Natural Capital Accounting and Valuation of Ecosystem Services in Mexico (NCAVES-Mexico) 2017-2020

June, 2019
1. Background
2. Institutional Settings
3. Results and products to date
4. Progress
   • Classification of ecosystems
   • Ecosystem Extent
   • Ecosystem condition
   • Mapping and valuing ecosystem services
5. Opportunities and Challenges ahead
Background

• Project started in 2017; Interinstitutional Technical Group set up in 2018
• Products to date:
  • Country assessment on natural capital accounting and valuation of ecosystem services
  • Pilot studies: countrywide, State-level, (Aguascalientes), local (Protected Areas)
• Focus:
  • Organic Carbon in Soils
  • Surface water supply
  • Food crop production
  • Coastal protection by mangrove ecosystems
National Institute of Statistics and Geography (INEGI) as Project Host/Leader

- Founded in 1983; autonomous since 2008
- Deals with official information about: territory, resources, population and economy, within the same institution
- INEGI coordinates National System of Statistical and Geographical Information (SNIEG), a consultative, inter-institutional mechanism with links to academia and the private sector.
Institutional Settings

• Arrangements with sectors, academia, other stakeholders
• **Interdisciplinary work**: Economists, national accountants, biologists, geographers, etc.
Mexico – Country Assessment

- Overview of precedents and current work in Mexico:
  - Environmental-economic accounts compiled since 1996, following the SEEA-Central Framework
  - Preliminary ecosystem services valuation studies (CONAFOR, CONABIO, INEGI)
  - Payment for Environmental Services scheme
  - Ecosystem services concept: initial recognition
  - Active engagement in international initiatives for valuing ecosystem services:
    - Advancing Natural Capital Accounting Project (2014-2016)
    - TEEB
    - IPBES

- Identification of areas where adoption of the SEEA-EEA approach might be most viable.
• Spatial coverage/geographic resolution:
  • Nation-wide
  • State-wide (Aguascalientes state pilot + 3)
  • Natural Protected Areas (NPA, federal)
  • Land tenure
  • Watersheds (projected)

• Themes:
  • Ecosystem extent
  • Ecosystem condition
  • ES Supply & use balance matrices
  • Economic Valuation of ES
Accounts in physical units

- Ecosystem classification
- Ecosystem extent
- Ecosystem condition
- Ecosystem services supply
- Ecosystem services use and benefits

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Accounts in economic/monetary units

- Ecosystem services supply & use values
- Ecosystem asset values
- Integrated accounts

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**Project overview**
**Ecosystem classification**

- **Basis**: INEGI’s Vegetation and Land-use classification (Series 0–VI):
  - Highly detailed classification system of the main types of natural vegetation and land-use occurring in the country (58 vegetation types, 24 land-use classes).

- **Aggregated version of INEGI’s classification, including:**
  - 14 vegetation classes
  - 4 land use classes (agriculture [annual or permanent crops], forest plantations, human settlements)

- **Criteria** (*Technical Recommendations in support of the SEEA – EEA 2012*)
  - Ecological factors: Characteristics such as vegetation type and structure, species composition, ecological processes, climate, hydrology, soil characteristics and topography, etc.
  - Ecosystem management and use: Protected areas, land management regime, etc.

- **Land management restrictions**: - Federal Protected Areas (CONANP)
  - Other restrictions

- **Land tenure**: Private, public & communal property (*ejido* and indigenous communities)
Ecosystem classification

Based on INEGI's Land Use & Vegetation Maps (series 0 - VI)
Ecosystem classification

Natural Protected Areas

Land Tenure

- COMUNIDAD
- EJIDO
## Ecosystem Extent accounts: The State of Aguascalientes

<table>
<thead>
<tr>
<th>Year</th>
<th>Pine forest</th>
<th>Oak woodland</th>
<th>Xerophytic shrubland</th>
<th>Deciduous tropical forest</th>
<th>Grassland</th>
</tr>
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<tbody>
<tr>
<td>2002</td>
<td>-</td>
<td>1,118</td>
<td>-</td>
<td>27</td>
<td>-</td>
</tr>
<tr>
<td>2007</td>
<td>-</td>
<td>1,184</td>
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<tr>
<td>2011</td>
<td>-</td>
<td>1,184</td>
<td>-</td>
<td>68</td>
<td>-</td>
</tr>
<tr>
<td>2015</td>
<td>-</td>
<td>1,184</td>
<td>-</td>
<td>68</td>
<td>-</td>
</tr>
</tbody>
</table>

**Ecosystem Extent**

2015
Ecosystem condition

1. Conservation status of vegetation:
   • Primary vs. secondary vegetation


3. Soil organic carbon content: Sample point data

4. Biodiversity:
   • Vascular plants species richness
   • Number of endemisms
   • Number of species at risk

5. Other soil properties (S-World model)

6. Indices or composite indicators:
   • Integrity Index (INECOL-CONABIO)
   • EcologEcosystemical Integrity Index (CONABIO)
   • Human footprint (SEMARNAT)
E.G.: Human footprint

• Based on Bonham-Carter (1994) and González-Abraham et al. (2015)
• Indicator assesses the extent and intensity of the transformation caused by various activities (for which spatially explicit information is available)
  - Cities and towns
  - Agriculture and aquaculture; forest plantations; cultivated pastureland
  - Roads (highway, dirt-road, carpeted road, gravel road), railways, electricity transmission lines
  - Industry
  - Wastewater treatment facilities
  - Archaeological sites
  - Solid waste final disposal sites (dump sites, landfills)
  - Mining fields
Mapping Condition (human footprint)
Open data cube as a tool to assess ecosystem condition over time

The ANPs as a successful policy instrument
Mapping and valuing ecosystem services

Organic Carbon in Soil

• Inputs:
  • Field data from the National Forest Inventory (CONAFOR)
    Two sampling cycles completed to date: 2004-2009 and 2009-2014
  • North American Terrestrial Ecoregions Level II chart (CEC-NA)
  • INEGI’s Vegetation and land-use charts, Series IV (2007) and V (2011)

• Methods:
  • Methods used for compiling the AFOLU sector National Inventory of Greenhouse Gases (CONAFOR-INECC, as per IPCC’s guidelines)
  • Estimate average carbon content in above/below-ground biomass per vegetation type, per ecoregion as of 2004-2009 and 2009-2014
  • Estimate annualized change in above/below-ground carbon content between 2004-2009 and 2009-2014, per vegetation type, per ecoregion -> Carbon capture
# Mapping and valuing ecosystem services

## Carbon capture and storage by Aguascalientes ecosystems

<table>
<thead>
<tr>
<th>Ecosystem condition</th>
<th>Ecosystems</th>
<th>ECOSYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conifer forest</td>
<td>Oak woodland</td>
</tr>
<tr>
<td>Carbon stored ca. 2007 (tm)</td>
<td>Primary</td>
<td>43,730.3</td>
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<tr>
<td></td>
<td>Secondary</td>
<td>-</td>
</tr>
<tr>
<td>Carbon stored ca. 2011 (tm)</td>
<td>Primary</td>
<td>44,135.4</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>-</td>
</tr>
<tr>
<td>Potential Carbon capture rate (tm/yr)</td>
<td>Primary</td>
<td>165.0</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>-</td>
</tr>
</tbody>
</table>

## Approaches to valuing C storage and capture by Aguascalientes ecosystems

a) Carbon offsets in voluntary markets

b) Social Cost of Carbon

c) REDD mechanisms
Mapping and valuing ecosystem services

Organic Carbon Soil

2004-09

2009-14
Mapping and valuing ecosystem services

Surface water supply

Type of substrate
- Land cover
- Precipitation
- Infiltration
- Evapo-transpiration

Mean annual volume of natural runoff

2002

2007
Mapping and valuing of ecosystem services

Food crop supply (Metric Tonnes)
Mapping and valuing of ecosystem services

Food crop supply (Monetary Units)

Beans 2007 (x10^3 pesos)

Legend

- < 7116
- 7116 - 39348
- 39348 - 91998
- 91998 - 174171
- 174171 - 466450
Results to date

- Nation-wide and for 3 states, for LUVC series III, IV, V & VI
  - Extension accounts (including balance and Exchange matrices)
  - Condition accounts for vegetation and organic carbon in soil

- Preliminary estimates for crop production and Surface water supply

- Preliminary economic valuation for soil carbon (social cost, etc)

- Local data (Aguascalientes) and raw national data for scenario modeling
Related targets: 6.3, 6.5 and 6.6.
This project retakes information on the **quality and uses of water**, in order to relate it to the condition of the ecosystems, as well as with the supply of this resource as part of a **ecosystem service of provision**. This will be able to support the integral management of the resource and the decision making.

Related targets: 13.1
Currently there is an assessment of the **socioeconomic impact** of the major **natural disasters** occurring in **Mexico**, this information is important because the **reduction of the impact** of disasters contributes to the efforts related to **sustainable development**.

Related targets: 15.1, 15.4, 15.5 and 15.a.2
Currently in Mexico there are registered indicators for 4 targets of this goal, but it is important to note that the SEEA-EEA Mx project provides useful information for the other goals of this objective.
INTEGRATION: GEOGRAPHY/ECOLOGY ↔ ECONOMY

In spite of favourable circumstances:

• Both realms within the same institution
• INEGI´S President calls for integration
• Sound legal foundation (Nt´l System of Statistical & Geographical Info)
• Autonomous institution (no political pressure)
• Over 30 years of experience (Env’tly Adjusted GDP, since 2003)

Paradigm differences hard to overcome
Involvement of other sectors:

- Sense of ownership in different sectors; participation in accounting
- Ministry of Finance
- Further participation of academic entities/ researchers
- Participation of private sector
- Communication/ outreach / public opinion
- Commitment to use results in reshaping public policies
- Integration with Development Plans
- Linkages to SDGs; Paris Agreement/ NDCs; Aichi; Sendai

SEEA EEA continuity after NCAVES
OPPORTUNITIES & CHALLENGES AHEAD III

TECHNICAL PROGRESS/ STANDARDIZATION

Improved Technical Guidance

• Revision of SEEA EEA Ecosystem Accounting
• Economy of Information; developing countries potential
• Completion of time series
• Improvement of data granularity
• Temporal / Spatial scales
• Economic valuation
• Replicability of pilot studies
• Tension between complexity of ecosystems and SEEA EEA needs
• Stock and Flow models: adequacy and limits

Strengthening the SEEA EEA approach
THANK YOU