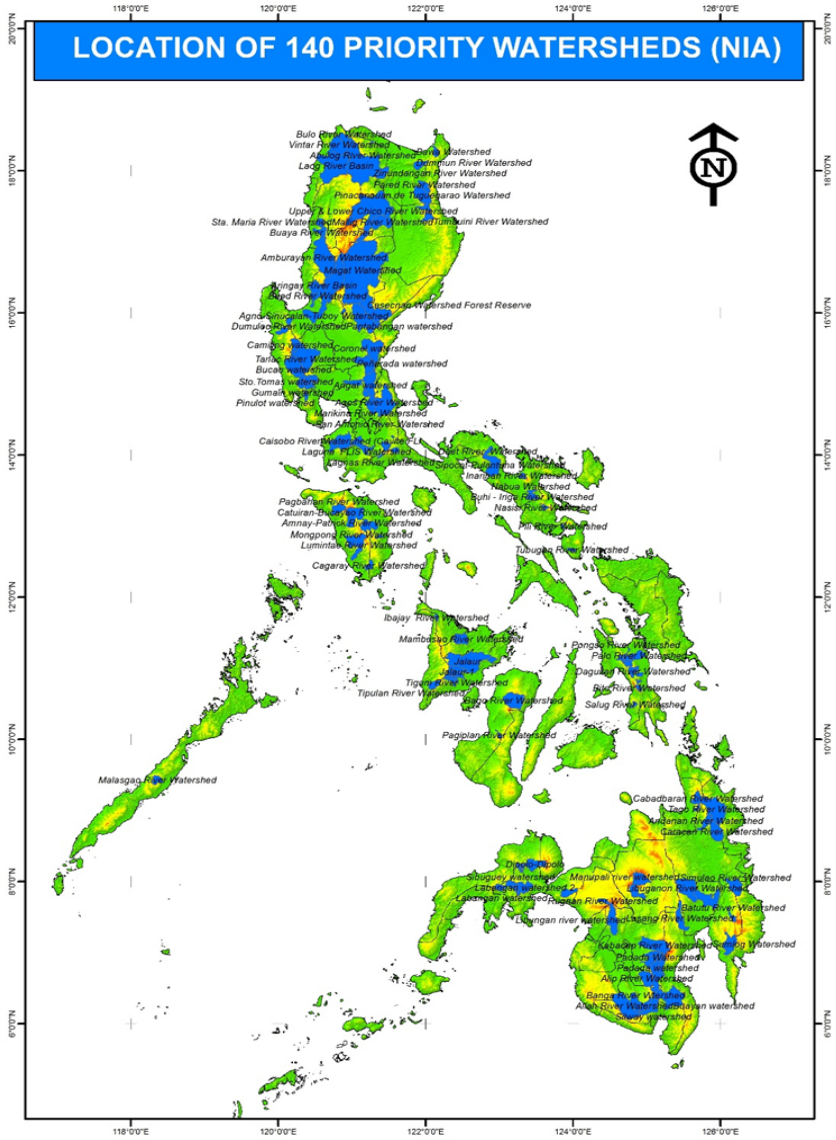
An Emerging Framework for Integrated Watershed and Resource Management (IWRM) in INREMP Upper River Basins

Materials compiled and prepared by ES Guiang

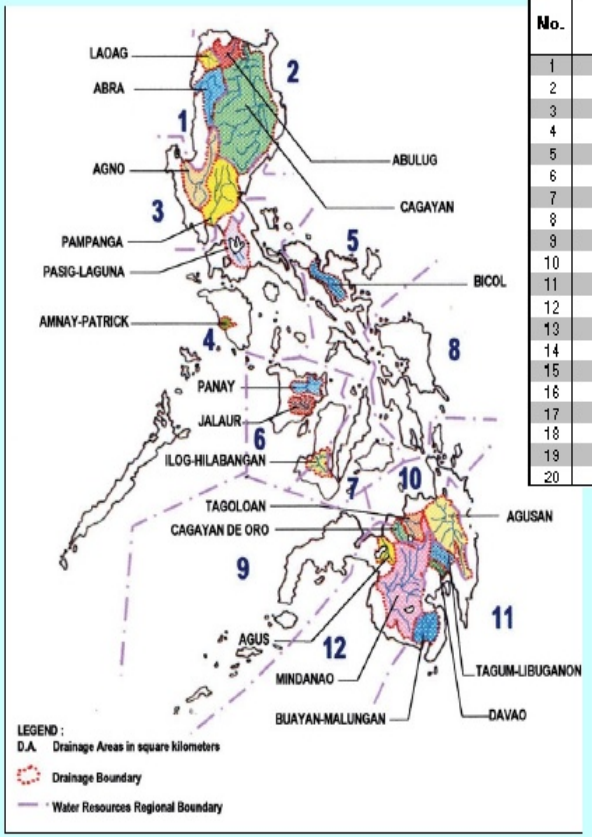
CESM Inception Report Workshop

Tagaytay City



Seascape-Landscapes in the Philippines -

Dominance of Islands, Basins & Watersheds (of 421 river systems)



Principal River Basins

No.	Name of River	Catchment Area (km2)	River Length (km)
1	LAOAG	1,353	73
2	ABRA	5,125	178
3	CAGAYAN	25,649	505
4	ABULUG	3,372	175
5	AGNO	5,952	206
6	PAMPANGA	9,759	260
7	PASIG-LAGUNA BAY	4,678	78
8	AMNAY-PATRICK	993	58
9	BICOL	3,771	136
10	PANAY	1,843	132
11	JALAUR	1,503	123
12	ILOG-HILABANGAN	1,945	124
13	AGUSAN	10,921	350
14	TAGOLOAN	1,704	106
15	CAGAYAN DE ORO	1,521	90
16	TAGUM-LIBUGANON	3,064	89
17	DAVAO	1,623	150
18	BUAYAN-MALUNGAN	1,434	60
19	AGUSAN	1,890	36
20	MINDANAO	23,169	373

A map of the Philippines which shows the 20 major river basins located in 12 water resources regions.

Region 3 or Central Luzon includes the Agno River Basin and the Pampanga River Basin.

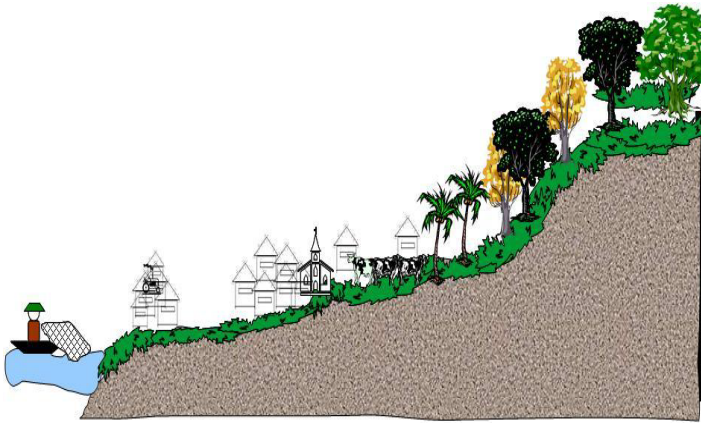
(3) Three i's in Islands, Basins, and Watersheds that Could Impact the Twin Goals of Conservation and Development

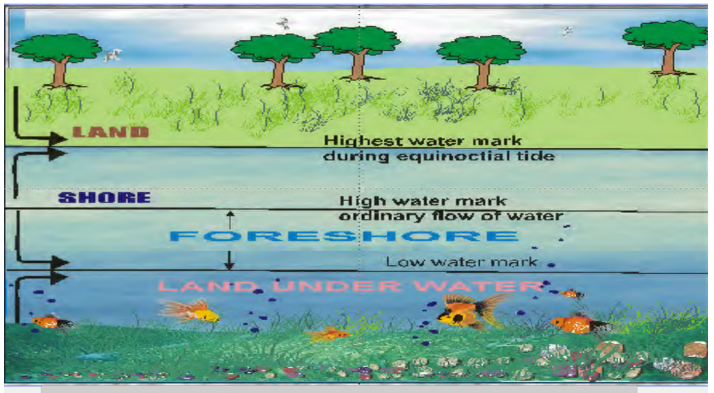
1.Inter-connected

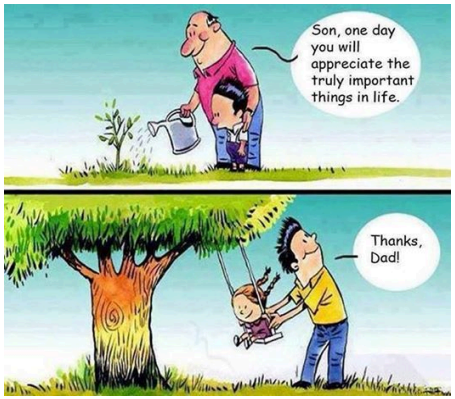
2.Inter-dependent

3.Inter-generational impacts

- ✓ **Various ecosystems** (forests, coastal, wetlands, agricultural areas)
- ✓ **Economies**
- ✓ **Political units**
- ✓ **Socio-cultural traits and practices**
- ✓ **Externalities (positive and negative)**



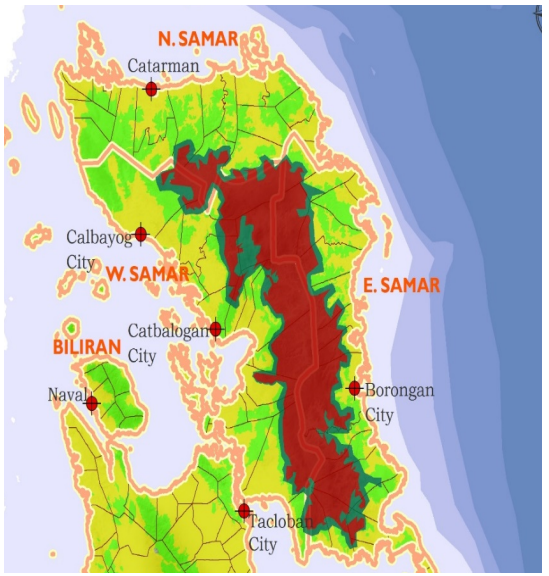




A landscape is a generic term for a delineated *"heterogeneous area composed of a cluster of interacting ecosystems that are repeated in various sizes, shapes, and spatial relationships".*
(Adapted from Barnes http://www2.ca.uky.edu/agc/pubs/for/for76/for76.pdf)

Landscapes in the Philippines are "**seascapes-landscapes**". They are:

- **Biophysically-defined -** Islands, basins, watersheds, wetlands/coastal/marine, biodiversity corridors
- **Legally-defined -** Protected areas, ancestral domains, reservations (energy, watershed, research)
- **Political units –** province, cluster of municipalities



A generic framework for the integrated management of various ecosystems in a watershed landscape for achieving synergy of results

Bringing sectors and stakeholders together to *jointly plan, design, and manage their* ***landscapes and institutional resources to****:*

- *conserve high recharge areas, habitats, biodiversity and diverse areas,*
- *improve food and fiber production,*
- *sustain livelihoods, and*
- *reduce carbon emissions from land and resource uses, industries, transport, and energy use.*

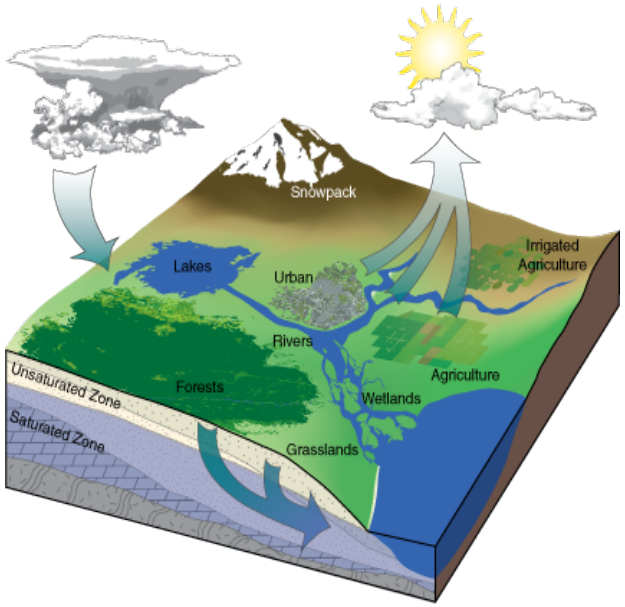
(Adopted from Winterbottom et al. 2013, DENR/ENRMP 2013; Senge, et. al., 2007; GiZ/PAME 2016; Guiang 2016).

COMMON FEATURES

- ✓ ***Participation,***
- ✓ ***Collaboration***
- ✓ ***Joint commitment to support common objectives and strategies*** *for:*
  - *managing landscapes, and*
  - *institutional resources*
- ✓ ***Shared learning for adapting management.***

IWRM Responds to Threats, Externalities, and Opportunities in a Watershed (Adapted from FAO 2013a)

- ✓ Encompasses **any human action** to ensure sustainable use of watershed resources such as *water, forests, land, wildlife, soil, biodiversity, natural heritage, others*
- ✓ Applies **comprehensive management and conservation** of all natural resources across a landscape e.g. *ridge to reef*
- ✓ Follows the landscape for **integrating and organizing different land uses** (forestry, pasture, agriculture)
- ✓ **Links ENRM** with agricultural and fisheries production, indigenous practices, livelihoods, and industries to optimize benefits
- ✓ **Employs good governance practices** – transparent, accountable, and participatory (TAP) - in making choices, decisions and actions (CDA)
- ✓ Mostly applied in a space-bound and geographically circumscribed **ridge to reef or wetland landscapes**



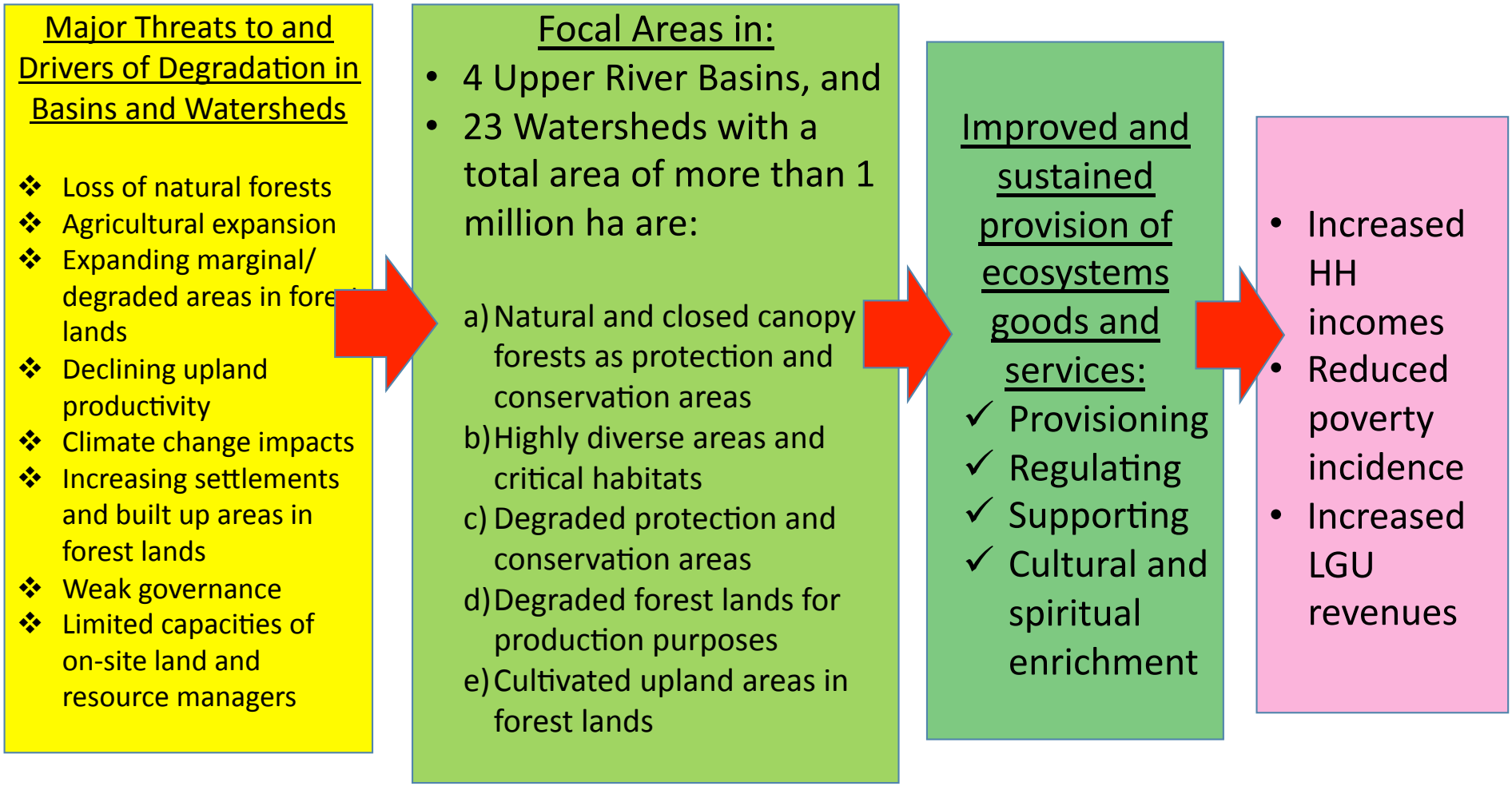
Features of a Climate Resilient IWRM

(Adapted from Darghouth, et al 2008)

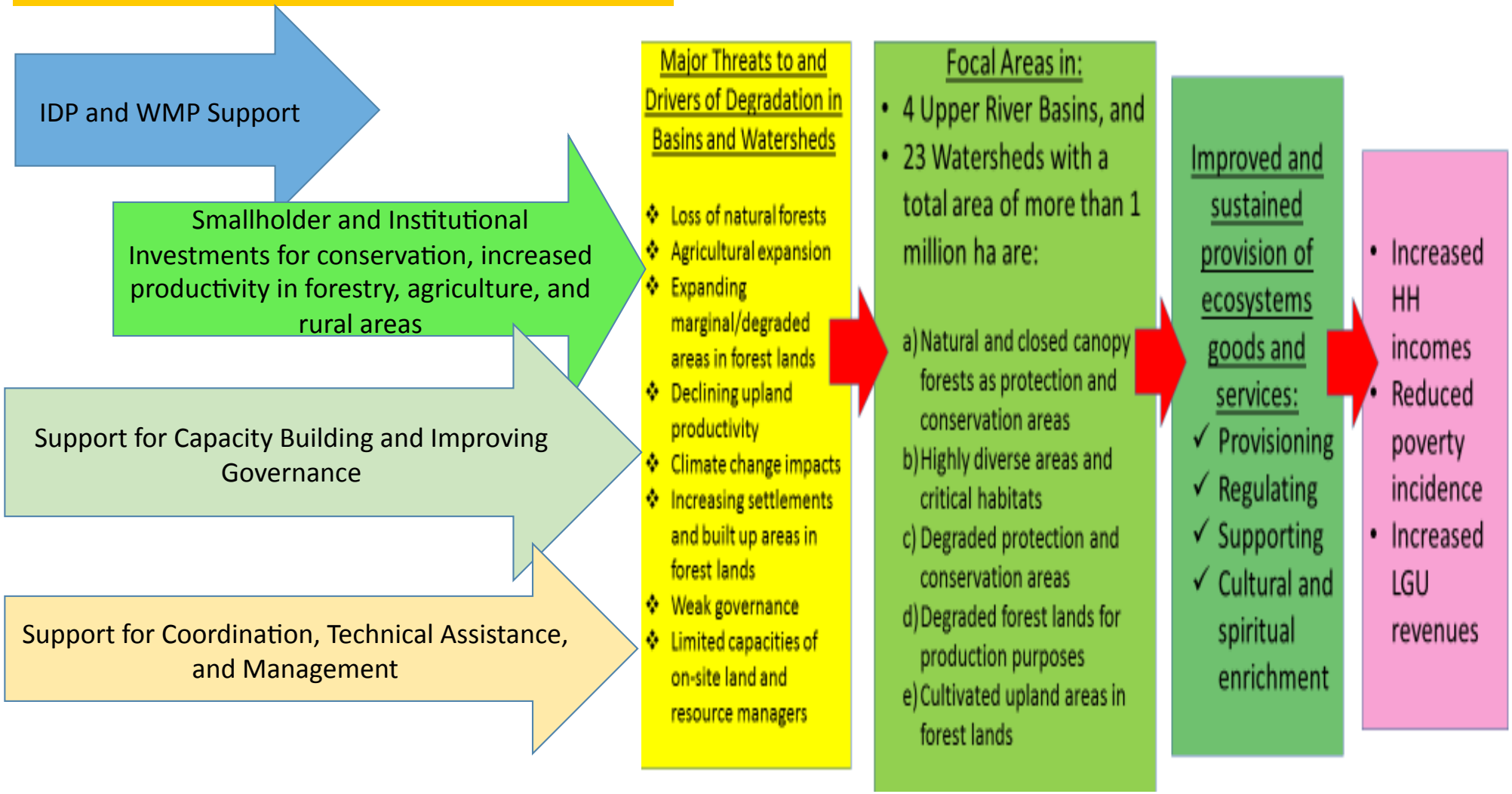
- Integrates land and water resources,
- Responds to the causal link between upstream land and water use and downstream impacts and externalities,
- Addresses the typical nexus of threats and drivers especially between conservation, resource depletion and poverty, and
- Factors and prioritizes needs and problems of multiple stakeholders.

Watershed management approaches have to be adapted to the local situation and to changes in natural resource use, land uses, and climate.

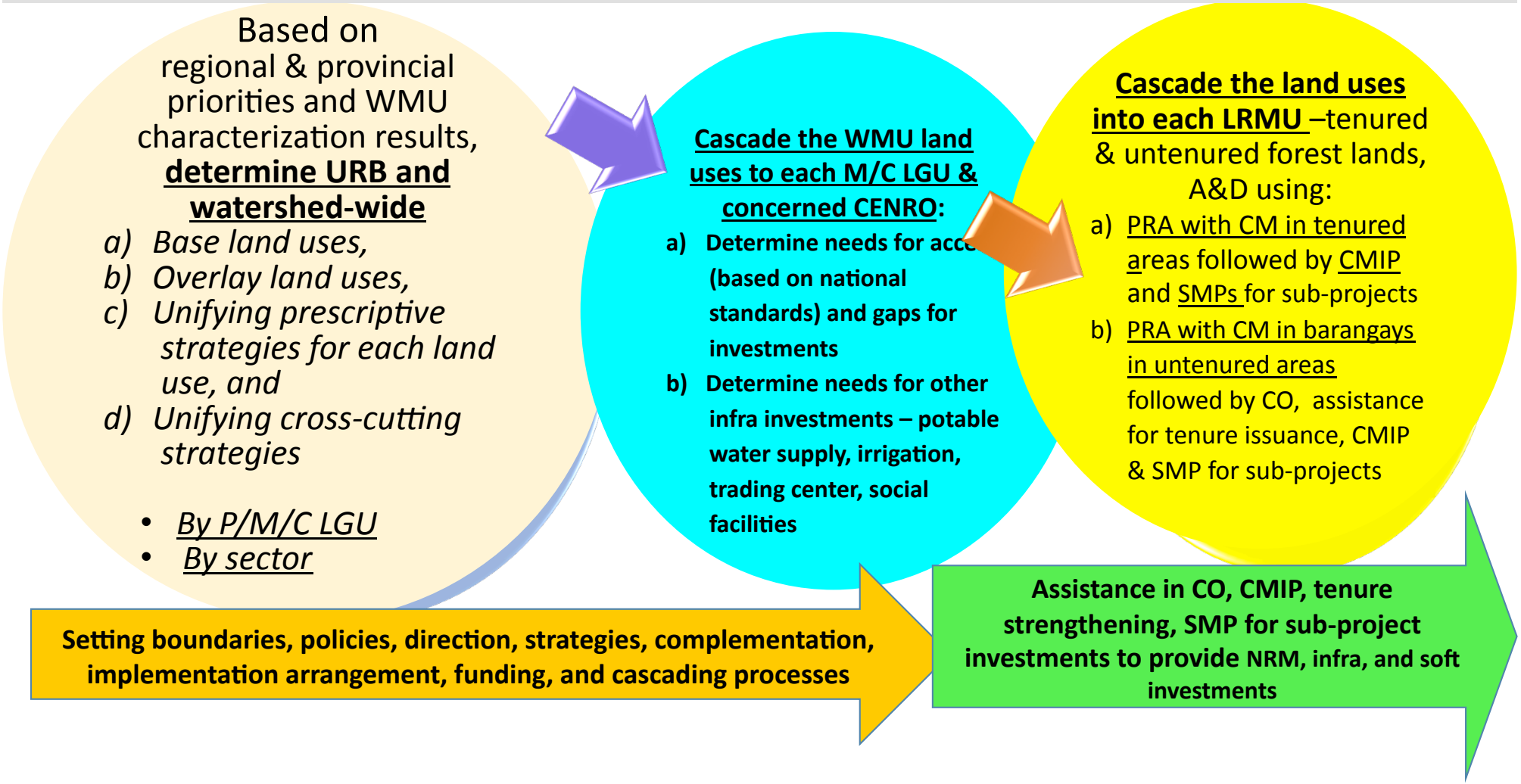
INREMP Focal Areas – URBs and Watersheds



INREMP Strategies

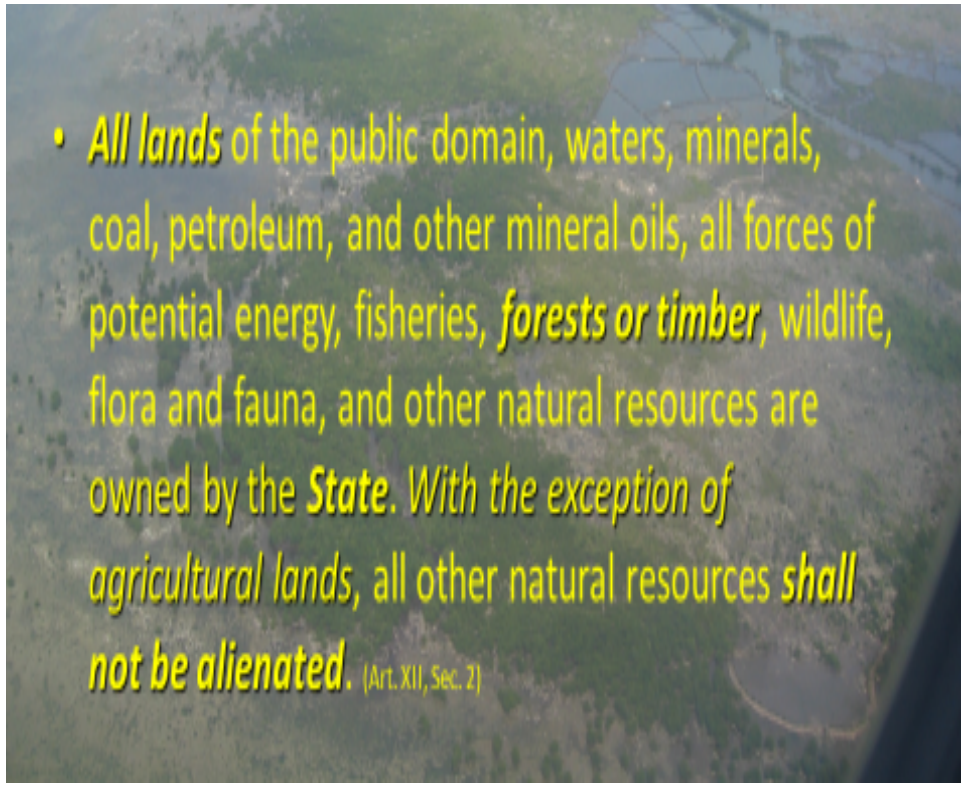


Determining & Cascading the URB and Watershed-Wide Base & and Overlay Land Uses with Appropriate Unifying Prescriptive & Cross-Cutting Strategies to each LGU, CENRO, and LRMU for INVESTMENTS



A Basin's or Watershed's Overall ENVIRONMENTAL GOVERNANCE Framework: The 1987 Constitution

- **Serves as controls** ***(what can be done and cannot be done) in land- and*** **ENR-** related development e.g. public and private programs, ENR uses, land uses, projects, and activities
- **Specifies limits, extent, coverage, boundaries, and restrictions of; and opportunities** for ENR improvement, property rights, investments, and socio-economic development



Policies that Direct the Governance of Lands of Public Domain and ENR:

The 1987 Philippine Constitution, Legislated Laws, and Administrative Issuances (ENRMP 2013)

Note: All land legal types and land cover maybe found in a landscape

Agricultural (A&D)	Timber or Forestlands	Protected Areas (National Park including Coastal Areas)	Mineral Lands
• Comprehensive Agrarian Reform Law • The Public Land Act • AFMA • Fisheries Code	• Revised Forestry Code • EO on CBFM • EO Sustainable Forest Management • RA-Forest Charges • Energy reservation • JMCs – DENR & DILG • EO 23 on log ban in natural forests • EO 26 and amendment in 2015 for post NGP	• NIPAS • Specific PA laws • Wildlife Act • International Commitments • Energy Law • JMC DENR-DAR-NCIP • EO 23 on log ban in natural forests	• Mining Act • Small Scale Mining Act

LGUs exercise their governance framework under LGC 1991; DENR, DA, DAR, and NCIP through their respective constitutional and legislative mandates

EO 192 of DENR, LGC of 1991, IPRA Law, Climate Change Law, DRRM Law, EIA Law, ESWM Law, Biofuels and Renewable Energy Act, Clean Water Act, Clean Air Act

The Governance of Islands, Basins, and Watersheds

All lands of the public domain, waters, minerals, coal, petroleum, and other mineral oils, all forces of potential energy, fisheries, ***forests or timber***, wildlife, flora and fauna, and other natural resources are **owned by the *State***. ***With the exception of agricultural lands***, all other natural resources ***shall not be alienated***. (Art. XII, Sec. 2)

Allocations of Lands of Public Domain	Governance-Designated Entity with Responsibility, Accountability, and Authority	% of 15+ million ha
1. Protected areas and reservations	DENR and Other Government Agencies (PAs and reservations)	26% (4+ million)
2. Allocations to civil and military reserves	Recipients of reservations (military, state universities, etc.	2%
3. Allocations to LGUs	LGUs with co-management agreements, communal forests	Minimal
4 Allocations to community forestry & ancestral domains	Communities with tenure; IPs with CADTs, CADCs, claims	35 % (>5.5 million ha)
5. Allocations to the private sector	Private tenure holders in forest lands	10 % (> 1.5 million ha)
6. Unallocated forestlands (no tenure, open access)	None – (State as the "de-facto")	19% (> 3 million ha)
7. Unclassified forestlands (and to be allocated)	None – (State as the "de-facto")	8 % (> 1 million ha)
8. Agricultural lands (A&D)	Title holders	14+ ,mil (47%)

Base Land Use 1– Protection and Conservation Areas (PCAs) by LGU in forest lands

Base Land Use 2 –Production Areas in forest lands and A&D = Total Land Area of WMU-PCAs (less MPAs)

- **All NIPAS areas**
- Natural **closed and open canopy forests** (EO 23 2011, EO 193 2015)
- ***Mangrove*** forests (RA 7161)
- ***IPRA- designated*** conservation areas (IPRA Law)
- **PD 705-designated protection & conservation areas** in tenured lands e.g. CBFMA, IFMA, FLEMA such as those areas in *> 1000* masl & *> 50% slope*
- ***Riparian zone*** *(20m in A&D and 40m in forest lands) – PD 705*
- Local and communal **watersheds & parks (RA 7160)**
- **Critical habitats (RA 9147)**
- **Ordinances for representative ecosystems** (elevation, type, corridors) based on studies & local knowledge (RA 7160)
- Ordinances and other administrative issuances for caves, **unique natural and cultural attractions and heritage sites**
- ***Marine protected areas/fish*** sanctuaries (Fisheries Code, RA 7160)
- ***Watersheds - Philippine Clean Water Act of 2004 (RA 9275) & Water Code of the Philippines (PD 1067)***
  - PD 1067 or the Water Code of the Philippines
  - Clean water act (RA 9275 or the Philippine Clean Water Act of 2004)

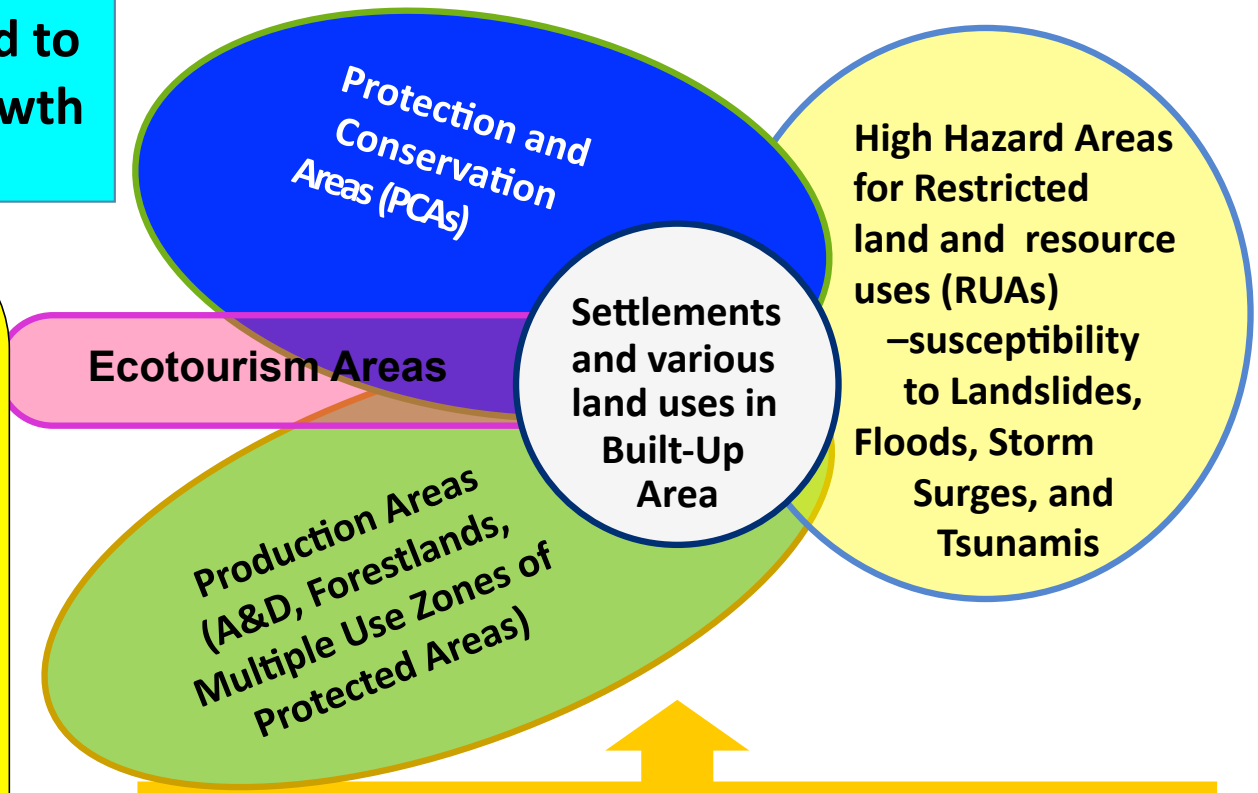
Base & overlay land uses based on the analysis of current policies, suitable uses, and future demand to meet resiliency and inclusive growth objectives

A. Base Land Uses

1. Protection and Conservation Areas (PCAs)
2. Production Areas (MUZs, NPAAAD, SAFDZ)

B. Overlay Land Uses

1. Settlements and Other Built Up Land Uses
2. High Hazard Areas for Restricted Land and Resource Uses (RUAs)
3. Ecotourism



Current and future land and natural resource uses in a basin, WMU, LGU, and LRMU level over time

Generic Rationale for Managing, Regulating, and Developing the Base and Overlay Land Uses (Adapted from HLURB CLUP Guide 2014)

1. **Protection and Conservation Areas (PCAs) –** To Increase Climate Change Resiliency, Conserve Biodiversity and Heritage Sites, and Restore Degraded Ecosystems
2. **Production Areas–** To increase production and value chains of competitive goods and services based on comparative advantages
3. **Settlements and Land Uses in Built Up Areas** – To regulate and direct urbanization and growth of settlements, industries, commercial and institutional land uses, including support infra and social services
4. **Restricted Use Areas (RUAs)** – To regulate Land & Resource Uses, set up appropriate mitigation& adaptation Strategies in High Hazard areas (landslides, flooding, earthquake, tsunami, storm surges) to reduce Risks and Damages from Natural Disasters affecting PCAs, settlements/built-up areas, and production areas
5. **Ecotourism Use –** maybe located in # 1-4 above; to optimize the revenue-generating potentials of the natural and cultural attractions to ignite local socio-economic development

Generic Steps and Processes in Preparing an IDP and Integrated Watershed Management and Investment Plan (WMP)

1. Where are we now? (Characterization)

- ✓Location & area by LGU
- ✓ Geo-morphological features (slope, elevation, origin, etc.)
- ✓ Agro-climatic – rainfall, RH, temperature, wind direction
- ✓Current land cover (2010 NAMRIA)
- ✓Forest resources
- ✓Soil resources
- ✓Biodiversity
- ✓Water resources
- ✓CC-susceptibility and vulnerability
- ✓Dominant Land Uses (CLUPs)
- ✓ Major Policies, governance & institutions on land and resource uses
- ✓ Demography (composition, distribution, economic)
- ✓ Economic sector (agri, forestry, industries, tourism)
- ✓ Infra and social services support (access, educational, health, waste, protective, energy, communications, etc.)
- ✓Comparative advantages (CAs)
- ✓ Priority ENRM- and socio-economic-related problems, needs, Issues; threats to ENRs and constraints to ENRM
- ✓ Gaps & Opportunities based on CA – policies, programs, support

3. How do we get there? (Prescriptive & Cross Cutting Strategies and Specific Investments for Improving General Land & Resource Uses)

A. Land Use Improvement Strategies
   a) Protect and Conserve & Restore degraded areas in PCAs
   b) Increase CA-based production and value chains of competitive goods and services
   c) Regulate settlements and built up areas in PCAs and Production areas
   d) Regulate use of ENR EGSs via ECC e.g. water, pollutants
   e) Regulate land & resource uses in Highly susceptible/vulnerable areas

B. Provide infra support and social services support

C. Cross-Cutting Strategies
   a) Establish multi-level governance systems
   b) Strengthen Capacities
   c) Set up database and RBME

D. Establish adaptive WMP implementation arrangement

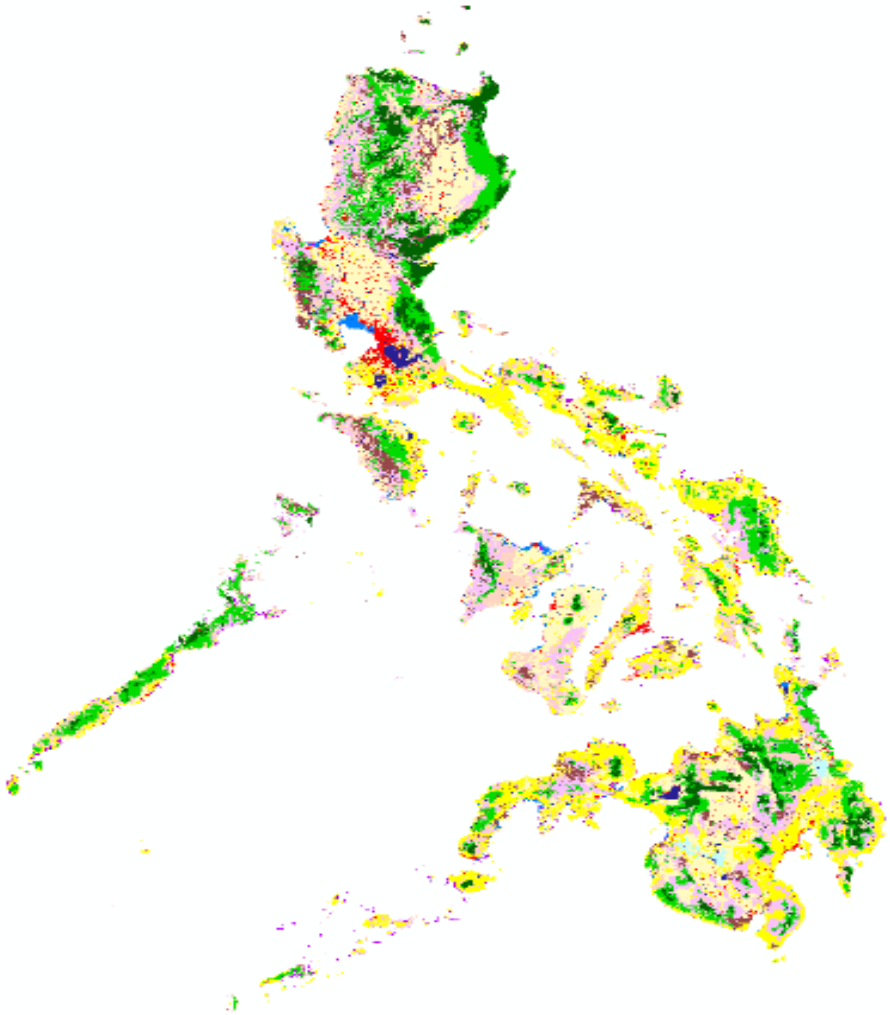
E. Estimate cost & set up sustainable & multi-source financing schemes – INREMP and post INREMP

2. Where do we want to go? (Vision, Mission, Objectives)

- **Vision** – Envisioned future for:
  - ✓The watershed land cover
  - ✓Governance bodies, and
  - ✓LRMUs and communities
- **Mission** – "What do we do? and For whom?
- **Objectives** – What do we want to achieve? (SMARTLY)
- **Specific Targets**?

4. What are the environmental & social safeguards of strategies and investments? What are the Mitigation and Enhancement Measures?

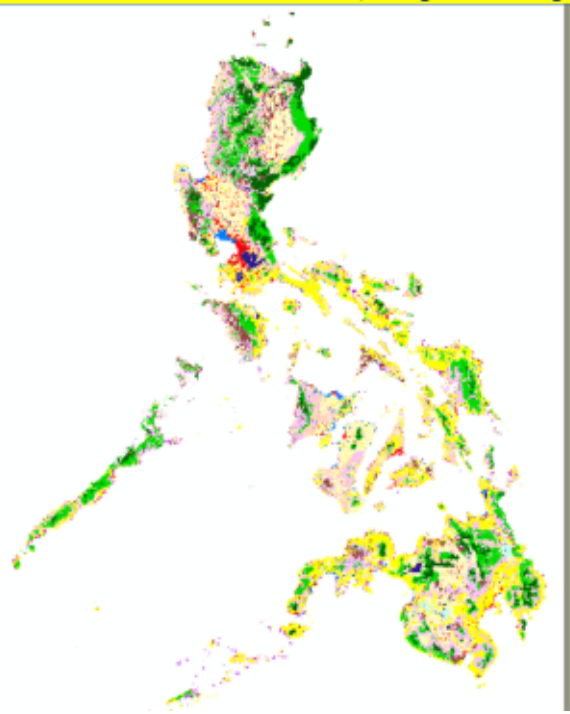
WMPs determine strategies and investments that will improve land uses which will ultimately result to desired **land cover** over time. These should result to increased climate resiliency, enhanced biodiversity, sustained supply of ecosystems goods and services, strengthened local governance, and inclusive growth



Closed Forest	1,923,866	6.51 %
Open Forest	4,614,704	15.61 %
Shrubs	3,415,452	11.56 %
Wooded grassland	3,819,978	12.93 %
Grassland	1,429,358	4.84 %
Fallow	7,379	0.02 %
Perennial Crop	6,166,236	20.86 %
Annual Crop	6,217,137	21.04 %
Built-up	693,931	2.35 %
Open/Barren	95,677	0.32 %
Mangrove Forest	307,682	1.04 %
Marshland/Swamp	131,460	0.44 %
Fishpond	256,246	0.87 %
Inland Water	475,360	1.61 %
TOTAL	29,554,467	100.00 %

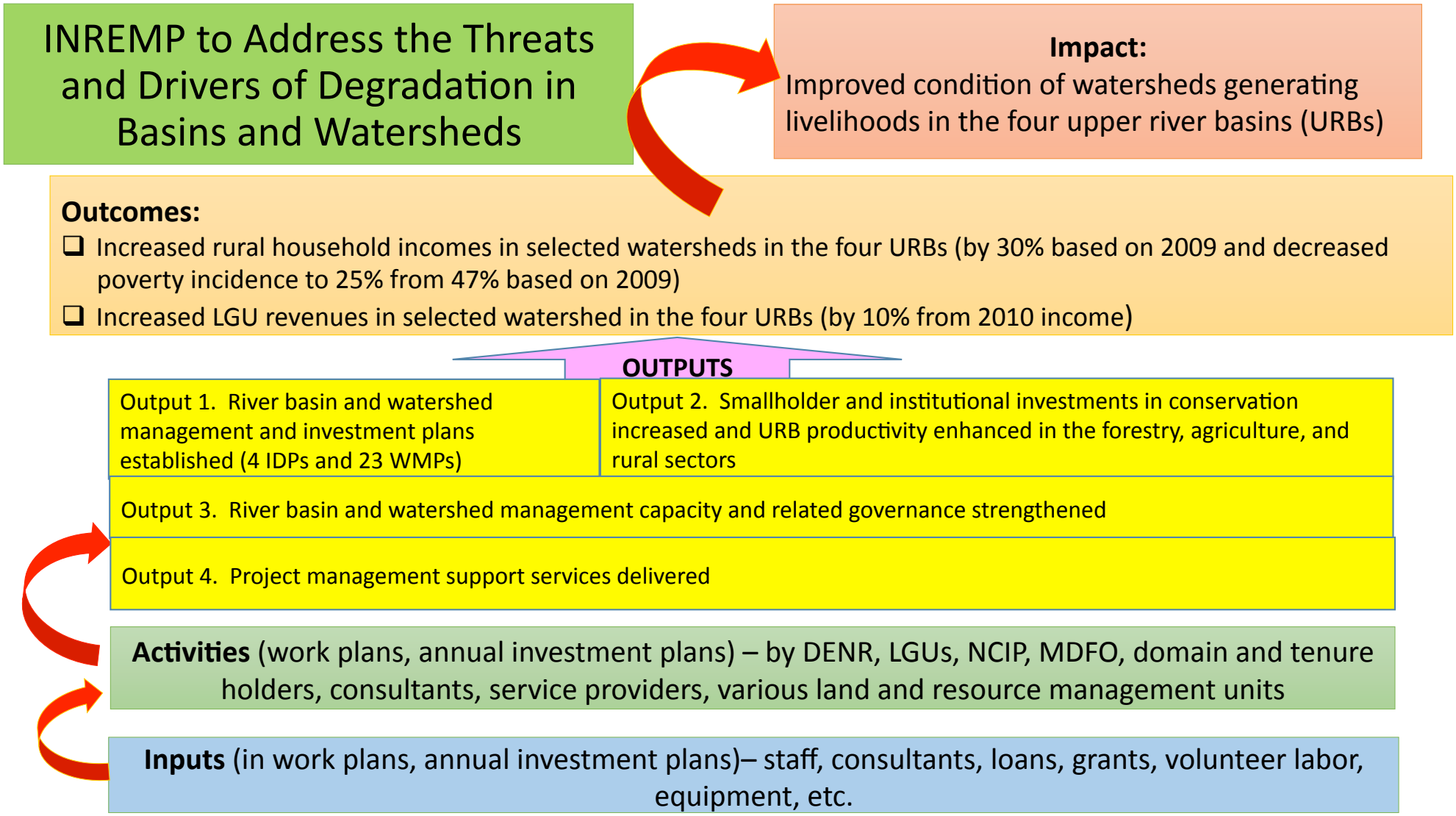
What will INREMP and Post-INREMP Strategies and Investments intend to do under the WMPs?

WMPs determine strategies and investments that will improve land uses which will ultimately result to desired **land cover** over time. These should result to increased climate resiliency, enhanced biodiversity, sustained supply of ecosystems goods and services, strengthened local governance, and inclusive growth



Closed Forest	1,923,866	6.51 %
Open Forest	4,614,704	15.61 %
Shrubs	3,415,452	11.56 %
Wooded grassland	3,819,978	12.93 %
Grassland	1,429,358	4.84 %
Fallow	7,379	0.02 %
Perennial Crop	6,166,236	20.86 %
Annual Crop	6,217,137	21.04 %
Built-up	693,931	2.35 %
Open/Barren	95,677	0.32 %
Mangrove Forest	307,682	1.04 %
Marshland/Swamp	131,460	0.44 %
Fishpond	256,246	0.87 %
Inland Water	475,360	1.61 %
TOTAL	29,554,467	100.00 %

The INREMP and Post-INREMP Strategies and Investments will support conservation, restoration, and production **(as land uses) to** improve the land cover in each watershed that are expected to increase HH income, reduce poverty, increase LGU revenues


INREMP to Address the Threats and Drivers of Degradation in Basins and Watersheds
Impact:
Improved condition of watersheds generating livelihoods in the four upper river basins (URBs)
Outcomes:
❑ Increased rural household incomes in selected watersheds in the four URBs (by 30% based on 2009 and decreased poverty incidence to 25% from 47% based on 2009)
❑ Increased LGU revenues in selected watershed in the four URBs (by 10% from 2010 income)
OUTPUTS
Output 1. River basin and watershed management and investment plans established (4 IDPs and 23 WMPs)
Output 2. Smallholder and institutional investments in conservation increased and URB productivity enhanced in the forestry, agriculture, and rural sectors
Output 3. River basin and watershed management capacity and related governance strengthened
Output 4. Project management support services delivered
Activities (work plans, annual investment plans) – by DENR, LGUs, NCIP, MDFO, domain and tenure holders, consultants, service providers, various land and resource management units
Inputs (in work plans, annual investment plans)– staff, consultants, loans, grants, volunteer labor, equipment, etc.

Basis in Formulating the Unifying Prescriptive Strategies

- **Priority problems, issues, needs, opportunities**
- **Vision, Mission, Objectives**
- **Base and Overlay Land Uses (Zones)**
- **Comparative Advantages to substantiate the intervention strategies**

Generic Unifying Prescriptive Strategies for Each Land Use

1. **PCAs**
   - zoning and enforcement e.g. LAWIN
   - community-based forest protection and conservation,
   - restoration and protection of degraded areas
   - PES with re-investments of revenues from PGP and penalties from PPP (energy, water, ecotourism)
   - Biodiversity and carbon stock monitoring
2. **Production**
   - zoning and regulation
   - providing support for developing forest plantations, high value perennial crops, tree farms, agroforestry systems,
   - Support for soil and water conservation systems;
   - value chains;
   - infra, extension, and marketing support
   - Carbon stock monitoring

3. **Settlements and Built Up Areas**
   - Zoning, regulations and enforcement,
   - Support for infra and social services
4. **Hazard areas –**
   - Zoning and enforcement
   - regulations of land and resource uses;
   - adaptation and mitigation support systems e.g. early warning device systems
   - safety net measures; r
   - Relocation, resettlements, livelihood/ enterprise support
5. **Ecotourism areas –**
   - Zoning and enforcement
   - support for PPP, PCP, PES;
   - linking production with demand in tourism areas e.g. agri-ecotourism
   - support for infra, social services, peace and order, and sanitation

Generic Unifying Cross-Cutting Strategies in Each Watershed

1. Improving Governance Systems – Land and Resource Uses
   - ✓ National policies – legislation and administrative issuances
   - ✓ Local policies – resolutions of governance bodies, executive orders of LGUs, LGU ordinances, barangay resolutions, PO/IPO resolutions
2. Improving Capacities to direct, manage, regulate, enforce, monitor, and support enhancement of land uses
   - ✓ Governance bodies – RDC, WMC, PDC, MDC, PO/IPO boards
   - ✓ DENR field units
   - ✓ NCIP field units
   - ✓ LGU staff
   - ✓ INREMP staff
   - ✓ Barangay leaders

Investment Strategies – INREMP, Post-INREMP

1. Improving land uses – PCAs, Production Areas in Forest lands through the LRMUs (tenured and untenured)
2. Infra support through the LGUs
3. Governance systems
4. Capacity building
5. Implementation arrangements

Pathway of Legitimization Actions – Endorsements, Resolutions, Affirmations, Approvals of IDPs and WMPs

1) Affirm the priority problems, needs, issues, and challenges that will have to be confronted in the watershed and in each LGU and by each key sector
2) Affirm the watershed's comparative advantages to anchor opportunity-centered strategies
3) Adopt the suggested vision, mission, and objectives
4) Adopt the major base and overlay land uses (zones) at the watershed and in each MLGU
5) Adopt the major strategies and interventions in each type of land use to achieve results
6) P/M LGUs to take actions for incorporating the major base and overlay land uses in preparing/modifying/revising their provincial, city and municipal land use plans
7) Endorse the INREMP and post-INREMP strategies for implementing the WMP
8) DENR Region's approval of the WMP based on items 1) to 7) above

Governance-Based Implementation Arrangement to Support Risk Resilient, Inclusive Growth and Results-Based WMP Implementation

- **Guided by the Statutory and Customary Laws;**
- **Translates Good Governance Practices during Implementation**
- **Facilitate measurement and monitoring and evaluation of outcomes and outputs**

- Protection and conservation areas
- Production areas
- Built-Up Land Uses including Infra and Social Services Support
- Governance systems
- Capacity building
- Investments in support of the economic sector

Unifying Strategies to Optimize benefits from a landscape

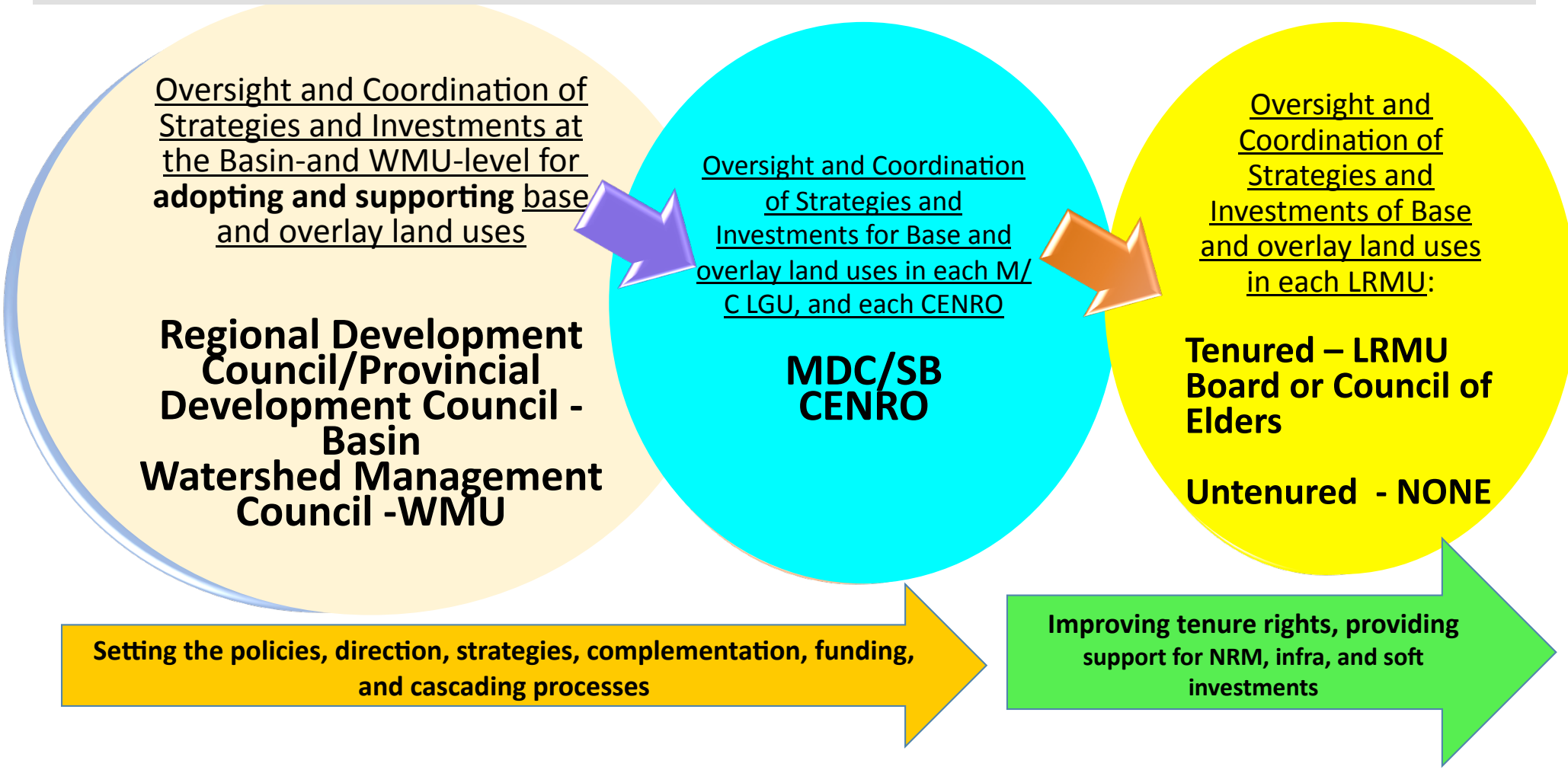
Define Tasks, Responsibilities, Accountabilities, and Authority (TRAAs) of executing units

Progress Monitoring and Evaluation based on common output and outcome indicators

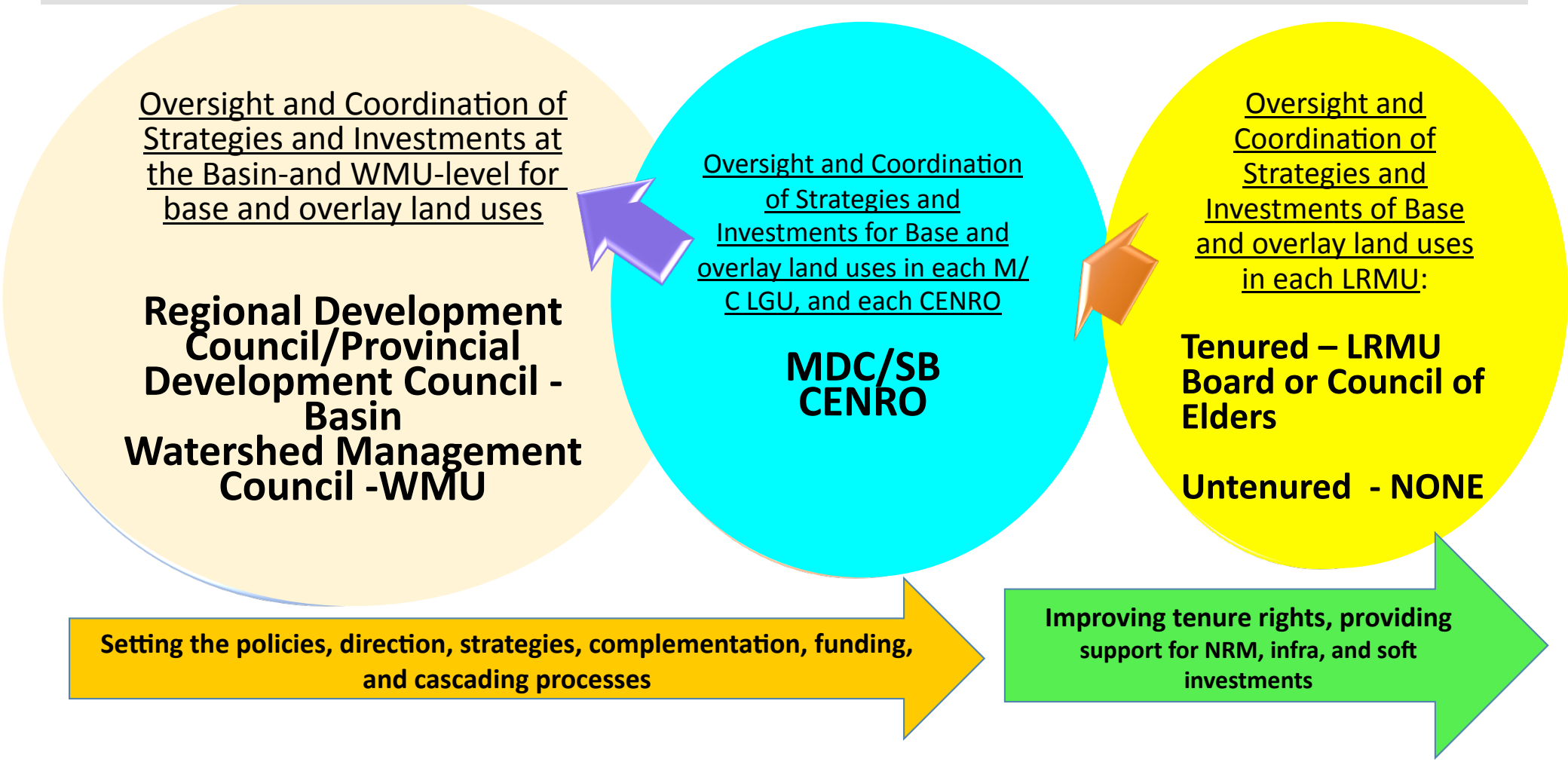
Vision-Oriented Leaders

Effective, Efficient, and Constituent-Responsive Executing Units

Governance Systems, Coordination and On-Site Management Systems at the WMU Level, LGU, and LRMU Levels



RBME and Feedback Systems from the LRMU to each LGU and CENRO and LRMU, and Basin Levels



Relationships of IDP, WMPs, FLUP_CLUPs, LRMU Plans/CMIPs)

URB Indicative Development Plan (IDP) – Coordination, complementation, advocacy, financing, support

Aggregation of WMPs in a URB

A **WMP** based on regional & provincial priorities and WMU characterization results, **determine watershed-wide**

a) *Base land uses,*
b) *Overlay land uses,*
c) *Unifying prescriptive strategies for each land use, and*
d) *Unifying cross-cutting strategies for integrating and jointly managing various* ***investments***

- *By P/M/C LGU*
- *By sector*

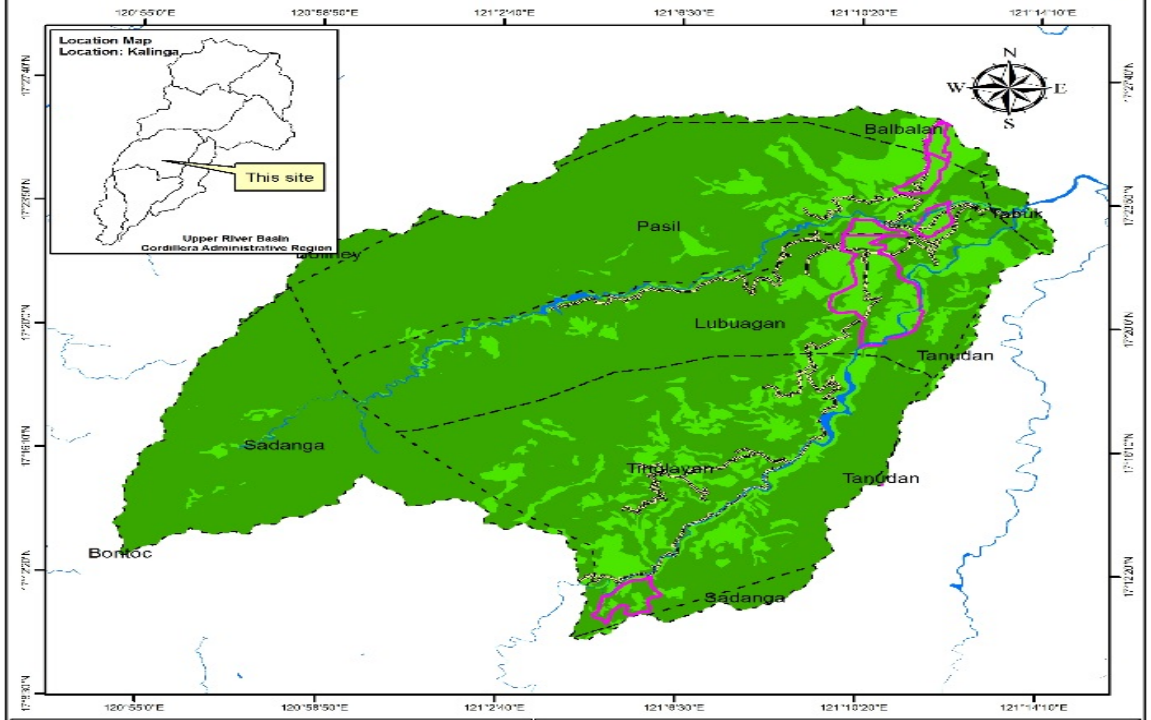
FLUPs

LRMU/ CMIP Plans

CLUPs/ CDPs

Sub-Projects

Integrated Natural Resources and Environmental Management Project



Protection and Production area map

Map showing the landclass within protection and production areas

0 2,050 4,100 8,200 12,300 16,400 Meters

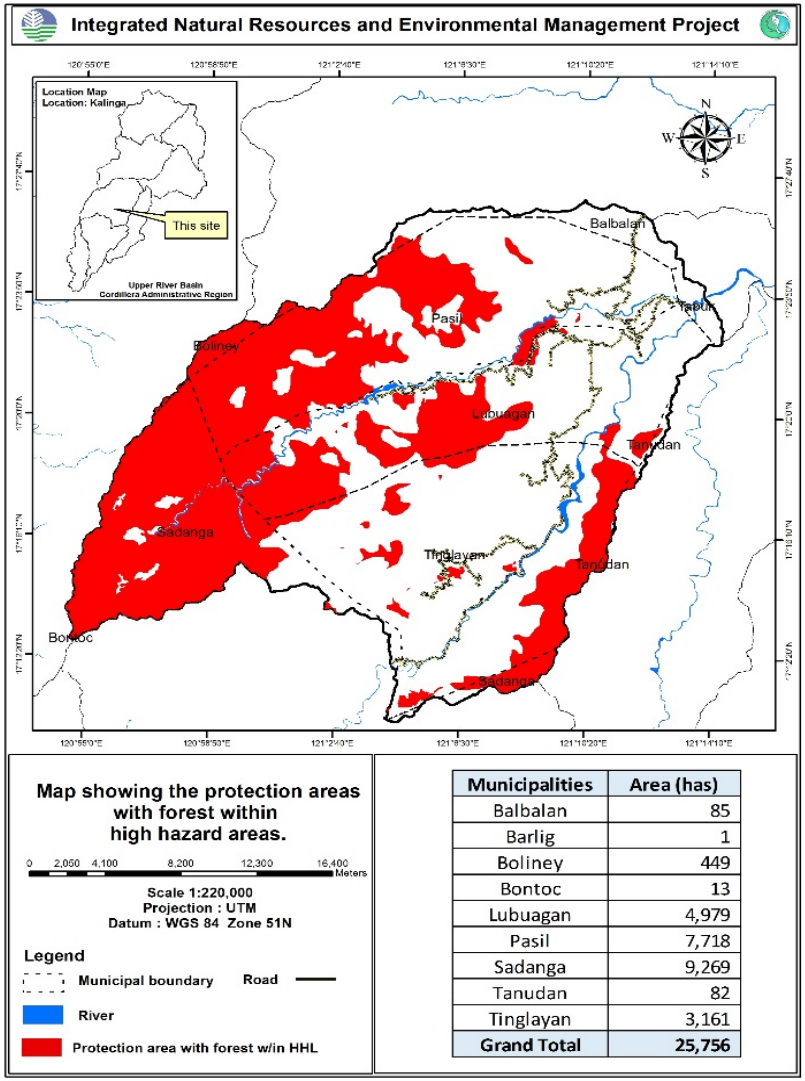
Scale 1:220,000
Projection : UTM
Datum : WGS 84 Zone 51N

Legend

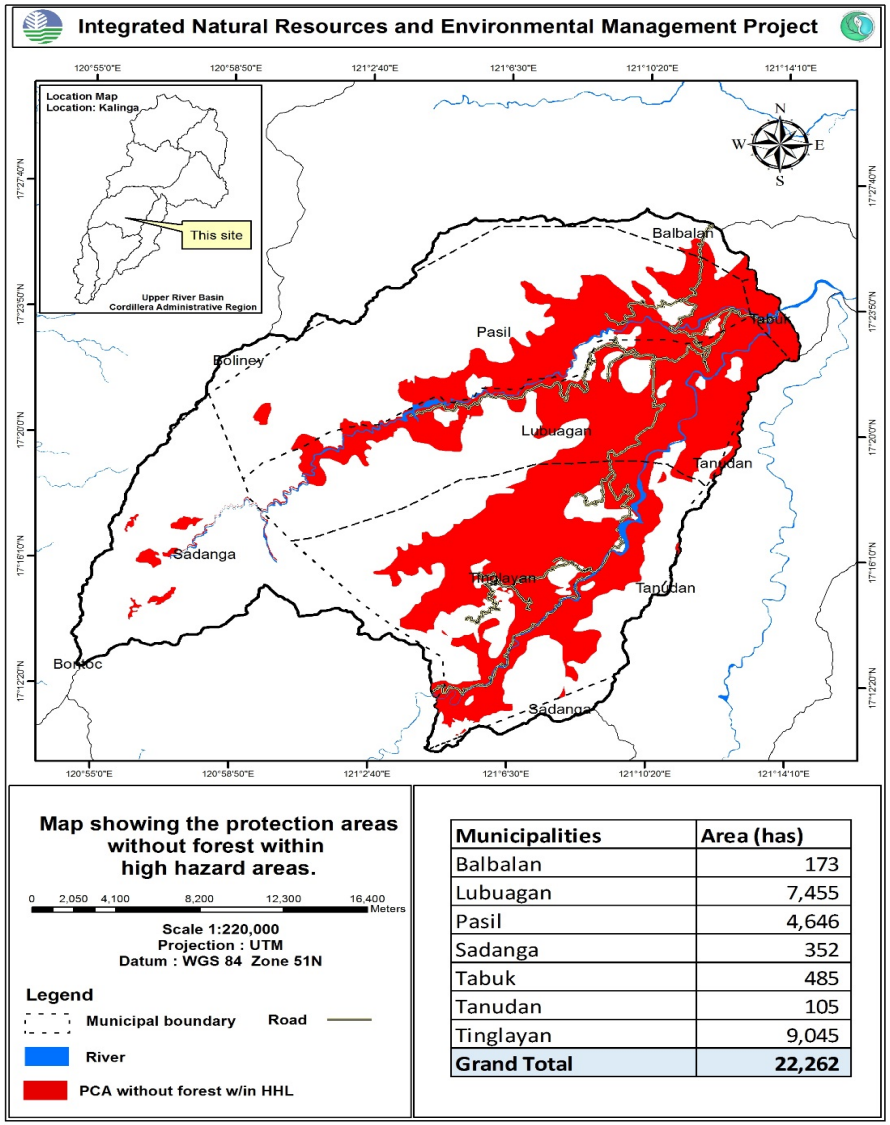
- Municipal boundary
- Production
- Protection
- Road
- river
- a&d

Municipality	Protection (PCA)		Total	Production		Total
	Forestland	A and D Area (ha)		Forestland	A and D Area (ha)	
Balbalan		1,019	1,019	113	388	501
Barlig		1	1			
Bolinay		449	449			
Bontoc		13	13			
Lubuagan	385	10,308	10,693	905	2,289	3,194
Pasil	79	14,678	14,757	395	2,131	
Sadanga		10,546	10,546		314	314
Tabuk		349	349		136	136
Tanudan		155	155		61	61
Tinglayan	207	13,269	13,476	105	4,062	4,167
Grand Total	**671**	**50,788**	**51,459**	**1518**	**9,380**	**10,898**

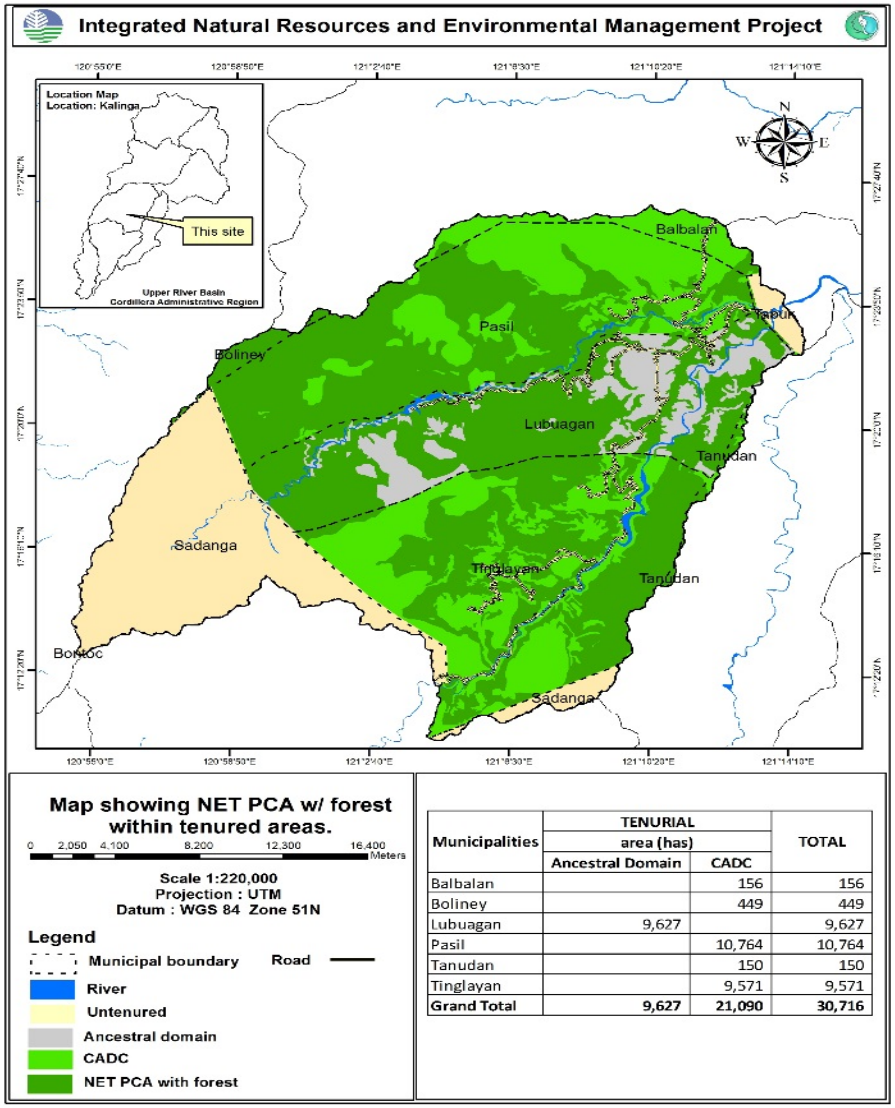
Table 1. General Production and Protection –Surong Watershed, Upper Chico							
Municipality	**(PCA)**		**Sub-Total**	**Production**		**Sub-total**	**Total**
	A and D	**Forestland**		**A and D**	**Forestland**		
	Area (ha)			**Area (ha)**			
Balbalan		1,019	1,019	113	388	501	1,520
Barlig		1	1				1
Boliney		449	449				449
Bontoc		13	13				13
Lubuagan	385	10,308	10,693	905	2,289	3,194	13,887
Pasil	79	14,678	14,757	395	2,131		14,757
Sadanga		10,546	10,546		314	314	10,860
Tabuk		349	349		136	136	485
Tanudan		155	155		61	61	216
Tinglayan	207	13,269	13,476	105	4,062	4,167	17,643
Grand Total	**671**	**50,788**	**51,459**	**1518**	**9,380**	**10,898**	62,357



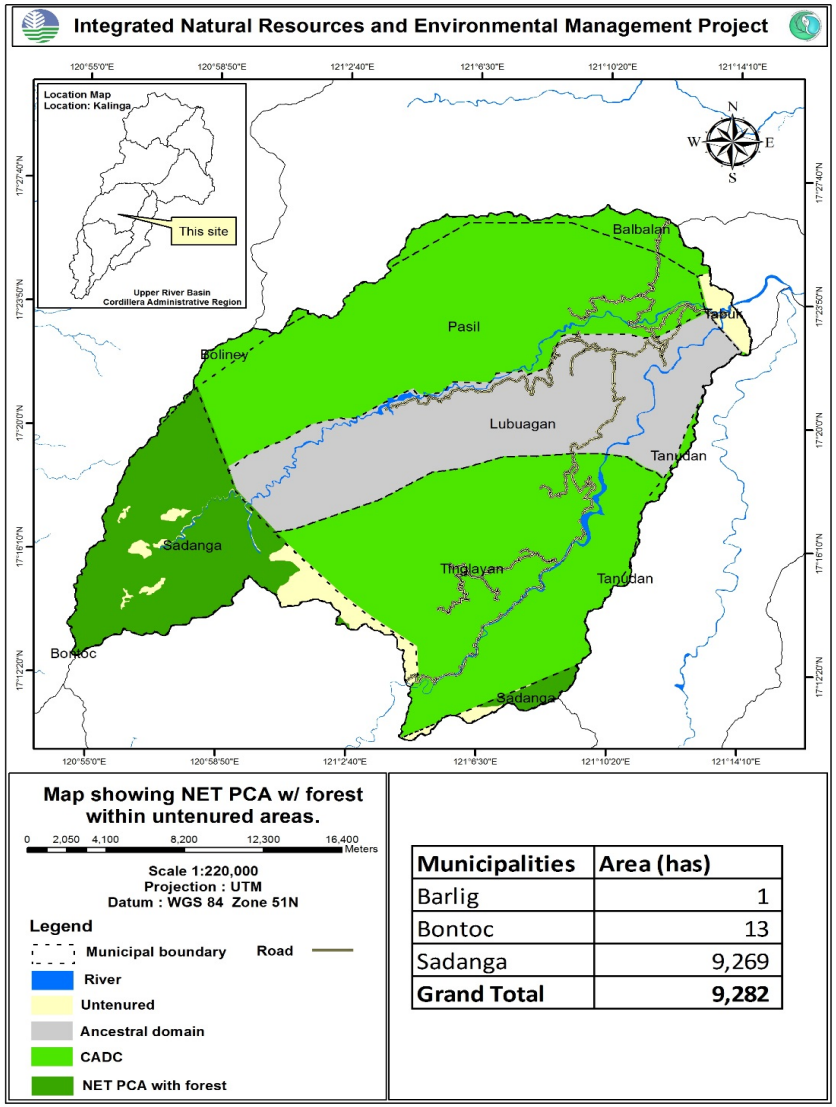
Municipalities	Area (has)
Balbalan	85
Barlig	1
Boliney	449
Bontoc	13
Lubuagan	4,979
Pasil	7,718
Sadanga	9,269
Tanudan	82
Tinglayan	3,161
Grand Total	**25,756**



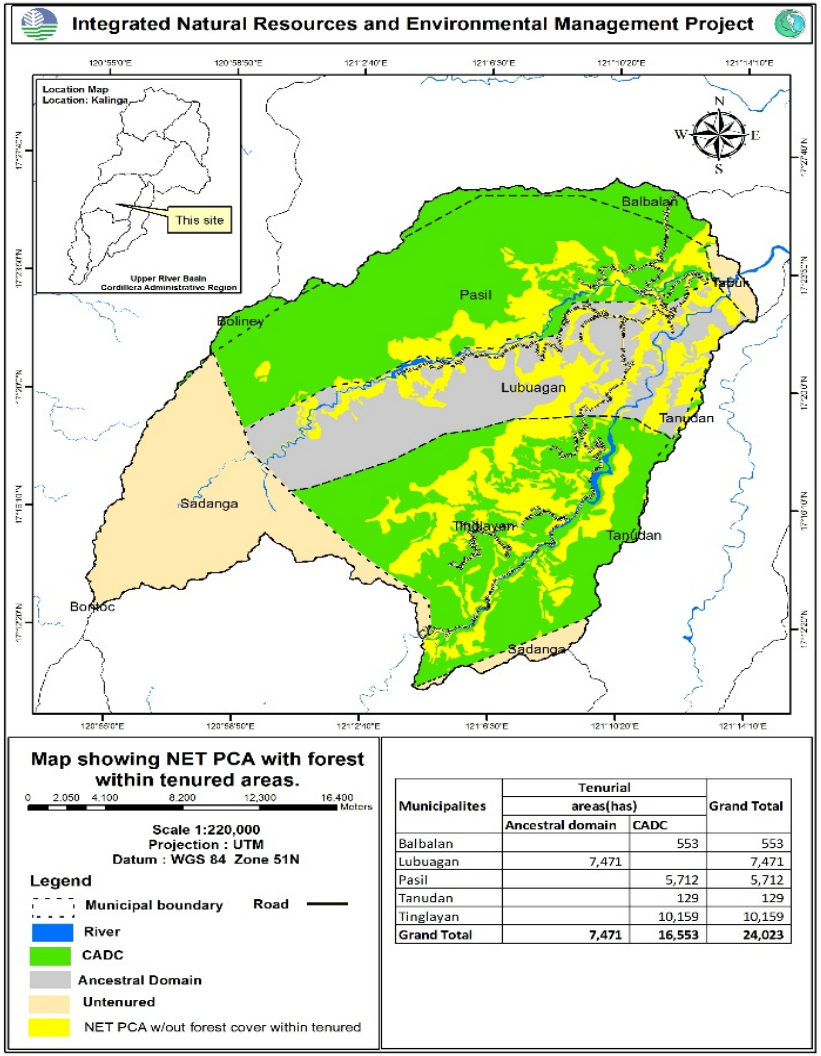
Municipalities	Area (has)
Balbalan	173
Lubuagan	7,455
Pasil	4,646
Sadanga	352
Tabuk	485
Tanudan	105
Tinglayan	9,045
Grand Total	**22,262**



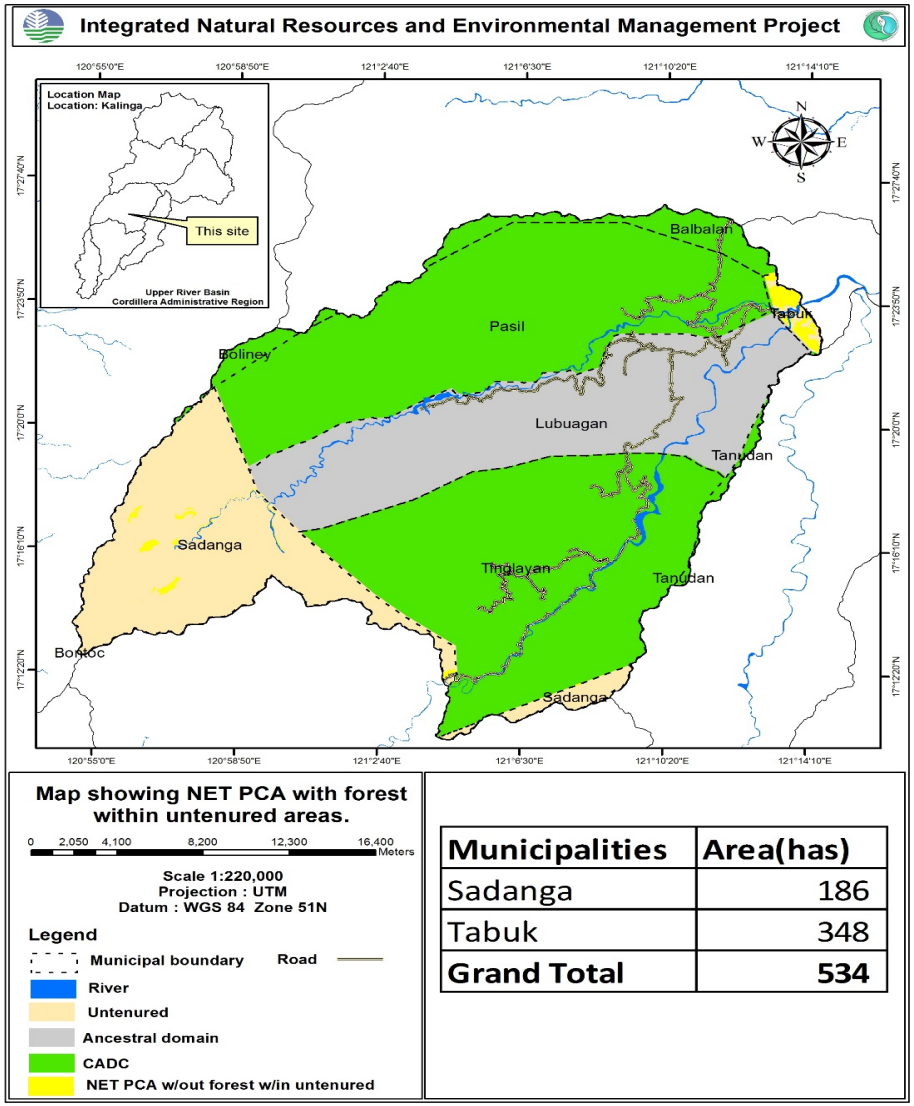
Municipalities	TENURIAL area (has)		TOTAL
	Ancestral Domain	CADC	
Balbalan		156	156
Boliney		449	449
Lubuagan	9,627		9,627
Pasil		10,764	10,764
Tanudan		150	150
Tinglayan		9,571	9,571
Grand Total	**9,627**	**21,090**	**30,716**



Municipalities	Area (has)
Barlig	1
Bontoc	13
Sadanga	9,269
Grand Total	**9,282**

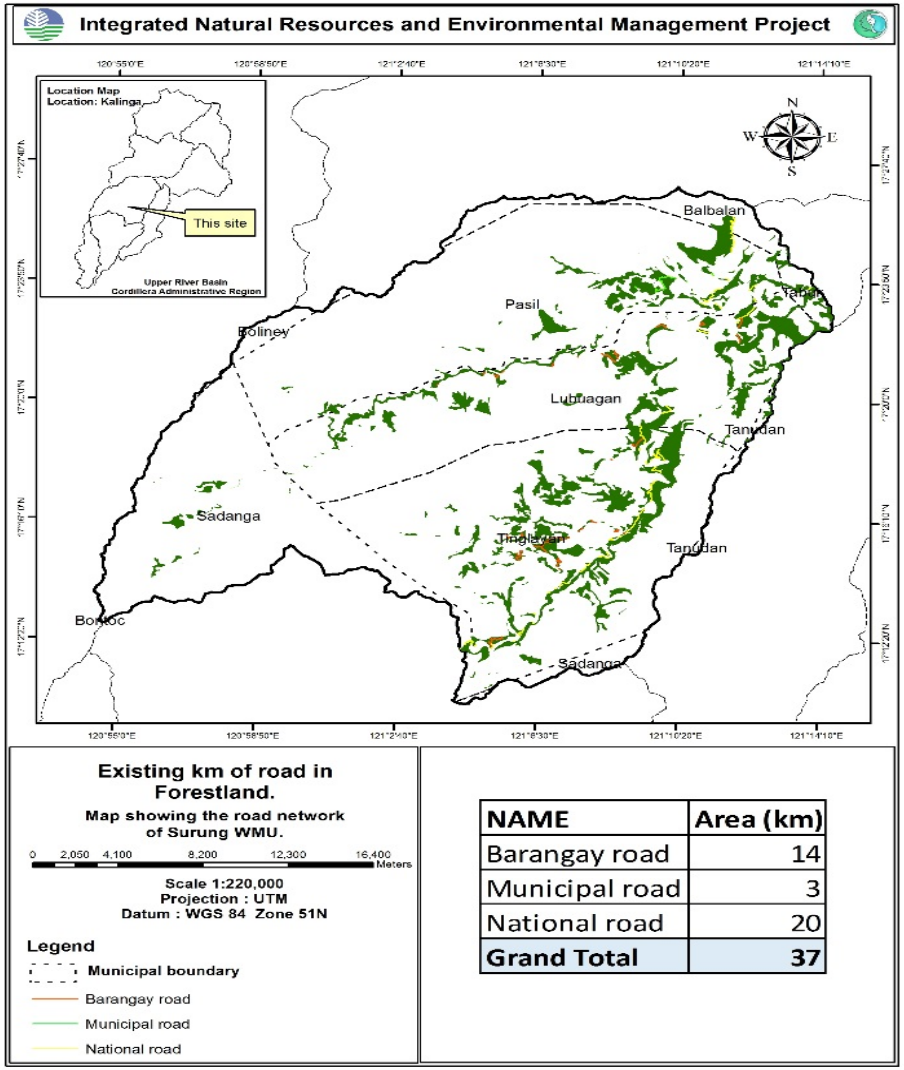


Municipalites	Tenurial areas(has)		Grand Total
	Ancestral domain	CADC	
Balbalan		553	553
Lubuagan	7,471		7,471
Pasil		5,712	5,712
Tanudan		129	129
Tinglayan		10,159	10,159
Grand Total	**7,471**	**16,553**	**24,023**

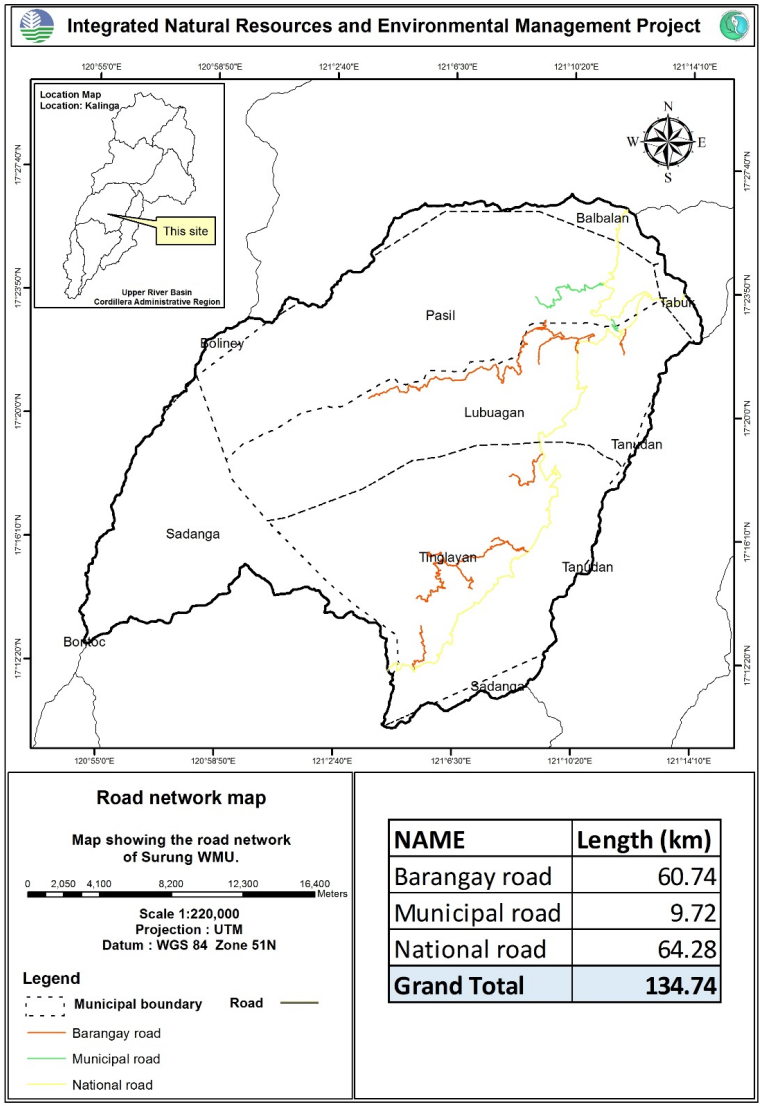


Municipalities	Area(has)
Sadanga	186
Tabuk	348
Grand Total	**534**

	General Land Uses	Balbalan High susceptible to landslide	Barlig High susceptible to landslide	Boliney High susceptible to landslide	Bontoc High susceptible to landslide	Lubuagan High susceptible to landslide	Pasil High susceptible to landslide	Sadanga High susceptible to landslide	Tabuk High susceptible to landslide	Tanudan High susceptible to landslide	Tinglayan High susceptible to landslide	Grand Total
A	Protection areas with Closed and Open forest	85	1	449	13	4,979	7,718	9,269		82	3,161	**25,756**
B	Protection areas with out Forest	173				7,455	4,646	352	485	105	9,045	**22,262**
C	Settlements/ Built-up (Protection Areas)					10	16		1		8	**34**
D	**NET P = (A+B)-C**	259	1	449	13	12,424	12,348	9,621	484	186	12,199	**47,985**
E	Production (Forestlands)	56				1,959	1,241	166	136	37	2,538	**6,132**
F	Production (A&D)	47				841	346				91	**1,325**
G	Settlements/ Built-up (Production Areas in FL)	0.06				16	39		3		28	**86**
H	Settlements/ Built-up (Production Areas in A&D)	0.16				50.44	16.89				0.46	**67.95**
I	**NET Production Areas (FL) = E-G**	55				1,944	1,202	166	133	37	2,510	**6,046**
J	**NET Production Areas (A&D) = F-H**	47				791	329				91	**1,257**
K	**TOTAL= (Net PCA + Net Production (FL) + Net Production (A&D)**	**361**	**1**	**449**	**13**	**15,159**	**13,878**	**9,786**	**617**	**223**	**14,800**	**55,288**
L	**TOTAL Settements (C + G +H)**	**0.22**				**75.70**	**72.09**		**4.48**		**35.65**	**187.70**



NAME	Area (km)
Barangay road	14
Municipal road	3
National road	20
Grand Total	**37**



NAME	Length (km)
Barangay road	60.74
Municipal road	9.72
National road	64.28
Grand Total	**134.74**

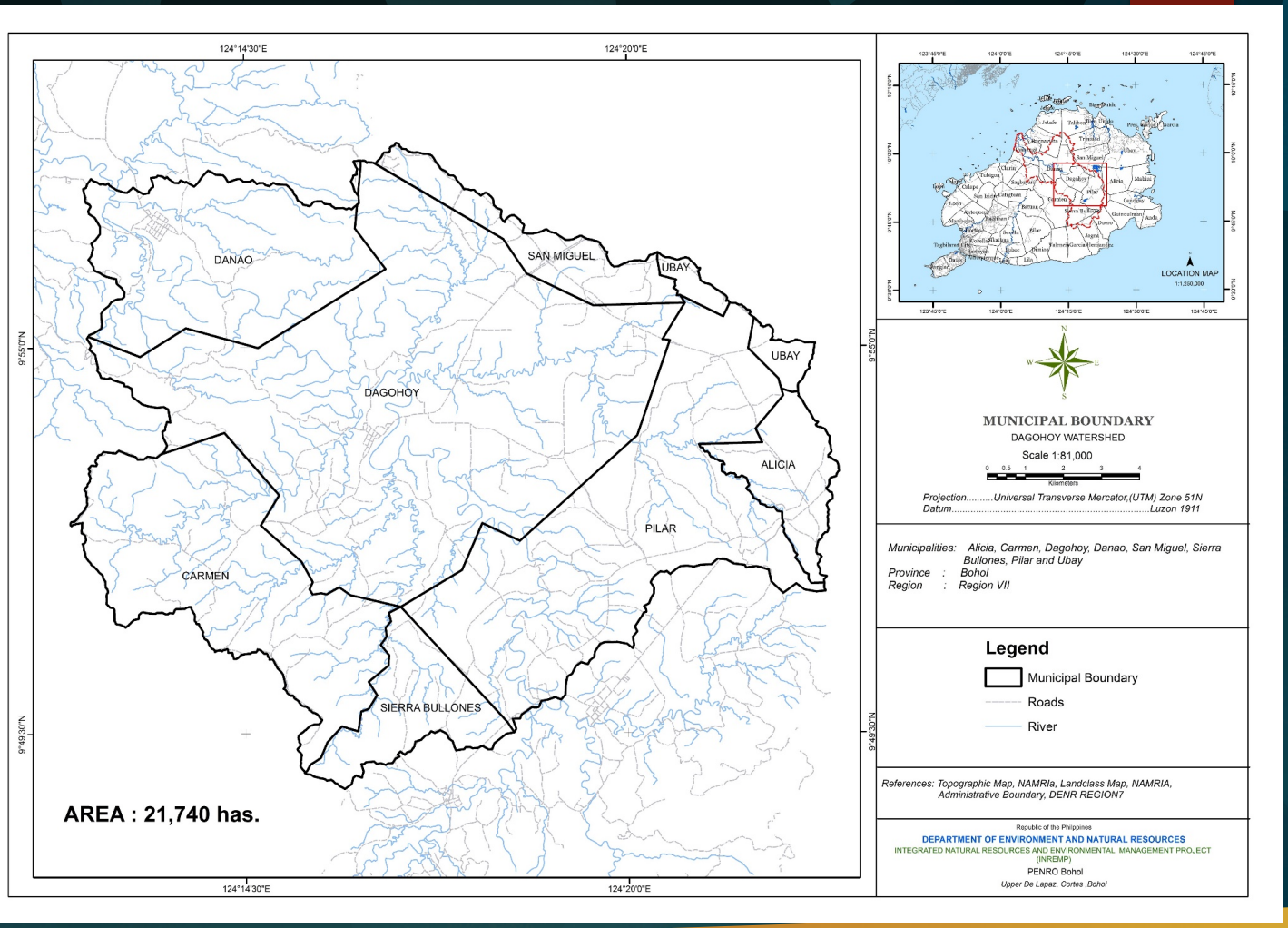
PROTECTION & CONSERVATION AREAS (PCAs) & PRODUCTION AREA

DAGOHOY WATERSHED

BOHOL, CENTRAL VISAYAS, R7

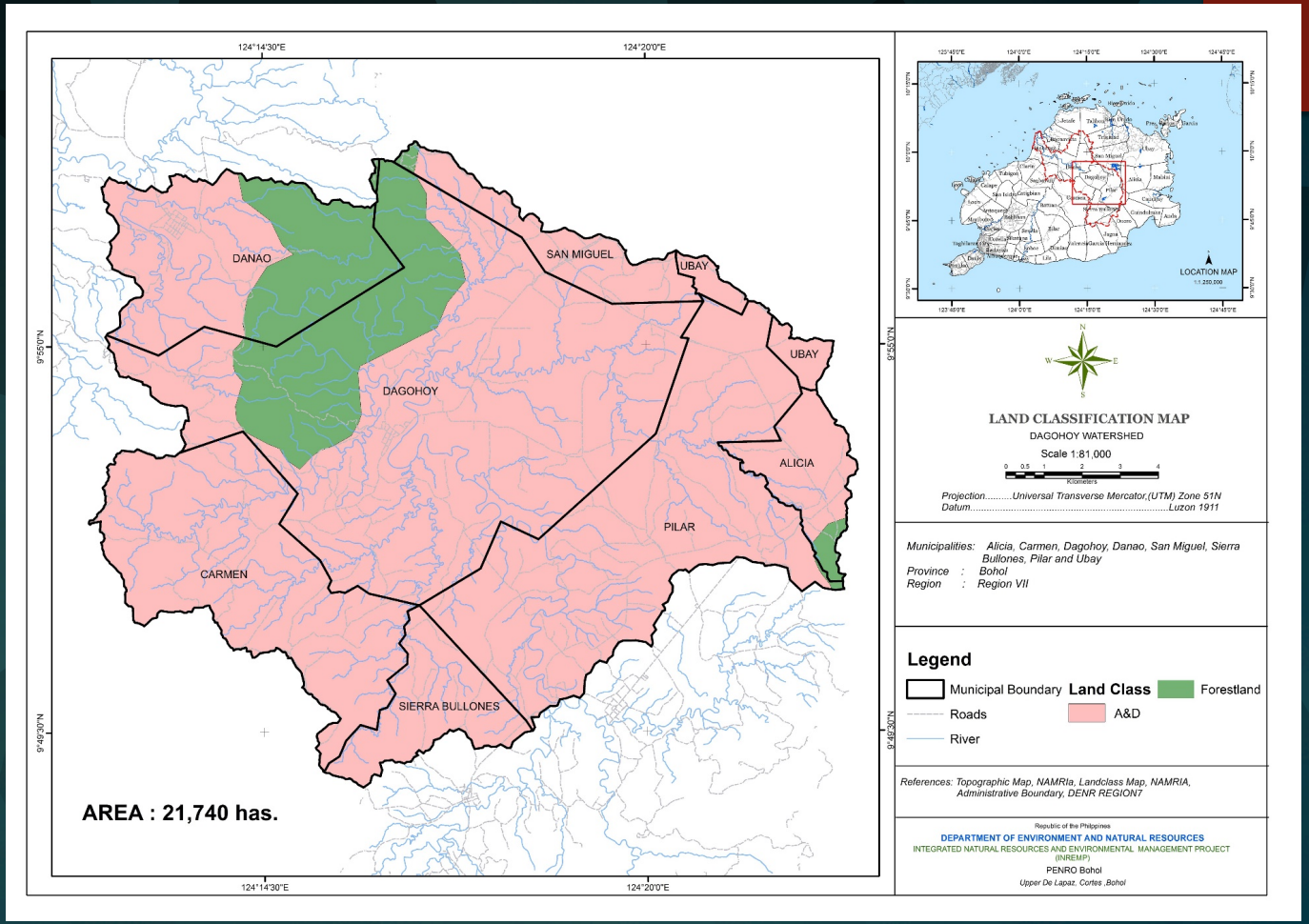
Preparation of Thematic Maps/ Base Maps

Municipal Boundary and Watershed boundary

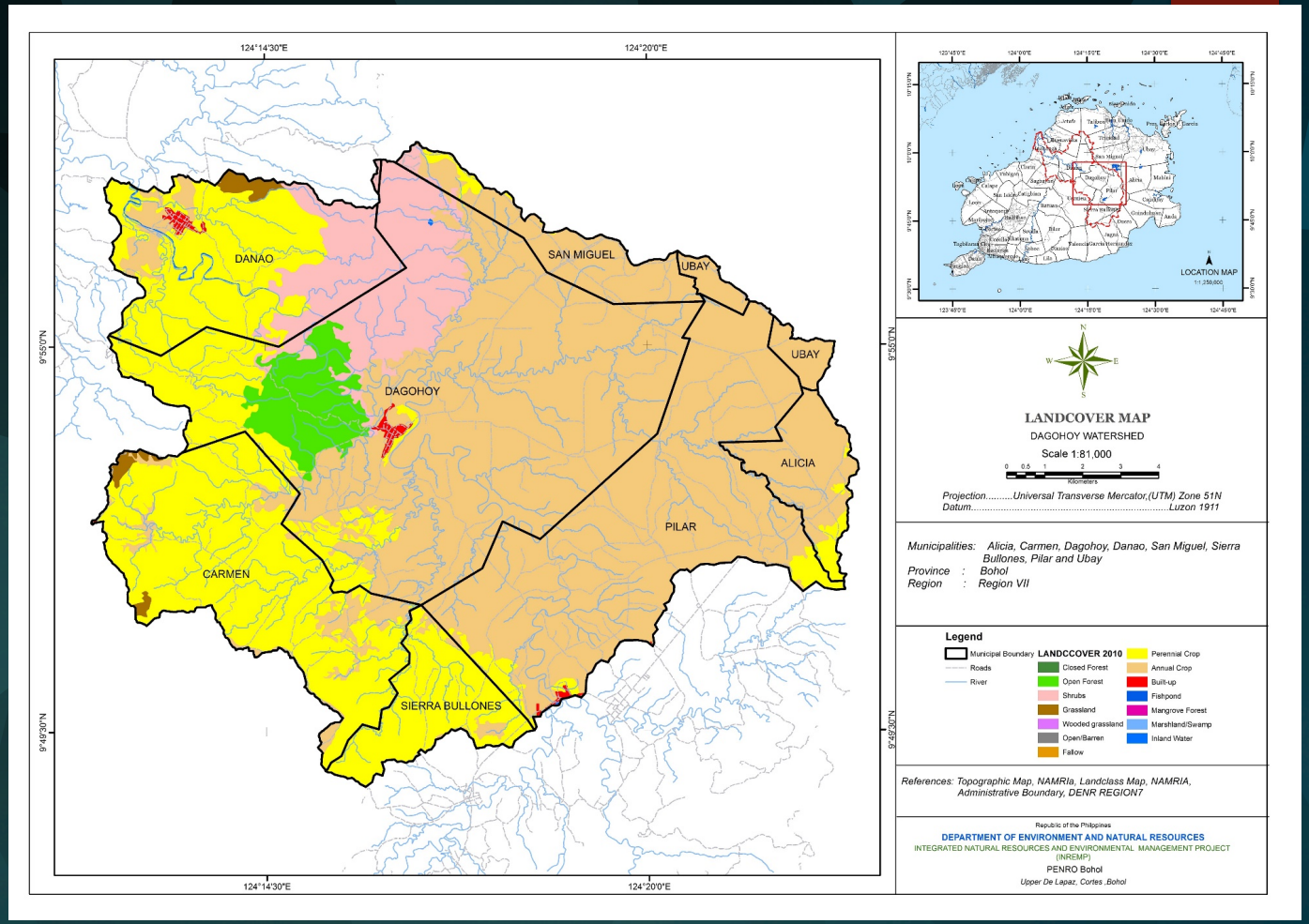


Land Classification

- Forestland
- Alienable & Disposable land

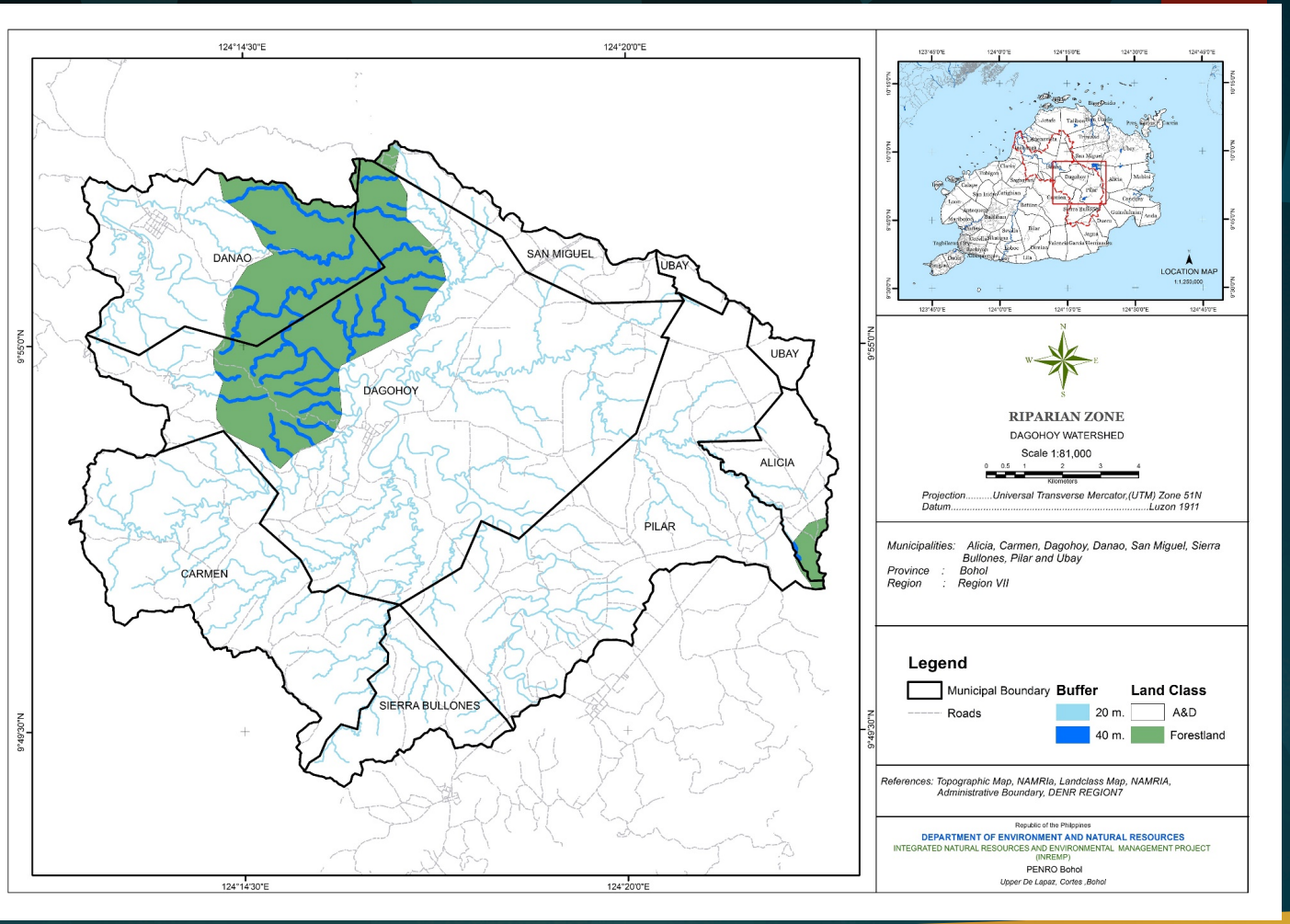


Land Cover 2010

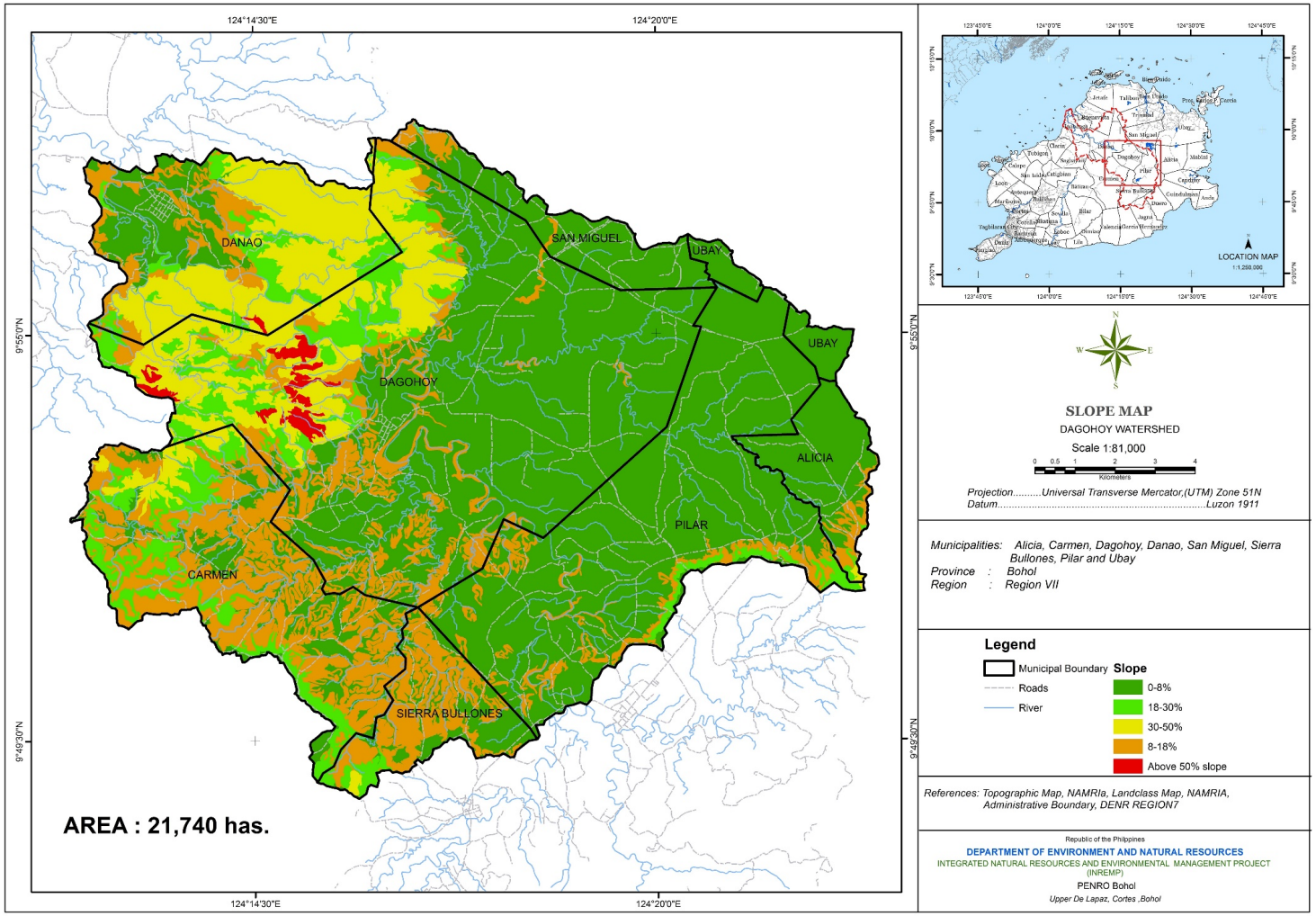


Riparian Zone

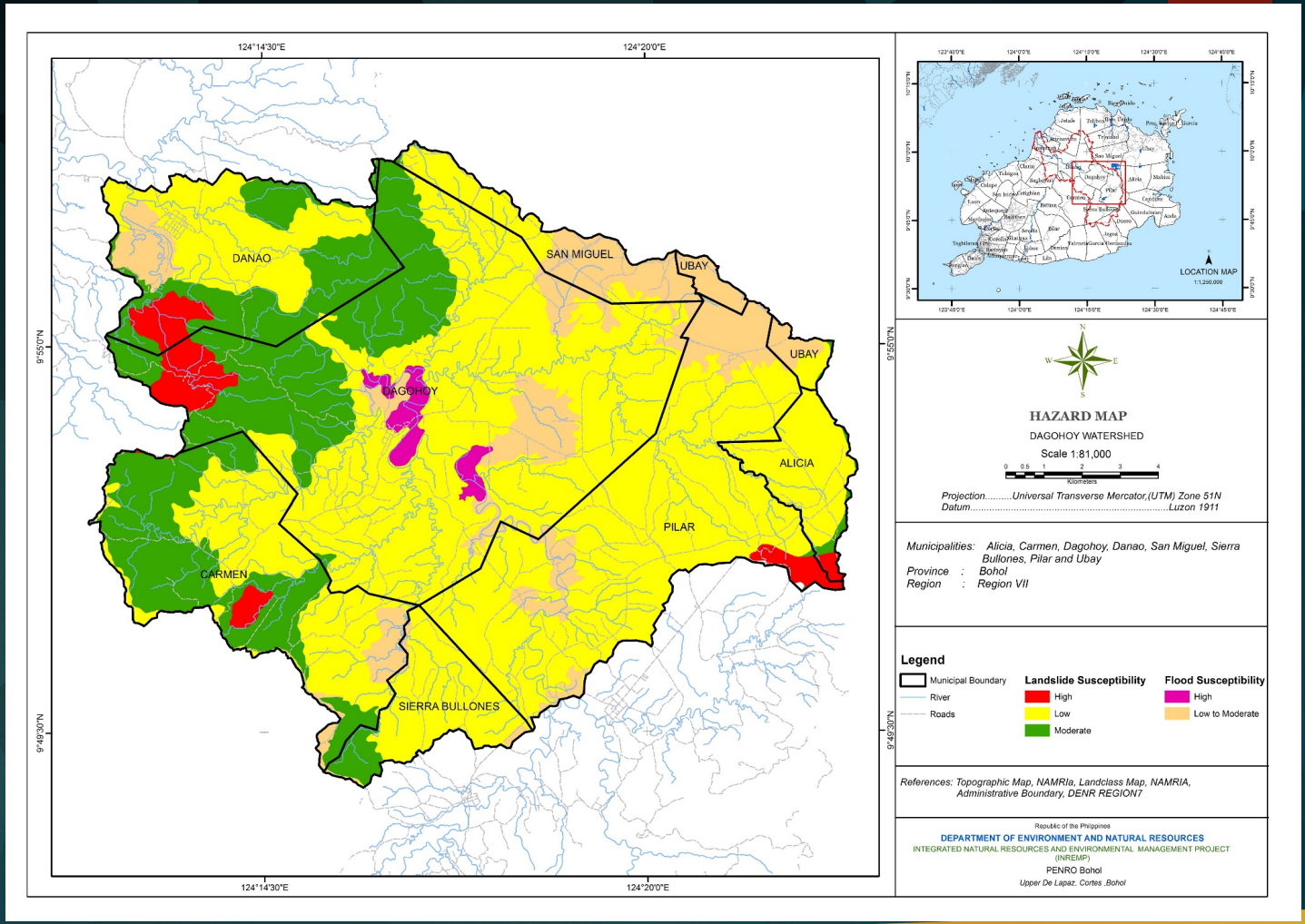
- within FL (buffer of 40x40m
- within A&D (Buffer of 20x20m)



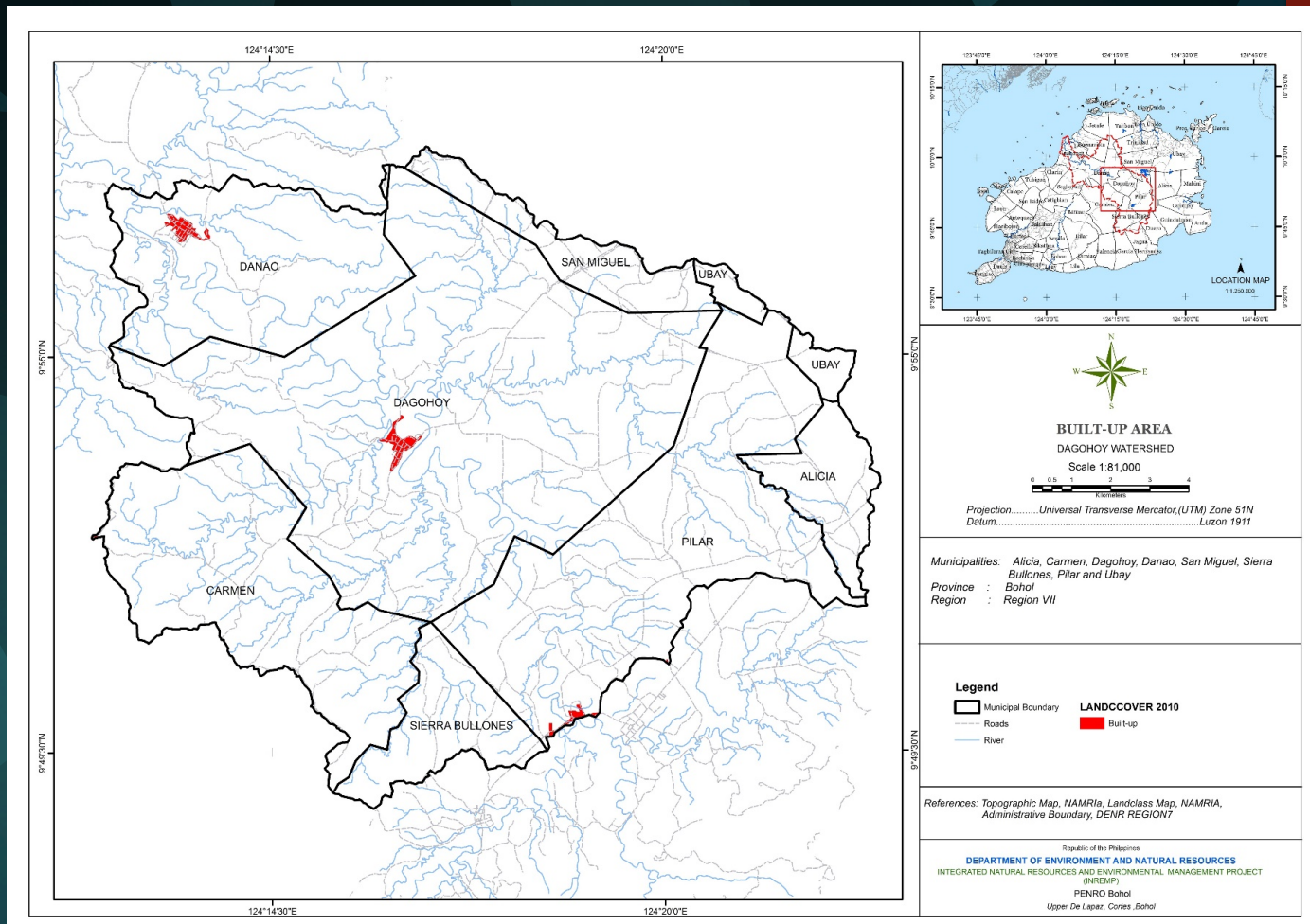
Slope Class


124°14'30"E
124°20'0"E
9°55'0"N
9°49'30"N
DANAO
SAN MIGUEL
UBAY
UBAY
DAGOHOY
ALICIA
PILAR
CARMEN
SIERRA BULLONES
AREA : 21,740 has.
LOCATION MAP
1:1,250,000
SLOPE MAP
DAGOHOY WATERSHED
Scale 1:81,000
0 0.5 1 2 3 4
Kilometers
Projection.....Universal Transverse Mercator,(UTM) Zone 51N
Datum.....Luzon 1911
Municipalities: Alicia, Carmen, Dagohoy, Danao, San Miguel, Sierra Bullones, Pilar and Ubay
Province : Bohol
Region : Region VII
Legend
Municipal Boundary
Roads
River
Slope
0-8%
18-30%
30-50%
8-18%
Above 50% slope
References: Topographic Map, NAMRIa, Landclass Map, NAMRIA, Administrative Boundary, DENR REGION7
Republic of the Philippines
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
INTEGRATED NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT PROJECT (INREMP)
PENRO Bohol
Upper De Lapaz, Cortes ,Bohol

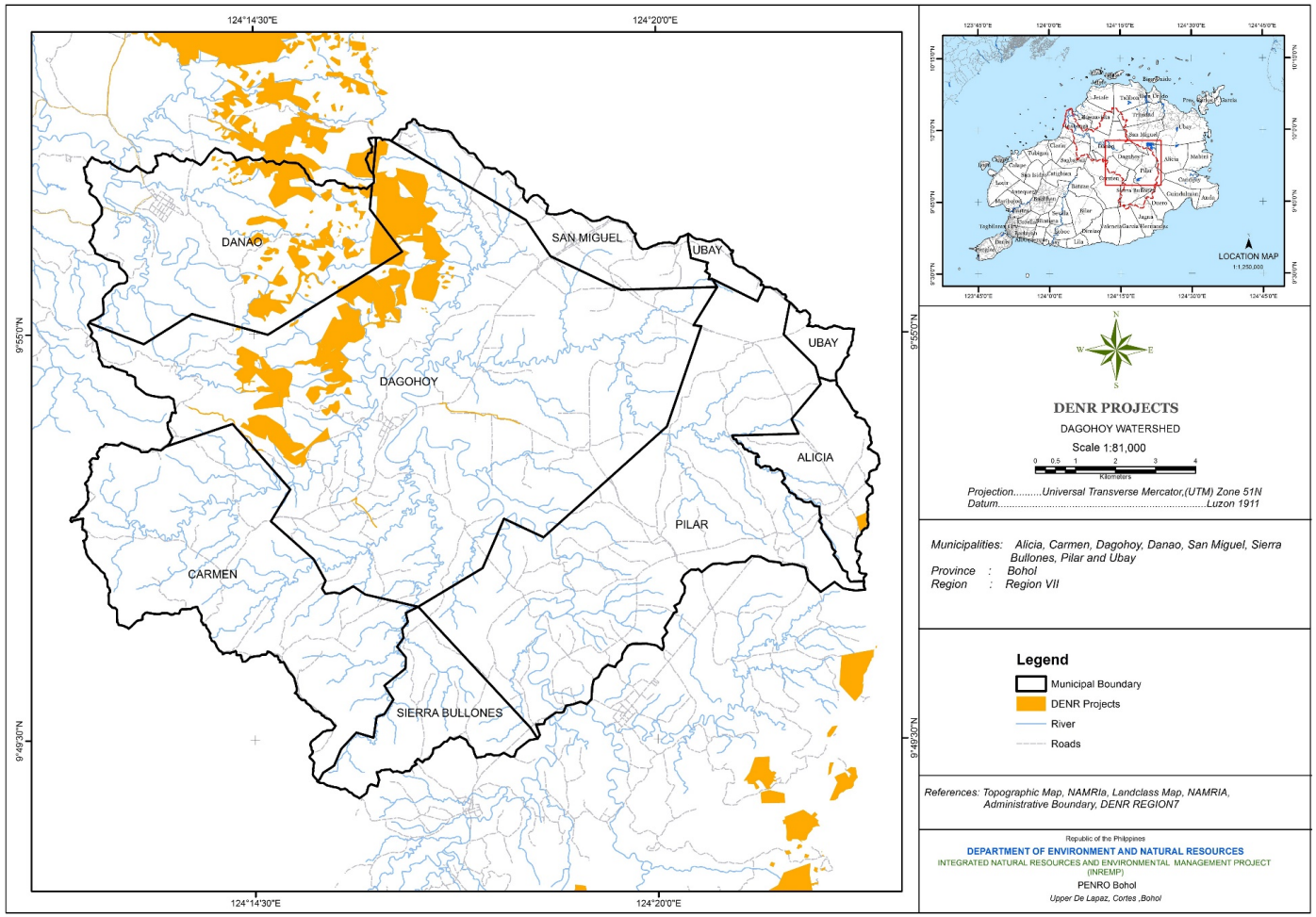
GEOHAZARD
-Landslide Susceptibility
-Flood Susceptibility



Built-Up Areas



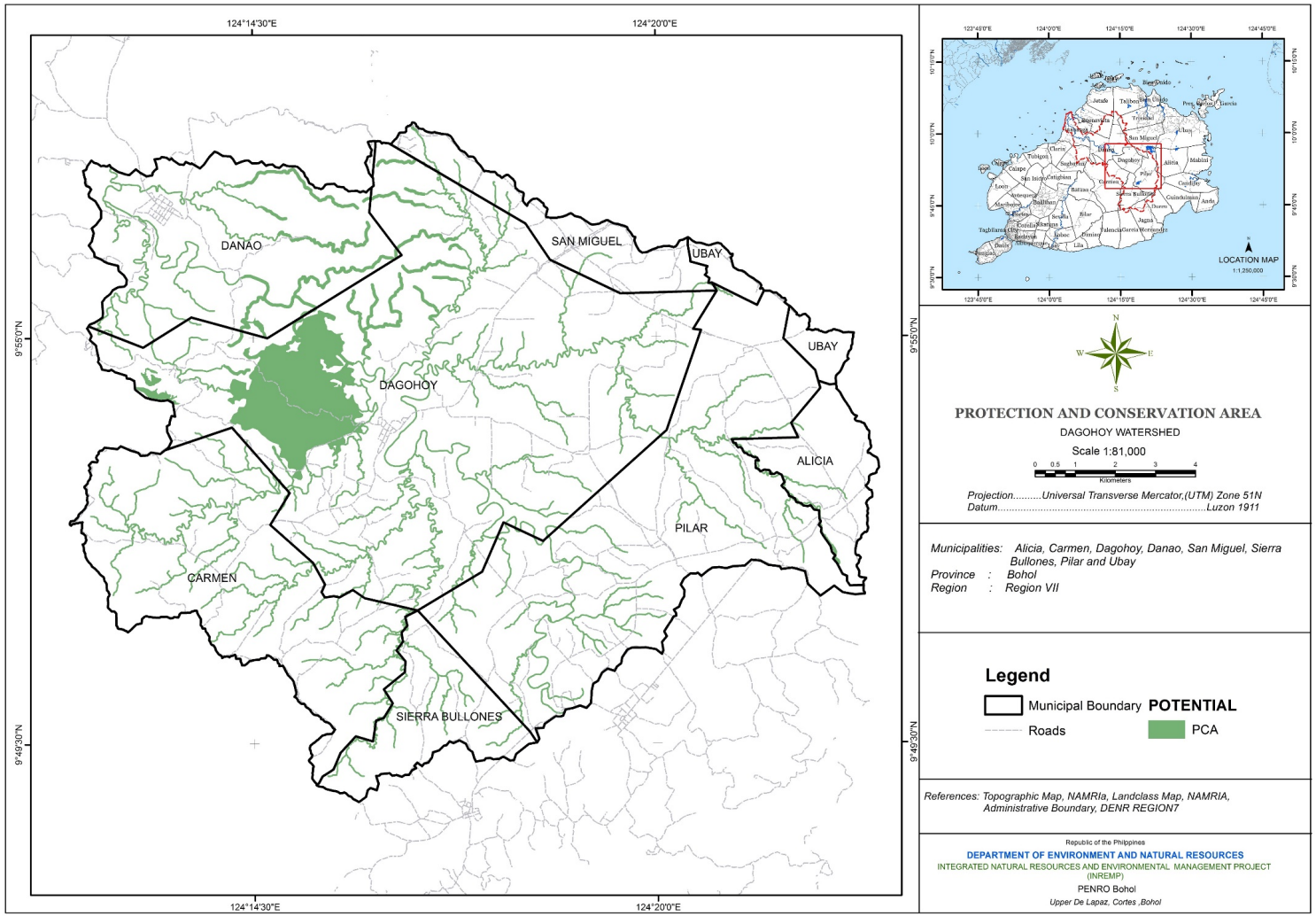
DENR PROJECTS
- National Greening Program
- UDP
- BFP
- YOLANDA



SET A. Parameter for Identifying Protection and Conservation Areas (PCAs)

- All natural Closed and Open Canopy Forest (EO 23-2011)
- Mangrove Forest
- Nipas Areas (RA 7586)
- All degraded/ Marginal forestland for ecological restoration that are above 1000 masl and above 50% slope (PD705 Sec 15)
- IPRA-and Tenured area designed conservation area
- Local and communal Watershed
- Representative ecosystem (elevation, type, corridors)
- Caves and unique natural and cultural attractions
- Local and national heritage sites
- Marine protected areas/ fish sanctuaries (fisheries code, NIPAS)
- Riparian Zone (40m x 40m (FL), 20m x 20m (A&D)

PCA= 2,319 has

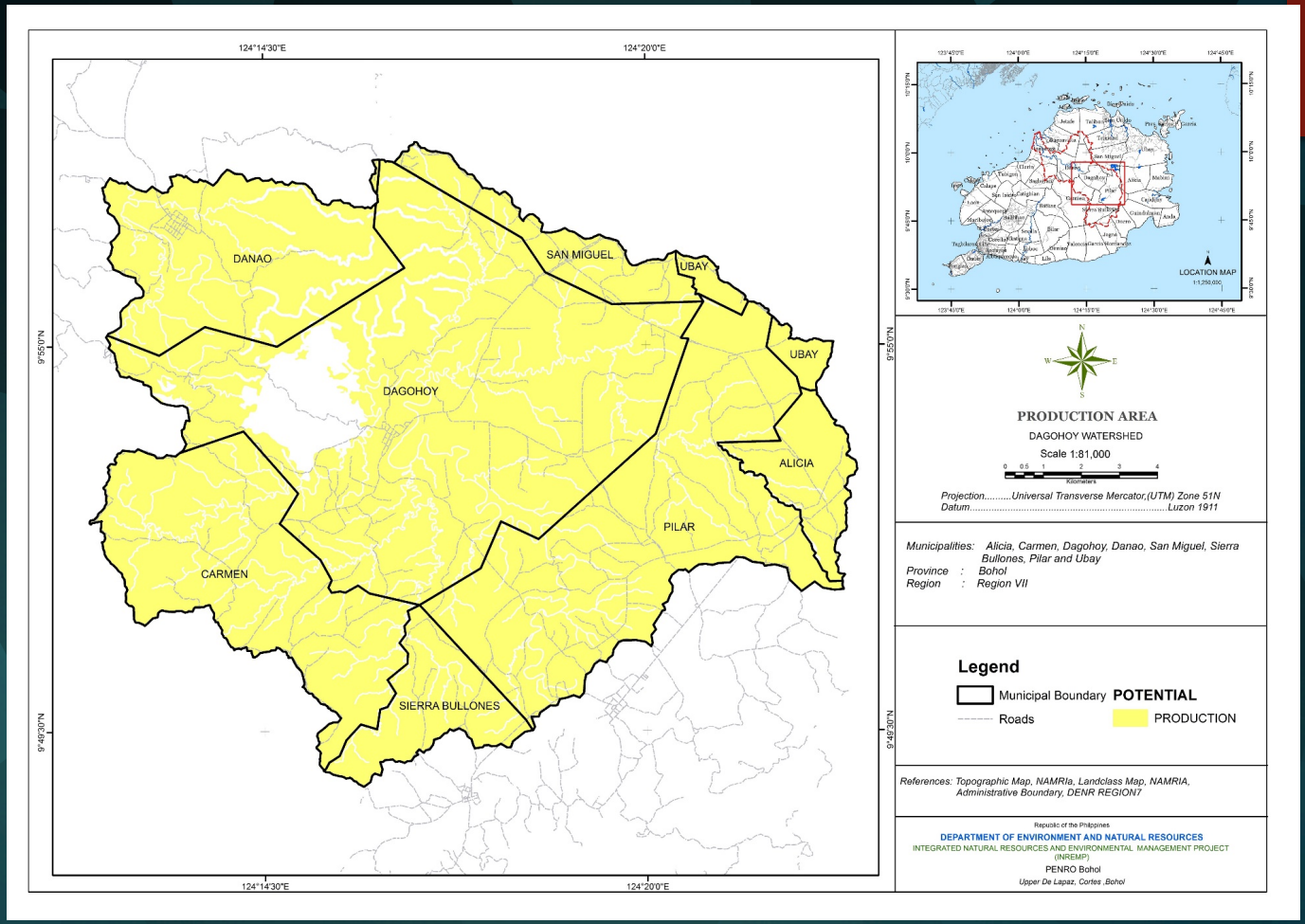

124°14'30"E
124°20'0"E
9°55'0"N
9°49'30"N
DANAO
SAN MIGUEL
UBAY
DAGOHOY
ALICIA
PILAR
CARMEN
SIERRA BULLONES
LOCATION MAP
1:1,250,000
N
W
E
S
PROTECTION AND CONSERVATION AREA
DAGOHOY WATERSHED
Scale 1:81,000
0 0.5 1 2 3 4
Kilometers
Projection.....Universal Transverse Mercator,(UTM) Zone 51N
Datum.....Luzon 1911
Municipalities: Alicia, Carmen, Dagohoy, Danao, San Miguel, Sierra Bullones, Pilar and Ubay
Province : Bohol
Region : Region VII
Legend
Municipal Boundary
POTENTIAL
Roads
PCA
References: Topographic Map, NAMRIa, Landclass Map, NAMRIA, Administrative Boundary, DENR REGION7
Republic of the Philippines
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
INTEGRATED NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT PROJECT (INREMP)
PENRO Bohol
Upper De Lapaz, Cortes ,Bohol

SET B. Parameter for Identifying Production Areas

- What remain in Protection is for Production areas in FL and A&D
- Existing Agricultural Areas, Agroforestry Sites, Tree Plantations,
- Shrub lands, Grassland, Wooded Grassland, Perennial, Annual crops, Open/ Barren, Fallow
- High Hazard Areas with existing production and adaptation method
- Excluding Built-up/Settlement areas
- Less Other Existing Projects (UDP, NGP, CHARMP, etc.)

Production Area (FL and A and D)

Production=19,421has



General PCAs and productio Area

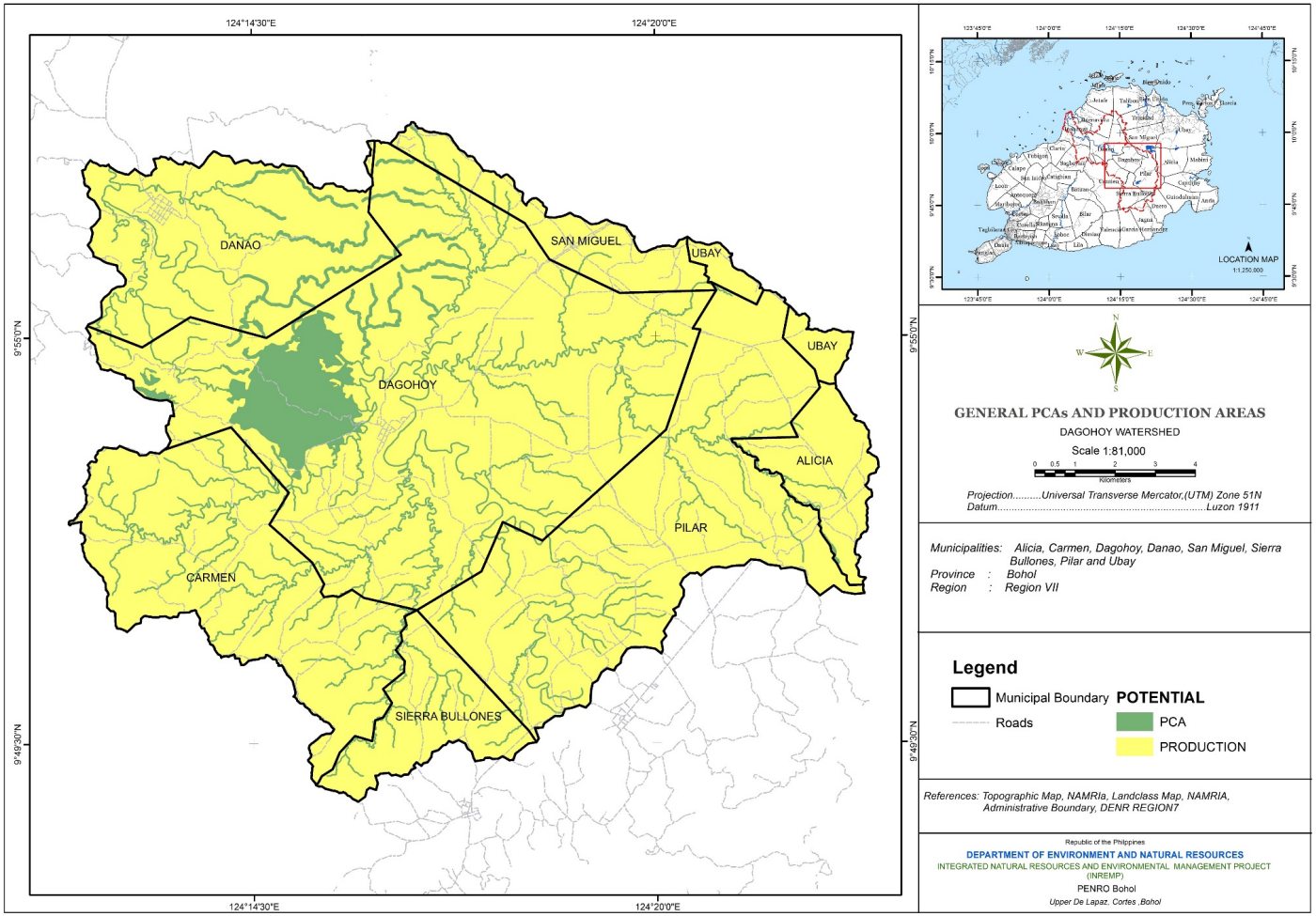
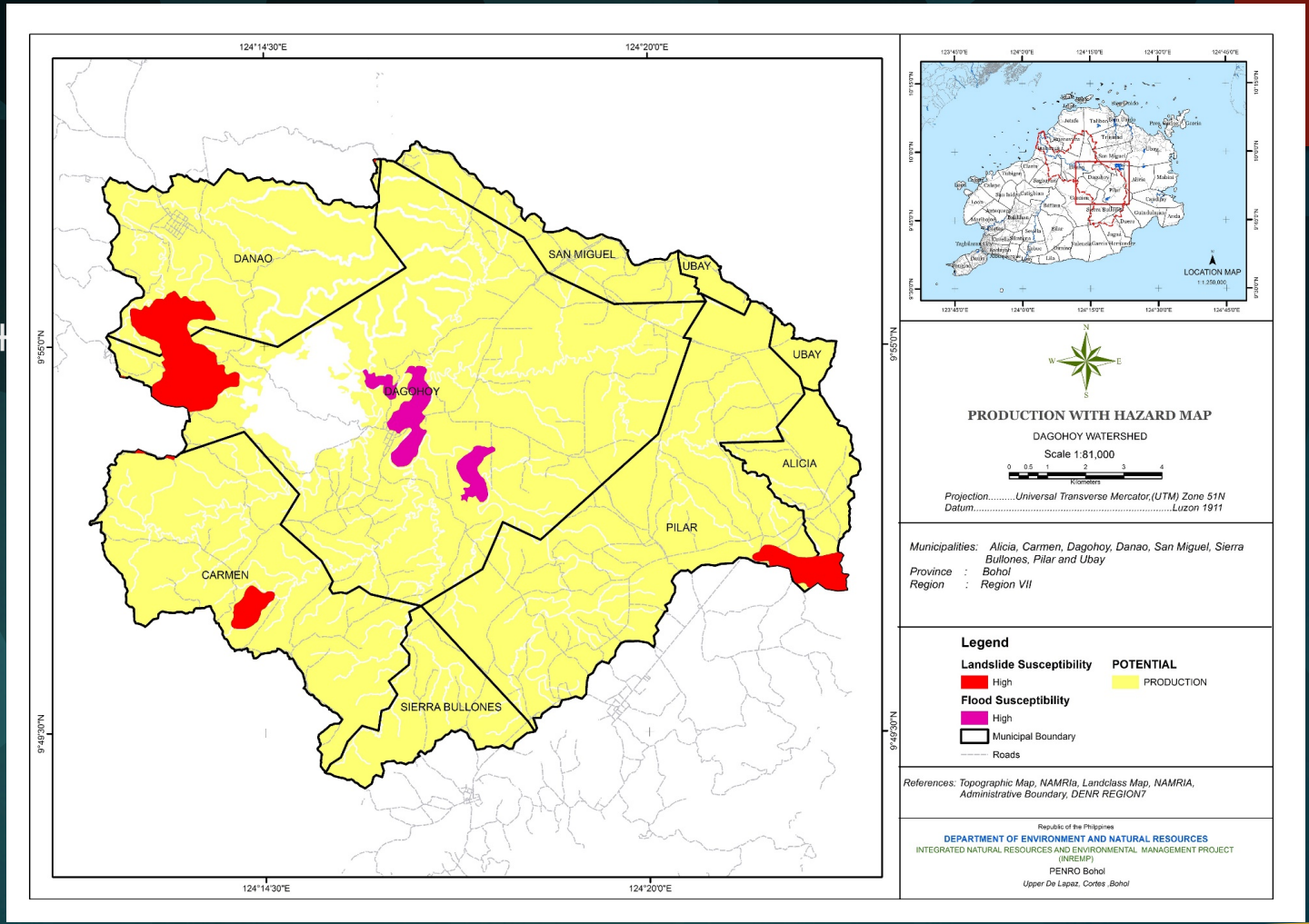


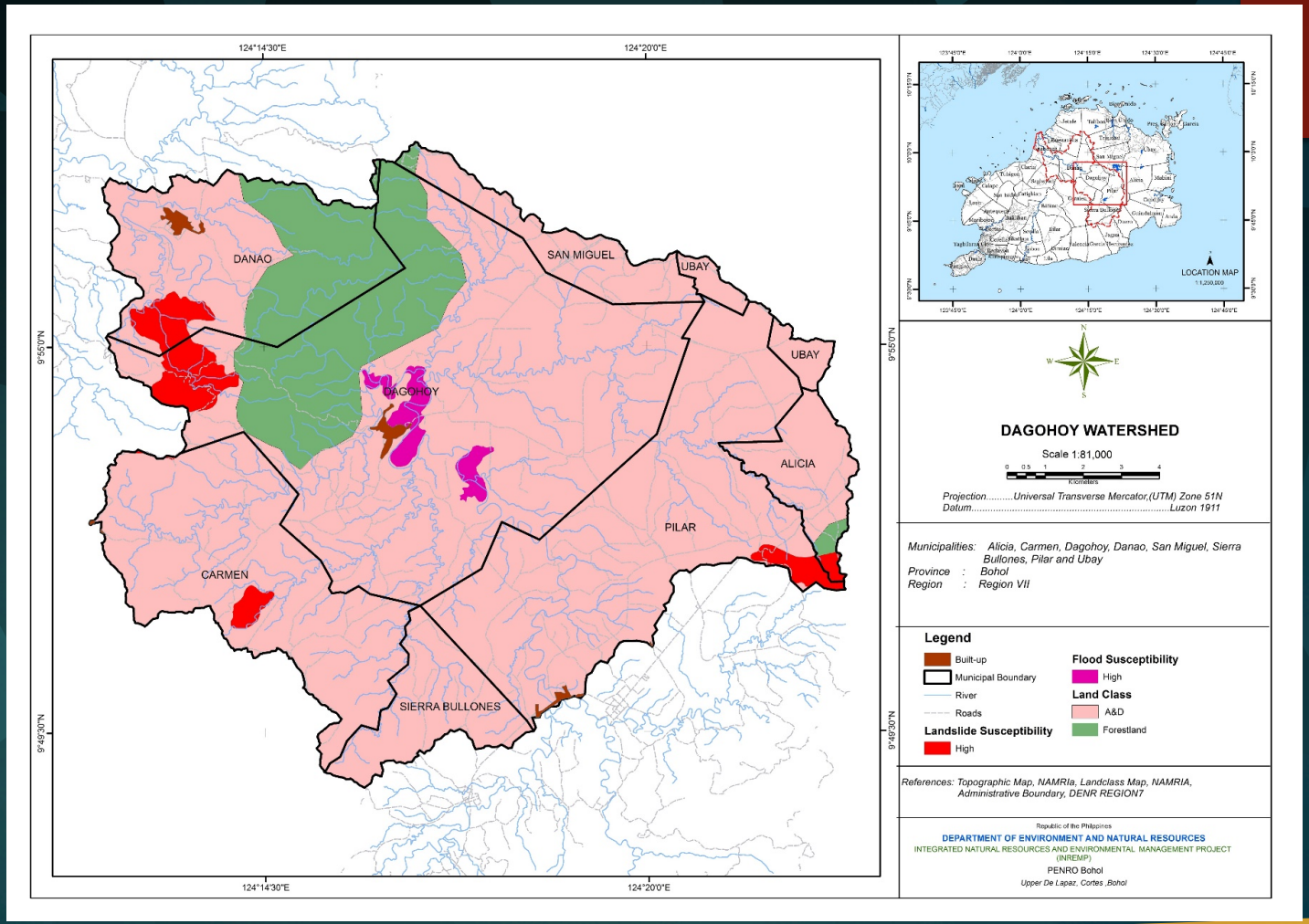
Table 1. General Protection and Conservation Areas and Production Areas

Municipality	Protection (PCA)			Production			Grand Total
	Forestland	A and D	Total	Forestland	A and D	Total	
	Area (ha)			Area (ha)			
ALICIA	4	24	28	79	654	733	761
CARMEN		252	252		2,997	2,997	3,248
DAGOHOY	856	592	1,448	967	6,043	7,010	8,458
DANAO	145	129	274	944	1,418	2,362	2,636
PILAR	0	227	228	13	4,274	4,287	4,515
SAN MIGUEL	1	22	23	28	769	797	820
SIERRA BULLONES		66	66		934	934	1,000
UBAY		0	0		301	301	301
Grand Total	1,007	1,312	2,319	2,031	17,390	19,421	21,740

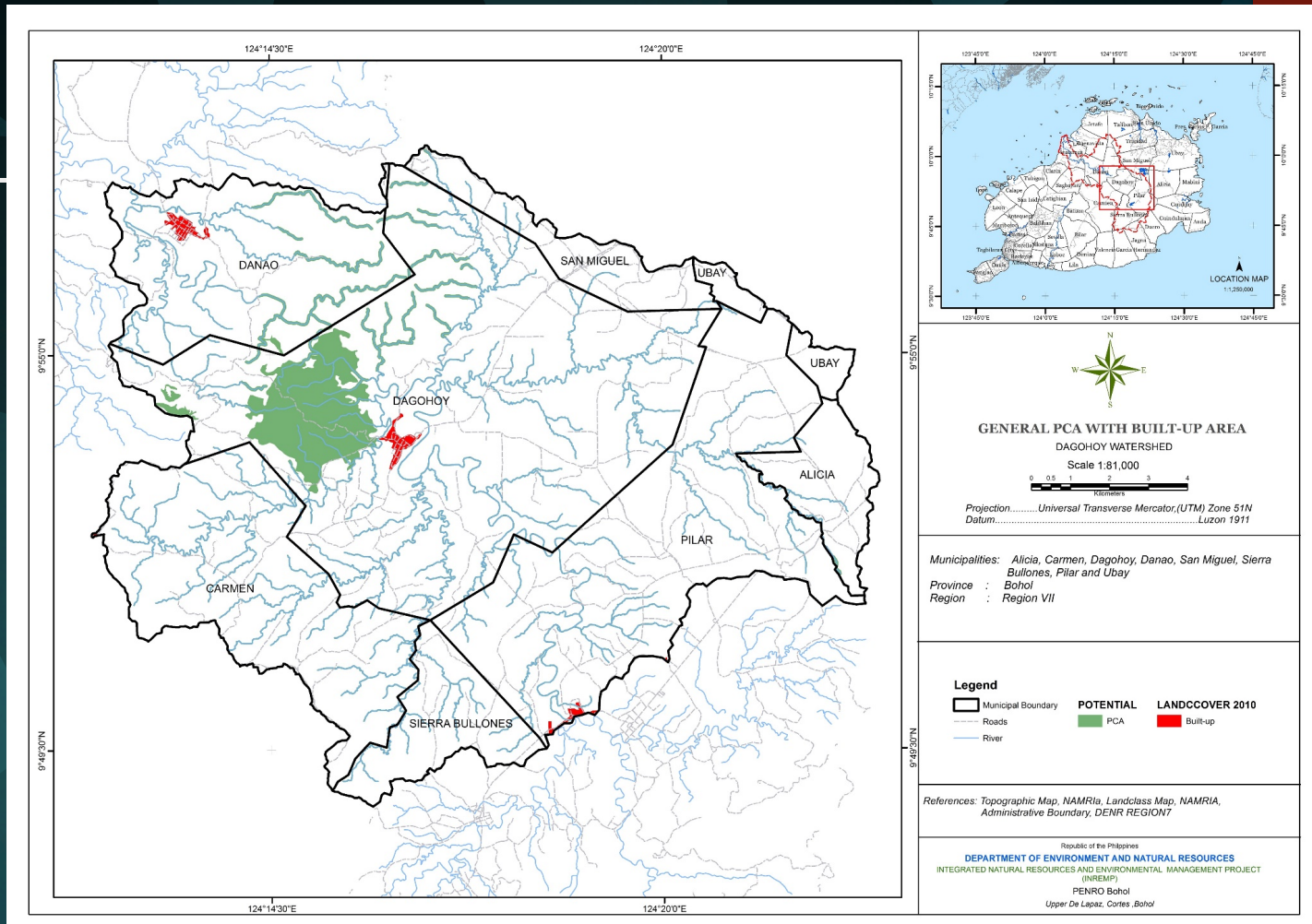
General production + Hazard



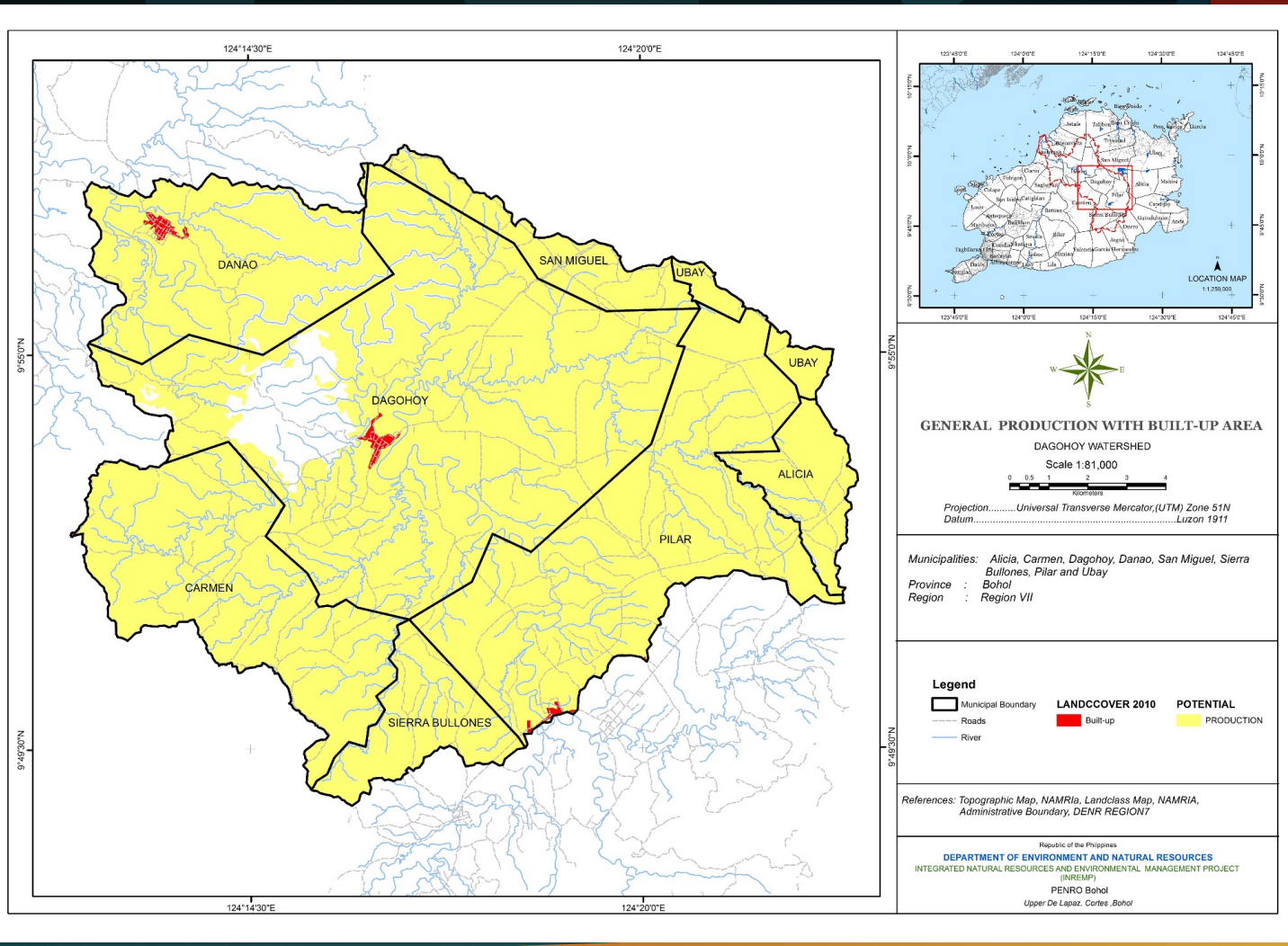
Built-up (FL and A&D) + Hazard



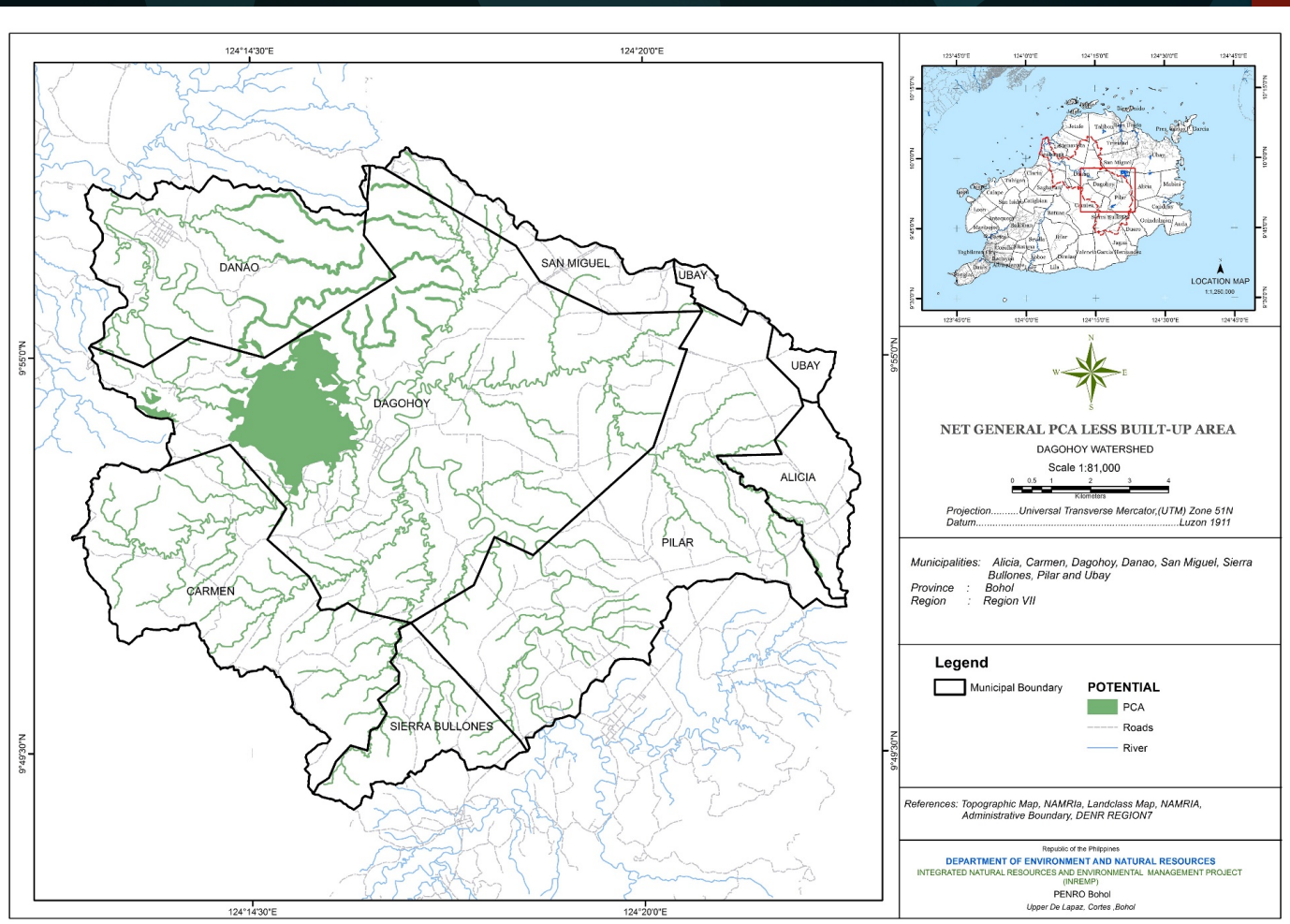
General PCA + Built-up



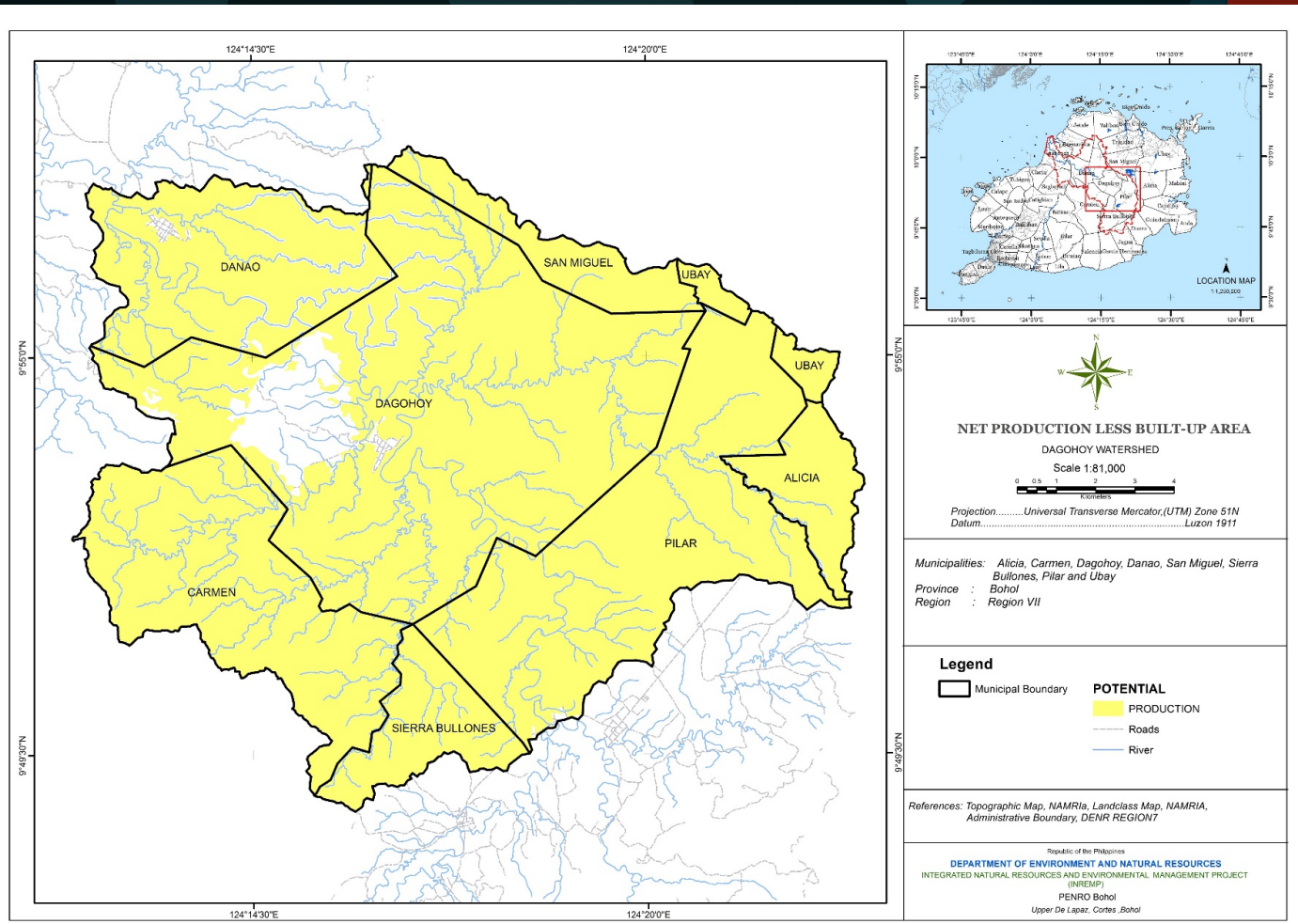
General Production Areas + Built-up



Net PCAs + Tenure and (less Built-up areas)



Net Production
less Built-up



Net PCA and Production less Built-up

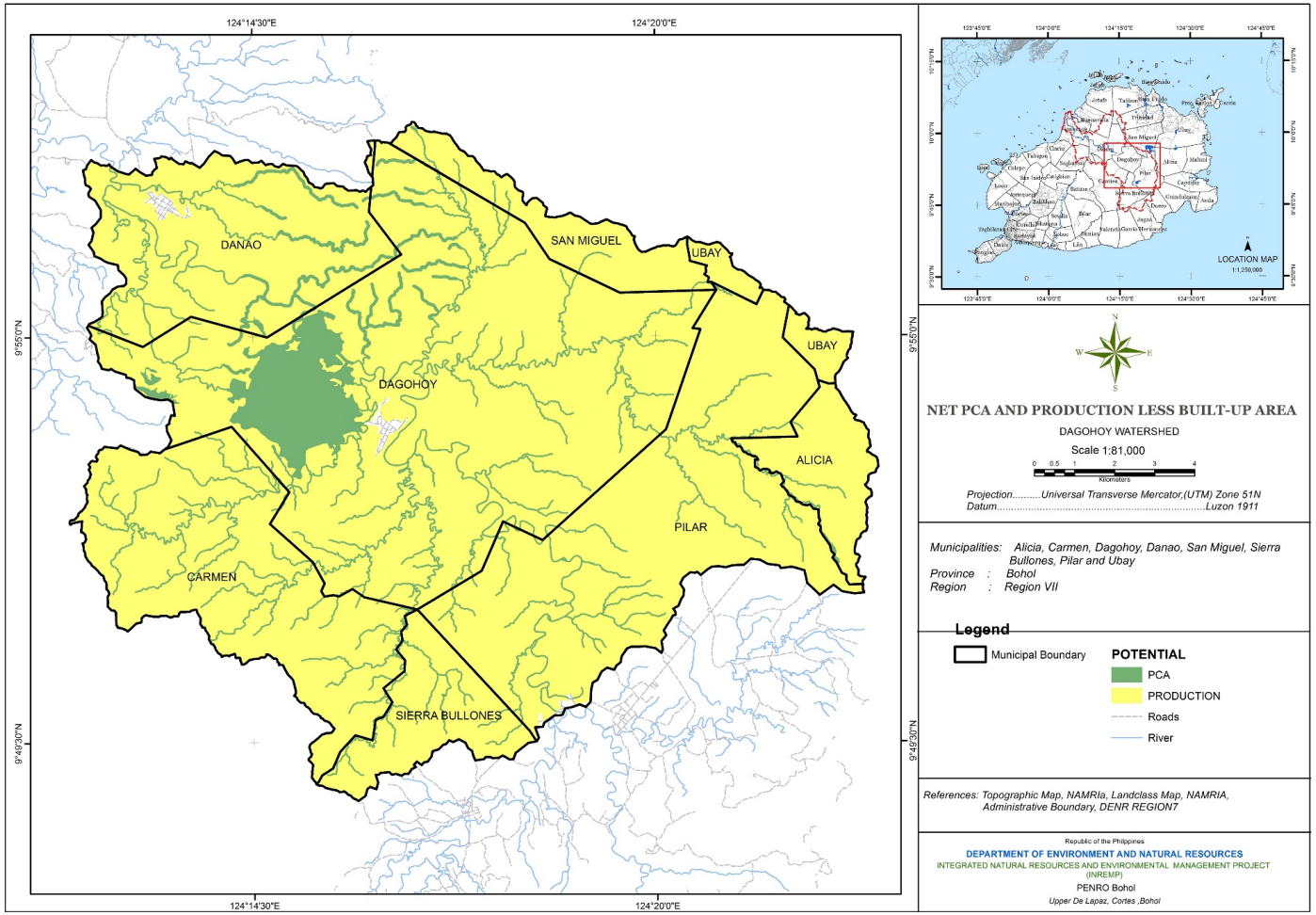
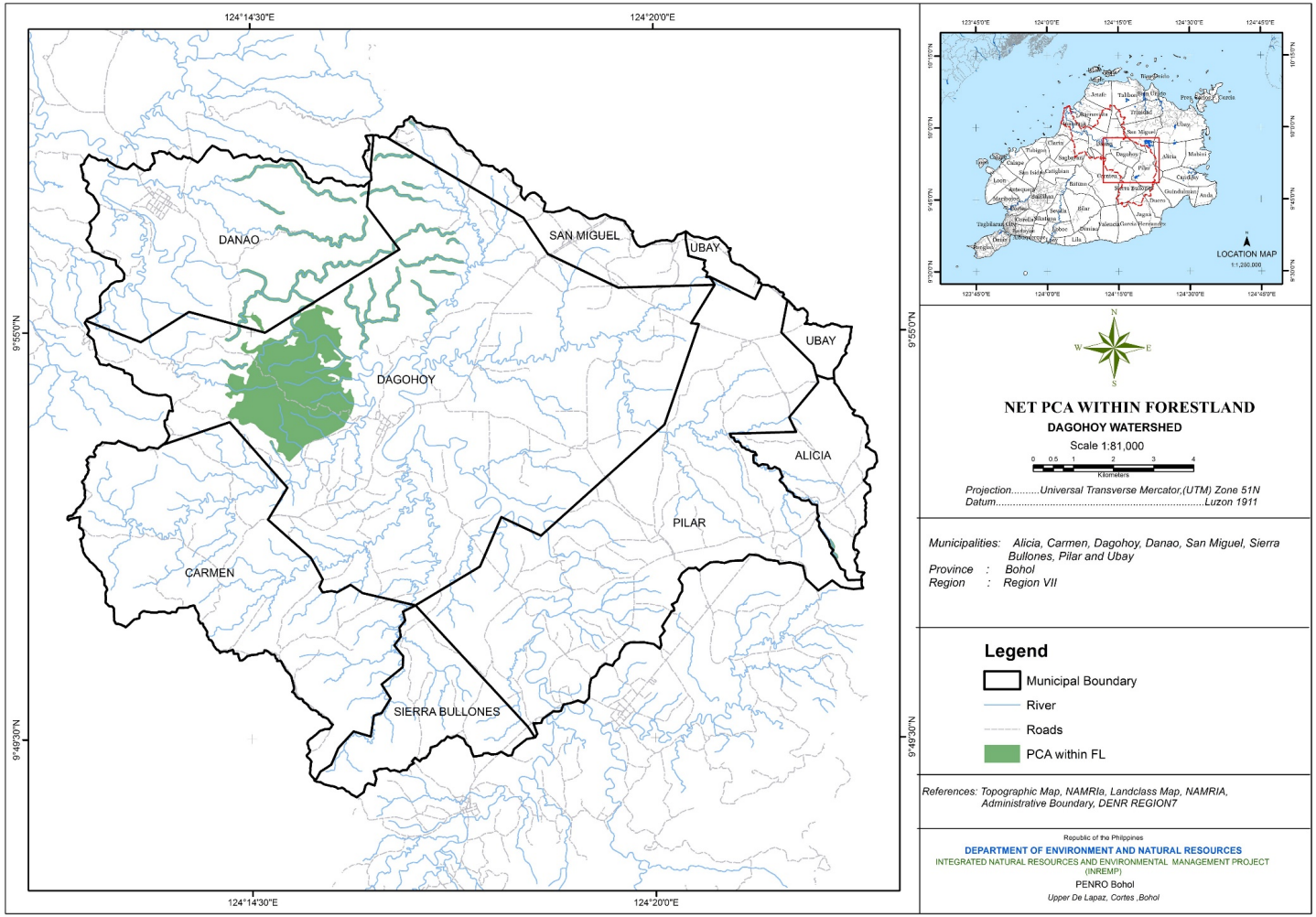


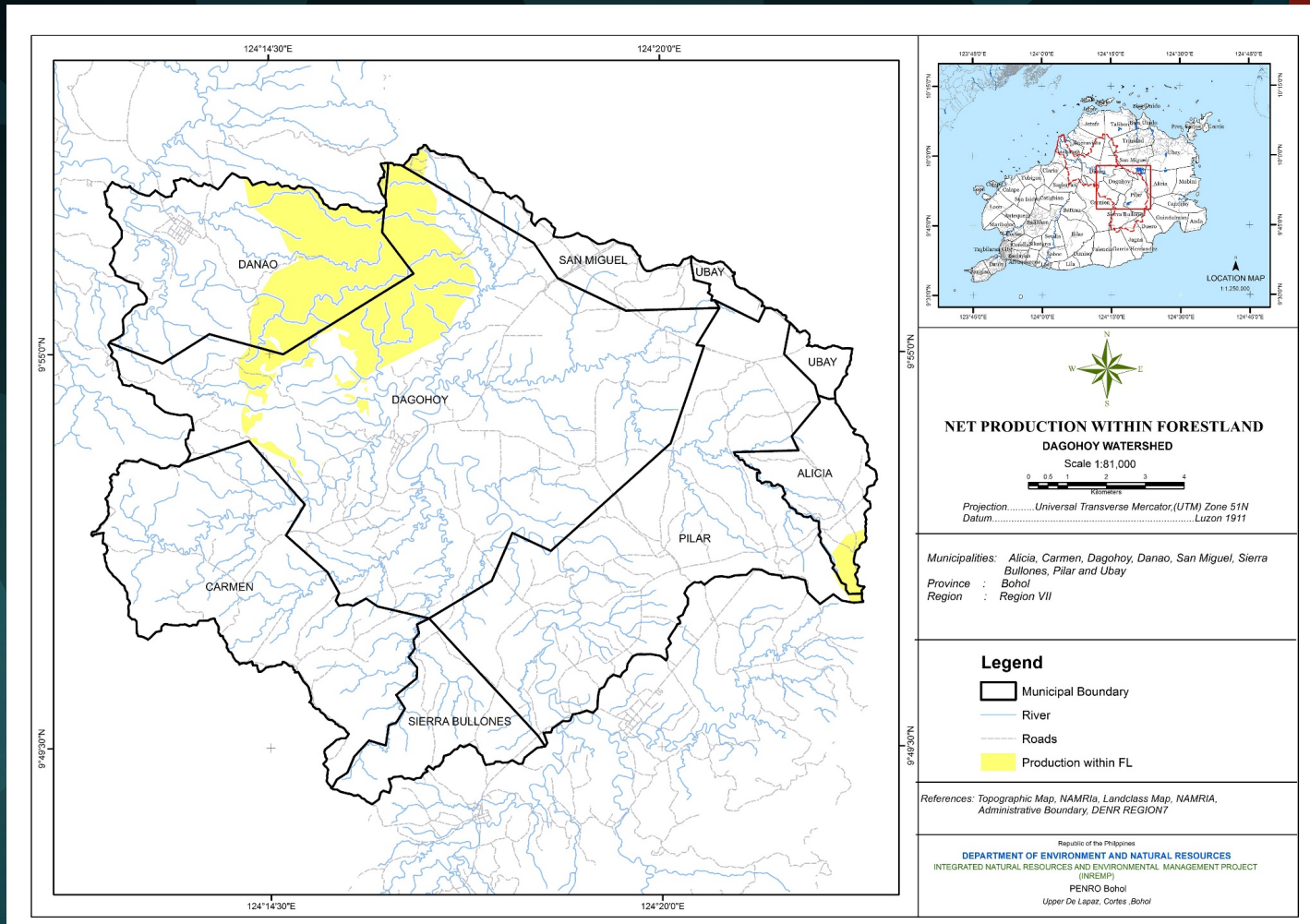
Table 2. High Hazard Areas within Protection and Production Zone by LGUs

Base/Overlays Land Uses	ALICIA			CARMEN			DAGOHOY			DANAO			PILAR			SAN MIGUEL			SIERRA BULLONES			UBAY			Total Area		
	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding	Total Area	High Hazard Landslide	High Hazard Flooding
PCA-with Closed and Open forest	-	-	-	-	-	-	732	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	732	-	-
PCA-with out Forest	28	1	-	252	6	-	716	46	29	274	16	-	228	1	-	23	-	-	66	-	-	-	-	-	1,587	71	29
Settlements/ Built-up (Protection Areas)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NET PCA = (A+B)-C	**28**	**1**	**-**	**252**	**6**	**-**	**1,448**	**46**	**29**	**274**	**16**	**-**	**228**	**1**	**-**	**23**	**-**	**-**	**66**	**-**	**-**	**-**	**-**	**-**	**2,319**	**71**	**29**
Production (Forestlands)	79	-	-	-	-	-	967	-	-	944	-	-	13	-	-	28	-	-	-	-	-	-	-	-	2,031	-	-
Production (A&D)	654	-	-	2,997	72	-	6,043	227	239	1,418	174	-	4,274	102	-	769	-	-	934	-	-	301			17,390	574	239
Settlements/ Built-up (Production Areas in FL)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Settlements/ Built-up (Production Areas in A&D)	-	-	-	2	-	-	38	-	8	35	-	-	16	-	-	-	-	-	-	-	-	-	-	-	90	-	8
NET Production Areas (FL) = E-G	**79**	**-**	**-**	**-**	**-**	**-**	**967**	**-**	**-**	**944**	**-**	**-**	**13**	**-**	**-**	**28**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2,031**	**-**	**-**
NET Production Areas (A&D) = F-H	654	-	-	2,995	72	-	6,005	227	231	1,383	174	-	4,258	102	-	769	-	-	934	-	-	301	-	-	17,300	574	231
TOTAL= (Net PCA + Net Production (FL) + Net Production (A&D)	761	1	-	3,247	78	-	8,420	273	260	2,601	190	-	4,499	103	-	820	-	-	1,000	-	-	301	-	-	21,650	645	260
TOTAL Settements (C + G +H)	-	-	-	2	-	-	38	-	8	35	-	-	16	-	-	-	-	-	-	-	-	-	-	-	90	-	8

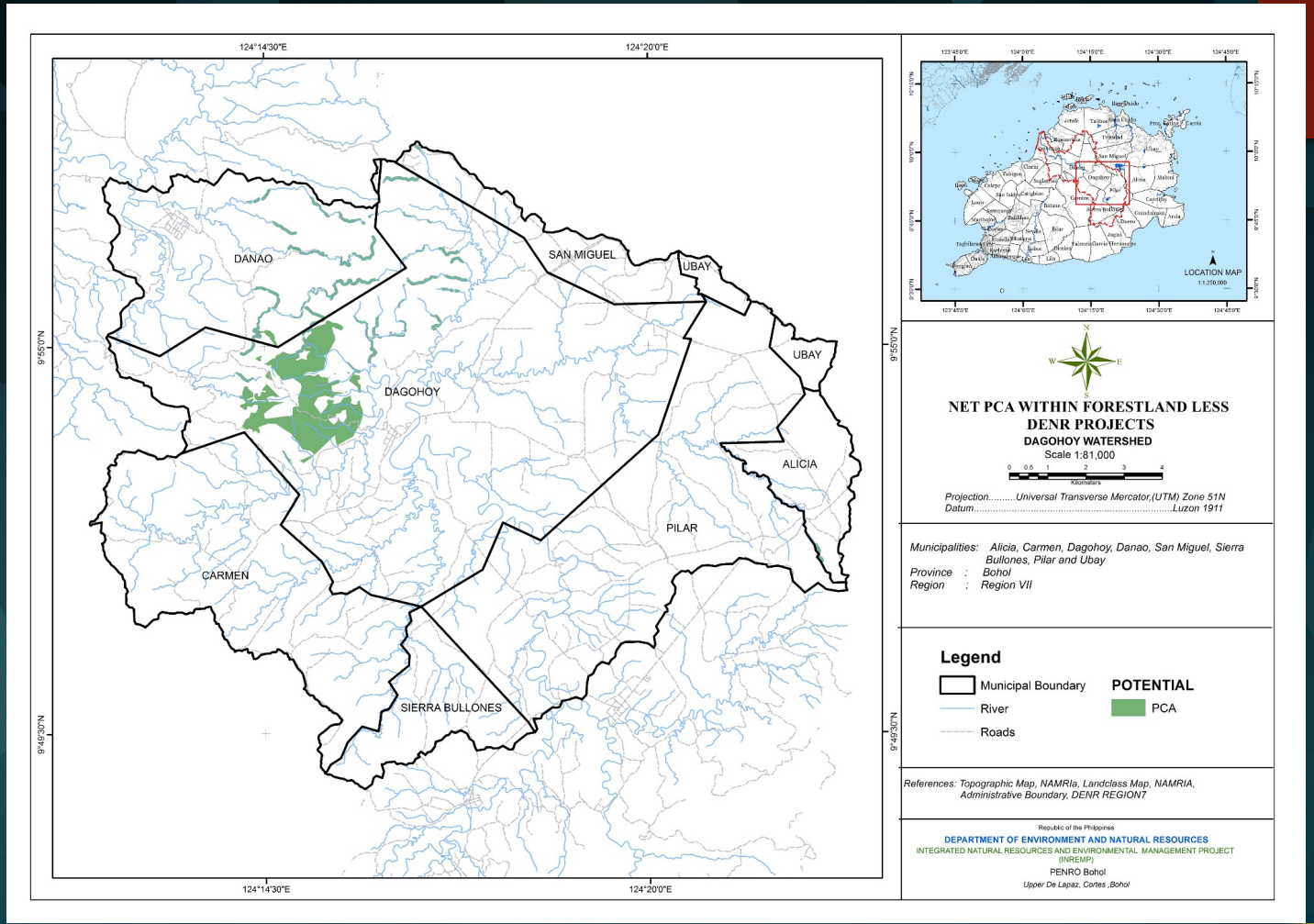
Net PCA (Mangrove, Close and Open, Slope within FL + Tenure



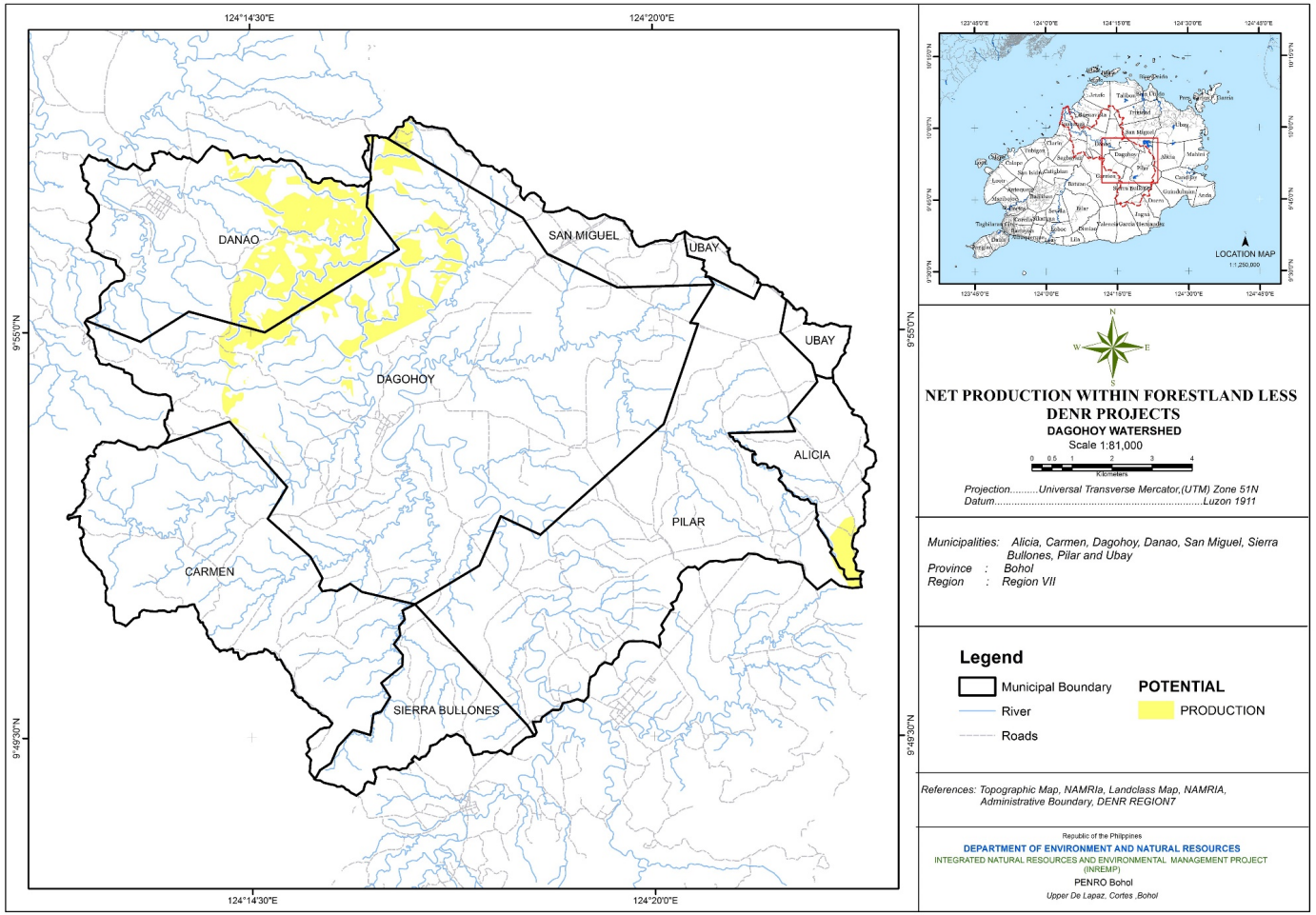
Net Production Areas within FL + Tenure



Net PCAs in FL less NGP+ Tenure



Net Production Areas within FL less NGP+ Tenure



Net **Production** Areas in FL less NGP+ Net **PCAs** in FL less NGP + Tenure

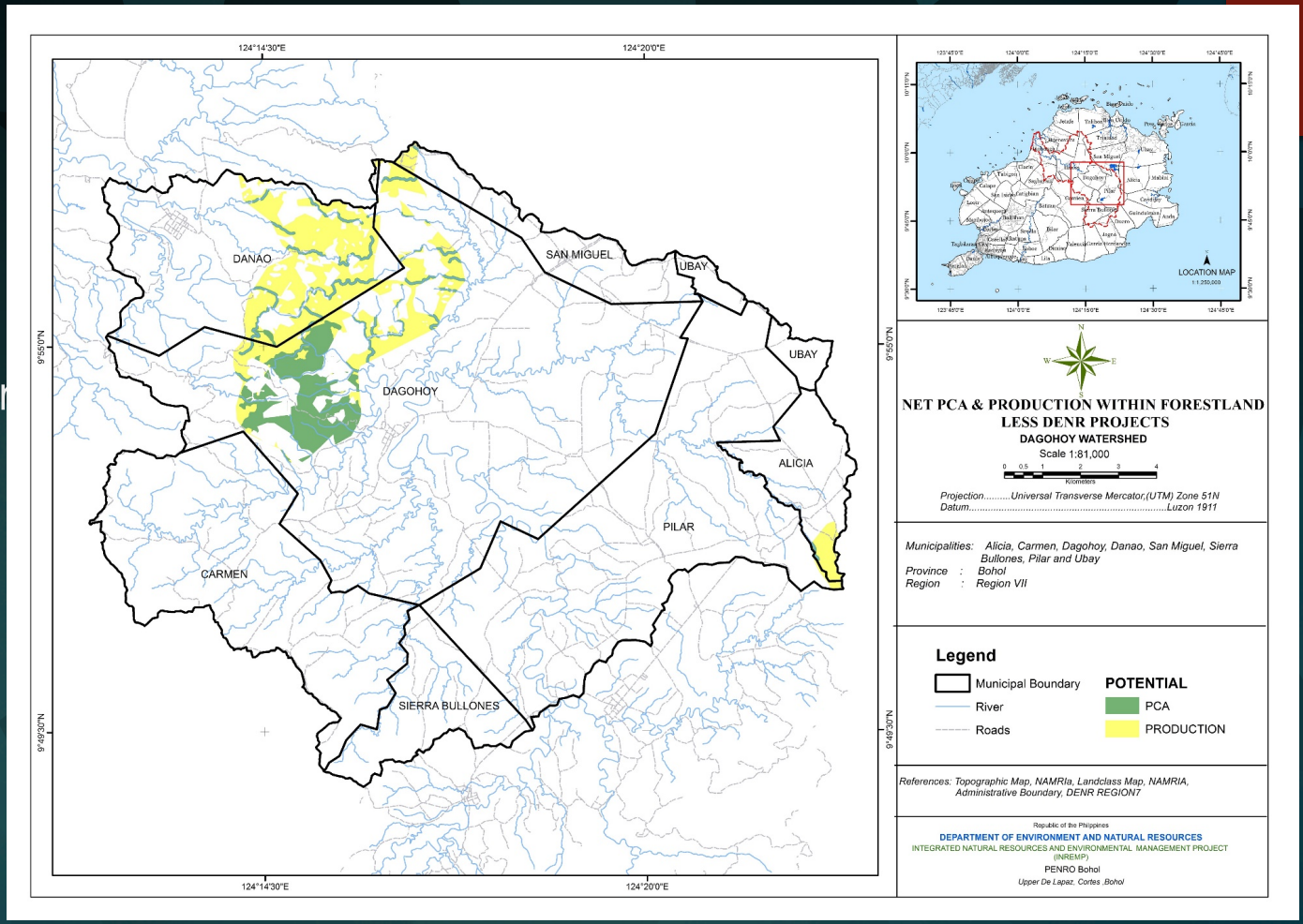


Table 3. Net Production and Protection Areas within Tenured Areas by LGUs

	ALICIA			DAGOHOY			DANAO			PILAR			SAN MIGUEL			Total Area	Total Area (Ha)	
Overlays/ Base Maps	Total Area (Ha)	Possible Management Regime	Untenured Areas (Ha)	Total Area (Ha)	Possible Management Regime	Untenured Areas (Ha)	Total Area (Ha)	Possible Management Regime	Untenured Areas (Ha)	Total Area (Ha)	Possible Management Regime	Untenured Areas (Ha)	Total Area (Ha)	Possible Management Regime	Untenured Areas (Ha)	Untenured Areas (Ha)	High Hazard Landslide	High Hazard Flooding
Net PCA																		
within Close and Open Forest	-		-	692	CBP	692	-		-	-		-	-		-	692	-	-
without Forest Cover	4	REFO	4	164	REFO	164	145	REFO	145				1	REFO	1	314	2	-
Net Production Areas in FL	79	Agro	79	967	Agro	967	944	Agro	944	13	Agro	13	28	Agro	28	2,031	46	-
Remaining net investment in net PCA (Net PCA Less NGP, UDP, CHARMP, etc.)	4	REFO	4	533	CBP	533	95	REFO	95	-		-	1	REFO	1	633	2	-
Remaining net investment in net Production (Net Production Areas (FL) Less NGP, UDP, CHARMP, etc.)	70	Agro	70	466	Agro	466	640	Agro	640	13	Agro	13	28	Agro	28	1,217	46	-
TOTAL AREAS AVAILABLE FOR INREMP = E+G	74		74	999		999	735		735	13		13	29		29	1,850	48	-