday.

In an advisory, the NGCP said the move was due to an insufficient contingency reserve resulting from a deficiency in power generation.

The load curtailment in the Mindanao grid was 210 mw from 10 am to 5:30 pm and 270 mw from 5:30 to 8:30 pm.

In its website, the NGCP claimed that it had a deficiency of -186 mw in Mindanao as of yesterday. It had a 1047-mw system capacity and 1233-mw system peak.

See **POWER**/p.11

Sedimentation of Coastal Seas

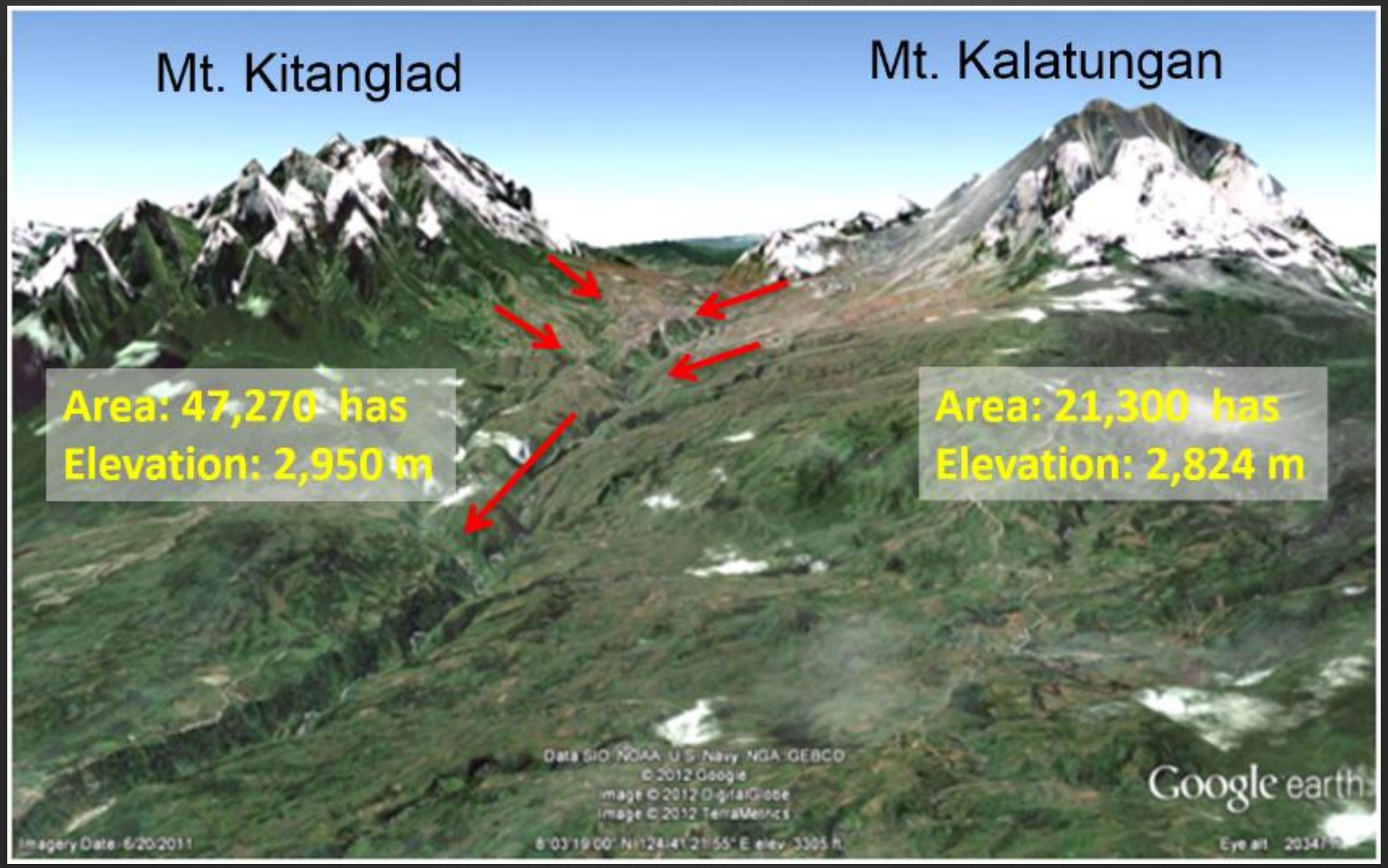
Description **English:** Flooding from Tropical Storm Washi
Date 22 December 2011, 03:39:14
Source NASA official- GeoTIFF
https://earthobservatory.nasa.gov/NaturalHazards/view.php?id=7678
Author NASA Earth Observatory image created by Jesse Alle

Regulating FLOOD and EROSION (and **DISASTER**)

Nartea/Malacañang Photo Bureau/PNA

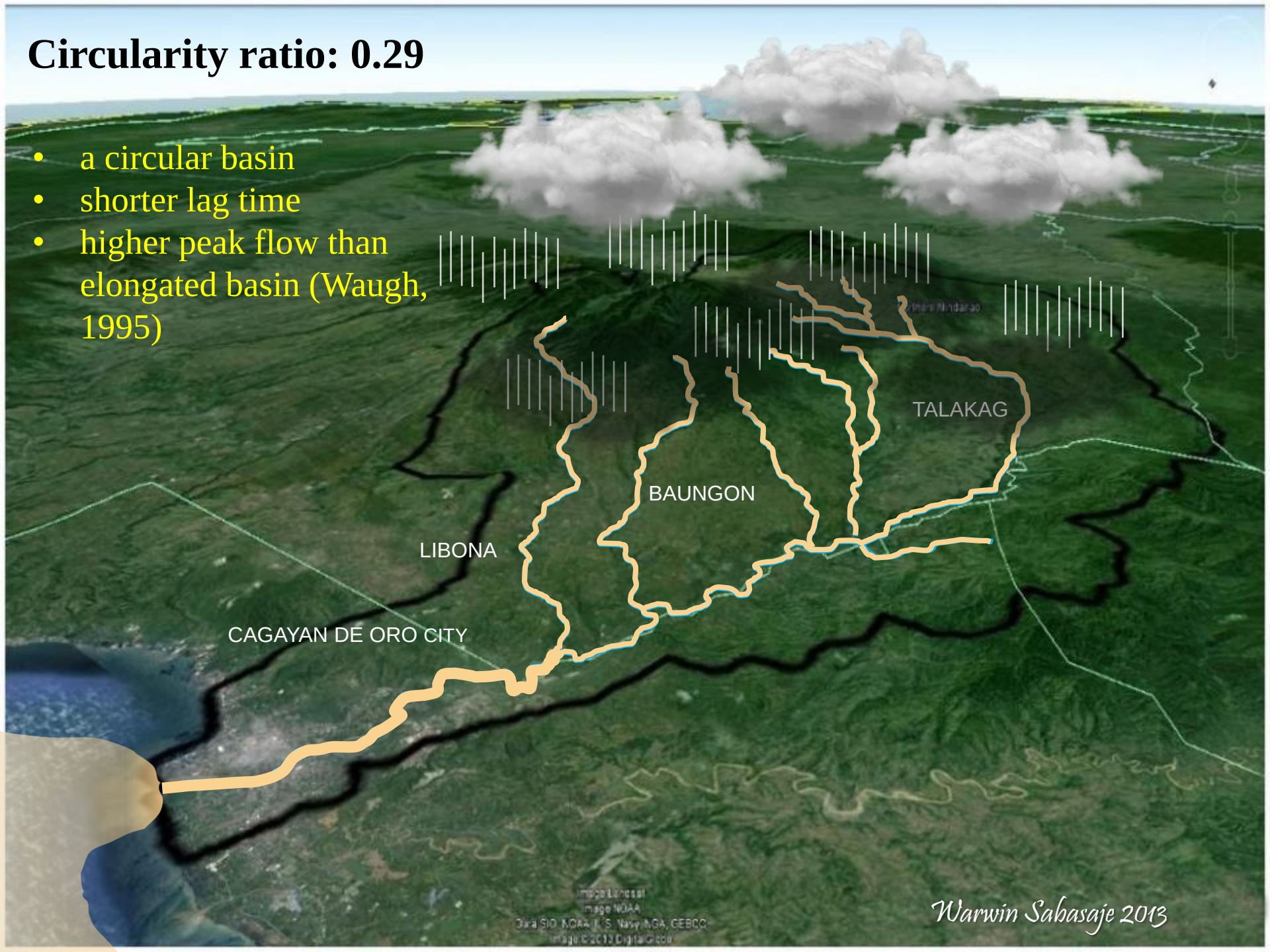
Perfect Recipe for Disaster

PRECARIOUS GEOMORPHOLOGY + **DENUDED HEADWATERS** + **HEAVY RAINFALL**



Circularity ratio: 0.29

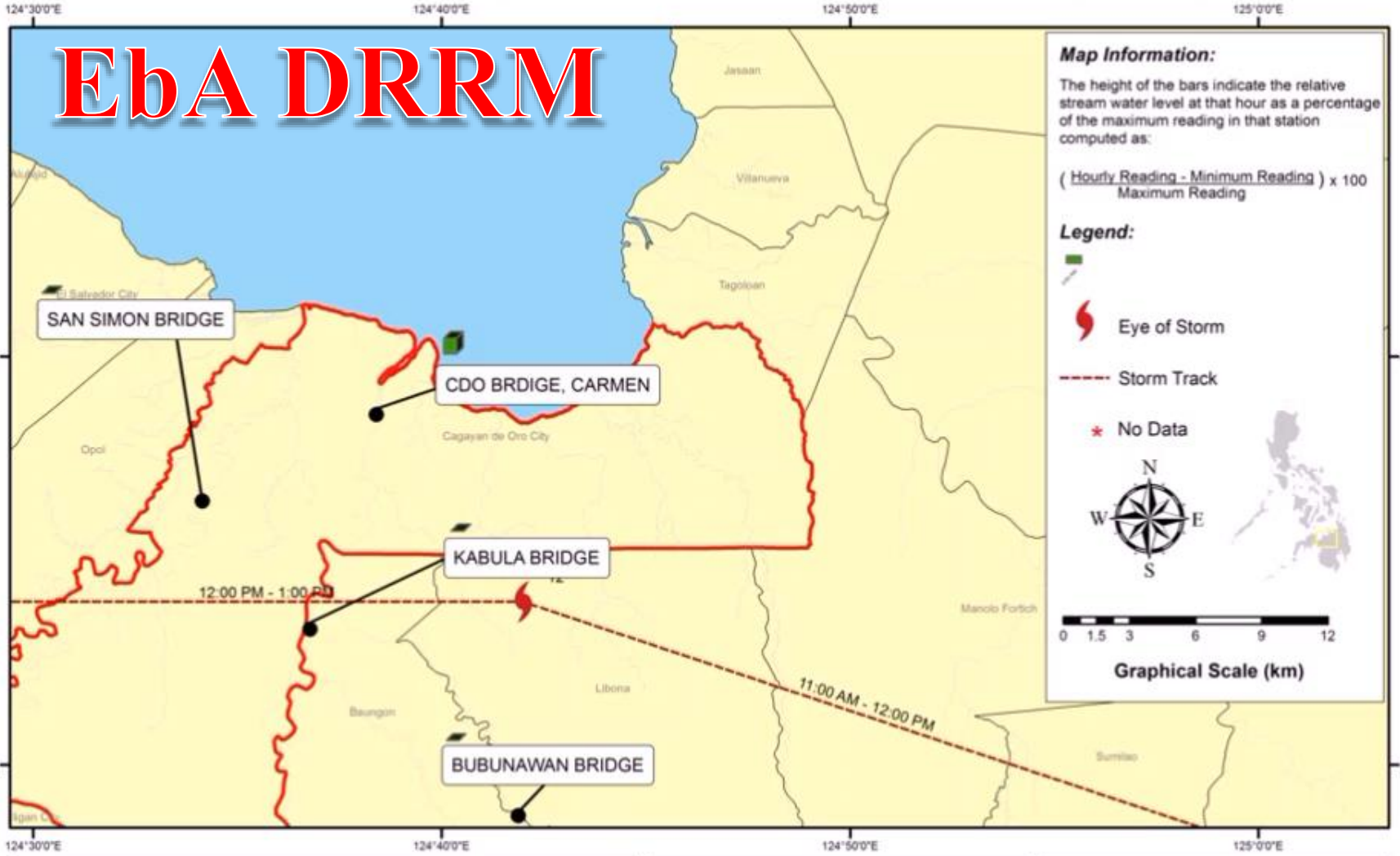
- a circular basin
- shorter lag time
- higher peak flow than elongated basin (Waugh, 1995)



Hourly Stream Monitoring

Stream Level For 2:00 AM 12/04/2012

Tracking BOPHA



Background:

Super Typhoon Pablo (Bopha – Category 5) traversed Northern Mindanao on December 4, 2012 with wind gusts reaching more than 80 kph in Cagayan de Oro City. Pablo also brought heavy rains in the watershed areas of the Cagayan de Oro River which inundated many villages in the city. Less than a year ago (December 17, 2011), these communities were also flooded due to Tropical Storm Sendong (Washi).

Data Sources:

NOAH PhilGIS PAGASA

Developed by:

Xavier University
ATENEO DE CAGAYAN
ENGINEERING RESOURCE CENTER

Published on December 8, 2012

Supporting Services

those that are **necessary** for the production of all other ecosystem services


BIODIVERSITY

Pygmy Fruit Bat

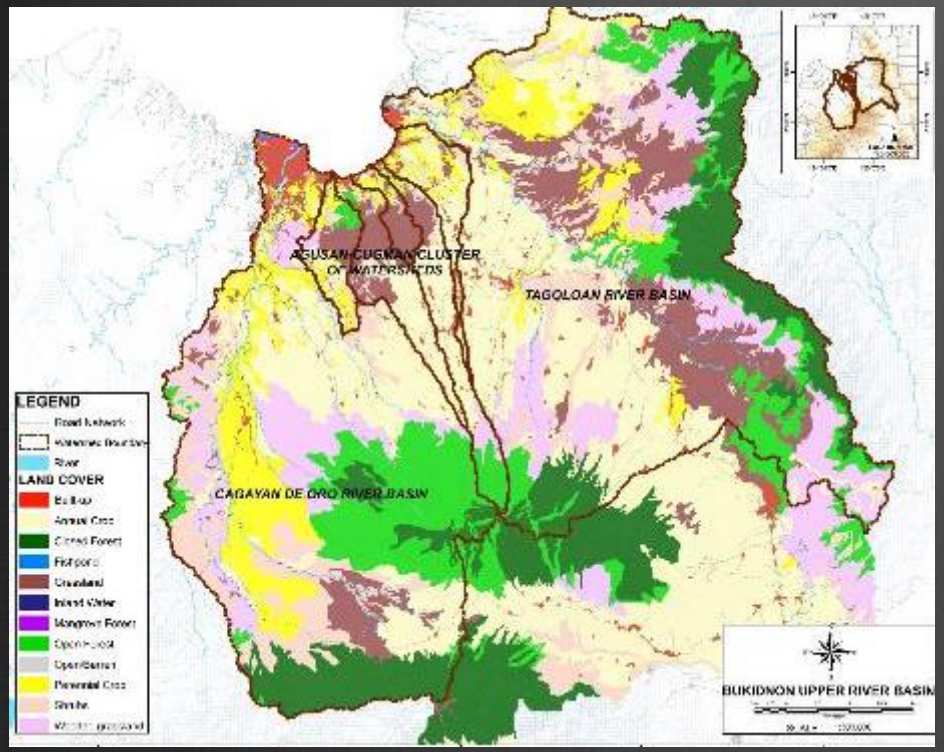
Crowned Flying Fox

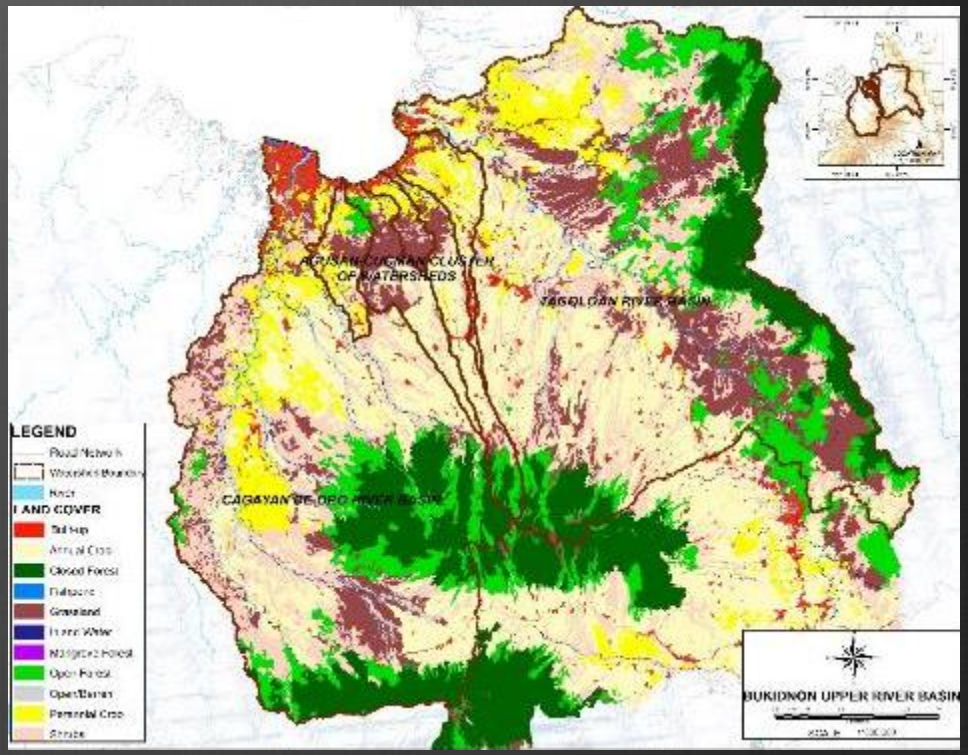
Mindanao Bleeding Heart Pigeon

Blue-capped kingfisher

Mindanao moon rat

Land Cover from 2010 to 2015





*Total Forest Cover Change from 2010 - 2015:

CDORB = decreased by 1,184 ha
TRB = increased by 3,297 ha

Source: DENR-INREMP 10

Cultural Services

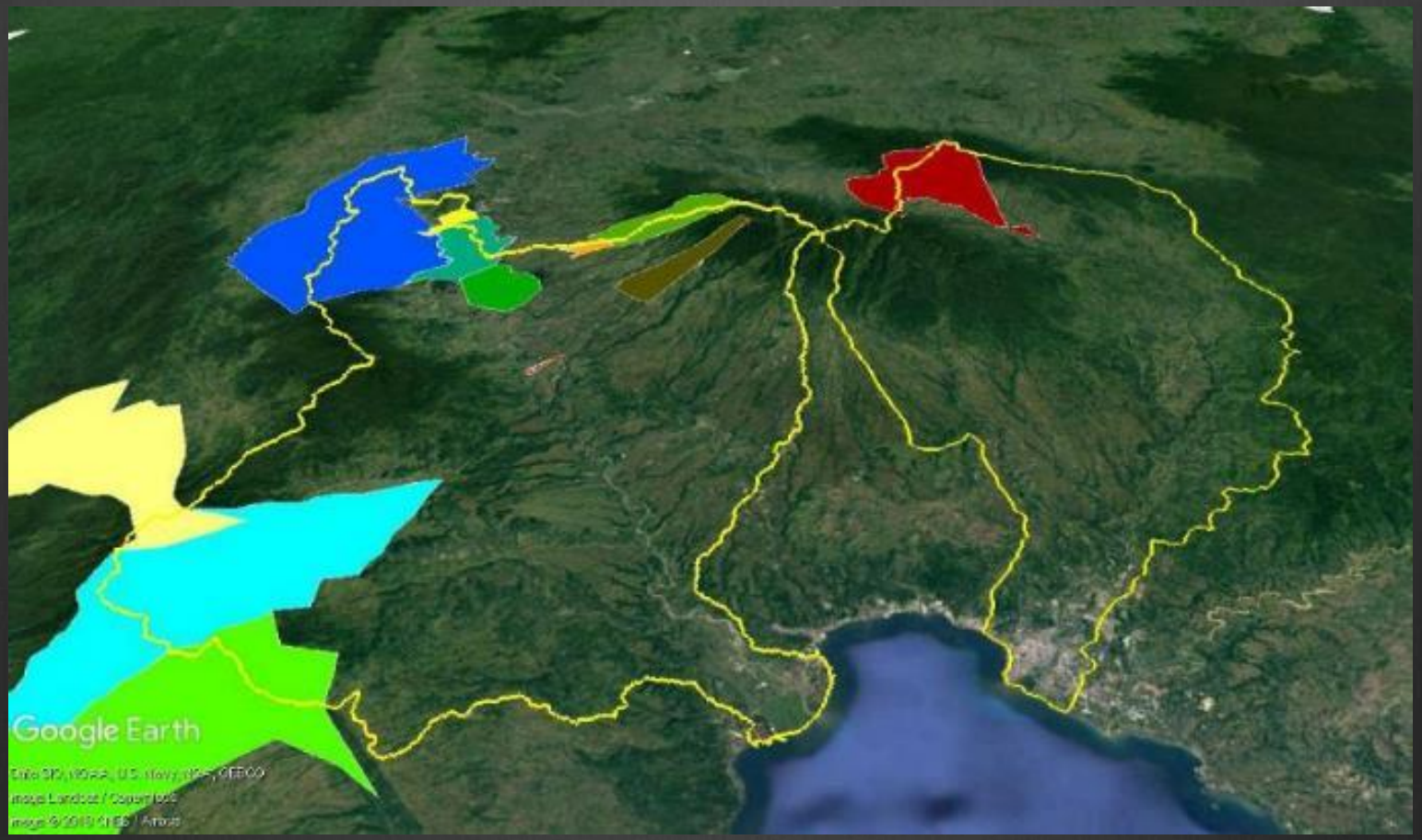
Intangible benefits in form of non-material spiritual, religious, inspirational and educational experience

Indigenous Peoples

Sacred Link of the IPs with Nature

- Burial grounds
- Sacred Places
- Worship areas

Certificate of Ancestral Domains



Tribes: Bukidnon

Tribes: Higaonon

Tribes: Talaandig

Tribes: Bukidnon

Tribes: Bukidnon

Tribes: Bukidnon Higaonon

Tribes: Higaonon

Tribes: Higaonon

Tribes: Bukidnon Tagakaolo

Tribes: Bukidnon Tagoloanon ICC

Tribes: Talaandig

Tribes: Higaonon

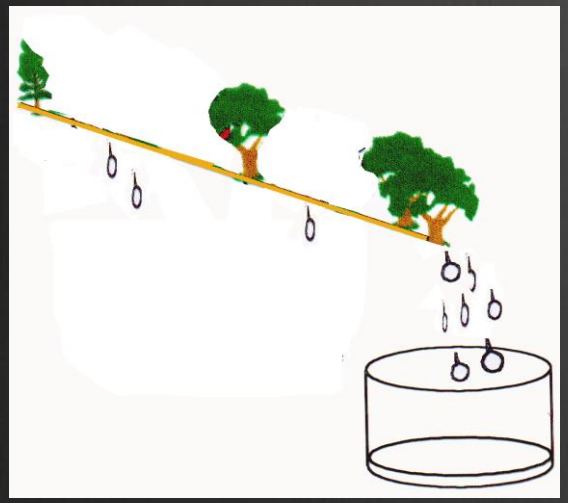
What have we done to ensure flow of ES?

1. Ecosystem Restoration

Restoration

POOR GROUND COVER

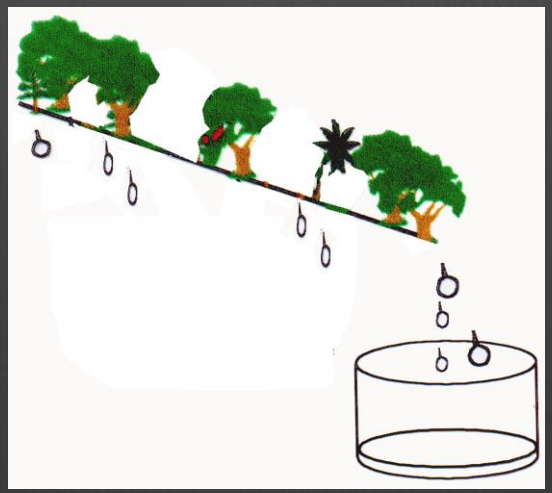
10% of ground covered with plants and litters



Surface run-off
= 75% of rainfall

FAIR GROUND COVER

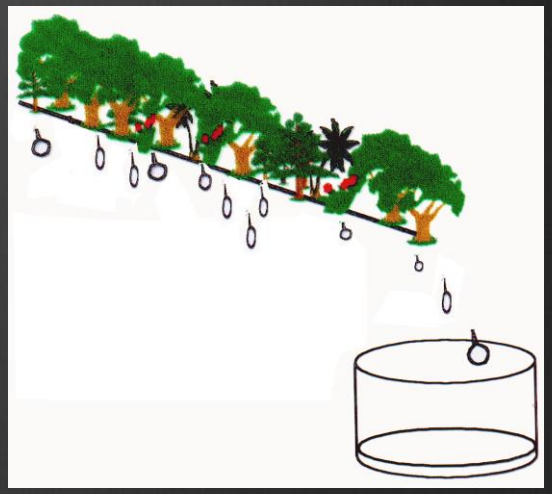
37% of ground covered with plants and litters



Surface run-off
= 14% of rainfall

GOOD GROUND COVER

60-75% of ground covered with plants and litters



Surface run-off
= 2% of rainfall or 12.4 mm

Source: RBCO

Restoration Models

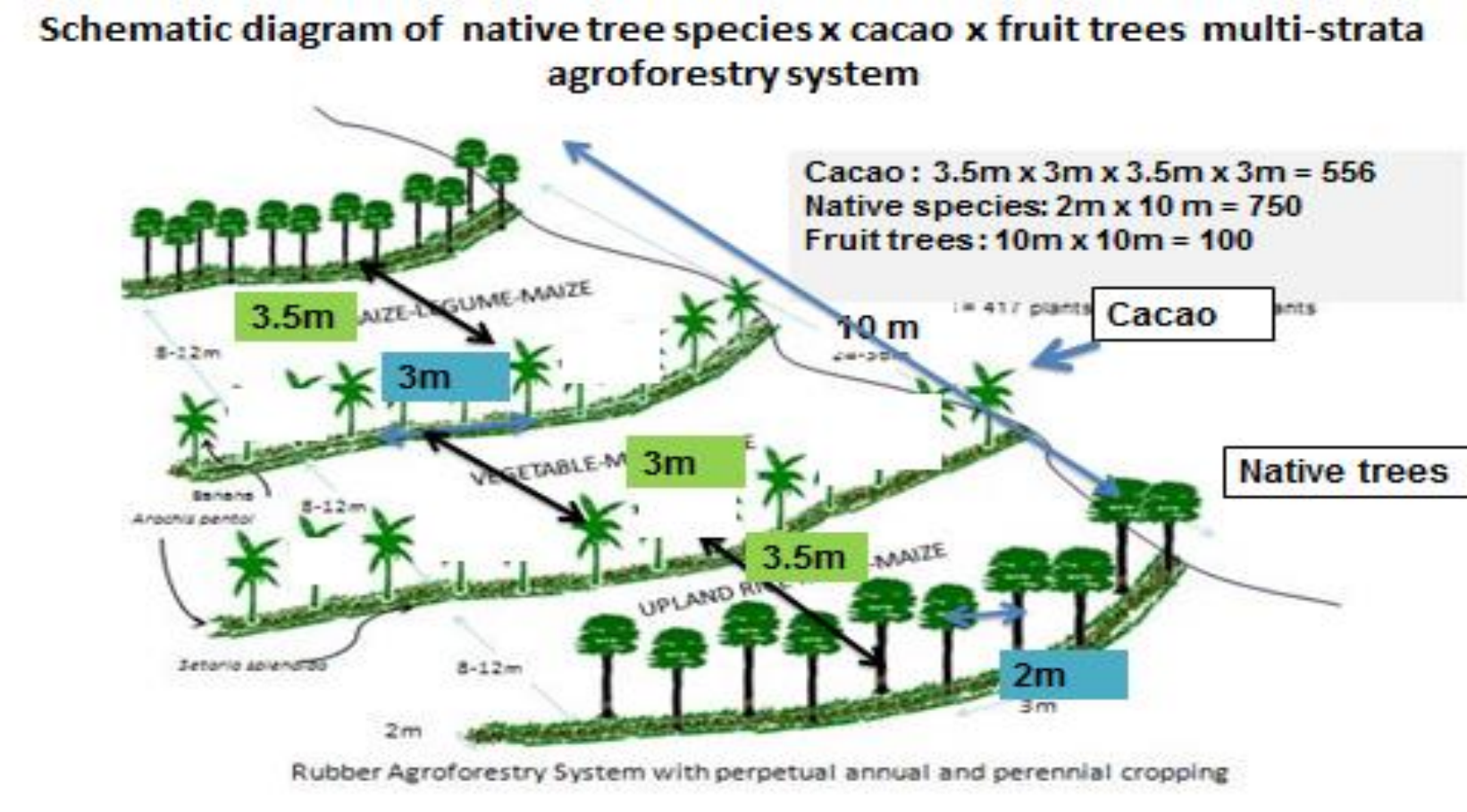
I. Slope Forest Species Restoration
   - Culiram, Talacogon

II. Riparian Buffer Restoration
   - San Jose & Poblacion, Monkayo

III. Restoration Succession
   - Hineleban Foundation

Ecosystem management and restoration (EMR)

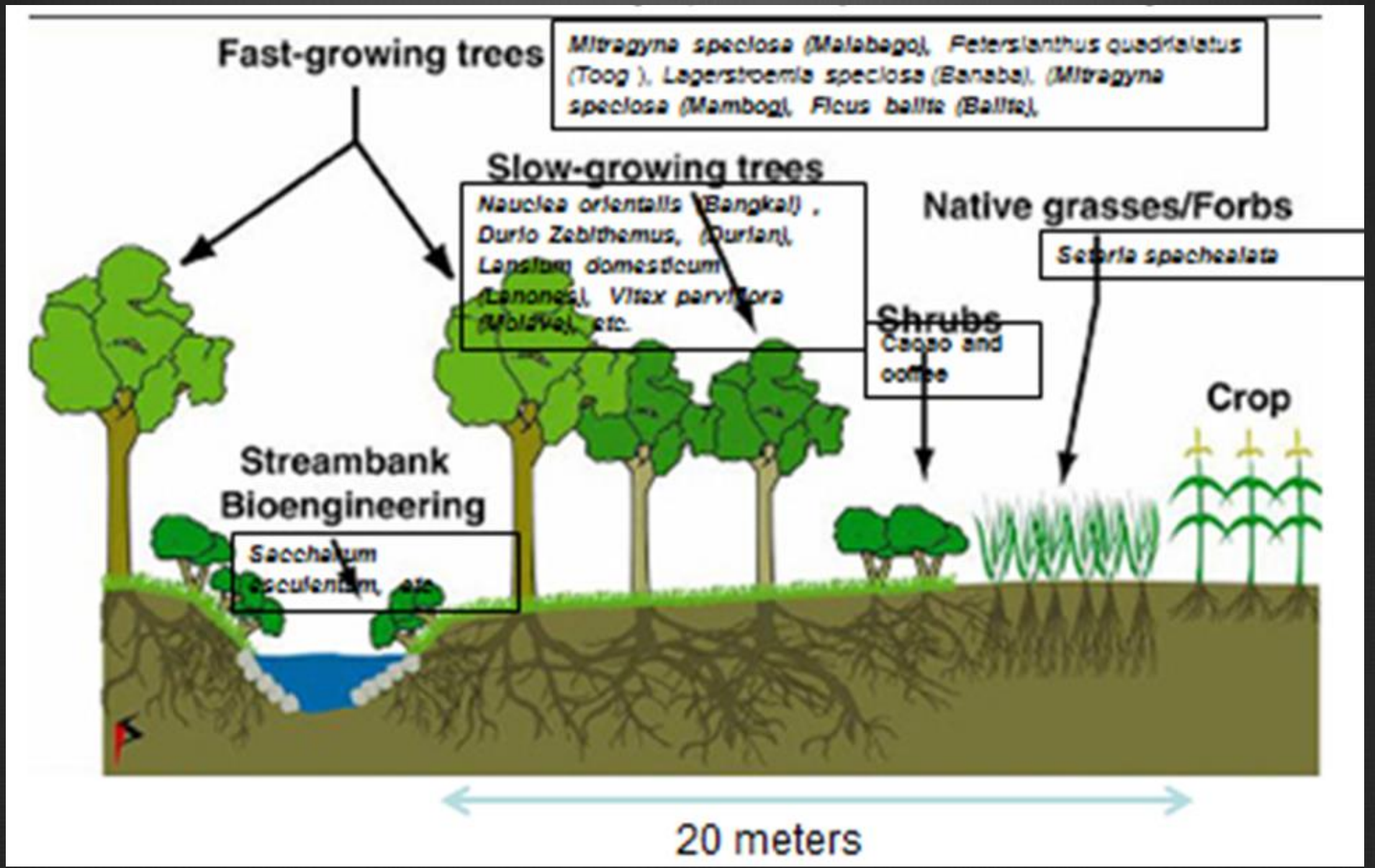
- Strategic design for 50 hectares as forest restoration



Culiram, Talacogon, Agusan del Norte

POMP Wetlands Intl

Strategic Design of 50 Hectares Riparian Buffer Restoration



Monkayo, Compostella Valley

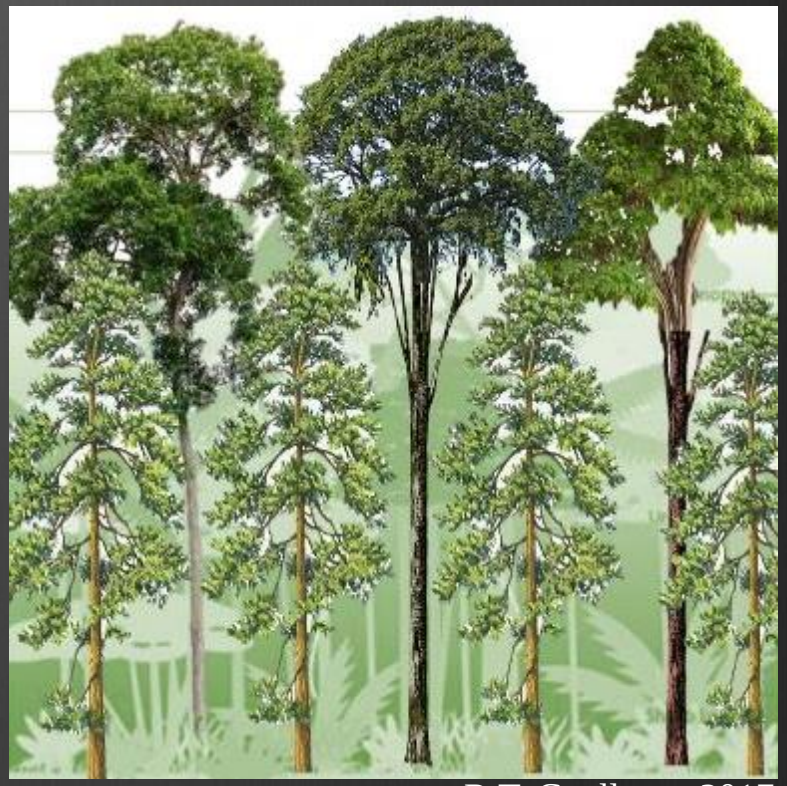
POMP Wetlands Intl

Hineleban Model on Restoration

FOREST PLANTATION SUCCESSION IN HFI

Calliandra **as nurse trees**

Calliandra **mixed and topped by** ***Pinus caribaea***



R.T. Geollegue 2017

Pinus caribaea intercropped with Dipteropcarps

Pinus carIbaea and *Calliandra*
Tree Mix

Restoration Models

I. Slope Forest Species Restoration
- Culiram, Talacogon

II. Riparian Buffer Restoration
- San Jose & Poblacion, Monkayo

III. Restoration Succession
- Hineleban Foundation

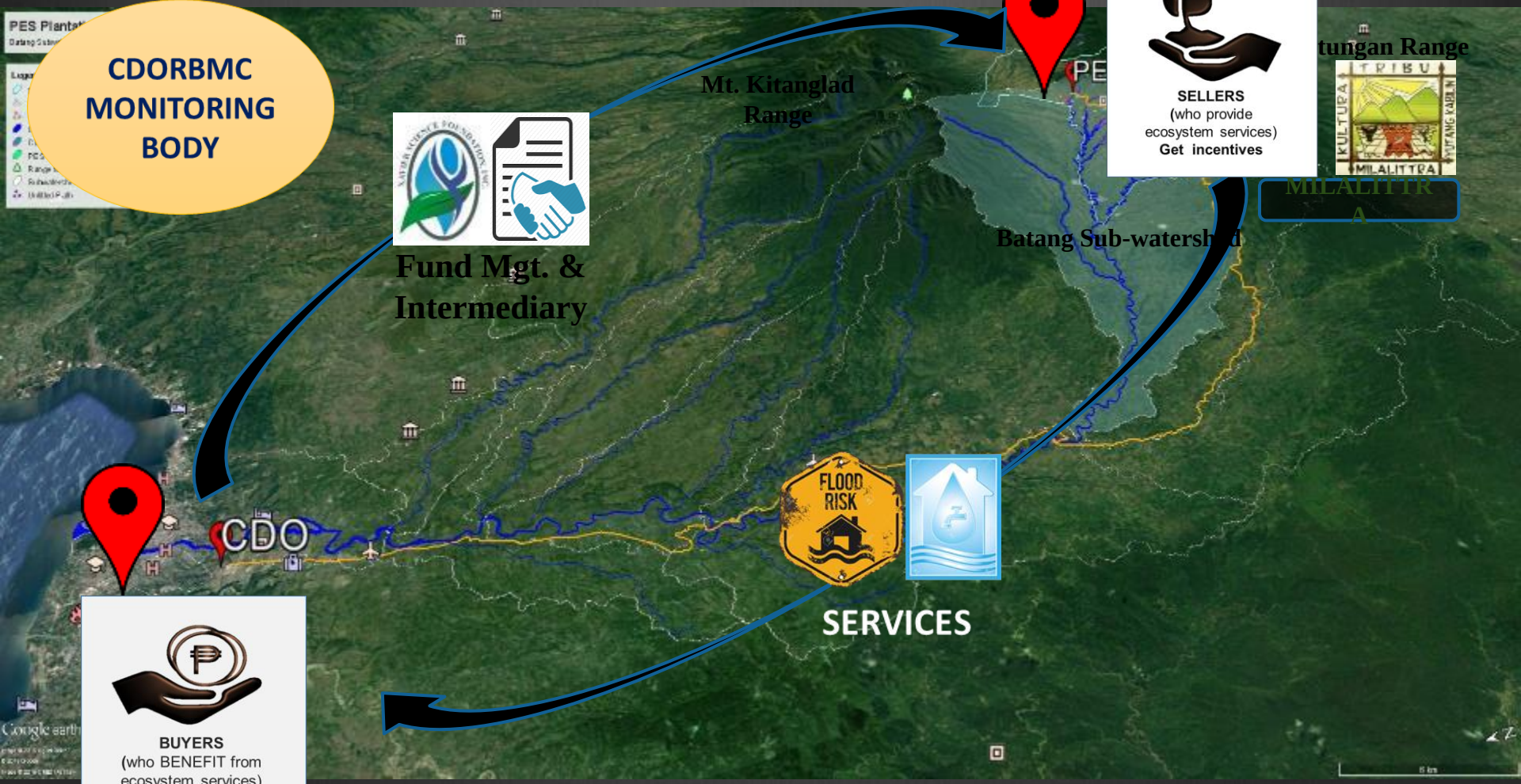
IV. Mangrove Rehabilitation
- Macajalar Bay

Strengthening natural systems as buffers to the storm surges and sea level rise

What have we done?

2. Payments for Ecosystem Services

PES Mechanism in Mt. Kalatungan Range



Sustainable financing scheme

TALAMA FUND

KGVs – Kitanglad Guard Volunteers

Lumads get incentives by protecting the mountain forest

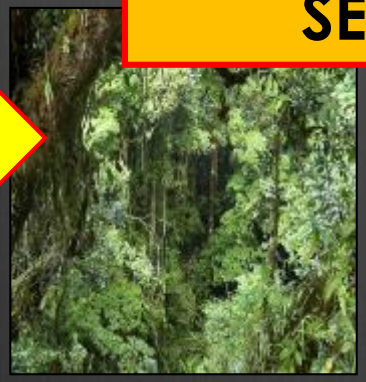
THE SACRED CUSTOMARY COMPACT

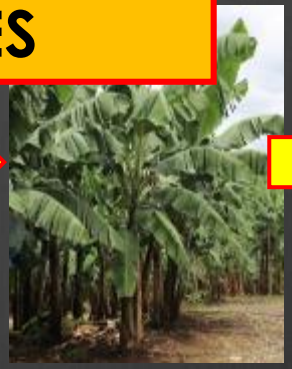
PES WITH TALAANDIG TRIBE OF BUKIDNON

Talaandig Tribe

PROTECTION OF WATERSHED

WATERSHED SERVICES





IRRIGATION WATER

BUYER

PhP 1,000 PER HECTARE PER YEAR TO OFFSET WATER USED FOR IRRIGATION OF BANANA AND PhP500 PER HECTARE FOR EVERY HECTARE OF PINEAPPLE PLANTATION

SELLER

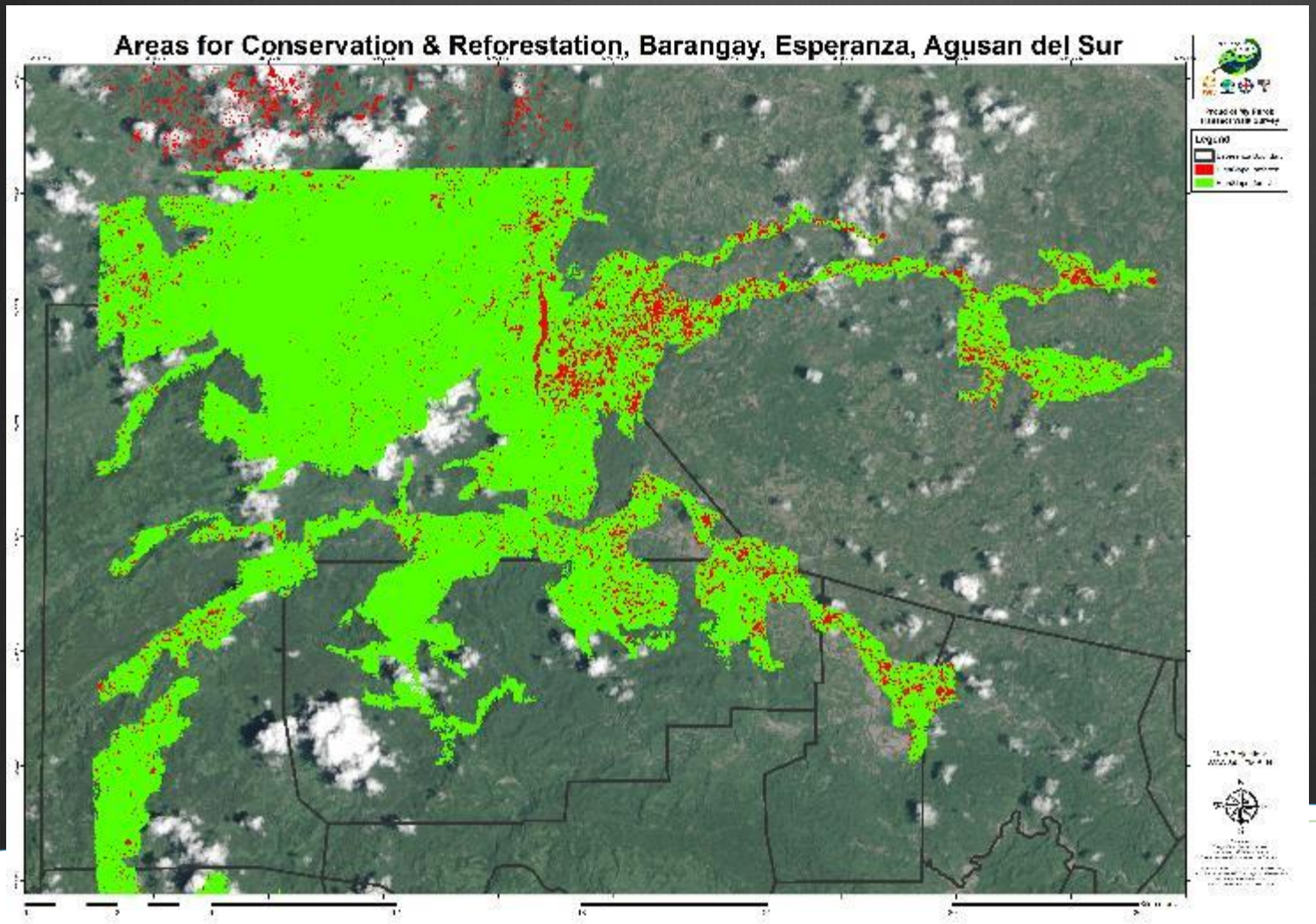
What have we done?

3. Ecosystem Management

Municipal hotspots maps to reduce landslides and erosion

Green: steep slope with forest = hotspot for conservation

Red: steep slope without forest = hotspot for restoration



Wetlands INTERNATIONAL

✓EMR-Smart BDRRM Plans

Republic of the Philippines
Region of CARAGA
Province of Agusan del Sur
Municipality of Esperanza
Barangay Langag

Barangay Disaster Risk Reduction Management Plan

CY 2017-2021

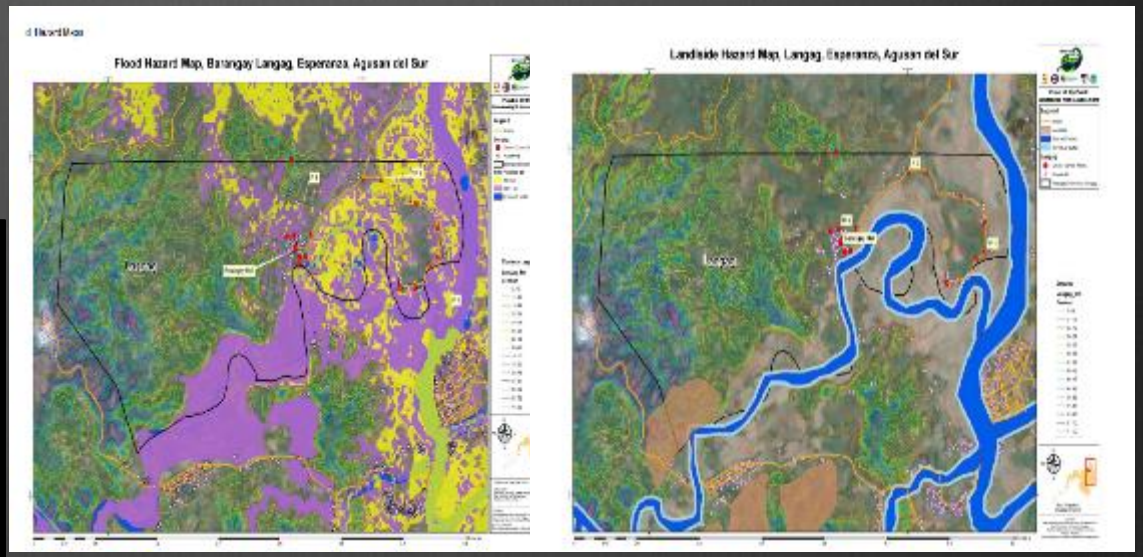
Section III. Walking Memory Down Lane

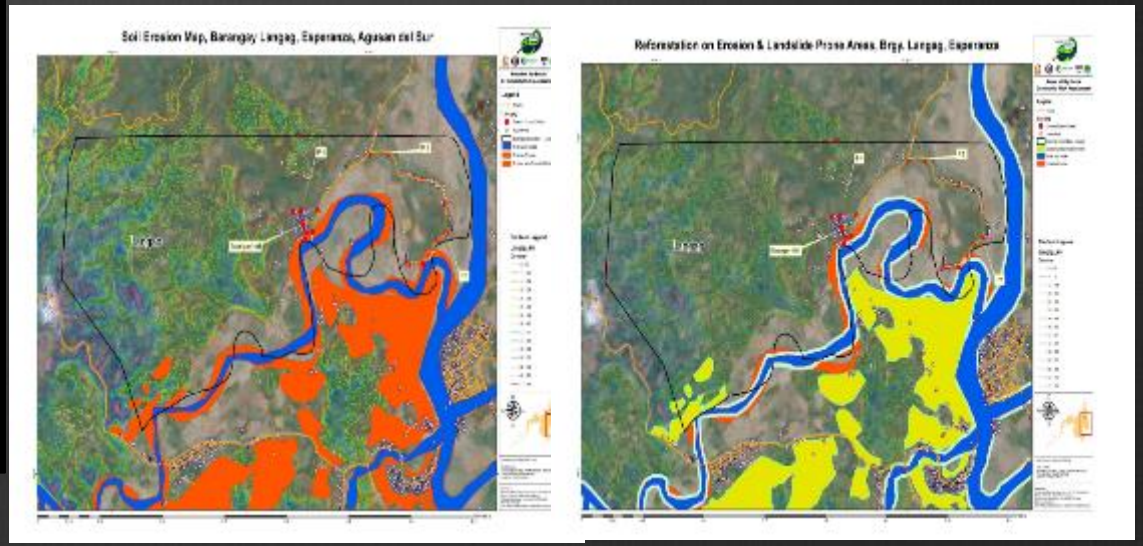
Section IV. BDRRM Plan
- Disaster Preparedness
- Disaster Prevention and Mitigation
- Disaster Response
- Disaster Rehabilitation and Rehabilitation

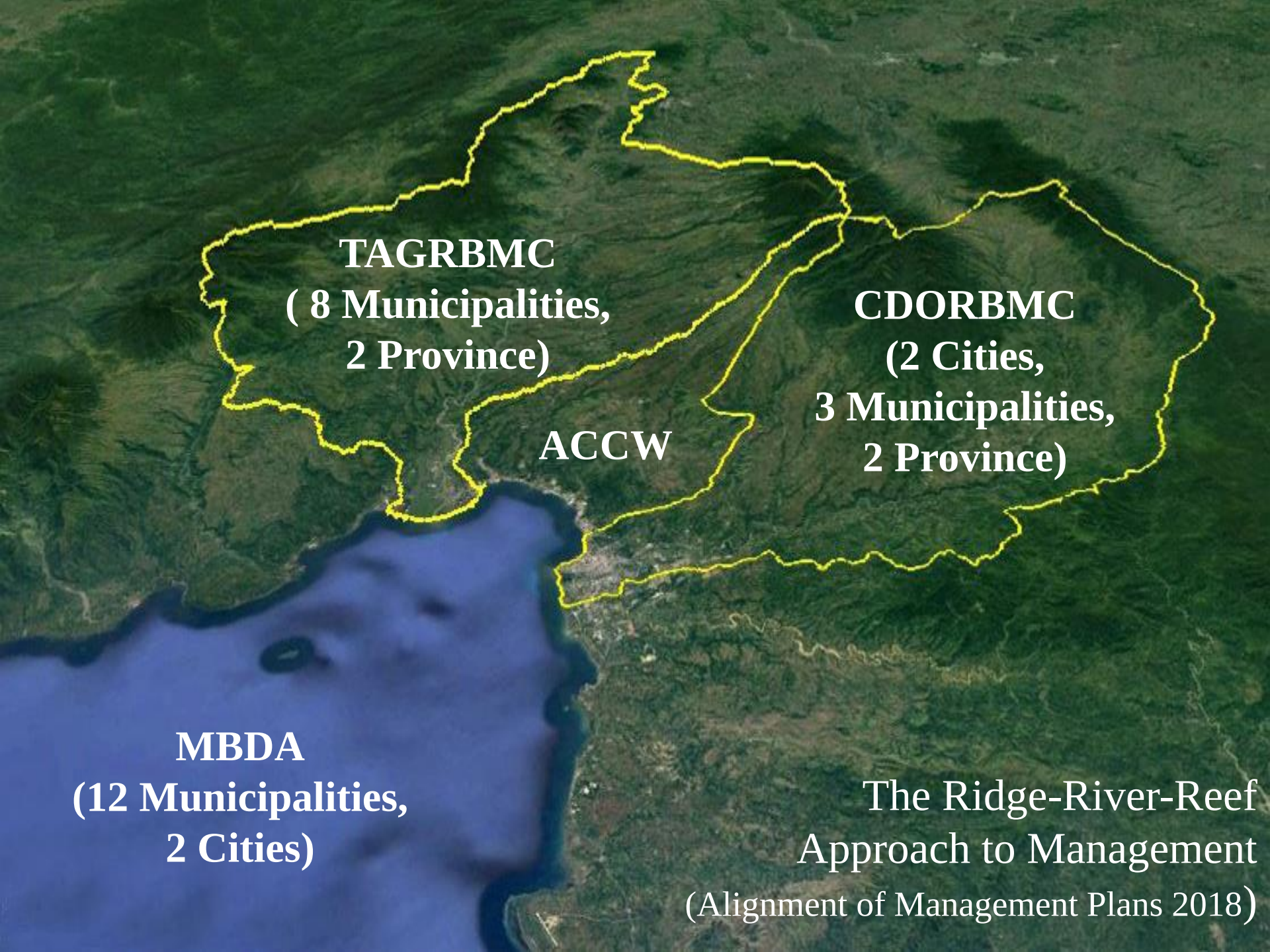
Section V. Monitoring and Evaluation
- Objectives of monitoring and evaluation
- Monitoring and Evaluation of Activities

Section VI. Annexes
- Local DRRM Council Structure
- Local DRRM Office Structure
- Incident Command System
- Hazards Maps
- Barangay Protocols

References







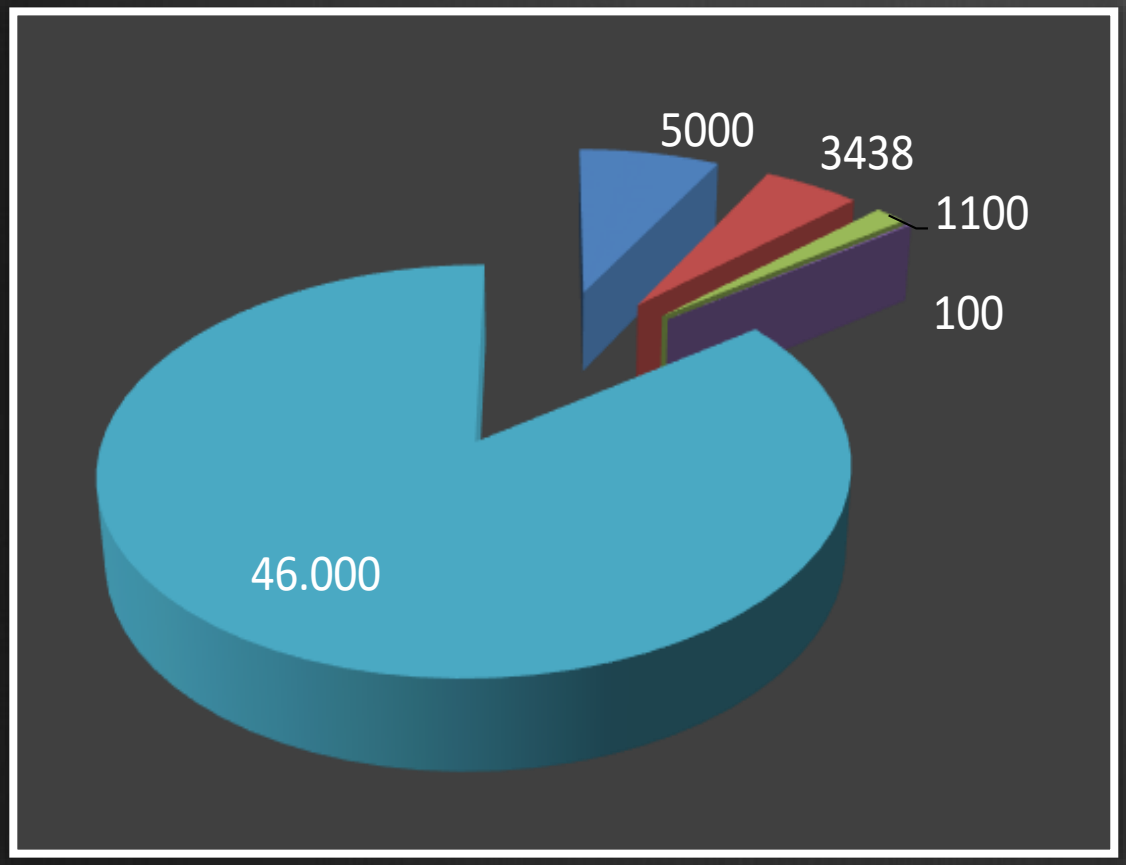
The Ridge-River-Reef Approach to Management

(Alignment of Management Plans 2018)

Ridge-River-Reef (R3) Characterization of CDORB

Elevation Range (MASL) / Parameters	2000-UP	1200-2000	600-1200	100-600	100-SEA LEVEL	BELOW SEA LEVEL
ECOSYSTEM	Mossy Forest	Mid-Montane Forest	Lower Montane Forest	Agricultural Land Ecosystem	Urban Ecosystem	Mangroves, Coral reefs, Seagrass
EXISTING INITIATIVES	Creation of PAMB; Strengthe-ning of CDO River Basin Mgt. Council	Bantay Lasang; FLUP; Implementat-ion of PES; INREMP; KGV; NGP; Strengthening of CDORBMC	CARP; FLUP; Implementation of PES; INREMP; KGV; NGP; DAR-CLOA	Strengthening of CDORBMC; CARP; DA; FLUP; INREMP; NGP; DAR-CLOA	Strengthening of CDORBMC; CLUP; Macalajar Bay Development Alliance; CRM/ICM	Strengthening of CDORBMC; CLUP; Creation of inter-LGU alliance, ie MBDA; MPAs; Implementa-tion of RA 10654; Seaborne Patrol for illegal fishery activities; CRM/ICM
THREATS/ ISSUES	Forest Fire; Massive Climbers; activities and residues	Forest Fire; Conversion to agricultural area/deforest ation; Timber Poaching	Forest Fire; Land Use Conversion; Land Develop-ment; Unsustai-nable Farming Practices; Rampant Quarrying; Conversion of forest areas to roads; Timber poaching	Forest Fire; Land Use Conversion; Land Development; Unsustainable Farming Practices; Rampant Quarrying; Conversion of forest areas to roads	Conversion of land area; Coordination between implementing agenda; Solid waste Management; Rampant Quarrying; Conversion of coastal area	Conversion of Mangrove areas to fish ponds; Reclama-tion of coastal areas; Waste disposal Illegal, unreported and unregulated fishing activities; Encroachment of commercial fishers to the municipal water; Inappropriate tourism activity

Target for Rehabilitation vs. Current Efforts



Congressional Initiative = 5000 has

National Greening Program (NGP) = 3438 has

Corporate Social Responsibility (CSR) = 1,100 has

Auto Regeneration = 1,000 has

Mt. Kalatungan PES = less than 50 has

THE CURRENT REHABILITATION INITIATIVES ARE NOT SIGNIFICANT ENOUGH TO MAKE A DIFERENCE

Source: RBCO

S E R V I C E S

Ecosystem Services Partnership (ESP)

ESP
Ecosystem Services Partnership

World ESP

Regional Asia ESP

Philippines ESP National Network

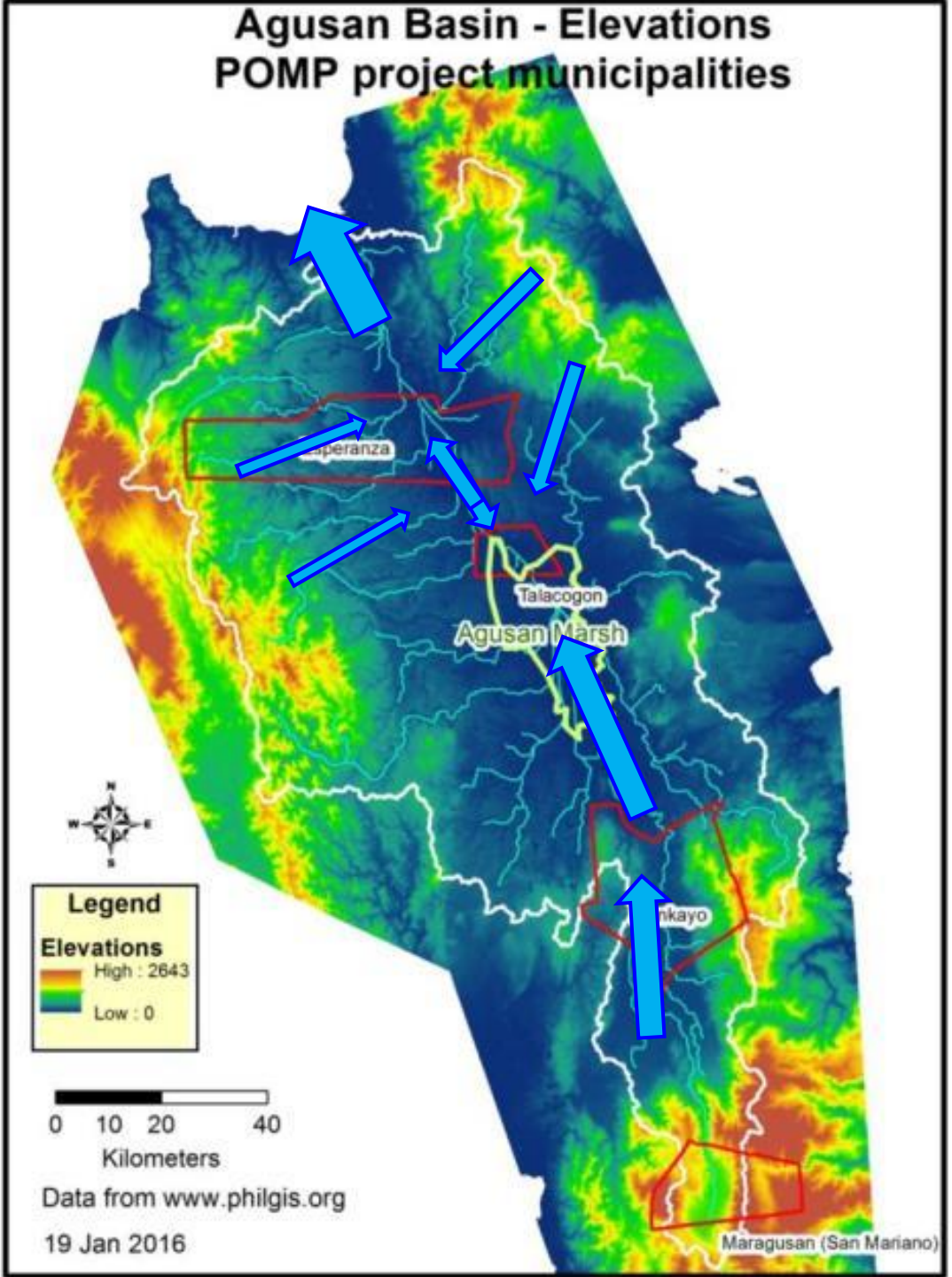
Join us!

on

ESP

Ecosystem Services Partnership

Agusan Basin - Elevations
POMP project municipalities



he Marsh

Siltation

Average Total Suspended Solids
EMB monitoring 2002-2014

Inflow Marsh

Sediment load tributaries

Deposition causing clogging

Outflow Marsh?

Class C: 80 mg/L

TSS (mg/L)

400
350
300
250
200
150
100
50
0

St. Josefa
Talacogon
Esperanza
Butuan Bit-Os NIA
Magsaysay Bridge
Butuan Ventura
Butuan Mouth

EMR importance of Monkayo based on the LRA

- Source of water and soil sediments to Agusan Marsh
- Control erosion of slopes (steep or high elevation)
- Reduce riverbank erosion

Promote eco-tourism along river banks;

12,000 Toog trees (Philippine Rosewood)

some of the 30,000 endemic tree seedlings

planted as “vegetative wall”

PES Soil Erosion – Mt. Kalatungan Talakag

In 2011, Typhoon Washi devastated the city of Cagayan de Oro and prompted institutions to employ sustainable mechanisms for disaster risk reduction and management.

Ordinance No: ORDINANCE NO. 042 (Series of 2015)

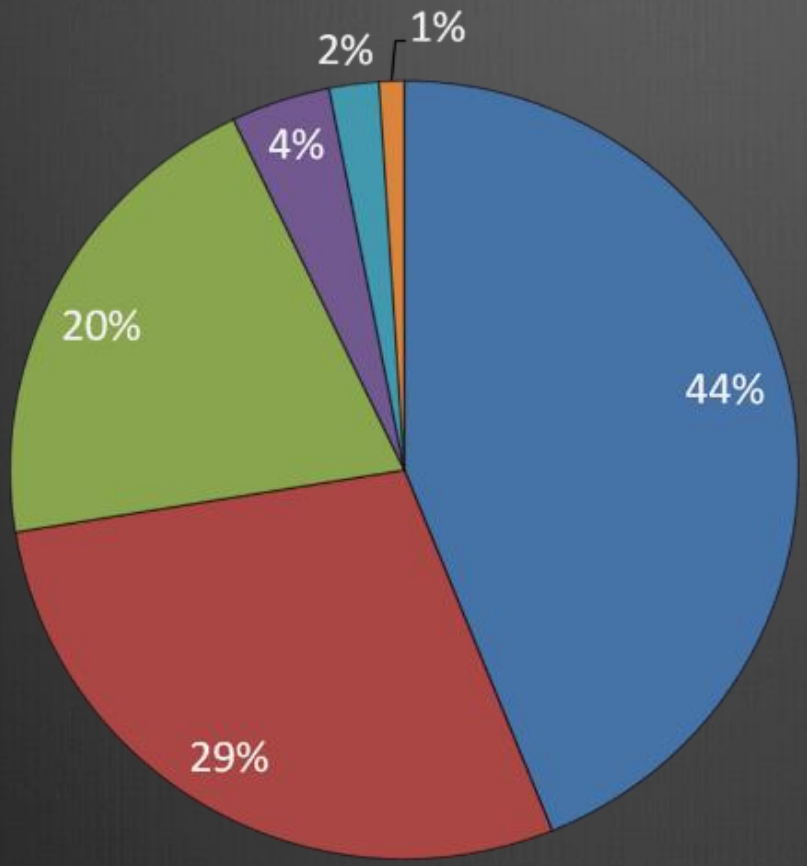
Main Author/Sponsor: Hon. Abdon V. Pacuño

Status: Enacted

“AN ORDINANCE ENACTING THE TALAKAG PAYMENT SYSTEM FOR ENVIRONMENTAL SERVICES ON THE PROTECTION AND CONSERVATION THE HEADWATERS NESTLED IN MOUNT KALATUNGAN”

S E R V I C E S

inVESTing on Nature



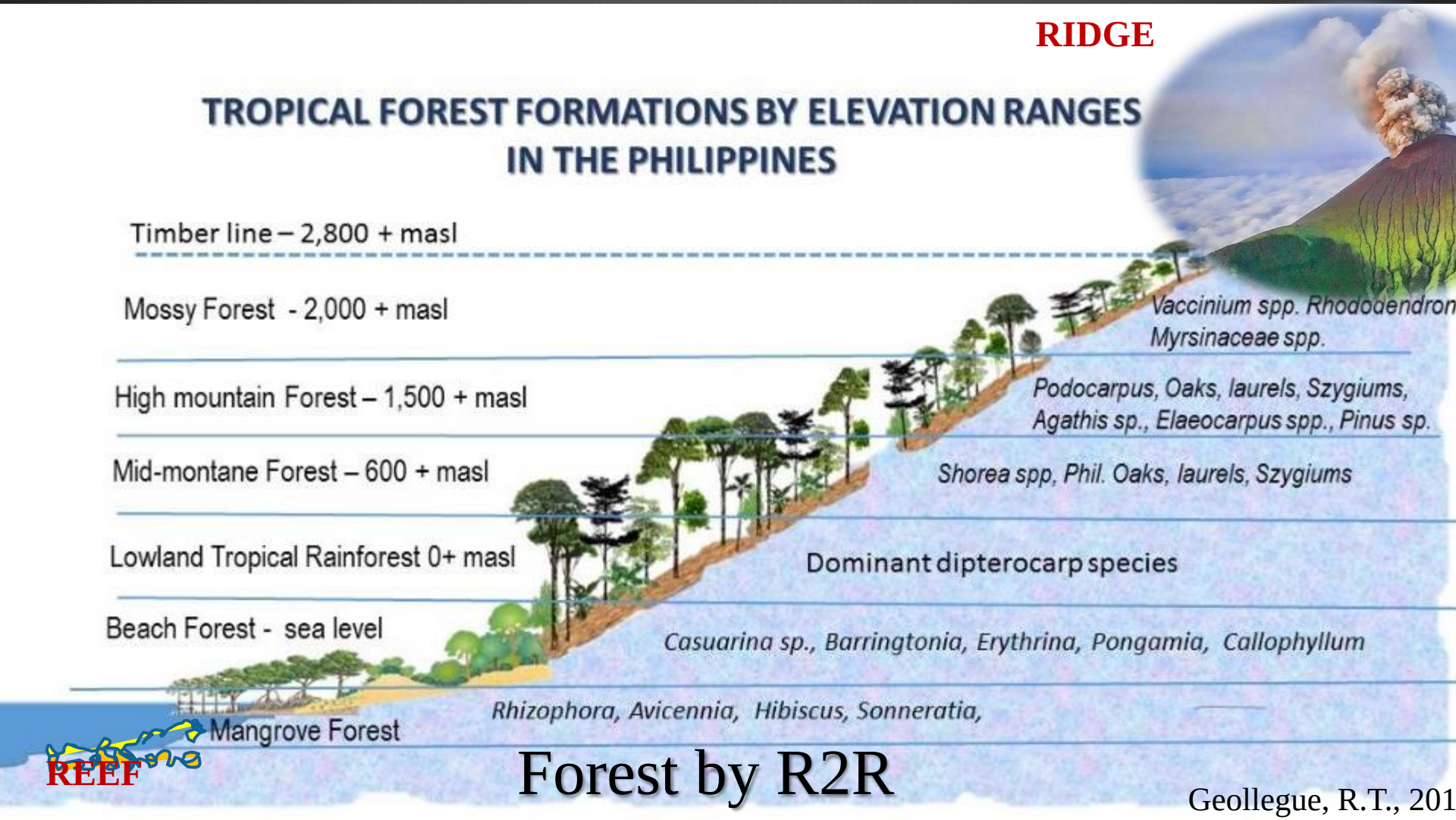
DENR-NEWCAPP

P14,000/year/hectare

P38.00/day/hectare

Based from REECS MILALITTRA CDP plan

NATURAL VEGETATIVE FORMATIONS FROM RIDGE TO REEF IN THE TROPICS



Forest by R2R

Geollegue, R.T., 201

Water Holding Capacity

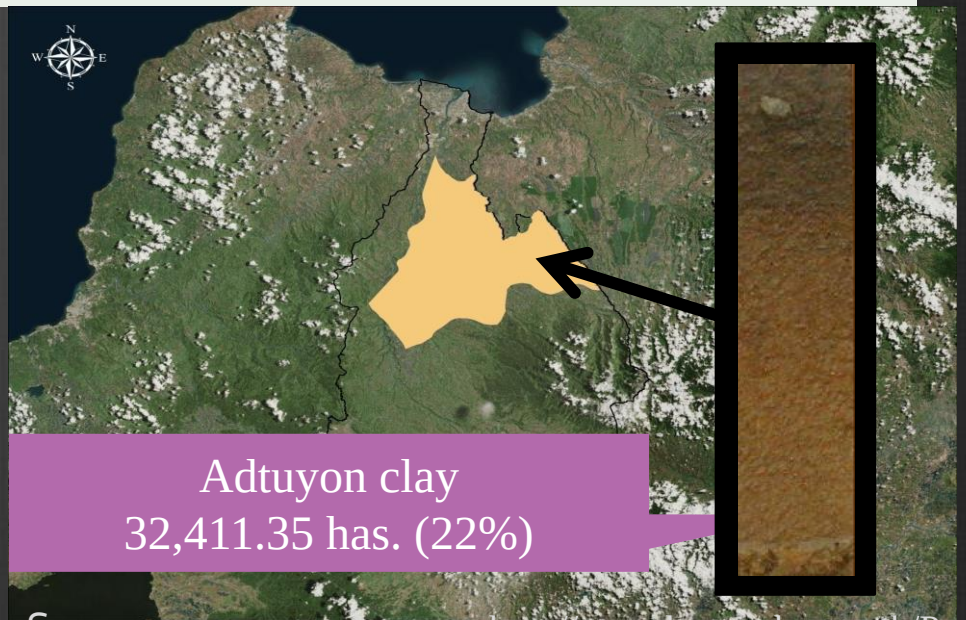
SOIL	CDORB	TRB
Total Available Water Holding Capacity	**LOW** depth) to (8.0 cm/cm high (19.5 cm/cm)	VERY LOW (2.5 cm/cm depth) to high (30.0 cm/cm depth)
Permeability Rate	GENERALLY SLOW: <0.5 cm/hr	GENERALLY SLOW: <0.5 cm/hr
Infiltration Rate	**MODERATE (0.5 – 2 cm/hr) to rapid (>2 cm/hr)**	**MODERATE (0.5 – 2 cm/hr) to rapid (>2 cm/hr)**

Total Estimated Permeabilty Rate of the representative Soil Profile

CLASS	ESTIMATED TOTAL PERMEABILTY RATE	SOIL SERIES
SLOW	<0.15 cm/hr	KIDAPAWAN CLAY
SLOW	<0.15 cm/hr	ADTUYON CLAY

- Heavy soils, sticky and has slow permeability, high surface area, high compactabiliy, high nutrient storage capacity, and high water transportability (*Bulanog-Pigcutin Characterization, 2014*)

Source: WMPCO Talakag

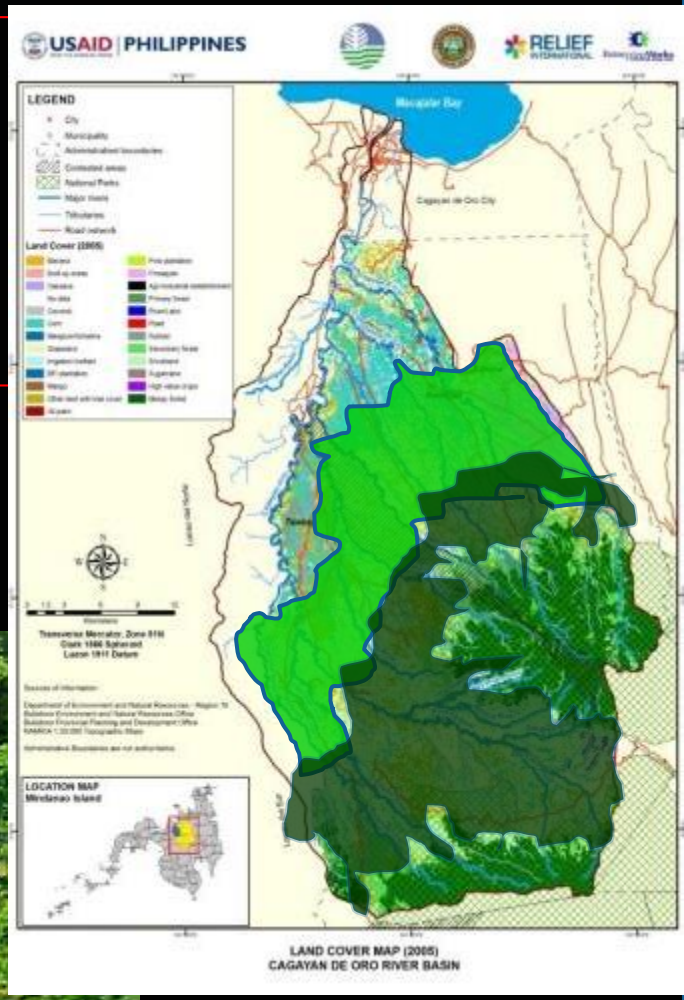


- ✓ **Municipal Risk Assessment**

Barangay Risk Assessment

AT WHAT COSTS?

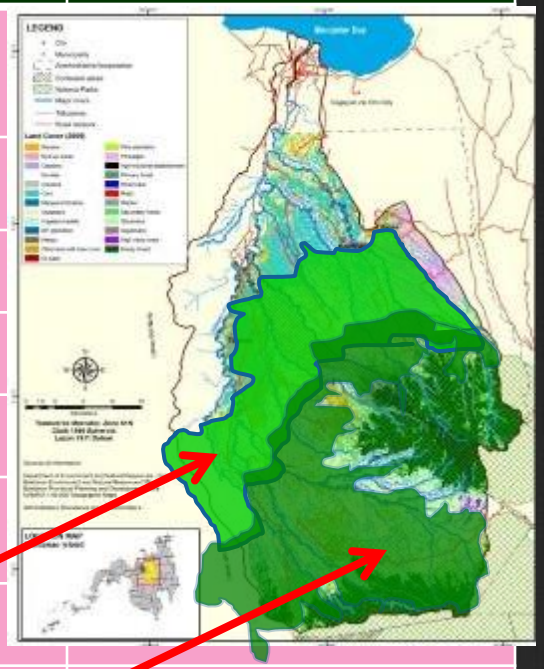
For 15,000 HECTARES IN 15 YEARS at P50,000 per hectare is P 750 million or 50 million pesos per year for 15 years



R3 COALITION

TARGETS FOR REHABILITATION AND PROTECTION INSIDE THE CDORB

SUB-WATERSHED	AREA	FOREST COVER	CULTIVATED AREAS	OPEN GRASS & IDLE LANDS	TOTAL TARGET AREA FOR REFO/SUSTAINABLE FARMING
TOTAL	26978 (2)	9152 (2)	5590 (1)	11561 (2)	
Tumalaong	17831 (5)	4725 (5)	3702 (3)	4808 (5)	
Tagiti	6002 (7)	2602 (8)	2475 (5)	3923 (7)	
Kalawaig	24649 (3)	9213 (2)	2038 (6)	7728 (3)	
Munigi*	5518 (8)	3511 (6)	2004 (7)	2007 (8)	
Pigkutin	19517 (4)	5513 (4)	5421 (2)	5420 (4)	
Pikalin-Ticalaan	7364 (6)	3177 (7)	391 (8)	4081 (6)	
Batang	30123 (1)	11572 (1)	2908 (4)	16532 (1)	
CDORB Total	136,047	49,465	24,177	56,060	80,237



SHIELD

Sustainable and Healthy Integrated Ecosystems
through Lobby and aDvocacy

Linking ES and Life on Land

Ecosystem Services

Supporting
- Nutrient Cycling
- Soil Formation
- Primary Production
- …

Provisioning
- Food
- Fresh Water
- Wood and Fiber
- …

Regulating
- Climate Regulation
- Food Regulation
- Disease Regulation
- Water Purification
- ….

Cultural
- Aesthetic
- Spiritual
- Educational
- Recreaional
- …

Constituents of Well Being

Security
- Personal Safety
- Secure Resource Access
- Security from Disasters

Basic Material for Good Life
- Adequate livelihoods
- Sufficient Nutritious Food
- Shelter
- Access to goods

Health
- Strength
- Feeling well
- Access to clean air and water

Good Social Relations
- Social Cohesion
- Mutual Respect
- Ability to help others

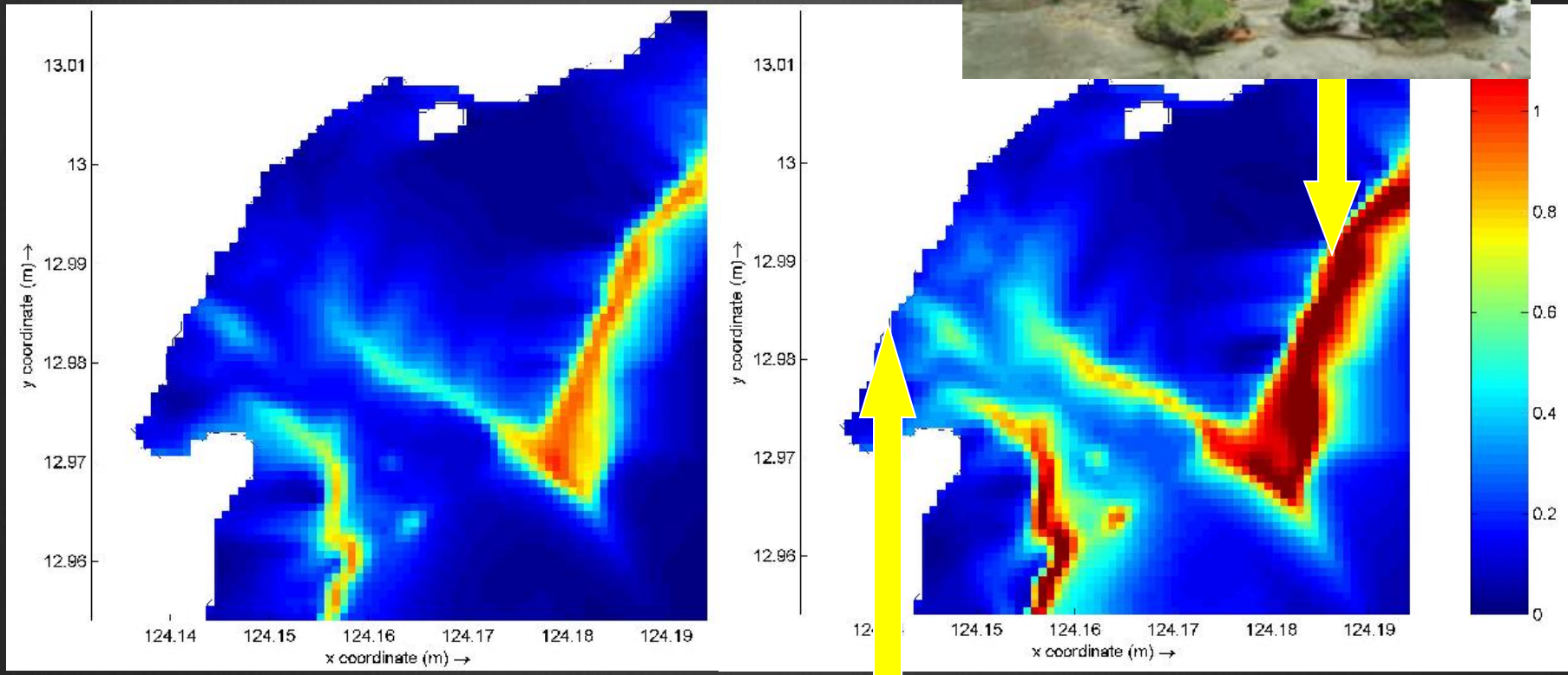
Freedom of Choice and Action

OPPORTUNITY TO BE ABLE TO ACHIEVE WHAT AN INDIVIDUAL VALUES DOING AND BEING

Source: Millenium Ecosystem Assessment (2005)

Coastal Hazard – physical oceanography

Consequence of increase intensity of storms or higher sea level = bigger waves



But the coast in front of channel receives more wave energy

UPMSI, Villanoy