Industry and Authorities Responsibilities: National Atmospheric Emission Inventory System NAEIS

Patience Gwaze
NACA Western Cape Seminar, Lord Charles Hotel, Cape Town
05 November 2014
Acknowledgements

• SAAQIS Team from DEA and South Africa Weather Service (SAWS)
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  – Tsietsi Mahema, Mark Zunckel, Benton Pillay, Tony Jeng, Peter Huang, Sony Su, Sindisiwe Mashele, Lunga Ngcukana, Seneca Naidoo, Gregor Feig, Thabo Setshedhi, Lungile Manzini, Karel de Waal, Jongikhaya Witi, Themba Dube
Outline of Presentation

• Background – Emissions in South Africa
• NAEIS Project Objectives
• Legislative Framework
• Roles and Responsibilities in NAEIS
• NAEIS Principles & Reporting Cycle
• Way Forward
South African Proxy Trends

- Population
- Energy Consumption
- Gross Domestic Product
- Vehicle/Vehicles Distance Travelled
South African Proxy Trends: Population

Population

51.8 million (Oct 2011)

60M
40M
20M
0M


Female Males
South Africa Primary Energy Consumption

Primary energy supply (TJ)

- Renewable energy
- Hydro
- Nuclear
- Natural gas
- Crude oil
- Coal

DEA, GHG Inventory, 2013
South African Proxy Trends: GDP

350.6 billion USD (2013)
South Africa, Gross domestic product

Sources include: World Bank
South African Live Vehicle Trends, eNatis

![Graph showing the trend of live vehicle population in South Africa from 1997 to 2012. The population has increased significantly over the years.](image-url)
GHG Trends, excl. Land Sub-sector

DEA, GHG Inventory, 2013
Criteria Pollutants Trends
Anthropogenic Sectoral Contributions

**CO**
- Energy prod. & dist: 49.05%
- Industry: 42.63%
- Transport: 2.81%
- Residential: 0.26%
- Solvents: 0.97%
- Agriculture: 4.28%
- Agr. waste burning: 0%
- Waste: 0%

**NOx**
- Energy prod. & dist: 8.92%
- Industry: 53.47%
- Transport: 30.17%
- Residential: 6.16%
- Solvents: 0.64%
- Agriculture: 0.07%
- Agr. waste burning: 0.57%

**SO₂**
- Energy prod. & dist: 79.85%
- Industry: 0%
- Transport: 12.52%
- Residential: 2.5%
- Solvents: 5.04%
- Agriculture: 0.08%
- Agr. waste burning: 0.01%

**NMVOCs**
- Energy prod. & dist: 33.1%
- Industry: 46.94%
- Transport: 9.8%
- Residential: 9.8%
- Solvents: 3.58%
- Agriculture: 2.42%
- Agr. waste burning: 1.15%
- Waste: 3%

**NH₃**
- Energy prod. & dist: 97%
- Industry: 0.5%
- Transport: 0.5%
- Residential: 0.5%
- Solvents: 0.5%
- Agriculture: 1.5%
- Agr. waste burning: 0.01%
EI Status for Emission Inventories

• National department initiative for GHG compilation towards UNFCCC reporting

• No official national emission inventories for criteria pollutants

• Inventories for provinces, metros, municipalities for AQ management

• National Air Quality Priority areas
  – Vaal Triangle, Highveld and Waterberg

• Inventories developed through research activities, e.g., SAFARI 2000, CSIR etc

• Regulated industrial sectors reporting to local authorities
Challenges with current inventories

• Constrained information gathering
  – Data availability, manual data capture, industrial disclosure and confidentiality
  – Transparency, accuracy, consistency, comparability & completeness
  – Reliability

• Technical difficulties
  – System operation, technical capacity, lack of standard methodologies
NAEIS Objective

By project completion, the SAAQIS, informed by local requirements and needs and international experience, contains a carefully designed, developed, tested and implemented web-based atmospheric emissions monitoring and reporting system that provides accurate, current and complete information on all significant sources of identified atmospheric emissions, including greenhouse gas emissions.
National System Requirements

• Simple, user friendly web-based operation
• Combination of environmental and governance platforms
• Flexibility in performing emission calculations
• Secure data system with dedicated access rights
• Expandable modular design with flexibility
• System built QA/QC processes
Emissions Inventory - definition

• Means an accounting of the amount of pollutants discharged into the atmosphere and it contains the total emissions for one or more specific greenhouse gases and air pollutants originating from all sources in a certain geographical area and within a specified time span.
## NAEIS and Proposed AEL System

<table>
<thead>
<tr>
<th>Activity</th>
<th>NAEIS</th>
<th>Proposed AEL System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>Online system</td>
<td>Online system</td>
</tr>
<tr>
<td>Users</td>
<td>Authorities and listed activities</td>
<td>Authorities and listed activities</td>
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<td>Purpose</td>
<td>Emission inventory estimation and reporting portal</td>
<td>AEL application, processing and management portal</td>
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<tr>
<td>Sectors</td>
<td>All sectors including listed activities</td>
<td>Listed activities</td>
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<tr>
<td>Output</td>
<td>Emission inventory profile from local to national level</td>
<td>All AEL application and processing activities</td>
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<tr>
<td>Regulatory framework</td>
<td>Emissions reporting regulations, Section 21 reporting requirements</td>
<td>Chapter 5 of AQA and Section 21</td>
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</table>
NAEIS Legislative Framework
Section 12 AQA (b-c), 43(l)

- Minister must prescribe the manner in which:
  
  (b) measurements of emissions from point, non-point or mobile sources must be carried out; and
  
  (c) the form in which such measurements must be reported and the organs of state to whom such measurements must be reported.

Section 43(l) – AEL holders reporting of GHGs
Section 21 Paragraph 19

• “Within three (3) years of the date of publication of this Notice, the National Air Quality Officer will establish an internet based National Atmospheric Emission Inventory System as a component of the South African Air Quality Information System (SAAQIS). Once established, reports contemplated in 8(1) must be made in a format required for the National Atmospheric Emission Inventory.”
# National Framework: NAEIS

## Table 10: Emissions Inventory Modules development targets

<table>
<thead>
<tr>
<th>Key Milestone, Product or Output</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission inventory compilation tool</td>
<td></td>
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<tr>
<td>Top-down and bottom-up Greenhouse Gas Inventory compilation tool</td>
<td></td>
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<tr>
<td>Emission data reporting facilitation tool</td>
<td></td>
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<td>Emission data report/view generating tool</td>
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<td>Emission data import facility component</td>
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<td>Emission data assessment tool</td>
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<tr>
<td>Emission data export tool</td>
<td>2014/15</td>
</tr>
<tr>
<td>Emission inventory guidelines, manuals, and reporting regulations</td>
<td>2015/16</td>
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</tbody>
</table>

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[Logo: Environmental Affairs, Department: Environmental Affairs, Republic of South Africa]
NAEIS Principles
NAEIS Overview

**Pollutants of Concern**
- National Ambient Air Quality Standards, those listed in the requirements of the minimum emission standards for listed activities
- GHG

**Potential Uses of the Emission Data:**
1. Evaluate the effectiveness of current air pollution control programs for human health protection,
2. Offer references to assist in future air permit review,
3. Provide technical data to developing future air quality management policies.
4. Provide helpful information to general public to better understand our air environment
EI Fundamental Principles

• **Accuracy**
  – Routine and consistent checks to ensure data integrity, correctness, and completeness;
  – Identify and address errors and omissions;
  – Document and archive inventory material and record all QC activities.
  – NAEIS Completeness Check, Authority auditing
  – National review of sectors, third parties

• **Completeness**
  – NAEIS Implementation Plan – prioritisation of relevant sectors outside the regulated industry
  – Time series – annual reporting and archiving in NAEIS
EI Fundamental Principles

• **Transparency**
  – Attachment of documents, system archiving of reviews and comments

• **Consistency**
  – Single reporting platform nationally
  – Use of methodologies, EFs,
  – Guidelines, IPCC

• **Comparability**
  – Across jurisdictions etc
EI Fundamental Principles – Data Confidentiality

• DEA developing the NAEIS Data Policy
  – Explaining the intended use of the data
  – Agreeing to the level at which data will be made public
  – Identifying the increased accuracy that can be gained through its use in inventories
  – Offering cooperation to derive a mutually acceptable data sets
  – And/or giving credit/acknowledgement in the inventory to the data provided.
NAEIS Functionality and Architecture
Data Input

Regulated Industries

- Residential
- Transport
- Waste
- AFOLU
- LULUCF
- Natural
<table>
<thead>
<tr>
<th>Emission Sector</th>
<th>Sub-sector</th>
<th>IPCC Sector</th>
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<tbody>
<tr>
<td></td>
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<td>Energy</td>
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<td>Industry</td>
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<td></td>
<td>Controlled emitters</td>
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<td></td>
<td>Mines and quarries</td>
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<tr>
<td>Transport</td>
<td>Road</td>
<td></td>
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<tr>
<td></td>
<td>Rail</td>
<td>X</td>
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<td>Aviation</td>
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<td>Marine</td>
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<td></td>
<td>Pipelines</td>
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<td>Agricultural and fishing</td>
<td>Fishing</td>
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<tr>
<td></td>
<td>Agricultural practices</td>
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<td>Residential</td>
<td>Fuel burning</td>
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<td>Waste</td>
<td>Waste water treatment works</td>
<td>X</td>
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<td></td>
<td>Landfills</td>
<td></td>
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<tr>
<td>Land use and forestry</td>
<td>Land use change and management</td>
<td></td>
</tr>
<tr>
<td>Natural sources</td>
<td>Biogenic</td>
<td></td>
</tr>
</tbody>
</table>
NAEIS Governance Structure

Relevant Authority

National

Provincial

Municipality/Metro

Facility/data provider

Responsibilities

Create facility, register facility user, prepare, report, confirm, audit and review national emission inventory.

Create facility, register facility user, prepare, report, confirm, audit and review provincial emission inventory. Manage facility reporting.

Create facility, register facility user, prepare, report, confirm, audit and review municipality emission inventory. Manage facility reporting.

Prepare, report and confirm emission inventory
<table>
<thead>
<tr>
<th>Actors</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Accounting Officer (AO)</td>
<td><strong>Responsible for preparing, certifying and signing the final EI Year report</strong></td>
</tr>
<tr>
<td></td>
<td>- Create/Associate Facility Users</td>
</tr>
<tr>
<td></td>
<td>- Confirm e-mail for source</td>
</tr>
<tr>
<td></td>
<td>- Enter or Revise Emission Data for relevant source</td>
</tr>
<tr>
<td></td>
<td>- Check and edit Emission Data completeness for relevant source</td>
</tr>
<tr>
<td></td>
<td>- Certify and Submit/Re-Submit Emission Data for relevant source</td>
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<tr>
<td>Facility Emission Control Officer (ECO)</td>
<td><strong>Responsible for preparing and organizing/ facilitating the reporting process</strong></td>
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<td></td>
<td>- Create/Associate Facility Users</td>
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<td></td>
<td>- Confirm e-mail for source</td>
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<td></td>
<td>- Enter or Revise Emission Data for relevant source</td>
</tr>
<tr>
<td></td>
<td>- Check and edit Emission Data completeness for relevant source</td>
</tr>
<tr>
<td>Facility Preparer/ Consultant</td>
<td><strong>Responsible for preparing certain parts of the EI Year Report</strong></td>
</tr>
<tr>
<td></td>
<td>- Enter or Revise Emission Data for relevant source</td>
</tr>
<tr>
<td></td>
<td>- Check and edit Emission Data completeness for relevant source</td>
</tr>
<tr>
<td>Facility Reviewer</td>
<td><strong>Proof-reading certain parts of the EI Year Report, but cannot make any data changes</strong></td>
</tr>
<tr>
<td></td>
<td>- View Emission Data for relevant sources</td>
</tr>
<tr>
<td></td>
<td>- Check Emission Data completeness for relevant sources</td>
</tr>
</tbody>
</table>
1. Register sources

2. Reminds for data providers to report

3. Prepare, certify and submits EI

4. Submissions and non-compliance reports issued

5. EI Review & Auditing (Authority)

6. Authority reported local EI

7. Prepare draft national EI

8. QA/QC draft national EI

9. Address errors in the draft EI

10. Finalise national EI and prepare archives

11. Submit to relevant authorities

1st January to 31st March

1st April to 30 August

1st September to 31st December

Email notification & confirmation by data provider

Email notification of reporting to facility and AQO

Email notification of non-compliance to facility and AQO

Email notification on emissions report audit - status, queries, confirmation

Email notification to registered data provider

Email notification to registered data provider

Email notification of non-compliance to facility and AQO

Email notification to registered data provider
Regulated Industries

- Residential
- Transport
- Waste
- AFOLU
- LULUCF
- Natural

Data Input

NAEIS Processing

Emission Factors

NAEIS

Other proxy data
NAEIS Landing Page: Authorities
Data Needed Before Preparing a Report

- Atmospheric Emission Licence
- Location and Extent of Plant
- Nature of Process / Activity
  - Process description
  - Listed Activity(ies), Unit Process(es), Hours of Operations,
  - Graphical Process Information
  - Process / Activity Diagram
- Raw Materials And Products
  - Raw Materials Used
  - Production Rates
  - Materials Used in Energy Sources
  - Sources of Atmospheric Emission
  - VOC / Sulfur Content
- Appliance and Measure to Prevent Air Pollution
Data Entry Form for Industrial Source

- **Source** – Reporting Entity basic information (name, location, etc.)
- **Contact** – Reporting Entity contact person (primary and secondary).
- **Stack** – Stacks connected to Emission Units
- **Emission Unit** – Units that emit pollutants
- **Reporting Group** – if applicable, it is used to combine “similar” emission units into one reporting group to simplify reporting.
- **Activity & Emission** – Describes operating schedules, material used, and resulting emissions for each emission unit (or reporting group). Each emission unit or reporting group must include at least one Activity (multiple activities are supported).
- **Submit** – certify and submit
- **Completeness Check** – to help the reporting entity to verify data quality to ensure meeting minimum submission criteria. If fields are incomplete or incorrect, the System will generate warning or error messages.
- **NAEIS Report Site Map** – Contains the EI report in “Window Explorer” like tree structure
NAEIS Data Relationship & Structure

**Data Relationship:**
- Facility
- Emission Unit and/or Reporting Group
- Stack
- Process (Activity)
- Emissions

**Data Structure:**
- Reporting Year
  - Report Entity
    - EI Report
Emission Basis and Calculation

- NAEIS Emission Factor (default)
- IPCC EF (default for GHG)
- CEM
- Landfill Model
- Mass Balance
- PEM
- Stack Test
- Tank Model
- Facility Emission Factor
- Other

\[ E = FC \times EF \times e^A \times (1 - CE) \]

Where \( E \) = Emission, \( FC \) = Fuel Consumed, \( EF \) = Emission Factor, \( A \) = Exponent Amount, and \( CE \) = Control Efficiency
Data Input

Regulated Industries
- Residential
- Transport
- Waste
- AFOLU
- LULUCF
- Natural

NAEIS Processing

Emission Factors

Other proxy data

Data Analysis & Reporting

UNFCCC

GIS Analysis

Specific Reports
- Facility
- Sector
- Spatial

National Requirements
NAEIS Data Mining Tool

• Interactive tool that will change and display data dynamically
• Adds emission total and breaks down individual emission sources
• Search emission data by
  • Pollutants, Year, Location, Energy Sector
• View Emissions, GHG-e, Global Warming Potential
# NAEIS Data Mining Tool

<table>
<thead>
<tr>
<th>Substance Code - NOX (Unit kg)</th>
<th>Industrial</th>
<th>Agriculture and Fishing</th>
<th>Aviation</th>
<th>Land Use and Forestry</th>
<th>Natural Sources</th>
<th>Pipelines</th>
<th>Ports</th>
<th>Railways</th>
<th>Residential</th>
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<tbody>
<tr>
<td><strong>Total (By Category)</strong></td>
<td>173,539,895</td>
<td>86,709,948</td>
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<td>Gauteng</td>
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<td>Ehlanseni District Municipality</td>
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<td>The Free State</td>
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</tbody>
</table>

[Logo: Environmental Affairs, Department: Environmental Affairs, Republic of South Africa]
NAEIS GIS Features

- Search by Single Pollutants (CH4, CO, CO2, N2O, NOx, PM10, SO2)
- Display Results by Single Source emission or District/Metro Summary Emission
- Display Emission, GWP, and CO2_Eqv Summary by Single Source or District/Metro Aggregate
NAEIS Data Query

- Allow users to create, edit, and run SQL statements directly from the user interface
- Quick way to display data without developing reports
- Run queries (search for data) based on different parameters (i.e., Search criteria)
- Export Query results to Excel
NAEIS Implementation
Overview

Welcome to the South African National Atmospheric Emission Inventory System (NAEIS). The NAEIS is an online national reporting platform that will hold both air pollutants and greenhouse emission inventories of the republic. The system offers new innovative ways to report emissions as is required by the National Environmental Management Air Quality Act of 2004. The NAEIS overarching objective is to provide all stakeholders with relevant, up-to-date and accurate information on South Africa’s emissions profile for informed decision making.

NAEIS Resources

The links below contain resources for you to discover, learn and use the NAEIS.

- NAEIS Authority User Manual
- NAEIS Training Video (Online tutorial)
- NAEIS Training Video (Download tutorial)
- NAEIS Source Classification Codes
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories

If you have any questions, please contact your local licensing authority or the Department of Environmental Affairs (DEA) on NAEISadmin@environment.gov.za; 012 310 3912/3792.
# NAEIS Industry Training

<table>
<thead>
<tr>
<th>Industry</th>
<th>Date</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferro Alloys Producers Association</td>
<td>16 May 2014</td>
<td>12</td>
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<tr>
<td>BUSA Representatives</td>
<td>9 June 2014</td>
<td>8</td>
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<td>South African Petroleum Industry Association</td>
<td>21 July 2014</td>
<td>18</td>
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<td>NMBM Industry</td>
<td>10 July 2014</td>
<td>45</td>
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<td>Engen Petroleum</td>
<td>08 August</td>
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<td>Cement Production Industry</td>
<td>14 August</td>
<td>16</td>
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<td>Sasol</td>
<td>20 August</td>
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<td>NW Industry, NAPCoF</td>
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<td>NMBM</td>
<td>10 November 2014</td>
<td>TBC</td>
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<td>Mine and Quarries</td>
<td>29 October 2014, DEA</td>
<td>22</td>
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<td>Pulp and Paper</td>
<td>27 November 2014</td>
<td>TBC</td>
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<td>Clay Bricks</td>
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<td>Gauteng Industries</td>
<td>2 December 2014</td>
<td>Edenvale, Johannesburg</td>
</tr>
<tr>
<td>Northern Cape Industries</td>
<td>04 December 2014</td>
<td>Upington</td>
</tr>
</tbody>
</table>
NAEIS Way Forward

• NAEIS Capacity Development
  – All provinces trained
• NAEIS Reporting Regulations
  – Finalised before end of 2014
• NAEIS Enhancements based on feedback
• NAEIS proposed to GO-LIVE on 1 January 2015
  – Master List **880 Section 21 facilities**
  – First eNotification by DEA
Thank you
pgwaze@environment.gov.za
012-399-9192
NAEIS Reporting Module - Input

- On-line reporting templates and forms for inputs of data down to processing unit
- Interactive process between regulated facilities and authorities in the line with the governance structure - jurisdictions
- Interactive GIS for mapping of facility, point and area sources
- Supporting document uploading functionality down to processing unit level - transparency and accountability of reported records
- 1st QA/QC level to check for historical consistencies, completeness of records and formats, calculation errors, etc, process before submission into NAEIS
- Both the top-down and bottom-up information requirements for emission reporting
NAEIS Processing Module

• Accommodate top-down and bottom-up information requirements for emission reporting
• Time series EF (& documentation) with NAEIS default, country specific or facility – specific EFs
• Time series AD (& documentation), emission calculations – allow for recalculation of EI whenever databases are updated
• Estimates for GHG GWPs as per IPCC 2006 Guidelines
NAEIS Data Reporting Module - Outputs

• Reports of all data entries and emission calculations – multiple export formats
• Multi-dimensional data reports (time, facility, jurisdiction, sector, pollutant type) – relevant authority – data mining tool
• Online public reports of emissions per sector
• For quick overview, NAEIS contains an interactive GIS mapping of emission locations, with multi-dimensional classification
• **Authorities tools for AQ management**