



GREENHOUSE GAS INVENTORY DEVELOPMENT

Town of Dover, NY

Presented by First Environment, Inc.
March 2018



Town of Dover
March 2018

Outline

Introductions

- Town's objectives

- About First Environment

Deliverables & timeframe

Introduction to GHG inventories

Quantifying GHG emissions

- Boundaries

- Types of emissions

Developing the government operations inventory





INTRODUCTIONS

- Town's Objectives
- About First Environment

Town's Objectives

The Town recognizes its role in meeting the global challenge of climate change; towards this purpose, it aims to:

- Achieve Climate Smart Certification through NYSDEC's Climate Smart Communities (CSC) Program
 - Gov't Operations Greenhouse Gas (GHG) Inventory
 - GHG Target Reduction Plan (1-, 5-, & 10-year)
 - Gov't Operations Climate Action Plan

About First Environment

45 EMPLOYEES

9 OFFICES THROUGHOUT
NORTH AMERICA

GREENHOUSE GAS & CLIMATE
CHANGE SERVICES SINCE 1990s

ANSI-ACCREDITED GHG
VALIDATION/VERIFICATION BODY
UNDER ISO 14065

Prepared GHG inventories for municipal clients, including:

- Westchester County, NY
- Morris County, NJ
- City of Clifton, NJ
- Lake County, FL
- Oklahoma City, OK

EMISSION REDUCTION EXPERIENCE

Verified 500+ offset
project verifications
across all sectors

Aluminum	Iron/Steel
Chemical	Landfill
Coal Mine	Livestock
Methane	Local Government
Composting	Manufacturing
Electronics Manufacturing	Power/Utility
Energy Efficiency	Pulp & Paper
Entertainment	Renewable Energy
Financial Services	Solid Waste
Forestry	IT
Oil & Gas	Transportation
Government	Wastewater
Healthcare	

Verification of
100+ GHG
inventories under
North American
programs,
including:

California Air
Resources Board

The Climate Registry

CDP

MassDEP

Climate Action
Reserve

PROJECT TEAM



QA Director

Economist / MBA

Adaptation planning,
mgmt. systems, & tools
development



PhD

Green finance, cap &
trade, & GHG mgmt.



**Project
Manager**

Energy, renewable
fuels, & GHG mgmt.



**Policy/GHG
expert**

GHG verification,
reduction projects

Other ways we help communities achieve
CLIMATE GOALS:

ADAPTATION/RESILIENCY PLANNING

ENVIRONMENTAL FINANCING/GREEN BONDS

VERIFICATION OF REDUCTIONS & INVENTORIES

Developed curriculum & serving as
adjunct faculty for **GHG measurement
& verification class** at **GEORGE
WASHINGTON UNIVERSITY**

Facilitated **Westchester County's
Climate Action Plan**
development, managing a **task force
of community stakeholders** &
representatives



DELIVERABLES & TIMEFRAME

Government Operations GHG Inventory

- Inventory quantifying the total GHGs produced directly and indirectly by organization's activities, relative to particular standard
- Standard: ICLEI's Local Government Operations Protocol (LGOP) - Specific guidance for local-scale accounting, applicable to all U.S. local governments

GHG Inventory Report:

- Inventory standards followed
- Boundary definition
- Data collection and emission quantification methods
- Assumptions material to inventory results

GHG Target Reduction Plan

- Projects emission growth at 1, 5 and 10 years, according to Business-as-Usual and demographic, economic, and transportation network forecasts information, as available
- Outlines 1-, 5-, and 10-year GHG target reduction plans
- Evaluates and proposes potential strategies to reduce GHG emissions
- Includes prioritized list of activities according target reduction plans, balancing costs and expected emission reduction benefits

Climate Action Plan (CAP)

The GHG emissions inventory is the foundation of the CAP

- Outlines measures and policies to mitigate climate change and reduce GHG emissions
- Identifies goals and emissions reduction targets, based on local priorities
- Provides guiding framework for achieving goals and targets
- Follows CSC guidance and templates, as applicable

Project Timeline

Project Milestones	Completion Week
Training and scoping meeting	March 26, 2018
Initial data provided for review	April 2, 2018
Document review/ initial emissions quantification	May 28, 2018
Interim progress review presentation	May 28, 2018
Data collection for government operations inventory, target reduction, and prioritized activities list and development of LGO Climate Action Plan	July 1, 2018
Public presentation of draft LGO GHG inventory summary, target reduction plan and LGO Climate Action Plan	July 1, 2018
Draft final report and presentation at town meeting	August 31, 2018
Final report	September 30, 2018



INTRODUCTION TO GHG INVENTORIES

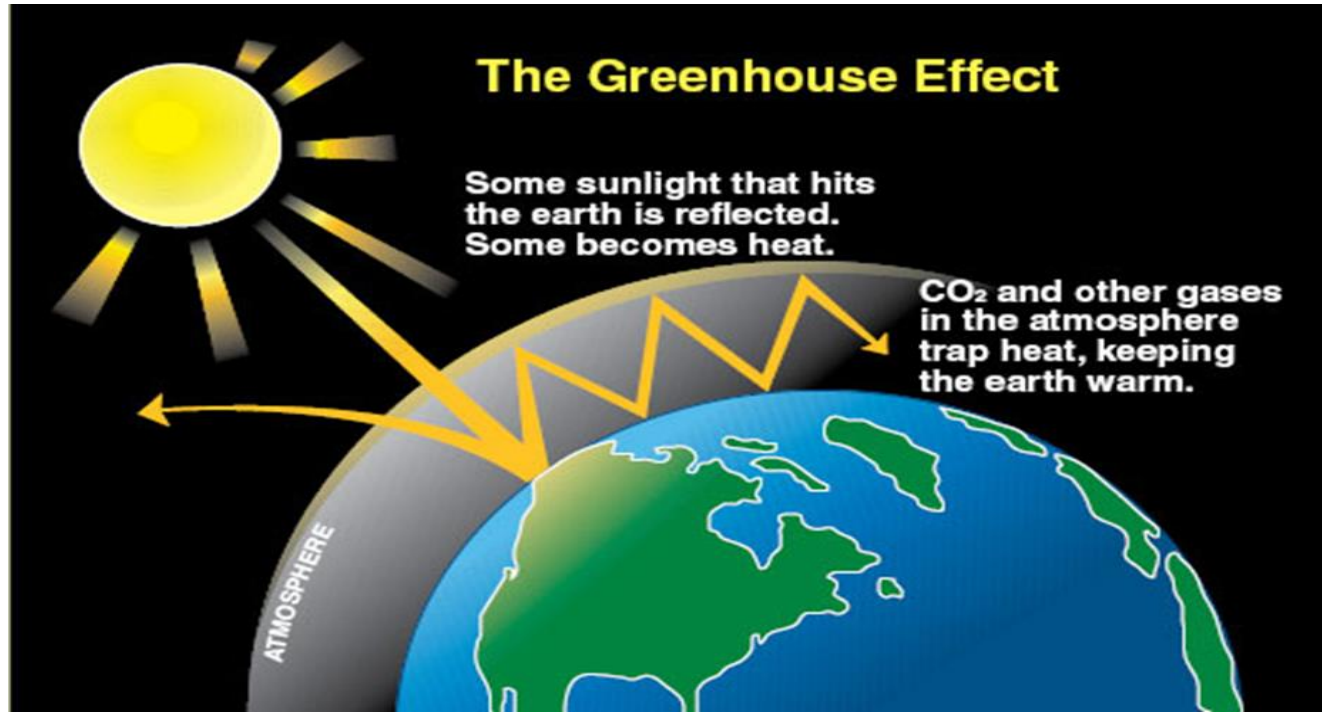
Greenhouse Gases

- Greenhouse gas – Any of various gaseous compounds (as carbon dioxide) that absorb infrared radiation, trap heat in the atmosphere, and contribute to the greenhouse effect
- Kyoto GHG – Seven greenhouse gases that are typically addressed by climate policy and regulation

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)

- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF₆)
- Nitrogen trifluoride (NF₃)

Greenhouse Effect



IPCC Global Warming Potential (GWP)

GHG	100-year GWP		
	SAR (1995)	AR4 (2007)	AR5 (2014)
CO ₂	1	1	1
CH ₄	21	25	28
N ₂ O	310	298	265
HFCs	140 – 11,700	124 – 14,800	4 – 12,400
PFC	6,500 – 9,200	7,390 – 12,200	6,630 – 11,100
SF ₆	23,900	22,800	23,500
NF ₃		17,200	16,100

GWP is a measure of how much energy the emissions of 1 metric tonne (t) of a gas will absorb over a given period of time, relative to the emissions of 1t of CO₂

GHG Inventory (aka “Carbon Footprint”)

- Emission inventory that quantifies total GHGs produced directly and indirectly by a business or organization’s activities, relative to particular standard, developed for a particular purpose:
 - To identify and understand emissions sources and trends
 - To evaluate effectiveness of policy
 - To demonstrate regulatory compliance
- Who has GHG inventories?
 - National and state governments
 - Local governments
 - Corporations
 - Facilities

World Business Council for Sustainable Development & World Resources Institute GHG Protocol

- Originally published: September 2001
Revised: 2004, 2015
- Collaborative stakeholder development effort involving business, government and non-governmental organizations
- Framework for how to measure, manage, and report GHG emissions
- Incorporates approaches from financial accounting
- Provides foundation for subsequent GHG inventory guidance and many reporting programs



GHG Inventory Protocols

Entities with specific protocols for accounting of emissions that contribute to climate change:

- U.S. Environmental Protection Agency (EPA)
- California Air Resources Board (CARB)
- California Climate Action Registry (CCAR)
- The Climate Registry
- International Council for Local Environmental Initiatives (ICLEI) – Local Government for Sustainability

Local Government Operations Protocol

Sector-specific guidance: translates GHG accounting principles to a particular industry or operation

Local Government Operations Protocol (LGOP)

- Specific guidance for local-scale accounting, applicable to all U.S. local governments
- Developed by the CCAR, CARB, ICLEI, and The Climate Registry
- Provides principles, approach, methodology, and procedures needed to develop an LGO GHG emissions inventory
- Developed in 2008, current Version 1.1 released in May 2010



QUANTIFYING GHG EMISSIONS

GHG Accounting Tools

Online applications for the calculation, tracking and management of GHG emissions at LGO and community scales

ICLEI - ClearPath Pro

- inventory, forecasting, planning, and monitoring
 - free to ICLEI Members, Regional Affiliates, and their consultants
- <http://icleiusa.org/clearpath/>

NYS CSC

- Local government GHG Accounting Tool (Excel-based)
- climatechange@dec.ny.gov

EPA Local GHG Inventory Tool

<https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool>

GHG Inventory Boundaries

- Temporal Boundaries
- Organizational Boundaries
- Operational Boundaries



Temporal Boundaries

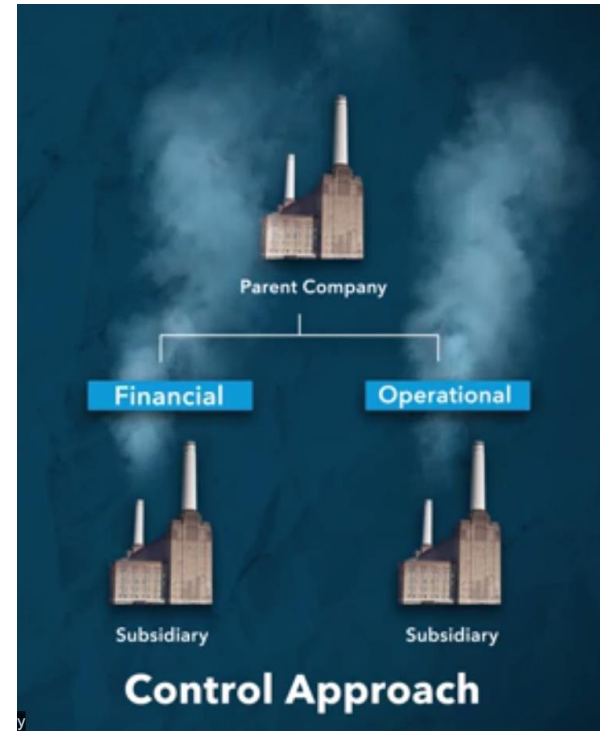
- GHG inventory represents emissions during a particular period in time (*a snapshot*)
- Typical temporal boundaries
 - Calendar year - *recommended*
 - Fiscal year
- **Base year inventory:** a GHG inventory that is used as a reference for future inventories, typically to demonstrate reduction or progress toward a target

Organizational Boundaries

Organizational boundary approaches

- **Control Approach**
 - Operational Control – recommended for LGOs
 - Financial Control
- **Equity Share Approach** – In general, not applicable to LGOs

Organizational Boundaries



Organizational Boundaries: Control

Operational Control

- An entity has operational control over an operation if the former (or one of its subsidiaries) has full authority to introduce and implement operating policies
- Most common organizational boundary approach
- *Recommended for LGOs*

Financial Control

- An entity has financial control over the operation if the former has the ability to direct the financial and operating policies of the latter with a view to gaining economic benefits from its activities

Leased Assets

- **Finance or Capital Lease**

- Lessee operates asset and also holds risks/rewards of ownership
- Assets are considered wholly owned in financial accounting (typically applies to large industrial equipment)
- GHG emissions are accounted as if the asset is wholly owned and controlled

- **Operating Lease**

- Lessee operates asset but does not hold the risks/rewards of ownership
- Any lease that is not a finance/capital lease is considered an operating lease (in most cases, applies to office space and leased vehicles)
- GHG emissions accounted depend on organizational boundary approach:
 - **Operational control:** report emissions from assets under an operating lease;
 - **Financial control:** emissions from a facility or source with an operating lease is optional; if reported --> Scope 3 emissions

Operational Boundaries

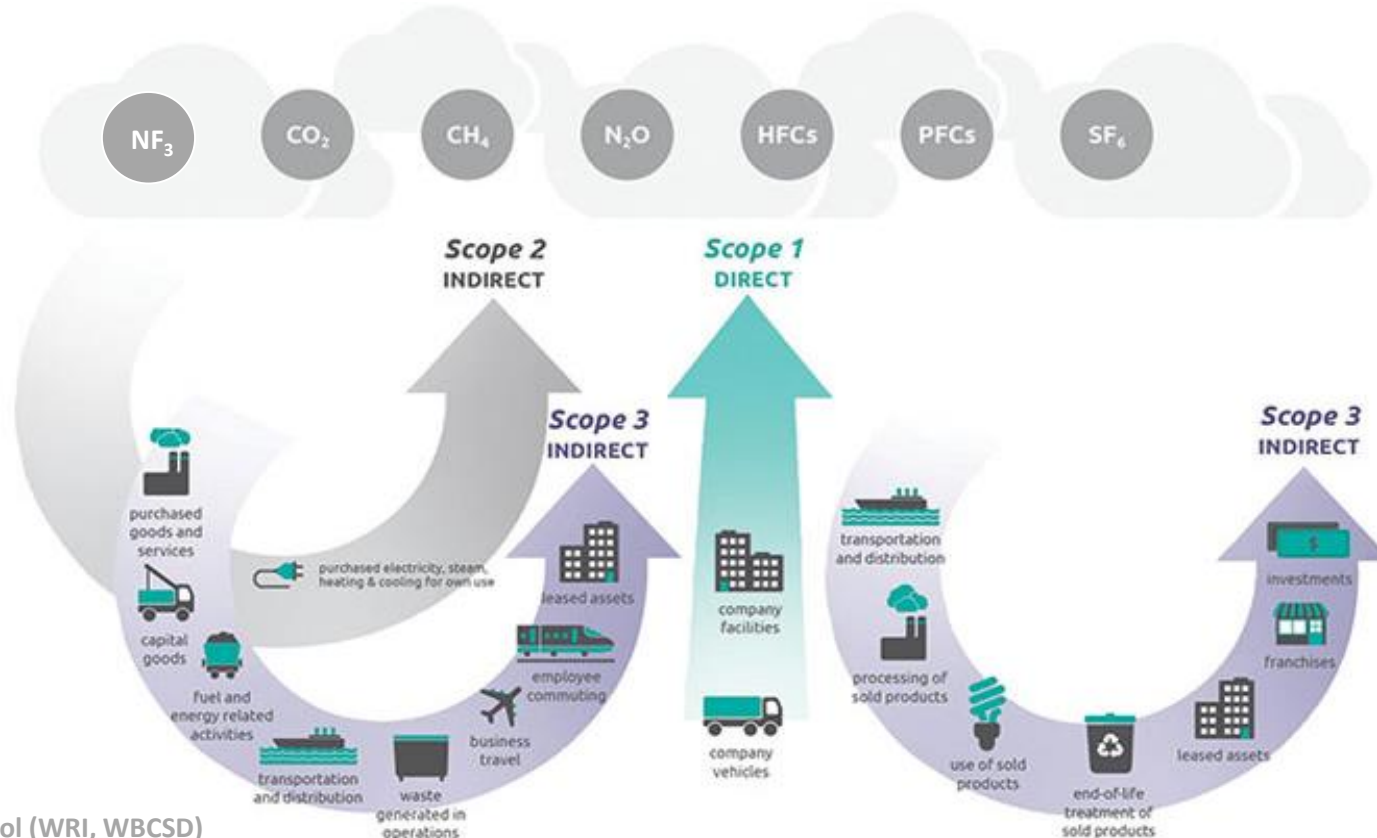
Direct emissions (Scope 1)

- Emissions from sources that are owned or controlled by a reporting entity

Indirect emissions (Scope 2, Scope 3)

- Emissions that are a consequence of the activities of the reporting entity, but occur from sources owned or controlled by another entity

Operational Boundaries



Direct Emissions - Scope 1

Stationary Combustion

Example: Natural gas combustion in boiler, water heaters

Mobile Combustion

Example: Diesel combustion in work trucks

Fugitive emissions

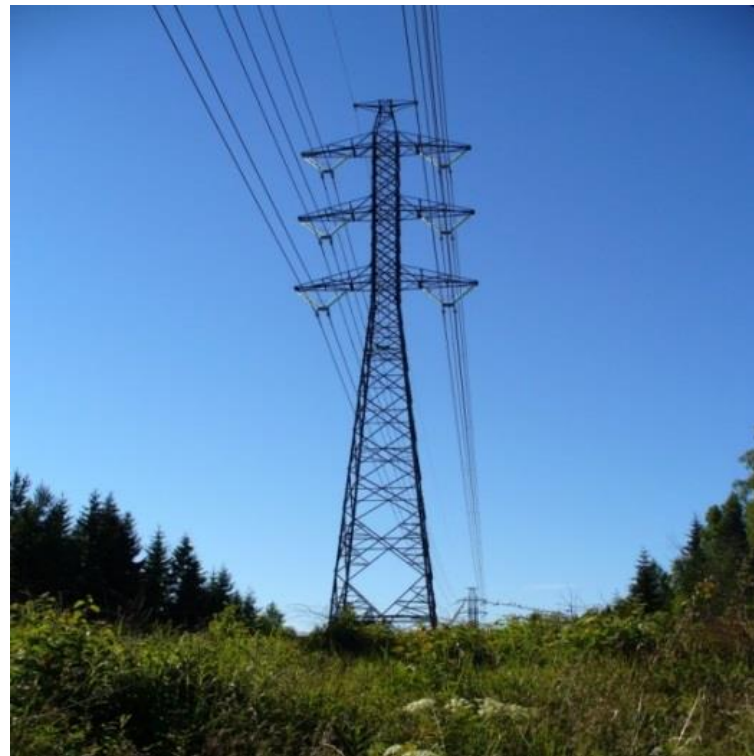
Example: Refrigerants leak from air conditioning equipment

Process emissions (Unlikely for LGOs)

Example: Carbon dioxide is release during cement manufacturing

Indirect Emissions - Scope 2

Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting entity



Indirect Emissions - Scope 3 (Optional)

All indirect emissions (not included in Scope 2) that occur in the value chain of the reporting entity, including both upstream and downstream emissions.

- Emission sources related to LGOs, but for which local governments do not have financial or operational control
- Reporting of Scope 3 emissions is considered optional



Identification of Emission Sources

Direct Emission Sources

- Stationary combustion
- Mobile combustion
- Fugitive emissions
- Process emissions

Indirect Emission Sources

- Electricity
- Purchased steam/heating

REMEMBER:

DIRECT EMISSIONS

- From sources owned or controlled by the Town

INDIRECT EMISSIONS

- Consequence of Town activities, but from sources owned or controlled by another entity

A simple line-art icon of a cloud with the text "CO2" inside it.A simple line-art icon of a cloud with the text "CO2" inside it.

LGO Direct Emissions: Stationary Combustion

Combustion of fuels to produce electricity, heat, or motive power using equipment in a fixed location

- Stationary sources in LGO buildings and facilities include: furnaces, boilers, burners and internal combustion engines consuming fossil fuels like natural gas, heating oil, coal, and diesel
- Includes CO₂ and smaller amounts of N₂O and CH₄

LGO Direct Emissions: Mobile Emissions

- Both on-road and off-road vehicles (e.g., automobiles, trucks, buses, trains, ships/other marine vessels, airplanes, tractors, and construction equipment)
- Combustion of fossil fuels in mobile sources emits CO₂, CH₄, and N₂O
- Emissions estimated based on vehicle fuel use and miles traveled
- CH₄ and N₂O emissions require data on vehicle (emission control technologies) and vehicle miles traveled

LGO Direct Emissions: Fugitive Emissions

- Emissions generated by leaks of HFC refrigerants during installation, use, and disposal of refrigeration systems
 - Includes HFC fugitive emissions from vehicle air conditioning
- Fire suppression equipment, including hand-held fire extinguishers
- Solid waste disposal facilities
- Wastewater treatment plants

LGO Indirect Emissions: Electricity – Steam/Heating

Indirect emissions associated with **purchase and use** of electricity *generated by other entities*

- Indirect emissions from electricity use may comprise the **largest source** of an LGO's GHG emissions
- Typically includes CO₂ and smaller amounts of N₂O and CH₄
- Steam and district heating **generated by other entities** and *purchased* by LGO for building space or process heating for industrial needs

Note: LGOs **generating** electricity for own use/sale must report combustion emissions as Direct Emissions - Scope 1

How Are GHG Emissions Calculated?

Activity Data

X

Emission
Factors

=

GHG emissions
for asset

- **Provided by town**
- Includes data such as fuel consumption, electricity consumption, miles driven, etc.

- **Included in ICLEI software**
- Amount of emissions per unit of activity

Sometimes, there are additional conversions:

Activity data * energy content * emission factor = GHG emissions

Frequently, unit conversions are needed:

Activity data * energy content * emission factor * unit conversion = emissions

DEVELOPING THE GOVERNMENT OPERATIONS INVENTORY

Purpose of the GHG Inventory

1. Demonstrate environmental leadership
2. Complete first critical step in preparation of a GHG Target Reduction Plan and Government Operations Climate Action Plan
3. Qualify for grant from NYS Climate Smart Communities Program
4. Assist board and staff in policy and decision making
5. Identify energy and fuel consumption efficiencies
6. Look for ways to mitigate direct and indirect GHGs
7. Use data to identify current and future trends and compare against other LGO inventories to benchmark progress
8. Prepare for future legislation related to GHG and carbon emissions

Common LGO Buildings and Facilities

- Owned and leased office space
- Police and fire stations
- Recreation centers and facilities
- Warehouse, fleet and equipment yards, service facilities
- Transportation facilities
- Port and airport facilities
- Hospitals and schools
- Courts and prisons
- Housing
- Water pump/lift stations
- Water treatment plants
- Wastewater treatment plants

Dover LGO GHG Inventory Boundaries

- **Temporal Boundary:** 2017-2018 (full calendar year would be preferable)
- **Organizational Boundary:** Operational control (*recommended*)
- **Operational Boundary**
 - Scope 1 sources
 - Scope 2 sources
 - Scope 3 sources (*optional, not required for CSC certification; not recommended for first GHG inventory*)

Organizational Boundary – Operational Control

Boundary determination:

- Geographical boundary - Maps
- Organization chart – LGO departments
- Facilities and assets list
- Schedule of real estate: owned and leased facilities
- Real estate: tenants, contractors occupying or operating LGO buildings
- Accounting/Financial: utilities contracts and billing records

Scope 1: Identification of Emissions Sources

Stationary combustion sources?

- Boilers?
- Heaters?
- Electricity power plant(s) or generators?
- Waste incinerators?

Stationary combustion fuel types?

- Natural gas?
- Diesel?
- Biofuels? (wood fuel, biodiesel, biogas)

Scope 1: Identification of Emissions Sources

Mobile combustion sources

- Cars?
- Trucks?
- Public transportation?
- Waste handling equipment?
- Road maintenance and snow removal equipment?

Mobile combustion fuel types

- Gasoline
- Diesel
- Other (CNG/LNG, Biodiesel, etc.)?

Scope 1: Identification of Emissions Sources

Fugitive emissions

- Refrigerant sources
 - Chillers
 - Freezers
- Fire extinguishing equipment
- Solid waste disposal – landfill, composting, recycling, incinerators
- Wastewater treatment plant

Scope 2: Identification of Emissions Sources

- Electricity provider(s)?
- Electricity accounts?
- Internal metering arrangements?
- Renewable energy purchases?
- Any other purchased energy?
- Renewable energy credit or carbon offset purchases?

Identification of Data Sources

- Operating or air permits for stationary equipment
- Utility invoices
- Fuel purchase and sales records
- Vehicle operation/maintenance records
- Equipment operating logs
- Waste records
- Town operations data
- GIS data sets

Data Checklists and ShareFile Account

- To facilitate sources and data identification, First Environment will provide scoping templates and checklists
- To facilitate document and data transfer, First Environment will provide a ShareFile account to upload/download information



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