Greenhouse Gas Data for Climate Change Policies

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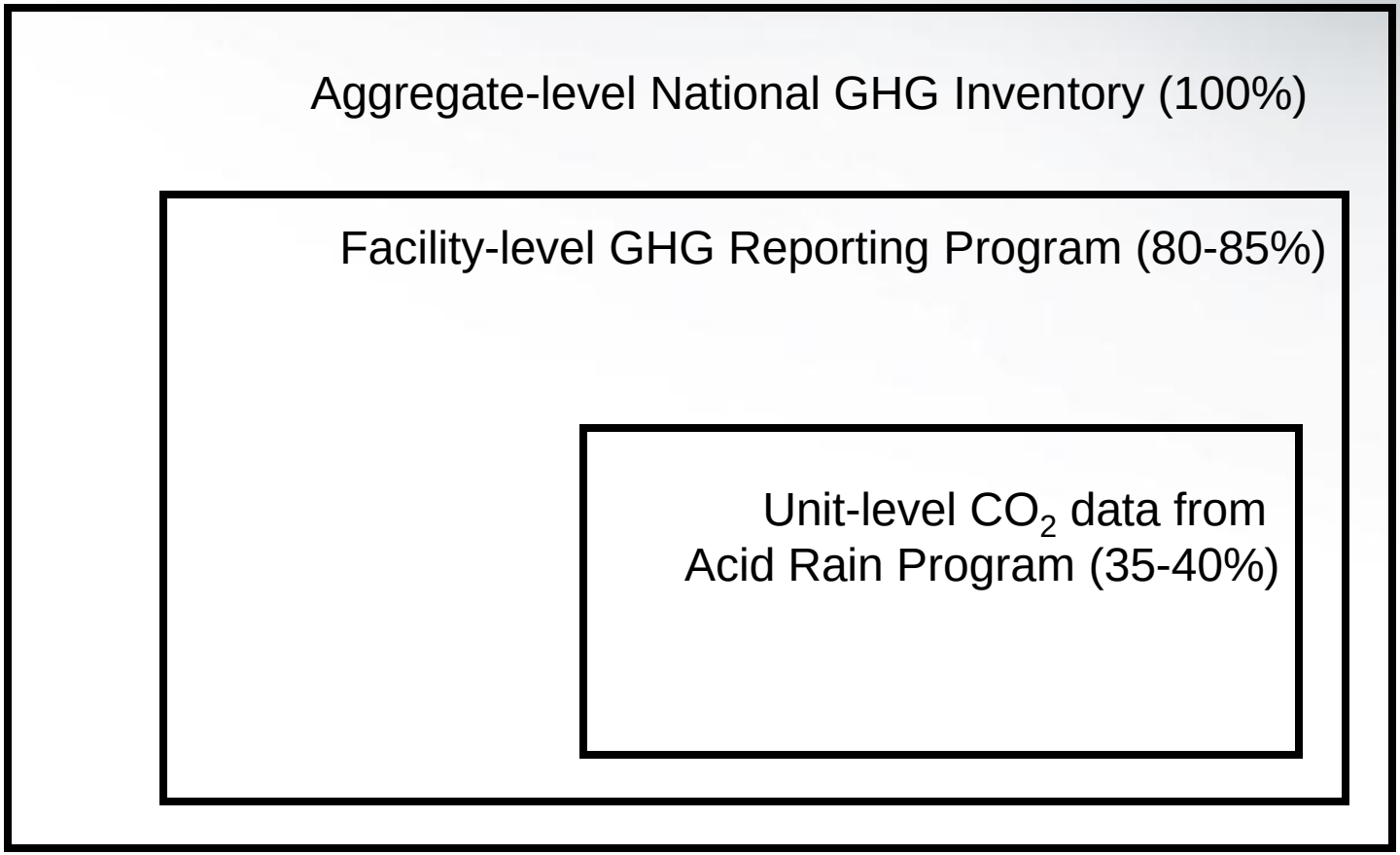
Overview

- Key considerations for GHG data
- The national GHG inventory as a foundation
- GHG data for domestic programs
- GHG data for international agreements
- Lessons Learned

Key Considerations

- Data needs should be tailored to the target policy or program
- Domestic Programs
  - -- Reporting programs
  - -- Market-based programs (cap and trade, offsets)
  - -- Regulatory or performance standards
  - -- Partnership programs
- International Programs/National Commitments
  - -- Aggregate national “caps”
  - -- Sectoral commitments (e.g., tropical forests)
  - -- Implementation of policies (e.g., energy efficiency, public transport etc.)

Overview of Existing EPA GHG Data Programs

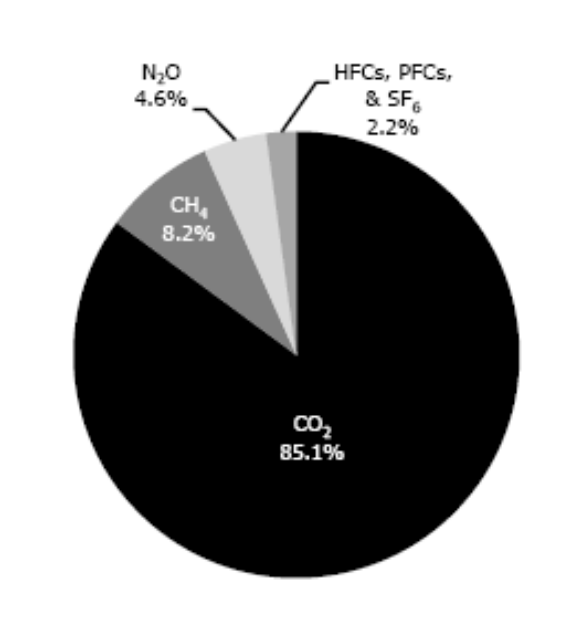


The National GHG Inventory

- U.S. National Inventory Report
  - The starting point for national climate policy
  - All anthropogenic sources and sinks, and all GHGs
  - Developed by EPA, in cooperation with other agencies
  - DOE/EIA: provides national data on fossil energy accounts
  - USDA: data and methodological support for agriculture and land-based emissions
- Fossil fuel methodologies
  - Estimates "piggy-back" off of existing government systems
  - Accurate within a few percentage points
  - Stoichiometric calculations: Carbon in = Carbon out
- Agriculture and LULUCF are more challenging
  - Soil N2O –Biological processes are inherently variable; ability to estimate incomplete
  - Sequestration of CO2 in soils/forests – Sampling and modeling by USFS and NRCS. Data are good, but room for integration of additional approaches

The National GHG Inventory

- Dominated by CO2 from fossil fuels
- Significant CH4 and N2O from agriculture
- Different economic sectors have very different fuel consumption profiles



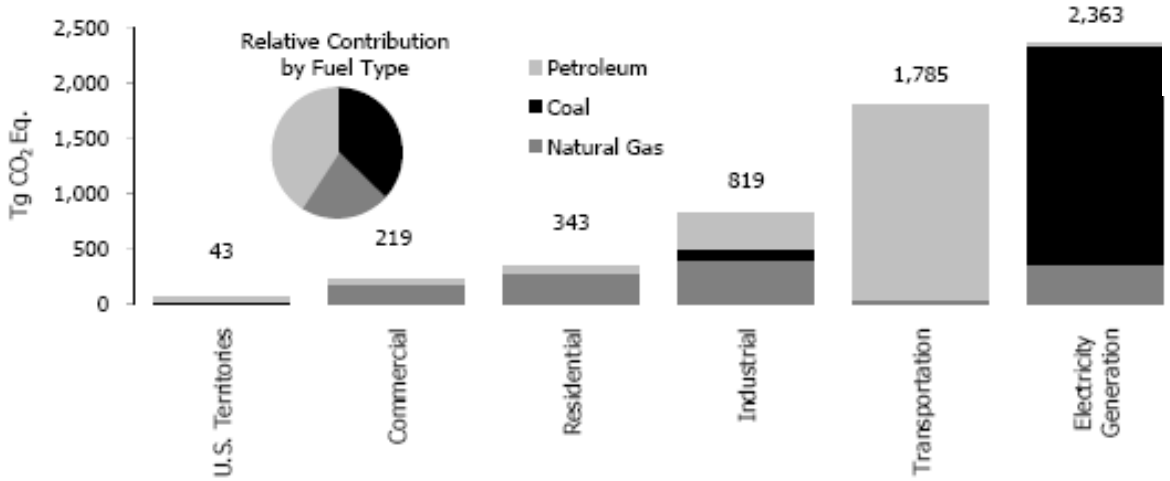


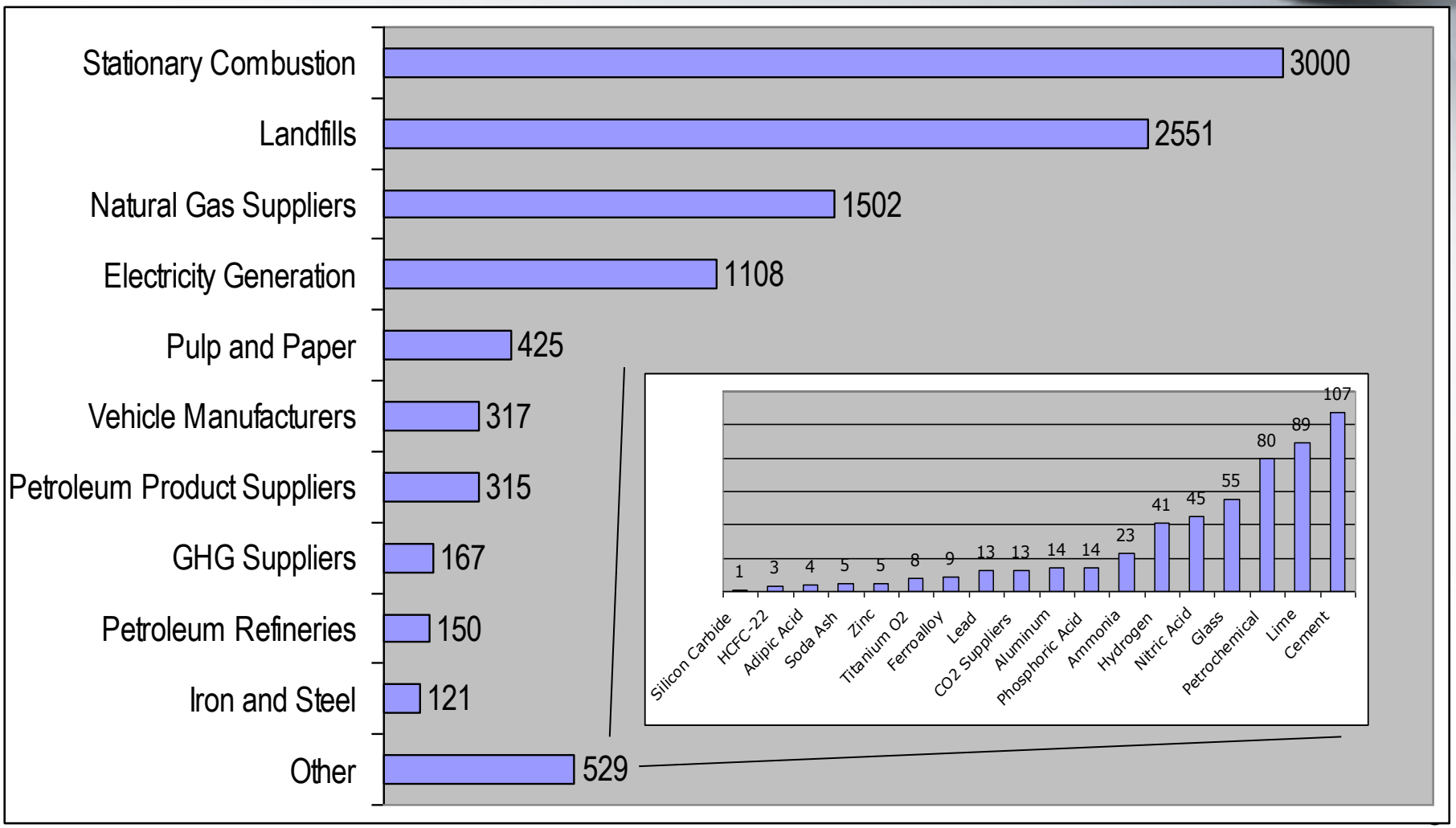
Figure ES-6: 2008 CO_2 Emissions from Fossil Fuel Combustion by Sector and Fuel Type

Note: Electricity generation also includes emissions of less than 0.5 Tg CO_2 Eq. from geothermal-based electricity generation.

EPA's Greenhouse Gas Reporting Program (Mandatory Reporting Rule)

- **Purpose of the program**
  - Obtain facility-level greenhouse gas (GHG) emissions data from all sectors of the economy to inform future climate change policies
- **Key elements**
  - Annual reporting (by March 31 of each year) directly to EPA
  - Both direct emitting facilities ('downstream') and suppliers of fossil fuels or industrial greenhouse gases ('upstream')
  - Estimated 10,000 facilities (80-85% of US emissions coverage)
  - Excludes emissions and sinks from agriculture and land-use
  - 25,000 metric tons CO2e per year reporting threshold for most sources
- **Methodologies**
  - A mix of engineering calculations and direct measurement
  - CEMS where infrastructure is already in place (e.g., Acid Rain Program)
  - Fuel-based calculations can be highly accurate for homogenous fuels (e.g., pipeline gas)
  - Extensive reporting requirements for supporting data (e.g., process data, sampling results) to facilitate EPA verification

Industries Covered **(# facilities)**



Domestic Cap and Trade

- Cap and trade requires accurate facility and/or unit-level data
  - Sources that cannot meet these requirements should not be included in cap and trade
- Methodologies and auditing/verification must ensure that the system is not being 'gamed'.
- EPA has implemented large-scale cap and trade programs since 1995 (SO2, and later NOx)
  - Continuous Emissions Monitors (CEMs) required for non-homogenous fuels
  - CEMs are relatively inexpensive for facilities; provide them with real-time information for compliance
  - Hourly stack-based measurements reported quarterly (along with other process related data); electronic QA/QC and verification
  - CO_2 data also reported by utilities since 1995
- GHG Cap and Trade
  - Waxman and Kerry bills require use of CEMs by other industries
  - EPA's GGRP provides a foundation for greenhouse gas cap and trade, but EPA would need to modify it based on new legislation

Offsets

- Offsets require rigorous assurance that project is “additional” (would not have happened anyway)
- Offsets could be appropriate for some source categories that are not candidates for cap and trade, where it is possible to measure reductions, e.g:
  - Methane capture (landfills, manure, coal mines)
  - Some agriculture and forestry activities (e.g., reforestation)
- Focus of monitoring approaches:
  - Measurement of reductions should give a comparable level of confidence to emissions from sources covered by cap and trade
    - Transparency and supporting data
  - Some options to address cases of higher uncertainty (e.g., 5:4 crediting of offsets in Kerry-Lieberman)
  - Ongoing verification of project status
- Opportunities for “top-down” approaches to support such verification, especially agriculture and forestry projects

Partnership Programs

- Natural Gas STAR Example: methane is the industry product, and it is emitted throughout the oil & gas system
- EPA works collaboratively with industry to reduce emissions
  - Initiated program in 1993, includes over 100 best practices
  - Utilizes direct measurements, engineering calcs & emission factors
  - Industry recognition of potential cost-savings associated with emission reductions has led to substantially improved measurement technology
  - Methane to Markets Partnership is now transferring these insights and technology internationally
- Monitoring and reporting are designed to provide information to companies that will assist them in reducing emissions

Bottom-up Measurement in Action

A natural gas well in Eastern Texas

- Naked Eye
- Infrared Camera

National Inventories from Other Countries (UNFCCC Reporting)

- **Developed countries:**
  - Annual electronic report of emissions and extensive supporting data (1990 – present year), accompanied by a National Inventory Report with narrative explanation, uncertainty estimates
  - Submissions reviewed annually by accredited international specialists
  - Transparency: National submissions and review reports posted on UNFCCC website
  - Europe, Japan, Canada, Australia have strong systems; issues of data continuity and quality in some economies-in-transition
- **Developing countries:**
  - No requirement for annual submission of inventories
  - This situation is more political than technical
    - Sovereignty concerns
  - In some cases, key economic statistics on which inventories rely (fuel use, industrial and agricultural production) are weak
  - Limited resources for basic research to improve key sources (e.g., refined emission factors, country-specific models)
  - Deforestation and agriculture represent a greater share of emissions in many developing countries, they are the most challenging to monitor

International Agreements

- GHG data needs depend on the nature of an international agreement
- US view (consistent with Copenhagen Accord)
  - No one size fits all
  - Countries commit to a portfolio of actions and report on them ("Nationally Appropriate Mitigation Actions")
  - NAMAs could include:
    - A national target
    - Intensity targets (emissions/GDP),
    - Energy efficiency goals,
    - Public transportation,
    - Removal of subsidies etc.
- A quick examination of the scope and nature of possible actions proposed already indicates that MRV approaches will be diverse and challenging, and may not use conventional emission monitoring approaches
  - E.g., Mongolia: portable wind generation for nomadic herders, coal briquetting

Review and Verification of National Inventories

- A critical element of overall assessment of national and international progress
- Uncertainties are inevitable and transparency is key
- Goal is to avoid bias in estimates and reduce uncertainties "as far as practicable"
- Focus on source categories, not individual GHGs
  - cement, electricity generation, enteric fermentation, etc
- Looking for large changes in emission trends or underlying data, comparability with "like countries", consistency with external datasets (IEA, Food & Agriculture Organization)
- Role of the uncertainty estimates developed by countries
  - Not used in the evaluation of the inventory, because
    - Countries have different sources with different irreducible uncertainties
    - "Acceptable" uncertainty for the power sector is different than for the agriculture sector
    - Uncertainty estimates are heavily reliant on expert judgment

Improvements in Developing Countries

- "Country Studies Program" is one model for assistance
  - Sponsored many developing country inventories in mid-1990s
- EPA has maintained targeted efforts
  - Regional approaches (e.g., Central America and Southeast Asia)
  - Country-specific approaches (Russian oblasts; Chinese provinces)
- Lessons learned:
  - Address both technical AND institutional challenges
    - Targeted data collection and software tools
    - Institutional management tools
  - Ensure that the fundamental building blocks of a good inventory are strong (e.g., statistical systems; appropriate emission factors)
- Costs of targeted capacity building programs ~$500K per country per year depending on scope and ambition

International Cap and Trade

- International cap and trade is not likely to be negotiated through UNFCCC from the "top-down"
- National GHG inventories will not be used for facility-level trading across borders
- Individual countries may decide to "link" domestic trading systems, with mutual recognition of emission allowances for use in compliance (e.g., EUETS and Norway)
- Decision to link based on comparability of monitoring
  - Level of accuracy depends on the policy
  - Markets do require transparency, confidence that monitored emissions are unbiased, and a strong compliance framework
- Unlikely that developing countries will have institutional or monitoring capacity in the near-term to implement cap and trade programs or link to other trading programs

Conclusions

- Solutions need to fit the problems
  - *The Specifics Matter*: MRV requirements differ for national inventories, cap and trade, NAMAs, etc.
- Effective MRV builds confidence in the integrity of the program
  - Such confidence need not depend on achieving a particular level of accuracy
  - Demonstrating that "evasion" or "gaming" will be detected and prevented is critical
- For domestic programs, compliance obligation resides with facility/company. Compliance assessed against the requirements specified in law and regulation.
- International framework for climate MRV is more complicated, as compliance frameworks are not well-developed.
- Given the scope of climate policies and programs, prioritizing resources to the most important issues and sources will be critical

For more information

- **www.epa.gov/climatechange**
- **www.epa.gov/airmarkets**