User's Guide to Incorporating Existing GHG Inventories for the Priority Climate Action Plan (PCAP)

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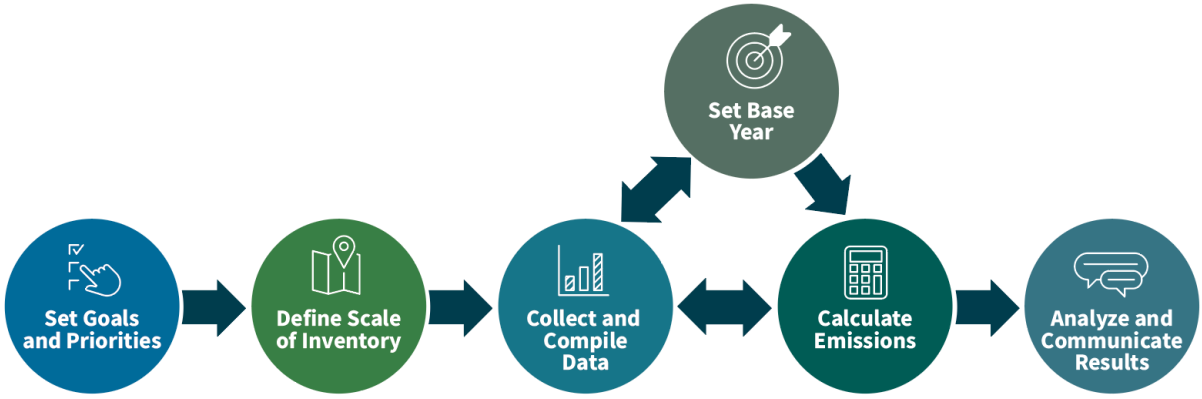
Purpose

The purpose of this document is to provide guidance for metropolitan statistical areas (MSAs)[1] developing or compiling greenhouse gas (GHG) inventories for their priority climate action plans (PCAPs) under the Climate Pollution Reduction Grant (CPRG) Program of the US Environmental Protection Agency's (EPA).[2] Figure 1 provides an overview of the key steps for developing an MSA-wide GHG inventory. This guide provides information particularly related to defining the scale of the inventory, collecting and compiling data, and setting a base year to aid localities with incorporating existing inventories into their PCAP.

Figure 1: Overview of Key Steps for Developing an MSA GHG Inventory



In some cases, localities within an MSA may have already completed their own GHG inventories, or regional organizations that comprise most of the MSA may have a recently completed inventory. The CPRG lead organization for an MSA can leverage these when developing an inventory for that MSA. The state(s) where the MSA is located may also have existing GHG inventories and GHG projections that could provide a useful starting point for developing an MSA's PCAP GHG inventory. This guide addresses potential approaches for utilizing and building on existing inventories when an MSA is experiencing one or both of the following scenarios:

- Scenario 1: An MSA is only partially covered by existing inventories
- Scenario 2: An MSA has multiple localities with inventories, but the inventory year or base year varies among the MSA's inventories.

This guide offers approaches to addressing these common scenarios and an overview of activity data and information on scaling activity and emissions data for a GHG inventory. For more detail about completing a GHG inventory or scenarios not covered in this guide, refer to the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC).

[1] For states and tribes that want to update, modify, or scale their GHG inventories, EPA has other tools and guidance available, including the State Inventory and Projection Tool and the Tribal Greenhouse Gas Inventory Tool. EPA also annually publishes State and Tribal Greenhouse Gas Data and Resources to provide recent information on state and tribal-level GHG data and inventory tools.

[2] For more information on the CPRG requirements for GHG inventories, please review the Climate Pollution Reduction Grants Program: Formula Grants for Planning guide, which includes program guidance for states, municipalities, and air pollution control agencies.

Activity Data and Emissions Scaling Guidance

Activity Data

Defined by the Intergovernmental Panel on Climate Change (IPCC) as "data on the magnitude of human activity resulting in emissions or removals taking place during a given period of time," activity data are the primary pieces of information needed to calculate a GHG inventory. Examples of activity data include the amount of electricity used or vehicle miles traveled in a calendar year. Table 1 provides several other examples of activity data by sector.

Table 1. Examples of Activity Data for Various Inventory Sectors

Sector	Activity	Recommended Scaling Factors
Stationary[a]	• Natural gas consumption • Any other fuel consumption (e.g. propane, fuel oil) • Building square footage	• Commercial/residential building square footage • Population
Transportation	• Vehicle Miles Traveled (VMT) • Fuel consumption • Vehicle population	• Vehicle registrations • Population
Electricity	• Electricity consumption	• Population
Waste	• Tons of solid waste disposed, recycled, composted, and/or incinerated • Population using sewer or septic systems • N2O effluent discharge	• Population
Industry	• Fuel consumption • Product produced	• GDP
Agriculture	• Livestock population • Crop production • Fertilizer applied	• Cropland acreage • Animal population
Natural Gas Fugitive Emissions[a]	• Natural gas consumption	• Commercial/residential building square footage • Population
HFCs	• Population	• Population

[a] Included within the Commercial, Residential, or Industrial sectors.

Emissions Scaling

When activity data are not available within the desired locality or region, GHG emissions can be calculated by scaling available data to that locality, by interpolating data between years, or by extrapolating data from one year to a future year. Activity data and emissions can be scaled up from local GHG inventories that are similar in scope to the desired inventory, or they can be scaled down from state, regional, or national level data using the appropriate scaling factors related to geography or reporting year. Table 1 provides examples of scaling factors and the text box provides scaling formulas.

According to the GPC, inventory data can be scaled using the following formula:

$$Inventory\ Data = \frac{Factor_{Inventory\ Data}}{Factor_{Available\ Data}} \times Available\ Data$$

In this formula, $Available\ Data$ refers to the activity or emissions data available that needs to be scaled, while $Inventory\ Data$ is the activity or emissions data for the locality. $Factor$ is the scaling factor data point for either the inventory data or the original available data. Potential scaling factors to use include, but are not limited to, activity data, population, or gross domestic product (GDP).

Below are three examples that show how activity data can be scaled and extrapolated:

Example 1: Extrapolating from one year to another

Population could be used as a scaling factor to extrapolate an MSA's residential electricity data from 2021 to 2022:

$$MSA\ residential\ electricity\ data\ 2022 = \frac{MSA\ population_{2022}}{MSA\ population_{2021}} \times MSA\ residential\ electricity\ data\ 2021$$

Example 2: Scaling from one location to another

Population could be used as a scaling factor to scale the waste data from one location within the MSA to another similar location within the MSA:

$$Location\ A\ waste\ data\ 2022 = \frac{Location\ A\ population_{2022}}{Location\ B\ population_{2022}} \times Location\ B\ waste\ data\ 2022$$

Example 3: Scaling down from state data to local data

Population could be used as a scaling factor to scale state level HFC emissions to localized HFC emissions:

$$MSA\ within\ State\ HFC\ data\ 2022 = \frac{MSA\ population_{2022}}{State\ population_{2022}} \times State\ HFC\ data\ 2022$$

For more detail about scaling data, refer to section 5.3.1 of the GPC. Chapters 6 to 10 of the GPC provide additional detail on how to scale data.

Scenario 1: Partial coverage of an MSA by existing inventories

Some localities within an MSA may have already completed a GHG inventory, while other localities within the MSA may not have. There are several questions to consider when integrating this partial data into an MSA-wide inventory:

Are activity data available for the localities that do not have GHG inventories?

If Yes

Use the locality-specific activity data to estimate emissions directly. Emissions can be estimated using one of several tools available, or by using a spreadsheet. If activity data are from multiple years, see Scenario 2.

If No

First, determine if any supporting information is available. There are several data sources available that can be used to proxy or estimate activity data, some of which are listed in Section 5.3 of the GPC or the EPA's CPRG Tools and Technical Assistance - Greenhouse Gas Inventory. If activity data are not available from these sources, proceed to the next question.

For the localities without GHG inventories, are the activities described in Table 1 either a) available in parts of the MSA that do have inventories or b) occur in comparable regions outside of the MSA that have inventories?

If Yes

Activity data and emissions from other localities within the MSA or from comparable regions (e.g., similar population density, geography/built environment, or types of commercial activity) outside of the MSA can be scaled to fill gaps in the MSA's inventory. See the *Activity Data and Emissions Scaling* section for additional scaling information and example calculations. Data should be modified to use consistent Global Warming Potentials (GWPs) across the inventory (see GWP text box).

If No

Gather the best available MSA or locality data, such as data from the EPA National Emissions Inventory (NEI) or the Department of Energy (DOE) State and Local Planning for Energy (SLOPE) Platform. Scale the data using literature and inventory tools. Partial MSA data and publicly available data can be combined or scaled to approximate emissions. For instance, state or national emissions could be scaled down using population or other factors to approximate MSA-wide emissions.

Use Consistent GWPs

- The concept of a Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. It is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO_2).
- It is important to ensure consistent GWPs are used across the inventory because the Intergovernmental Panel on Climate Change (IPCC) updates the GWP values when it releases new Assessment Reports. This change can be due to updated scientific estimates of the energy absorption or lifetime of the gases or to changing atmospheric concentrations of GHGs that change the energy absorption of 1 additional ton of a gas relative to another.
- IPCC recommends using the latest GWP values from the IPCC Fifth Assessment Report (AR5). The following example formula can be used to convert emissions data for each GHG from a previous Assessment report (e.g., AR4) to GWP AR5.

$$Emissions\ of\ a\ specific\ GHG\ in\ AR5 = Emissions\ of\ specific\ GHG\ in\ AR4 \times \frac{AR5\ GWP}{AR4\ GWP}$$

Scenario 2: Varying inventory years among localities in an MSA

In some cases, localities within an MSA may have GHG inventories for different years that need to be reconciled and/or combined to develop an MSA-wide inventory. There are several questions to consider and address when using these inventories to develop one for the whole MSA region:

Do the existing GHG inventories across the MSA use different base years?

If Yes

Select the GHG inventory year (i.e., the base year) with the largest amount of complete available data and that is representative of a "typical" year. Check the GWPs of the data and choose consistent GWPs to use across the inventory. Select a base year to use for the PCAP inventory and future inventories. EPA is not requiring a specific GHG inventory base year; inventory years should be chosen based on availability of underlying data, whether that year represents a typical year, and to support development of GHG targets.

If No

Before proceeding to the next question, check the GWPs of the different inventories to standardize

Were similar types and levels of activities described in Table 1 likely occurring between the desired inventory year and the years the GHG inventories were conducted?

Note: the answer is most likely "Yes" unless there were significant changes in MSA operations (e.g., a new power plant, coal mine decommissioned)

If Yes

The inventory from one year can be used as a proxy or to help scale emissions for the other year. Typically, it is best to use the inventory with most recent activity data, ideally data from the latest "typical" reporting year.

If No

Update the GHG inventory using activity data from the desired inventory year.

If activity data is unavailable for the GHG inventory year, see the *Activity Data and Emissions Scaling* section for more information on scaling data from outside the inventory boundary.

What if my activity data are not from the most recent reporting year?

If data are out of date but are the best available, that is acceptable as long as the data are sufficient enough to support the development of GHG targets for the MSA. When possible, update the GHG inventory data to the most recent reporting year (e.g., a GHG inventory updated in 2023 ideally uses complete available data from reporting year 2021, the most recent year with available state data).

Conclusion and Other Considerations

- If time and data availability are constraints, start with a simplified (e.g., scaled) GHG inventory for the PCAP, and then complete additional analyses and data collection to provide a comprehensive GHG inventory in the comprehensive climate action plan (CCAP).
- Document inventory methodologies, datasets, and emissions factors to ensure a replicable process and track areas for potential improvement during the CCAP.
- While using locality-specific data is ideal, scaled proxy data from GPC/EPA, other localities within or comparable to the MSA, or national/state inventories can also be used. The MSA must determine what option makes the most sense for their MSA GHG inventory.