Community Greenhouse Gas Inventory

Introduction

Columbia City Council reaffirmed Columbia's commitment to take action to reduce climate pollution (Resolution 89-19A) on June 17th, 2019, by adopting the Climate Action and Adaptation Plan (CAAP). The CAAP has two main purposes. The first is to prepare Columbia's natural resources, built environments (neighborhoods, resources and systems) and people to be more resilient to the impacts of climate change. The second main purpose of the CAAP is to reduce GHG emissions communitywide through targeted municipal, residential, industrial, and commercial activities. Starting in our **baseline year of 2015**, the City of Columbia Office of Sustainability completes a yearly Community Greenhouse Gas (GHG) Emissions Inventory to track changes in emissions over time and to help the City reach goals outlined in the CAAP of **reducing community emissions by 35% by 2035 and by 80% by 2050**.

Methods

The methodology used for our GHG inventories is the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. This protocol was developed through ICLEI-Local Governments for Sustainability USA (a US nonprofit corporation organization) and is widely used by municipalities in over seventy countries. GHG emissions are organized in eight sectors: residential energy, commercial energy, industrial energy, transportation, solid waste, water and wastewater, and process and fugitive.

For this report, GHG emissions generated in the community were totaled by calculating emissions of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). CH4 and N2O were converted to CO2 equivalent (CO2e) using global warming potential (GWP) values developed by the Intergovernmental Panel on Climate Change (IPCC). The total units of CO2e, including CO2, then represent the sum total of all greenhouse gases multiplied by their corresponding GWP factor. The protocol does not calculate the hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), or other GHGs in the community analysis. The report calculates and converts emissions from all sectors into metric tons of carbon dioxide equivalent (MT CO2e).

This inventory is for Scope 1 and Scope 2 emissions associated with Columbia. Scope 1 refers to emissions produced within the city limits and released into the community atmosphere. This includes combustion of all fossil fuels such as gasoline, diesel, natural gas, coal, propane and any other fuel producing greenhouse gases within the city limits. Methane produced from landfill waste and wastewater treatment is also included in Scope 1. Scope 2 emissions include all greenhouse gases that are emitted outside of Columbia as a direct result of activities that occur within Columbia (e.g. grid-supplied electricity) .

Methods (Continued)

This report does not address Scope 3 emissions, which refers to all other greenhouse gas emissions that occur outside of the city as a result of activities that take place within city limits. An example of Scope 3 emissions would be production of goods used or consumed within the city. These scope distinctions help to avoid double counting between communities and to clarify where emissions are generated.

Calculations of Inventory Sectors

Energy: energy emissions are those created by the production of electricity and the combustion of fossil fuels, primarily natural gas. To calculate CO2e emissions from electricity the energy production, energy usage by sector, and power purchase information are collected from the three utilities that provide electric power to the City: Columbia Water and Light, University of Missouri Columbia (MU) Power Plant, and Boone County Electric Cooperative. Each of the three utilities purchases power from multiple sources, including various power production facilities or power control areas (PCA). Emission coefficients in carbon dioxide equivalent per megawatt hour, or CO2e/MWh for each power production facility and PCA are obtained from the Environmental Protection Agency's Emissions & Generation Resource Integrated Database (eGRID).

The energy Columbia consumes (in MWh) from each power provider and power supplier is multiplied by the specific emissions coefficient to calculate annual emissions in metric tons. Total emissions are assigned to residential, commercial, and industrial sectors using electricity sales reports from each utility that separates the total electricity consumption by customer type. University and Government are attributed entirely to the commercial sector. Government emissions are also considered commercial. Electricity quantities of natural gas sold are provided from Ameren Missouri, the city's sole provider. This amount is converted to CO2e using emissions factors provided by ICLEI and assigned by customer class.

Wastewater: this inventory calculates emissions from each stage of treatment: primary treatment, anaerobic digestion, and treatment pond/effluent release. This data comes from the Columbia Wastewater Treatment Plant.

Transportation: transportation emissions are from combustion of fossil fuels, biodiesel, and ethanol internal combustion engines within the City of Columbia. Transportation data for 2015-2017 uses vehicle miles traveled data from the Federal Highway Administration. This yearly data was then converted to MTCO2e.

Transportation (continued): Transportation emission data from 2018 and after are obtained from Google's Environmental Insights Explorer (EIE), which provides more detailed and accurate transportation data. Google's EIE data uses activity data to calculate distance traveled by mode (automobile, bus, bicycle, foot) in combination with area-specific data from CURB: Climate Action for Urban Sustainability to factor in fuel type

Calculations of Inventory Sectors (continued)

Fugitive Emissions: when transporting natural gas, there is an assumed 0.3% leakage rate. To accurately account for emissions used from natural gas, the emissions from leakage must also be calculated. The quantity of natural gas sold is used to calculate these process and fugitive emissions. As natural gas usage increases, the estimated process and fugitive emission also increase.

Solid Waste: Methane (CH4) emitted from municipal solid waste landfill is obtained from the EPA's Facility Level Information on GHG's Tool (FLIGHT). This CH4 data is then converted to MTCO2e in ICLEI's ClearPath tool. Biogenic CO2 is excluded at the recommendation of ICLEI.

Attributing Causes of Emission Changes

Many factors contribute to the changes in emissions from one year to the next. Each year, the Office of Sustainability conducts a Contribution Analysis to understand how various individual drivers of emissions, such as weather, changed from the previous year to the current year. For example, a year with a colder winter and a warmer summer will result in more home heating and cooling energy used, increasing emissions. A cooler summer and warmer winter can reduce energy related community emissions. Population growth, changes in employment, energy usage per household, waste generated per person, vehicle miles traveled, industrial natural gas used, number of homes using electric heating, and fuel mixes are all analyzed. From this data emerges an understanding of why emissions increased or decreased from one year to the next. Each inventory year's GHG Report includes information on significant drivers of emission changes.

Improving Our Data

Since our baseline year of 2015, more accurate data and methods have been made available with the progression of calculation tools and technology such as Google's EIE. As new data sources and calculation methods are realized, we have update all inventories to establish consistency and improve on what was previously reported. This allows each inventory year to be compared accurately to other years, as "apples to apples". For more detailed information on data updates that have been made, see "Updates to Community GHG Inventories" on como.gov/sustainability/areas-of-focus/climate-action.