



PMG
Programa Mexicano del Carbono



Mexico's experience to use the National Forest Inventory to improve GHG reporting

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Elements

- Introduction
- National Forest Inventory as a basis to calculate emission factors
- Activity data
- Steps forward:
 1. Measurements of all C-pools
 2. Satellite monitoring system of activity data

Introduction

Applying IPCC Good Practice Guidance and Guidelines (LULUCF, AFOLU):

Approaches (Area change)	Tiers (C pool change)
1. Basic land use data -country statistics, i.e. FAO	1. IPCC default values (i.e. biomass in forest types, carbon fraction etc.)
2. Surveys of land change: i.e. national statistics on land use transitions	2. Country specific data (i.e. from field surveys, inventory, permanent plots)
3. Spatially explicit data: a. From remote sensing b. National inventory	3. National inventory of C stocks in different pools and assessment of any change in carbon pools or national methodologies which are fulfilling IPCC tier 3 requirements

- Mexico has presented 4 national communications that include summaries of GHG inventories.
- The first two inventories were at TIER 1 (IPCC default emission factors with a few literature data) with approach 1 (FAO statistics of land cover in different years).
- The third inventory (2006) was based on national forest inventory data, national LU maps and some default emission factors (Approach 2 and between TIER 1 and 2).
- The fourth inventory(2009) was based on a new forest inventory, revised LU maps with quality control and national emission factors (Approach 3 and between TIER 2 to 3). Excluding DOM and Litter.
- The fifth inventory (due 2012) will include all C-pools and is planned to be at Approach 3 and TIER 3.
- The third and fourth inventory include uncertainty analysis of major data sources

Existing datasets in Mexico:

Land-use maps (to derive major activity data):

1970s LU/LC map; scale 1:250,000, min resolution 50 has, based on aerial photographs

1993 LU/LC map; scale 1:250,000, min resolution 50 has, based on Landsat

2002 LU/LC map; scale 1:250,000, min resolution 50 has, based on Landsat

2007 LU/LC map; scale 1:250,000, min resolution 50 has, based on SPOT imagery

National LU classification system based on RS and ground surveys is under construction

Inventory data (to derive emission factors)

1992-1994 National Forest Inventory (16,000 plots)

2004-2007 Permanent National Forest and Soil Inventory
(>22,000 permanent plots established)

2008-2009 Re-measurement of approximately 9,000 plots

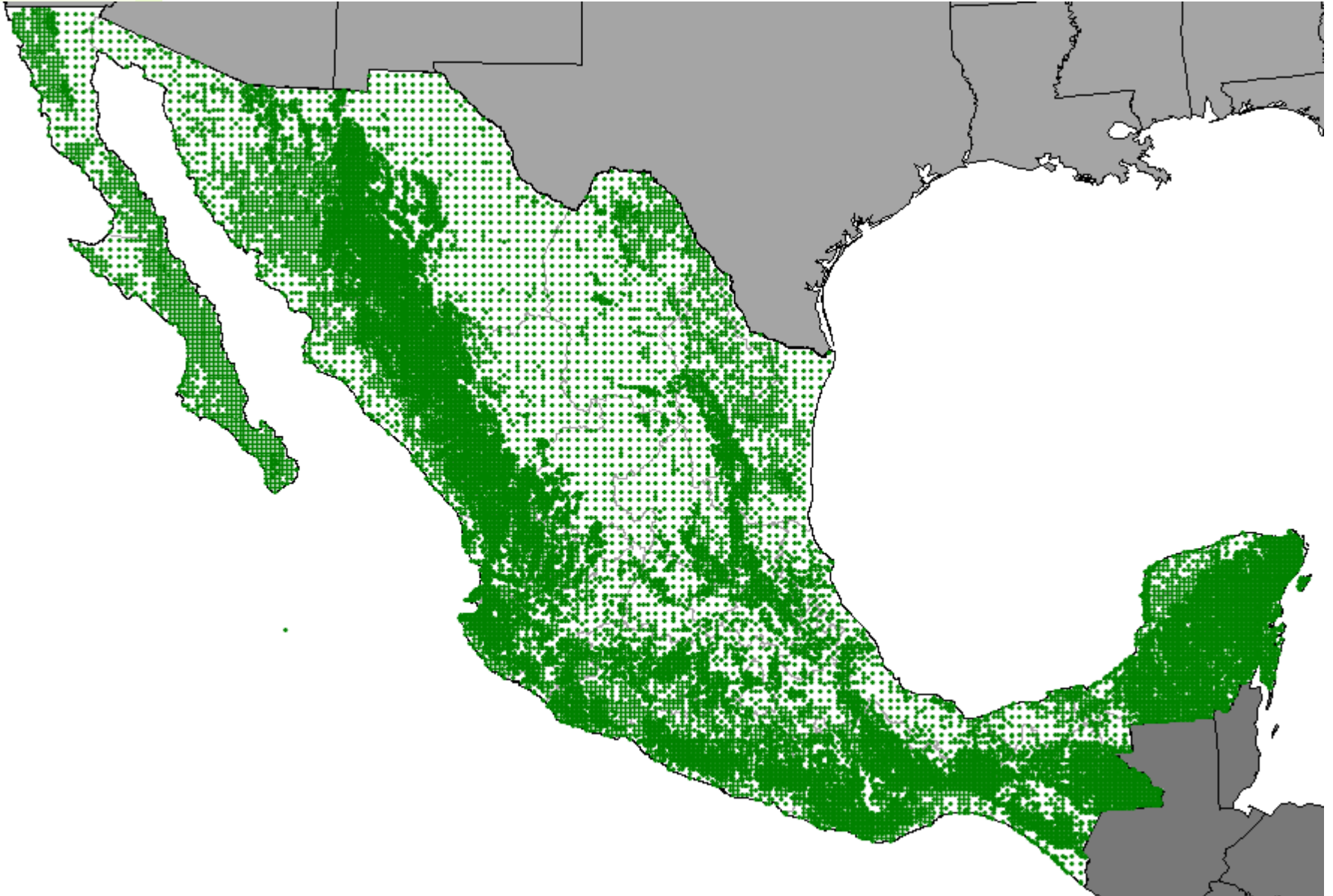
Other data sources

National, state and municipality-level statistics on forest harvesting and fire disturbances

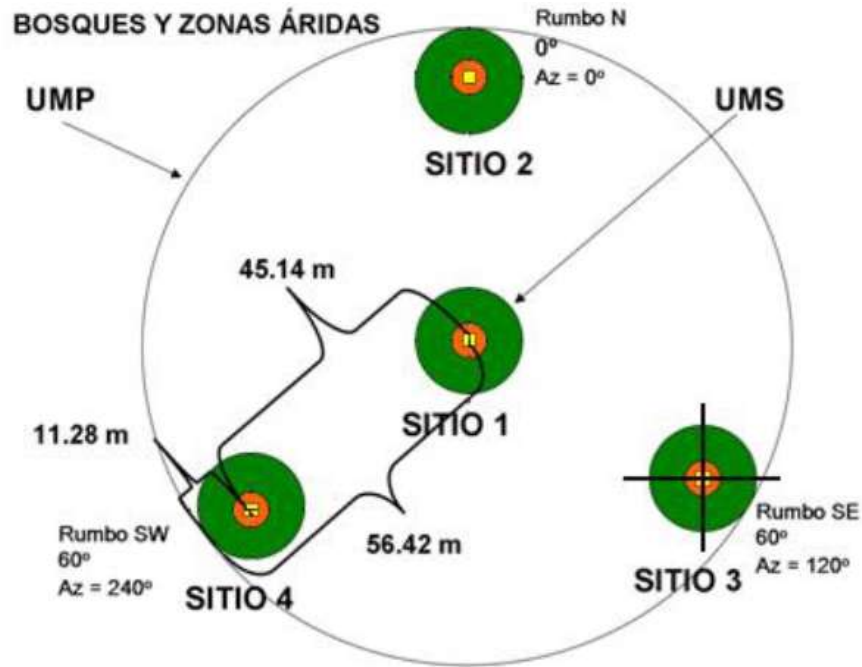
A decorative vertical strip on the left side of the slide features three balloons: a light green one at the top, a light blue one in the middle, and a light purple one at the bottom. Each balloon is accompanied by several small, yellow, triangular shapes that resemble rays of light or streamers.

National Forest Inventory as a basis to calculate emission factors

**Approx 25,000 plots established, of which 23,000 measured
20% re-measured every year**



INFyS: 2004-2007 Design

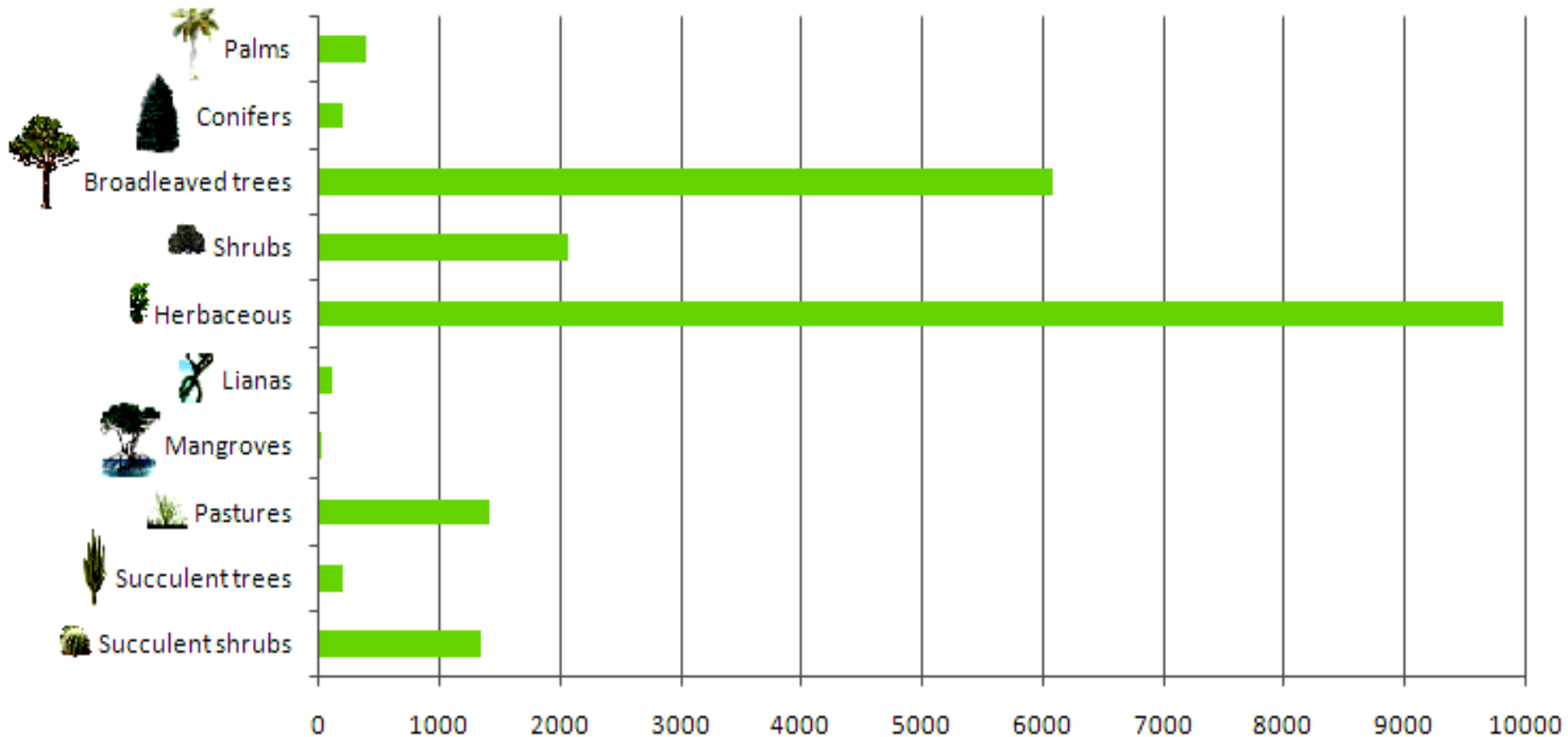


4 Sites of 400 m², the plot represents 1 ha.

Data collected:

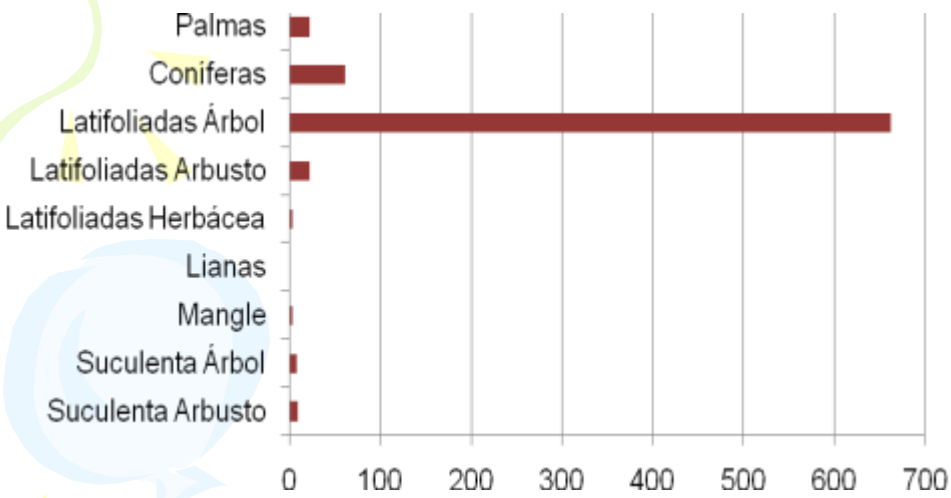
trees, shrubs and woody regrowth, dead standing trees and stumps

Number of species reported in the Nat Forest Inventory for each life form

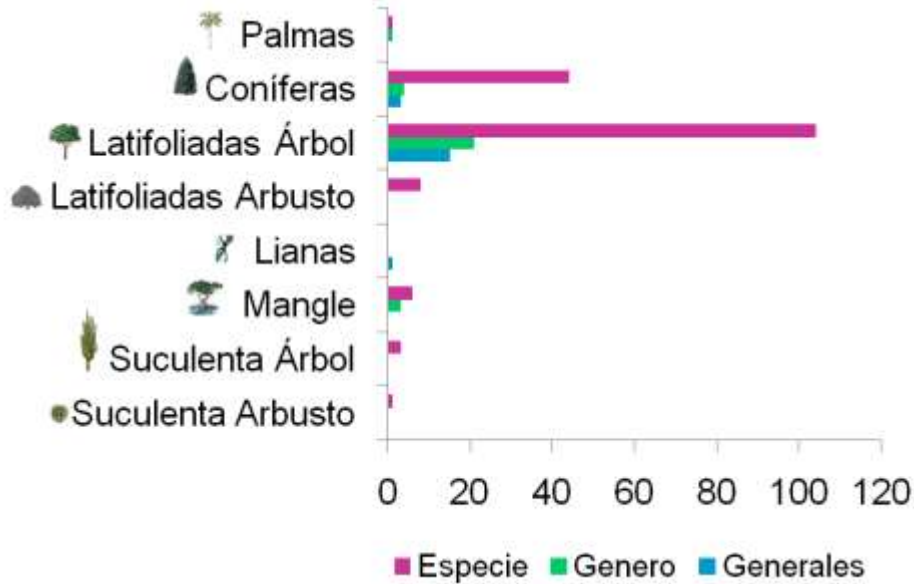


Allometric equations to convert inventory data to volume or biomass

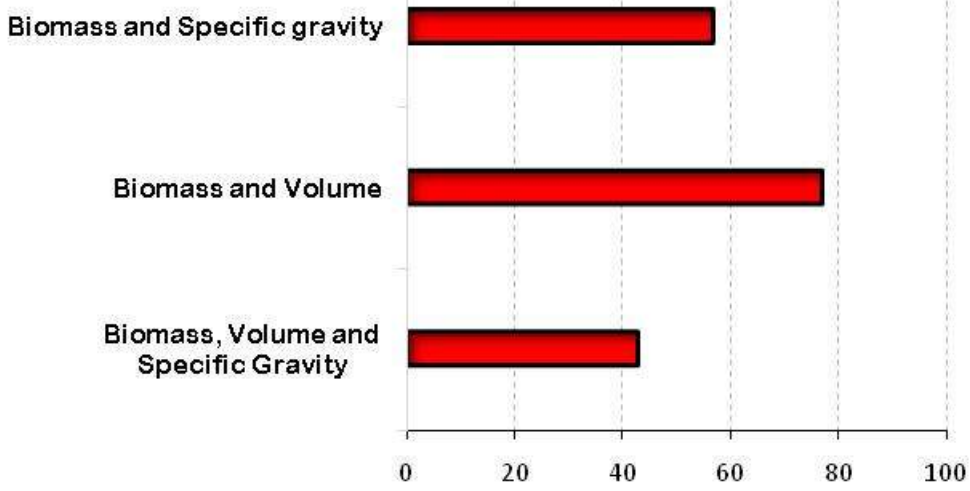
Volume



Biomass



Number of species with more than one attribute



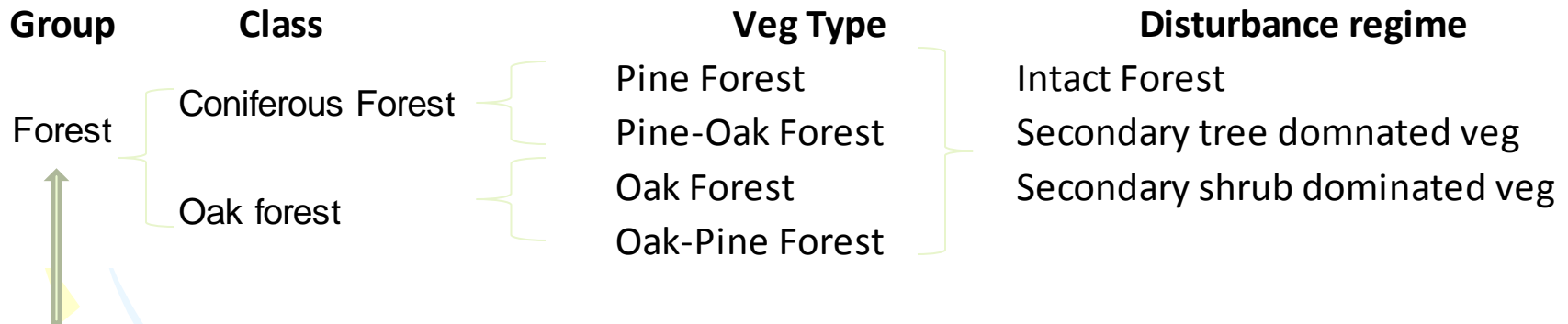
Additionally:

4 Generic equations for trees according to ecosystem (Tropical humid forest, tropical dry forest, cloud forest, scrub vegetation)

How to stratify the forests in reporting units?

LU-classification system applied in Mexico (as reported to FAO and UNFCCC)

TIER 1 → → → → → → → → → → → → TIER 3

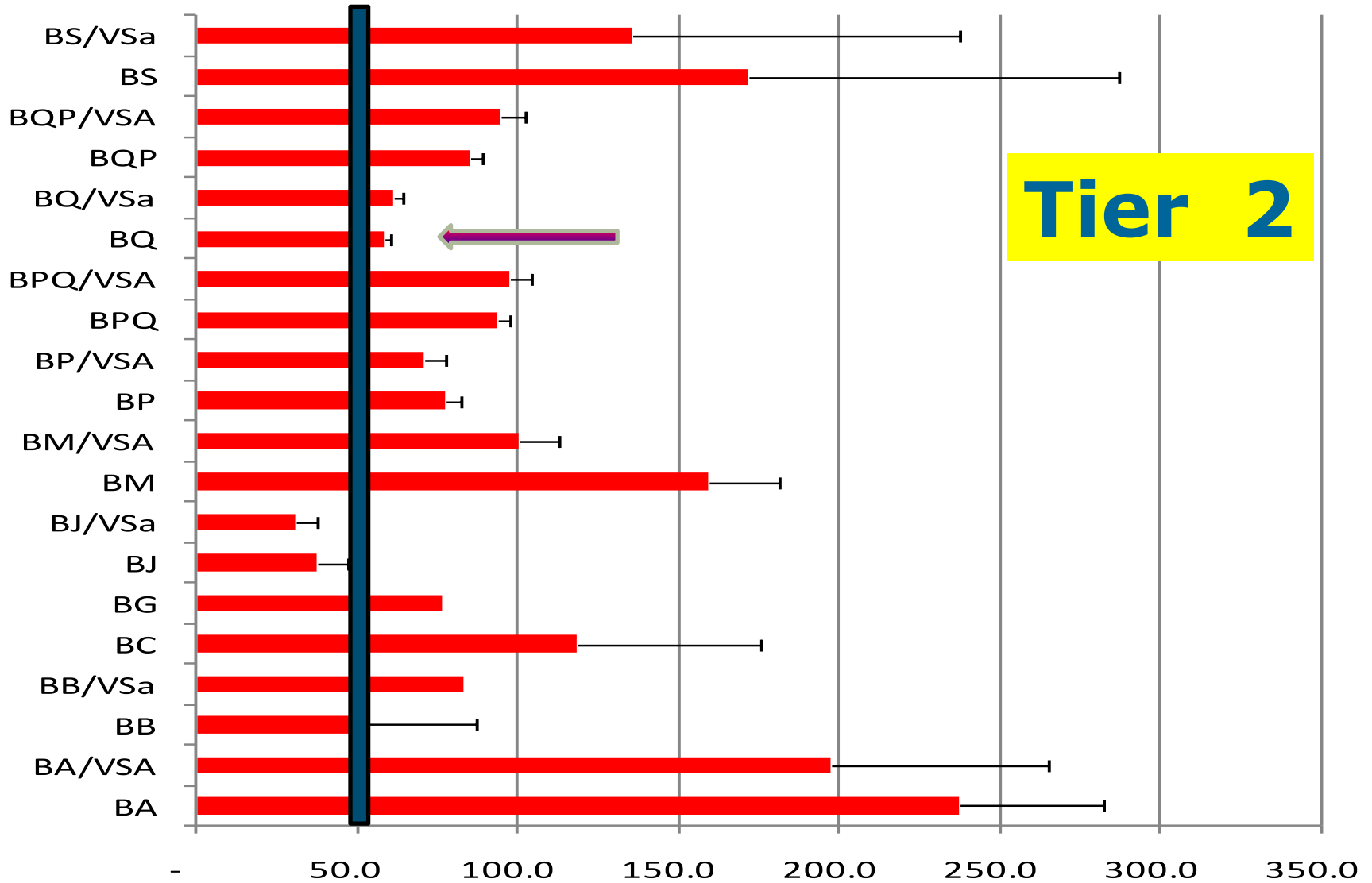


IPCC reporting

Pine forests contain in general a combination of 2-3 Pine species, out of 70 species

Oak forests contain 2-4 Oak species out of 150 species

Av Biomass and 95% CI



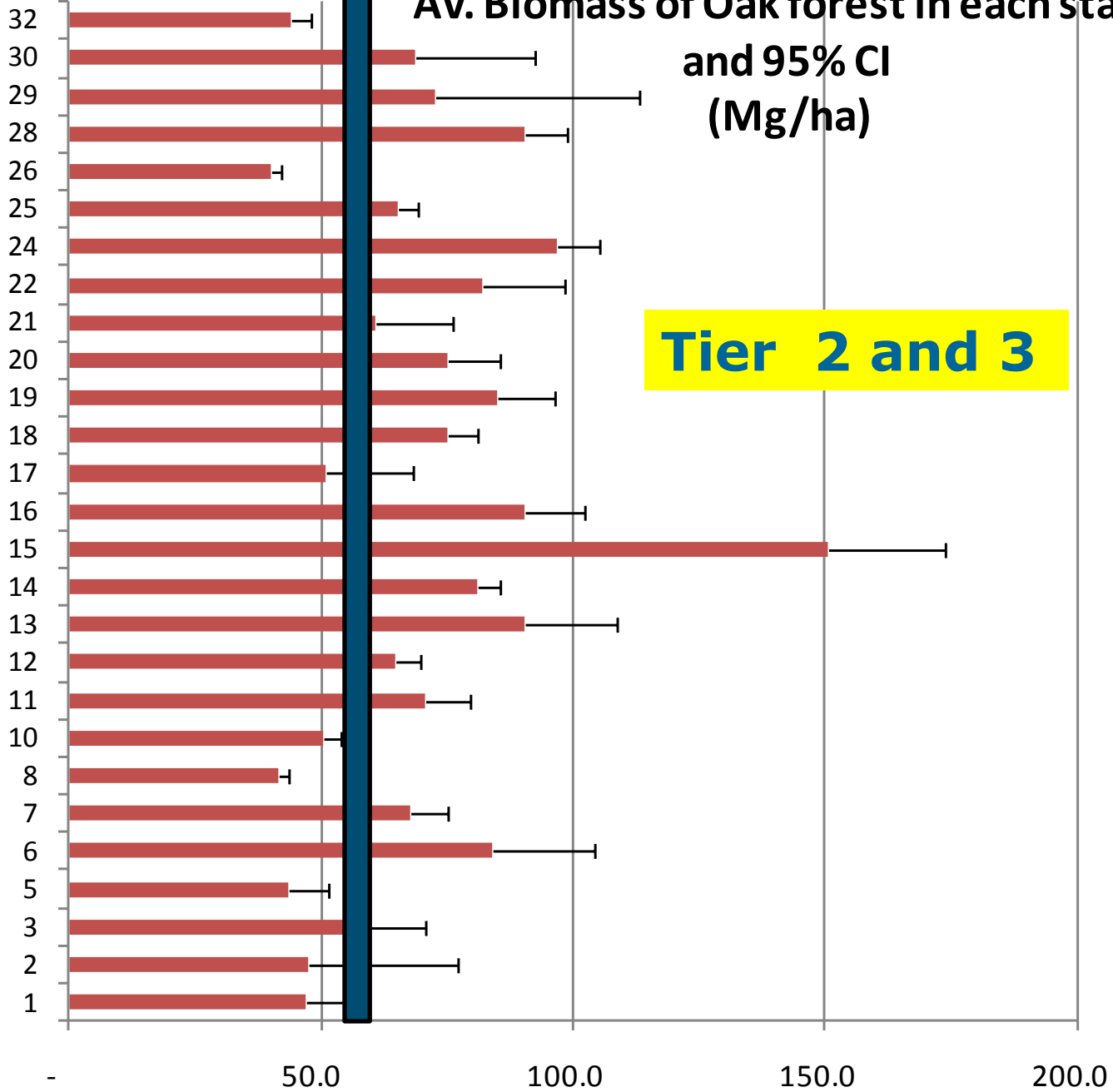
Tier 2

Average biomass, based on 10,300 plots.

Average range from 31 to 237 Mg/ha

95% CI ranges from 4 to 113 %

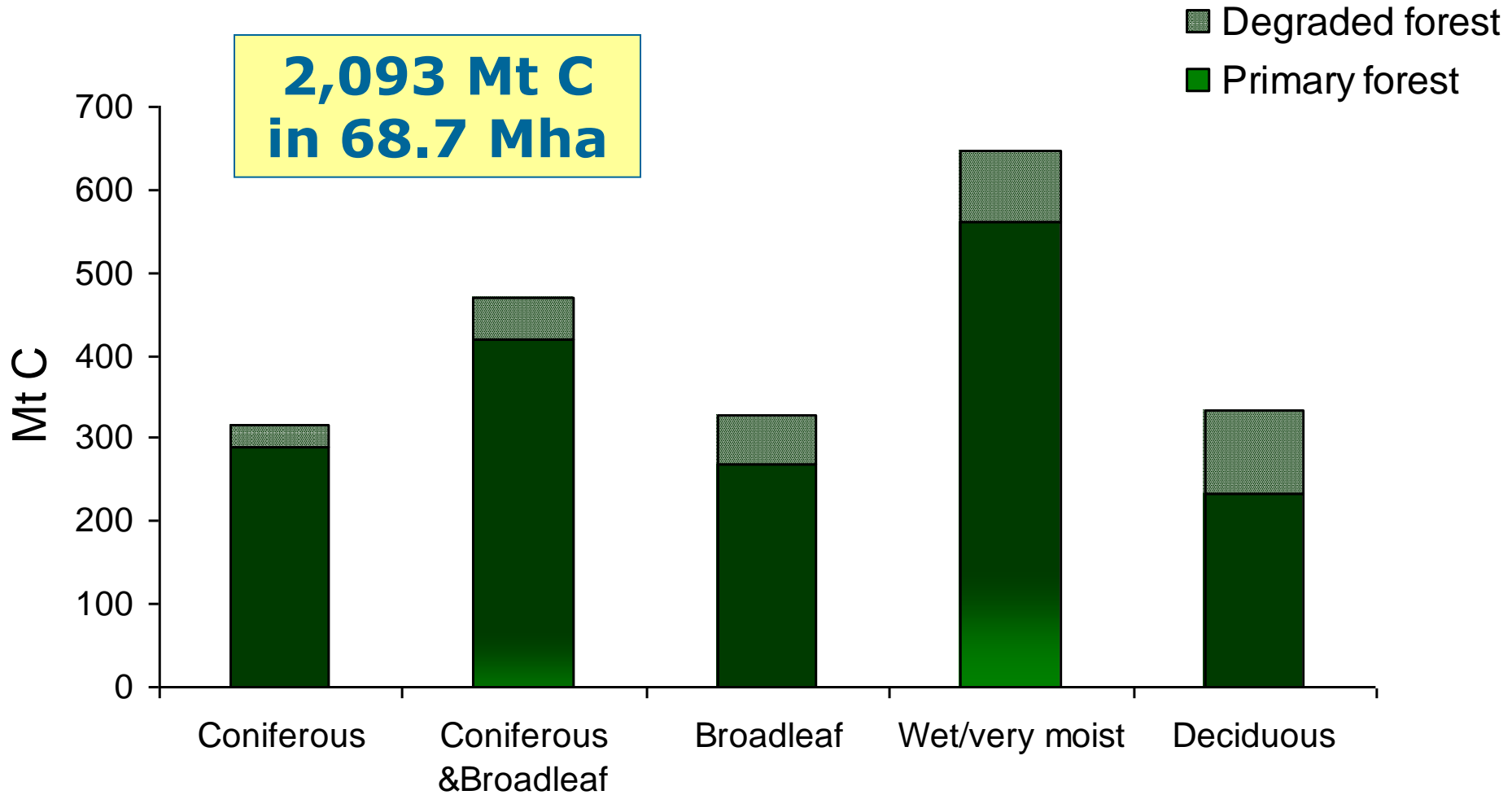
Av. Biomass of Oak forest in each state and 95% CI (Mg/ha)



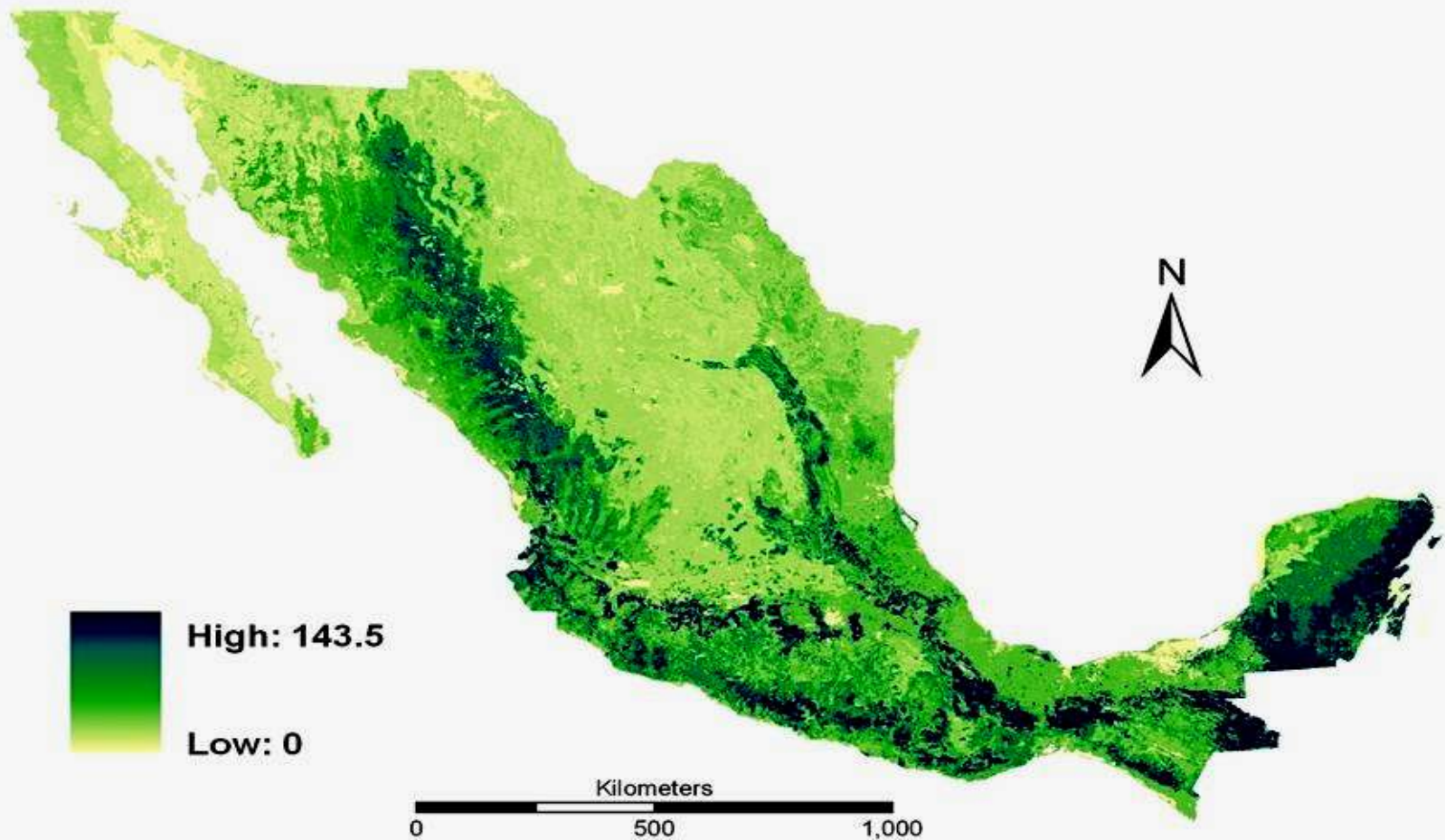
Tier 2 and 3

Total C stock in forest biomass (2002)

**2,093 Mt C
in 68.7 Mha**



Carbon density map (t C ha⁻¹)



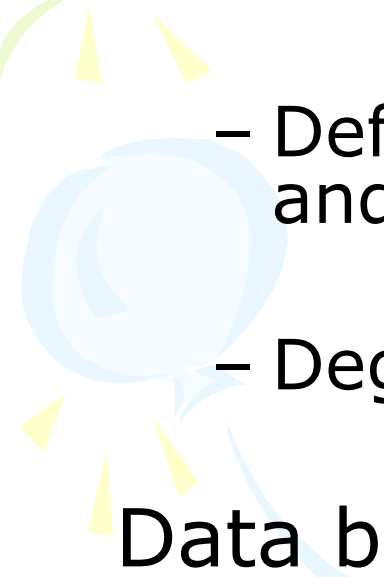



Activity data

4 LUC processes related to forests:

- Deforestation and Reforestation (natural and planted)
- Degradation and Restoration (natural)

Data bases used in Inventory of GHG:

- Land-cover maps of 1993, 2002, and 2007
- 
- 

Disturbance classes

Intact forest

*Secondary forest dominated
by trees*

*Secondary forest dominated
by shrubs*

Intact forests

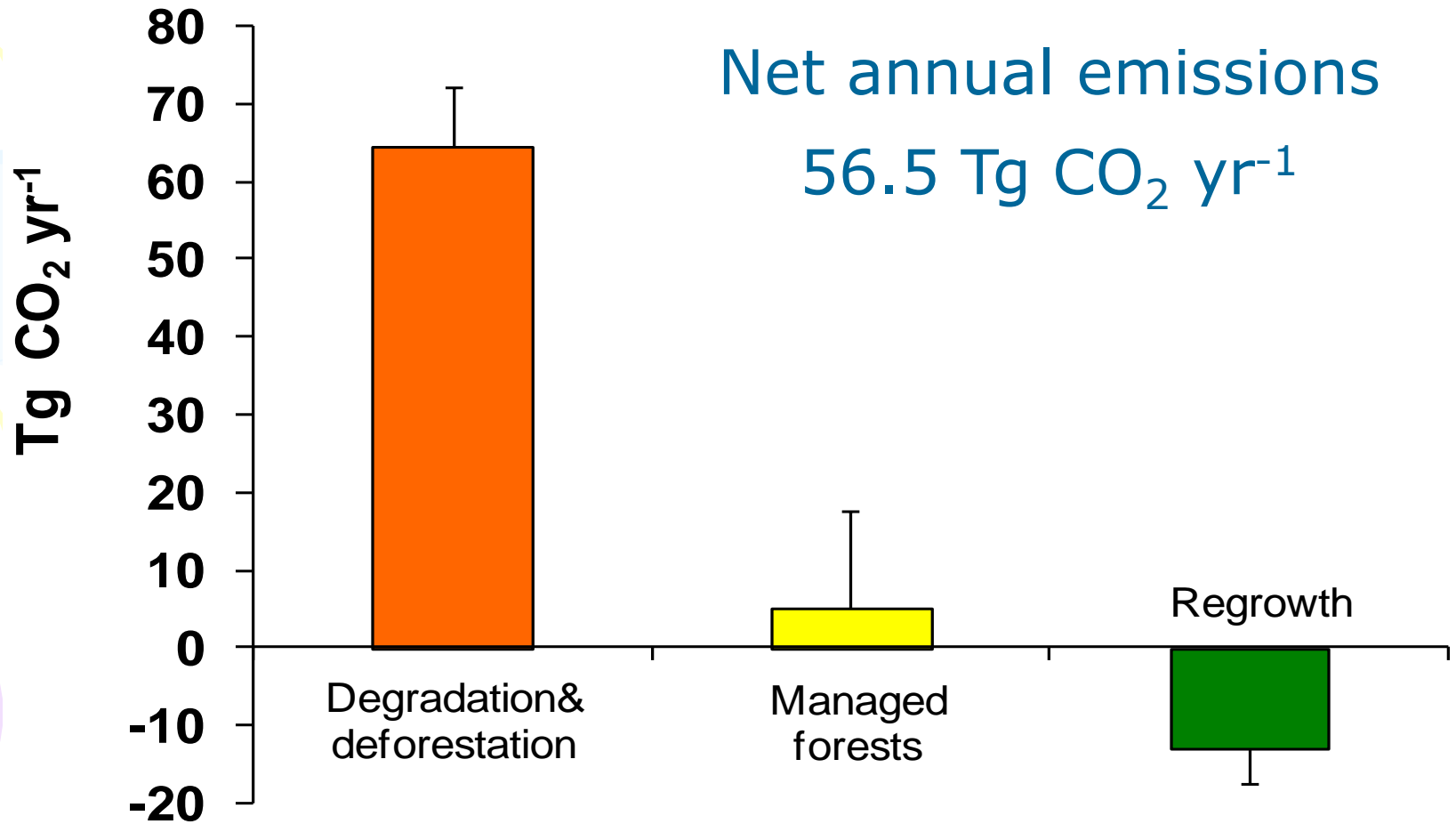
Degraded forests

Differences in area change according to approach

	Approach 1	
	1993-2002	2002-2007
Deforestation	330,800	197,702
Degradation	294,762	181,534
Total (ha/yr)	625,562	379,236

	Approach 2-3	
	1993-2002	2002-2007
Gross deforestation	595,413	590,418
Degradation	633,018	415,803
Recovering	176,079	109,375
Reforestation	264,612	392,715
Total (ha/yr)	1,669,122	1,508,311

CO₂ emissions from changes in biomass



Steps forward: INFyS since 2009

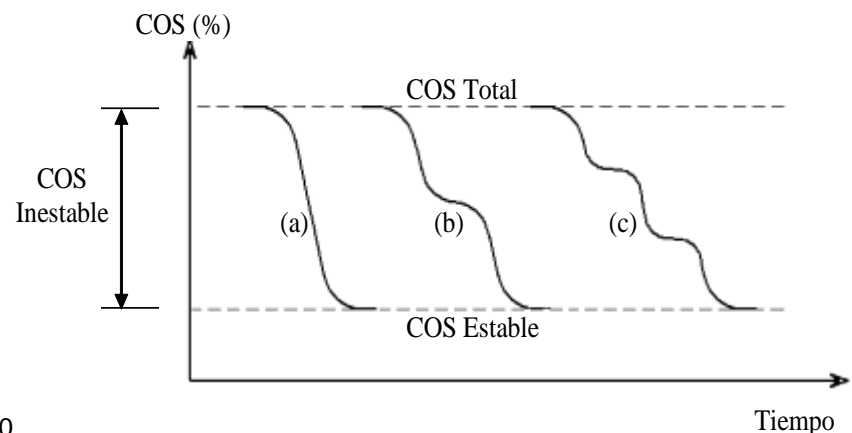
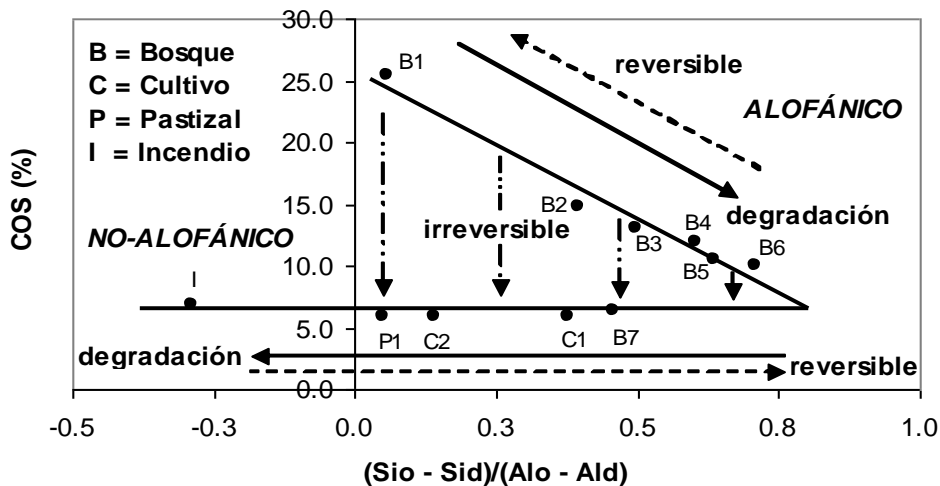
all pools to be measured, all according to IPCC

- Each tree marked individually
- Field measurements of dead fallen material (also important to determine fuel load to estimate fire related non-CO₂ emissions)
- Litter (2 layers) and soil samples (0-30, 31-60 cm) for laboratory analysis (Weight, relative density and C-content)

Adjustments in the inventory since 2010

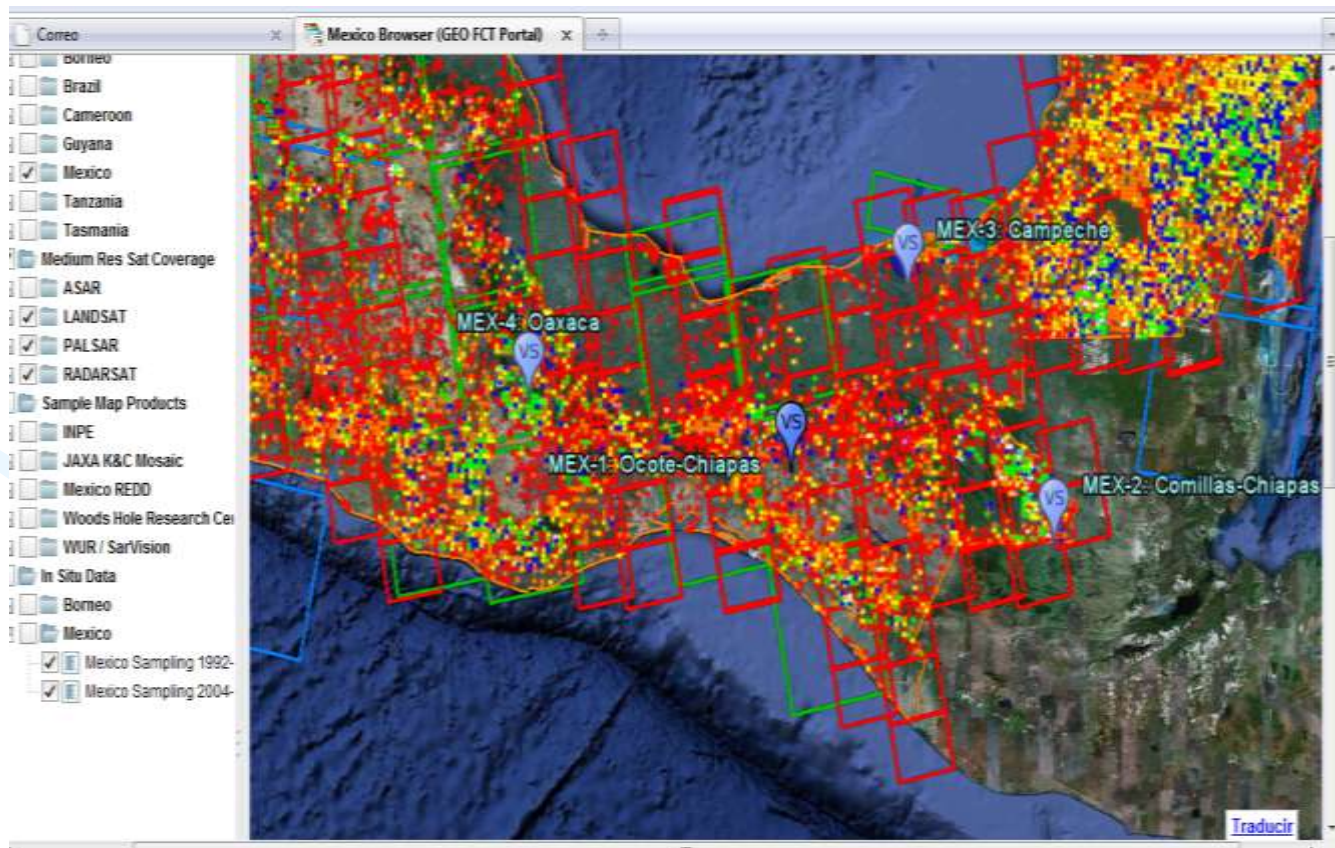
- Sampling of dead fallen material for laboratory analysis (relative density and C-content).

- Measurements of all pools in all forest types
 - Direct relationship between biomass and soil carbon
 - Estimate of labile SOC fraction
 - Fuel load in each forest type and ecoregion



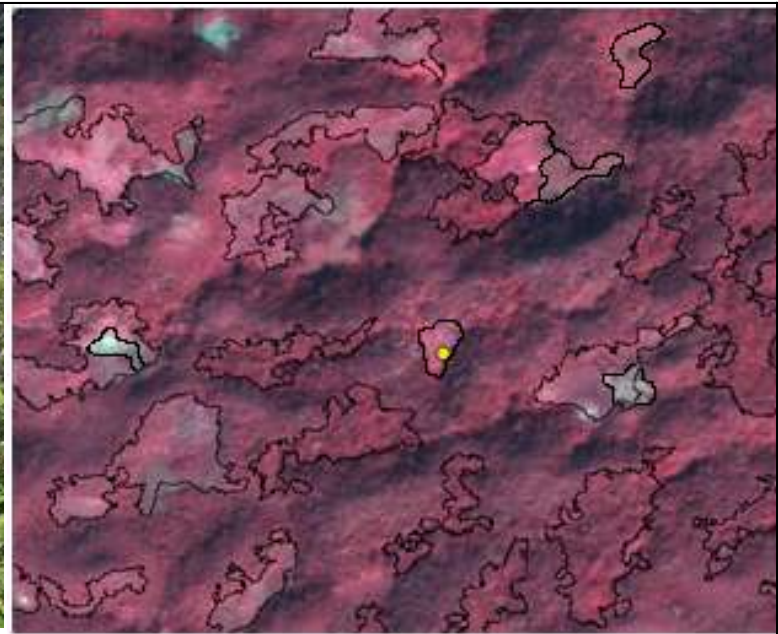
The Forest Carbon Tracking Task (GEO FCT) has been established to support countries wanting to establish national forest-change, carbon estimation and reporting systems. It will facilitate access to long-term satellite, airborne and in situ data, provide the associated analysis and prediction tools, and create the appropriate framework and technical standards for a global network of national forest carbon tracking systems.

Mexico is one of the 7 demonstrator countries

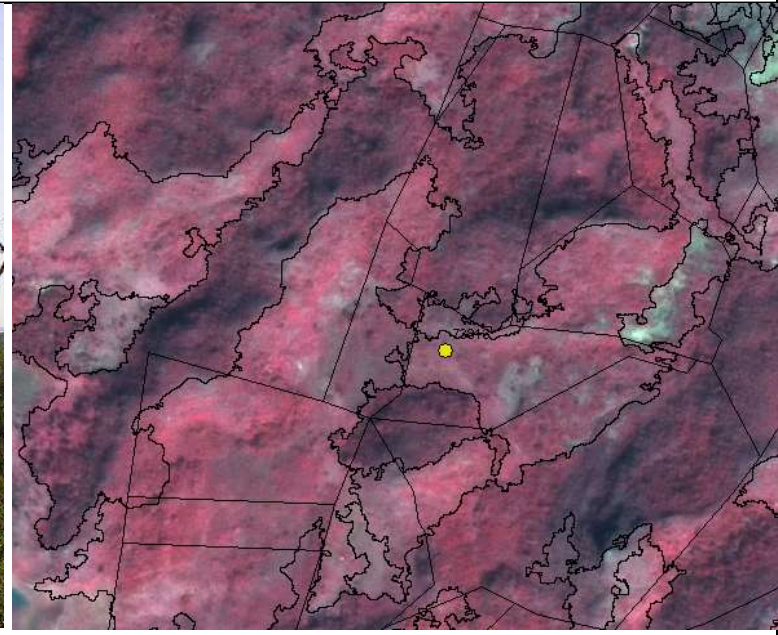


B5. Bosque arbustivo-arbóreo cerrado degradado.

SPOT IMAGERY



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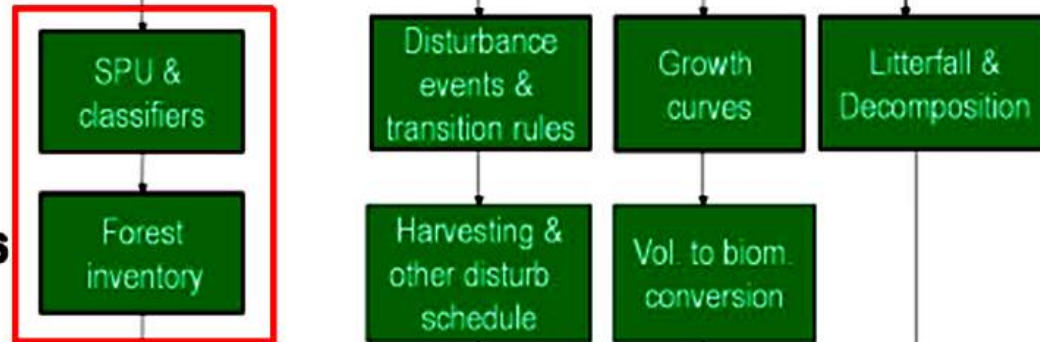
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3. Integration of information in a modelling environment (Tier 3)

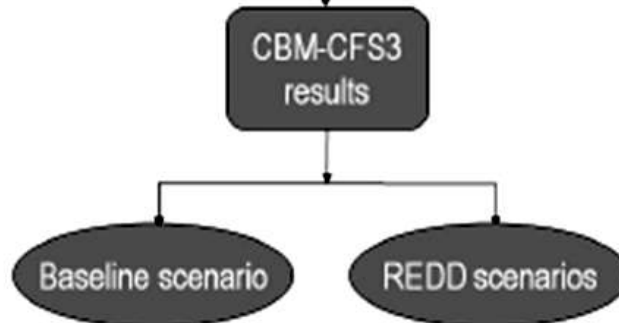
Input data



CBM-CFS3 components



Simulation scenarios





Thanks

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