System of Environmental Economic Accounting

INEGI

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

June, 2019

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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

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CONABIO
COMISIÓN NACIONAL PARA EL CONOCIMIENTO Y USO DE LA BIODIVERSIDAD

CONANP
COMISIÓN NACIONAL DE ÁREAS NATURALES PROTEGIDAS

CONAGUA
COMISIÓN NACIONAL DEL AGUA

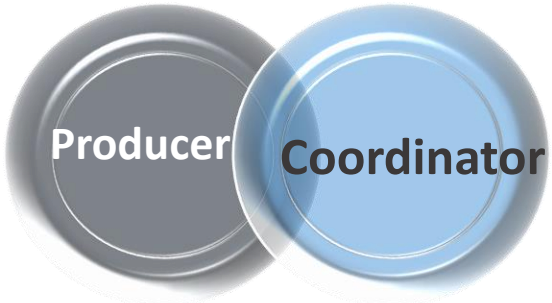
INECC
INSTITUTO NACIONAL DE ECOLOGÍA Y CAMBIO CLIMÁTICO

CONAFOR
COMISIÓN NACIONAL FORESTAL

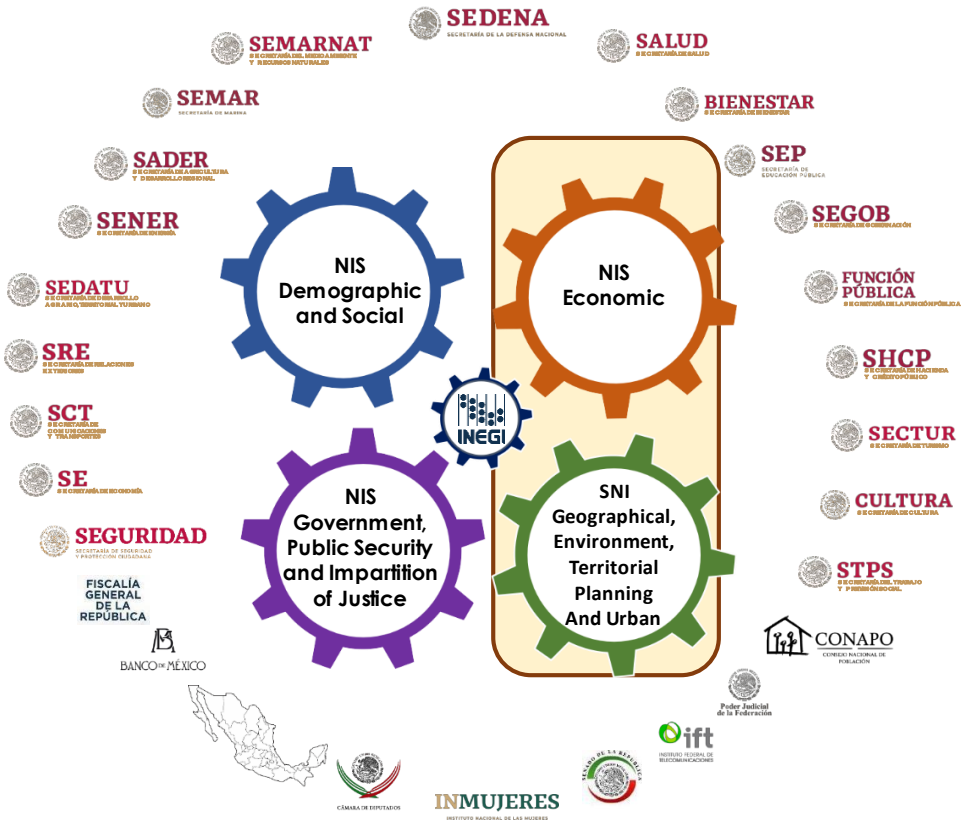
Institutional Settings

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.

Work to date

Mexico – Country Assessment

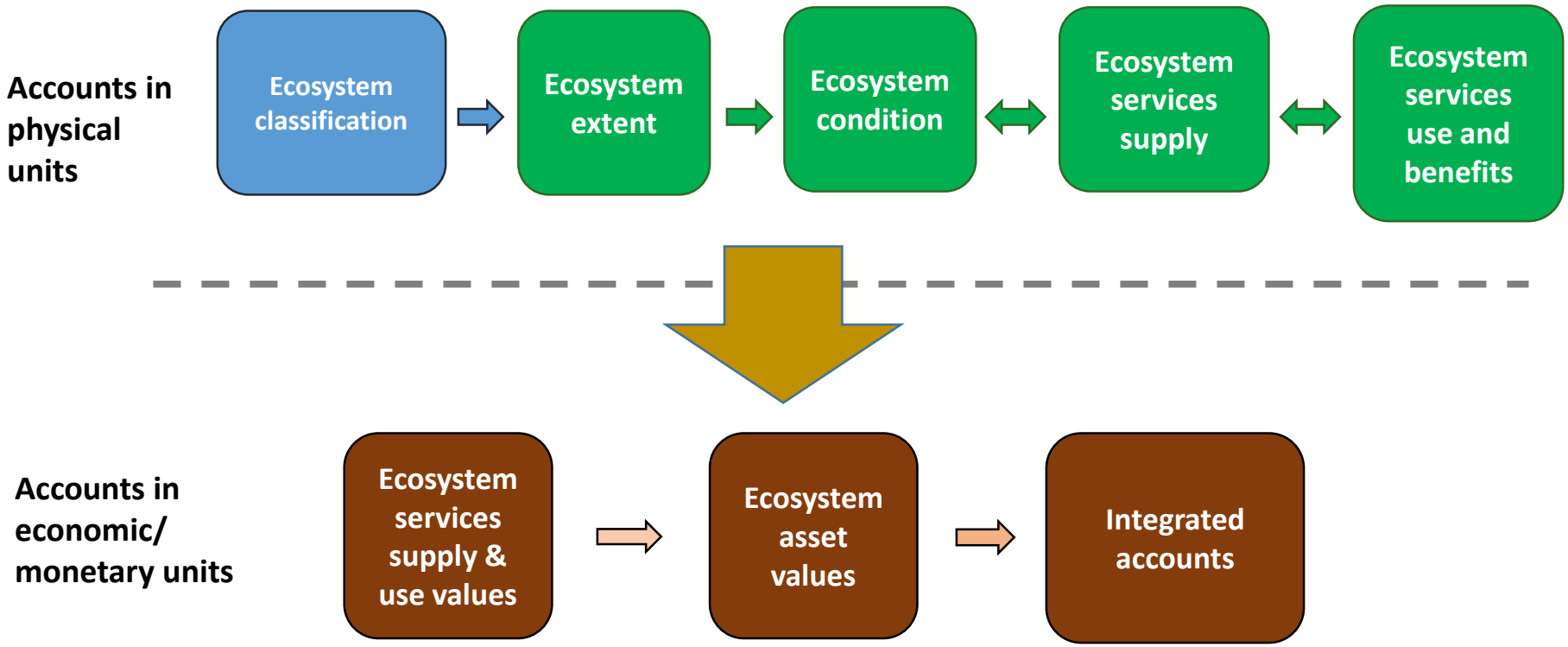
- Overview of precedents and current work in Mexico:
  - Environmental-economic accounts compiled since 1996, following the SEEA-Central Framework
  - Preliminary ecosystem services valuation studies (CONAFOR, CONABIO, INEGI)
  - Payment for Environmental Services scheme
  - Ecosystem services concept: 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.

Work to date (cont'd)

- 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

Project overview



Ecosystem classification

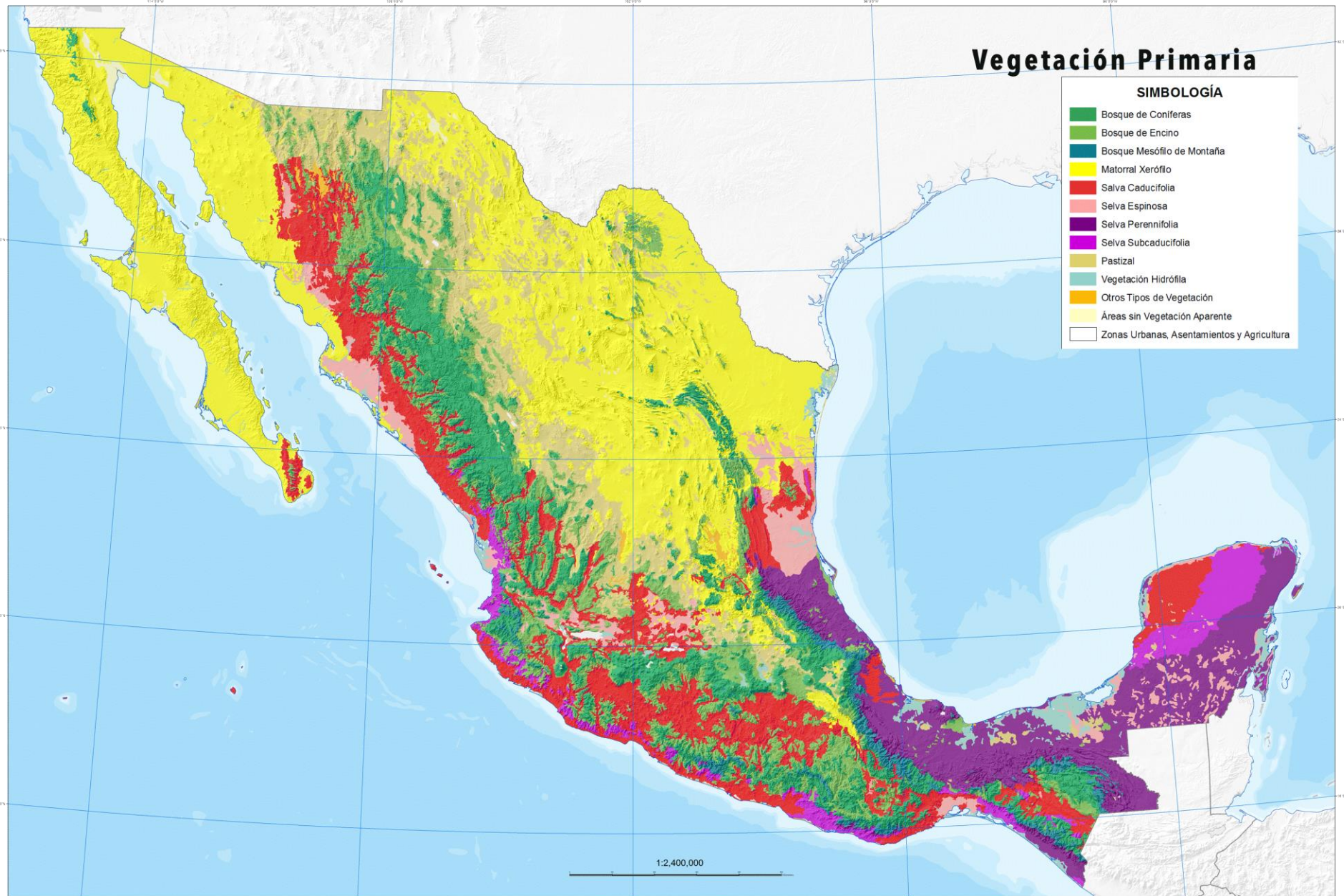
- **Basis:** INEGI's Vegetation and Land-use classification (Series 0 –VI) :
  - Highly detailed classification system of the main types of natural vegetation and land-use occurring in the country (58 vegetation types, 24 land-use classes).
- **Aggregated version of INEGI's classification, including:**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

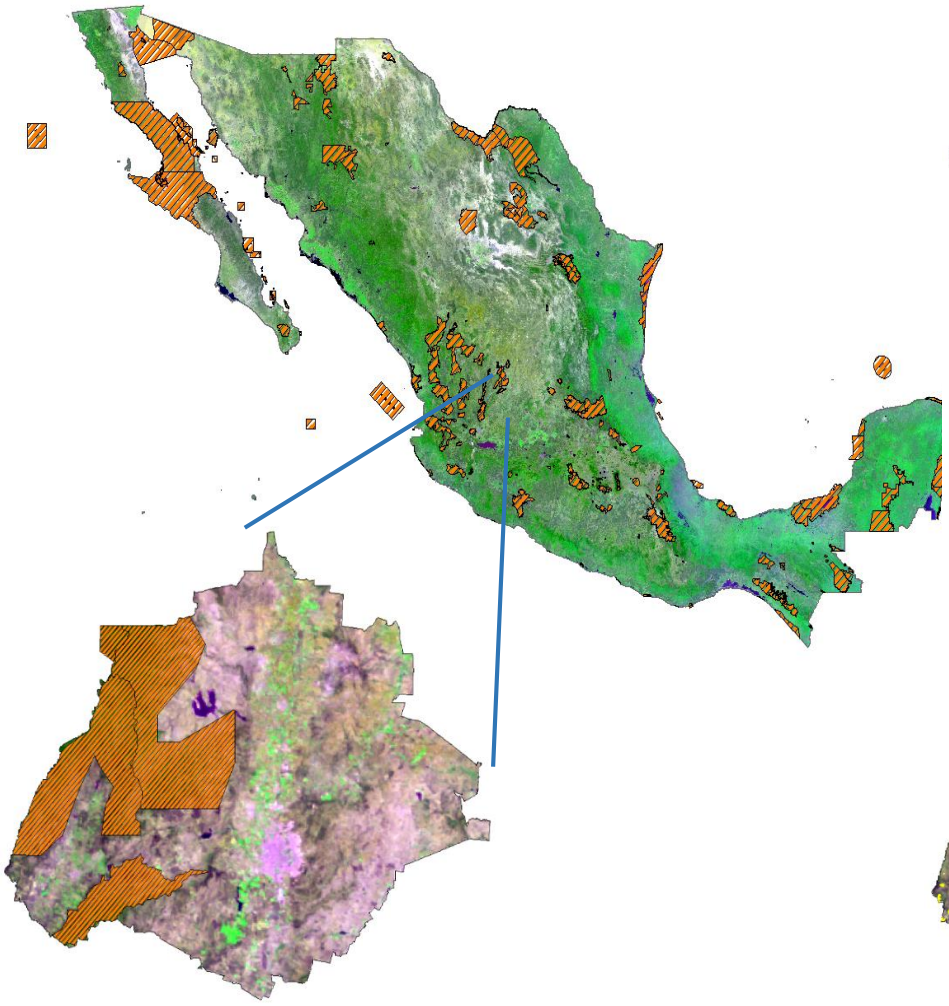
Ecosystem classification

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

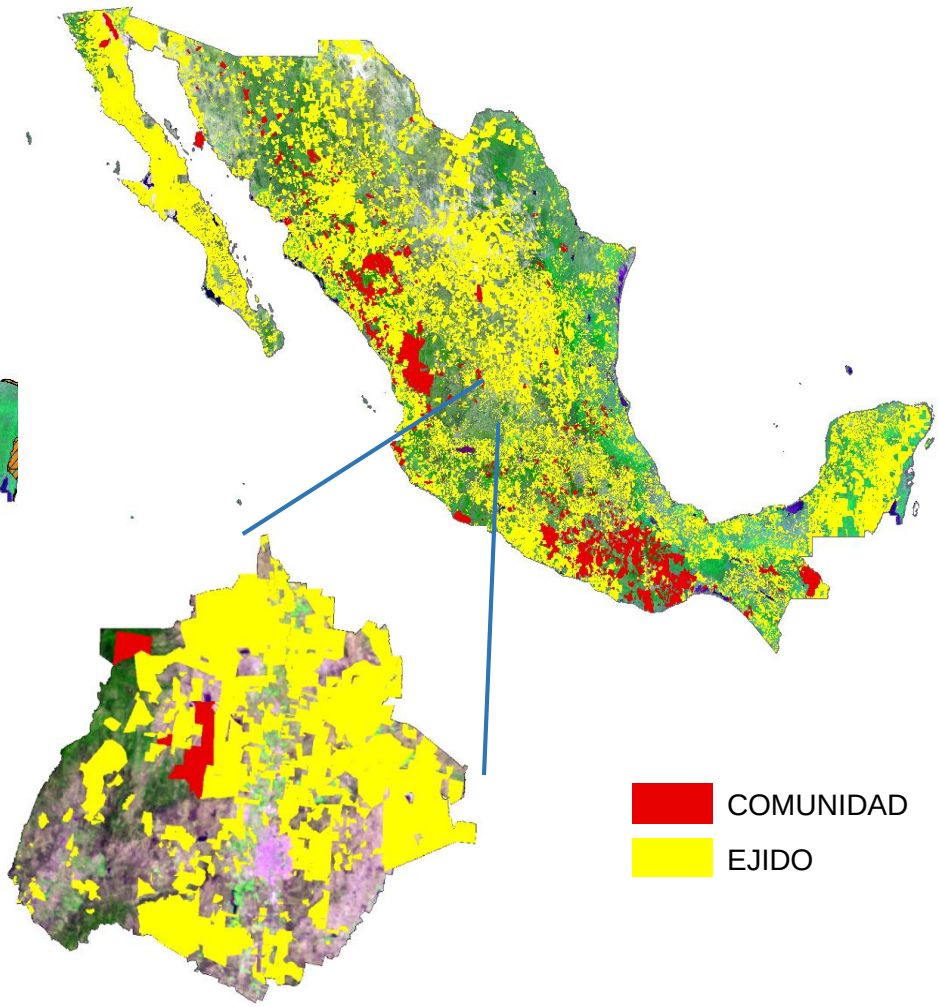


Ecosystem classification

Natural Protected Areas



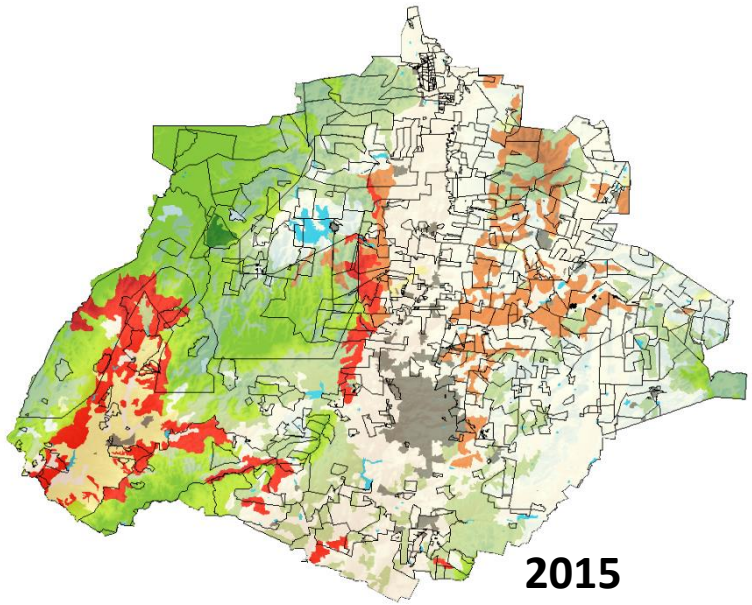
Land Tenure



Ecosystem Extent

Ecosystem Extent accounts: The State of Aguascalientes

	Pine forest						Oak woodland						Xerophytic shrubland						Deciduous tropical forest						Grassland					
	Indigenous community		Ejido		Private		Indigenous community		Ejido		Private		Indigenous community		Ejido		Private		Indigenous community		Ejido		Private		Indigenous community		Ejido		Private	
Year	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP	ANP	No ANP
2002	-	-	1,118	-	27	-	8,636	28	10,276	8,345	51,608	12,868	487	-	690	28,121	86	9,952	-	-	3,542	10,671	7,749	10,573	1,315	492	13,028	56,859	23,537	45,370
2007	-	-	1,184	-	68	-	8,436	28	10,623	8,371	51,470	12,878	487	-	690	26,315	86	9,964	-	-	3,237	10,250	6,862	9,763	1,515	492	12,700	52,717	23,161	41,204
2011	-	-	1,184	-	68	-	8,941	12	13,413	9,350	53,009	12,615	487	-	690	25,465	86	9,871	-	-	3,540	10,678	9,447	11,340	1,047	508	9,840	51,452	18,982	40,141
2015	-	-	1,184	-	68	-	8,941	12	13,355	9,350	52,984	12,615	487	-	690	25,465	86	9,871	-	-	3,527	9,996	9,447	11,165	1,047	508	9,911	51,983	19,006	39,977



2015

Ecosystem condition

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

2. Soil erosion: INEGI's hydric soil erosion chart (2015)

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)

Ecosystem condition

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

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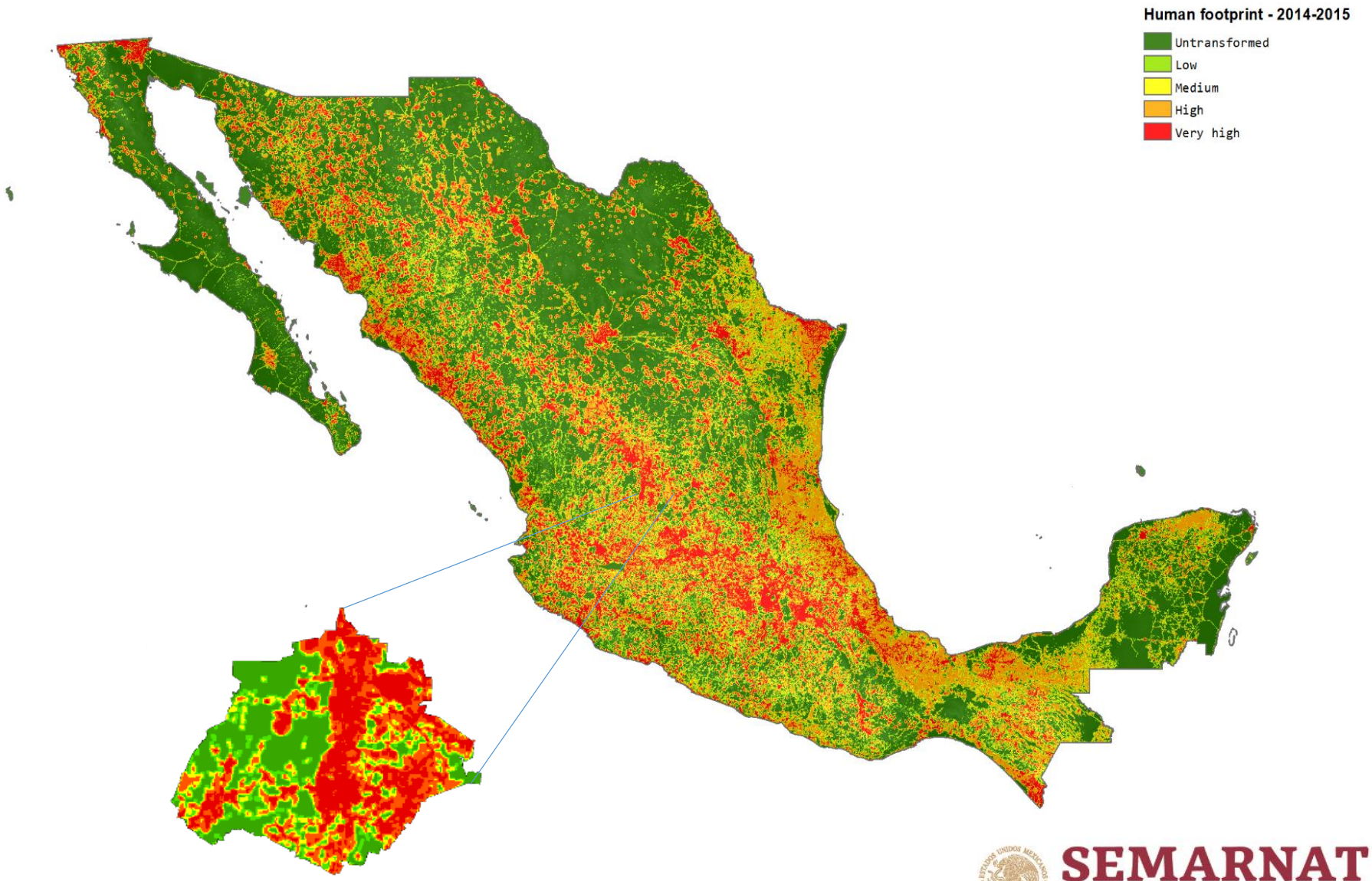
Mapping Condition (human footprint)



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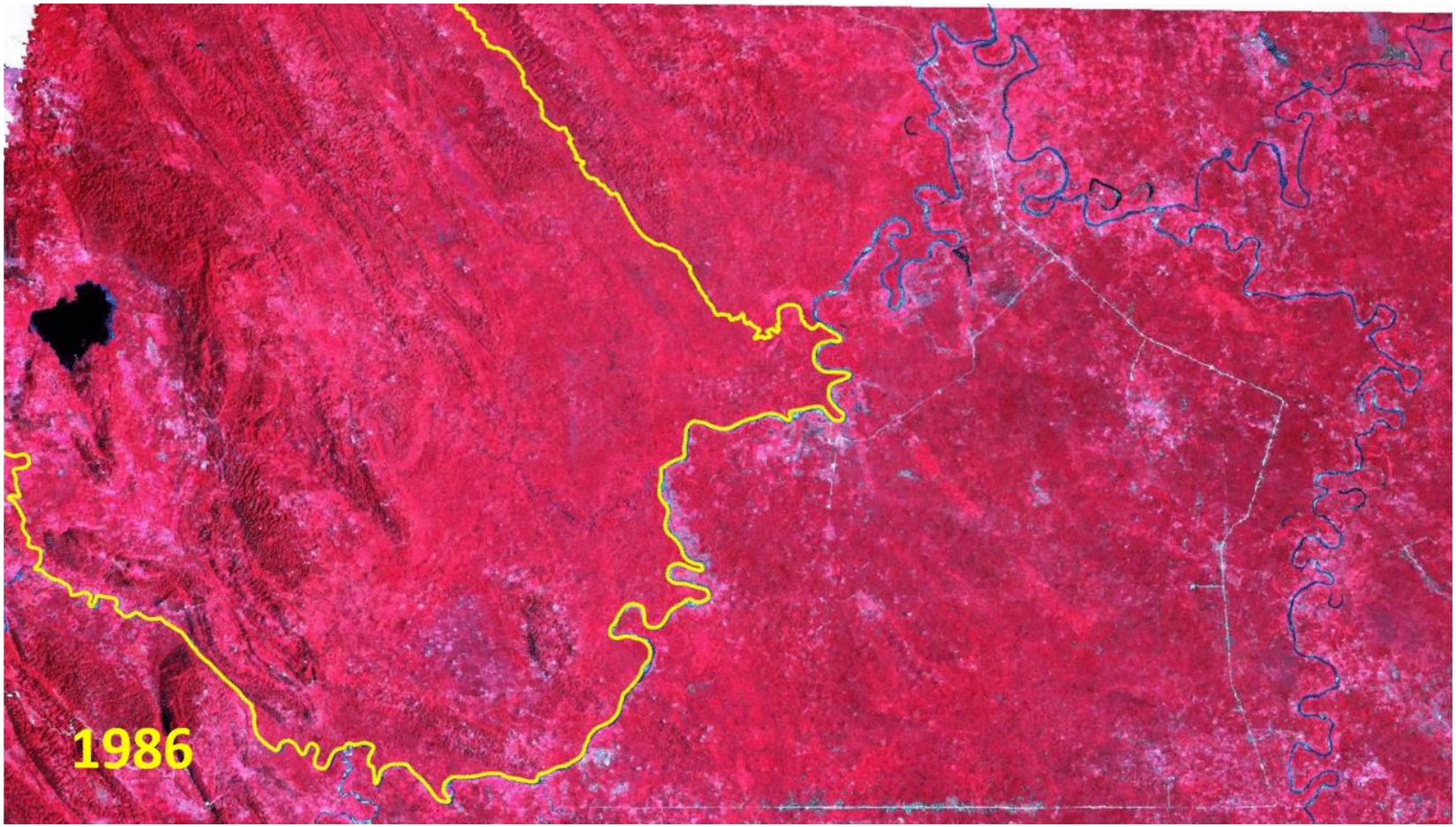
Open data cube as a tool to assess ecoystem condition over time



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

	Ecosystem condition	ECOSYSTEMS					STATE-WIDE TOTAL
		Conifer forest	Oak woodland	Woody xerophytic shrubland	Grassland	Deciduous tropical forest	
Carbon stored ca. 2007 (tm)	Primary	43,730.3	795,746.3	33,836.9	716,732.4	-	2,591,033.4
	Secondary	-	701,878.0	5,045.0	-	294,064.4	
Carbon stored ca. 2011 (tm)	Primary	44,135.4	817,806.5	42,581.2	854,161.0	-	3,021,576.5
	Secondary	-	848,265.5	10,550.2	-	404,076.8	
Potential Carbon capture rate (tm/yr)	Primary	165.0	8,759.2	285.4	39,377.8	-	59,351.9
	Secondary	-	4,374.9	1,315.9	-	5,073.6	

Approaches to valuing C storage and capture by Aguascalientes ecosystems

a) Carbon offsets in voluntary markets

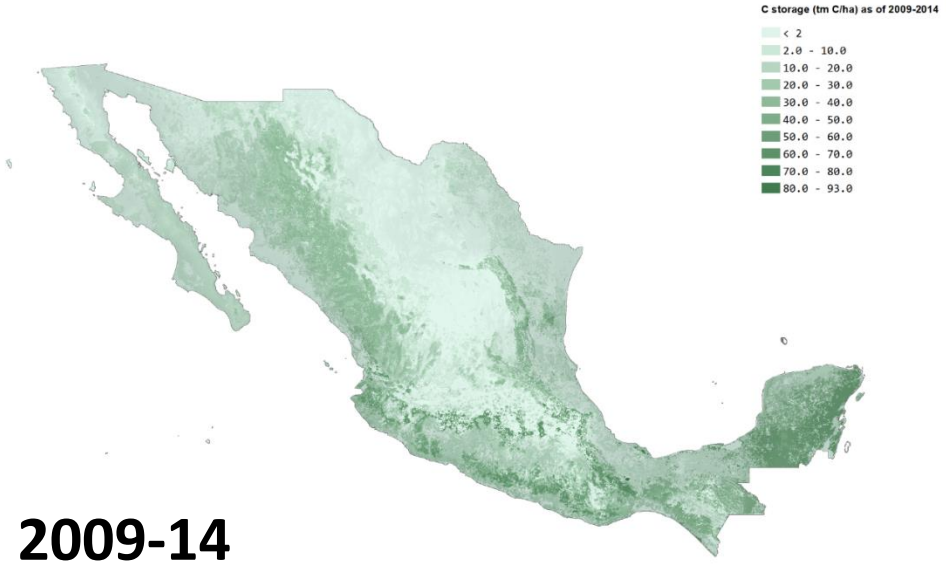
b) Social Cost of Carbon

c) REDD mechanisms

Mapping and valuing ecosystem services

Organic Carbon Soil

2004-09



2009-14

Mapping and valuing ecosystem services

Surface water supply

2002

Type of substrate
Land cover
Precipitation
Infiltration
Evapo-transpiration

Mean annual volume of natural runoff

2007

Mapping and valuing of ecosystem services

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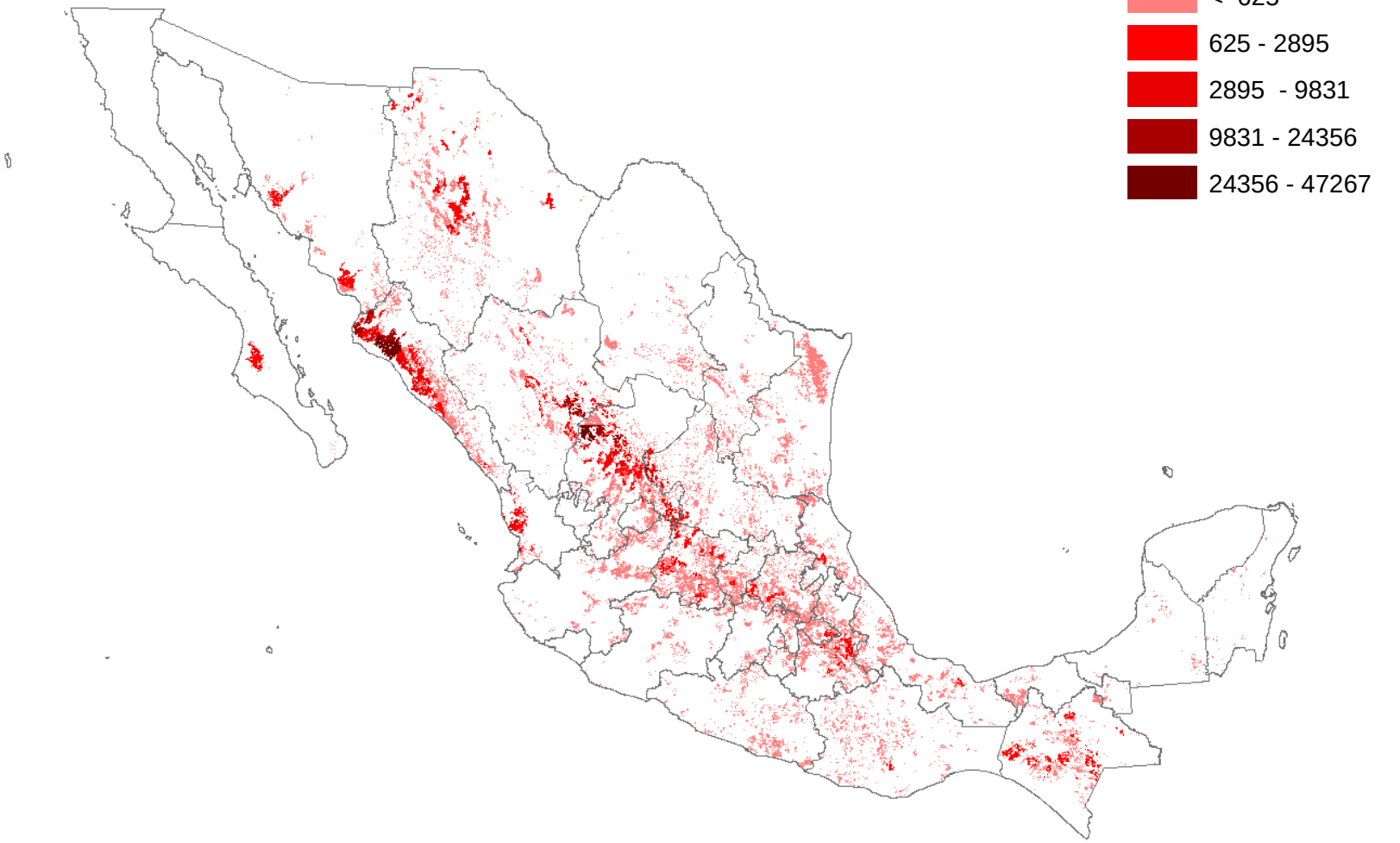
Food crop supply (Metric Tonnes)



Mapping and valuing of ecosystem services

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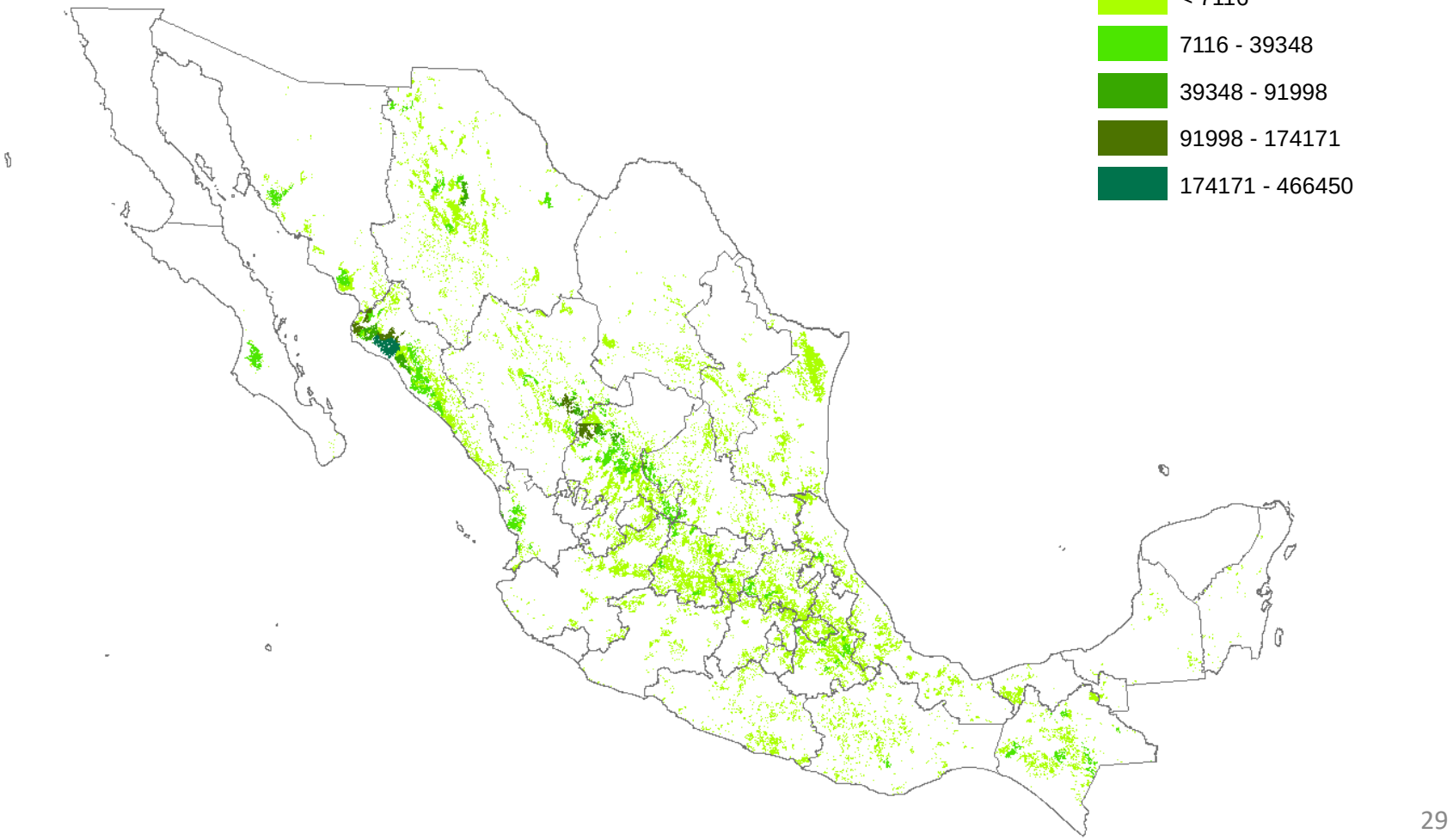
Food crop supply (Monetary Units)



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 wáter supply
- Preliminary economic valuation for soil carbon (social cost, etc)
- Local data (Aguascalientes) and raw national data for scenario modeling

Linkages to the SDGs

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.

OPPORTUNITIES & CHALLENGES AHEAD I

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

OPPORTUNITIES & CHALLENGES AHEAD II

MAINSTREAMING/ CONTINUITY

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

System of Environmental Economic Accounting

THANK YOU

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2017-2020

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