# Opportunities and Challenges for Payments for Environmental Services

## International Perspective

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World Bank

**7th International Conference on Eco-compensation and PES**
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# Payments for Environmental Services (PES)

- What is PES?
- Experience in Latin America
- Does PES work?
- Putting PES into practice

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# Carapina Water Treatment Plant

## Vitória, Espírito Santo, Brazil

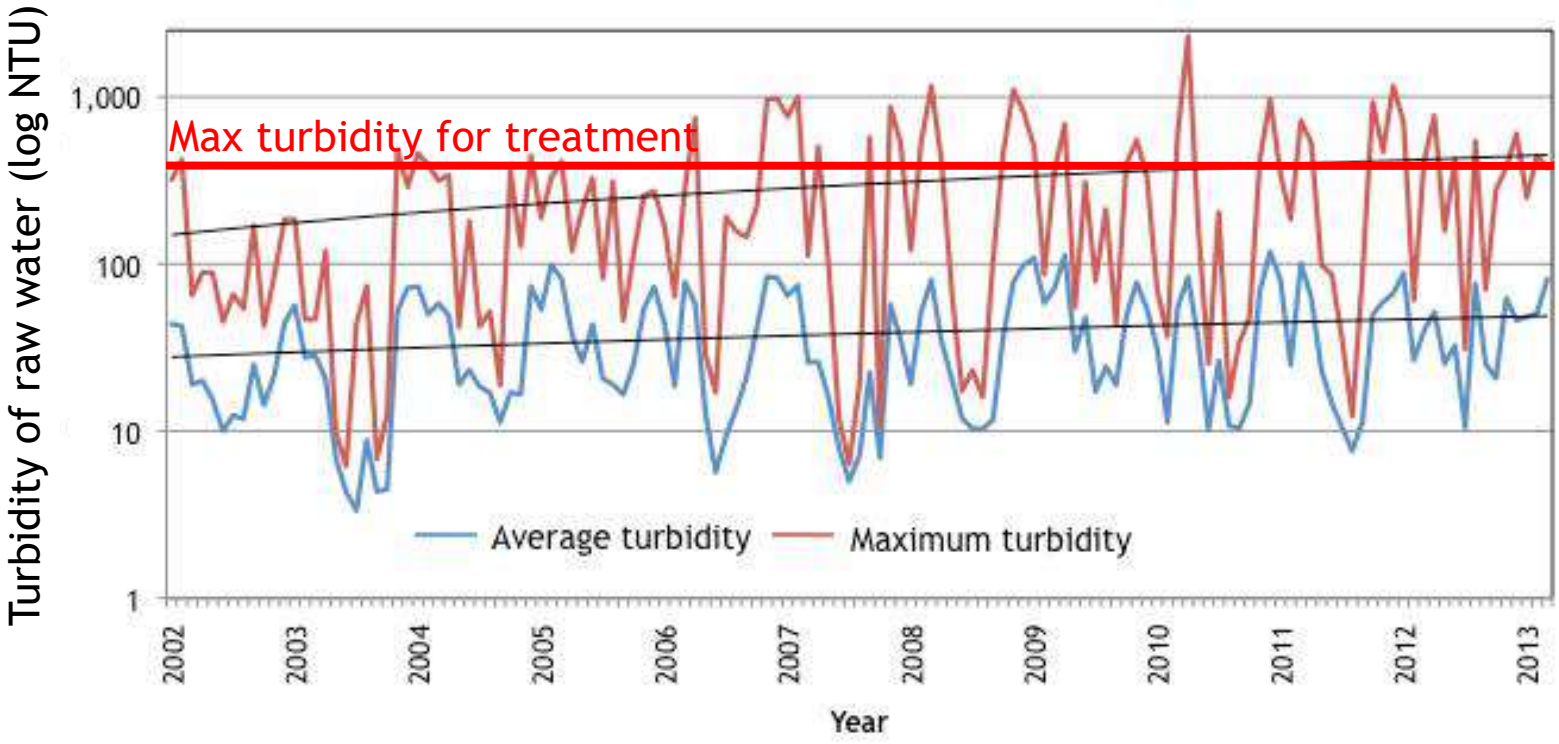

*Source*: CESAN

# Watershed degradation

## Rio Santa Maria de Vitória watershed

*oto*: Stefano Pagiola

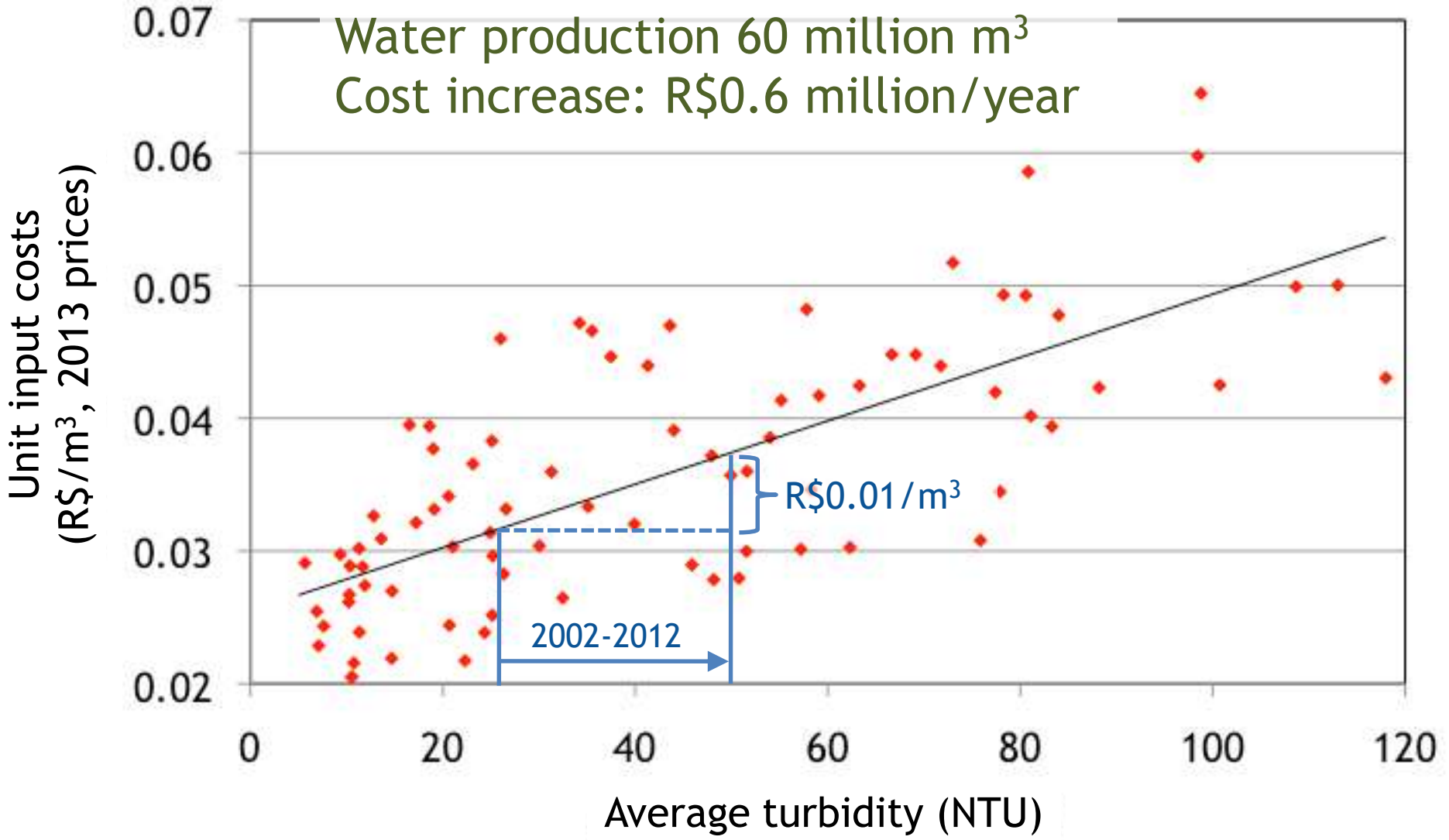
# Increase in turbidity




- Average turbidity almost doubled from 2002-03 to 2012-13
- Maximum turbidity often exceeds plant capacity

*Source*: Espírito Santo Integrated Sustainable Water Management Project PAD

# Effect of watershed degradation on water treatment costs




*Source*: Espírito Santo Integrated Sustainable Water Management Project PAD

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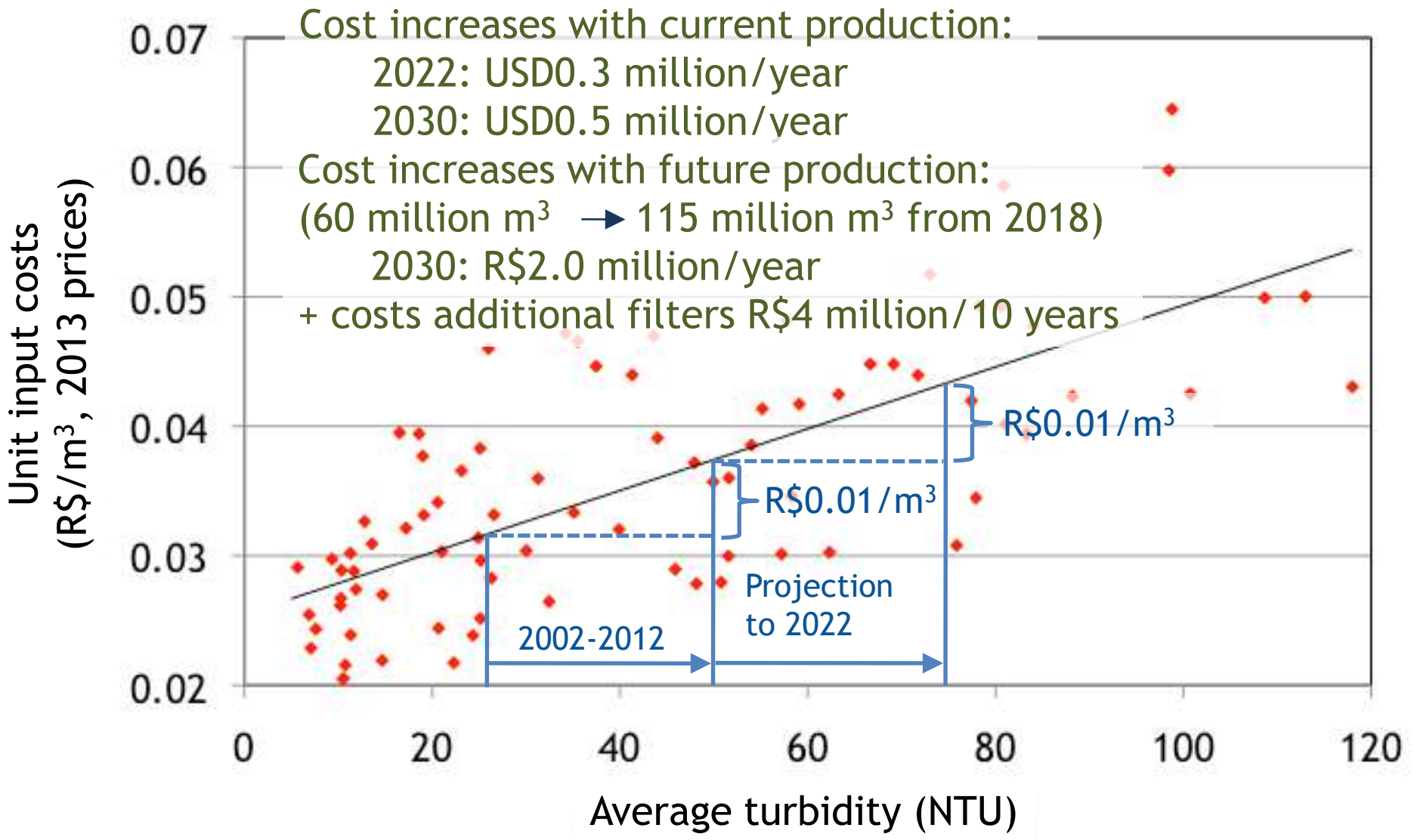
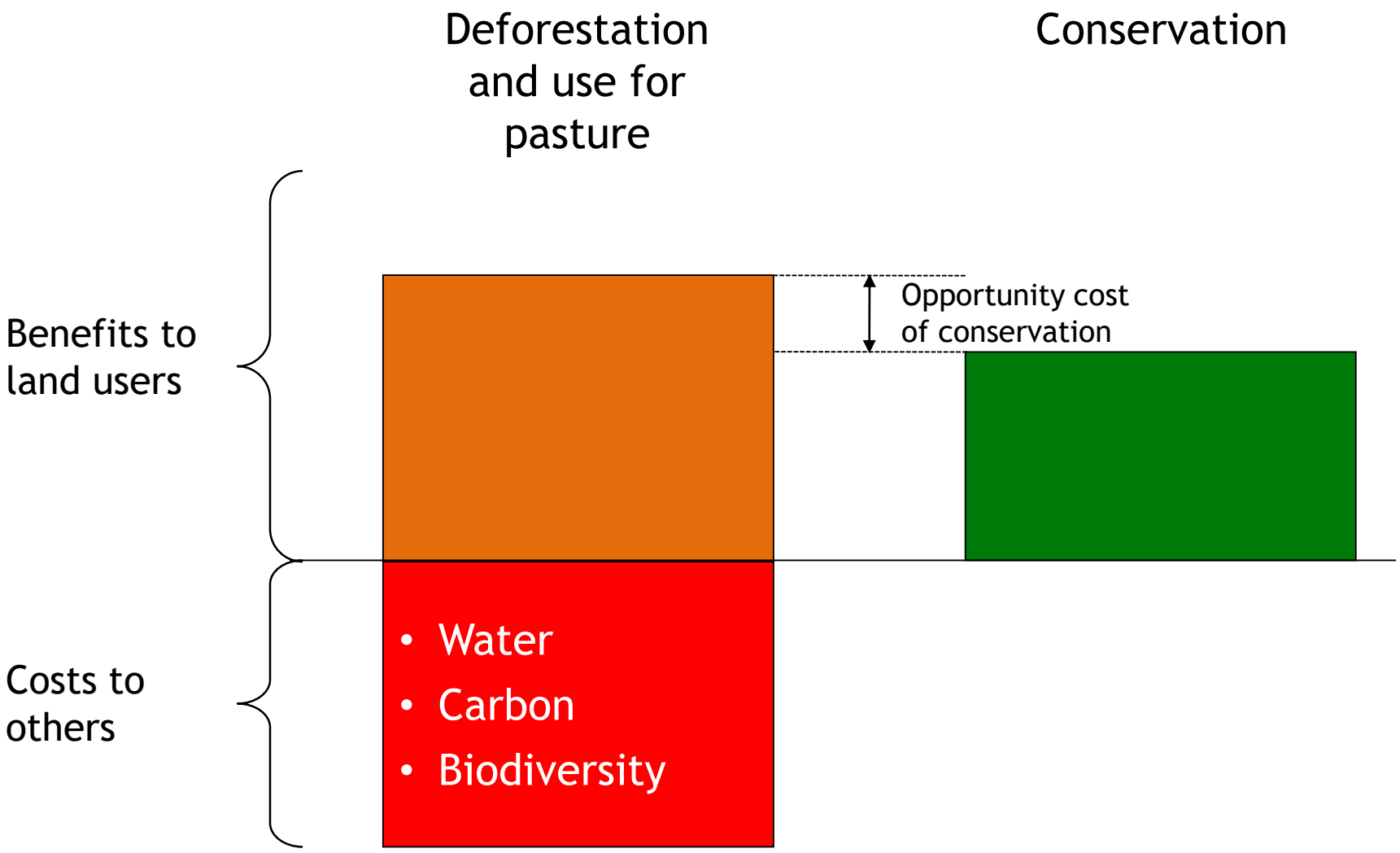
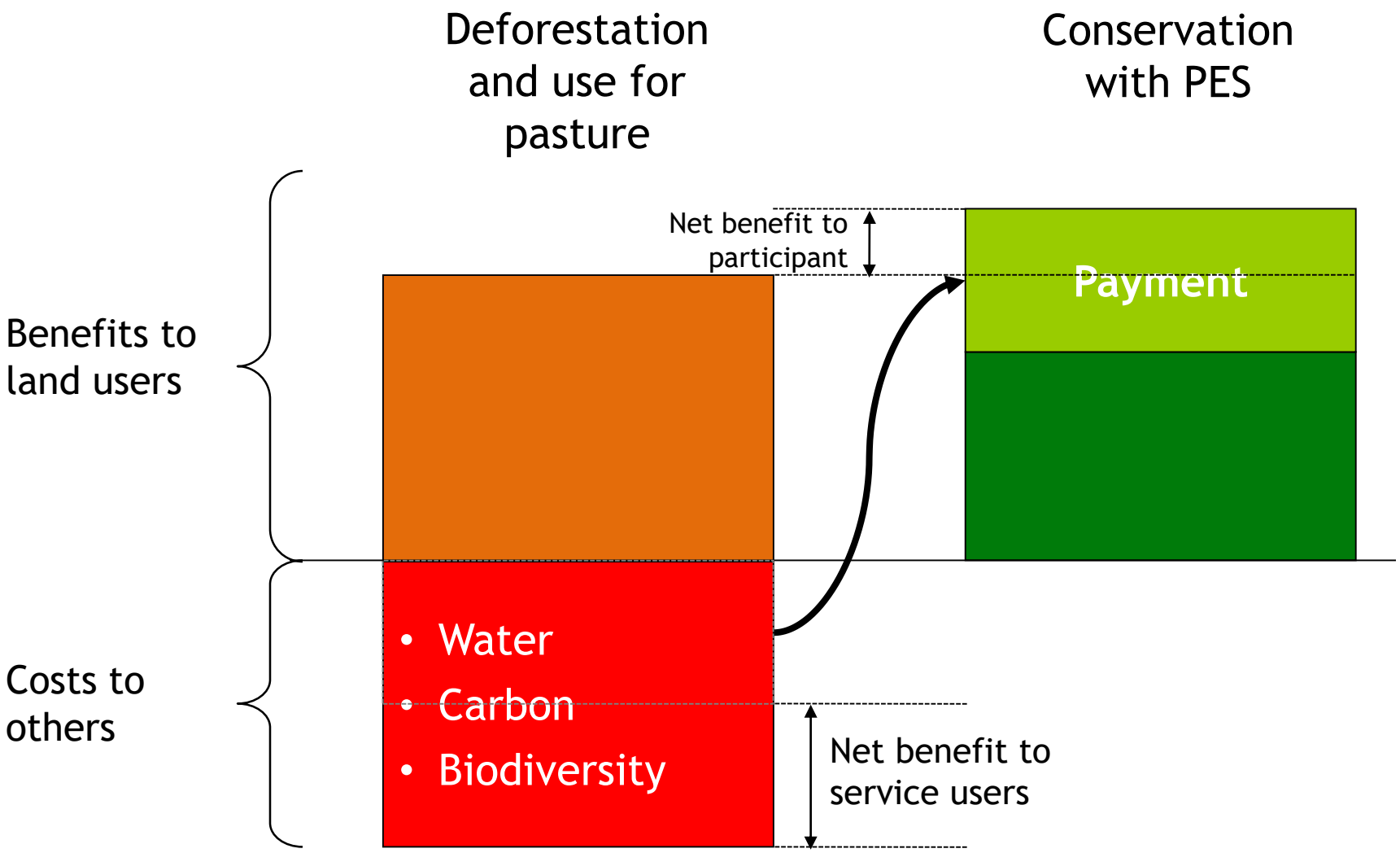



*Source*: Espírito Santo Integrated Sustainable Water Management Project PAD

# What is the problem?



# PES as a solution

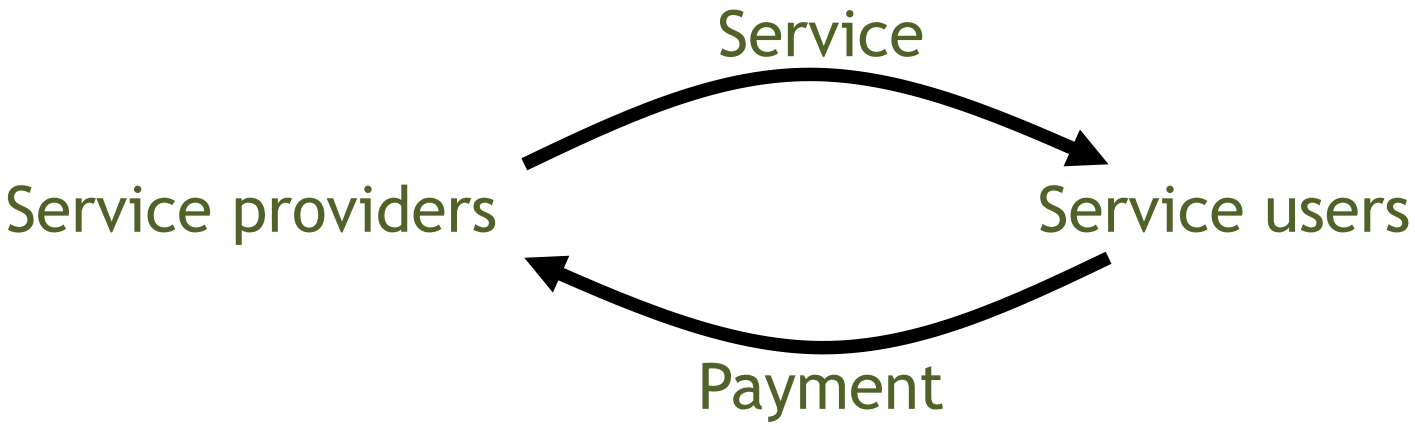


# Payments for Environmental Services (PES)

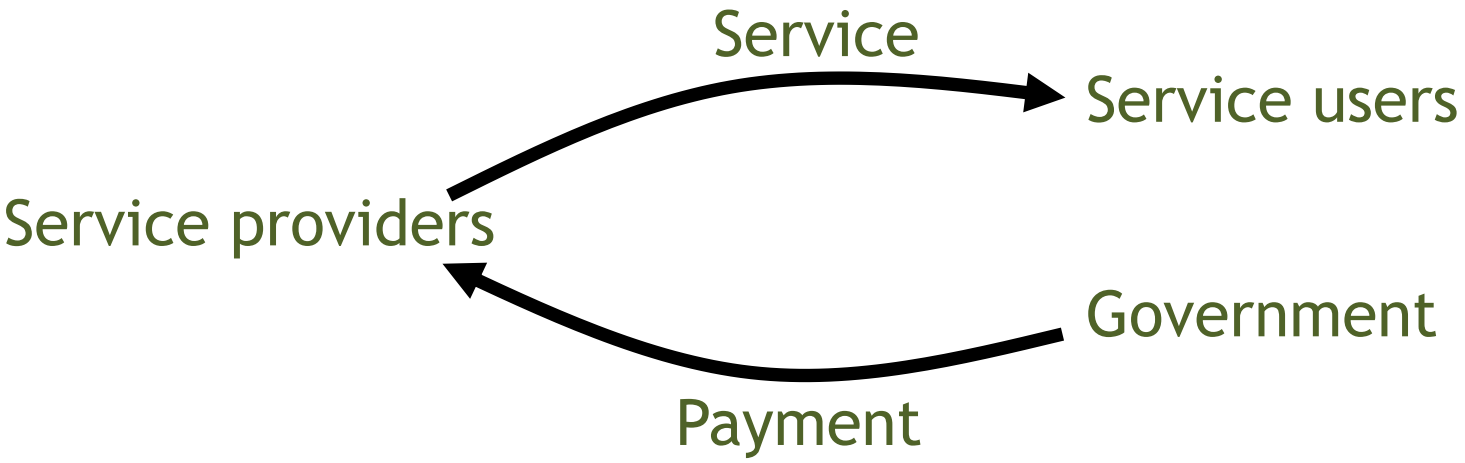
Payments that are conditional on managing natural resources in ways that generate benefits for others

# Two kinds of PES programs

- User-financed programs ("Coasian" PES):

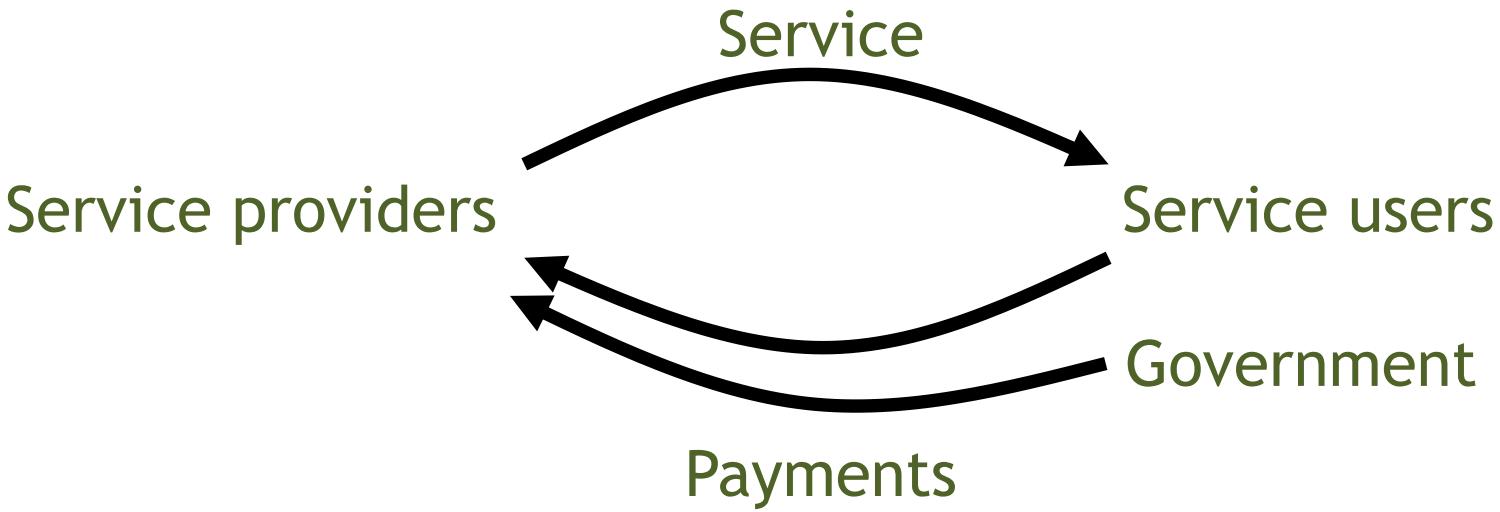



- Government-financed programs ("supply-side PES"):



# Hybrid PES programs

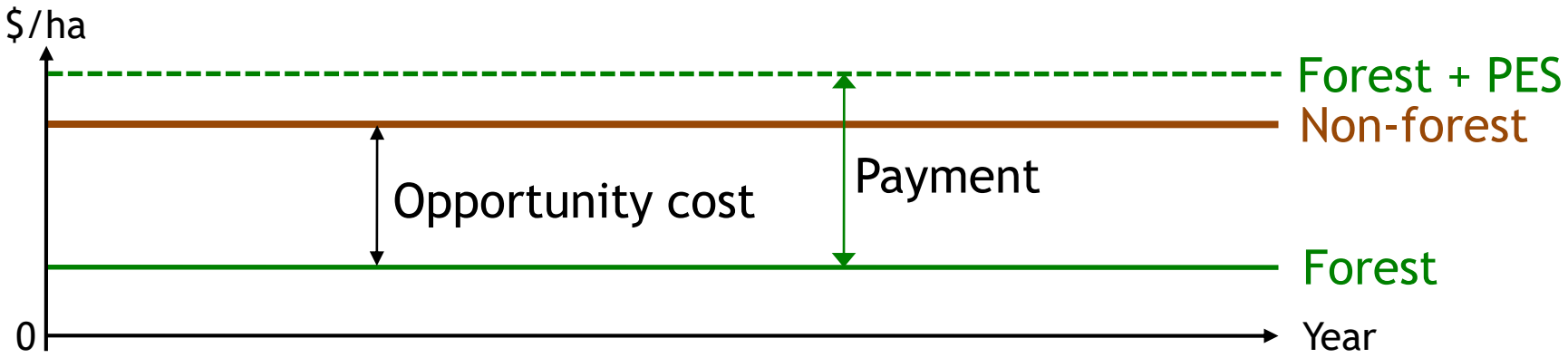
- User-financed programs ("Coasian" PES):




  - Leverage economies of scale of national program, incentives and information of user-financed program

  - Costa Rica
  - Mexico "Fondos Concurrentes"

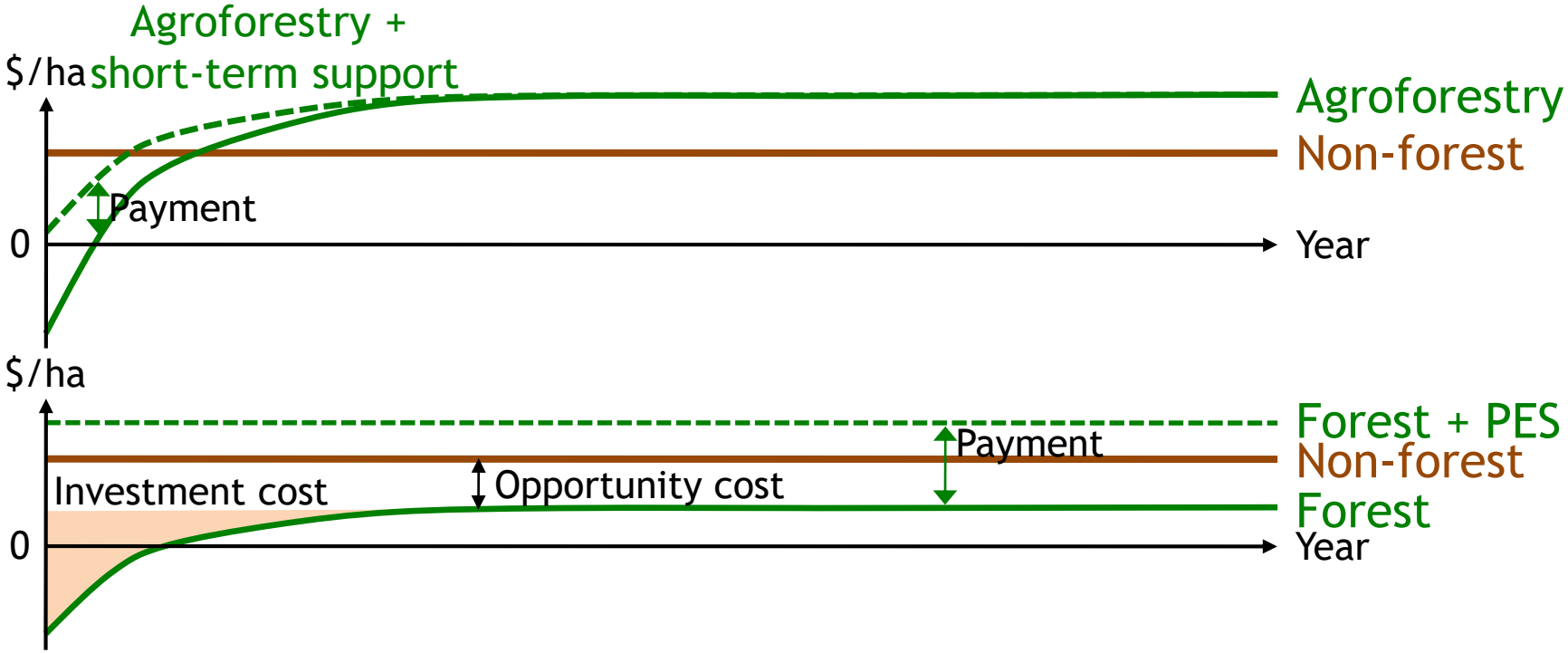
# Types of PES Programs - Conservation




- Conservation-oriented PES ('use-restricting')
- Most common type of PES
- Long-term payments (5-year, renewable)

- Costa Rica PPSA ('Protection' contract)
- Mexico PSAB

# Types of PES Programs - Restoration




- Restoration-oriented ('asset-building')
- Increasingly common
- Often only short-term payments (1-5 years, one-time)
- China SLCP Program
- Costa Rica PPSA ('Regeneration' + 'Conservation' contract)
- Espírito Santo Reflorestar Program

# Payments for Environmental Services (PES)

- What is PES?
- Experience in Latin America
- Does PES work?
- Putting PES into practice

# World Bank support to PES


Since 1998

8 completed projects

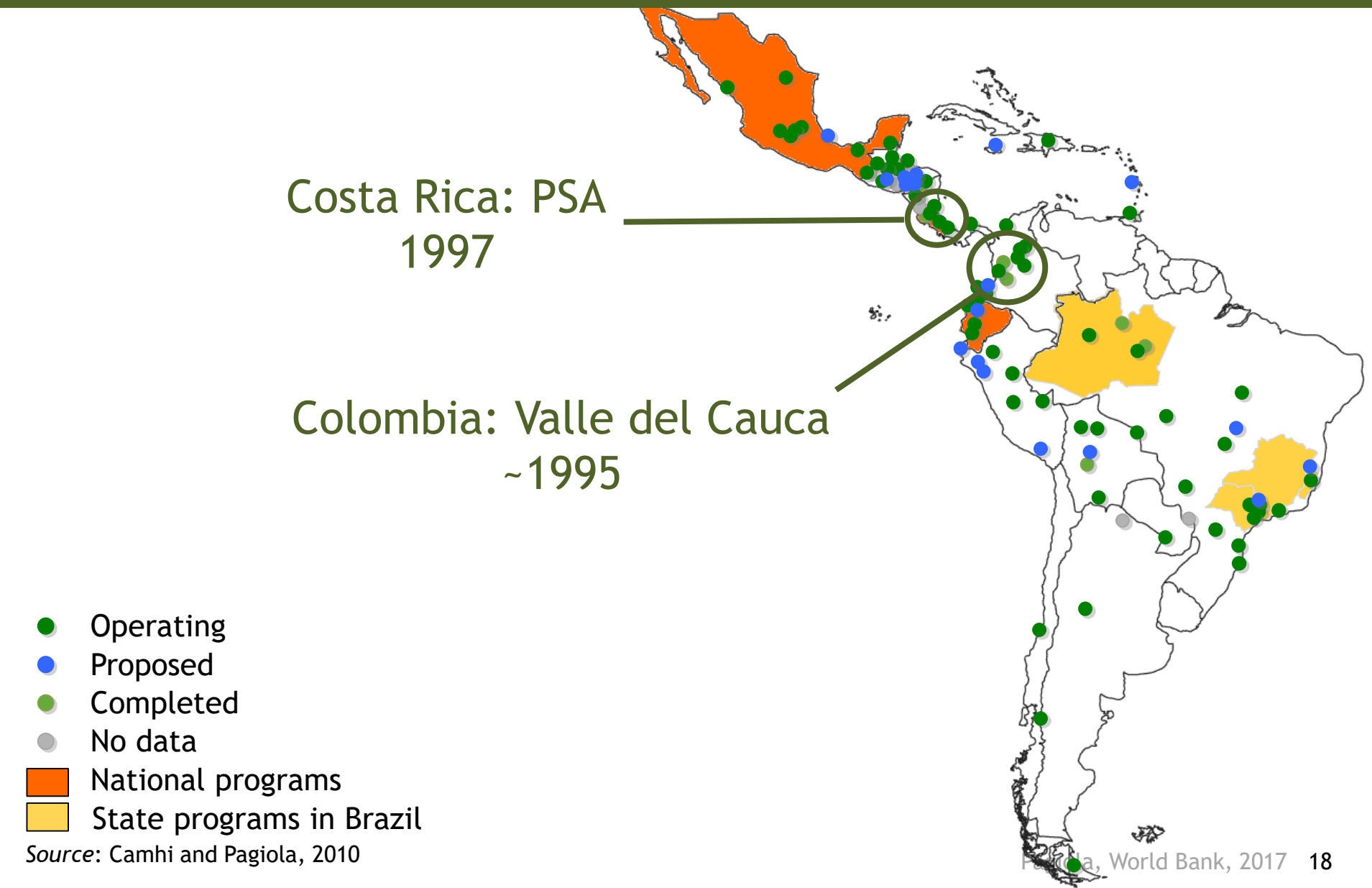
12 projects under implementation (+ carbon projects)

2 projects under preparation

> USD 100 million a year

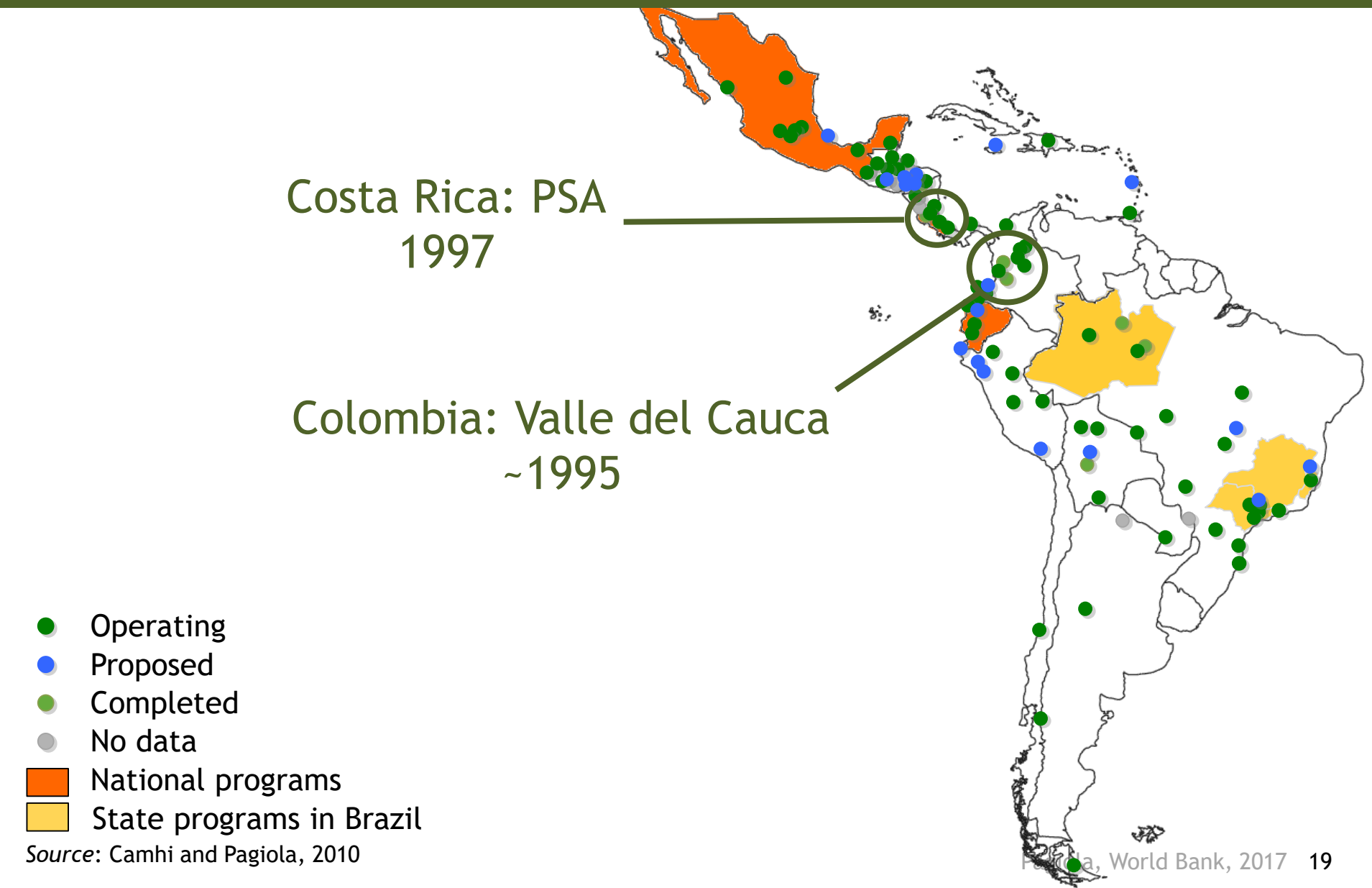
> 3 million ha of forest under conservation contracts

# PES in Latin America




*Source*: Camhi and Pagiola, 2010

# PES in Latin America



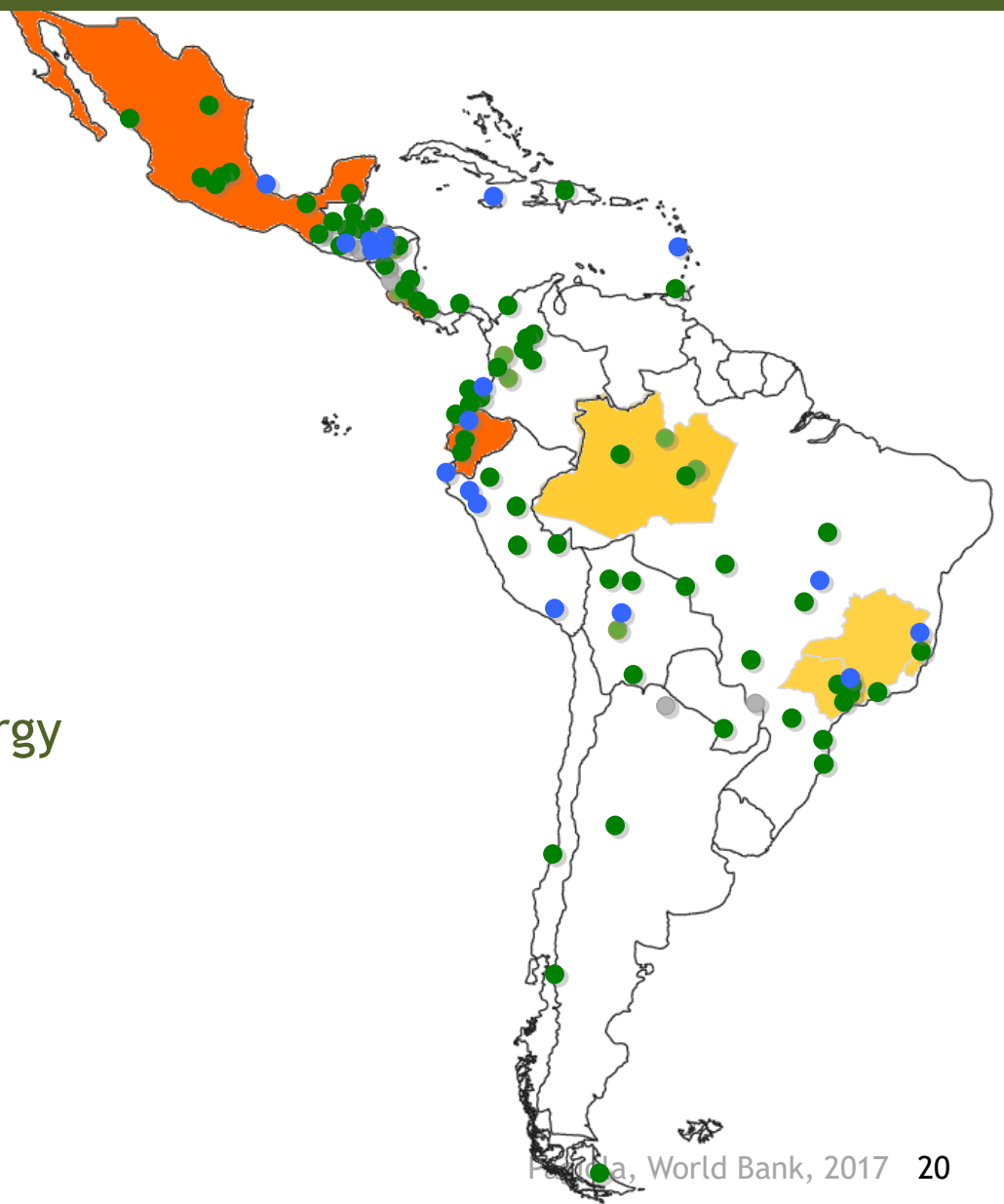

*Source*: Camhi and Pagiola, 2010

# PES works on many services

**Water** — Dominant
- Local
- 75% of PSAB

**Carbon** — Growing
- Voluntary
- CDM
- REDD?

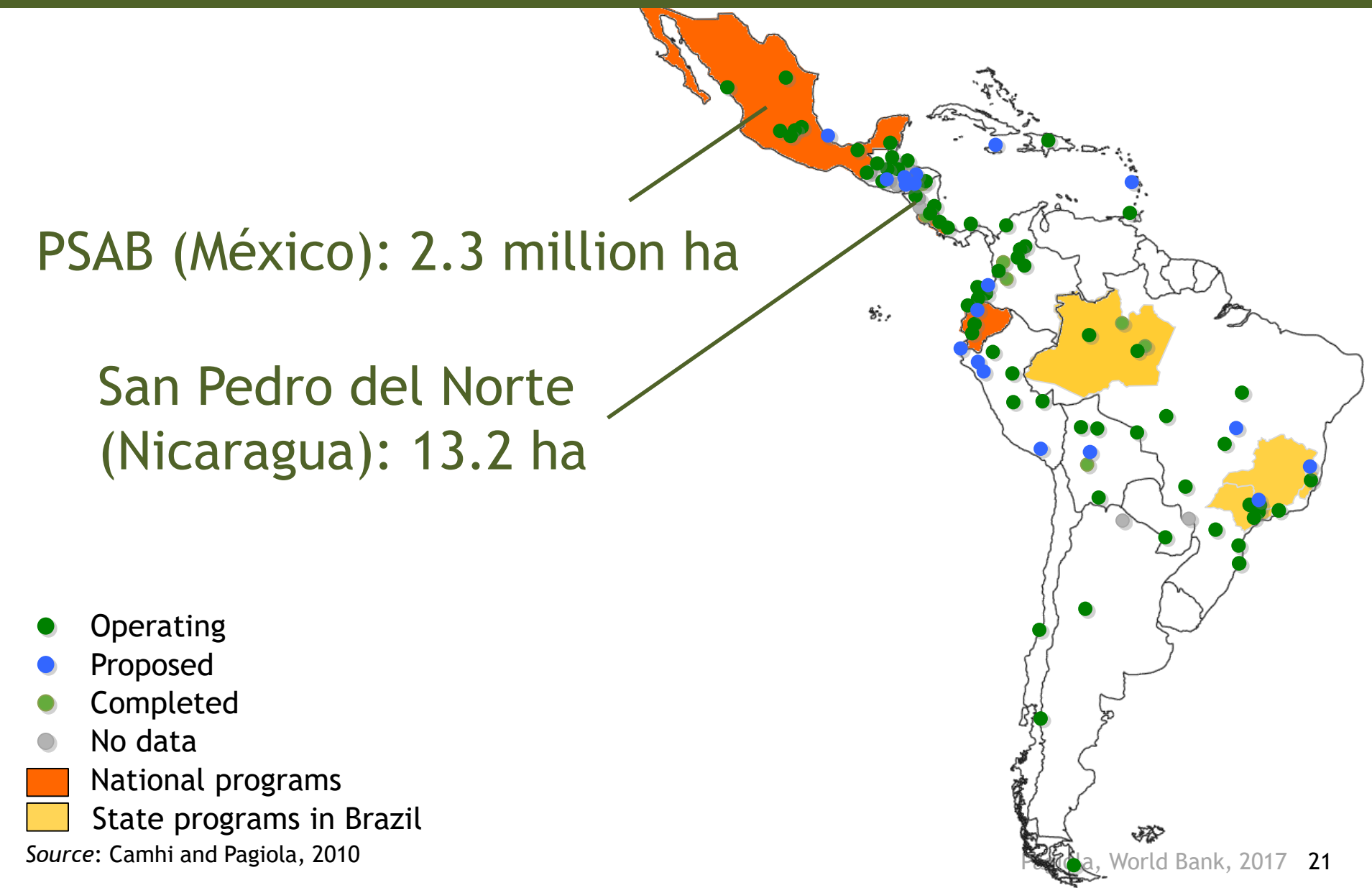
**Biodiversity** — Few
- Search for synergy



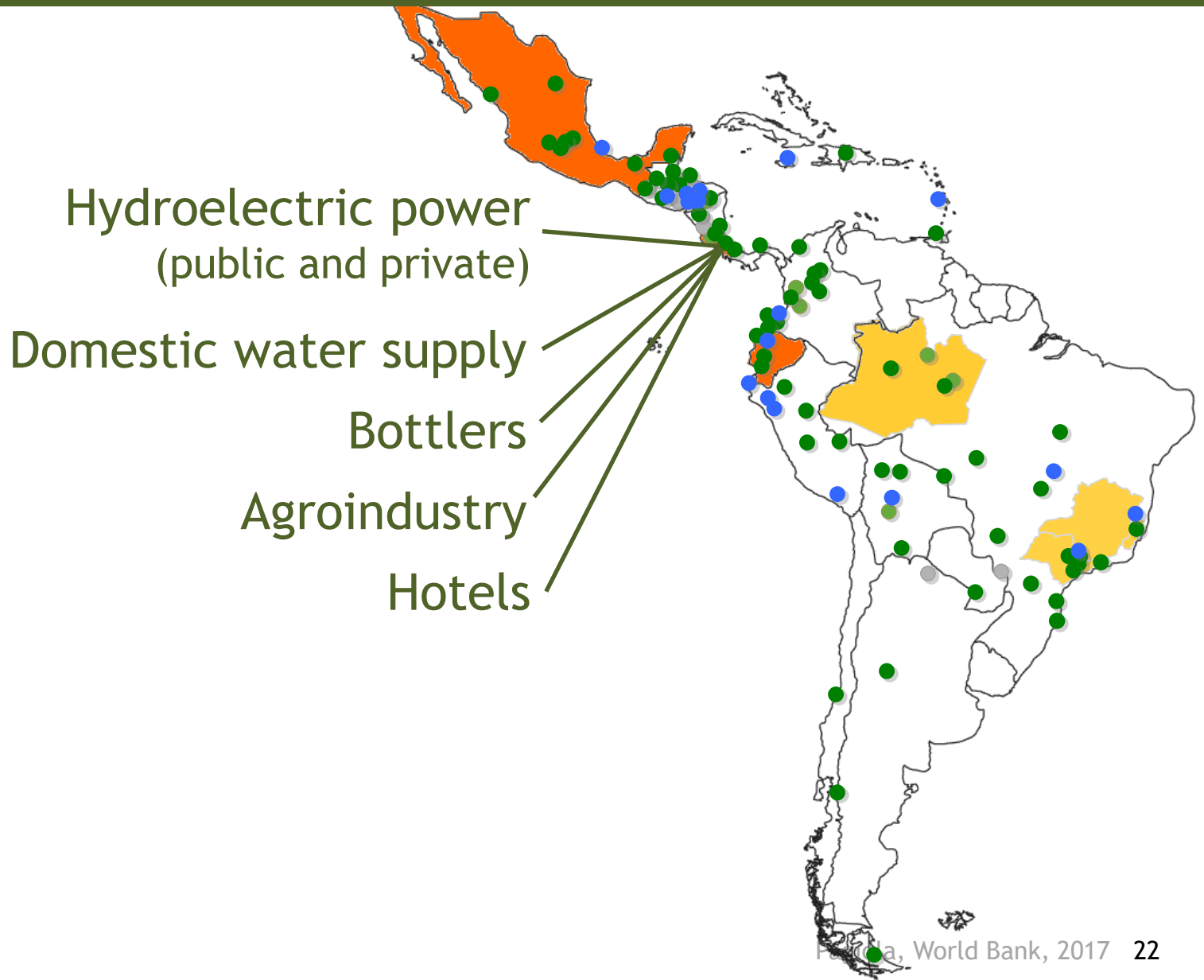
- Operating
- Proposed
- Completed
- No data
- National programs
- State programs in Brazil

*Source*: Camhi and Pagiola, 2010

# PES works at many scales



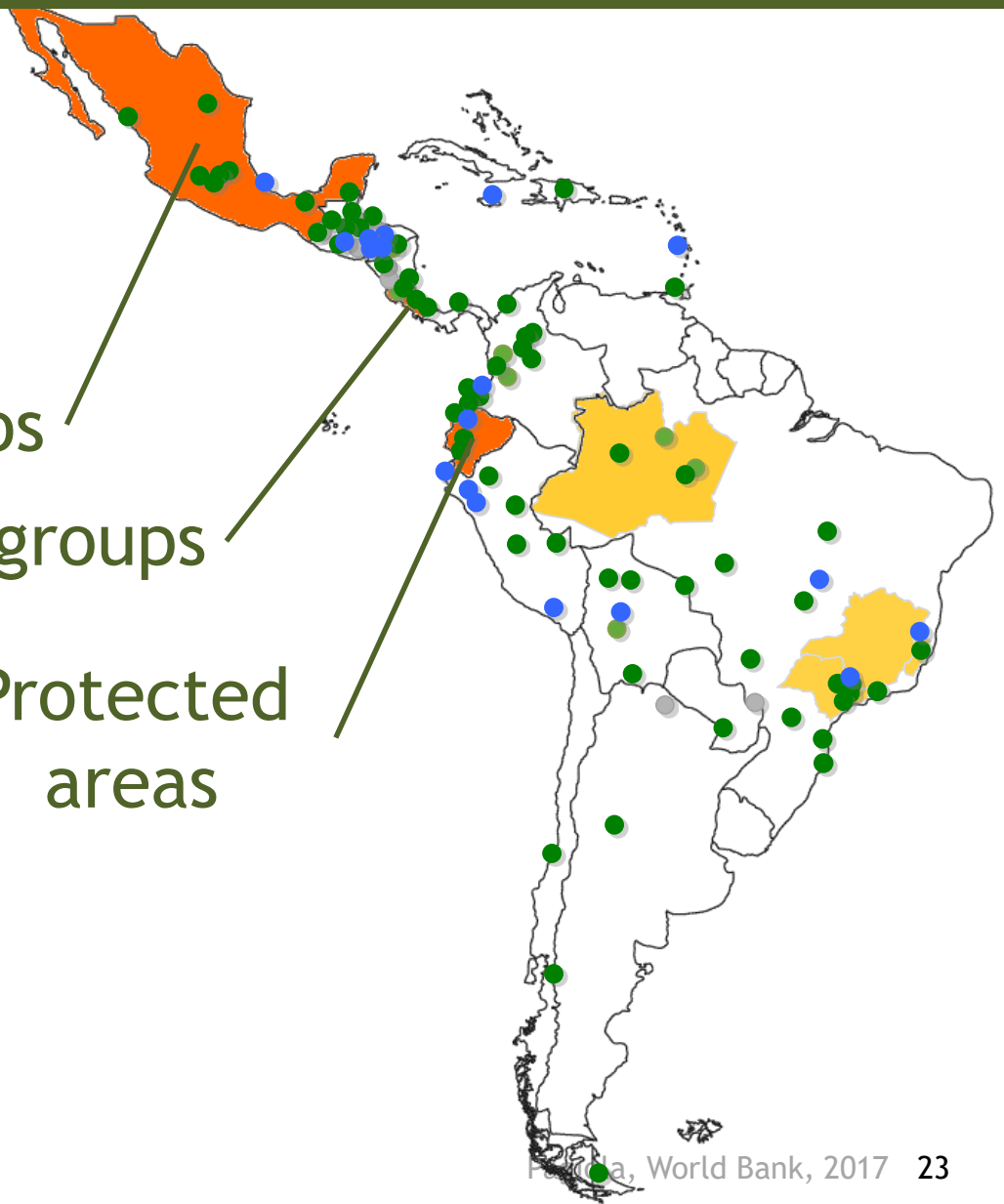
# PES works with a variety of users



# PES works with a variety of providers

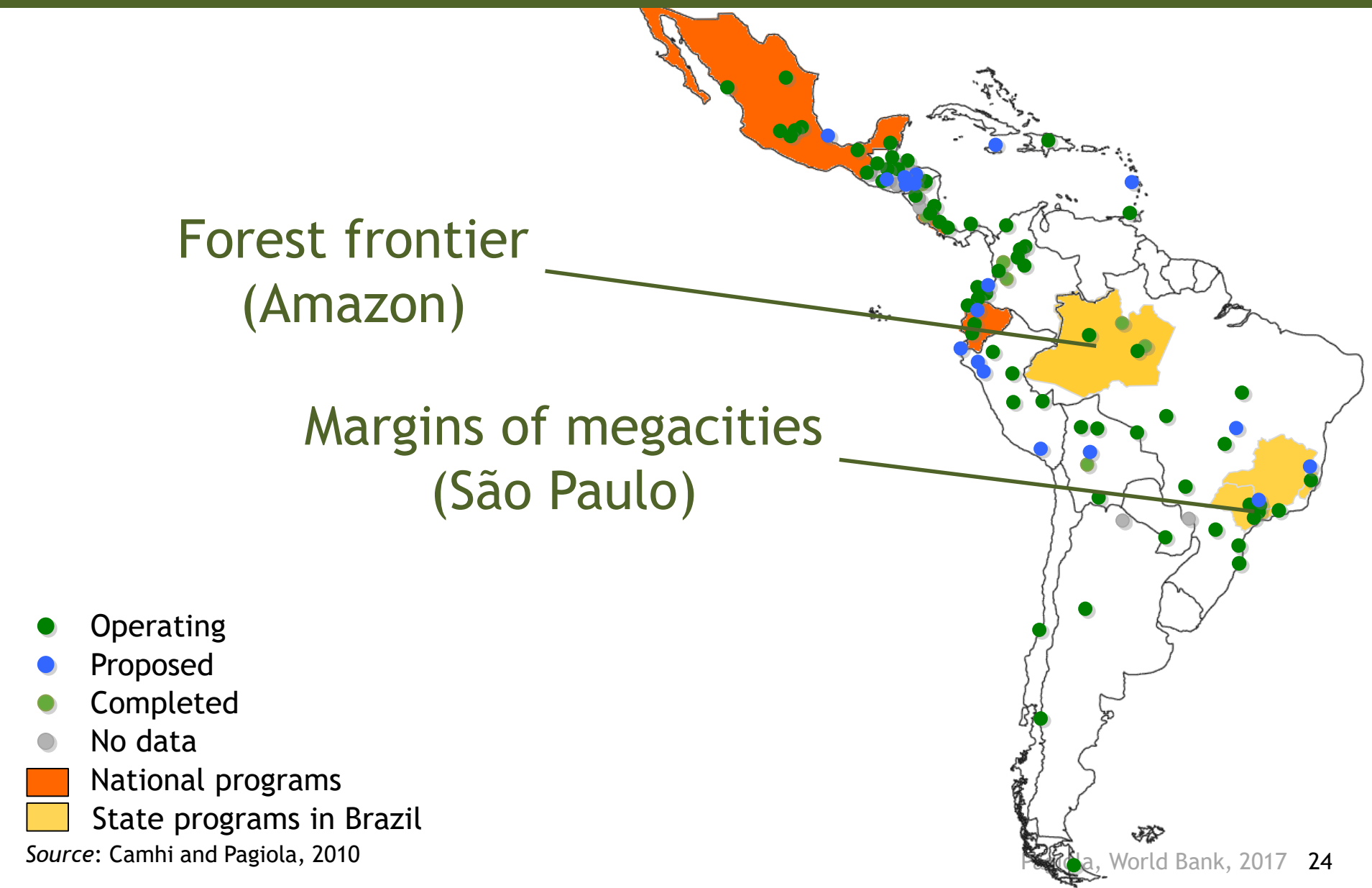
## Farmers, ranchers

- Small, medium, large
- Poor, rich




*Source*: Camhi and Pagiola, 2010

# PES works in many contexts




*Source*: Camhi and Pagiola, 2010

# Payments for Environmental Services (PES)

- What is PES?
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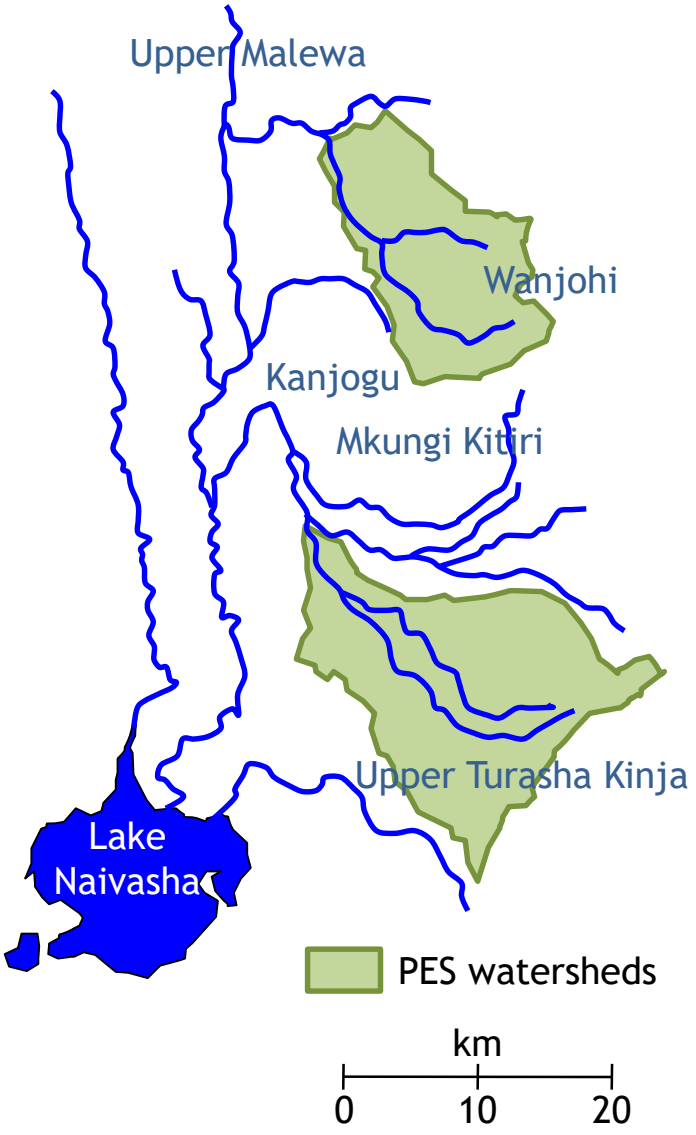
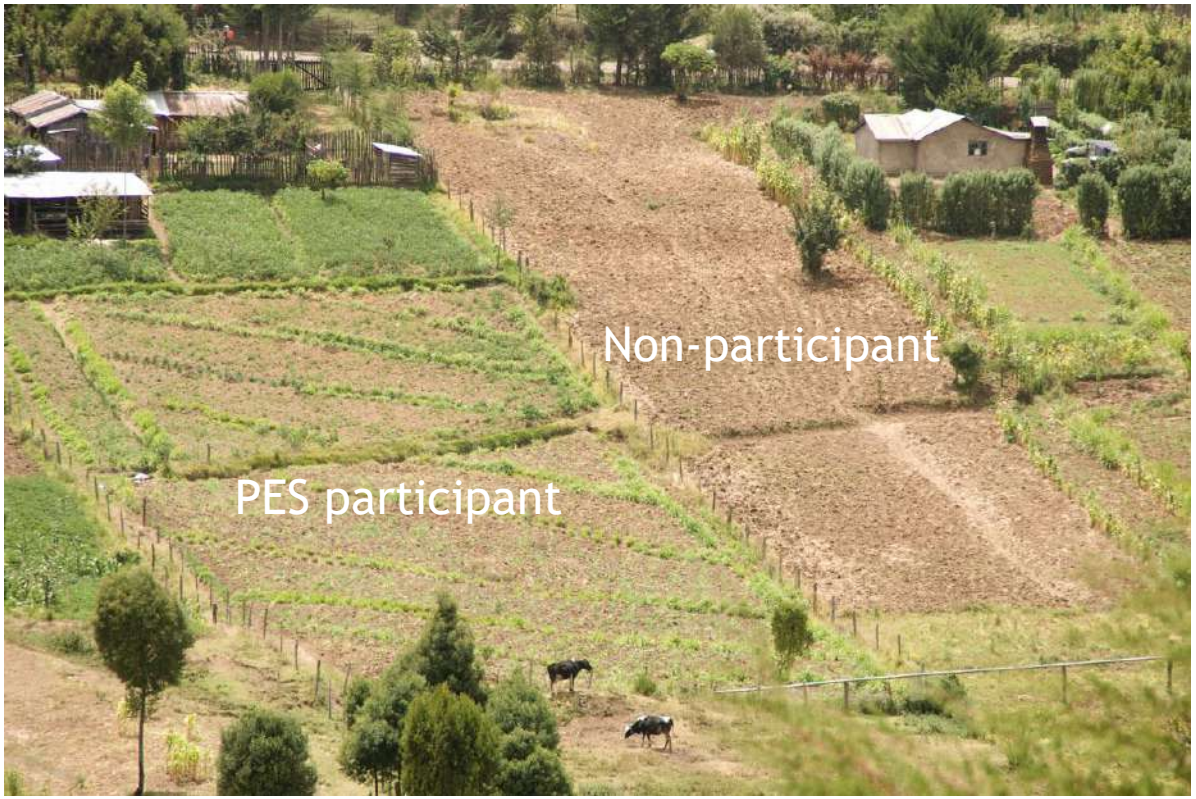
# Kenya: Naivasha-Malewa Project



# Mexico: Impact on reducing deforestation

- Alix-Garcia and others: Deforestation by PES participants reduced from 0.8% to 0.4%
- INE (Muñoz-Pina, 2012):

Reduction of deforestation

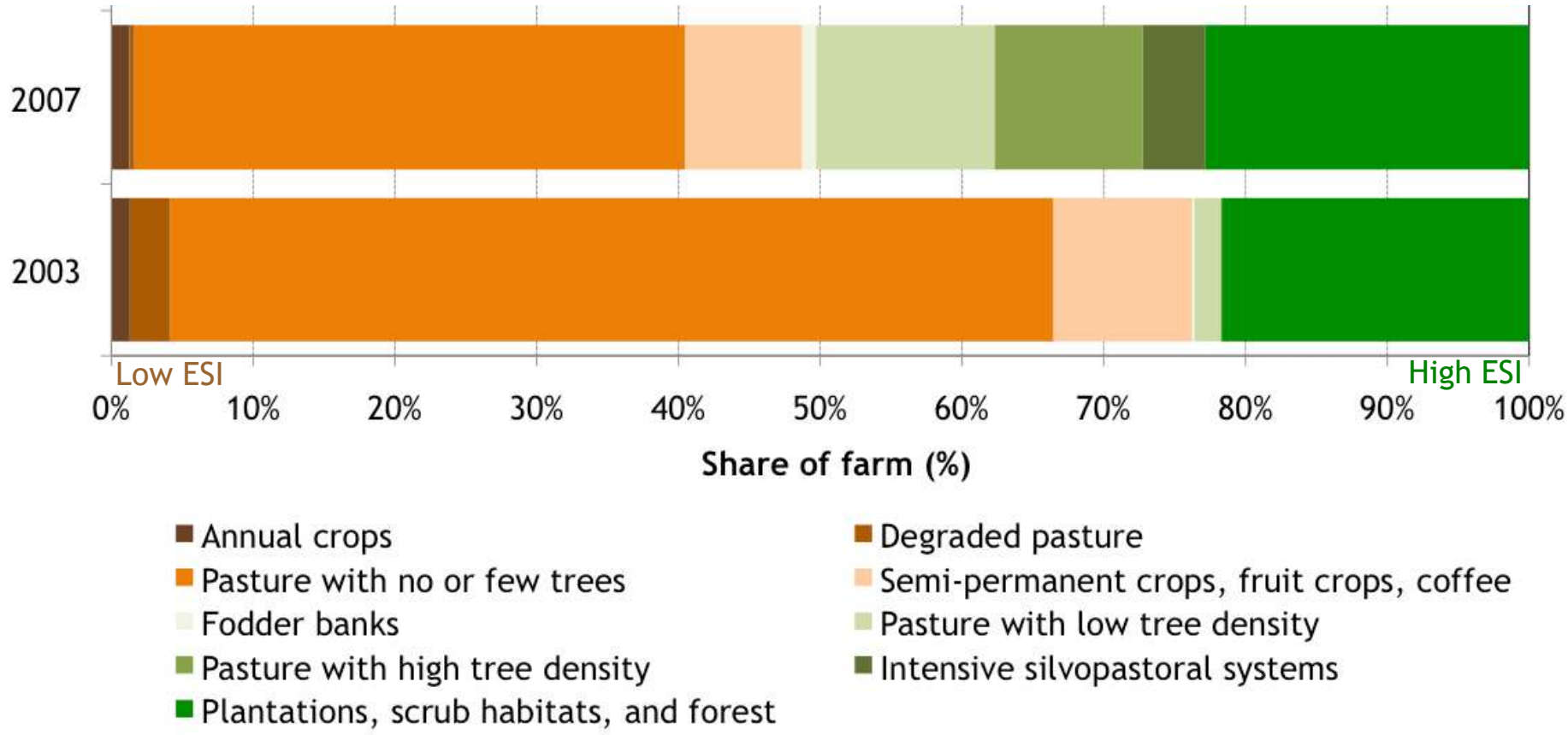
| *Deforestation 2000-07* | *Participants* | *Non-participants* |
|---|---|---|
| Observed (%) | 0.6 | 3.7 |
| Estimated without PES (%) | 1.6 | 3.7 |

Need to improve targeting

- New impact evaluation underway

# Impact of PES on land use change

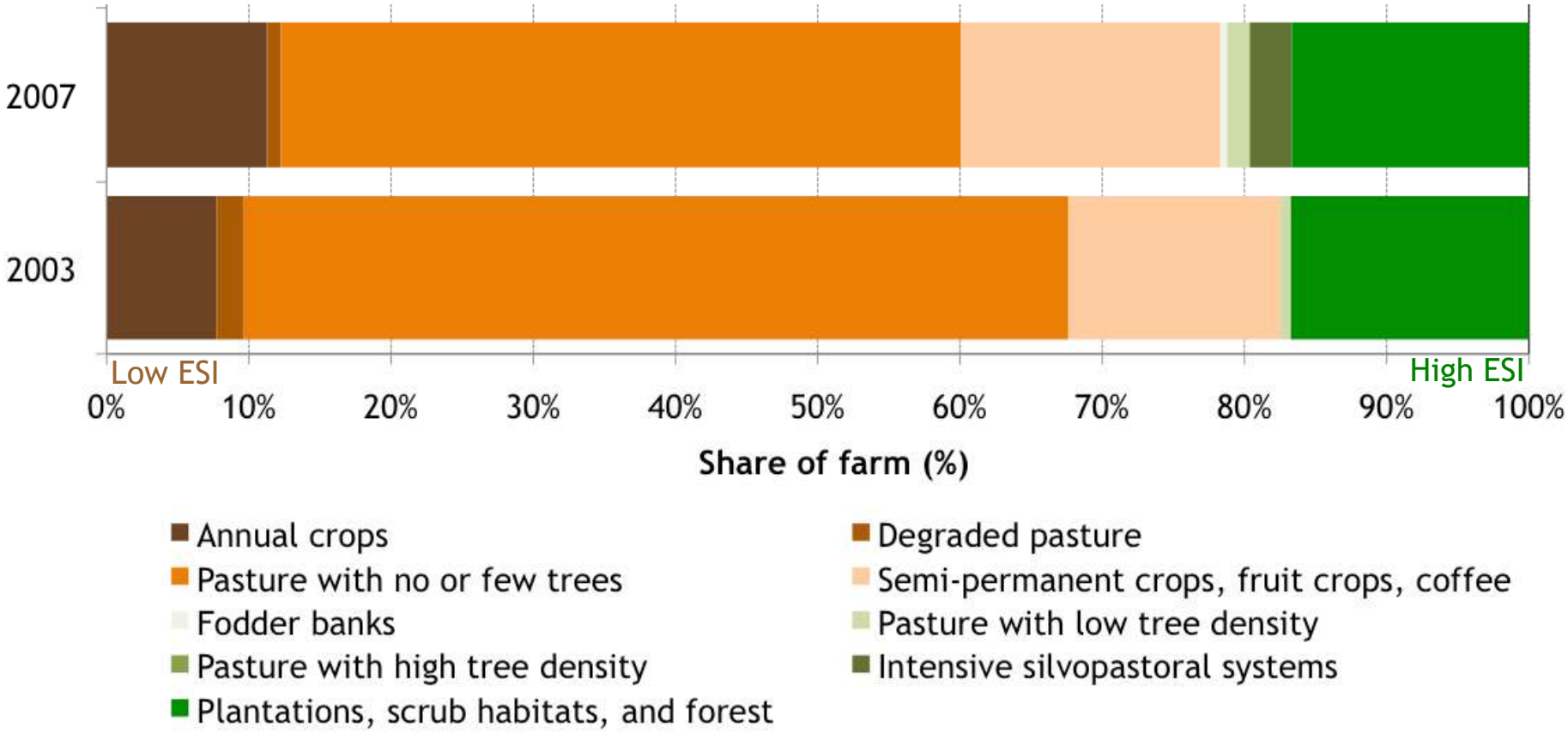
Regional Silvopastoral Project - Quindío, Colombia - PES Recipients




*Source*: Silvopastoral Project data

# Impact of PES on land use change

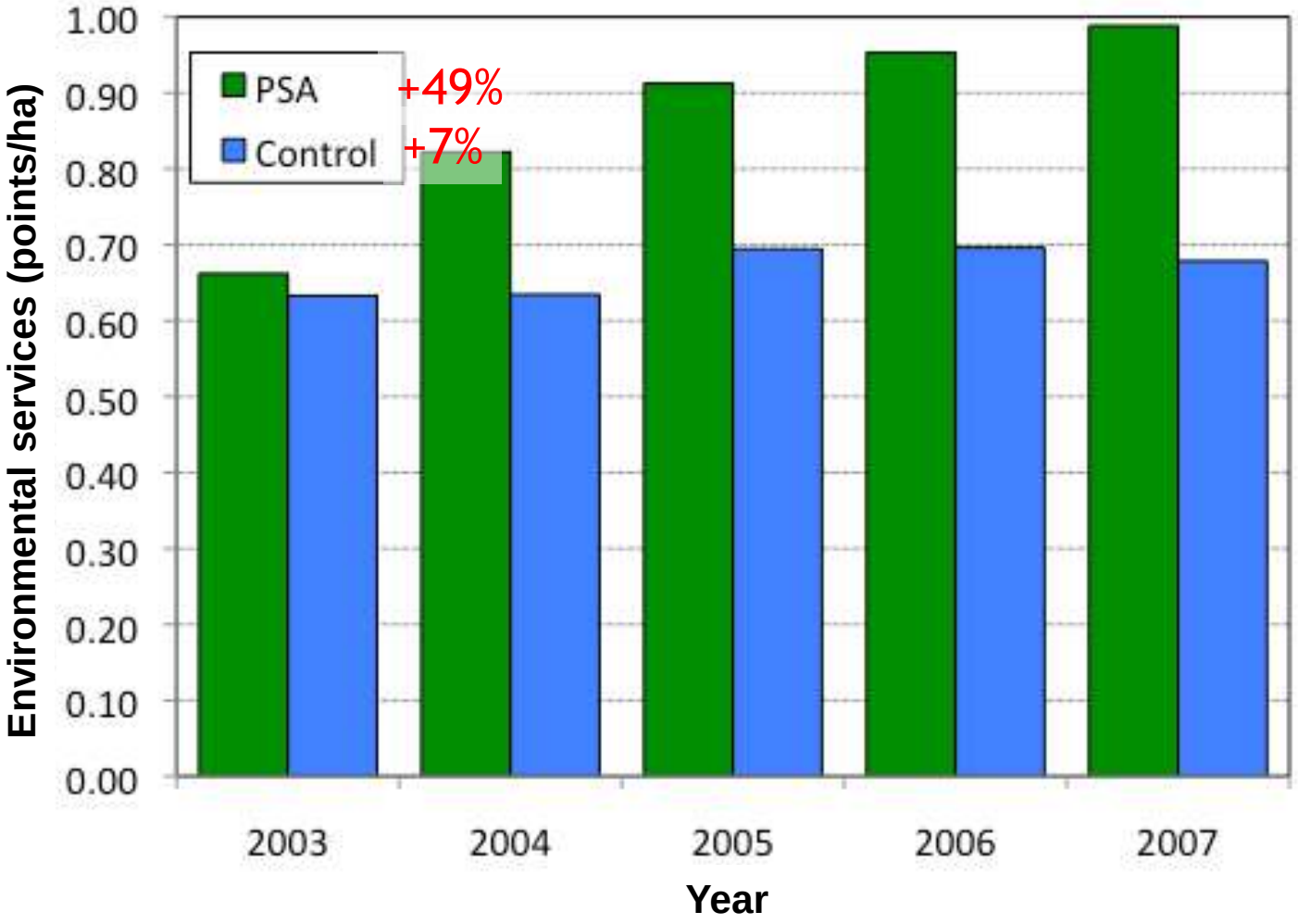
Regional Silvopastoral Project - Quindío, Colombia - Control Group




*Source*: Silvopastoral Project data

# Impact of PES on environmental services

Regional Silvopastoral Project - Quindío, Colombia

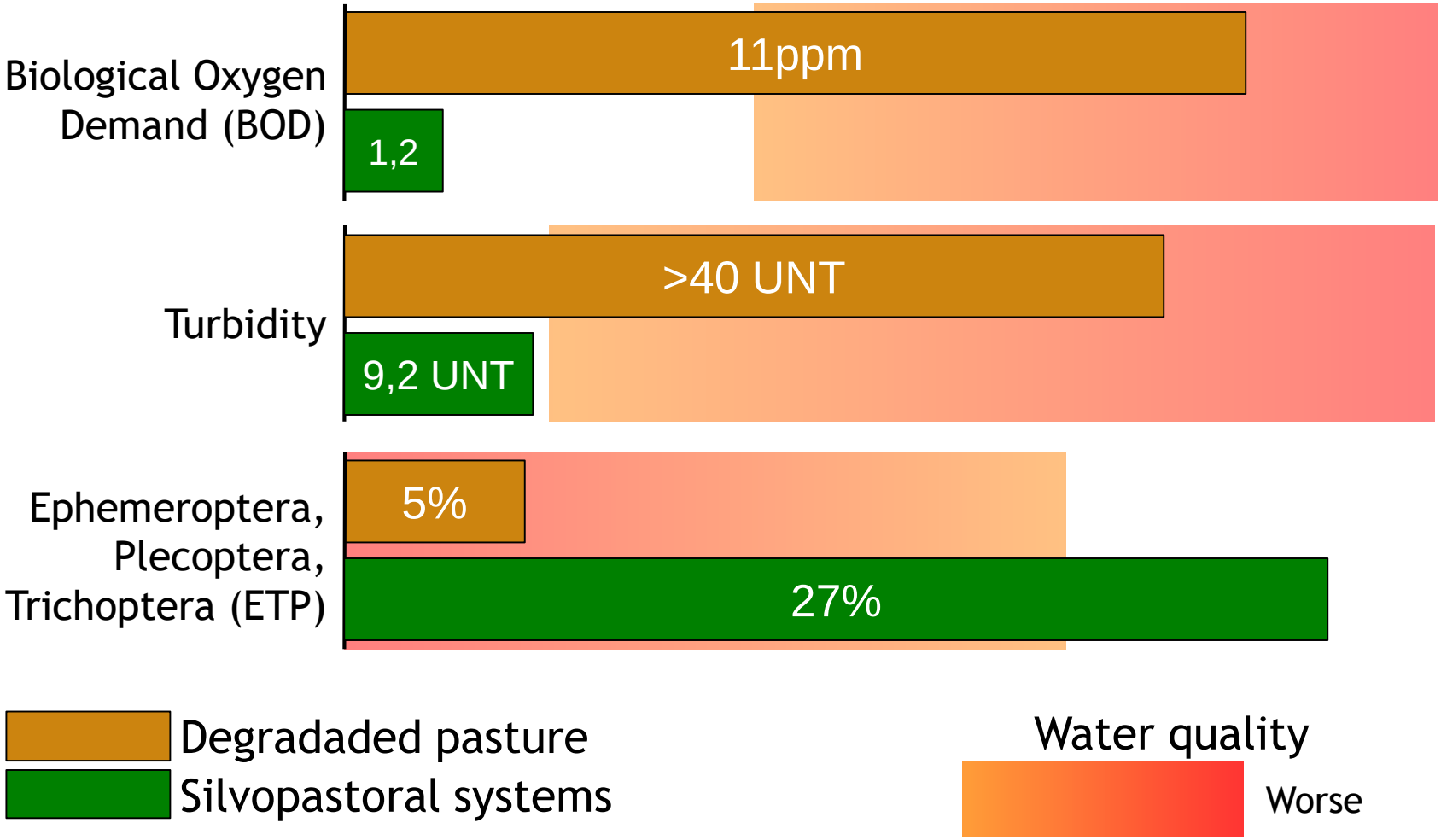



*Note*: According to project's environmental service index, which includes biodiversity and carbon

*Source*: Silvopastoral Project data

# Impact of PES on water quality

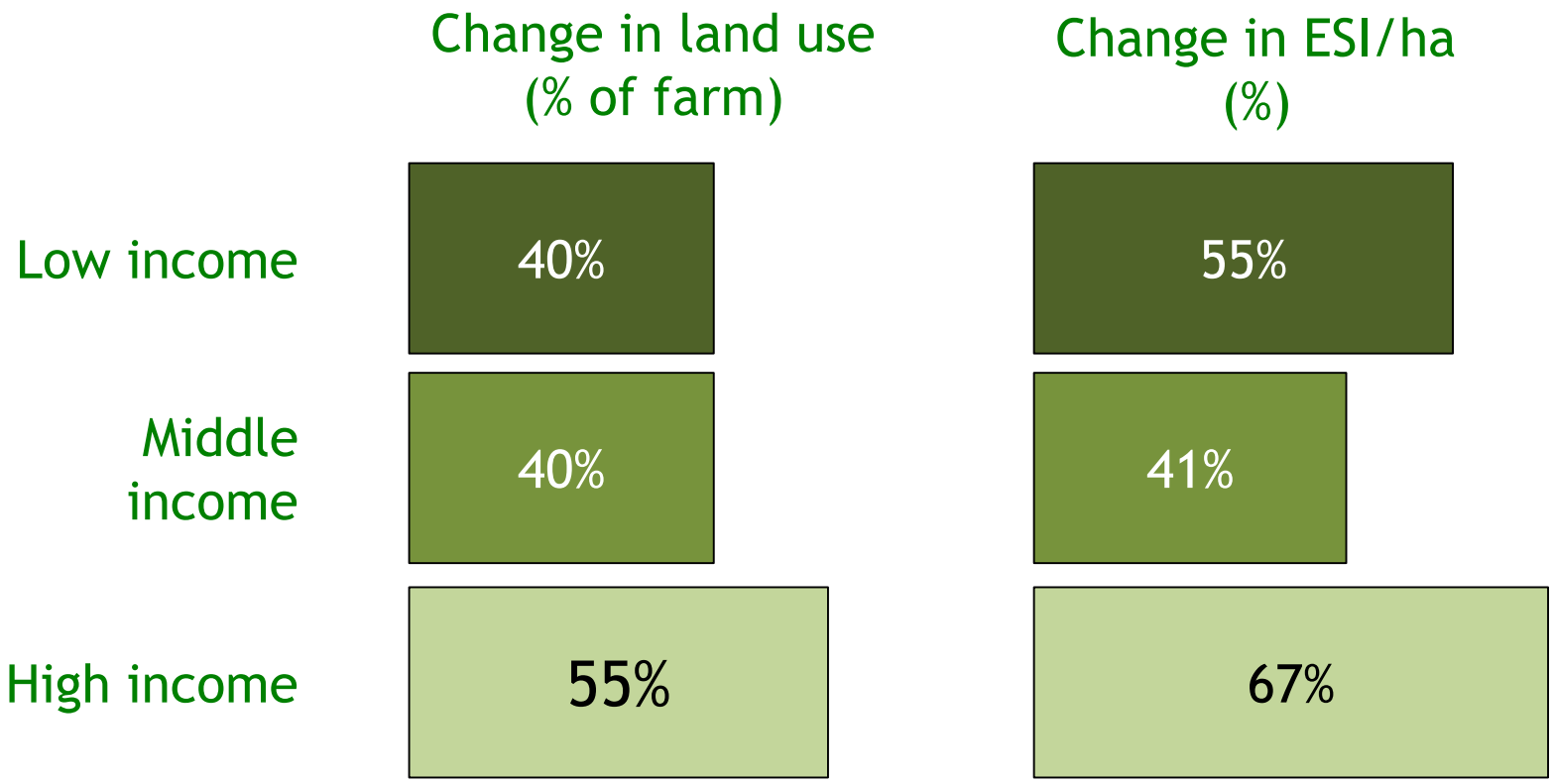
Regional Silvopastoral Project - Quindío, Colombia




*Source*: Silvopastoral Project data

# Can the poor participate?

Regional Silvopastoral Project - Quindío, Colombia - PES Recipients

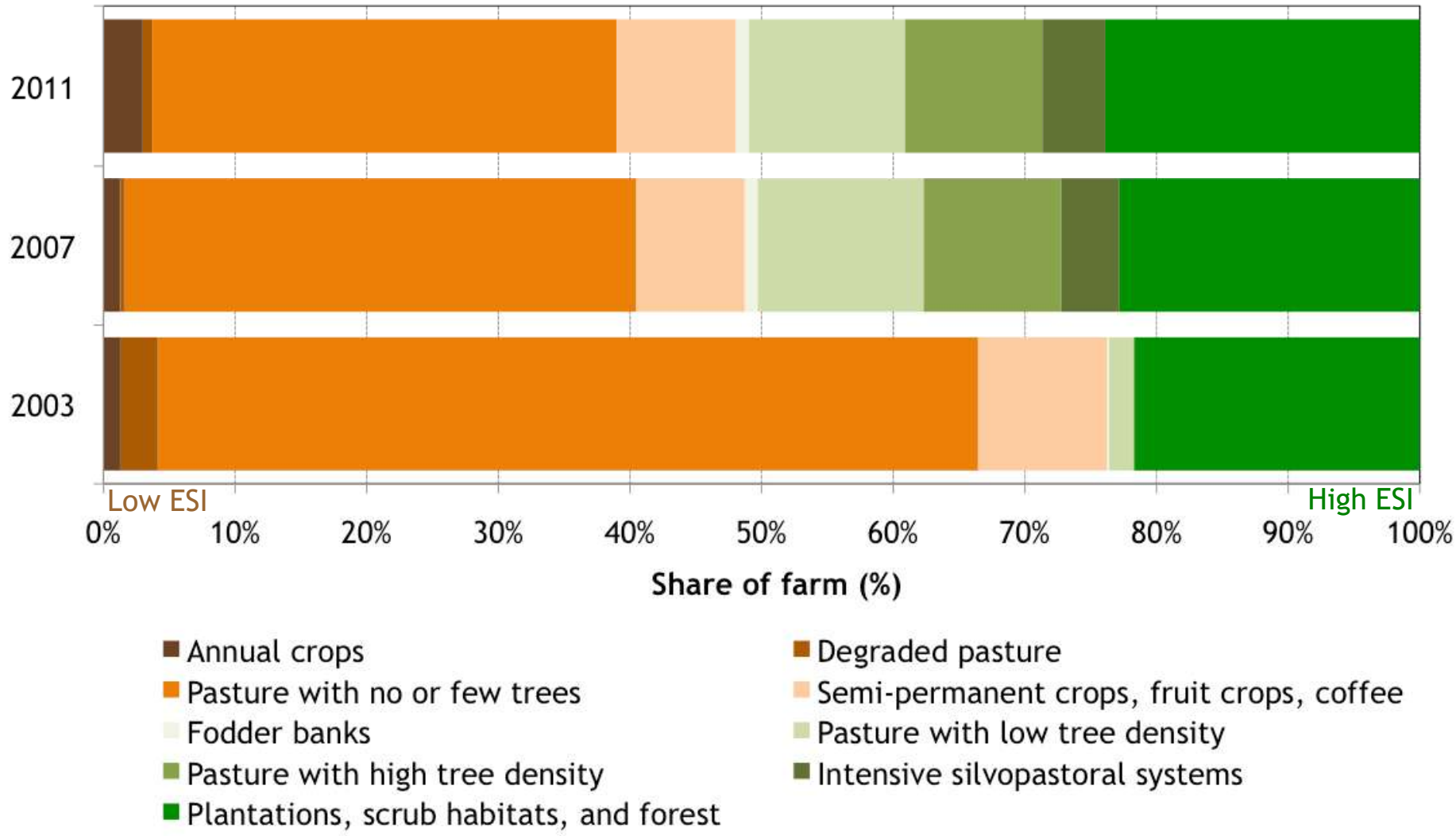



Differences are not statistically significant

*Source*: Pagiola, Rios, and Arcenas (2010)

# Do the results last?

Regional Silvopastoral Project - Quindío, Colombia- PES Recipients

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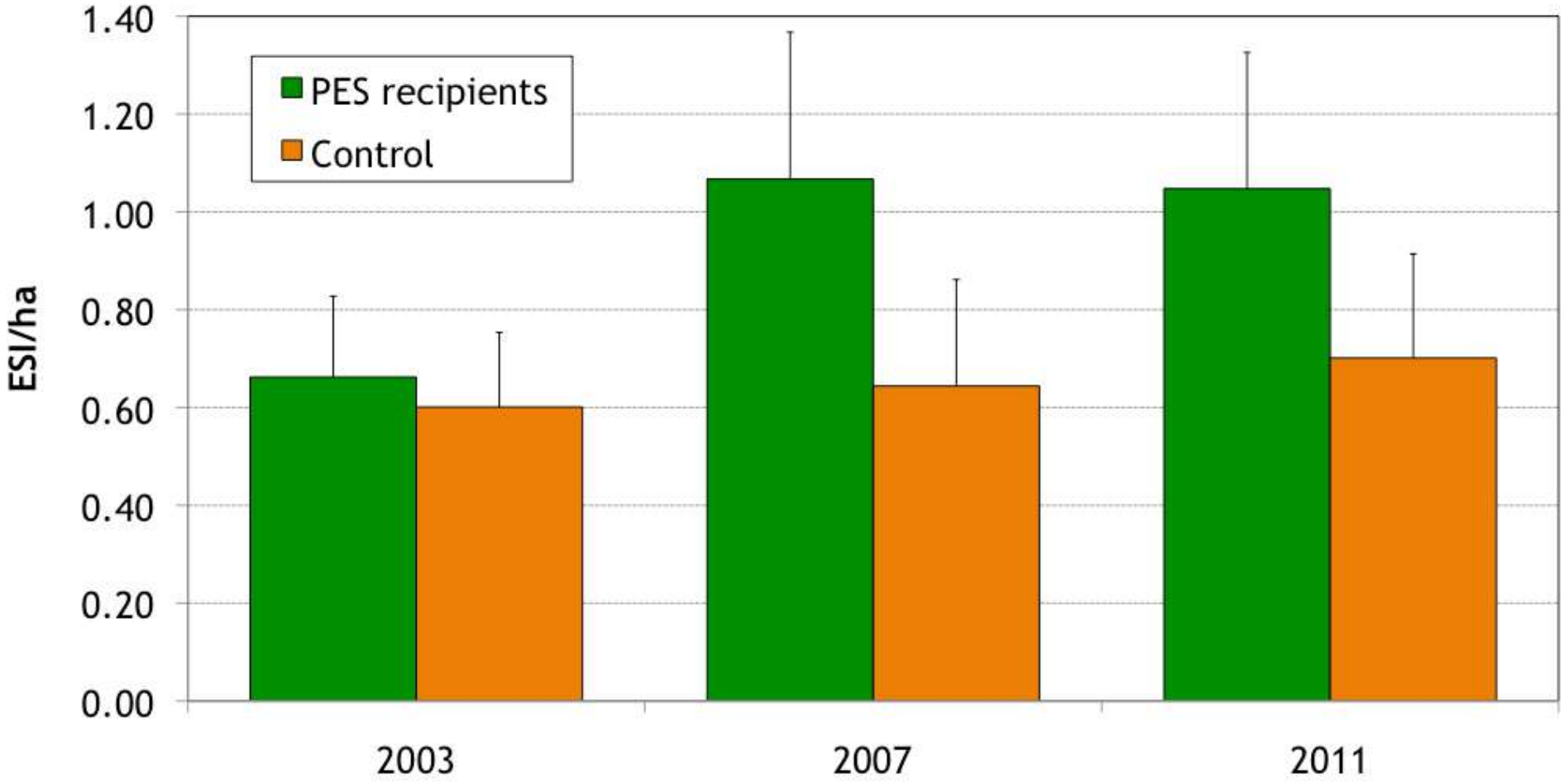
# Do the results last?

Regional Silvopastoral Project - Quindío, Colombia




*Source*: Silvopastoral Project data

# Payments for Environmental Services (PES)

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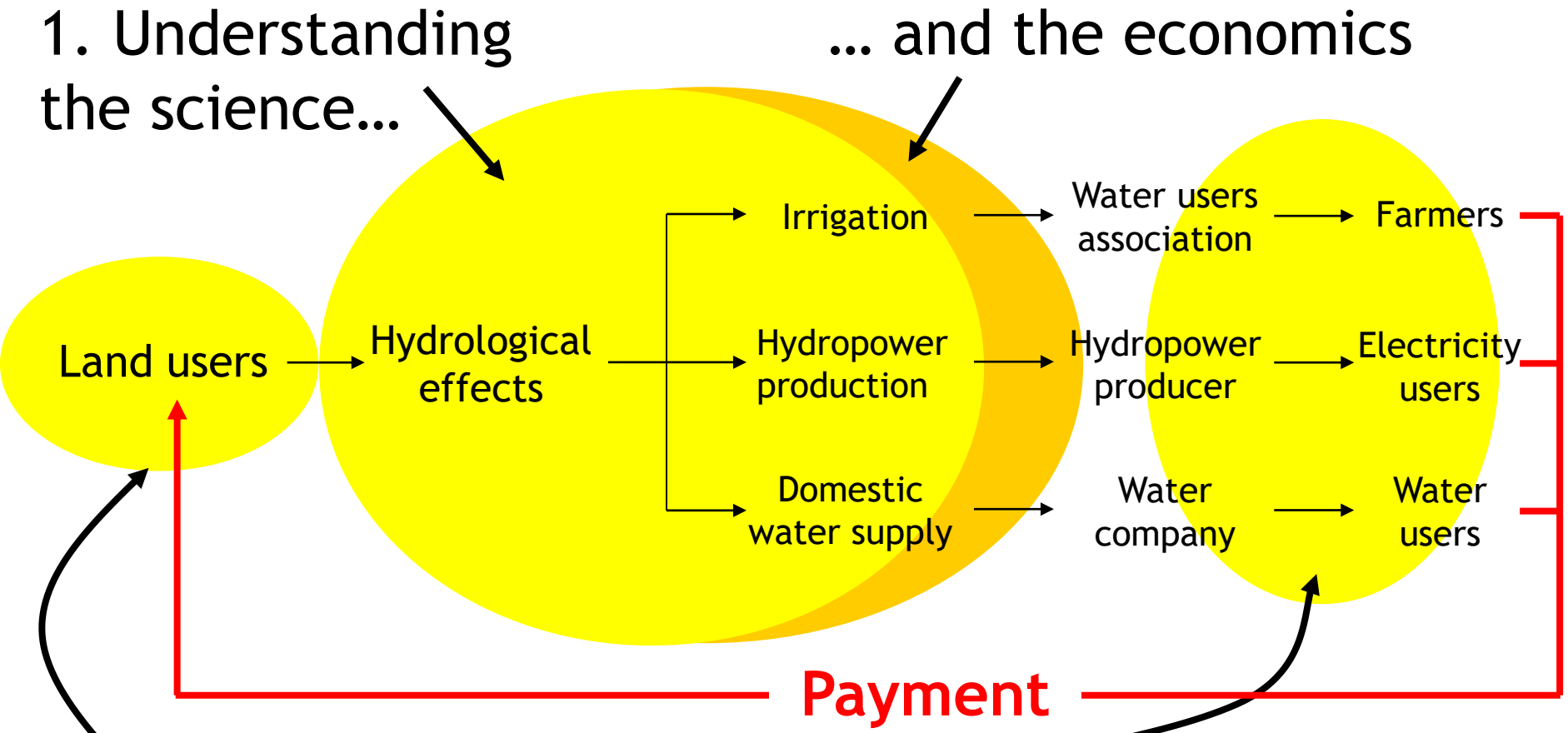
# From theory to practice



# Some lessons from experience

- Understand the problems
- Justifying the program
- Target payments
- Differentiate payments
- Evaluate the impact

# Challenges for all PES programs

- Understanding how to generate services
- Implementation arrangements

# Challenges for national programs

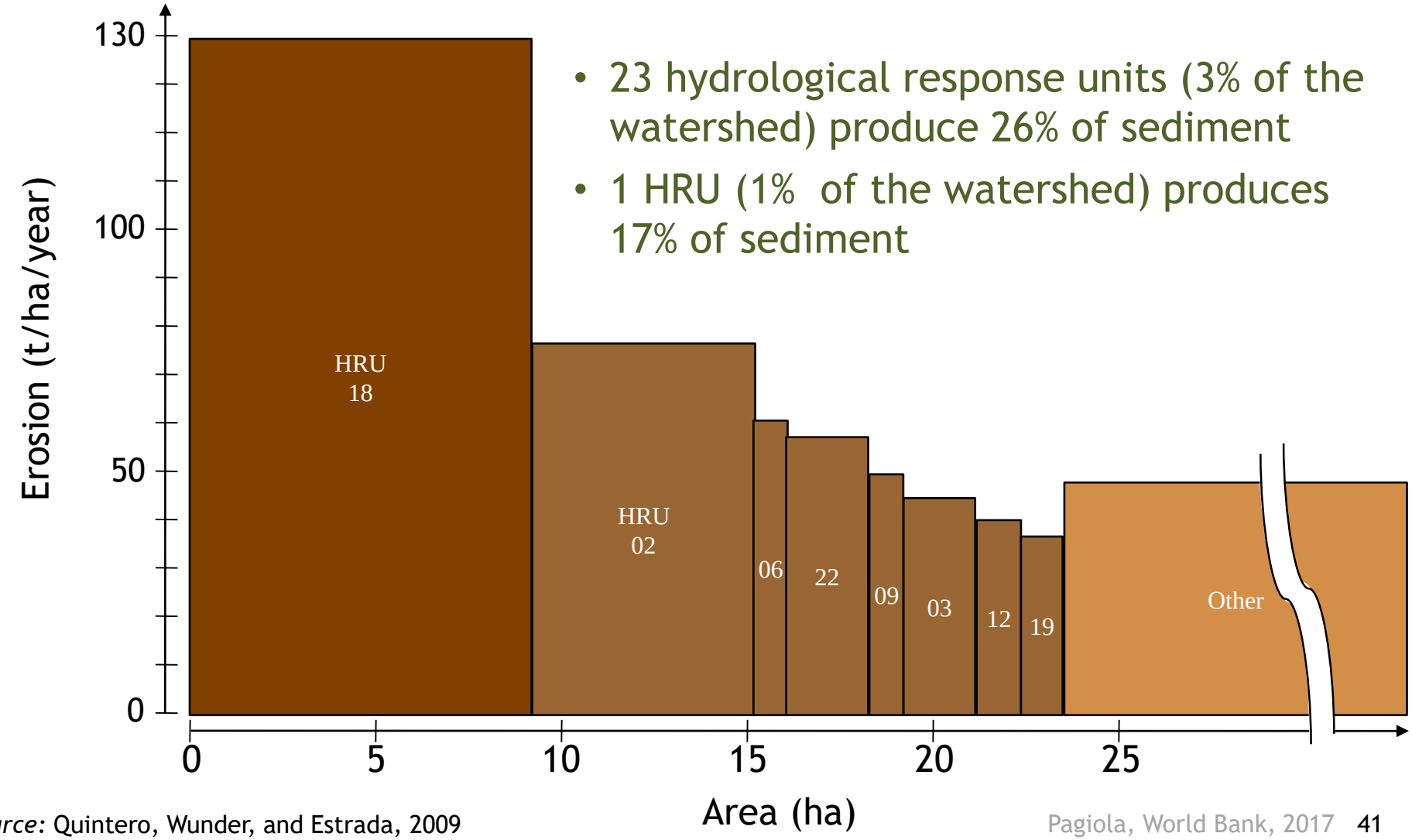
- Targeting
  - Maps of eligible areas
  - Differential payments
- Dealing with multiple objectives
  - Prioritizing applications
- Bureaucratic/legal constraints
  - Budget cycles
  - Compliance with regulations
- Unreliable financing
  - Earmarked funding
  - Disburse to Fund

# Challenges for user-financed programs

- Perverse incentives
- Legal constraints
- Targeting
  - Maps of eligible areas
  - Differential payments
- Cost-effectiveness

# Using hydrological models to target payments

## SWAT estimates: Erosion in Mishquiyacu watershed, Perú




- 23 hydrological response units (3% of the watershed) produce 26% of sediment
- 1 HRU (1% of the watershed) produces 17% of sediment

*Source:* Quintero, Wunder, and Estrada, 2009

# Using hydrological models to target payments

SWAT estimates: Main sediment sources to Lake Cocibolca (Nicaragua)


Pagiola, World Bank, 2017

# Using hydrological models to target payments

SWAT estimates: Reductions (% of current levels)

| *Scenario* | *Sediment* | *Total N* | *Total P* |
|---|---|---|---|
| Reforest the entire watershed | 99 | 45 | 87 |
| Reforest all areas with precipitation >1500 mm | 97 | 35 | 74 |
| Reforest all areas with slope >8%, install small dams | 90 | 45 | 87 |
| Reforest all areas with slope >15%, adopt zero tillage | 88 | 18 | 46 |

# Differentiated payments: Using indices

- Index of watershed protection benefits
  - Land use (vegetation cover)
  - Plot characteristics (slope)
  - Location of the plot (distance from watercourse)

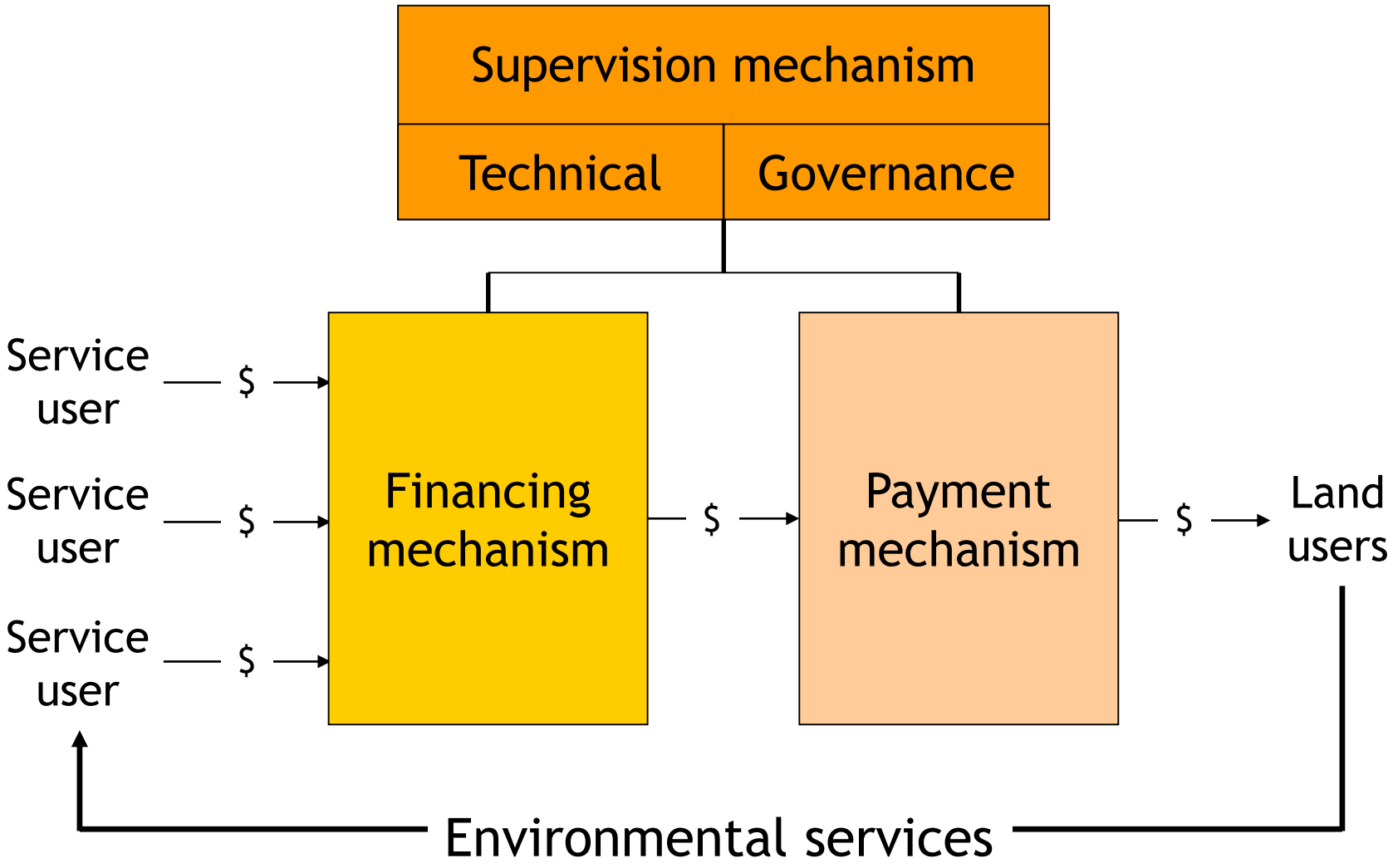
| | | Slope (%) | | |
|---|---|---|---|---|
| | | 15-45 | 45-65 | >65 |
| Vegetation cover | <30 | 0 | 0 | 0 |
| | 30-50 | 15 | 40 | 60 |
| | 50-70 | 20 | 50 | 80 |
| | 70-80 | 25 | 60 | 90 |
| | > 80 | 40 | 70 | 100 |

Incremental points
70 – 40 = 30

Value of points
30 x US$2 = US$60

+ 30 points if within < 50m of watercourse

# Components of a payment system



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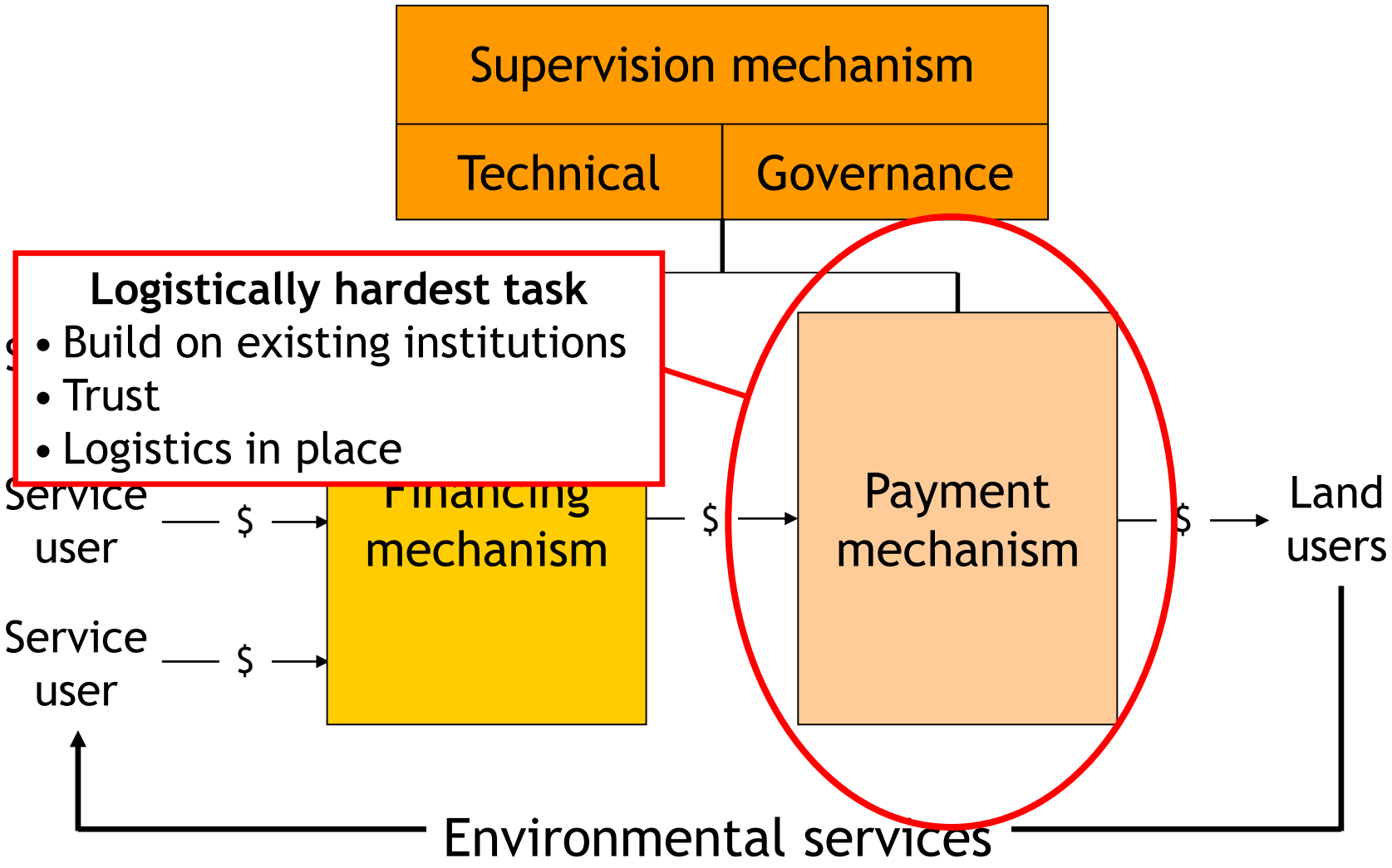

# Organizational frameworks

## User-financed PES

- Direct implementation
  - San Francisco del Norte, Nicaragua
  - Heredia, Costa Rica
  - Extrema, Brazil
- Contracting an NGO or other partner
  - Guandu, Brazil – in cooperation with Instituto Terra
- Contract with national PES program
  - Costa Rica – contracts with PSA Program
  - Mexico – 'Fondos Concurrentes' program
- Specific organization
  - Quito, Ecuador - FONAG

# Organizational frameworks

## Government-financed

- Specific organization
  - FONAFIFO, Costa Rica
- Existing organization
  - CONAFOR, Mexico
  - Programa *ProdutorES de Água*, Espírito Santo, Brazil
- Contracting NGO or other partner
  - Programa *Reflorestar*, Espírito Santo, Brazil
- Cooperation with local authorities
  - Programa *Mina d'Água*, São Paulo, Brazil

# Impact evaluation

- Are the right land users participating?
- Are participants changing their land uses?
- Are land use changes generating the desired environmental services?
- Are the land use changes persistent?

# Key problems

- Getting the science right
- Getting the institutions right

# World Bank support to PES: Documenting lessons


http://tinyurl.com/peslp

https://www.researchgate.net/profile/Stefano_Pagiola