Enhancing forest C monitoring and GHG emissions projection using a systems approach: lessons learned from Mexico

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September 13th, 2017, Rome, Italy
3er User Workshop, ESA DUE GLobBiomass
Since 2011, the Commission for Environmental Cooperation and forest services of North America have collaborated to **improve modeling tools/methods** for monitoring GHG fluxes, while being able to **assess, project and communicate the effect that policy decisions can have on GHG emissions in the future**.

### 1. Background

Examples of pilot areas

- Cranbrook
- Dog River
- North Wisconsin
- South Carolina
- Durango
- Quintana Roo

Maximise Carbon stocks ....

... or maximise Carbon uptake?

Activity options

Forest Ecosystems

Fossil Emissions

Biofuel

Fossil Fuel

Wood Products

Other Products

Services used by Society

Fossil Emissions

Biofuel

Fossil Fuel

Wood Products

Other Products

Activity options

Forest Ecosystems
2. Scenarios for Mexico

- **Historic:** 2000 to 2016

- **Future:**
  - a) **Baseline:** 2017 to 2050 (e.g. average rate of AD as in historic)
  - b) **Mitigation scenarios (2018-2050)**

<table>
<thead>
<tr>
<th>Forest ecosystem</th>
<th>Harvested Wood Products</th>
<th>Substitution benefits</th>
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<tbody>
<tr>
<td><img src="image1" alt="Forest" /></td>
<td><img src="image2" alt="Wood Products" /></td>
<td><img src="image3" alt="Substitution" /></td>
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**M1** Net 0 deforestation by 2030

**M2** M1 + increase 10% forest recovery

**M3** Increase forest productivity and harvests up to 50%

**M4** All of the above

* e.g. Mexico’s NDC goal, Climate Change Law
** e.g. ENAIPROS goal

Increase carbon retention in long-lived products (LLP).
- **M3a.** Same % as in base
- **M3b.** 100% of increased harvest goes to LLP

Use wood products or wood waste (bioenergy) to replace:
- emissions-intensive products (steel and concrete) and fossil fuels
Systems approach to emission reductions

Multiple Sectors

Forest Sector

- Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3)
- Carbon Budget Modeling Framework for Harvested Wood Products (CBMF-HWP)

- forest ecosystems
- bioenergy
- wood products
- fossil fuel
- other products

Substitution: avoided emissions

* Consistent with IPCC-GPG (2003), National Inventories of GHG (2006)
Pilot areas in Mexico

- **Durango**
  - 5.8 M ha of forests
  - ~62% managed forest (coniferous and broadleaf)
  - contributes ~30% of the national wood volume

- **Quintana Roo**:
  - 3.8 M ha of forests
  - ~14% managed forest (tropical humid);
  - included in REDD+ program

*Source: INEGI 2002, FAO-FRA/CONAFOR*
3. Results and key messages

Cumulative mitigation benefit in the forest sector (baseline = 0)

- Importance of reducing deforestation (immediate avoided emissions) \textit{relative to increasing forest recovery or forest productivity} (slow future sink)

- Crucial to consider a systems approach to include multiple sectors (e.g. ↑Harvests ↑ CO\textsubscript{2} e emissions, but ↑ CO\textsubscript{2} “sink” if LLP + substitution benefit are considered)
Country’s mitigation targets should acknowledge state (municipal?) characteristics and components.
4. Final comments

This study provides initial insight since it:

- Inputs are the same as used in national official GHG emissions reporting. In addition:
  - Does not assume a fixed mitigation potential
  - Tracks carbon in HWP
  - Assesses the potential interaction with other sectors to reduce emissions
  - Shows the implication of non-carbon objectives on the forest sector affecting the achievement of mitigation targets.

- Provides specific information related to Mexico’s NDC and Mid-Century plans for 2030 and 2050 using a systems approach

- Can be expanded to other regions of Mexico and other more complex scenarios can now be implemented
5. Potential future work

- Continuing to collaborate to find resources and new partners, to improve information exchange and development of tools and their application

GlobBiomass products provide:

☑ New opportunities to develop, compare and improve biomass accumulation rates and age-class structure assumptions

- Growth curves by spatial unit and classifier set, using MLE routine + NFI plot pairs t2-t1

Proxy of age:

- Time since last major disturbance.
- Forest structural attributes
5. Potential future work

- Improve assumptions on the effect of disturbances over time
  - Improve the efforts modeling of stand-replacing changes (and non-stand-replacing?)
  - Move towards more spatially-explicit analysis

Main drivers of net GHG balance:
- FL → FL (growth + harvest + fire)
- FL → OL (deforestation)

Considerations for baselines:
- Same rate of disturbances yields different net GHG balance over time.
  - aging of forest
  - less forest area over time
Transition to generic integration tools for MRV systems and more...

“Full Lands Integration Tool – FLINT”

- Cover all land uses and carbon pools
- Have projection capabilities and allow scenario testing
- Use existing country-specific data of varying completeness and quality
- Allow for continuous improvement
- Not be locked to a specific data set or method (e.g. spatially-explicit and spatially referenced, Tier 1, 2 &3)
- Support policies beyond GHG reporting

Source: info@moja.global
Submitted to Environmental Research Letters:

- Olguin et al., Applying a systems approach to assess carbon emission reductions from climate change mitigation in Mexico’s forest sector
- Dugan et al., A systems approach to assess climate change mitigation options in landscapes of the United States forest sector
- Smyth et al., Climate change mitigation in Canada’s forest sector: a spatially-explicit case study for two regions

**Technical Report submitted to CEC:** Magnan et al., Carbon flows and stocks in North America’s forest product sector

**Collaborators**

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Grazie mille

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