Developing the Mexico National Emissions Inventory

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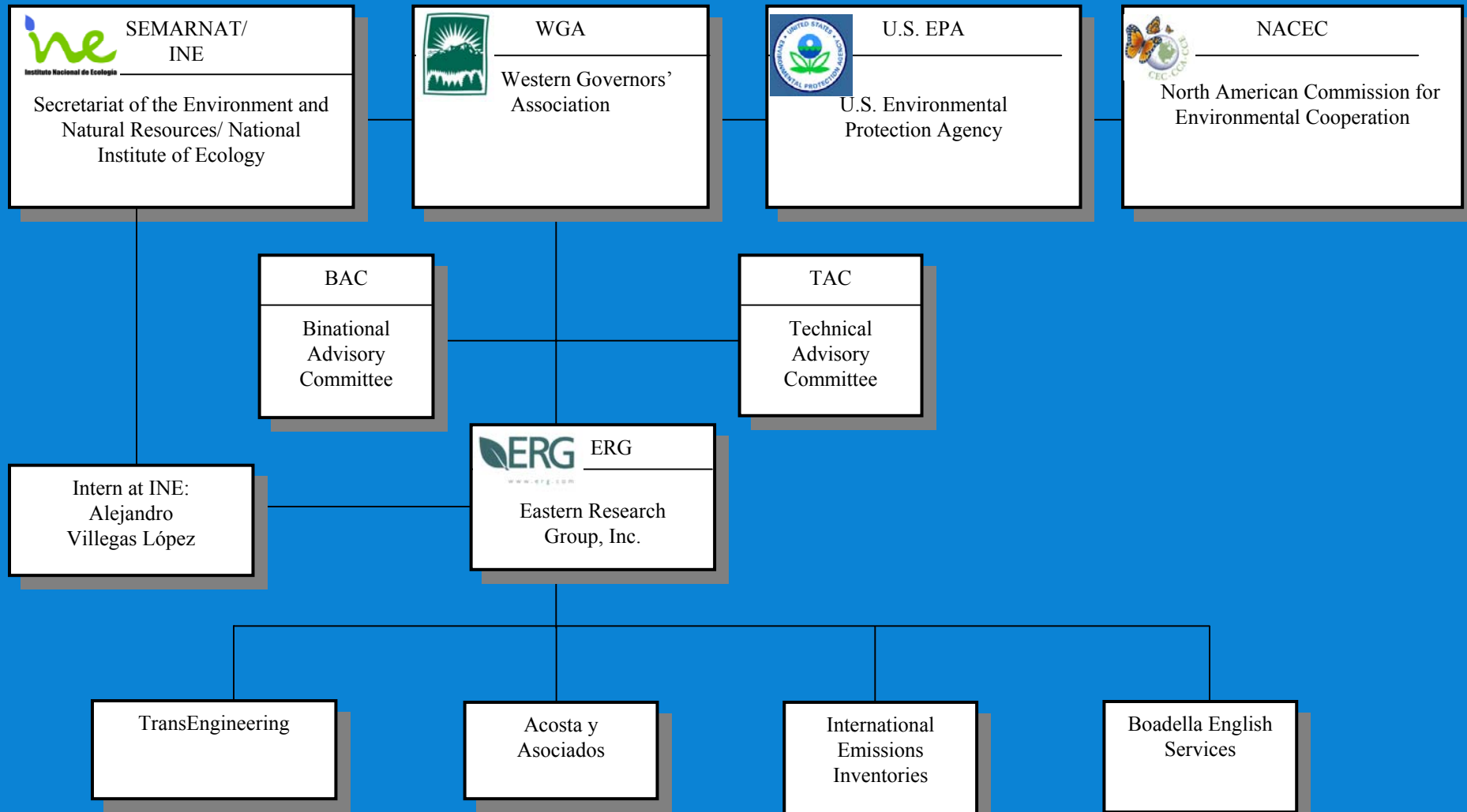**Western Governors' Association**
Denver, Colorado

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History of Projects
to Build Inventory Capacity

- 1994 to 2001:
  - Inventory manuals and training
  - Special studies
  - MOBILE5-Mexico model
  - Inventories in Mexicali and Tijuana
- 2001 to date: Mexico National Emissions Inventory (NEI)

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Organization of the Mexico Emissions Inventory Projects

SEMARNAT/ INE
Secretariat of the Environment and Natural Resources/ National Institute of Ecology

WGA
Western Governors' Association

U.S. EPA
U.S. Environmental Protection Agency

NACEC
North American Commission for Environmental Cooperation

BAC
Binational Advisory Committee

TAC
Technical Advisory Committee

ERG
Eastern Research Group, Inc.

Intern at INE: Alejandro Villegas López

TransEngineering

Acosta y Asociados

International Emissions Inventories

Boadella English Services

Mexico NEI Schedule

Phase	Scope	Status
I	Planning	Completed July 2002
II	**Preliminary Mexico NEI for the Six Northern States**	**Completed July 2003**
III	Draft Final Mexico NEI for the entire country	Scheduled March 2004
	Final Mexico NEI	Scheduled July 2004

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Unique Aspects of the Mexico NEI

- **Procedural:**
  - Partnering so that Mexico has a leadership role
  - Overcoming obstacles related to data availability
  - Managing data ownership and confidentiality concerns

- **Technical:**
  - State-by-state data collection for point sources
  - National fuel balance
  - Per capita VKT estimates
  - Remote sensing data for paved/unpaved road distribution

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Mexico NEI Goals and Characteristics

- **Goals:**
  - Develop first national inventory for Mexico
  - Facilitate EI capacity in Mexico
  - Support other tri-national air quality goals

- **Characteristics:**
  - 1999 annual inventory
  - Criteria pollutants + NH_3
  - State-level for border states
  - Municipality-level for all 32 states

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Mexico NEI Source Types

Source Type	Draft/Preliminary Inventory Categories	Additional Draft Final/Final Inventory Categories
Point	• 11 federal sectors • State-jurisdiction sources	
Area	• Solvent, ammonia sources • Commercial, residential fuel use • Paved and unpaved roads • Locomotives, aircraft, vessels • ~30 others	• Wind erosion • Charbroiling, vendors • Graphic arts • ~10 others
Mobile	• Light and heavy-duty vehicles	
Nonroad	• Not included	• Agricultural machinery • Construction equipment
Natural	• **Vegetative VOC** • **Soil NO$_x$**	• Volcanic SO$_x$

Preliminary Mexico NEI

- Methods
- Data collection process
- Results

Mexico NEI
Point Source Methodology

- Use existing databases for areas with air quality plans and existing inventories
- Collect other data from State Environmental Agencies (SEAs) and Federal Regions
- Perform QA and make corrections
- Report results with confidence rating by facility

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Mexico NEI
Area Sources Methodology

- Use preferred methods for preliminary inventory
- Collect raw data from agencies etc.
- Conduct special study for paved/unpaved road VKT
- Calculate emissions with emission factors, material balance
- Allocate (disaggregate) to state level
- Report results with confidence rating by source category

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Confidence Rating Approach

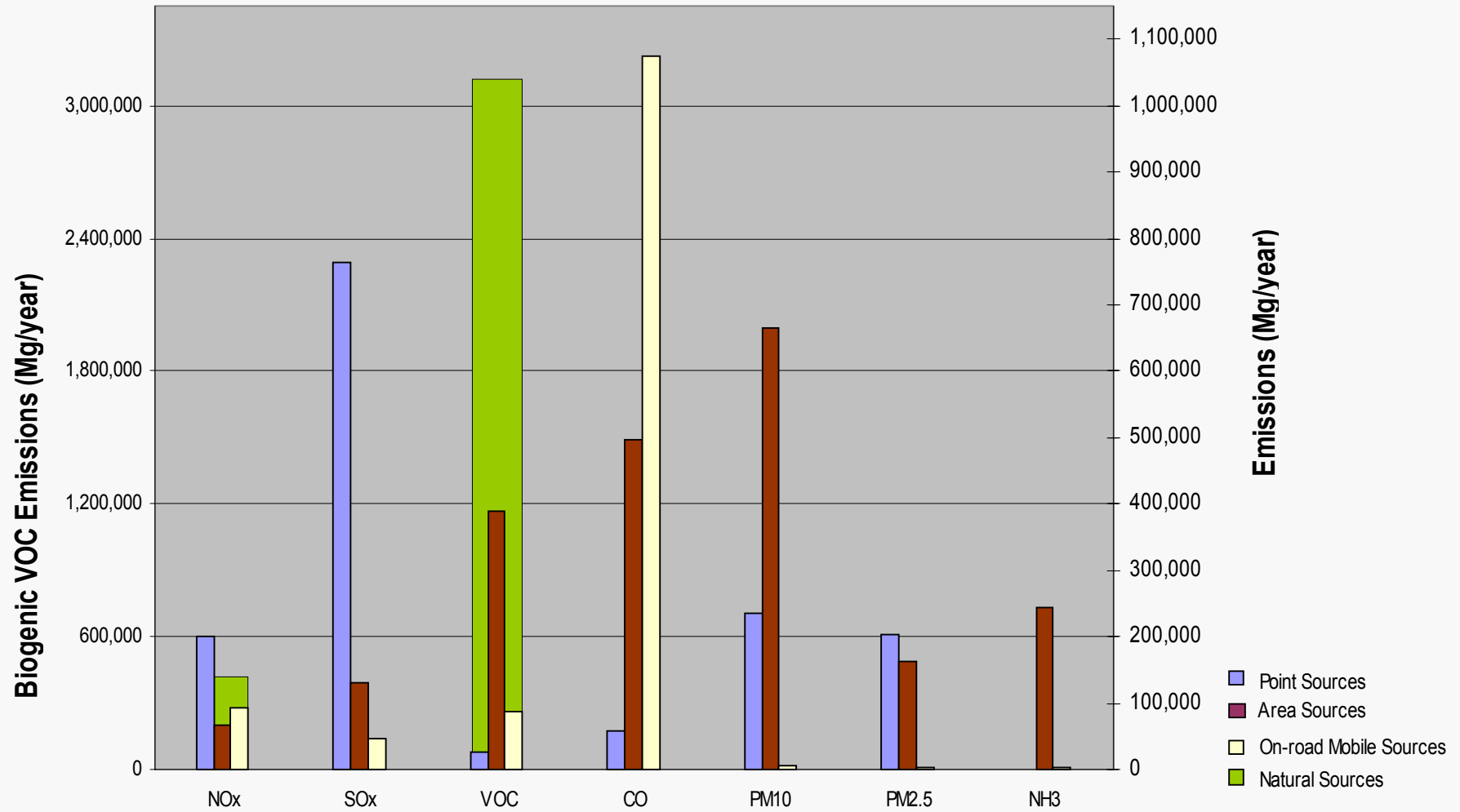| Rating	Activity Data	Emission Factor
A	Based on comprehensive Mexico-specific data	Based on comprehensive Mexico-specific data
B	Based on limited/extrapolated Mexico-specific data	Based on limited Mexico-specific data
C	Based on expert judgment	Based on expert judgment
D	Based on extrapolated U.S. data	Based on U.S. factors
E	Insufficient data	No emission factors exist

Mexico NEI
Mobile Sources Methodology

- Determine daily per capita emission rates for 7 representative urban areas
  - Traffic volume, congestion modeling => link-level VKT
  - MOBILE6-Mexico model => emission factors
  - PrepinPlus => Emission rates assigned to specific links
  - Total daily emissions = Σ(daily link emissions)
  - Per capita emissions = Total daily emissions / population
- Estimate annual emissions for each municipality
  - Emissions = Daily per capita emissions $\times$ population $\times$ 365

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Mexico NEI: Natural Sources Methodology

- 3 (Emission factor $\times$ area by vegetation type)
- Model required for complex algorithms
  - Global Biosphere Emission and Interactions System (GloBEIS)
- Estimates developed for each municipality; summed up to the state level

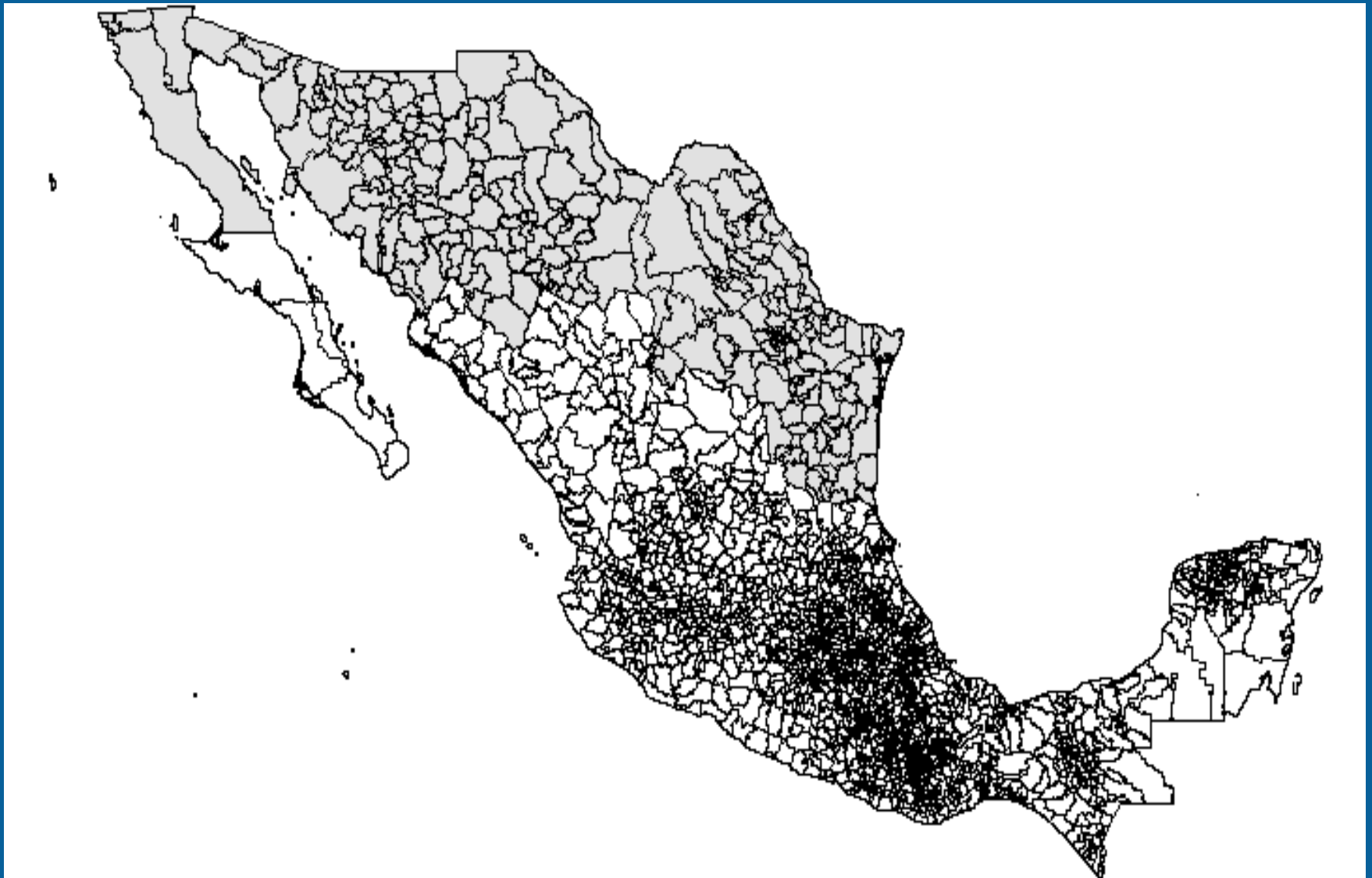ERG

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Preliminary 1999 Mexico NEI for the Six Northern States

Biogenic VOC Emissions (Mg/year)

Emissions (Mg/year)

Legend:
- Point Sources
- Area Sources
- On-road Mobile Sources
- Natural Sources

Categories: NOx, SOx, VOC, CO, PM10, PM2.5, NH3

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Preliminary 1999 Mexico NEI for the Six Northern States

Source Type/ Location	NO_x	SO_x	VOC	CO	PM_{10}	$PM_{2.5}$	NH_3
Point Source Emissions by State (Mg/year)							
Baja California	5,695	26,605	**16,567**	758	6,079	4,679	0
Coahuila	**113,760**	157,762	917	**18,888**	**156,903**	**146,347**	0
Chihuahua	18,133	65,187	2,308	13,822	7,241	6,279	0
Nuevo León	16,403	49,003	3,816	15,891	31,635	28,754	0
Sonora	32,190	**331,485**	2,098	4,585	30,865	14,728	0
Tamaulipas	12,882	133,568	1,124	2,769	3,805	2,969	0
Emissions by Source Type (Mg/Year)							
Point Sources	*199,063*	*763,610*	*26,830*	*56,713*	*236,528*	*203,756*	*0*
Area Sources	*65,516*	*130,194*	*389,975*	*496,587*	*663,659*	*163,080*	*243,354*
MV Sources	*93,367*	*45,683*	*88,277*	*1,075,116*	*4,695*	*4,302*	*1,596*
Natural Sources	*417,884*	*0*	*3,120,629*	*0*	*0*	*0*	*0*
Total (Mg/Year)	*775,829*	*939,487*	*3,625,711*	*1,628,416*	*904,883*	*371,138*	*244,951*

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Mexico NEI Data Release Policy

Acknowledges importance of data for air quality planning in the U.S. and Mexico, and respects Mexico's ownership of the data and results

"Project sponsors have agreed that data files will not be released until the inventory has been approved by Mexico and published in final form, except in extraordinary circumstances, and even then with certain limitations and restrictions. This will not occur until at least March 2004 for the six northern Mexican states and July 2004 for the remainder of the country."

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