Developing a Baseline and Projections Emissions Inventory for the Border 2012 Program

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What is Border 2012?

- 10-year, binational environmental program for the U.S.-Mexico border region
- Implemented under the La Paz Agreement (1983)

Goals

- #1 – Reduce water contamination
- #2 – Reduce air pollution
- #3 – Reduce land contamination
- #4 – Improve environmental health
- #5 – Reduce exposure to chemicals
- #6 – Improve environmental performance
100 km U.S.-Mexico Border Zone
Overall Approach for 1999 Baseline

- 1999 U.S. NEI + 1999 Mexico NEI
- Point, area, on-road motor vehicle, nonroad sources
- GIS for identifying sources and emissions located in the 100 km border zone
- Examination and explanation of differences in source categorization between U.S. and Mexico
- 2002 and 2012 projections
- 4 km x 4 km gridded inventory for 1999
GIS Procedure

- Determined which counties/municipalities lied entirely or partially within the border zone
- Determined fraction of emissions within the border zone
  - UTMds for point sources
    - Gap filled missing UTMds in Mexico using centroid of municipality or specific locality
  - Spatial surrogates for area, on-road, nonroad sources
Spatial Surrogates

- United States:
  - Population
  - Agricultural land
  - Forest land
  - Airports
  - Railroads
  - Ports

- Mexico:
  - Population
  - Agricultural land
  - Forest land
  - Airports
  - Railroads
  - Ports
  - Border crossings
Analysis of Source Categories

● U.S. NEI
  ➢ No min. threshold for point sources
  ➢ SIC codes
  ➢ Range of area source categories (e.g., TX = 126; CA = 139)
  ➢ 500 on-road MV subcategories
  ➢ 228 nonroad subcategories

● Mexico NEI
  ➢ Point sources = (federal + state) > 10 Mg/year
  ➢ NAICS codes
  ➢ 50 area source categories
  ➢ 7 on-road MV classifications
  ➢ 2 nonroad categories (agriculture, construction)
### 1999 Baseline Inventory (1,000 TPY)

<table>
<thead>
<tr>
<th>State</th>
<th>NO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>SO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>PM&lt;sub&gt;10&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>120.6</td>
<td>6.2</td>
<td>86.6</td>
</tr>
<tr>
<td>Arizona</td>
<td>48.7</td>
<td>11.6</td>
<td>43.1</td>
</tr>
<tr>
<td>New Mexico</td>
<td>26.0</td>
<td>20.1</td>
<td>86.1</td>
</tr>
<tr>
<td>Texas</td>
<td>96.6</td>
<td>5.6</td>
<td>191.0</td>
</tr>
<tr>
<td>Baja California</td>
<td>34.1</td>
<td>45.8</td>
<td>125.3</td>
</tr>
<tr>
<td>Sonora</td>
<td>8.5</td>
<td>4.1</td>
<td>50.0</td>
</tr>
<tr>
<td>Chihuahua</td>
<td>30.0</td>
<td>40.1</td>
<td>82.0</td>
</tr>
<tr>
<td>Coahuila</td>
<td>118.4</td>
<td>168.6</td>
<td>29.1</td>
</tr>
<tr>
<td>Nuevo León</td>
<td>1.2</td>
<td>0.3</td>
<td>4.9</td>
</tr>
<tr>
<td>Tamaulipas</td>
<td>23.1</td>
<td>22.3</td>
<td>61.0</td>
</tr>
<tr>
<td>U.S. Total</td>
<td>291.9</td>
<td>43.5</td>
<td>406.8</td>
</tr>
<tr>
<td>Mexico Total</td>
<td>215.3</td>
<td>281.3</td>
<td>352.2</td>
</tr>
<tr>
<td>Region Total</td>
<td>507.2</td>
<td>324.8</td>
<td>759.0</td>
</tr>
</tbody>
</table>
1999 NO<sub>x</sub> Contributions

- **Point Sources (MEX)**: 26.9%
- **Area Sources (MEX)**: 5.0%
- **On-Road Motor Vehicles (MEX)**: 6.9%
- **Nonroad Mobile Sources (MEX)**: 3.6%
- **Point Sources (US)**: 7.7%
- **Area Sources (US)**: 4.1%
- **On-Road Motor Vehicles (US)**: 29.0%
- **Nonroad Mobile Sources (US)**: 16.8%
1999 SO$_x$ Contributions

- **Point Sources (MEX)**: 0.8%
- **Area Sources (MEX)**: 10.5%
- **Nonroad Mobile Sources (MEX)**: 19.4%
- **Point Sources (US)**: 9.2%
- **On-Road Motor Vehicles (US)**: 1.3%
- **Nonroad Mobile Sources (US)**: 2.1%
- **Area Sources (US)**: 0.8%

- **Point Sources (MEX)**: 74.7%
1999 PM$_{10}$ Contributions

- **Area Sources (US)**: 51.2%
- **Area Sources (MEX)**: 40.8%
- **Point Sources (US)**: 0.9%
- **Point Sources (MEX)**: 5.1%
- **Nonroad Mobile Sources (US)**: 0.9%
- **Nonroad Mobile Sources (MEX)**: 0.4%
- **On-Road Motor Vehicles (US)**: 0.6%
- **On-Road Motor Vehicles (MEX)**: 0.1%
Projections Methodology

- **United States**
  - Point sources
    - EGAS (growth, only)
  - Area sources
    - EGAS
    - Population growth
  - On-road MV
    - Draft 2002 NEI
    - 2012 projection factors from WRAP
  - Nonroad
    - NONROAD2004

- **Mexico**
  - Point sources
    - OECD (industrial growth)
    - SENER (power plants)
  - Area sources
    - Regional energy demand forecasts
    - Ag and livestock for 10 years (1993-2002)
    - Population forecasts
  - On-road MV
    - MOBILE6-Mexico (+controls)
  - Nonroad
    - Fuel demand forecasts (ag and construction)
## 2012 Baseline Inventory (1,000 TPY)

<table>
<thead>
<tr>
<th>Location</th>
<th>NO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>SO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>PM&lt;sub&gt;10&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2012</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Total</td>
<td>228.3</td>
<td>45.2</td>
<td>515.8</td>
</tr>
<tr>
<td>Mexico Total</td>
<td>271.2</td>
<td>343.1</td>
<td>481.5</td>
</tr>
<tr>
<td>Region Total</td>
<td>499.5</td>
<td>388.3</td>
<td>997.2</td>
</tr>
</tbody>
</table>

### Change from 1999 (%)

<table>
<thead>
<tr>
<th>Location</th>
<th>NO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>SO&lt;sub&gt;x&lt;/sub&gt;</th>
<th>PM&lt;sub&gt;10&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>-21.8</td>
<td>+3.9</td>
<td>+26.8</td>
</tr>
<tr>
<td>Mexico</td>
<td>+26.0</td>
<td>+22.0</td>
<td>+36.7</td>
</tr>
<tr>
<td>Region</td>
<td>-1.5</td>
<td>+19.6</td>
<td>+31.4</td>
</tr>
</tbody>
</table>
2012 NO$_x$ Emissions

- Point Area Mobile Nonroad Total
- 1,000 TPY

- Mexico
- U.S.
2012 SO$_x$ Emissions

- Point Area Mobile Nonroad Total
- 1,000 TPY
- Mexico
- U.S.
2012 PM \(_{2.5}\) Emissions

- **Mexico**
- **U.S.**

**1,000 TPY**

- **Point**
- **Area**
- **Mobile**
- **Nonroad**
- **Total**
Overall Conclusions

- Good summary of overall criteria pollutant emissions for the border region
- Take care in comparing state-to-state, and source type-to-source type
- Projections give baseline emissions (growth, no control)
- Policy tool for implementing future control strategies in the border region