

ECUADOR TEEB PILOT STUDY

COCA WATERSHED
ECUADORIAN AMAZON



This project is funded
by the European Union





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CONTENTS

Overview

- TEEB objectives
- Watershed importance
- Legal Environment Context, Ecosystem Services & Scenarios

Methodology

- Biophysical modelling
- Valuation Approach

Results

- Biophysical
- Economical

Proposal of Public Policies

Identifying Issues

Opportunities

Challenges





General Objective:

To inform policy makers how investing in natural capital supports the transformation of the country's productive and energy matrix.

(Incentive Nationwide Programs "Socio Bosque" - Forest Partner)



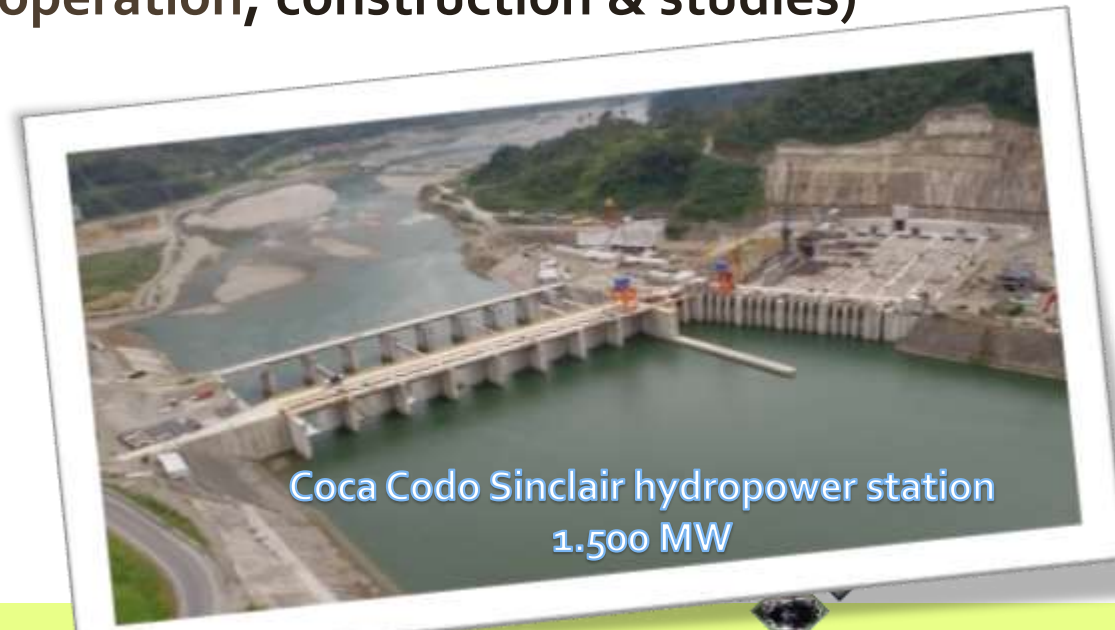
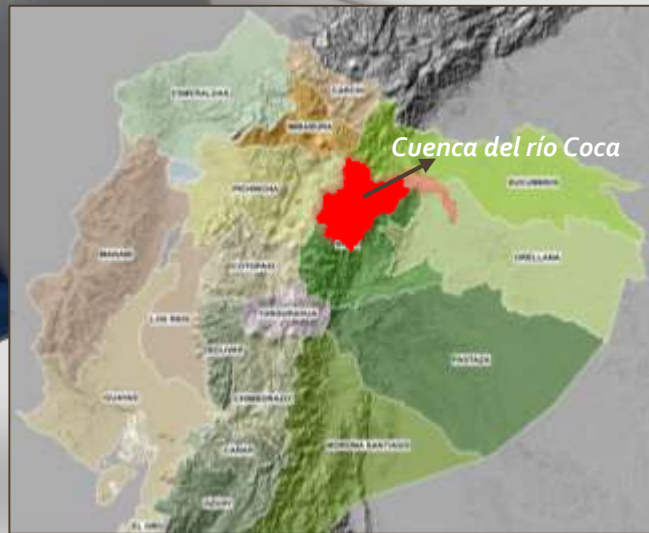
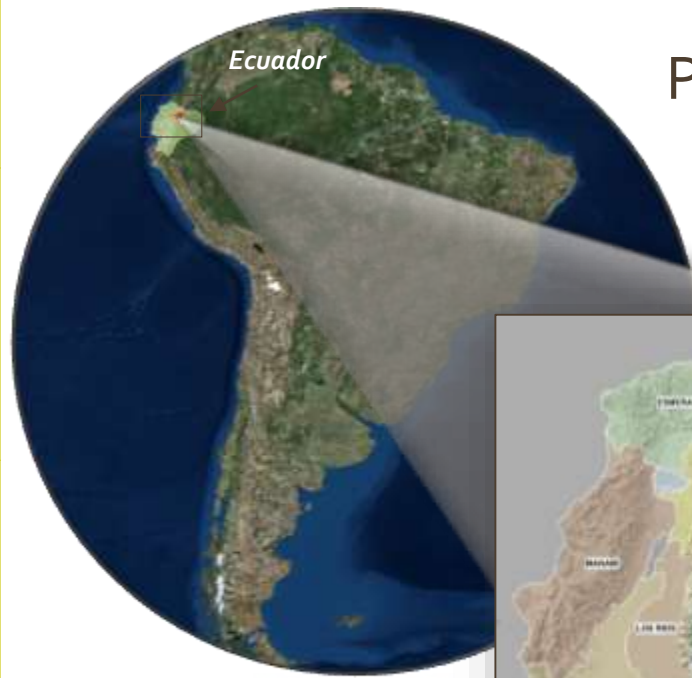
COCA WATERSHED – ECUADORIAN AMAZON

OVERVIEW

Privileged area (high biodiversity and abundant water resources)

Strategic area for projects related with the new energy matrix.

**22 hydropower projects
(operation, construction & studies)**



Coca Codo Sinclair hydropower station
1.500 MW

30 % of the national energy demand (actual) →

METHODOLOGY

RESULTS

POLICIES



SPECIFIC OBJECTIVES

OVERVIEW

METHODOLOGY

RESULTS

POLICIES

Biophysical Modelling

- To analyze the changes in ecosystem service provisioning under various scenarios of incentive programs for ecosystem restoration, conservation and sustainable use

Valuation Approach

- To demonstrate the HCCS's dependence on hydrological services (economic benefits)



WATERSHED STATE

OVERVIEW

METHODOLOGY

RESULTS

POLICIES

Flows of Ecosystem Services are economically invisible

ES are not considered in public and private decisions

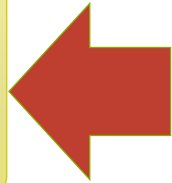
Inefficient control of extensive livestock
(main economic activity)

Changes in the use of natural resources
(land, water & energy)



LEGAL ENVIRONMENT CONTEXT

2030 Agenda Sustainable Development



Supported by

- CURRENT LEGAL FRAMEWORK**
- Political Constitution of Ecuador
 - Organic Law of Water Resources
 - Forestry Law

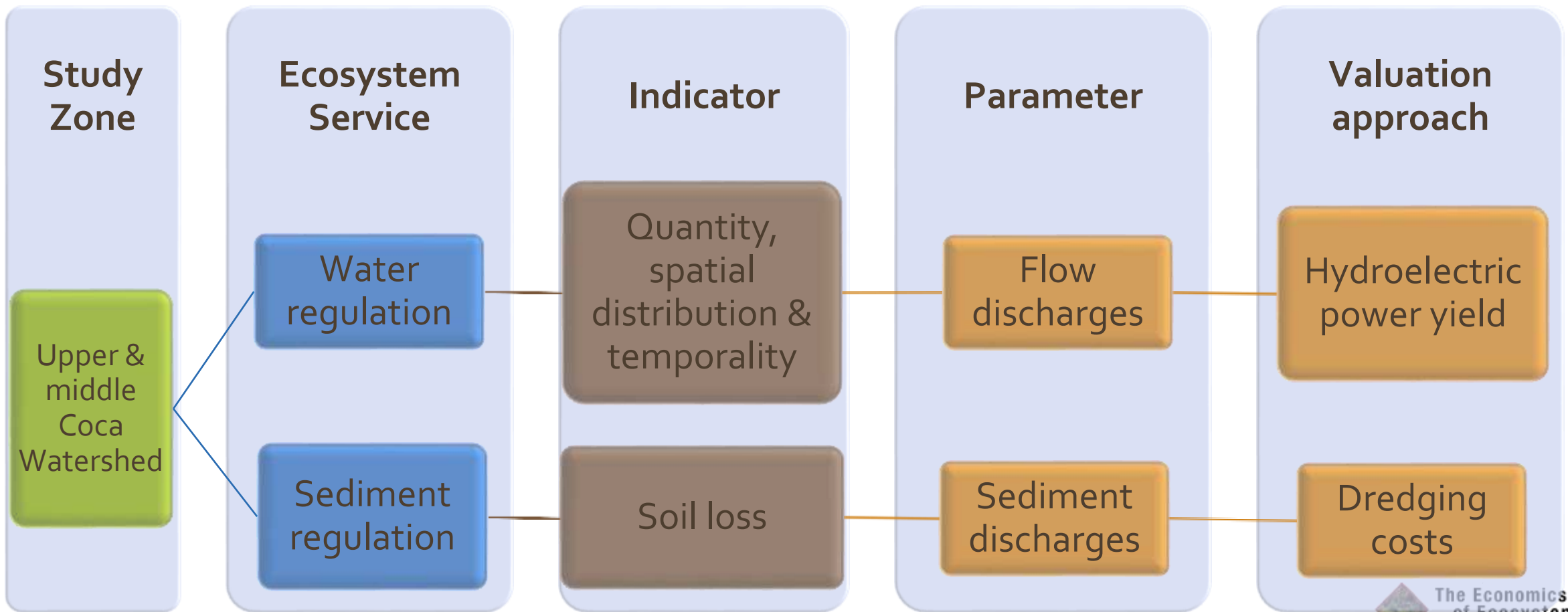
OVERVIEW
METHODOLOGY
RESULTS
POLICIES





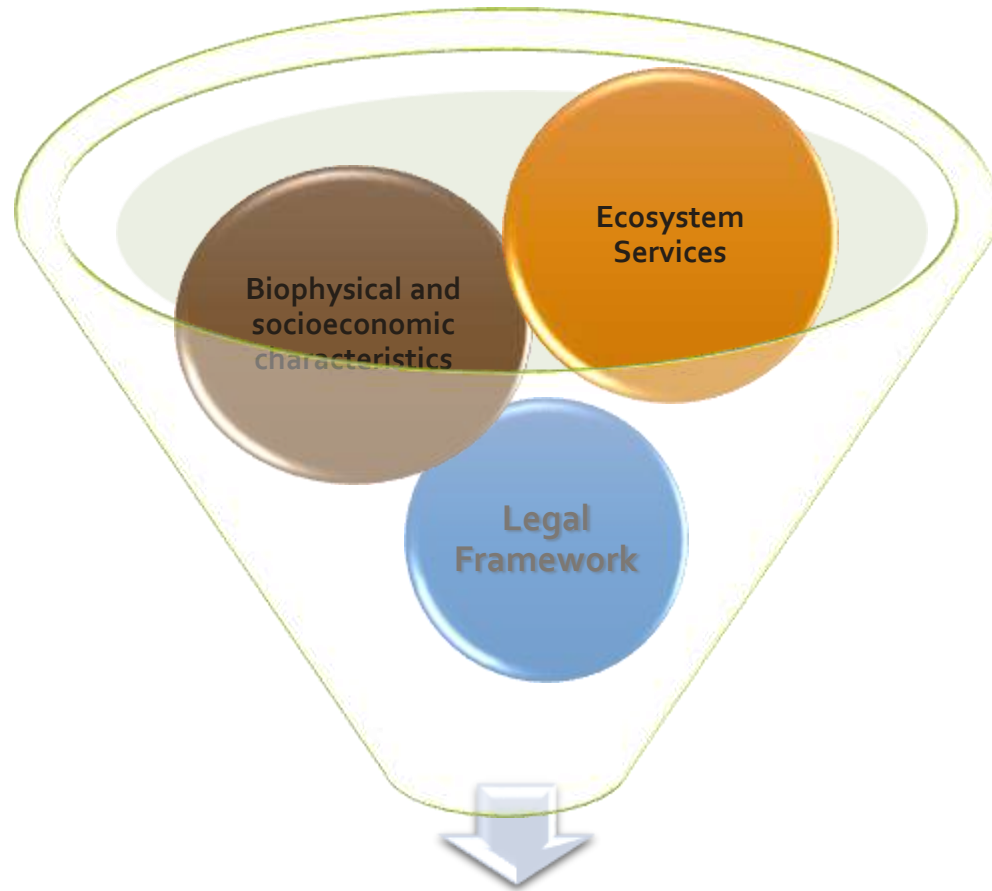
ECOSYSTEM SERVICES

OVERVIEW
METHODOLOGY
RESULTS
POLICES





LAND USE CHANGE SCENARIOS



SCENARIOS DEFINITION

1

BAU

2

SSB: Strengthening of the "Socio Bosque" (forest partner) Program

3

NPI: National Plan of Incentives

4

DEG: Degradation



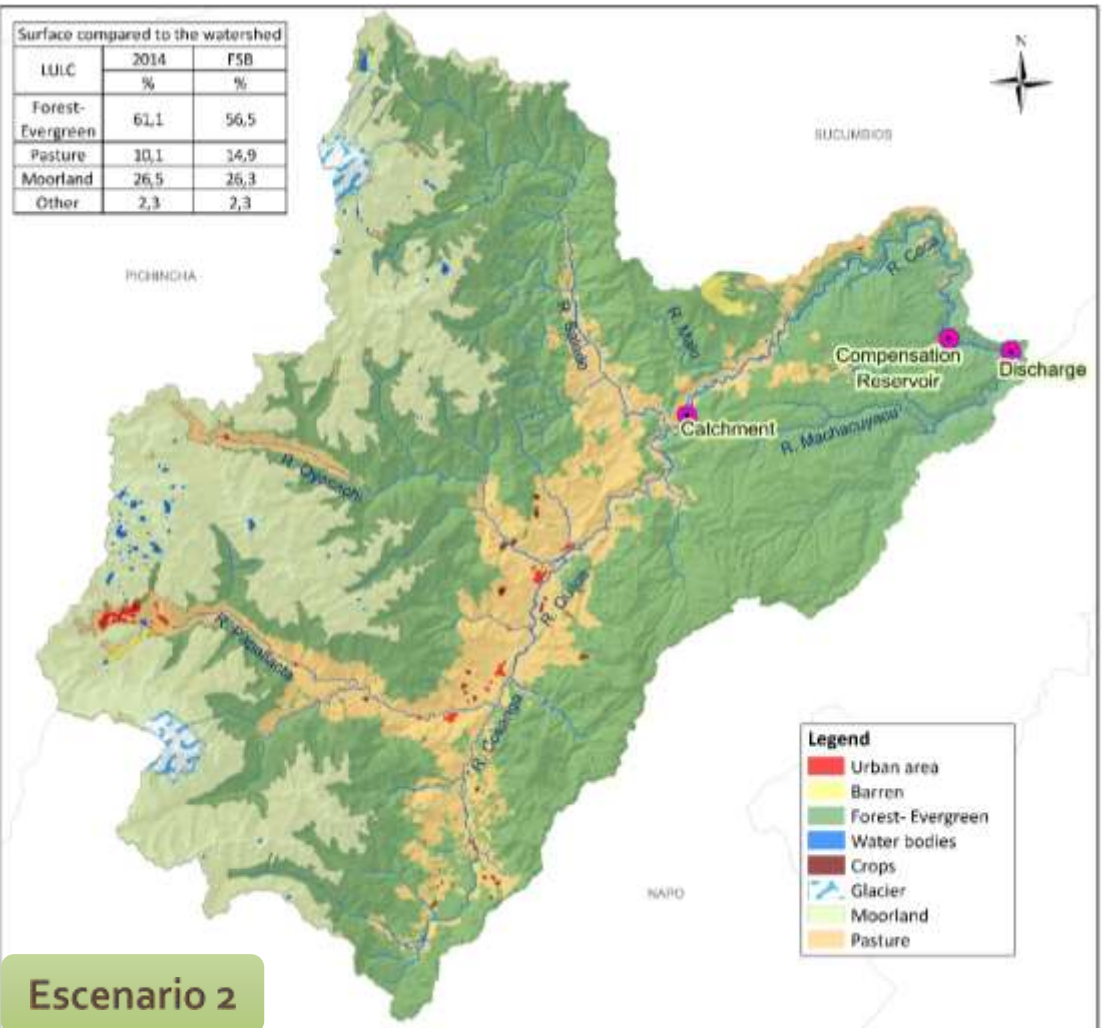
LAND USE CHANGE SCENARIOS

OVERVIEW

METHODOLOGY

RESULTS

POLICIES



Scenario 1 **BAU: Current Trend**

- Historical trends projection (2009 – 2014)
- Keeping the same conservation areas (2014)

Scenario 2 **SSB: Strengthening the Socio Bosque (Forest Partner) Program**

- Conservation of water importance zones



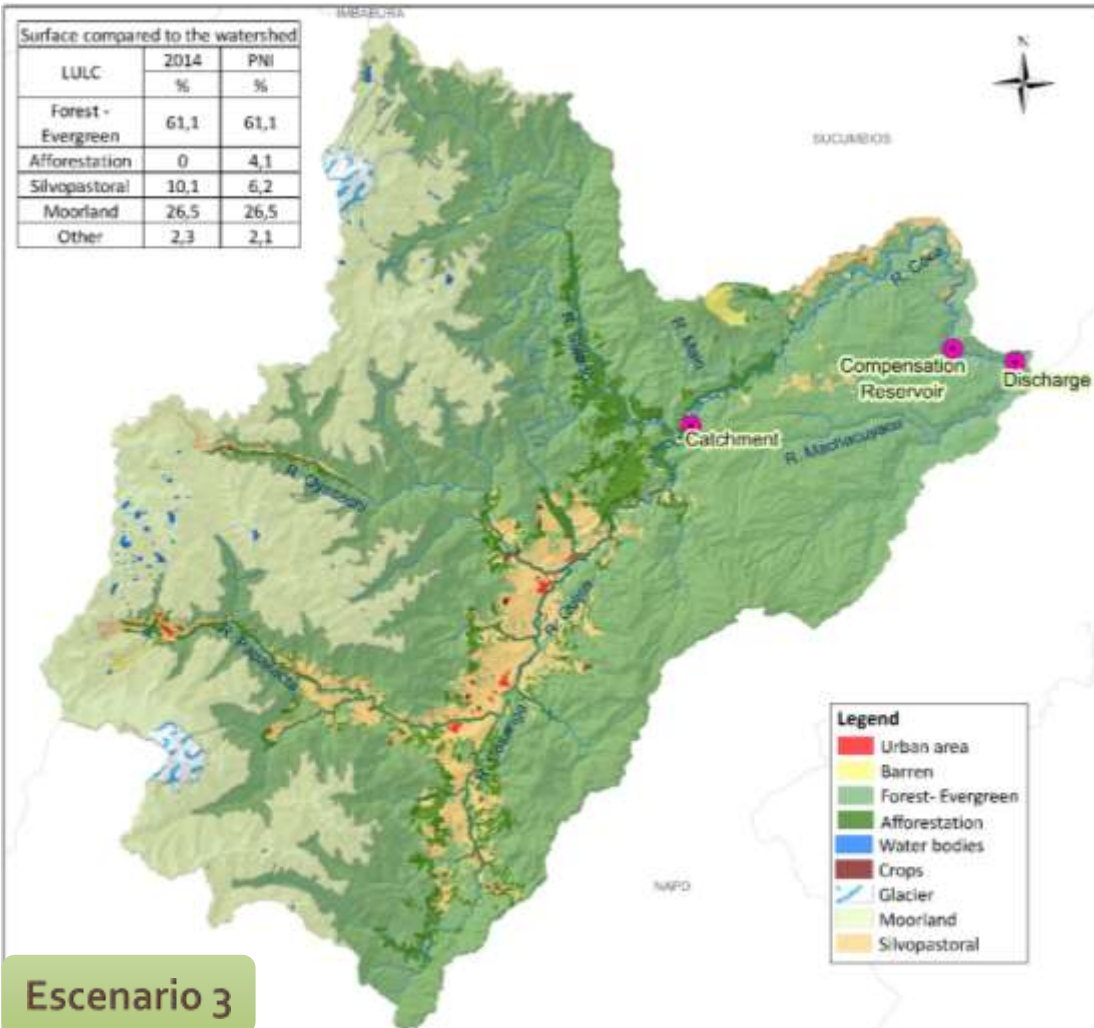
LAND USE CHANGE SCENARIOS

OVERVIEW

METHODOLOGY

RESULTS

POLICIES



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- Scenario 2** **SSB: Strengthening the Socio Bosque (Forest Partner) Program**

 - Conservation of water importance zones
- Scenario 3** **PNI: Nacional Plan of Incentives**

 - Conservation of water importance zones
 - Restauration of degraded areas
 - Transformation to sustainable productive systems



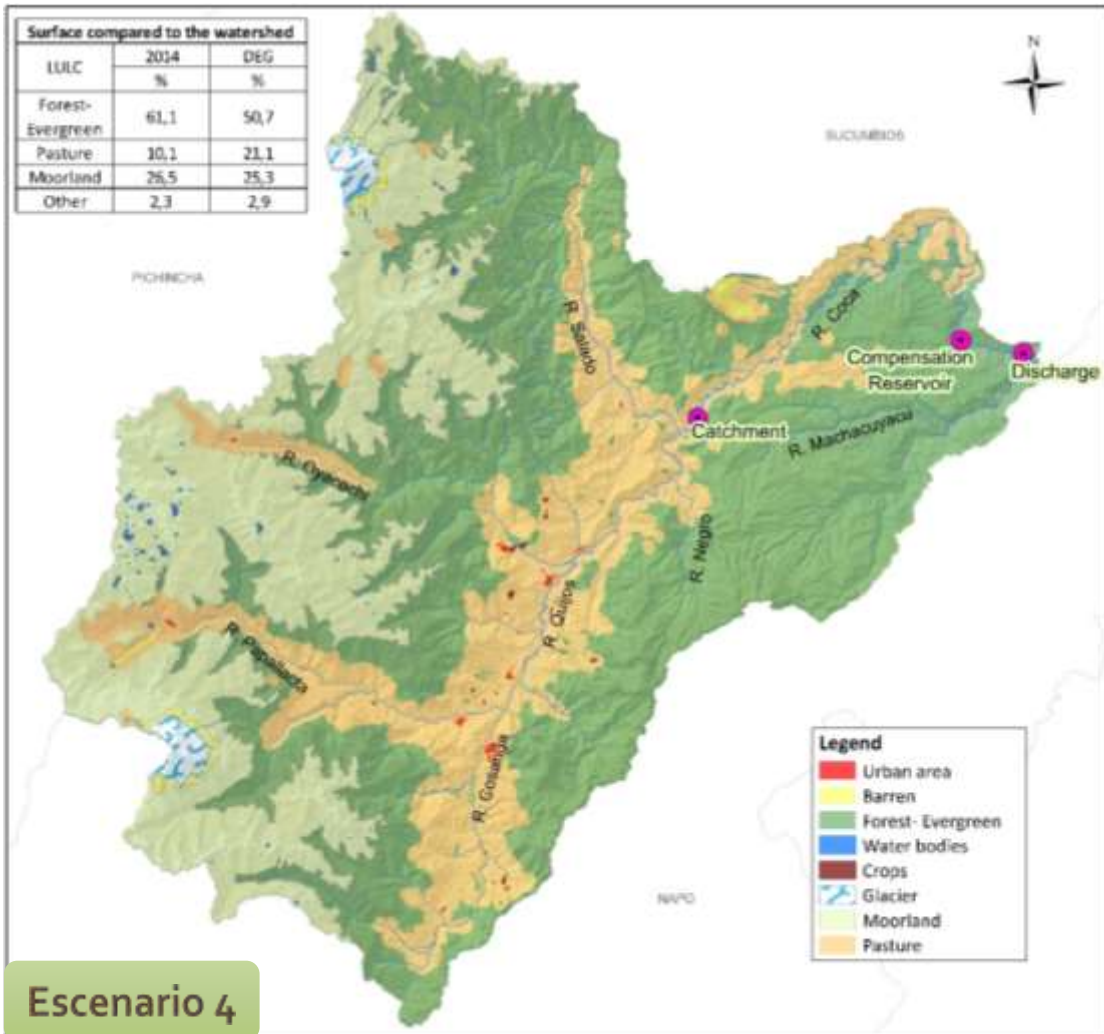
LAND USE CHANGE SCENARIOS

OVERVIEW

METHODOLOGY

RESULTS

POLICIES



Scenario 1

BAU: Current Trend

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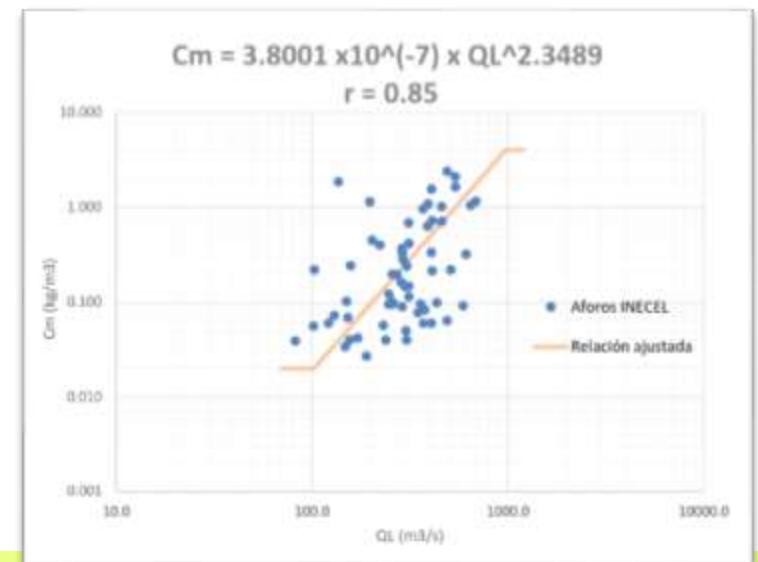
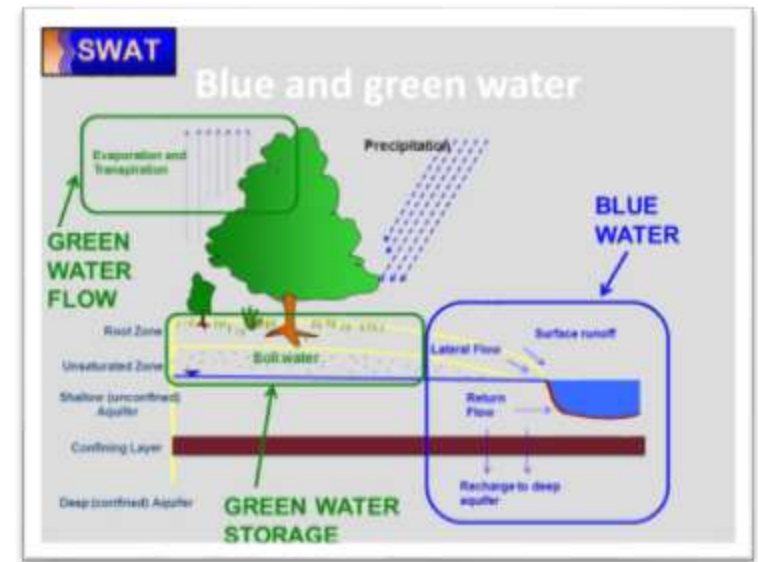
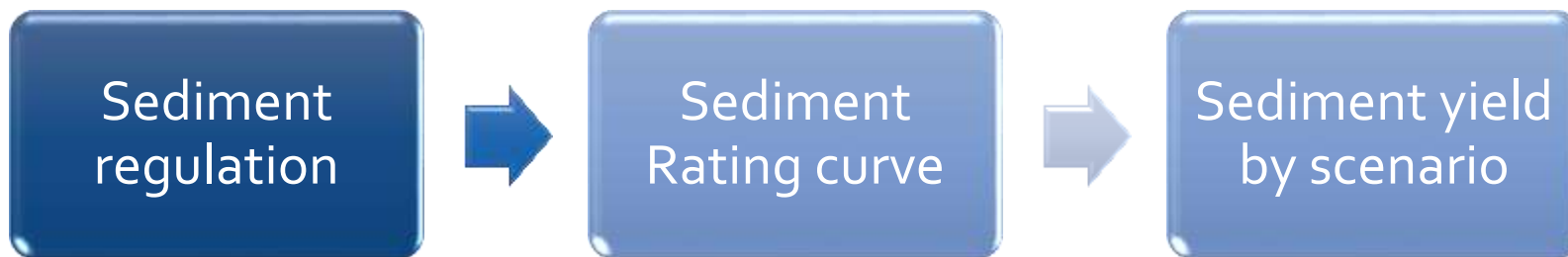
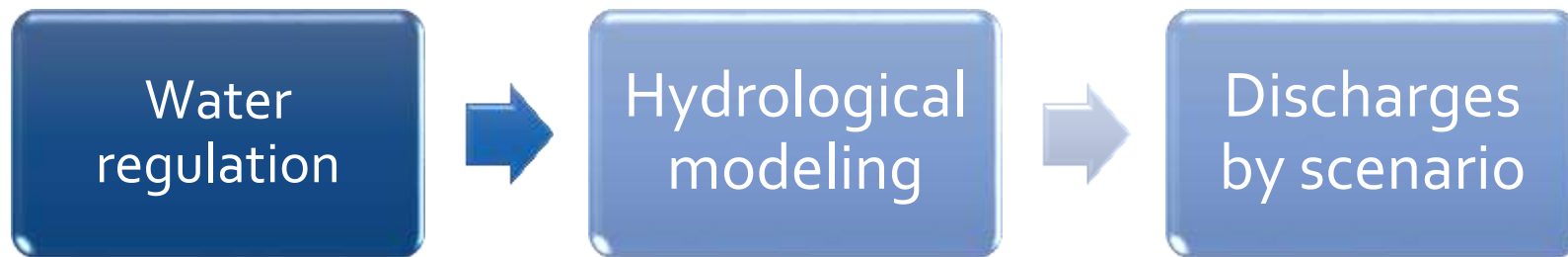
Scenario 4

DEG: Degradation

- Low implementation of conservation policies
- Livestock production activities are highly promoted



BIOPHYSICAL MODELING





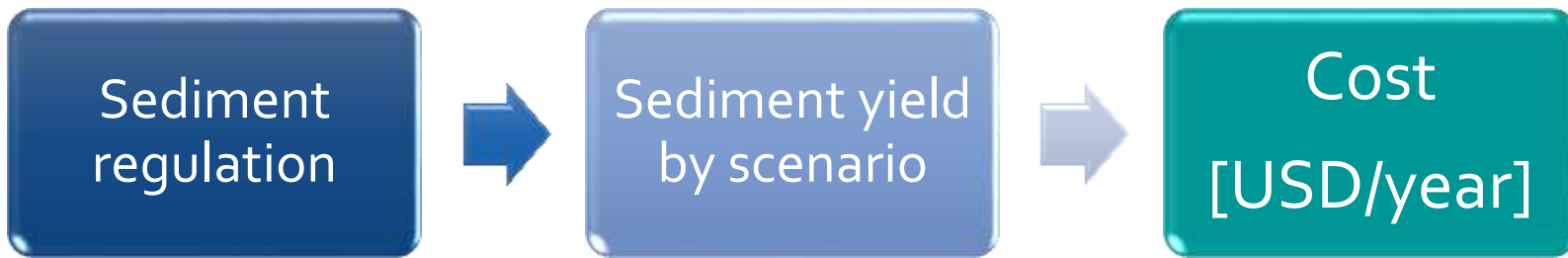
VALUATION APPROACH



$$VWR = P_{kwh} * \sum_{i=1}^{365} (\gamma * H * Q_i * \eta * t)$$

Where:

- VWR: Annual water regulation service value for hydroelectric generation (\$)
- P_{kwh} : KWh annual price of sale (\$/KWh)
- γ : Specific weight of water (9800 N/m³)
- H: Net hydraulic load (620 m H₂O)
- Q: Daily generation daily flow (m³/s)
- η : Turbine efficiency (0.9)
- t: Time (24 hours)



$$VRS = C_{dc} * \sum_{i=1}^{365} \left(\frac{S_i * Q_i * t * (1 - \eta)}{\delta} \right)$$

Where:

- VRS: Annual sediment regulation service value for hydroelectric generation (\$)
- C_{dc} : Annual dredging cost in the compensation reservoir (\$/m³)
- S_i : Sediment concentration in the dam site (kg/m³)
- Q_i: Inlet flow (m³/s)
- t: Time (86400 sec)
- η : Sand trap efficiency (0.85)
- δ : Sediment density in the compensation reservoir (1550 kg/m³)



BIOPHYSIC RESULTS

| Scenario | Land Use & Cover Change (2014 – POR) | | | Water Regulation Temporal Distribution | | Sediment Regulation |
|--------------------------------|--------------------------------------|----------|---------|---|-----------|---------------------|
| | Forest | Moorland | Pasture | Base flow | Peak flow | Amount of Sediment |
| 1 Current Trend | ↓ 11 % | ↓ 0,68 % | ↑ 66 % | ↓ | ↑ | ↑ |
| 2 Strengthening "Socio Bosque" | ↓ 7,5 % | ↓ 0,66 % | ↑ 47 % | ↓ | ↑ | ↑ |
| 3 Nacional Plan of Incentives | ↑ 6,6 % | — | ↓ 40 % | ↑ | ↓ | ↓ |
| 4 Degradation | ↓ 17 % | ↓ 4 % | ↑ 108 % | ↓ | ↑ | ↑ |



OVERVIEW
METHODOLOGY
RESULTS
POLICIES



VALUATION APPROACH RESULTS

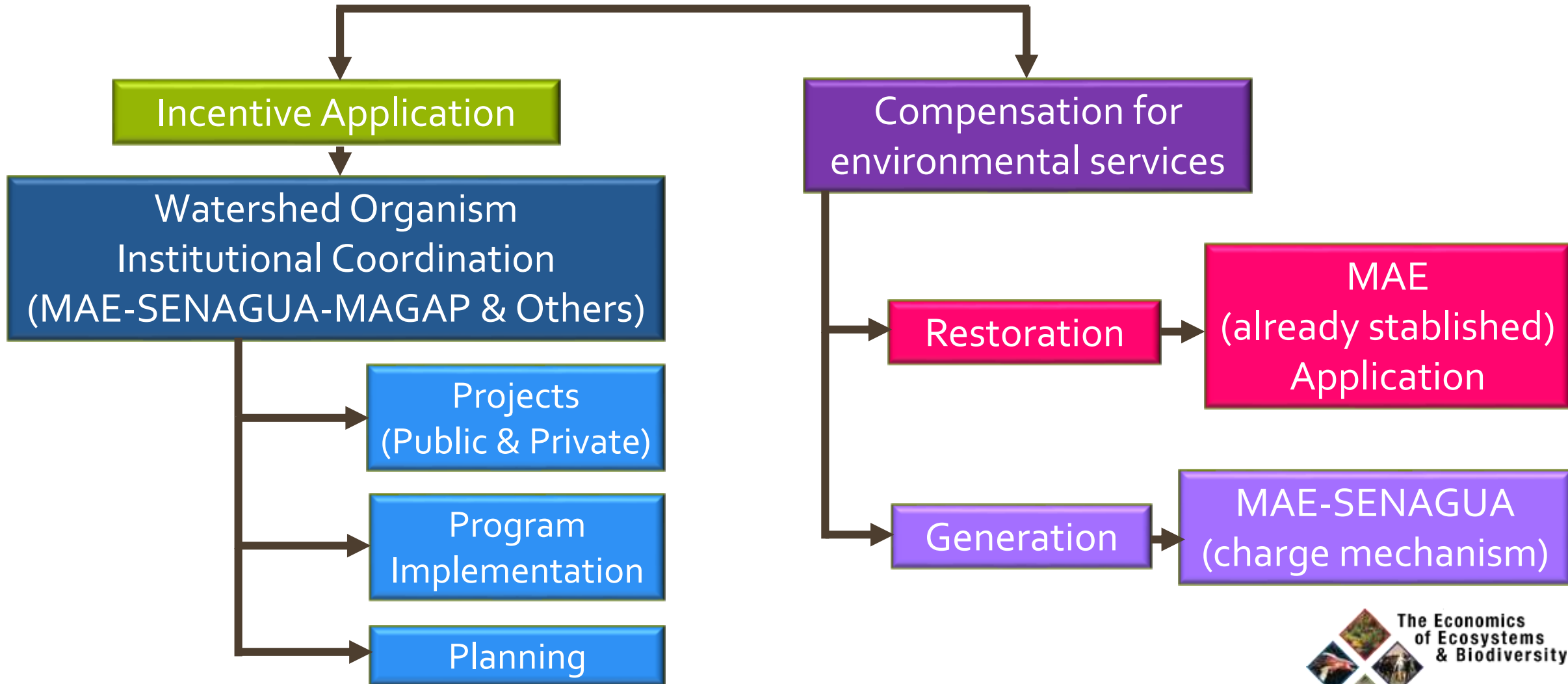
OVERVIEW
METHODOLOGY
RESULTS
POLICIES

| Point of Reference → Current Trend Scenario | | | |
|---|------------------------------|---------------------------|---------------------|
| | Scenario | Water Regulation | Sediment Regulación |
| | | Hydroelectric power yield | Dredging costs |
| 1 | Current Trend | — | — |
| 2 | Strengthening "Socio Bosque" | ↑ | ↓ |
| 3 | Nacional Plan of Incentives | ↑ | ↓ |
| 4 | Degradation | ↓ | ↑ |





PROPOSAL



OVERVIEW
METHODOLOGY
RESULTS
POLICIES





IDENTIFYING ISSUES

- ❑ To apply ecosystem approach in Ecuador, it is necessary to improve conditions:
 - Compatibility between development objectives (**traditional structures of natural resource exploitation**) and conservation of natural heritage.
 - Sustained financing for conservation programs
 - Support for TEEB structure process (Inter-ministerial co-ordination)

- ❑ Existing policies are not well instrumented in order to apply conservation actions transversally, they need:
 - Effective citizen participation
 - Enable institutional articulation and coordination




OPPORTUNITIES

- ❑ Better understanding of the area and the ecosystem hydropower service.
- ❑ Problem identification:
 - ✓ Need of Watershed Organization
 - ✓ Laws in force lack of tools for its application
- ❑ Proposal of legal reforms necessary to achieve cross-cutting effects.



CHALLENGES

- ❖ Replicate methodologies
- ❖ Generate new conservation, restoration and sustainable production mechanisms.
- ❖ Organizing collaborative watershed information systems
- ❖ Use this study to influence the creation of new public policies related with suitable water resources management.
- ❖ Study another ES
- ❖ Getting articulated stakeholder participation (incentives)



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ECUADORIAN AMAZON

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