“Learning we got it wrong is helpful, but learning why is better”

Some Comments on
Science to Improve Emissions Inventories

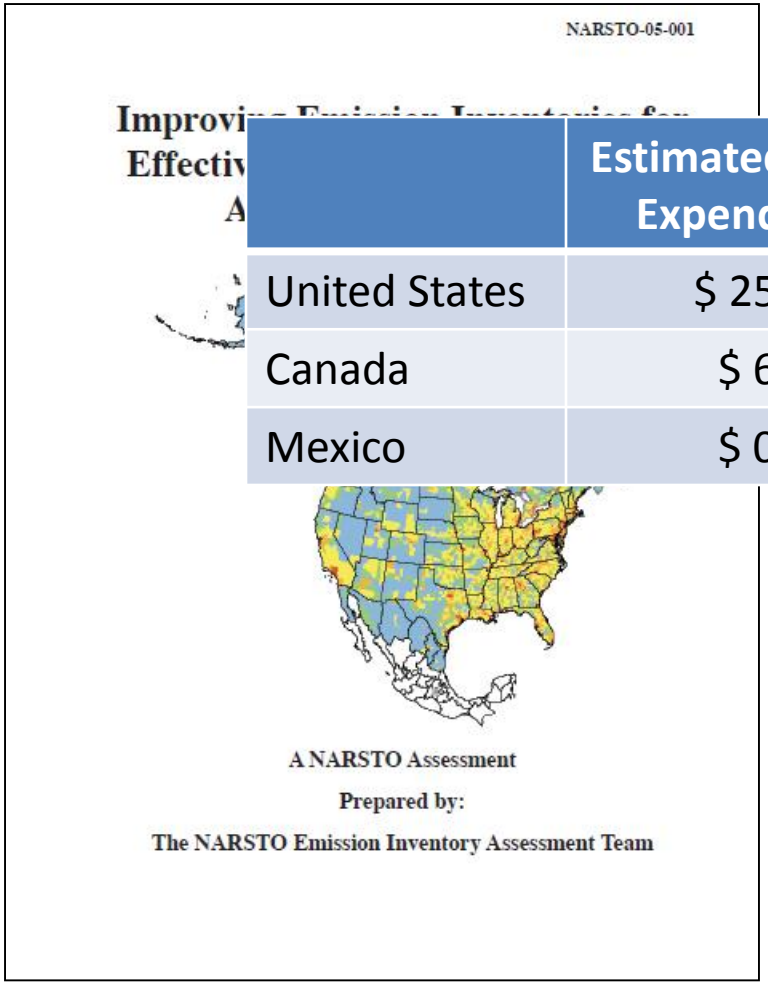
Terry J. Keating, PhD
Office of Air & Radiation
U.S. Environmental Protection Agency

21 March 2014

Emissions Inventory Development at EPA

Criteria Air Pollutants (& Hazardous Air Pollutants)	Long-Lived Greenhouse Gases
OAR/OAQPS (RTP)	OAR/OAP (DC)
States and Other Stakeholders	UNFCCC Process
Spatially Resolved (at least county level)	National Totals
Produced Every 3 years (v1, 2 yr delay)	Produced Annually (2 yr delay)
Air Emissions Reporting Rule, Compliance and Emissions Data Reporting	Greenhouse Gas Reporting Rule

2005 NARSTO Emissions Inventory Assessment



	Estimated Annual Expenditures	Recommended Additional Expenditures
United States	$ 25. M	$ 35. M
Canada	$ 6. M	$ 9. M
Mexico	$ 0.6 M	$ 7. M

Key Findings & Recommendations

1. **Address Priority Emission Inventory Needs**
   - Fine particles and their precursors
   - Paved and unpaved road dust
2. **Improve Emission Inventory Speciation Estimates**
3. **Improve Existing and Develop New Emission Inventory Tools**
4. **Quantify and Report Uncertainty**
5. **Increase Emission Inventory Compatibility and Comparability**
6. **Improve User Accessibility**
7. **Improve Timeliness**
8. **Assess and Improve Emission Projections**

What is needed to improve inventories?

Ambient Concentration
= f(Emissions, Dispersion, Transport, Chemistry, Deposition)

Emissions
= Activity Level x Emissions Factor x Control Factor

- Need to understand and articulate uncertainties and limitations of “top-down” and “bottom-up” estimates.
- Need to close the loop back to activity level and emissions factors, which goes beyond typical measurement activities/interests.
- More Observations: Source Emissions, Ambient Observations, Activity Levels
- More Evaluation: Past Trends, Future Projections

Who will make the investment?

- ***Anthropogenic vs. Natural Sources***
  - What is perceived as a "science" activity and what is perceived as a "regulatory" activity?
- ***Public Sector vs. Private Sector Funding***
  - How do we harness private sector interests?
- ***Within the United States vs. Globally***

Role of Coordination Activities

- ***Avoiding Duplication and Achieving Better Coverage***
  - Avoiding "Kindergarten Soccer"
  - Methane example: Current focus is on oil & gas, but we also need more information about agricultural reservoirs, hydroelectric reservoirs, open pit coal mining, forest fires, …
  - There is a draft interagency methane strategy that is part of the President's climate action plan.
- ***Understanding Customer Needs***
  - E.g., NOAA's operational air quality forecasting program: "Can EPA provide updates for modeling purposes more often than NEI base years?"
- ***Understanding Supplier Capabilities***
  - Identifying windows of opportunity in production cycles to make improvements.
  - Identifying highest priority sources/issues for improvement.

Venues for Coordination

- **GEIA:** ***The International Community***
- **The Federal Interagency Community:** ***A Work Group under USGCRP and AQRS?***
  - Define appropriate roles for agencies
  - Help leverage limited funding
  - Help justify investments by articulating contribution to science and value to applications.

Role of Information Technology

- **Facilitating Data Access, Data Analysis, and Expert Communication**
- **Challenge of Completeness and Transparency**
- **Central Clearinghouses/Archives vs. Distributed, Interoperable Networks of Systems**
- **Need for Standards/Conventions, Open Source Approaches**

GEO Atmospheric Composition/Air Quality Community of Practice

Convenors: Martin Schultz (Germany), Terry Keating (US),
Rudy Husar (emeritus)

Mission:

- enabling communication across the air quality and atmospheric research communities globally
- contributing to the definition of metadata and data exchange standards
- aiding the implementation of interoperable data exchange systems in the context of GEOSS

http://wiki.esipfed.org/index.php/GEO_AQ_CoP

GROUP ON EARTH OBSERVATIONS | Air Quality Community of Practice

Cyberinfrastructure for Air Quality Management

(CyAir) Best Practices Guidelines

- Introduction to Interoperability
- Data Format Standards
- Naming Conventions
- Web Services
- Metadata
- Data Publication and Discovery

http://wiki.esipfed.org/index.php/CyAirProject

North American Online Informational, Interactive Platform on Climate Change

Working towards a Tri-National Emissions Inventory for GHGs, Black Carbon, and related Co-Pollutants

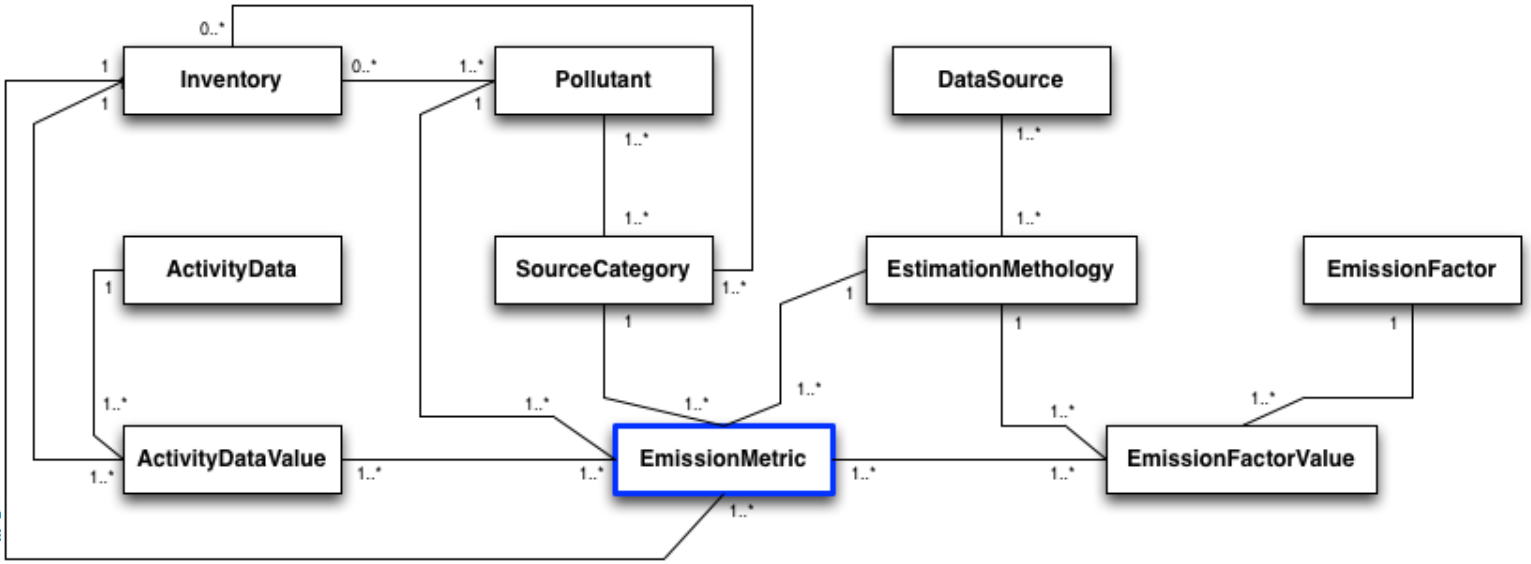
GHG	BC	CAC
CAN NIR CAN Emission Trends	Arctic Council Assessment	CAN NPRI
US NIR US SIT	Report to Congress on Black Carbon	US NEI
MEX Nat'l Communication		MEX INE

OPEN ORGANIZE

North American Online Informational, Interactive Platform on Climate Change

Three Core Deliverables:

- Data Dictionary (framework for comparison)
- Web Services (framework for distribution, application ecosystem)
- Web Application (to be demonstrated at GEIA 2014)



North American Black Carbon Emissions Estimation Guidelines

Task 1 Literature Review (Nov 2013 – Apr 2014)

Thorough review and comparison of data and methodologies

Task 2: Expert Consultation (Apr 2014 – Aug 2014)

Establishment of consensus methodologies to harmonize and improve North American black carbon emissions inventories

Task 3: Guidance Document (Sep 2014 – Apr 2015)

Incorporation of these into a user-friendly guidance document

ERG

Where will the next global inventory of air pollution emissions come from?

- **EPA needs global inventories**
  - To provide boundary conditions for U.S. domain
  - To inform international engagement and evaluate overseas mitigation opportunities
- **EDGAR is the only "production" global inventory for criteria pollutants.**
  - It is not tied to nationally-reported emissions information.
- **HTAP "Mosaic" Approach: Replace parts of global inventory with "best" or "official" regional data.**
  - Can we do this in a "production" mode?