Greenhouse Gas Emissions Inventory for Delta County, Colorado
2019

Prepared by:
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For
Citizens for a Healthy Community
September 2021-Revised

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Citizens for a Healthy Community (CHC) is a grassroots nonprofit 501(c)3 organization dedicated to protecting the air, water and foodsheds of the North Fork Valley and Delta County region from the impacts of oil and gas development and paving the path to a clean, resilient and renewable energy future. CHC is the county's watchdog for oil and gas development, conducts research and advocacy, and works with partner organizations to ensure a resilient and livable community for present and future generations.

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Preparing an emissions inventory covering many different sectors (energy, transport, agriculture, waste disposal, wastewater treatment, etc.) requires the different expertise and input of many people. A special note of appreciation is extended to Robbie LeValley, Delta County Administrator, who provided much of the data. She was also instrumental with connecting me to the many helpful people all over Delta County who graciously provided the data necessary to complete this inventory.

Thank you also to all the officials and staff of Delta County including Debbie Griffiths (County Assessor), Gary Bardessona (Adobe Buttes Landfill Manager), Greg Rajnowski (Delta County Health Department Director of Environmental Health), staff from DMEA and Black Hills Energy as well as John Gavan. All were generous with their time in responding to the many requests for the data that was necessary to complete this project. Andrea Denney from the US EPA provided helpful support in terms of understanding the inventory tool and Kim Wells from Lotus Energy Consulting provided knowledge in several areas based on her extensive experience preparing the GHG inventory for San Miguel and Ouray counties.

Lastly, much appreciation to The West Elk Community Fund for generously providing support for this inventory.

Executive Summary

The Delta County inventory was compiled using the U.S. Environmental Protection Agency's Local GHG Inventory Tool Community Tool[1], which is widely used by communities and local governments across the United States. The inventory utilizes 2019 as a baseline year, because of the accessibility of consistent data across all sectors for that year.

In 2019, Greenhouse Gas (GHG) emissions for Delta County totaled 575,786 MT CO_2e (metric tons of carbon dioxide equivalent gases). However, this total does not include fertilizer use, livestock and agricultural soil management practices[2]. The electricity is the largest source of emissions in Delta County contributing 34%, followed by transportation at 31%. The third largest emissions contribution comes from fossil fuel extraction, with abandoned coal mines and oil and gas extraction combined contributing to 25% of GHG emissions. Wastewater treatment and solid waste disposal emissions contribute 1% each. Tree cover plays an important role in sequestering carbon dioxide and reducing gross emissions by 28%.

This GHG emissions inventory is limited to sectors within Delta County's political boundaries. However, it is important to note that the large West Elk coal mine in Gunnison County is just across the border from Delta County. Because of the trans-boundary nature of greenhouse gas emissions it is worth making note that while the emissions from this mine are not included in the Delta County inventory, they represent 73% of Delta County's gross emissions (2019 reported emissions[3] = 418,799 MT CO_2e), and the impacts from the West Elk coal mine emissions should be of interest to the county.

The inventory report explains the benefits of GHG emissions inventory, the methodology and modeling tool behind the inventory, the different between direct and indirect emissions, the sectors inventoried, and the detailed breakdown of the carbon emissions from each sector.

[1] https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool

[2] According to 2015 aggregate statewide data used in the Colorado GHG Emissions Inventory Report released in September 2019, the agricultural sector makes up 8% of statewide GHG emissions.

[3] www.ghgdata.epa.gov

Introduction

In May 2019, House Bill 19-1261 was passed with a focus on the reduction of greenhouse gas pollution. It established Colorado's statewide greenhouse gas (GHG) pollution reduction goals to reduce GHG emissions by 50% of 2005 levels by 2030 and by 95% by 2050. In 2020, Citizens for a Healthy Community (CHC) initiated the process of preparing a Greenhouse Gas Inventory for Delta County, Colorado. The aim of this effort is to compile a comprehensive and accurate baseline of emissions. This inventory will help to help track trends and to contribute to Delta County's knowledge base in order to inform the citizens and county leadership as they move forward with sustainability planning and climate action.

The inventory utilizes 2019 as a baseline year, because of our ability to collect as much data as possible for that year. The inventory was compiled using the U.S. Environmental Protection Agency's Local GHG Inventory Tool Community Tool[4], which is widely used by communities and local governments across the United States. The initial scope of work for this inventory also included an inventory for 2005, however, after many conversations with different sectors, it became apparent that data availability for 2005 is limited in some sectors.

There are many benefits to preparing a GHG inventory. This type of accounting allows communities and authorities to:

- Create an emissions baseline
- Track emissions trends
- Assess the relative contributions of emissions sources
- Communicate with stakeholders
- Partner with other municipalities to create a regional inventory
- Develop mitigation strategies and policies
- Measure progress toward meeting GHG reduction goals[5]

As outlined in House Bill 19-1261, climate change adversely affects Colorado's economy, air quality and public health, ecosystems, natural resources, and quality of life. Colorado is already experiencing harmful climate impacts, including declining snowpack, prolonged drought, more extreme heat, elevated wildfire risk and risk to first responders, widespread beetle infestation decimating forests, increased risk of vector-borne diseases, more frequent and severe flooding, more severe ground-level ozone pollution causing respiratory damage and loss of life, decreased economic activity from outdoor recreation and agriculture, and diminished quality of life. Many of these impacts disproportionately affect rural communities, communities of color, youth and the elderly, and working families. Reducing statewide greenhouse gas pollution will protect these frontline communities, first responders, and all Colorado residents from these and other climate impacts.[6] Local communities have a role to play in reducing statewide greenhouse gas emissions, and that starts with a local greenhouse gas emissions inventory to understand the

[4] https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool

[5] https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool

[6] https://leg.colorado.gov/sites/default/files/2019a_1261_signed.pdf

local contribution to greenhouse gas emissions. This is particularly important because climate change is a problem of cumulative emissions. Understanding local emissions is also critically important, because as we learned in conducting this inventory, the state GHG emissions inventory does not extract county level data.

Methodology of Inventory

EPA's Local Greenhouse Gas Inventory Tool (EPA Tool) was developed to help communities across the United States evaluate their greenhouse gas emissions. This free, interactive spreadsheet calculates GHG emissions for many sectors, including residential, commercial, transportation, and waste and water management. The tool is comprised of two separate modules: one for community-wide inventories, the other for inventories of local government operations only. The tool helps users to develop a base-year community greenhouse gas inventory, following the Global Protocol for Community-Scale GHG Emissions (GPC).

This is a companion tool to the Local Government Operations Module, however our effort did not attempt to inventory independently the emissions related to county government operations. Should Delta County want to undertake this type of inventory in the future, any totals estimated in the Local Government Operations Module could then be included in the Industrial/Commercial sector in the Community GHG Inventory tool.

The tool is pre-programmed with default emission factors and system assumptions needed to calculate emissions or you may enter municipality-specific information. The tool is scalable to accommodate different levels of activity data to meet the needs and constraints of different local governments.[7]

This tool is similar in design to those used by the State of Colorado to prepare the last two updates to the Colorado State Greenhouse Gas Emissions Inventory.[8] For two sectors (coal and oil/gas) the state-level modules were utilized, and then input the resulting emissions into the community module into the "Other Emissions" worksheet. Guidance and advice from climate analysts at both the US EPA and the Colorado Department of Public Health and Environment was extremely helpful in ensuring that this methodology was properly applied.

Methane is a more potent GHG in the atmosphere than carbon dioxide. To reflect this, the EPA Tool's default Global Warming Potential factor of 25 for methane was used to model the 2019 Delta County emissions.

Direct and Indirect Scope of Emissions

To account for direct and indirect emissions, and to provide transparency and a guiding framework for the inventory tool, GHG estimates are normally categorized according to three scopes. The following scopes are defined by the Global Protocol for Community-Scale GHG Emissions and are used throughout the inventory tool:

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[7] https://www.epa.gov/statelocalenergy/local-greenhouse-gas-inventory-tool

[8] https://drive.google.com/file/d/1TxyoktxCOLFd6CaUKZzeqsKgEIHMjdqt/view

- Scope 1: All direct GHG emission sources from activities taking place within the community's geopolitical boundary.
- Scope 2: Energy-related indirect emissions that result as a consequence of consumption of grid- supplied electricity, heating and/or cooling, within the community's geopolitical boundary.
- Scope 3: All other indirect emissions not covered in Scope 2, such as emissions resulting from the extraction and production of purchased materials and fuels, outsourced activities, waste disposal, etc.

The inventory is separated into the nine main emission source categories below, consistent with the reporting standards established under the Local Government Operations Protocol (LGOP), and these sources are further organized by scope.

- Stationary Combustion of Fossil Fuels (for example: emissions associated with heating/cooling, cooking with natural gas, etc.) (Scope 1)
- Electricity Consumption (for example, electricity used in residential homes, businesses, and other usages) (Scope 2)
- Mobile Combustion of Fossil Fuels (for example, cars, trucks, motorcycles, etc.) (Scope 1)
- Solid Waste Disposal (landfills) (Scope 1)
- Wastewater Treatment (septic systems or wastewater treatment facilities) (Scope 1)
- Water Consumption (if water has to be imported via trucks-not applicable in Delta County) (Scope 3)
- Agriculture & Land Management (livestock and fertilizer associated emissions) (Scope 3)
- Urban Forestry (positive carbon sequestration) (Scope 3)
- Waste Generation (if waste is landfilled outside of a jurisdiction-not applicable in Delta County) (Scope 3)
- Additional Emission Sources (Emissions associated with oil and gas drilling and coal mining) (Scope1, 2, or 3)

For each source, data was entered about the relevant county-wide activities (e.g., electricity consumed, fuel used, trash deposited at the county landfill, fossil-fuel extraction, etc.) during 2019. The tool was used to develop a total emissions estimate for a 2019 and also by source category. Default emission factors for each activity are provided which were generally accepted unless additional information was made available. Each emissions source follows a distinct process that was followed to determine the emissions for that source. The Local GHG Inventory Tool provides a useful overview of emissions by source (MT CO_2e) with data from different categories (detailed information on the calculations is provided in Appendix 3 as well as some discussion of potential underestimates in some categories based on limited data.

For this inventory, oil and gas extraction and coal mining have been estimated and included as Scope 1 emissions for these extractive industries by entering values in the "Other Emission Sources" in the Excel tool. These values were calculated using the US EPA State Inventory Modules for coal and oil/gas. (See Appendix C for detailed information on how calculations were handled). Note that these values are different from the stationary combustion category.

Greenhouse Gas Emissions by Source

The overall gross GHG emissions for Delta County is 575,786 MT CO_2e (Table 1). Tree cover has a positive carbon sequestration effect, sequestering 160,475 MT of CO_2 and resulting in a net total emissions of 415,311 MT CO_2e. Figure 1 shows GHG emissions per sector and Figure 2 shows the relative contribution to net emissions by source category. Electricity is the largest overall contributor to GHG emissions, while wastewater treatment and waste disposal emissions contribute the least. It is important to note that fertilizer use, livestock and agricultural soil management practices have not been incorporated into this inventory. [9] As livestock, soil and land management practices can potentially have significant positive and negative impacts on carbon sequestration and emissions, future inventories for Delta County should seek to quantify both the positive and negative impacts from this sector.

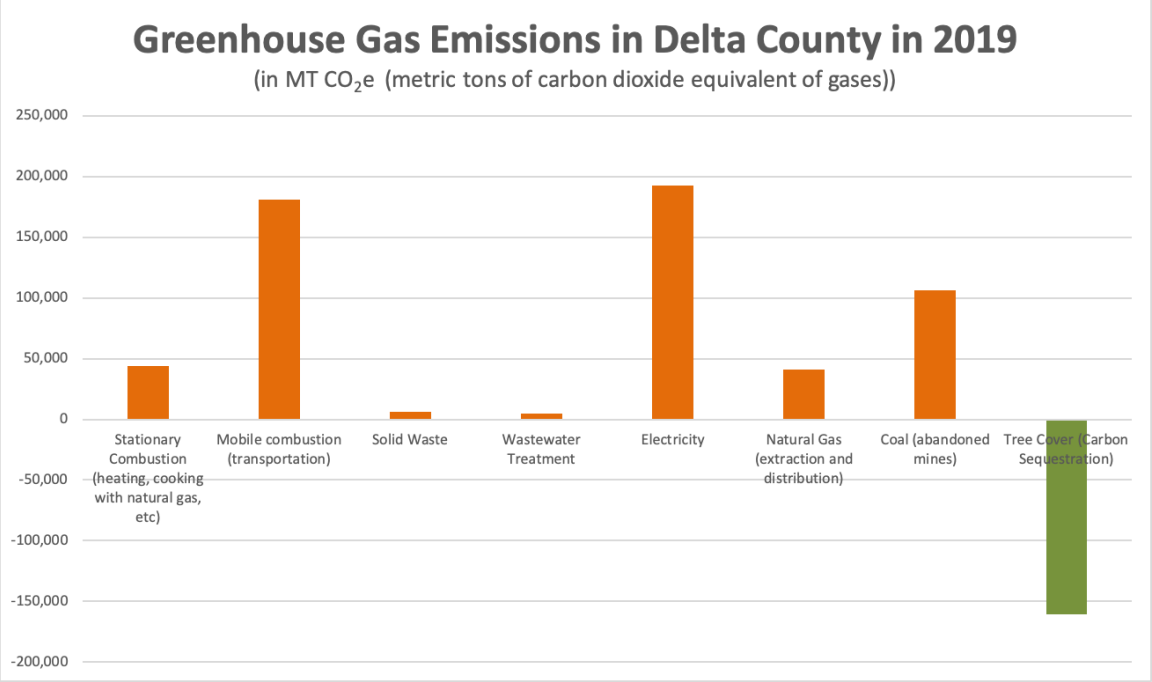

Figure 1: Greenhouse Gas Emission in Delta County, Colorado in 2019

[9] Based on the most recent statewide data through 2015, according to the Colorado GHG Emissions Inventory Report released in September 2019, the agricultural sector makes up 8% of GHG emissions. This is based on aggregate statewide data which does not extract county level data. Localized agricultural emissions can therefore vary across counties.

Table 1: Summary Table of Greenhouse Gas Emissions in Delta County, Colorado in 2019

Source	CO_2	CH_4	N_2O	Total	Percent of Gross Total
Stationary Combustion (heating, cooking with natural gas, etc)	43,642	4	0	43,646	8%
Mobile combustion (transportation)	175,247	537	5,001	180,784	31%
Solid Waste	-	6,193	-	6,193	1%
Wastewater Treatment	-	4,507	-	4,507	1%
Electricity	192,974	-	-	192,974	34%
Natural Gas (extraction and distribution)	20,000	21,175		41,175	7%
Coal (abandoned mines)		106,508	-	106,508	18%
Tree Cover (Carbon Sequestration)	-160,475	-	-	-160,475	-28%
Total (Gross Emissions) MT CO_2e	431,862	138,923	5,001	575,786	
Total (Net Emissions) MT CO_2e	271,387	138,923	5,001	415,311	

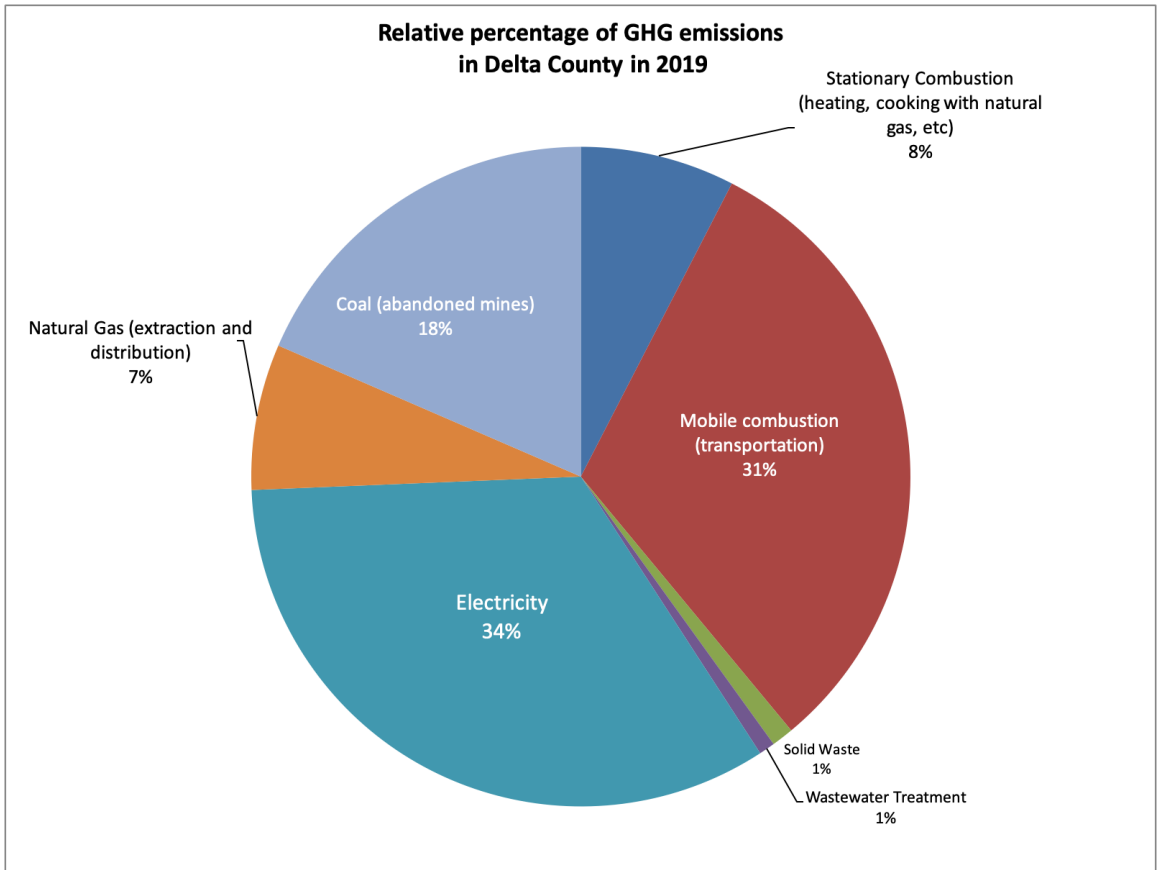

Figure 2: Relative percentage of GHG emissions in Delta County, Colorado in 2019 by category

Conclusions

This emissions inventory is offered in the spirit of providing useful information for forward-looking decision-making to everyone in Delta County. Other counties and cities in Colorado (see Appendix D) have undertaken greenhouse gas emissions inventories prior to, or as part of, sustainability planning or climate action efforts. Inventories of this type are a point in time estimate and can be improved upon by obtaining more detailed information or updating them to reflect real world changes.

For example, because this inventory covers the 2019 calendar year, the emissions estimate associated with electricity usage will likely be higher than future years if overall electricity usage stays relatively the same. This is because in 2020 DMEA changed their energy source mix, transitioning early out of a contract with Tri-State Generation & Transmission Association to a new contract with Guzman Energy that includes at least 40% renewable energy[10]. This change in source will likely have a positive impact in terms of reducing overall emissions.

[10] https://www.montrosepress.com/news/delta-montrose-electric-association-transitions-to-guzman-energy-as-power-wholesaler-finalizing-departure-from-tri/article_328904d0-bd61-11ea-af0a-c7ddd8812518.html

This inventory will help to track trends and to contribute to Delta County's knowledge base in order to inform the citizens and county leadership as they move forward with sustainability planning and climate action.

Appendix A: Glossary of Terms (from EPA GHG Community Inventory Tool)

Term	Definition
Base Year	A measurement, calculation, or time used as a basis for comparison. According to LGOP, it is good practice to aim for a base year that is likely to be representative of the general level of emissions over the surrounding period.
BAU	Business As Usual. Used to refer to a future scenario in which there are no changes to the status quo.
Biogenic	Biogenic emissions or fuels are produced by the biological processes of living organisms. Note that this term refers only to recently produced (i.e., non-fossil) material of biological origin
BOD_5	Biological Oxygen Demand. The amount of oxygen consumed in five days by decomposing waste, used to measure the amount of waste input or output into a system.
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent emissions. This is determined by multiplying the emissions of methane and nitrous oxide by their Global Warming Potential.
CH_4	Methane. Methane is a greenhouse gas with a GWP that is 25 times that of CO_2. It is produced through anaerobic decomposition of waste, enteric fermentation, production of natural gas and petroleum products, and other industrial processes.
Denitrification	The process by which microorganisms remove nitrogen from its fixed form in the soil and release it into the atmosphere in the form of nitrous oxide (N_2O)
Direct Emissions	The emissions generated on-site (as opposed to electricity delivered through a grid system), such as from the combustion of fossil fuels
EF	Emission Factor. The value for scaling emissions to activity data in terms of a standard rate of emissions per unit of activity (e.g., grams of carbon dioxide emitted per barrel of fossil fuel consumed).
Effluent	The treated or untreated wastewater that flows out of a source
EPA	United States Environmental Protection Agency
Fossil Fuel	Any fuel derived from the pre-historic burial of organic matter. Examples include natural gas (methane or CH_4) and petroleum products (gasoline, diesel, kerosene, propane, and others). Combustion of petroleum products releases greenhouse gases into the atmosphere.
Fugitive Emissions	Emissions of gases that escape from pressurized equipment, such as fuel transportation pipelines or wastewater treatment plants.
G.G.E.	Gallon of gasoline equivalent
GHG	greenhouse gas
GPC	Global Protocol for Community-Scale GHG Emissions
GWP	Global Warming Potential. Conversion factor used to compare all greenhouse gas emissions to carbon dioxide equivalent units. The GWP represents the combined effect of the differing times these gases remain in the atmosphere and their relative effectiveness in absorbing outgoing thermal infrared radiation.

Indirect Emissions	Refers to indirect emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling. These emissions can be allocated in an inventory to an entity, but are generated offsite. An example is electricity that is not generated directly at a facility. A facility uses electricity on-site, but the fuels used to generate the electricity are combusted off-site, perhaps at a regional power plant. If the generation source is at a different site that is also operated by the city, it is not an indirect emission source.
kg	kilograms
kWh	kilowatt-hour
LEED	Leadership in Energy and Environmental Design
LFG	landfill gas
LGOP	Local Government Operations Protocol
mcf	thousand cubic feet of natural gas
MG	million gallons
MMBtu	million British Thermal Units, a measure of energy
Mobile Combustion	The combustion of fuels to power a moving vehicle, such as gasoline or diesel fuel in a car or truck
MT CO_2e	Metric tons of carbon dioxide equivalent. This is the standard unit for measuring greenhouse gas emissions.
N_2O	nitrous oxide
Nitrification	Biological process in which ammonia is converted to nitrate (NO_3).
Operational Control	A local government has operational control over an operation if it has the full authority to introduce and implement its operating procedures
RPS	Renewable Portfolio Standard
Scope 1 Emissions	All direct GHG emissions
Scope 2 Emissions	Indirect GHG emissions from the consumption of purchased electricity, heat, or steam.
Scope 3 Emissions	Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, outsourced activities, etc. The Scope 3 emissions included in this inventory are imported water consumption, waste generation, urban forestry, and agriculture & land management.
Short Tons	American ton, equal to 2,000 lbs. One short ton = 0.907 metric tons
Stationary Combustion	The on-site combustion of fuels to produce electricity, heat, or motive power using equipment in a fixed location

Appendix B: Background on EPA Community GHG Inventory Tool

The information below is from EPA.gov's website on the Community GHG Inventory Tool.

EPA's Local Greenhouse Gas Inventory Tool was developed to help communities across the United States to evaluate their greenhouse gas emissions. Use this tool to compile a greenhouse gas (GHG) inventory for an entire community or for local government operations in particular.

This free, interactive spreadsheet tool calculates GHG emissions for many sectors, including residential, commercial, transportation, and waste and water management. The tool is comprised of two separate modules: one for community-wide inventories, the other for inventories of local government operations only. You may choose to use one or both modules.

The tool is pre-programmed with default emission factors and system assumptions needed to calculate emissions or you may enter municipality-specific information. The tool is scalable to accommodate different levels of activity data (ranging from city-wide to individual meters) to meet the needs and constraints of different local governments.

The tool is designed for governments interested in compiling a relatively quick and simple GHG inventory. People interested in emissions from specific facilities should consult EPA data on greenhouse gas emissions from large facilities. The data set includes public information from facilities in nine industry groups that directly emit large quantities of GHGs, as well as suppliers of certain fossil fuels.

Setting up a baseline: The GHG emissions inventory for your city/jurisdiction should encompass all GHG emissions occurring during a selected calendar year. As the Global Protocol for Community Scale GHG emissions indicates, reporting on a calendar year basis is considered standard under existing international, national, state, and voluntary reporting programs. As your city monitors and tracks progress over time in reducing GHG emissions, it is necessary that you establish a performance base year with which future years may be compared. The tool can be used to develop a base year of emissions, as well as used to track emissions over time if different versions of the Excel file are saved.

The selection of the base year should take into account several factors: data availability, anomalies present in the baseline caused by external factors such as weather or economic conditions, emission reduction efforts that the city has undertaken in recent years, and the context in larger state, national, or voluntary efforts.

Appendix C: Bases of Calculations for Delta County GHG Inventory

This information is provided to detail how the values in Table 1 were calculated using the inventory tool.

General Data

- Population entered as 31,162. 2019 Population of Delta County obtained from US Bureau of Census[11]
- The control sheet in the module was set to the RMPA eGRID subregion for the electricity grid.
- Note that in this report, all sectors are **reported together** as disaggregation is not possible. DMEA and Black Hills Energy provided one value for all the electricity and natural gas provided to Delta County and did not disaggregate by sector (residential, commercial/institutional, industrial, energy generation). In light of this limitation, all data for other categories was entered in the "Residential" sector. When viewing the summary emission calculations in the associated excel worksheet, please recall that residential emissions will be misleading, **this is the total emissions for all sectors.**

Residential & Commercial Building Energy Use (Stationary and Electricity Modules)

Electricity

- Emission factor for DMEA supplied electricity (0.73 kg - CO2e/kWh) and total energy usage for Delta County (264,902,705 kwh) supplied by the James M. Heneghan, DMEA Chief Power Supply Officer.
- Note that DMEA provided one value for all the electricity provided to Delta County and did not disaggregate by sector, therefore it is not possible to view electricity emissions by sector type (residential, commercial/institutional, industrial, energy generation).
- Note that 2019 data will not reflect DMEA's 2020 change in energy source mix which will likely have a positive impact in terms of reducing overall emissions.

Natural Gas

- Black Hills Energy Corporation provided usage data for 2019 along with emissions factor. Total natural gas provided to customers in Delta county was 8,719,640 therms[12] or 800,702 mcf (based on 2019 EIA conversion factor for the State of Colorado of 1 mcf=10.89 therms[13]).

Propane and other sources

- This inventory did not attempt to estimate emissions from propane used in the county or other sources of fuel (gasoline, diesel, LPG, butane, residential fuel oils) due to complexity in gathering this data.

Transportation (Mobile module)

[11] https://www.google.com/search?q=population+of+delta+county+colorado&oq=population+of+delta+coun&aqs=chrome.0.0l2j69i57j0l3.5376j0j4&sourceid=chrome&ie=UTF-8

[12] A therm is a unit for quantity of heat that equals 100,000 British thermal units.

[13] https://www.eia.gov/dnav/ng/ng_cons_heat_a_EPG0_VGTH_btucf_a.htm

- Emissions values for all fuels are calculated using the supplied values in the module.

Vehicle Transportation

- Transportation tail-pipe emissions are calculated using total Vehicle Miles Traveled (VMT), which is derived using average annual vehicle miles traveled by number of vehicles by type registered in Delta County. This calculation utilizes average annual miles traveled by vehicle type data using federal Department of Energy data sources[14].
- The Colorado Department of Public Health and Environment (CDPHE) conducts on-road vehicle surveys to characterize the Colorado vehicle mix (95% gasoline, 5% diesel) which has been applied to passenger cars and light trucks. For motorhomes, the fuel mix has been estimated at 60% gasoline, 40% diesel based on personal knowledge.
- Gasoline (95% per CDPHE) 24.1 average mpg per EPA module for passenger cars, 18.5 for light tricks and 50 mpg for motorcycles per EPA module.
- Diesel (5% per CDPHE) 32.4 average mpg per EPA module for passenger cars, 22.1 for light trucks and 12.96 for heavy duty vehicles (school buses) per EPA module
- All 105 registered buses in Delta County were assumed to be school buses for the purposes of calculating emissions.
- Motorhomes VMT data based on Federal Highway Administration, 2009 National Household Travel Survey (NHTS)[15]
- Note: Delta County supplied vehicle registrations under the vehicle type Special Mobile Machinery (167) however due to uncertainty in VMT and average gas mileage, the inventory does not include those vehicles.

Airline Transport

- No estimates of airline travel have been incorporated into the estimate at this stage.

Solid Waste

- Annual tons of waste disposed at the Adobe Buttes Landfill for years 2007-2019 were provided by personal conversation with the current operator of the landfill, Gary Bardessona.
- The California Air Resources Boards Landfill Emissions tool, which is based on the IPCC First Order Decay (FOD) module was utilized per guidance in the EPA Community GHG inventory tool.
- Calculations for this category only account for landfilled waste and are not inclusive of any county or private composting efforts.

Wastewater Control

- Personal conversations with Greg Rajnowkis, Environmental Health Director from the Delta County Department of Public Health confirmed that there are approximately 6700 permitted septic systems in Delta County. Assuming that the residents inside municipalities are largely on municipal wastewater treatment services, then approximately ~18000 people in Delta utilize septic.
- The municipalities of Delta, Hotchkiss, Paonia, Crawford and Cedaredge all have wastewater treatments plants (Orchard City is all septic). Requests for information on the operations of the plants were sent to each municipality, however at this time, no

[14] https://afdc.energy.gov/data/10309

[15] https://nhts.ornl.gov/tables09/fatcat/2009/best_VEHAGE_VEHTYPE.html

information has been provided. Therefore, the purposes of completing this project in a timely manner, the model assumes that all systems are aerobic treatment facilities and that there is little to no industrial nitrogen load into the wastewater treatment system. Therefore, the results for the wastewater control should be viewed as potentially not accurately reflecting the total emissions for this category if any of the plants utilize nitrification/dentrification systems.

Water

- Personal communication with Delta County Administrator Robbie LeValley confirmed that Delta County does not import any water for usage. Therefore, the scope 3 emissions associated with this category would be zero.

Agriculture and Land Management

- The local GHG inventory tool does not currently incorporate any calculations associated with livestock. Delta County has a significant livestock population with more than 40,000 cattle, 9000 chickens, 15,000 sheep, 3000 goats and 3000 horses.
- Fertilizer usage (both manure as well as commercial fertilizers for agricultural sector or home lawn/gardening) have not been not included.
- Emissions for livestock and land management are likely significant, however they are not included in this inventory due to limitations of the inventory tool and available data.

Urban forestry

The Local GHG Inventory Tool utilizes the carbon sequestration factor of 2.23 metric tons C/hectare/year to calculate the sequestration benefit of urban forestry. However, the Tool is not optimized for larger geographies such as Delta County with a heterogeneous mix of different vegetation types, therefore there is some inherent uncertainty associated with this calculation. Therefore, in lieu of using the urban forestry model within the Local GHG Inventory Tool, this inventory instead used the annual carbon sequestration values available at the online tool *I Tree County* (https://county.itreetools.org/maps/) of 176,893.9 tons CO2E/year (160,475.45 CO2E metric tons/year).

Other Emissions

- The Local GHG Inventory Tool allows for integration of other emission sources. For Delta County the emissions associated with oil and gas extraction and coal mining were integrated into the module under the "other emissions" category.
- EPA State Inventory modules[16] specific to these sectors were utilized to calculate the emissions associated with these operations in Delta County following the methodology utilized by the State of Colorado for their most recent GHG inventory[17] and confirmed by EPA staff Andrea Denney via email of the applicability of the modules for this purpose.

Oil and Gas

- Default emissions factors and activity for State of Colorado were selected on the control sheet in this module.

[16] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

[17] https://drive.google.com/file/d/1120LdxmecGTuf7uil9l6YmjOQonYOnxV/view

- Production values for oil and gas for 2019 were obtained from Colorado Oil and Gas Conservation Commission's online data sources[18]. In 2019, the COGCC recorded 14 oil and gas wells in Delta county, 3 of which had natural gas production in 2019. No wells produced oil.
- Natural gas transmission pipeline length (in miles): obtained by utilizing mapping feature on the National Pipeline Mapping System public view website tool[19]. Note that this does not include the Bull Mountain Pipeline which is not mapped because it is classified as a rural gas gathering pipeline, which is exempt from pipeline safety regulations.
- Natural gas distribution pipeline length was provided by Black Hills Energy.
- Natural gas gathering line pipeline length was provided via email correspondence from the Delta County tax assessor, Debbie Griffith.
- Venting and Flaring calculations were based on a data contained within a multi-NGO 900 Series Prehearing Statement which detailed that approximately 12.70% of natural gas production is flared in Delta County. The county's total production in 2019 of 445,542 mcf is converted to BTU by multiplying by the 2019 conversion of 1000 MCF=1.037 MMBTU and then 1000 MCF=0.001037 Billion BTU. This result of 462 billion BTU was utilized in the inventory tool as the activity data.
- The values in the summary sheet of the Natural Gas and Oil module are 0.2 MMTCO2e and 847 $MTCH_4$. $MMTCO_2e$ for CO2 multiplied by 1,000,000 to provide $MTCO_2e$ and CH_4 values multiplied by 25.

Coal

- As of 2019, there are no active coal mines in Delta County. Therefore, the emissions associated with this area were calculated from "abandoned "mines (mines that were formally under active coal mining that continue to emit some emissions). Information related to the former mines (Sanborn Creek, Bowie #1, Hawks Nest East, Somerset Mine, Bowie #3, Cypress Amax Minerals Company, Bowie Resources) in Delta County was obtained from the State Inventory Coal Module which was used for the 2019 Colorado State Inventory.
- It is of note that the large West Elk coal mine in Gunnison County is just across the border from Delta County. Because of the trans-boundary nature of greenhouse gas emissions it is worth making note that while the emissions from this mine (2019 reported emissions[20] = 418, 799 MT CO_2e) are not included in the Delta County inventory, the impacts from the emissions maybe of interest to the county.

[18] https://cogcc.state.co.us/data5_ext.html#/cogis

[19] https://pvnpms.phmsa.dot.gov/PublicViewer/

[20] www.ghgdata.epa.gov

Appendix D: Examples of GHG Inventories and Climate Change Plans from other counties or cities in Colorado

Colorado State 2019 Inventory
https://drive.google.com/file/d/1TxyoktxCOLFd6CaUKZzeqsKgEIHMjdqt/view

Gunnison County
https://www.gunnisoncounty.org/DocumentCenter/View/1181/Gunnison-County-Carbon-Policy-Task-Force-Final-Report-and-Recommendations?bidId=

City of Durango
https://thrivingearthexchange.org/project/durango-co/

Ouray and San Miguel counties
https://www.sanmiguelcountyco.gov/DocumentCenter/View/172/Gas-Emissions-Inventory-Report-and-Sustainable-Energy-PDF

Crested Butte
https://www.crestedbutte-co.gov/vertical/sites/%7B6058FFBB-CB06-4864-B42F-B476F794BE07%7D/uploads/Crested_Butte_Climate_Action_Plan_December_2019.pdf

Garfield County
http://garfieldcleanenergy.org/wp-content/uploads/2019/08/Glenwood-Springs-ECAP.pdf

Boulder
https://bouldercolorado.gov/climate/boulders-community-greenhouse-gas-inventory