

# Southern New Mexico Ozone Modeling Study

University of North Carolina (UNC-IE)

Ramboll-Environ (RE)

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# Summary

- Meteorology (WRF) Modeling Update
- Emissions (SMOKE) Modeling Update
  - Sunland Park NAA and NEI inventories
  - Mexico Inventories
- Air Quality (CAMx) Modeling Update
  - Ozone Season and Modeling Domains
- Next Steps
- Action Items and Next Call

# Meteorology Modeling Update

## WRF Configurations

- UNC-IE and RE seeking optimal WRF configuration for SW US
- Recent studies (table) show similar configurations
  - San Juan Mercury study optimized configuration for low precipitation bias
- WRFv3.7.1 includes scale-aware cumulus parameterizations that should help with NA monsoon
- Other ideas?

WRF Treatment	WAQS (WRFv3.5.1)	San Juan Hg (WRFv3.4.1)
Microphysics	Thompson	Thompson
Longwave Radiation	RRTMG	RRTMG
Shortwave Radiation	RRTMG	RRTMG
Minutes between radiation physics calls	20	20
Land Surface Model (LSM)	NOAH	NOAH
Planetary Boundary Layer (PBL) scheme	YSU	YSU
Cumulus parameterization	Kain-Fritsch in the 36-km and 12-km domains only.	Kain-Fritsch in the 36-km and 12-km domains only.
Analysis nudging	Applied to winds (uv), temperature (t) and moisture (q) in the 36-km and 12-km domains	Applied to winds, temperature and moisture in the 36-km domains
Analysis nudging coefficients	uv: 5e-4 (d01), 3e-4 (d02) t: 5e-4 (d01), 3e-4 (d02) q: 1e-5 (d01 and d02)	uv: 3e-4 (d01) t: 3e-4 (d01) q: 3e-7 (d01)
Observation Nudging	Applied to surface wind and temperature in the 4-km domain	Applied to surface wind in the 12-km and 4-km domains
Observation nudging coefficients	uv: 1.2e-3 (d03) t: 6e-4 (d03)	uv: 6e-4 (d02 and d03)
Initialization Dataset	12 km North American Model (NAM)	80-km ERA Interim from ECMWF
Top (mb)	50	100
Vertical Levels	37	34

# Emissions Modeling Update

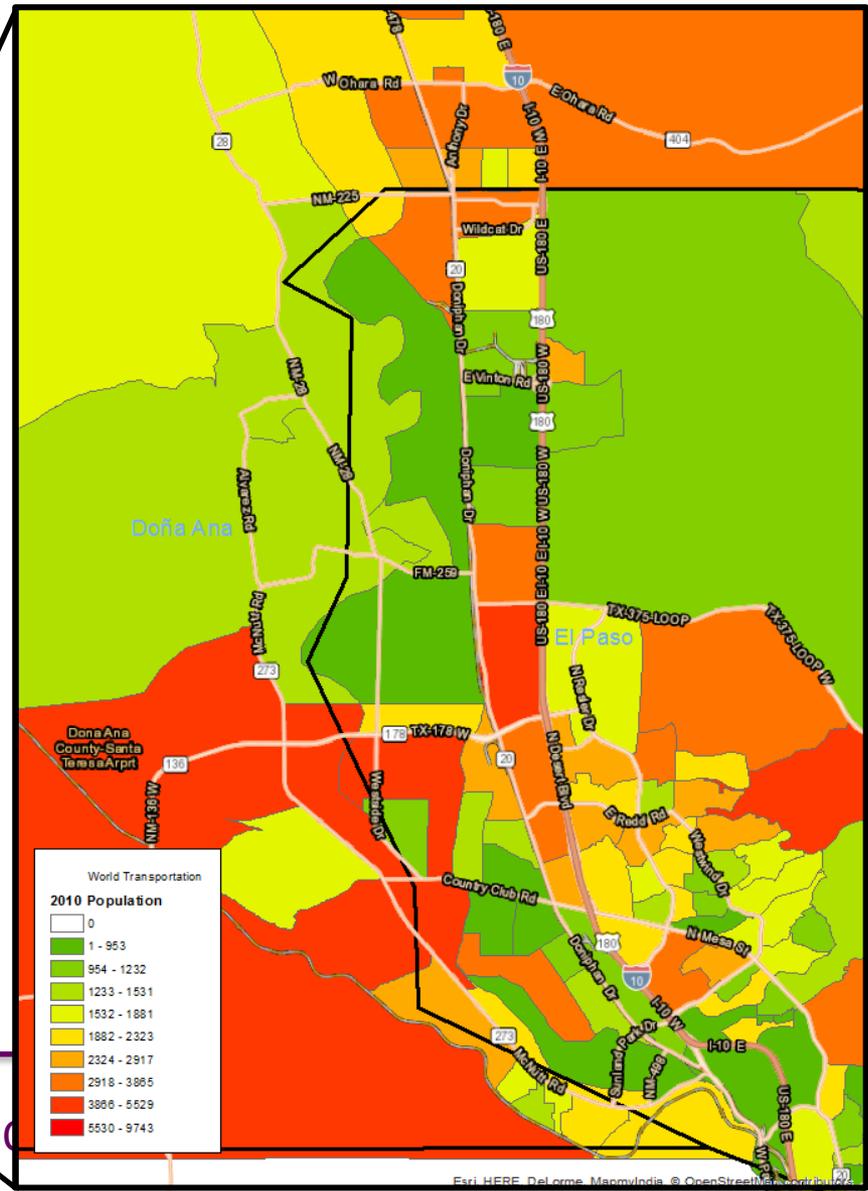
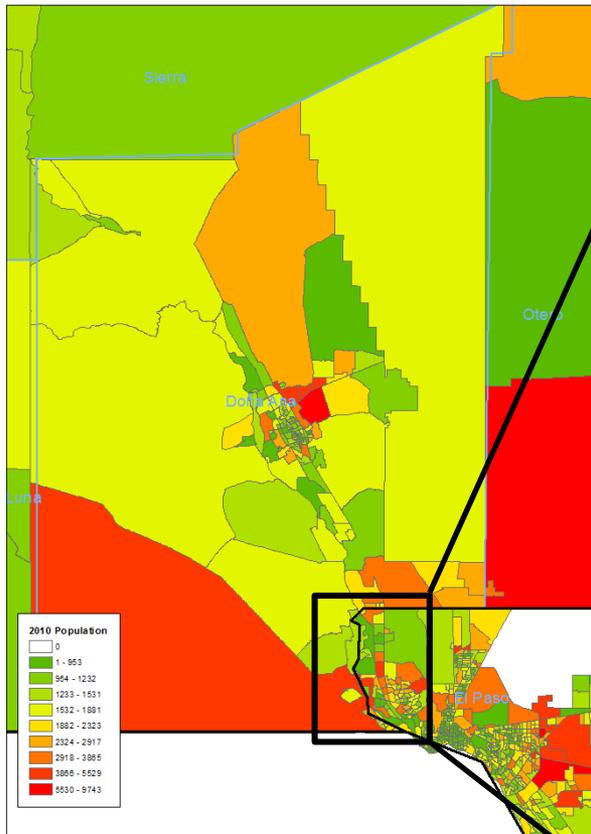
## Sunland Park Inventory

- Objective: Produce a complete and reliable estimate of 2011 emissions for Doña Ana and surrounding area
- Fusing the NEI and NMED Sunland Park Inventories
  - NEI needed for the rest of Doña Ana County and surrounding counties/states
  - Need to “remove” NMED Sunland Park sources from NEI for Doña Ana Co.
    - Straight subtraction
    - Use a surrogate

# Emissions Modeling Update

## Sunland Park Inventory

2010 Population by Census Tract



# Emissions Modeling Update

## Sunland Park Inventory

- Subtraction

- Doña Ana EI = NEI for Doña Ana – Sunland Park EI
- Assumes that the Sunland Park EI (a) includes all of the same sources (SCCs) as the NEI; and (b) was developed with a similar methodology as the NEI

- Use a surrogate to remove Sunland Park

- X% of the county population is in the Census tracts that comprise Sunland Park
- Doña Ana EI = NEI for Doña Ana \* (1-x/100)

# Emissions Modeling Update

## Sunland Park Inventory

- Considerations

- Much effort to fuse the NEI and Sunland Park EIs
  - Fusing inventories will introduce some errors
  - Spatial surrogate effort will be large
- The effort may not be justified if the impact of the Sunland Park EI on the modeling is small
  - If the Sunland Park EI only includes “nonpoint” and industrial/EGU point sources (no mobile), most of the emissions will be from the NEI anyway (see later slides)

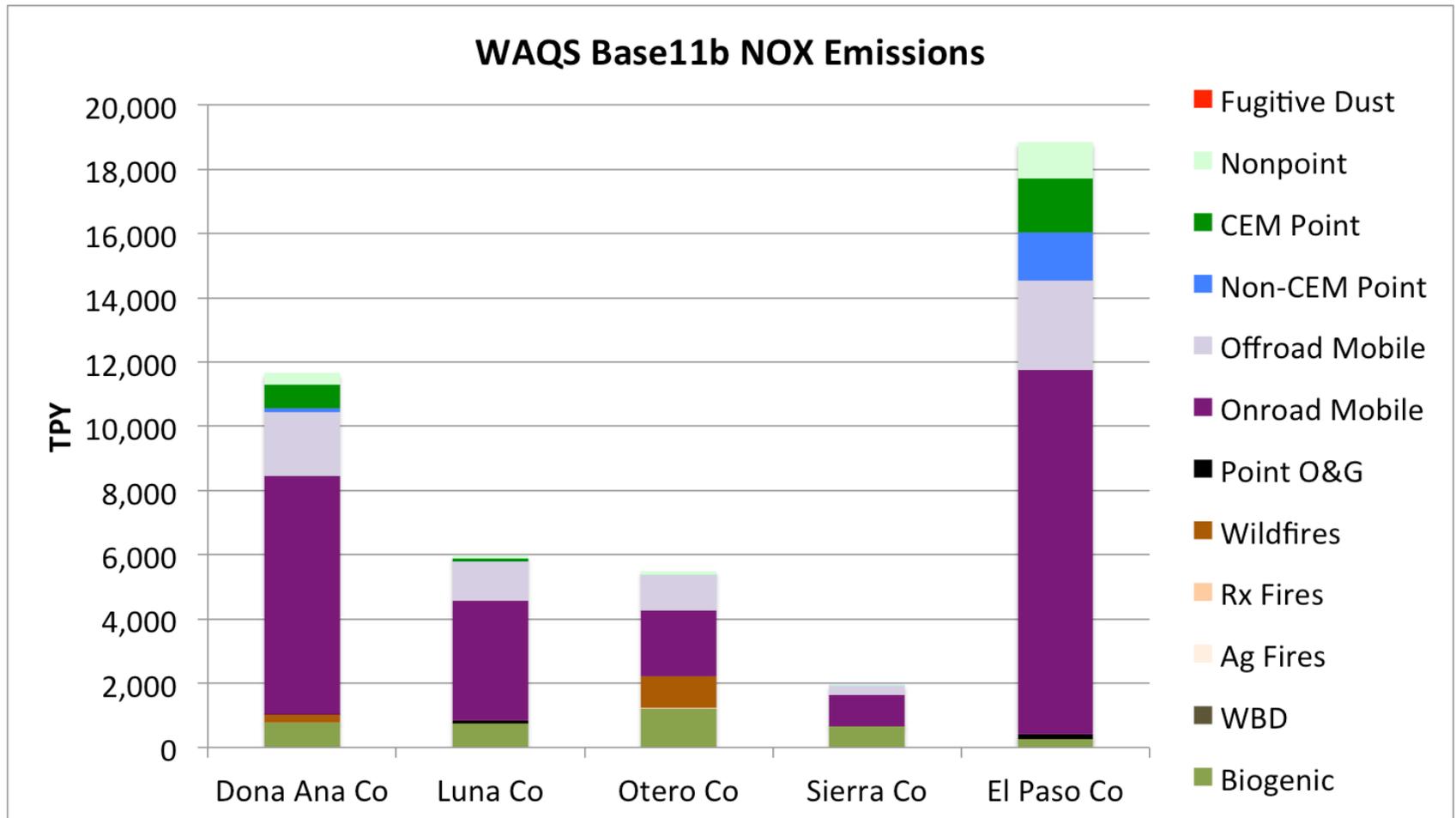
# Emissions Modeling Update

## Doña Ana County Inventory

- NEI2011v2 (WAQS Base11b)
  - Documentation: [EPA NODA](#)
- Dona Ana and surrounding US Counties
- Dona Ana and surrounding US Counties + Mexico Municipalities (INEM 2008)

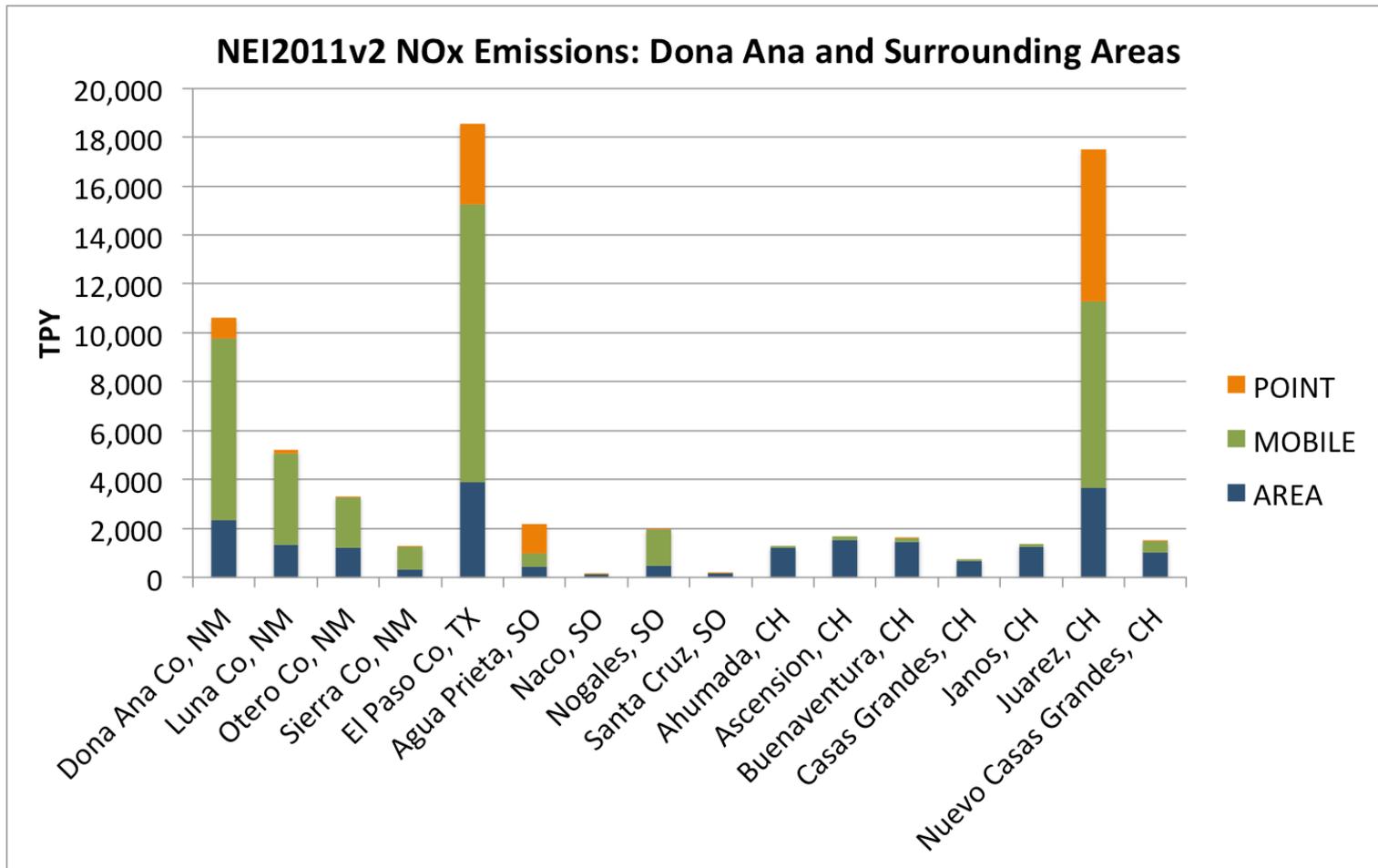
# Emissions Modeling Update

## Doña Ana County Inventory



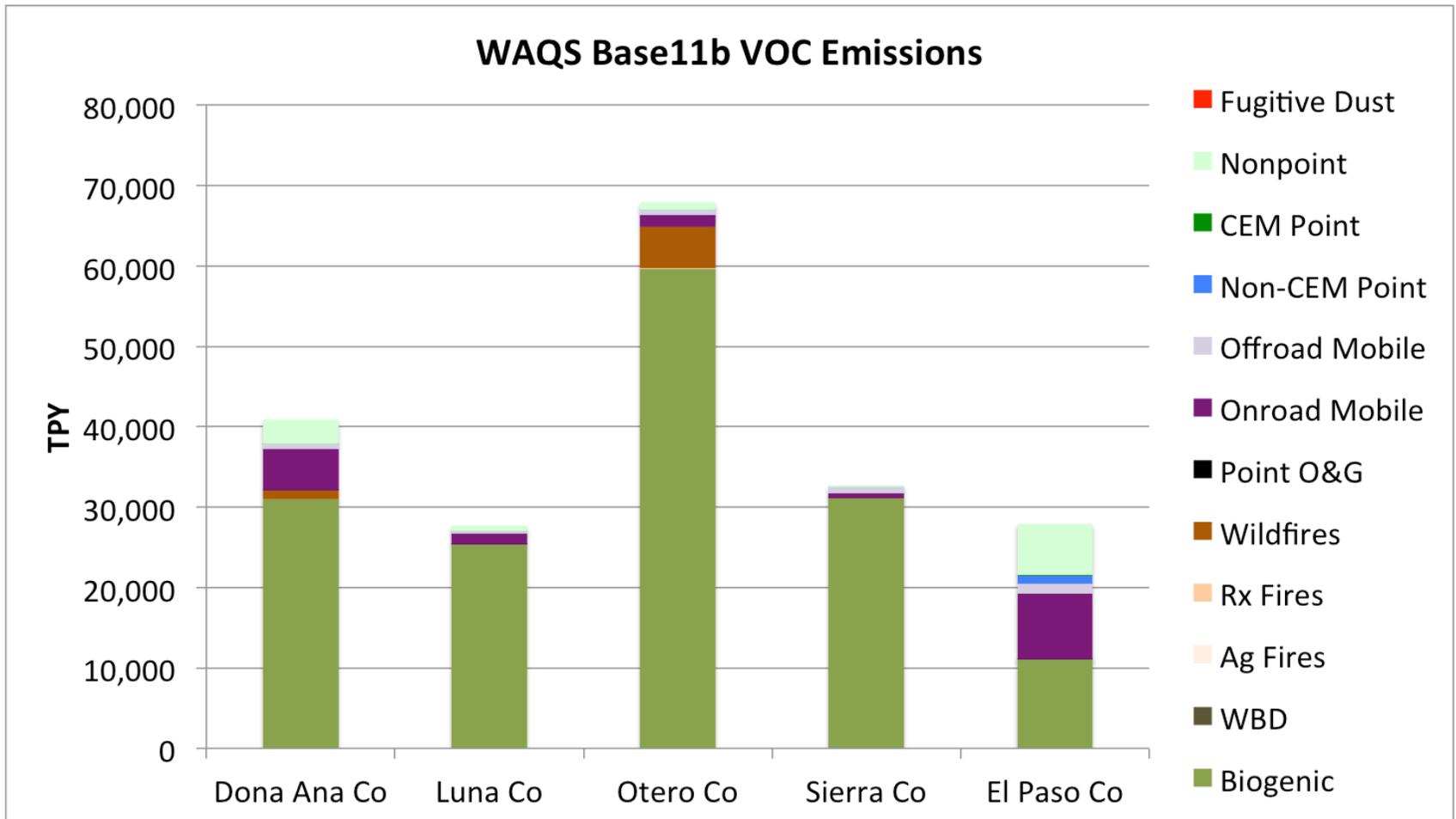
# Emissions Modeling Update

## Doña Ana County Inventory



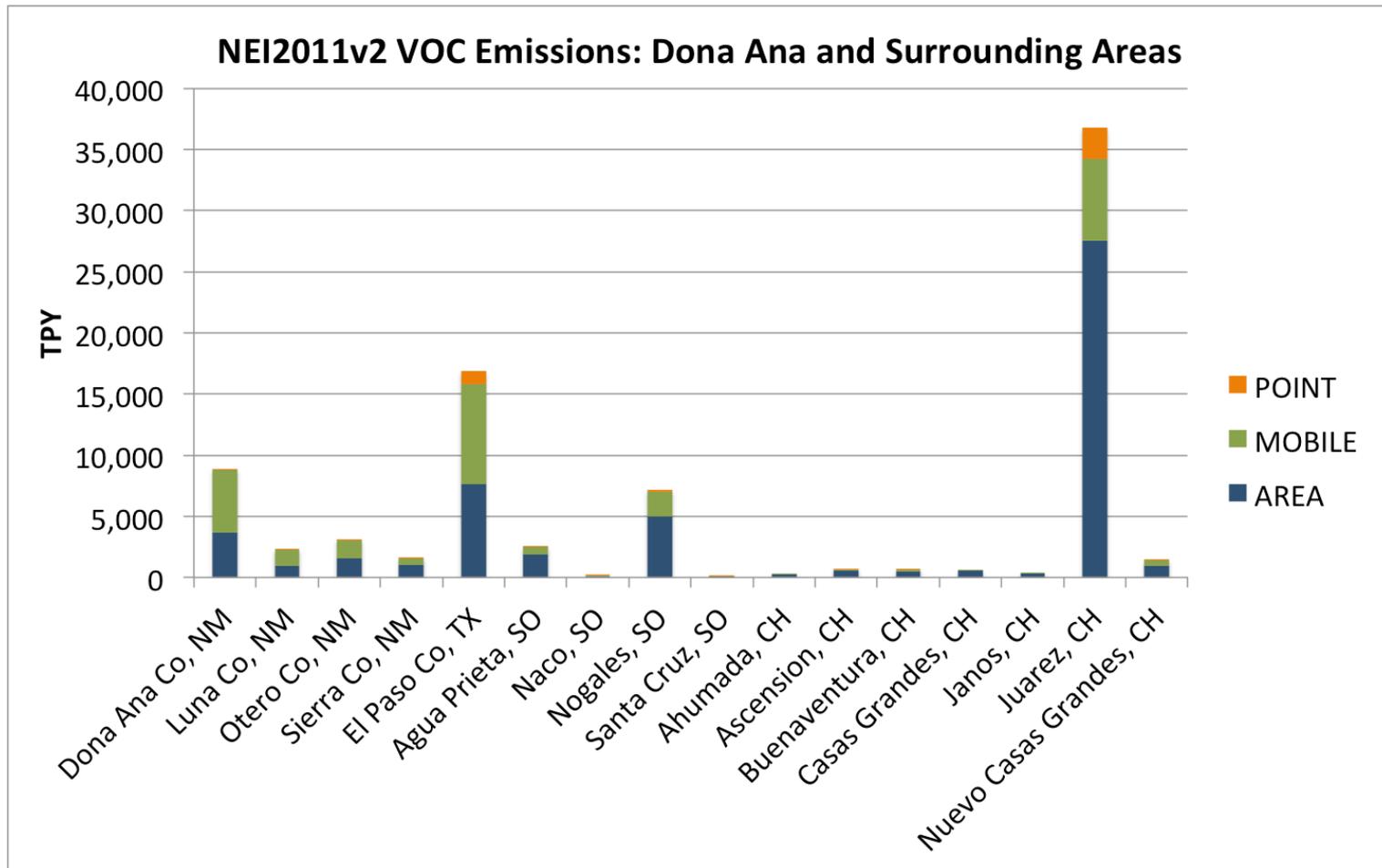
# Emissions Modeling Update

## Doña Ana County Inventory



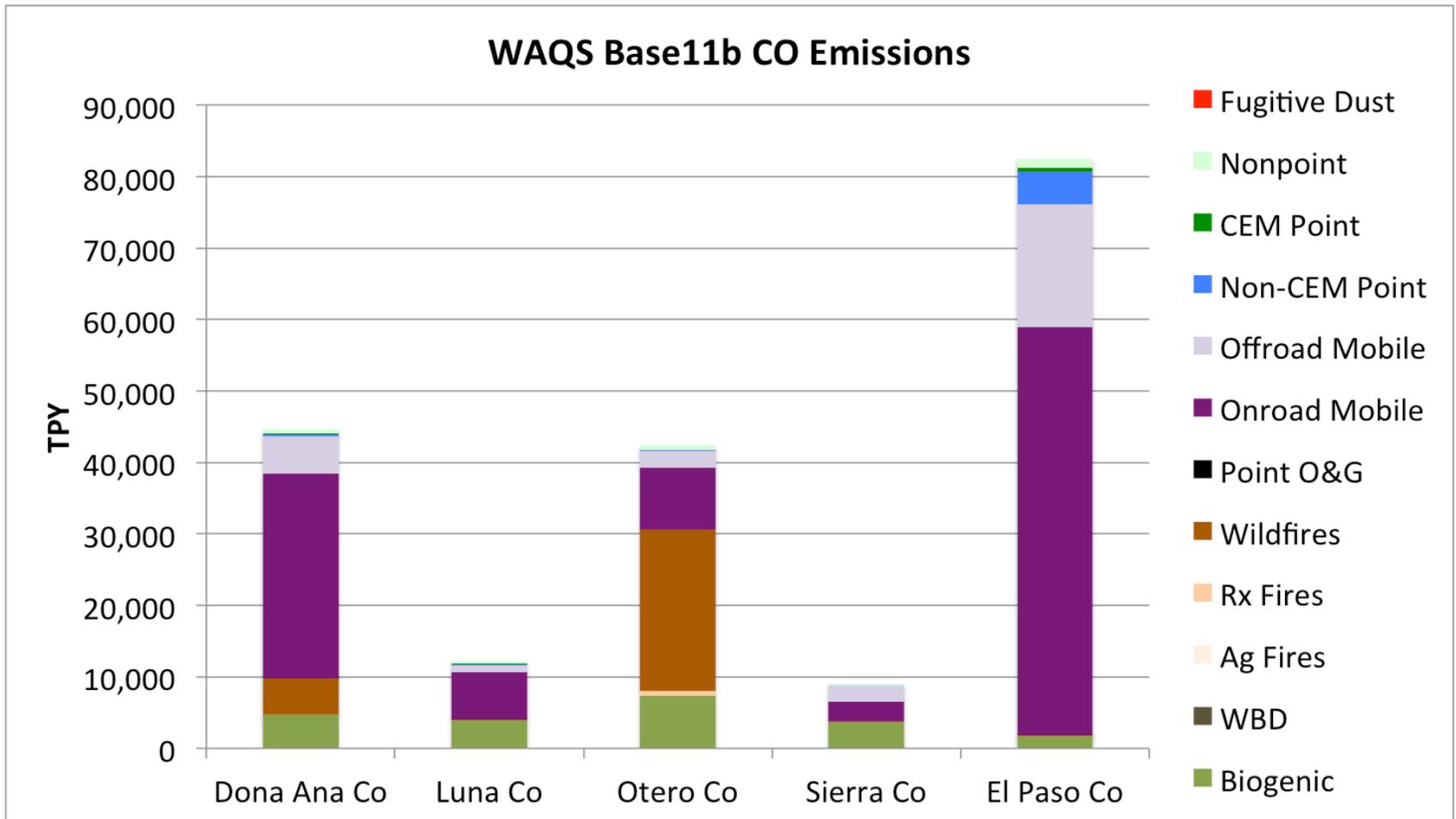
# Emissions Modeling Update

## Doña Ana County Inventory



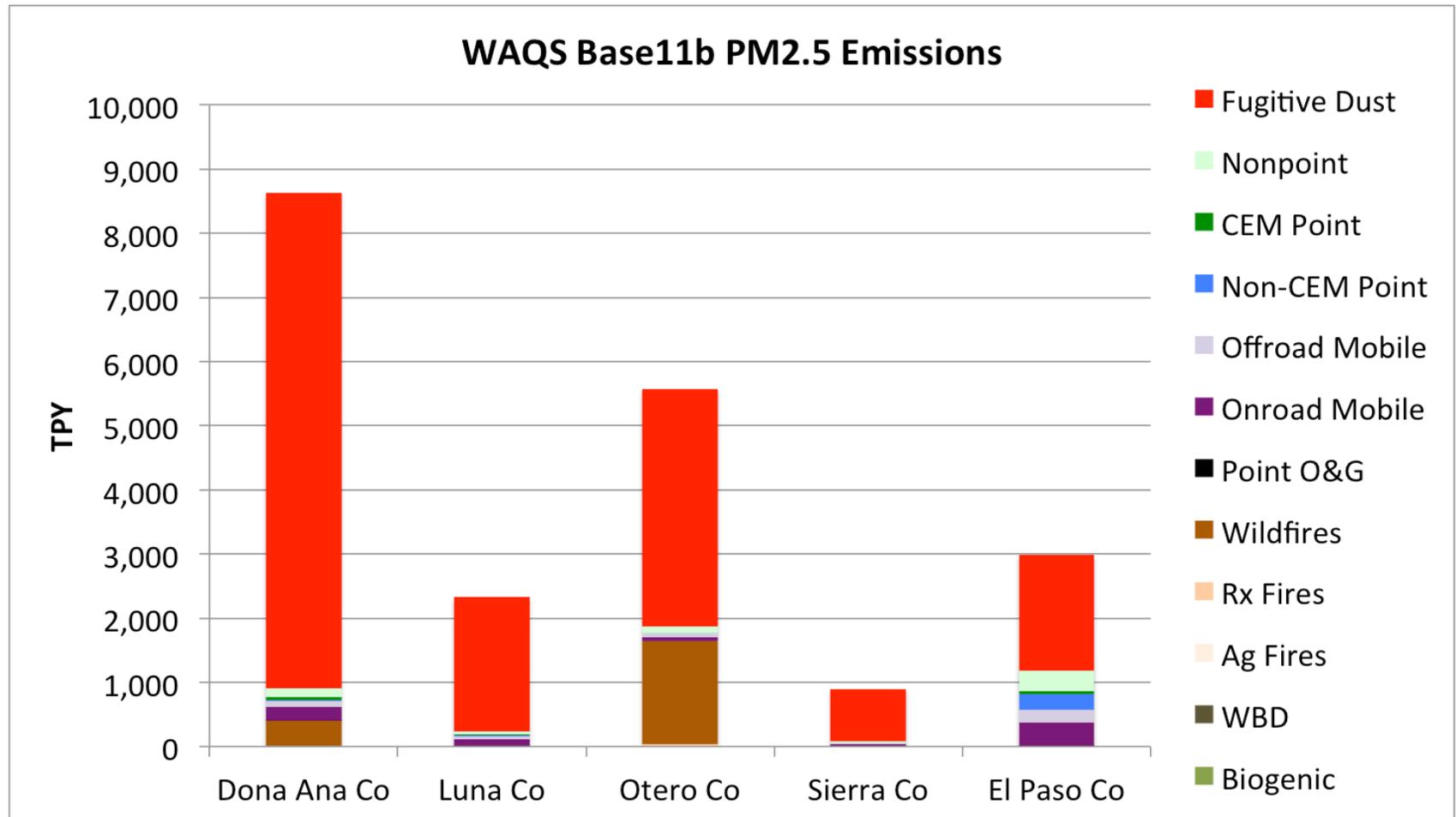
# Emissions Modeling Update

## Doña Ana County Inventory



# Emissions Modeling Update

## Doña Ana County Inventory



# Emissions Modeling Update

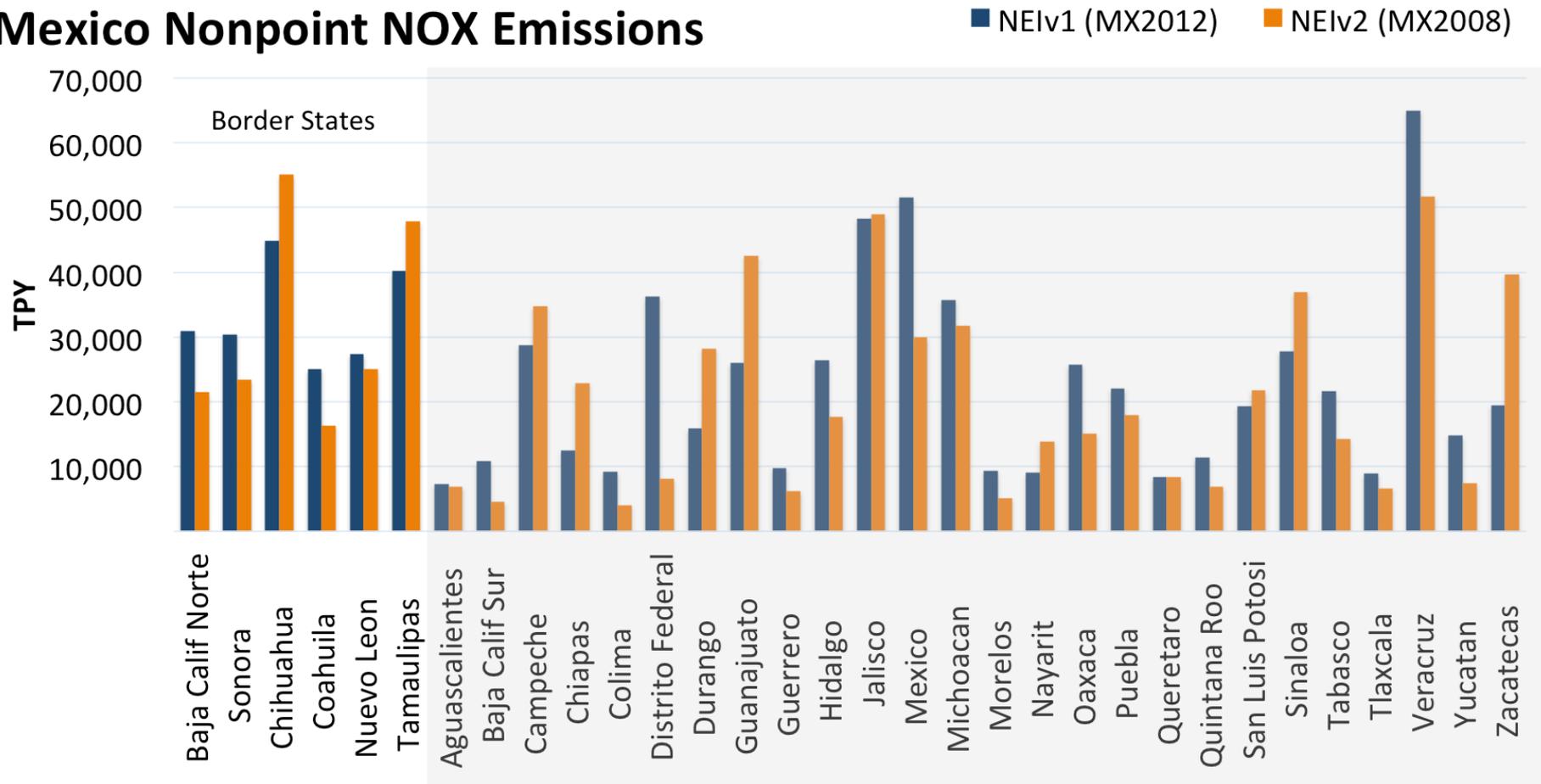
## Mexico Inventory Analysis

- US EPA 2011 Modeling Platforms
  - NEI 2011v1
    - 1999 Mexico NEI (INEM) projection to 2012
    - Documentation: [EPA TSD](#); [ERG Inventory Conference Paper](#)
    - Projection years: 2018, 2025
  - NEI 2011v2
    - 2008 INEM inventory with corrections
    - Documentation: [ERG report to EPA](#)
    - Projection Years: 2018, 2025

# Emissions Modeling Update

## Mexico Inventory Analysis

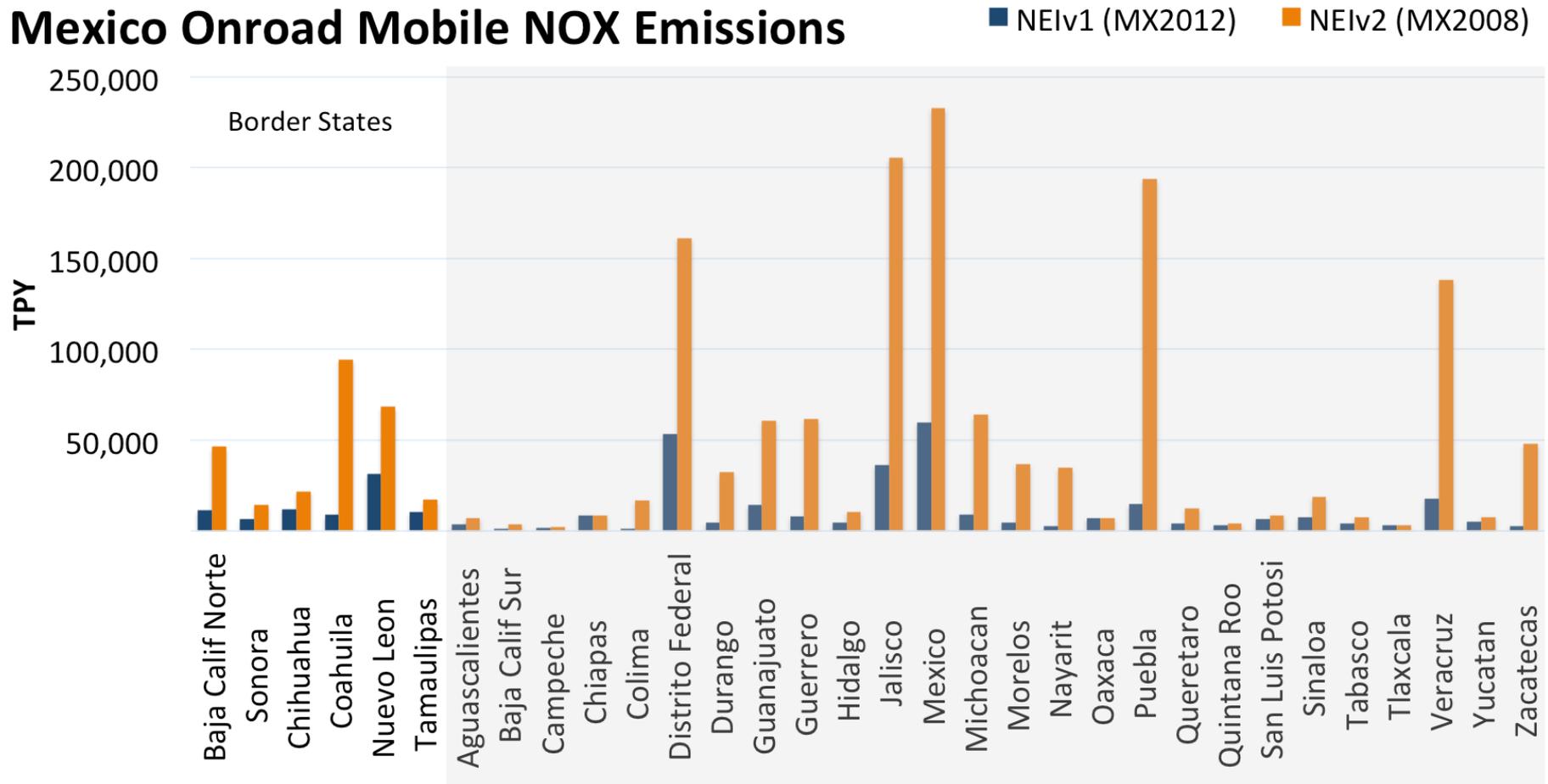
### Mexico Nonpoint NOX Emissions



# Emissions Modeling Update

## Mexico Inventory Analysis

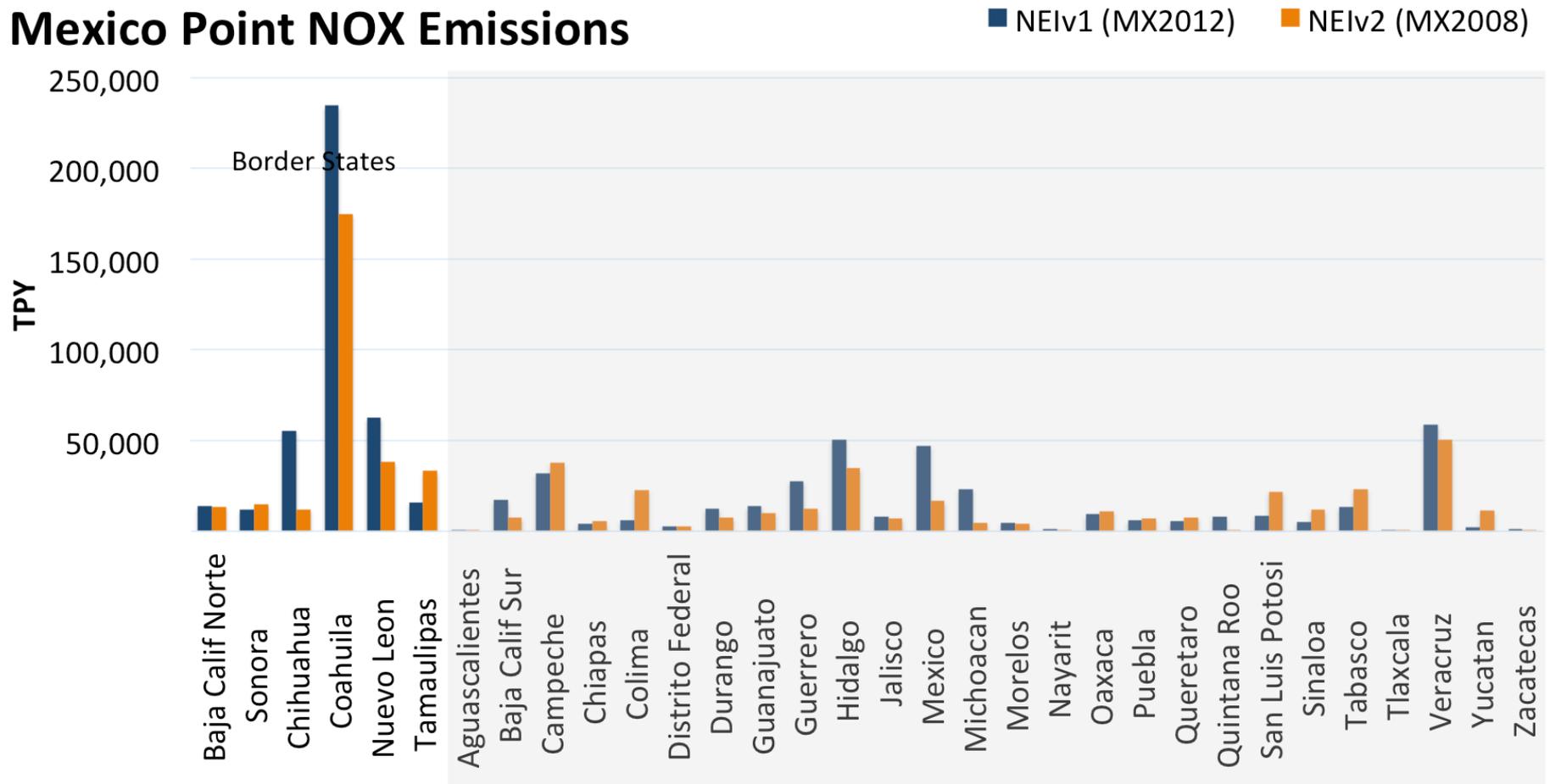
### Mexico Onroad Mobile NOX Emissions



# Emissions Modeling Update

## Mexico Inventory Analysis

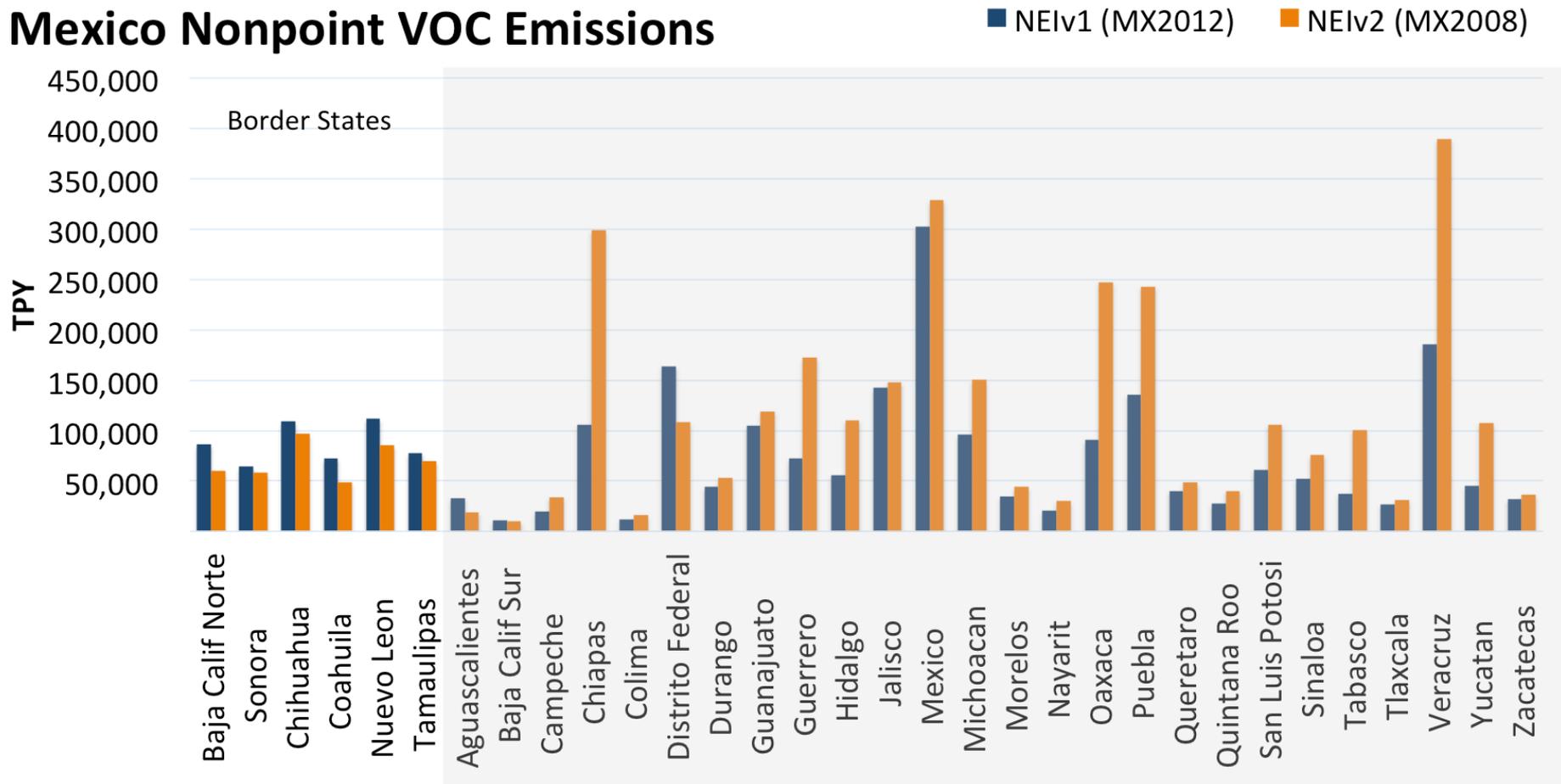
### Mexico Point NOX Emissions



# Emissions Modeling Update

## Mexico Inventory Analysis

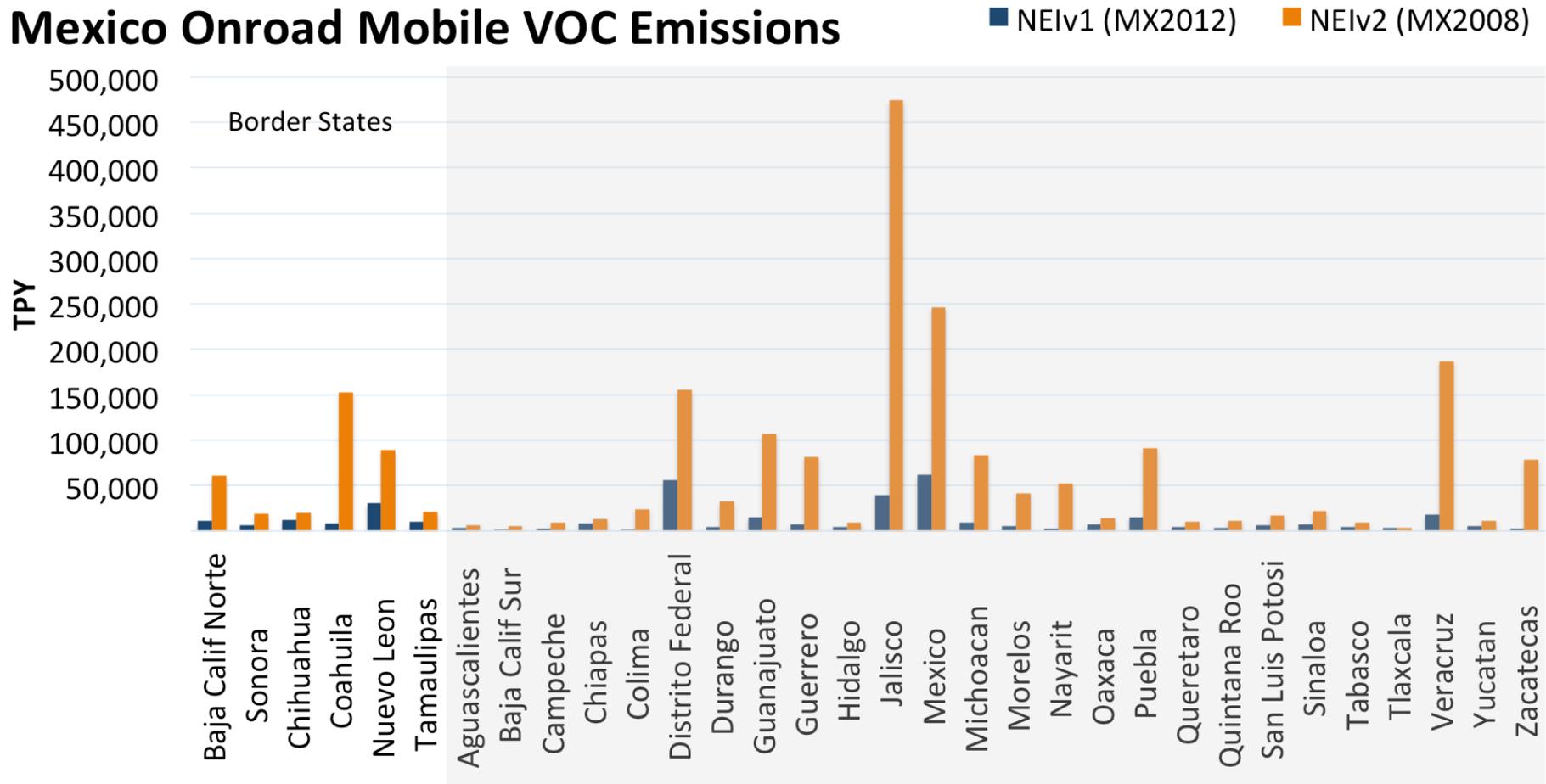
### Mexico Nonpoint VOC Emissions



# Emissions Modeling Update

## Mexico Inventory Analysis

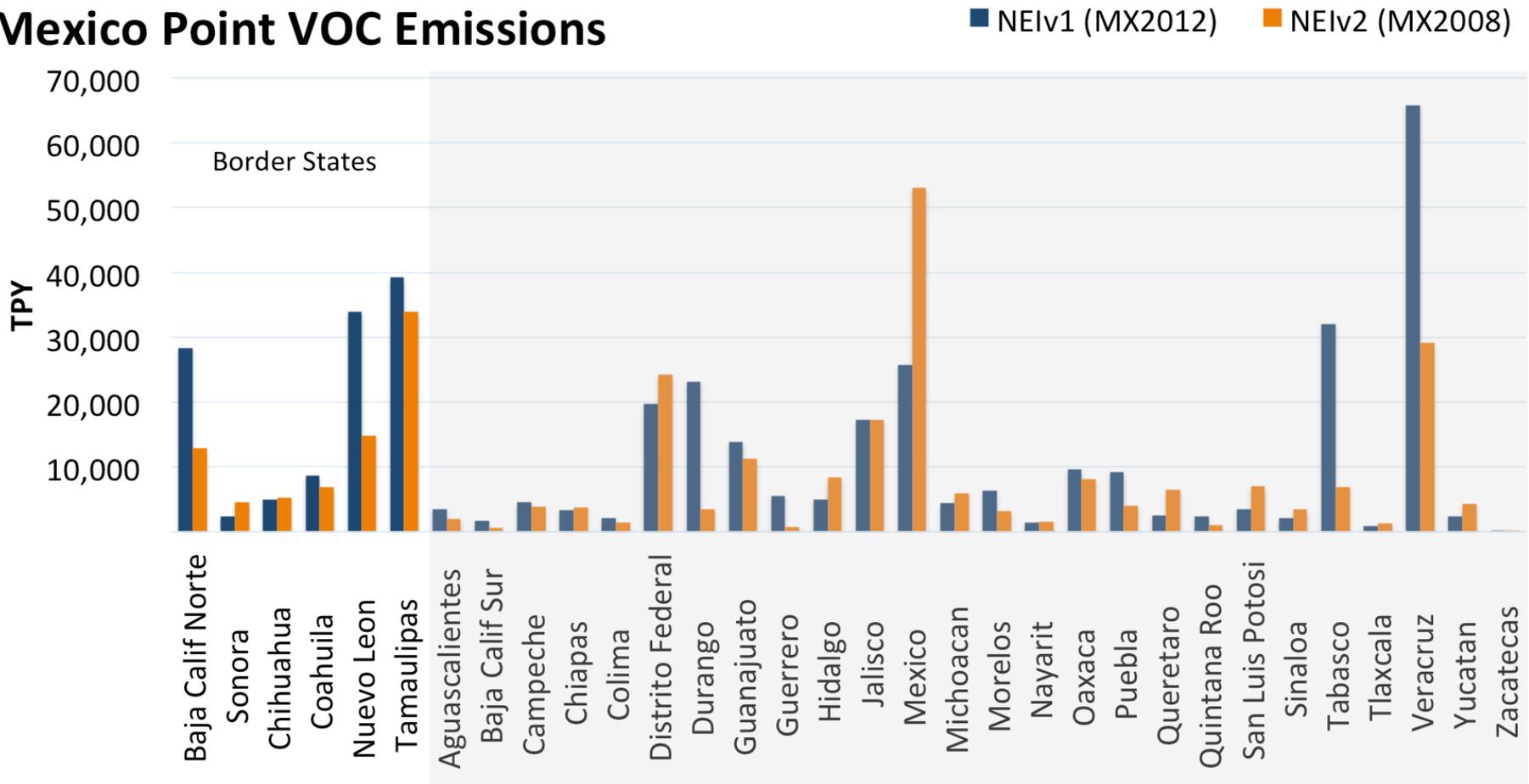
### Mexico Onroad Mobile VOC Emissions



# Emissions Modeling Update

## Mexico Inventory Analysis

### Mexico Point VOC Emissions



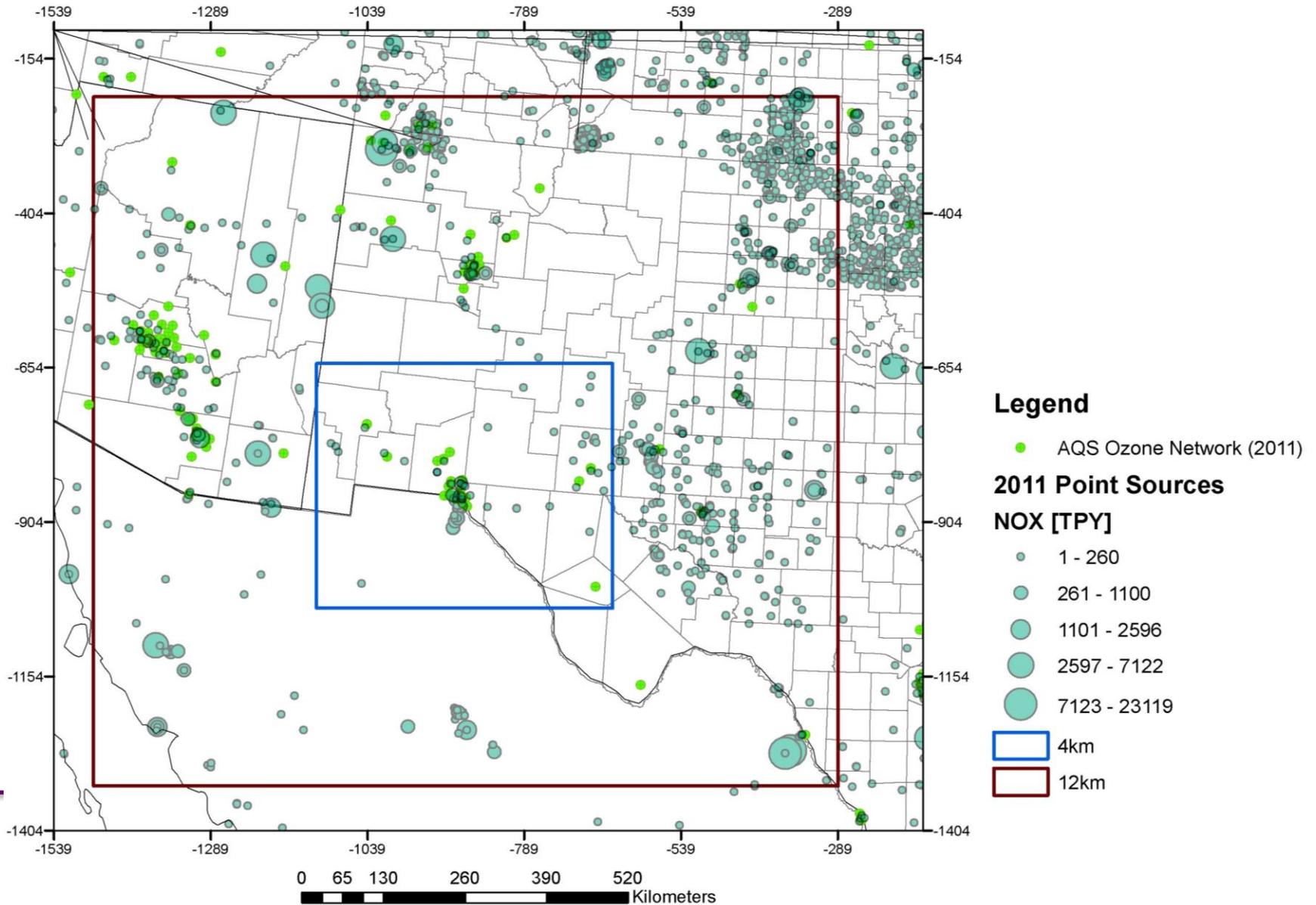
# Air Quality Modeling

## Ozone Season and Modeling Domains

- Modeling Periods
  - Proposed: April 15 – August 31, 2011
  - Ozone Season: What is the official season?
- Modeling Domains
  - 36/12/4-km WRF Domains that are larger than CAMx domains
  - 12/4-km CAMx Domains
    - Need to “snap” to emissions spatial surrogates

# Air Quality Modeling

## Proposed CAMx Modeling Domains



# Next Steps

- **Documentation**
  - Draft Work Plan
- **Meteorology**
  - Images of final WRF and CAMx domains
  - WRF sensitivity runs and evaluation
- **Emissions**
  - Compare NMED inventories with NEI 2011v2
  - Explore if additional Mexico EI data are available
- **Air Quality**
  - Generate 12-km CAMx BCs from 12-km WAQS 2011b modeling