



System of
Environmental
Economic
Accounting



**INSTITUTO NACIONAL
DE ESTADÍSTICA Y GEOGRAFÍA**

MONETARY VALUATION OF THE CARBON STORAGE AND SEQUESTRATION

PROJECT: NATURAL CAPITAL ACCOUNTING AND VALUATION OF ECOSYSTEM SERVICES

NATURAL CAPITAL ACCOUNTING AND VALUATION OF ECOSYSTEM SERVICES

This project on Natural Capital Accounting and the Monetary Valuation of Ecosystem Services is financed by the European Union and it is implemented in Mexico by the Instituto Nacional de Estadística y Geografía (INEGI), with the support of the Statistical Division Of United Nations (UNSD) and the Environmental Program of United Nations (PNUMA).

INTRODUCTION

- Climate change and a global negative externality.
- National Determined Contributions (NDC).
- Carbon storage and sequestration is a regulating service.
- Monetary valuation of “carbon services” consistent with climate change policies.

INTRODUCTION

1. Carbon storage and sequestration are different services and potentially asymmetric.
2. Monetary valuation:
 - The MAC method.
 - Direct estimations.
 - SCC.

SOCIAL COST OF CARBON (SCC)

Chart 1. Meta-analysis: SCC: Random effects.

Parameter	Total	Rate 1	Rate 2	Rate 3	Rate 4
M	\$25.83	\$100.63	\$16.47	\$30.14	\$6.29

Source: Alatorre, *et al.*, (2019).

Rate 1 = 0 y 0.3%, Rate 2 = 1 y 1.5%, Rate 3 = 2% a 3.5% and Rate 4 is above 4

GENERAL ACCOUNTING FRAMEWORK

Aggregation:

$$(1) \quad C_t = \sum_{j=1}^J (C_{j,t})$$

Where j defines the type of vegetation.

Stock:

$$(2) \quad C_t = C_{t-1} + \Delta C_t$$

where C_t represents total carbon storage in period t , C_{t-1} is carbon storage in period $t - 1$ and ΔC_t is carbon sequestration between period $t - 1$ y t .

Reordering (sequestration):

$$(3) \quad \Delta C_t = C_t - C_{t-1}$$

THE SOURCES OF CHANGE

The sources of changes:

$$(4.a) \quad \Delta C_{Bt} = \alpha_{Bt-1}(BIO_t - BIO_{t-1}) + (\alpha_{Bt} - \alpha_{Bt-1})BIO_t$$

$$(4.b) \quad \Delta C_{St} = \alpha_{St-1}(SUE_t - SUE_{t-1}) + (\alpha_{St} - \alpha_{St-1})SUE_t$$

Where the coeficientes are.

$$(5.a.) \quad \alpha_{Bit} = \left[\frac{C_{jt}}{BIO_{jt}} \right]$$

$$(5.b) \quad \alpha_{Sit} = \left[\frac{C_{jt}}{SUE_{jt}} \right]$$

where BIO_t represents biomass and SUE_t the type of soil and α_{Bt} y α_{St} corresponds to the coefficients.

MONETARY VALUATION OPTIONS

Options of the monetary valuation (Edens, *et al.*, 2019):

1. Carbon storage (annual service):

(6)
$$VC_t = \sum_{j=1}^J C_{j,t} * PC$$

Where VC_t represents the monetary valuation of the carbon storage service, $C_{j,t}$ is carbon storage in t and j represents the type of vegetation and PC is the carbon price.

The monetary valuation:

(7)
$$VAC_t = r_t * (C_t * PC)$$

Where VAC_t represents the annual monetary value of carbon storage and r_t is the interest rate.

“Social interest rate”: 2% annual.

“Market interest rate”: 4% annual.

MONETARY VALUATION OPTIONS

2. Monetary valuation of carbon sequestration:

$$(8) \quad \Delta C_t = C_t - C_{t-1}$$

Where ΔC_t is carbon sequestration at period t .

The monetary valuation is:

$$(9) \quad V\Delta C_t = \Delta C_t * PC_t$$

Where $V\Delta C_t$ represents the monetary valuation of the service of carbon sequestration.

MONETARY VALUATION OPTIONS

3. Monetary valuation of carbon storage and sequestration:

$$(10) \quad VTC_t = VAC_{t-1} + V\Delta C_t$$

Where VTC_t represents the monetary valuation of carbon storage and sequestration.

- Consistent with climate policies.
- Consistent with capital theory.
- Consistent with economic decisions.

Chart 2. Monetary value of carbon storage (t-1) and sequestration in biomass.

Concept	25 dollars		30 dollars	
	2%	4%	2%	4%
Annual value of storage (% of GDP)(t-1)	0.1893	0.3786	0.2271	0.4543
Annual value of sequestration (% of GDP)	0.1256	0.1256	0.1507	0.1507
Annual value of storage and sequestration (% of GDP)	0.3149	0.5042	0.3779	0.6050

Source: Own elaboration.

Chart 3. Monetary value of storage and sequestration service of organic carbon in soils : 2014.

Concept	25 dollars		30 dollars	
	2%	4%	2%	4%
Annual value of storage (% of GDP)	1.3293	2.6586	1.5952	3.1903
Annual value of sequestration (% of GDP)	0.0254	0.0254	0.0305	0.0305
Annual value of storage and sequestration (% of GDP)	1.3547	2.6840	1.6257	3.2208

Source: Own elaboration.

Graph 1. Changes in biomass and carbon sequestration

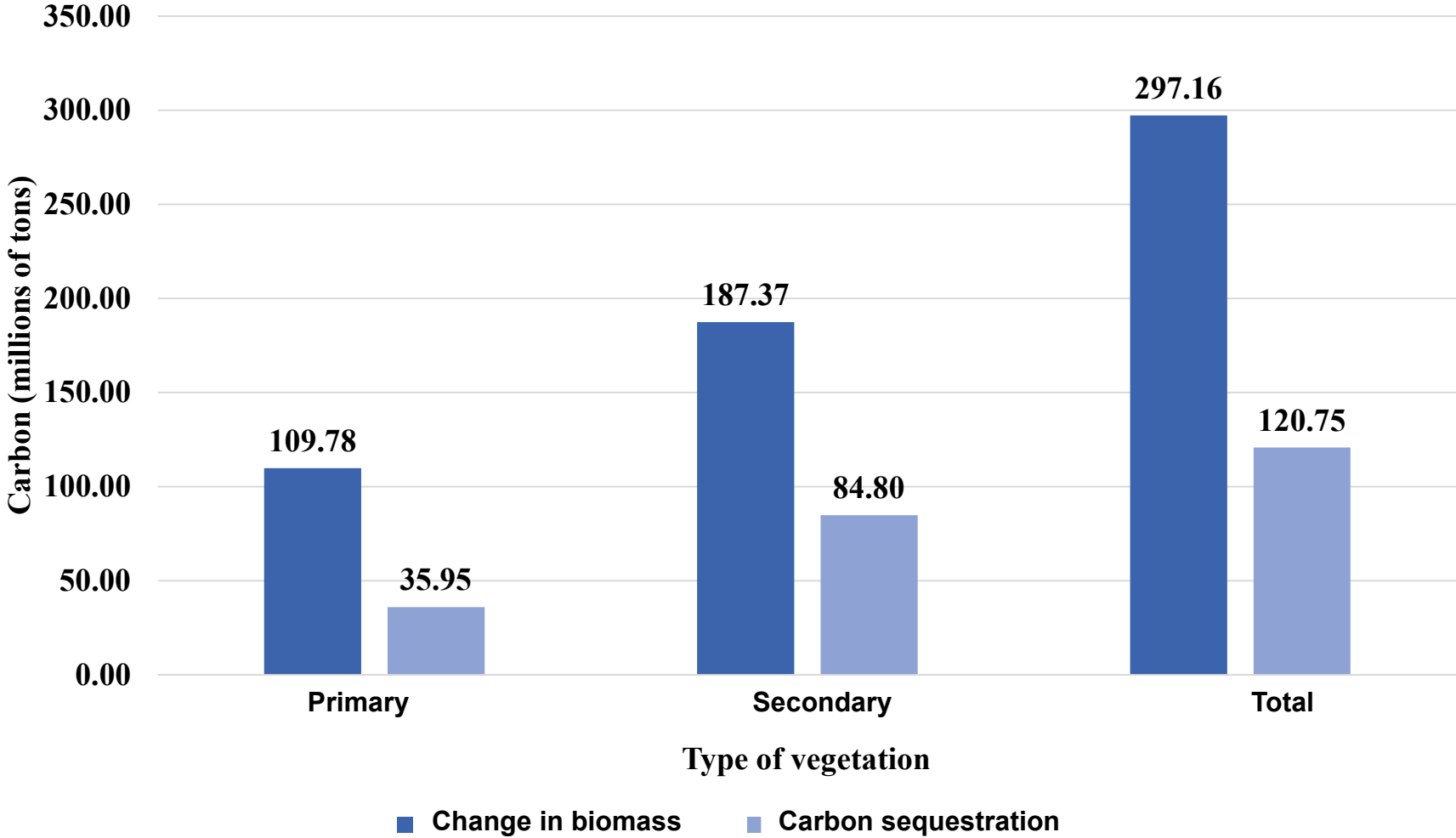
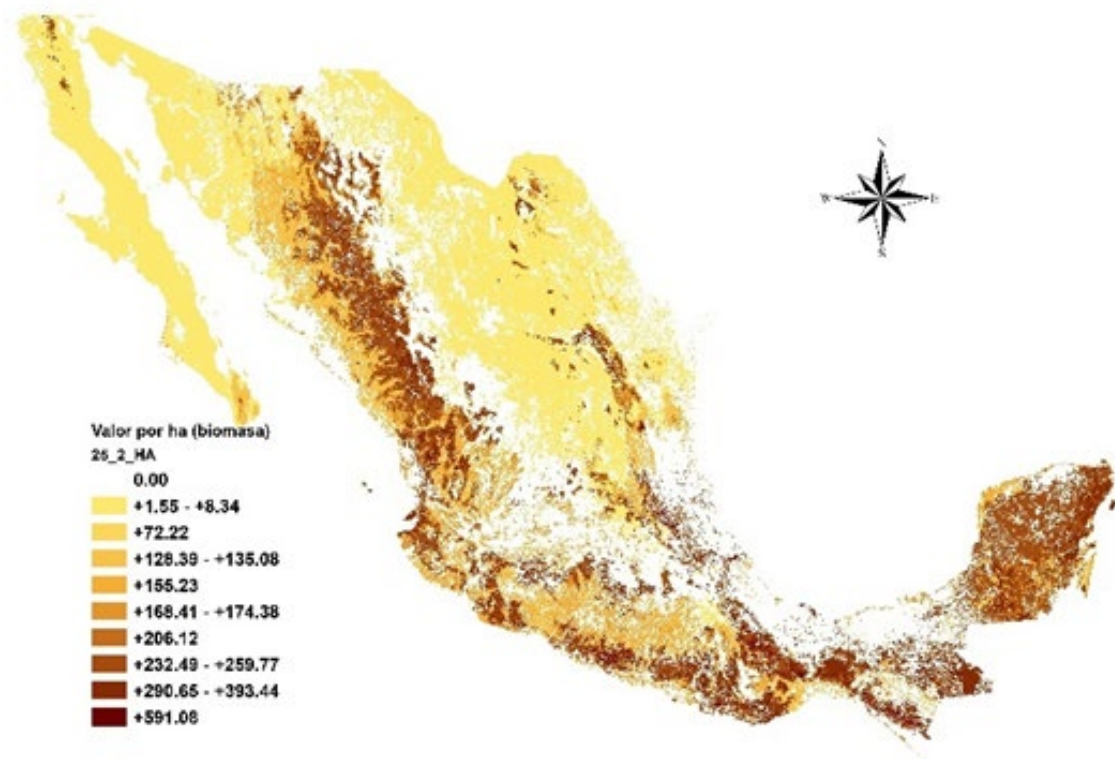
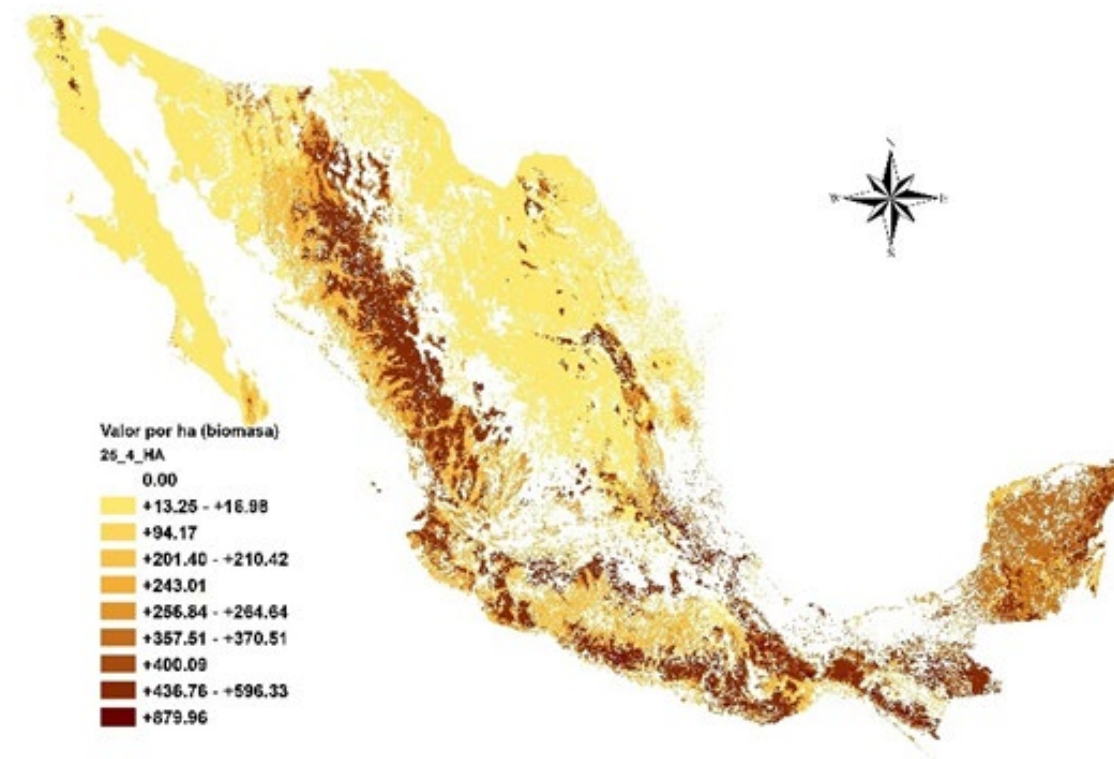


Figure 1. Annual value of storage and sequestration carbon service in biomass in 2014 (pesos of 2014 per ha)

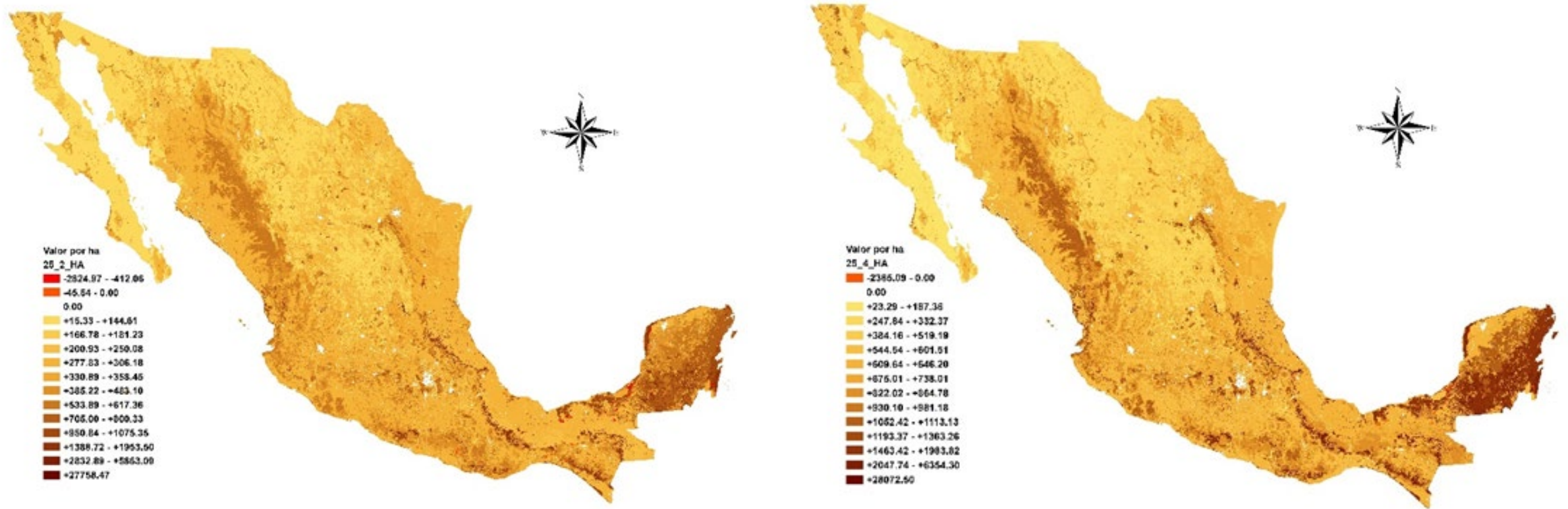


25 dollars and discount rate of 2%



25 dollars and discount rate of 4%

Figure 2. Annual value of storage and sequestration carbon service in soils in 2014 (pesos of 2014 per ha)



25 dollars and discount rate of 2%

25 dollars and discount rate of 4%

CONCLUSSIONS

- Relevance to consider carbon storage and sequestration.
- Monetary Value is very sensitive to climate policies.
- Monetary valuation of Ecosystem Services are related with economic, social factors and public policies.
- Non-linear relationship with circular causality channels.



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