# The Next NARSTO Science Assessment:

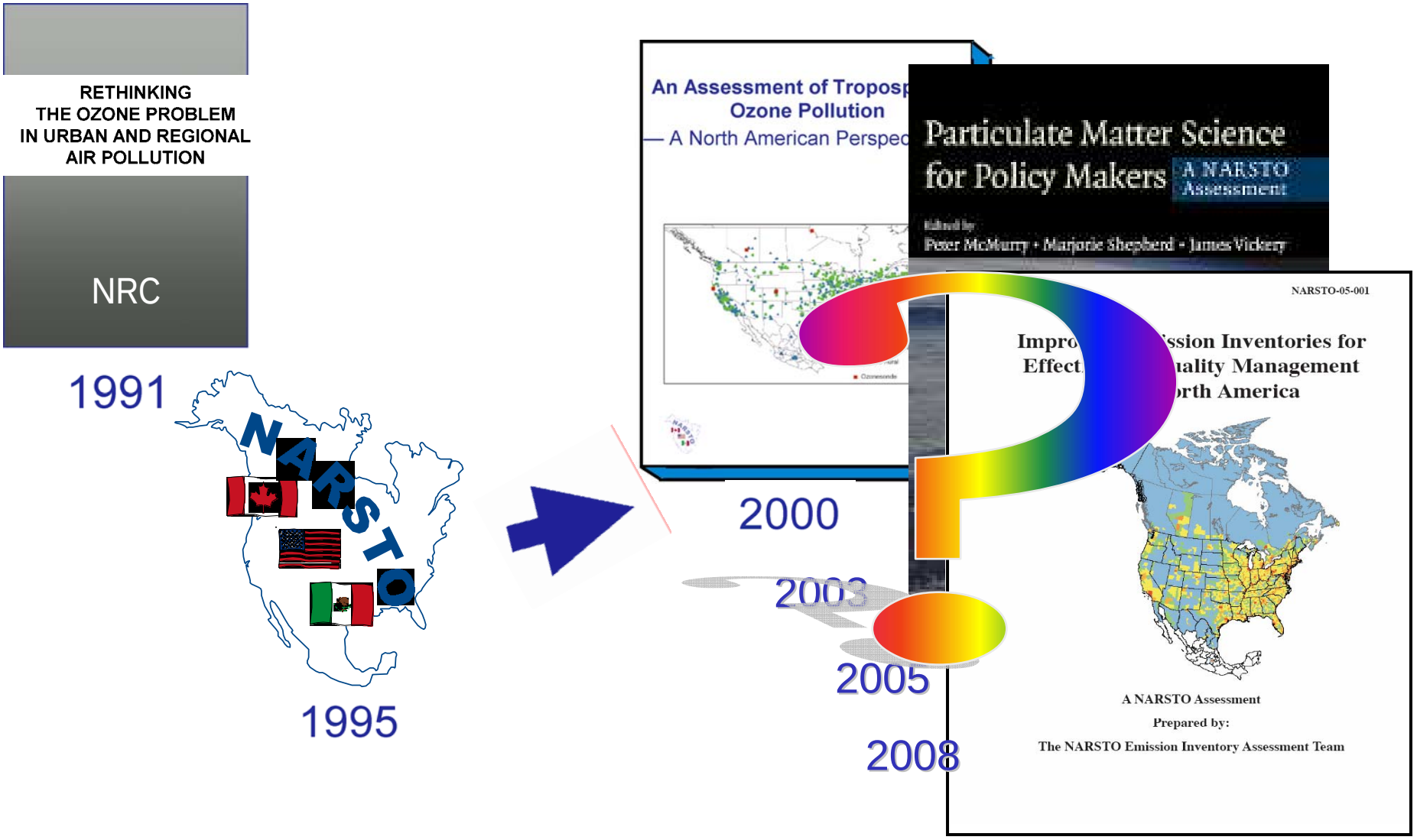
## Science to Help Define the Problem and Set the Right Priorities

Clean Air Act Advisory Committee
September 14, 2006
Crystal City, VA

William T. Pennell, NARSTO Management Coordinator

Jim Vickery, Public Sector Co-Chair

# NARSTO,
# who we are and what we do



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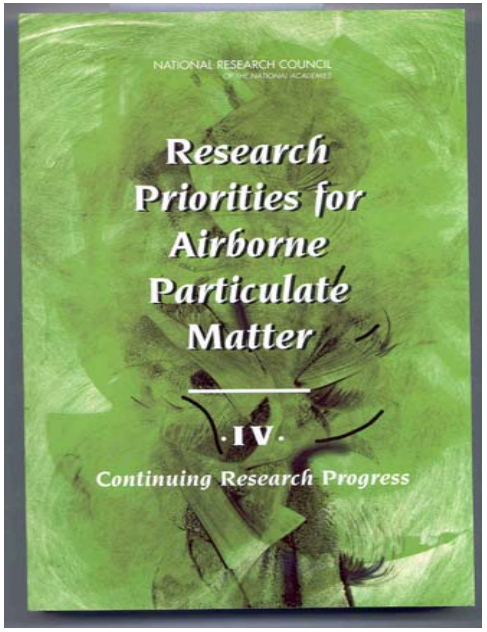
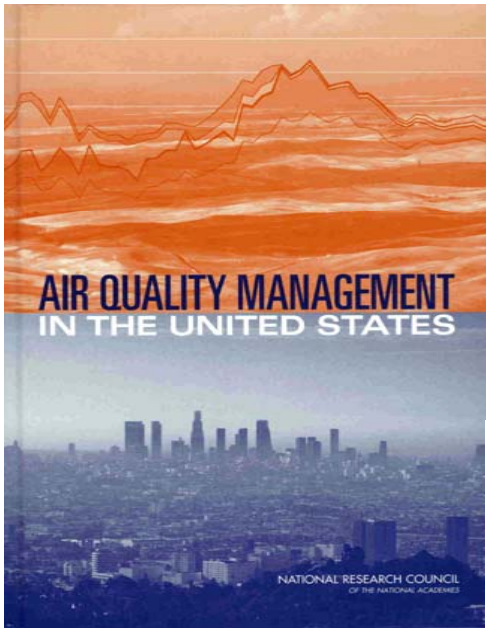
# Influential Guidance




2004




2004

**U. S. National Research Council themes:**

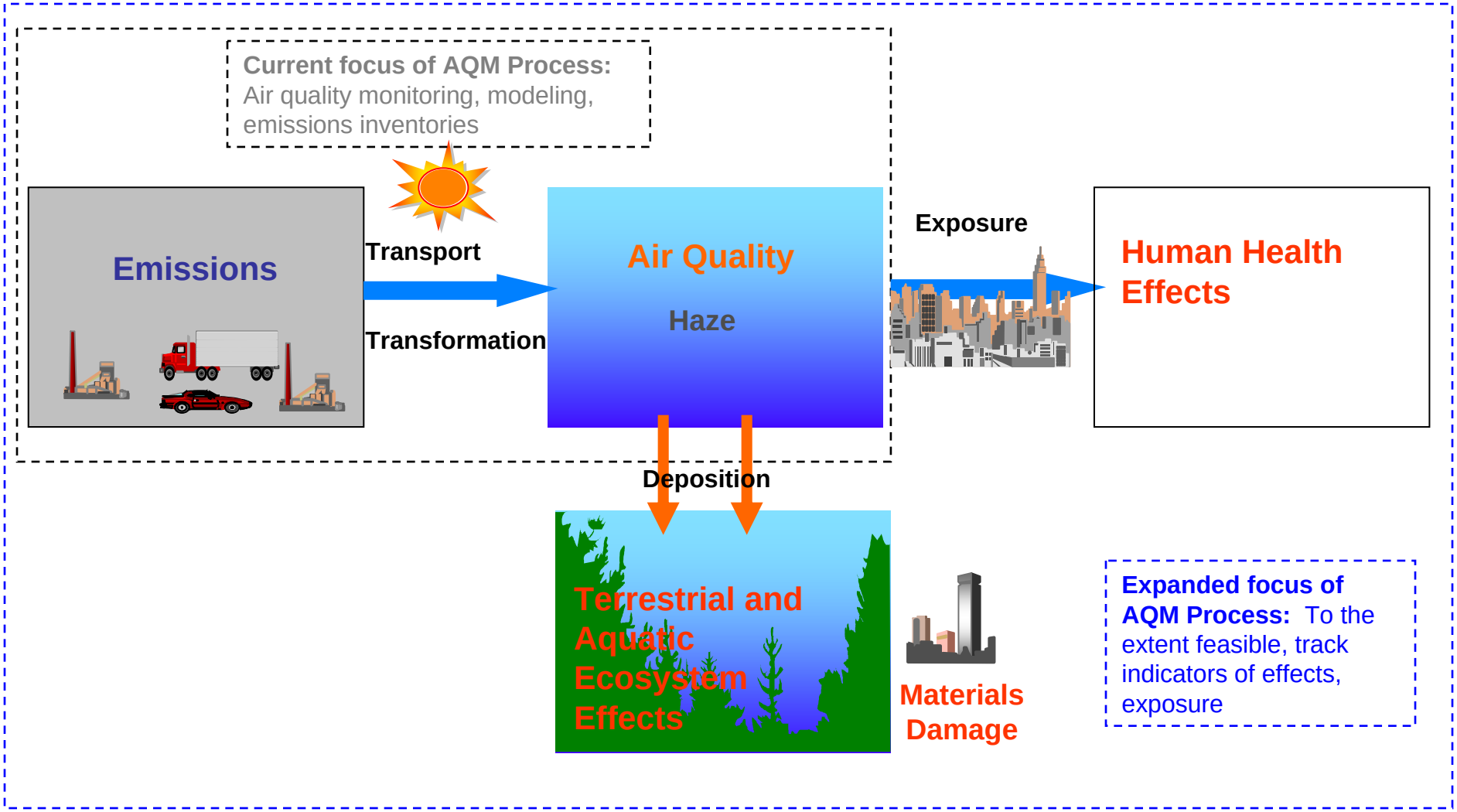
- **Integrated, multi-pollutant programs and research**
- **Accountability**

**But Canada and Mexico have different drivers**

# In Particular

- Recommendation 3: Transform the SIP into a Air Quality Management Plan (and make the necessary changes in the planning and implementation process to do so).
- Recommendation 4: Develop an integrated program for criteria pollutants and hazardous air pollutants and begin transition towards an integrated, multi-pollutant approach that targets the most significant exposures and risks.
- Recommendation 5: Enhance protection of ecosystems and other aspects of public welfare.
- But going beyond these recommendations, NARSTO will also consider the implications of climate change and greenhouse gas emissions to a multi-pollutant approach.

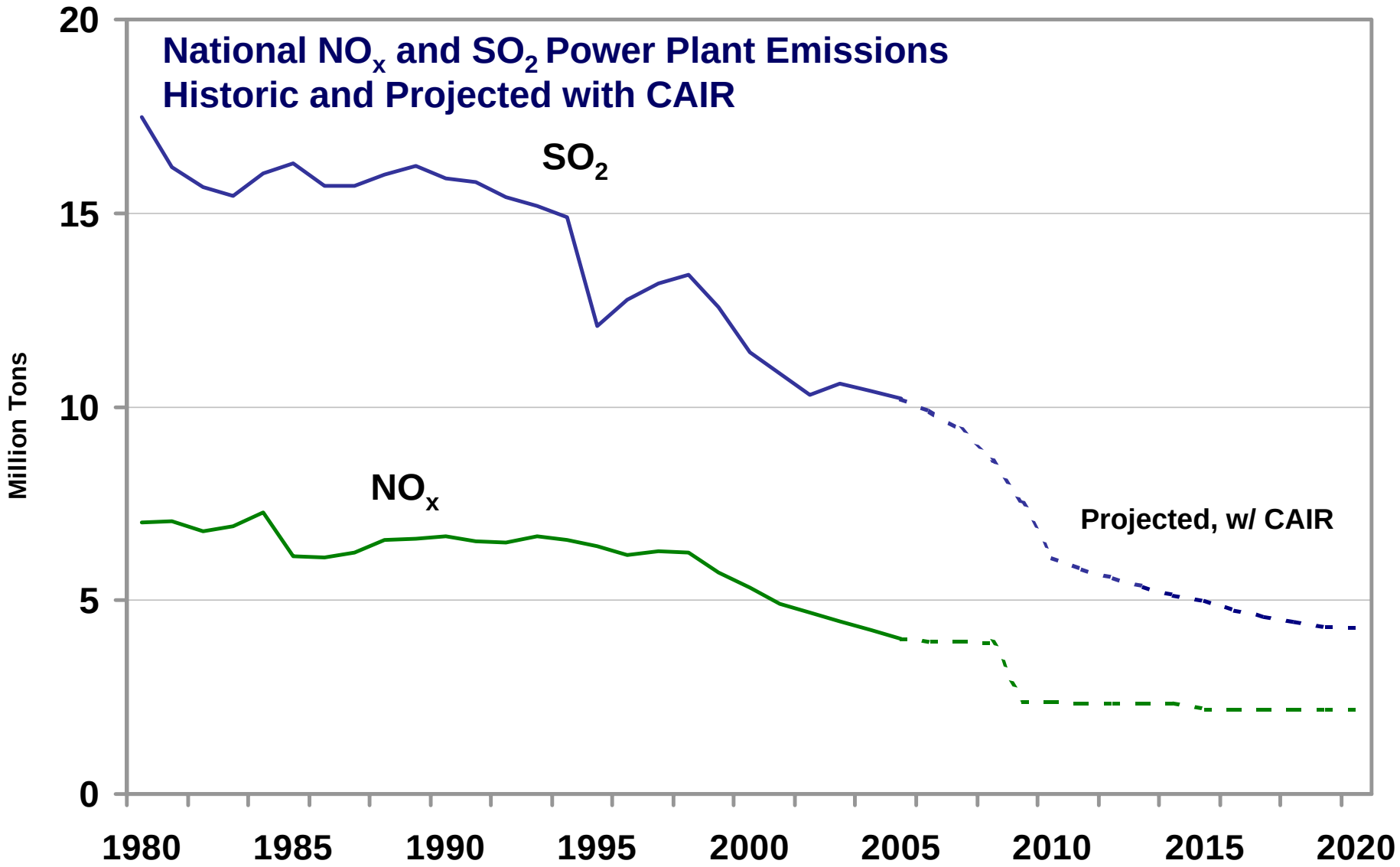
# Air Quality Management
# Expanding Air Accountability



# National/Regional Rules: multi-pollutant sector approaches

- Regional controls for major stationary sources
  - The NOx SIP call
  - The Clean Air Interstate Rule (CAIR) and Clean Air Mercury Rule (CAMR) (SO2, NOx, Hg)
- National rules for mobile sources
  - Tier 2 motor vehicle standards (VOC, NOx, SO2)
  - Heavy duty on-road diesel standards (PM, NOx. SO2)
  - Off road diesel standards (PM, NOx. SO2)
- State and local controls
  - PM and Ozone SIPs under NAAQS implementation

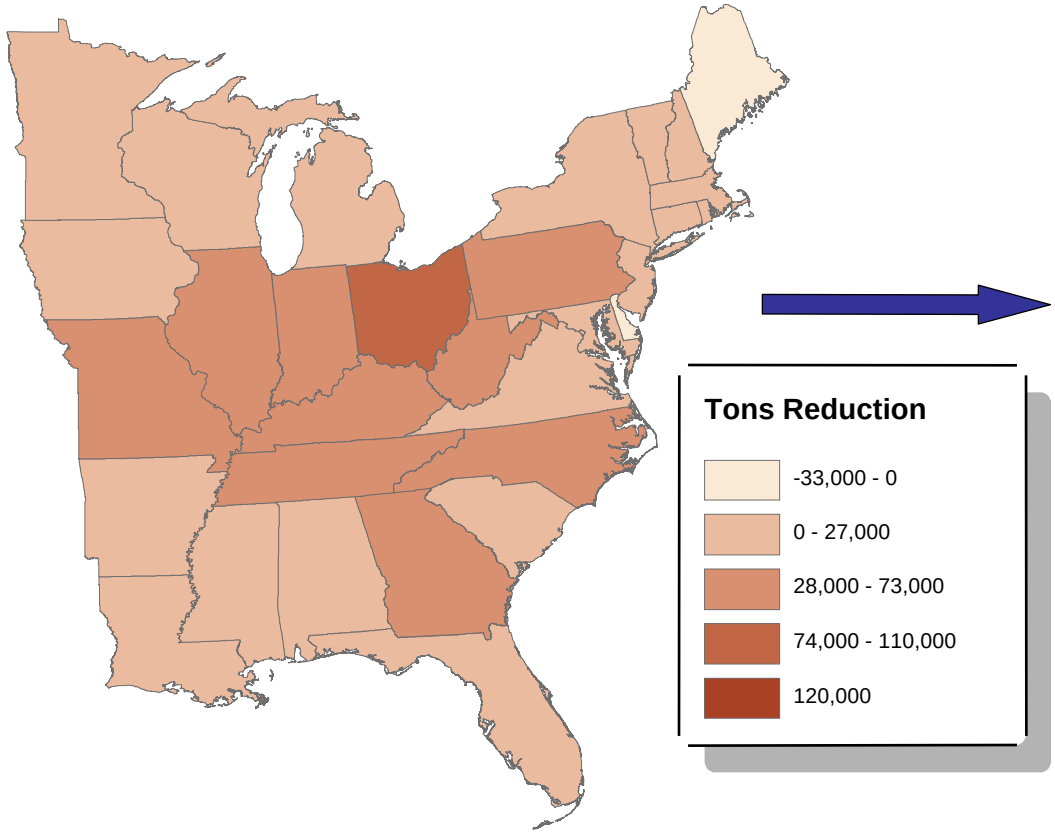
# Big National reductions via CAIR



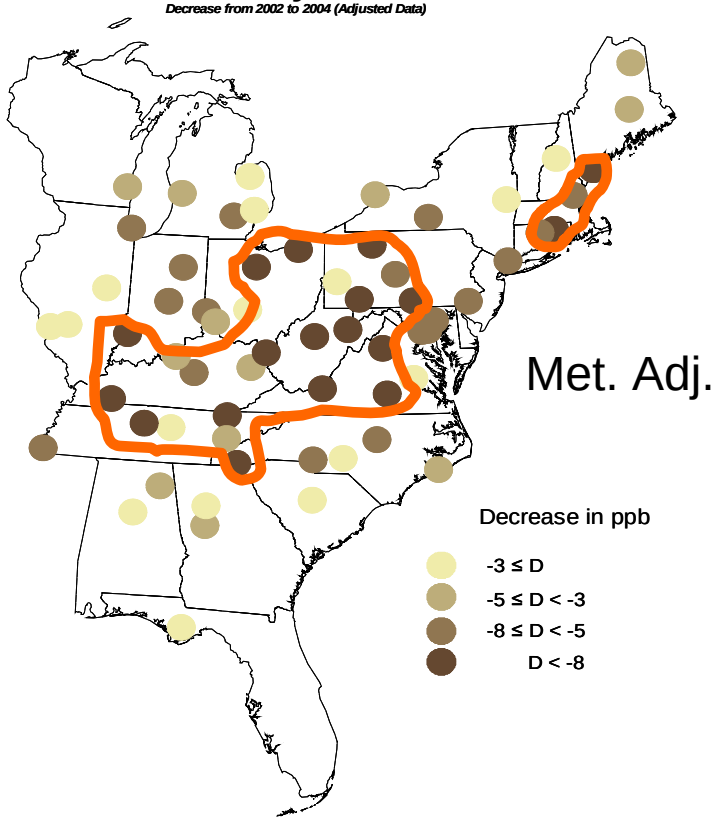

Source: EPA

# Big regional impacts via NOx SIP Call

EGU NOx Tons Reduced




Decline in “Seasonal Average”
8-Hour Daily Maximum Ozone

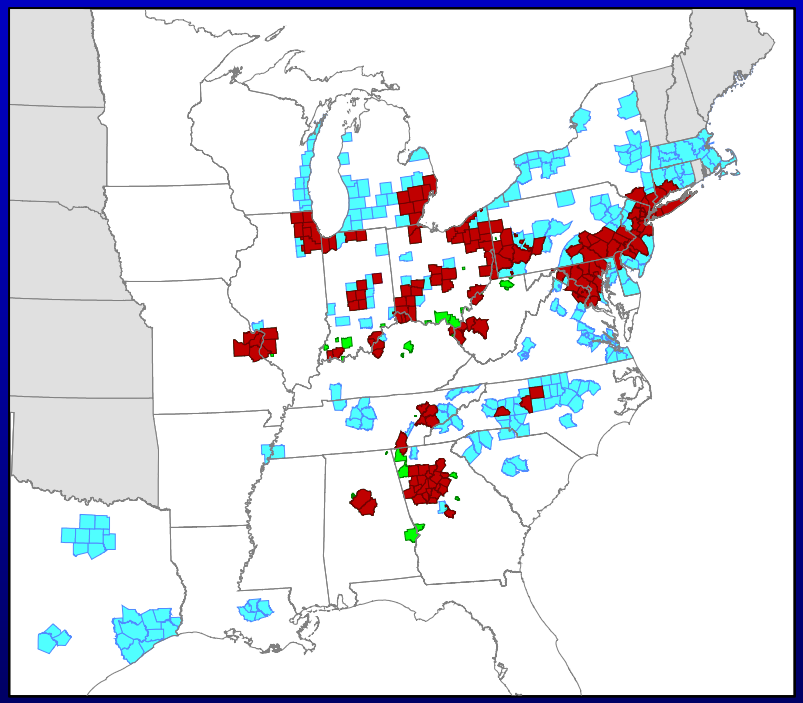



**Ozone decline downwind of major EGU NOx emissions reductions after 2002**

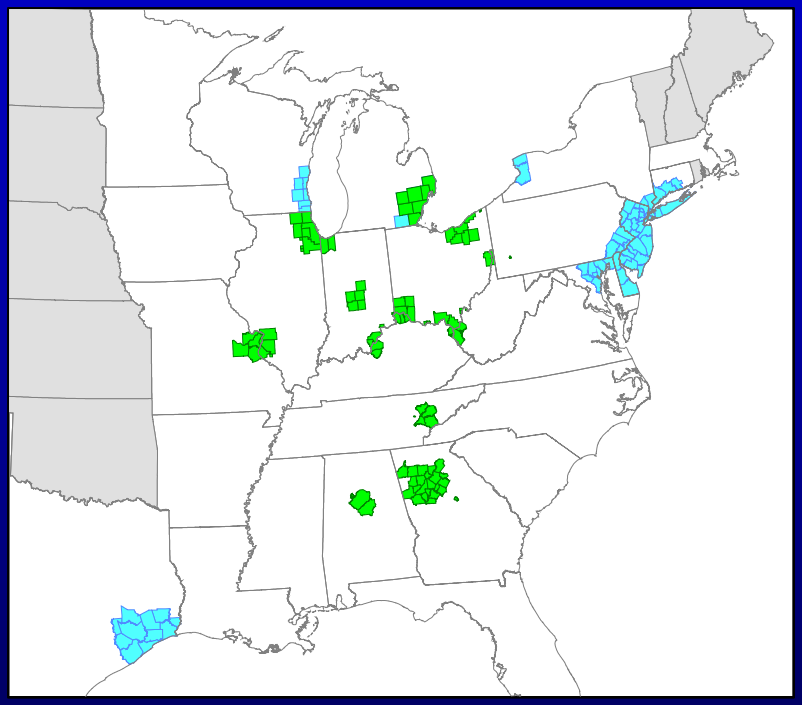
Average rate of decline in ozone between 1997 and 2002 is 1.1%/year.
Average rate of decline in ozone between 2002 and 2004 is 3.1%/year.

# CAIR and other programs greatly reduce transported ozone and Particle Pollution: residual nonattainment in the East -- 2015

**Ozone and Fine Particle Nonattainment Areas (March 2005)**



**Projected Nonattainment Areas in 2015 after Reductions from CAIR and Existing Clean Air Act Programs**



- Nonattainment areas for 8-hour ozone pollution only
- Nonattainment areas for fine particle pollution only
- Nonattainment areas for both 8-hour ozone and fine particle pollution

*These areas are a priority for PM/O3 programs – today*

**Projections concerning future levels of air pollution in specific geographic locations were estimated using the best scientific models available. They are estimations, however, and should be characterized as such in any description. Actual results may vary significantly if any of the factors that influence air quality differ from the assumed values used in the projections shown here.**

The question is how well can we demonstrate the effectiveness of such programs (and on what timeframes) -- especially in terms of actual human and ecosystem outcomes?

# NARSTO Multi-Pollutant Assessment

- The proposal: ***The Technical Challenges of a Multi-Pollutant Approach to Managing Air Quality Under an Accountability Framework: A NARSTO Assessment***

- Response to 2005 Executive Assembly directive
  - Small working group reviewed / considered NARSTO multi-pollutant activity during 2005
  - Proposal submitted to the Executive Steering Committee (ESC) - December, 2005; and Executive Assembly – May 2006
  - Proposal was modified per ESC/EA comments

    "Let's hear from the potential users"


# And What Is Accountability?

Accountability is a formal iterative process for evaluating the effectiveness of air quality management actions in meeting air quality management objectives. These objectives can include reducing the adverse effects of air pollution on human health, reducing the effects of air pollution on ecosystems, improving visibility, reducing air-pollution related damage to materials, etc. The accountability process attempts to verify whether or not air quality actions have contributed to the achievement of air quality management objectives. Verification includes (a) confirming that emission reductions were achieved in accordance with air quality management plans, (b) determining whether or not changes in emissions have resulted the expected changes in pollutant concentrations and human or ecosystem exposure, (c) determining whether or not these changes have resulted in detectable responses in human health and welfare and ecosystem health. The knowledge gained during this verification is used to modify current or improve future air quality management actions.


# Air Quality Manager Needs
## (A NARSTO View)

- In Canada and the U.S.
  - Means to measure progress toward air quality, public health and environmental goals
  - Means to be reassured that the goals are the right ones
  - Means to determine adjustments to existing emissions controls if progress / goals are not sufficient
- In Mexico
  - Information for policy / program development

# NARSTO Contribution in the US AQM Context

- **AQM T1- G1- R1:** **Improve accuracy, robustness, and availability of environmental and health data** to enable more complete characterization of air quality, emissions, and environmental and health outcomes and to facilitate the assessment and characterization of relative risks.
  - Improve **air quality data**
  - Fill gaps in **emission inventories** and **air quality modeling**
  - Improve information on health and ecosystem endpoints
  - Improve coordination/ communication between EPA and **external partners**
  - Improve the collection of control and cost data

- **AQM T1- G1- R2:** **Improve the priority setting process** by creating mechanisms to systematically realign resources and regulatory focus toward areas of greatest health and environmental risk. ***(a relative risk, Multi-pollutant approach)***
  - Develop a comprehensive, **multipollutant air quality plan** and review/update every 5 years
  - Use the updated information to in developing national regulatory priorities
  - EPA and CDC working with S/L/T should produce an **air quality health trends report** every 5 years
  - EPA, Federal Land Managers, others should produce a **report on links of air quality and ecosystem health** every 5 years
  - Improve the link from improved science to improved policy through a **new science to policy mechanism**
  - EPA and States should focus on multipollutant approaches

- **AQM T1- G1- R3:** **Improve accountability** by systematically monitoring progress and evaluating results, working to ensure that data collection is meaningful and that feedback loops exist to ensure that actual environmental results inform the future allocation of resources and the establishment of priorities.
  - Adjust the NAAQS review process to be more timely and efficient
  - EPA in close consultation with the States should develop an **air accountability framework** providing an overarching structure for priority setting
  - EPA should work with CDC and others to improve **indicators**
  - EPA and S/L/T should evaluate the **progress** being made under various programs

- **AQM T1- G2- R2:** EPA, States, local governments, and Tribes should **move from a single pollutant approach to an integrated, multiple pollutant approach** to managing air quality through the creation of an AQMP as a comprehensive air quality management plan updated every 5-10 years
  - Develop a **framework for an AQMP**, identifying legislative changes
  - Transition to an AQMP approach with **tools** and incentives
  - Assess period of NAAQS reviews correlating them with **new/ improved science**
  - Assess option of developing NAAQS in parallel
  - Continue support of multipollutant control strategies with **pilots, guidance, tools and data**
  - Use AQMP Phase I to target emissions reductions
  - Determine approaches for targeted, expeditious, greatest overall benefit emissions reductions

- **AQM T1- G3:** **Coordinate with other programs such as land use, energy, transportation and climate**.


# Charge Statement

Provide a state-of-science evaluation of the technical challenges of implementing risk-based, multi-pollutant air quality management strategies that employ an accountability process to measure their effectiveness and to provide feedback for their improvement. The assessment will provide a critical analysis of the ability of the atmospheric sciences, within the next five years, to provide the information needed to design and assess the performance of the kinds of multi-pollutant air quality management strategies that may be implemented in North America. These strategies will certainly encompass the traditional set of pollutants ($O_3$, CO, $SO_2$, PM, and $NO_x$) and certain hazardous air pollutants, but they may also include greenhouse gases as well. Thus, the assessment should include an evaluation of our ability to understand and account for the coupled effects of climate change and air quality. The intended audience for the assessment is air quality management decision-makers in the three NARSTO countries.

# Charge Statement (Cont.)

**Sub Charge 1**: In time to lay the foundations for a 2010 assessment of improvements in human health and ecological conditions,

- Air quality scientists will work with exposure, health and ecosystem scientists to identify the air quality information needed to associate:
  - Air quality composition and concentration with health and environmental conditions, and
  - Source emissions with health and ecosystem effects.

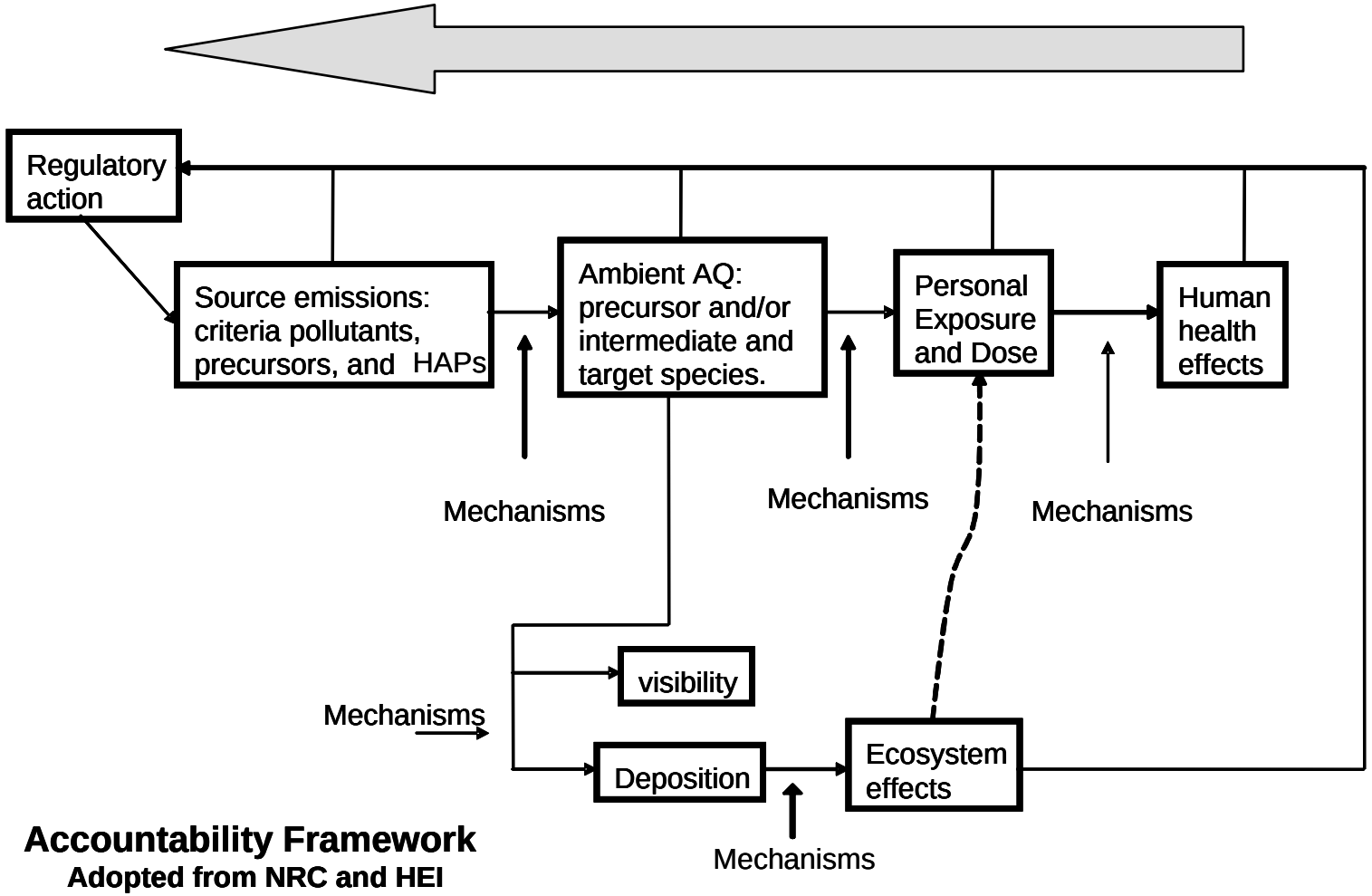
# Charge Statement (Cont.)

**Sub Charge 2**: In time to lay the technical foundation for a 2010 assessment of progress in air quality improvement,

- Identify the technical challenges to and the capabilities of emission inventories, monitoring networks, and modeling systems to provide the information needed to understand effects of air quality on human and ecosystem health, including the technical challenges of:
  - Quantifying air quality changes of criteria, hazardous and precursor pollutants,
  - Determining the source emissions and meteorological factors responsible for observed air quality changes,
  - Determining the importance of hemispheric transport, and
  - Understanding the relationships between climate change and air quality.

# Approach

## Direction of Assessment Inquiry




**Accountability Framework**
**Adopted from NRC and HEI**

# Principal Tasks of the Assessment

1. **Identify health and exposure related air accountability assessment needs**

   Products

   - Prioritized technical monitoring and source apportionment needs from the health and exposure community
   - Atmospheric sciences assessment of the capabilities for meeting these needs
   - Identified course of action to fill the gaps

2. **Identify ecosystem related air accountability assessment needs**

   Products

   - Prioritized technical monitoring and source apportionment needs from the ecosystem science community
   - Atmospheric sciences assessment of the capabilities for meeting these needs
   - Identified course of action to fill the gaps

3. **Identify air quality accountability assessment data requirements, tools, and procedures**

   Products

   - Combined set of accountability needs
   - Assessment of the capabilities for meeting these needs
   - Recommendations for strengthening these capabilities
   - Description of the activities required to perform multi-pollutant assessments of progress in meeting air quality, public health, and environmental goals

4. **Produce assessment synthesis**

# Task 1 **Identify Health and Exposure Related Air Accountability Assessment Needs**

- Workshop(s) involving human exposure scientists, health scientists, and NARSTO air quality scientists.
- What is needed to
  - Associate health and exposure changes with air quality and emission changes
  - Associate hazardous components and mixtures of air pollution and their sources, personal exposures and specific health effects (needed to evaluate standards)
- NARSTO AQ scientists assess the capabilities of monitoring and modeling to address these needs

# Task 1 **Identify Health and Exposure Related Air Accountability Assessment Needs**

- Products
  - Prioritized technical monitoring and source apportionment needs from the health and exposure community
  - Atmospheric sciences assessment of the capabilities for meeting these needs
  - Identified course of action to fill the gaps

# Task 2 **Identify Ecosystem Related Air Accountability Assessment Needs**

- Workshop(s) involving ecosystem scientists and NARSTO air quality scientists.
- What is needed to
  - Associate ecosystem changes with air quality, deposition, and emission changes
  - Investigate the effects/consequences of acid deposition, ozone exposure, and mercury deposition on ecosystems
    (also needed for evaluating standards)
- NARSTO AQ scientists assess the capabilities of monitoring and modeling to address these needs

# Task 2 **Identify Ecosystem Related Air Accountability Assessment Needs**

- Products
  - Prioritized technical monitoring and source apportionment needs from the ecosystem science community
  - Atmospheric sciences assessment of the capabilities for meeting these needs
  - Identified course of action to fill the gaps


# Task 3 **Identify Air Quality Assessment Data Requirements, Tools, and Procedures Needed to Implement Multi-Pollutant Air Quality Management**

- Assess challenges of meeting Sub Charge 2. Principally,
  - Quantifying air quality changes of criteria, hazardous and precursor pollutants
    - Account for the effects of meteorology
    - Account for the potential effects of climate change (or consequences for climate policy)
  - Determining the contributing source emission changes
    - Relationship of emission changes to AQ management actions
    - Contribution of transported pollutants to local changes and the contribution of local emissions to long range transport

# Task 3 **Identify Air Quality Assessment Data Requirements, Tools, and Procedures – Cont'd**

- Conduct an integrated assessment of the technical challenges in meeting all air quality management accountability needs.

- Products
  - Combined set of accountability needs
  - Assessment of the capabilities for meeting these needs
  - Recommendations for strengthening these capabilities
  - Description of the activities required to perform multi-pollutant assessments of progress in meeting air quality, public health, and environmental goals

# Next Steps / Timetable

- ✓ Endorsement by Executive Assembly
  - May 9-10
- ✓ Chairs Selected
  - George Hidy, Riche Scheffe, Ken Demerjian, Keith Puckett
- Mini-Workshop on Scope and Implementation
  - October 4-5 in Washington, D.C.
- Selection of Assessment Team
  - June-November
- Assessment begins
  - Fall, 2006
- Assessment Complete
  - End of Year, 2008


Thoughts ?