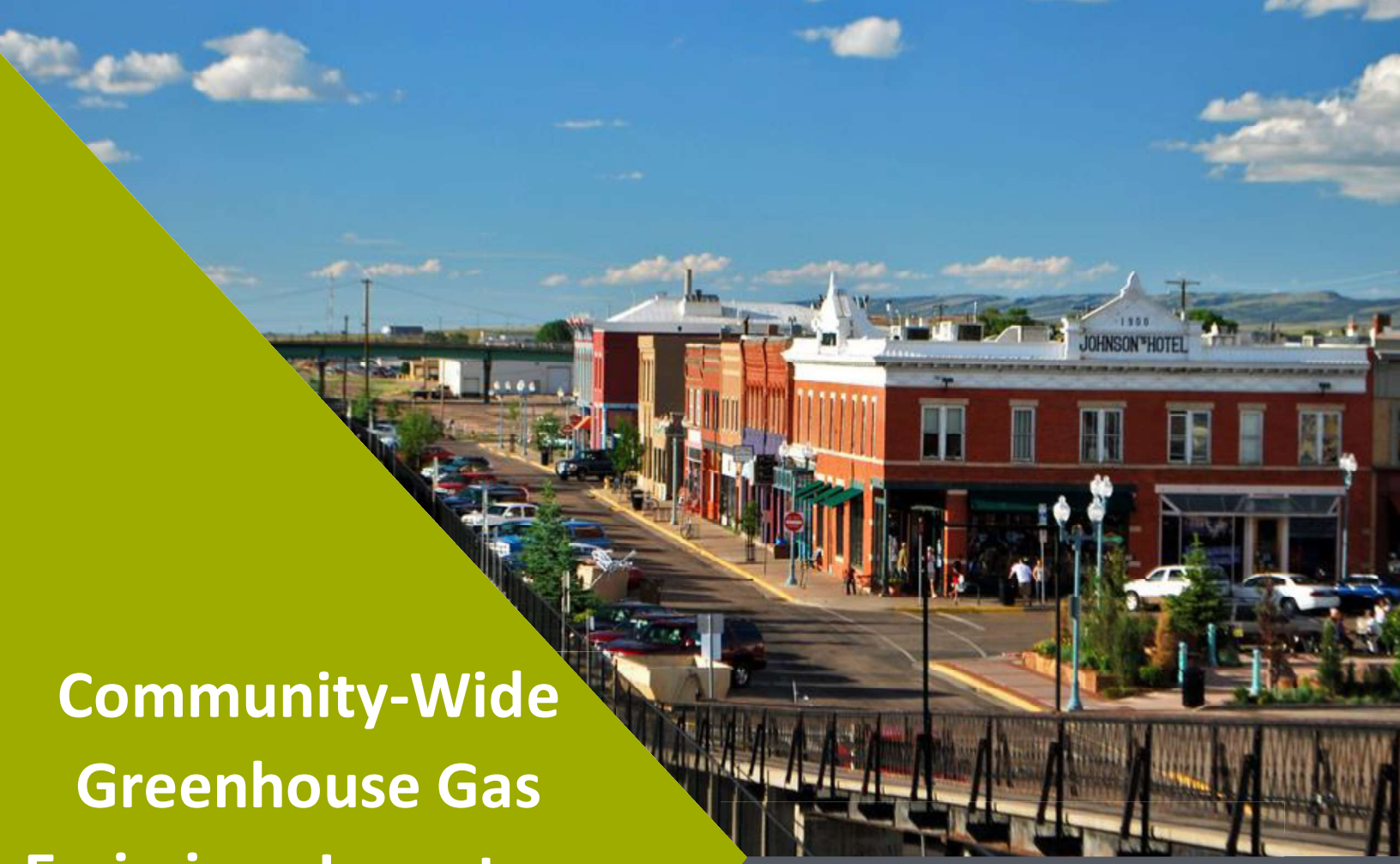

Community-Wide Greenhouse Gas Emissions Inventory

Authors

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Introduction and Purpose

The City of Laramie has never conducted a comprehensive greenhouse gas emissions inventory. This is a problem because in order to make reductions it is necessary to have an understanding of the current situation and have data to support recommendations for the future. The purpose of this project is to collect greenhouse gas data from the City of Laramie and the greater surrounding area. This includes emissions from each sector of the community such as; municipal, university, commercial, residential, and transportation related areas. Other towns with demographics similar to Laramie have participated in greenhouse gas emissions inventories as a necessary first step toward achieving emission reduction goals. With the inventory completion through this project, a baseline carbon footprint for the city will be established. Once the baseline is established, the city can move forward toward planning to reduce its' carbon footprint and achieving emission reduction goals (Bendstend, 2020). This project will also serve as a guide for a yearly greenhouse gas inventory for the City of Laramie to ensure continuous improvements.

Background

The city of Laramie helped to facilitate a greenhouse gas emissions inventory concerning municipal use within the city in 2019. (Leininger, 2020). The Alliance for Renewable Energy (ARE) played a key role in pushing the city for emissions reductions -- in the Fall of 2018, a group of Laramie community members organized in the interest of passing a carbon neutral resolution (Leininger, 2020). The group pitched the idea to the Environmental Advisory Committee and gained the support of the City Manager's office by demonstrating how other cities have committed to emissions reductions (Leininger, 2020). A partnership was forged between the city and the University of Wyoming's Campus Sustainability course, housed in the Haub School, to complete the first municipal-level emissions inventory (Leininger, 2020). After the inventory was presented to City Council, the Environmental Advisory Committee started working on carbon emissions reduction recommendations (Leininger, 2020). Throughout the entirety of the process ARE has continued to foster community support to show elected officials that moves toward carbon neutrality is what the community wants (Leininger, 2020). The group has also engaged in community stakeholder outreach, for example, encouraging the Laramie Regional Airport, and other entities, to apply for Blue Sky Grants designated for rooftop solar (Leininger, 2020). The alliance continues to do more educational outreach to let community members know about opportunities for Renewable Energy (Leininger, 2020).

The Environmental Advisory Committee (EAC) is a group of members appointed by the City of Laramie to make actionable recommendations concerning environmental issues that the city may face. In regard to the Emissions Reductions and Carbon Neutrality, the group created a document that describes 14 recommendations for the City of Laramie to achieve this goal. The recommendations are broken into two groups, Framework Recommendations and Targeted Recommendations – the first group essentially laying the necessary foundation for the second

group. The Framework Recommendations include; Establish Goals, Draft Comprehensive Plan, Perform Regular Emissions Assessments, Implement Outreach, Provide Training, and Explore Financing. The Targeted Recommendations include; Streamline Procedures, Upgrade/Replace Current Fleet Vehicles, Replace Maintenance Equipment, Continue Improving Facility Energy Efficiency, Install Rooftop Solar on Municipal Facilities, Facilitate Rooftop Solar Bulk Buy Program, Reduce Emissions from Solid Waste Management, and Increase Natural Carbon Capture. The full EAC Recommendations document can be found in **Appendix D**.

The greenhouse gas data collected for use in this project was done so in partnership with the International Council for Local Environmental Initiatives (ICLEI), an international organization empowering local governments towards sustainable development (ICLEI, 2020). Many communities across the nation and around the globe have jumped on the opportunity offered by ICLEI to conduct a greenhouse gas emissions inventory with the hope that the initial measure would help to illuminate areas of highest emissions and make significant strides toward carbon neutral goals in the future. In the U.S. alone, there is participation from 48 states and hundreds of communities within them (ICLEI, 2020).

Laramie has joined the movement as part of the climate action cohort. “Spearheaded by the Municipal Government of Park City, Utah, and ICLEI-Local Governments for Sustainability, the cohort is one outcome of the Mountain Towns 2030 Summit held in Park City and provides a pathway to turn the event’s thought leadership into immediate action.” (Roberts, 2020). Out of the participating mountain towns in the Mountain West region, Laramie is the only community in the state of Wyoming taking action as part of this cohort. Other cohort participants include; from Idaho; Bellevue, Blaine County, Carey, Hailey, Ketchum, McCall, and Sun Valley. From Utah; Grand County, Moab, Park City, Salt Lake County and Summit County. From Montana; Big Sky and Bozeman. And from Colorado; Gunnison, Golden, Mountain Village, Mount Crested Butte, Salida, and Vail. Jackson is the only other ICLEI member community in the state of Wyoming.

The shared goal among all involved communities is to achieve net zero carbon emissions by the year 2030. This is imperative for mountain towns in the mountain west because climate change possess a serious threat to the tourism industry which these communities rely on so heavily. In order to reach this goal, ICLEI has developed a five milestones framework. This framework has been used by hundreds of U.S. cities in order for them to, “manage greenhouse gas emissions, plan for community resilience, and develop a comprehensive sustainably plan.” (Roberts, 2020).

The inventory is part of the first step in which the community is to simply asses where it currently stands. The inventory process requires communities to gather and analyze data concerning the amount of energy consumed by various sectors, the diversity of energy sources utilized and offered, the amount of waste generated, the amount of and variety of vehicle fuel use, and more. By collecting the data of this project, the results can be used to set goals specifically for the Laramie community, in addition to the zero carbon by 2030 goal proposed by the cohort and develop a strategy for execution. The last milestones include implementation and motoring to ensure long term success.

ICLEI provides a toolkit equipped with how-to instructions as well as helpful resources and aides such as ClearPath which, "is a powerful, advanced web application for energy and emissions management." (ClearPath, 2020). ClearPath analyzes inputs from various community sectors including Residential energy, commercial energy, industrial energy, transportation and mobile sources, solid waste, water and wastewater, agriculture process emissions, upstream activities, and consumption. Member communities of ICLEI have been able to utilize the tools provided, including ClearPath, to create impactful change in their communities concerning low emissions, nature based, circular, resilient, and equitable and people-centered development.

Project Description

This project has been divided into three different components - data collection, data entry, and data interpretation. The first step for this project required each group member and our project mentor to create accounts with the International Council for Local Environmental Initiatives (ICLEI). This membership provided educational webinars for data collection and processing, as well as connection to the 2030 Mountain Towns Cohort (ICLEI, 2020). These highly structured webinars were released on a weekly basis (every Thursday) for 7 consecutive weeks. The webinars walk through all of the necessary steps for both gathering data from the appropriate sources as well as digesting the information and working with ICLEI's web-based calculator, ClearPath. Each week, at least one member of our group attended the webinar. The topics included; Climate Science and Scoping, Data Collection for Energy, Waste, Water, and Wastewater, Data Collection for Transportation Sector, Data Collection for Airport and Waterborne Emissions, ClearPath Data Entry, and Quality Assurance Protocol Compliance (see **Appendix C**). Additionally, this resource provided invaluable access to greenhouse gas emission inventory professionals as well as interactions with other towns currently working through this process. The city of Laramie is now a member of ICLEI and through this membership the city can continue the inventory process. In order to accurately calculate Laramie's carbon footprint, our group has had to become familiar with Clear-Path, ICLEI's online software for data analysis (ClearPath, 2020). Since the conception of this project, our team has worked closely with our project mentor, Monika Leininger, a staff member of the Powder River Basin Resource Council and a member of the Alliance for Renewable Energy (ARE). As an engaged community member and diligent organizer, Monika has been essential to our project. She has provided us with important contacts, helped problem solve, and kept close tabs on our projects progress (Leininger,2020).

The second step in the planning phase was to start gathering contacts for the data collection. We needed to obtain contacts for; The City of Laramie, Black Hills Energy, Rocky Mountain Power, Wyoming Department of Transportation, Transit Services at the University of Wyoming, The Laramie Regional Airport, and Union Pacific Railroad. All of the contacts obtained are listed in **Appendix A**. The data being collected from these sources include; solid waste, waste and wastewater, residential energy, commercial energy, industrial energy, transportation and mobile resources.

The next step in our project was the data collection phase during which we reached out to our contacts to obtain data. We reached out to the city for wastewater treatment, water supply, waste and municipal vehicle miles traveled (VMT). ICLEI has provided templates through the 2030 Mountain Town cohort which lay out the necessary data requests and facilitate seamless communication with stakeholders. Data requests were also sent out to the Wyoming Department of Transportation and the Laramie Regional Airport. Industrial emissions data were obtained from EPA Flight, a federal greenhouse gas reporting tool that large facilities are required to use. Our deadline to get all data requests sent was Friday February 21st, in concurrence with ICLEI's final data collection webinar.

Once we obtained the necessary data, the final step involved entering our data into the ClearPath online greenhouse gas emissions calculator. In order to use this calculator, we developed structured factor sets and parameters. The factor sets and parameters are unique to each town and must be individually entered to ensure accuracy. Transportation set factors were obtained directly from ICLEI. Waste set factors were collected from Cal-Recycle. Grid utility factors were obtained from the EPA. Please see, "Laramie GHG inventory 2019 Manual" in **Appendix B** for details regarding specific data acquired, Clear-Path Entry, and contacts.

Outcomes

The desired outcomes for this project are comprehensive and broad in scope. As mentioned, this report aids in the completion of the first milestone of the ICLEI framework but there is still much work to be completed in order to enact change in the community. With the City of Laramie having recently passed a net zero carbon emissions goal by 2050 (Bendstend, 2020), and having partners such as our peer mentor, Monika Leininger, who were engaged and able to connect us with ICLEI mountain towns, we were well positioned for this project.

This project required immense collaboration within the local community and with stakeholders to obtain information and get results. Each of us managed an emissions sector and gathered data with the of help contacts relative to each sector. With this information, we compiled a comprehensive evaluation of the emissions production within the City of Laramie. This information will serve as a baseline of GHG emissions as well as aid the City of Laramie in the reduction of these captured emissions.

Sector Emissions

The city of Laramie produced 1,015,620 metric tons of CO_2 equivalent in 2019. Of these emissions, the majority were scope 1 emission as seen in figure 1. Scope 1 Emissions are all direct emissions that originate within the city limits. Scope 2 emissions are emissions that are indirectly produced such as purchased electricity (Green Element ltd, 2020). The ClearPath calculator broke down the emissions into six categories, Waste & Wastewater, Commercial Energy, Solid Waste, Transportation and Mobile Services, Residential Energy, and Industrial Energy. Each sector had its own carbon dioxide equivalent that contributed to Laramie's overall footprint. Figure 1a shows a pie chart of Laramie's greenhouse gas emissions by sector.

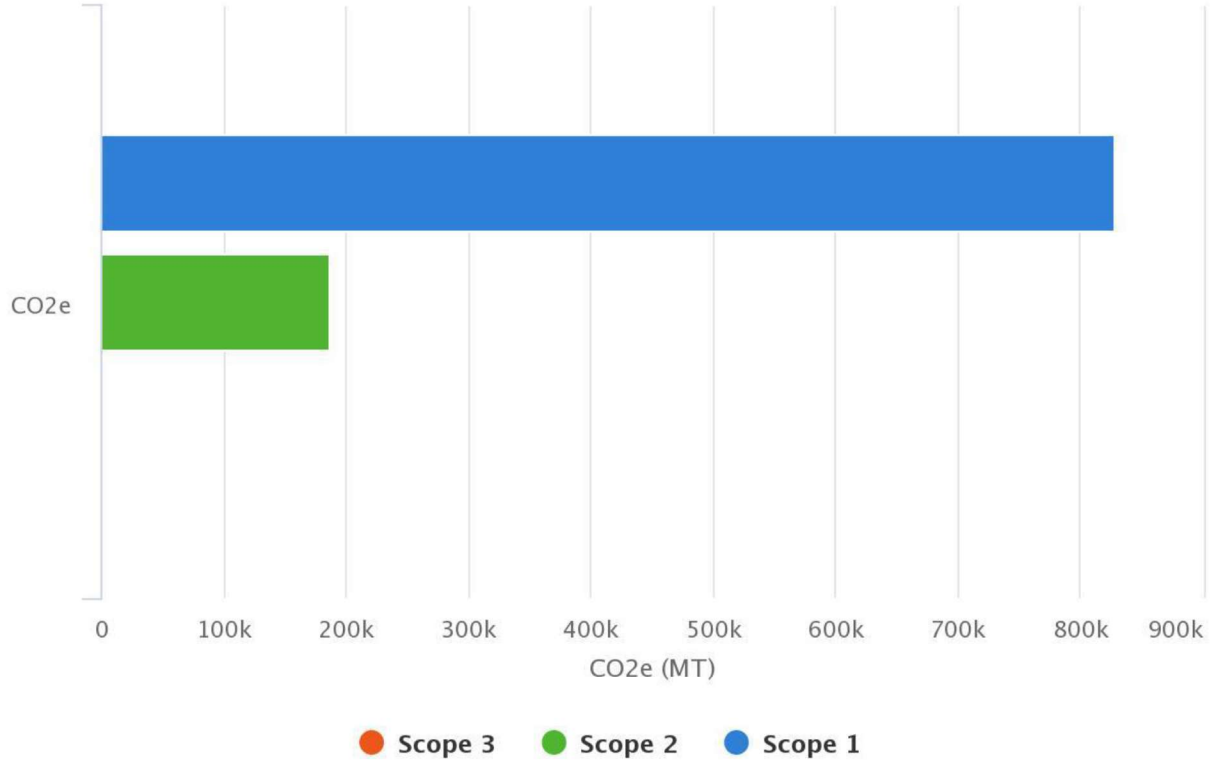

Figure 1

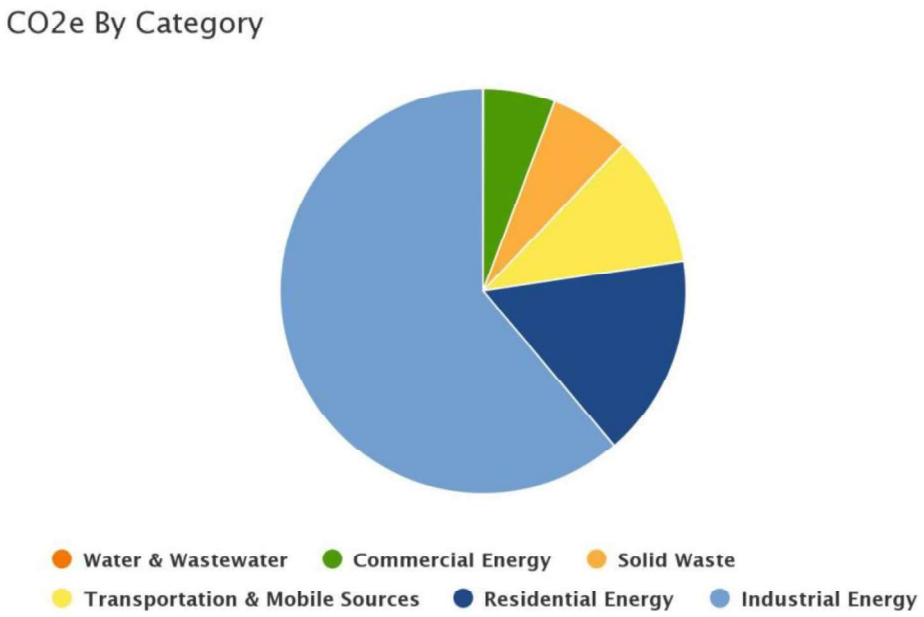

Figure 1a

As shown in the diagram the sector of the city that is contributing the most to Laramie's greenhouse gas footprint is Industrial energy, next residential energy, transportation, followed by solid waste, water and commercial energy.

For the industrial energy sector there were two entities that contributed to the greenhouse gasses. The Mountain Cement Company and the University of Wyoming's Central Energy Plant. These two sources combined total 621,416 CO_e (MT) or 61.19% of emissions. This data was obtained directly from the EPA due to all industrial entities being required to report their greenhouse gas emissions. The breakdown of the emissions is shown in figure 2.

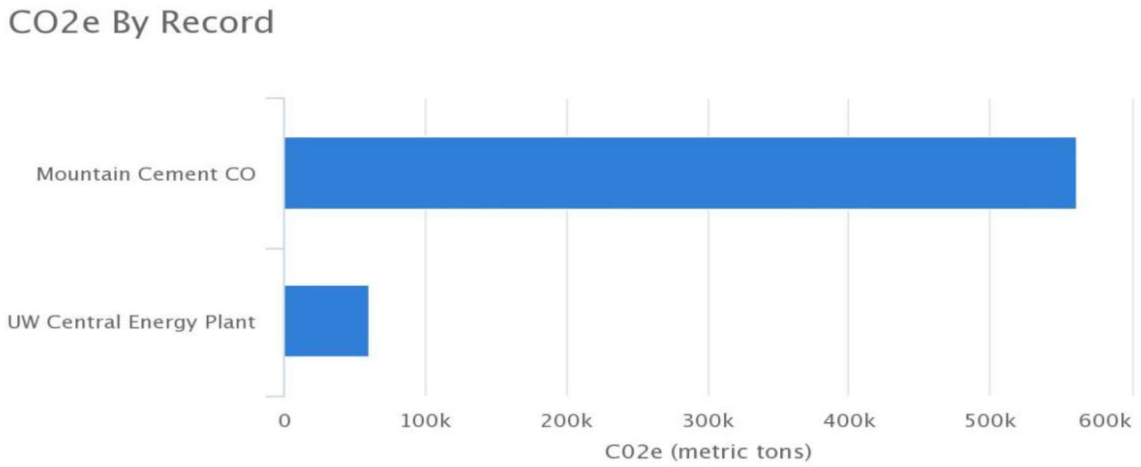

Figure 2

Residential Energy was the next largest contributor followed by commercial energy. Residential energy contributed 134,286 CO_2e (MT) or 13.22% of emissions and commercial energy contributed 52,222 CO_2e (MT) or 5.14%. This consisted of Electricity from Rocky Mountain Power and Natural Gas from Black Hills Energy. Power comes to Laramie from three different substations and is distributed to residences - the natural gas is distributed directly to houses. The emission breakdown for residential energy is shown in figure 3 and the breakdown for commercial energy is show in figure 4.

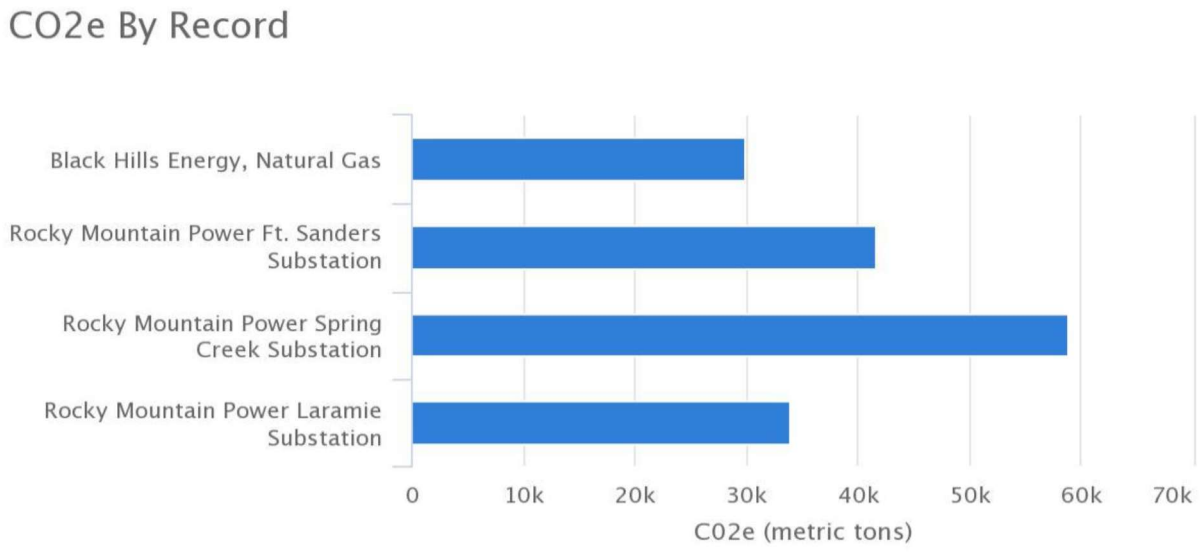

Figure 3

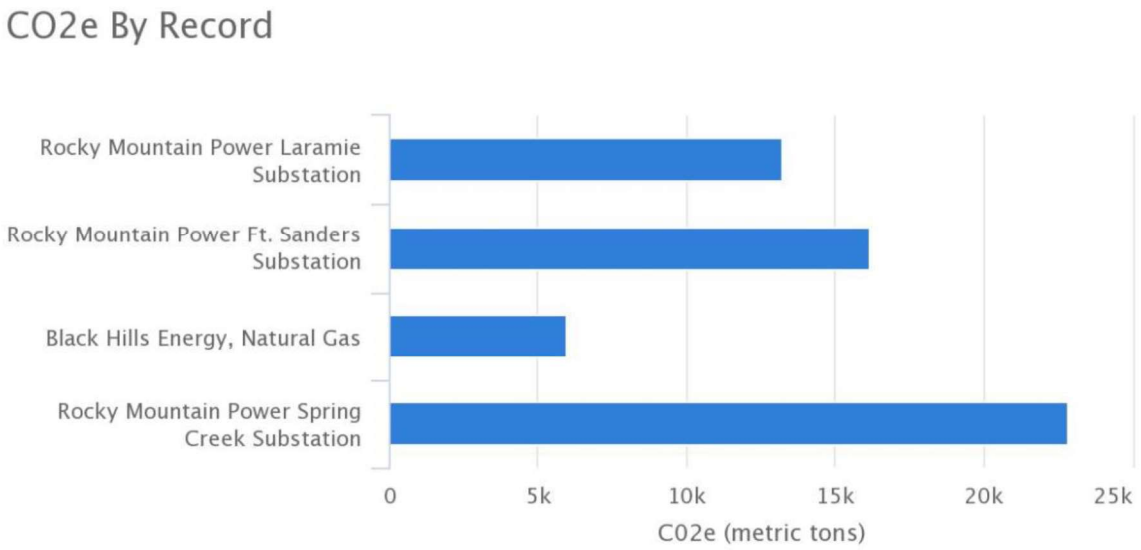

Figure 4

Following residential energy, the next biggest contributor was transportation services. Transportation services contributed 104,882 CO_2e (MT) or 10.32%. The transportation greenhouse gasses are from the Wyoming Department of Transportation vehicle mileage data and is translated into gasoline and diesel burned. Also included in transportation, is rail transport. The railroad emission was estimated based on total miles of track within jurisdiction. The airport emission was calculated based on fuel sales at the airport. The emission breakdown is shown in figure 5.

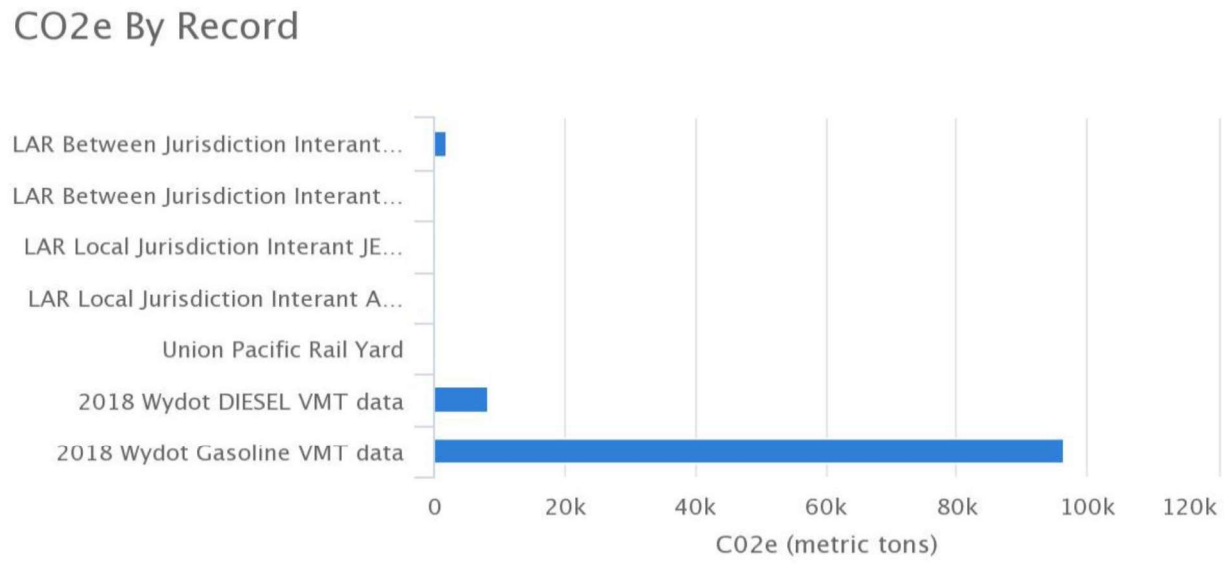

Figure 5

The city's own internal entities had the next largest amount of greenhouse gas emissions. The Laramie landfill contributed 64,823 CO_2e (MT) or 6.38%. The water treatment plant contributed 274 CO_2e (MT) or 0.03%. Solid waste emission was obtained from the city owned Landfill. The water transportation and treatment were also obtained directly from the city. These can be seen in figures 6 and 7.

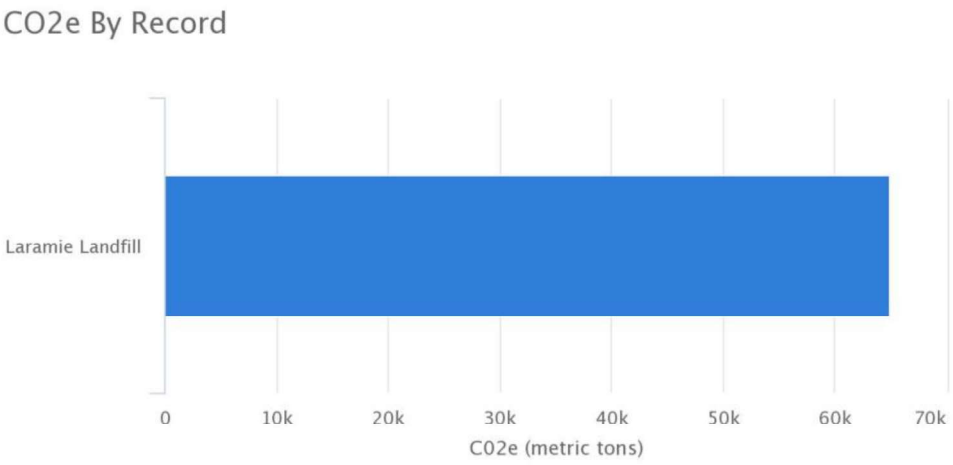

Figure 6

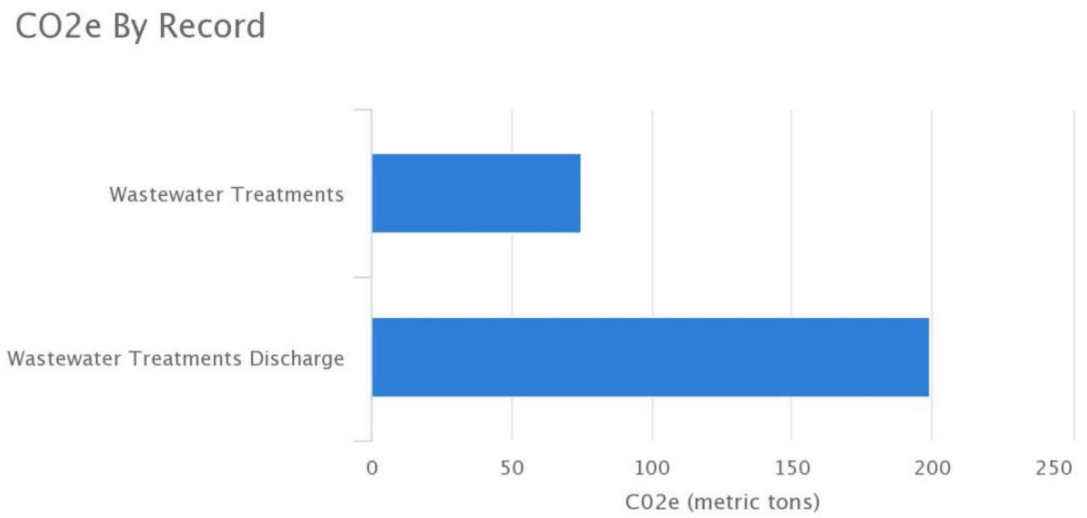

Figure 7

How-To Guide (GHG Manual)

As a deliverable for this project, our group assembled a Greenhouse Gas Emissions Inventory Manual for the City of Laramie (see **appendix B**). This guiding document describes the data processing program (ICLEI ClearPath) utilized, the process underwent to gather data, all of the necessary contacts for data collection, and the methods for uploading the data into a digestible format. The sections of this document include; Overview, ICLEI and ClearPath Registration, Data Collection Methods, Data Input Methods, and an appendix with relevant documents. Not only does Laramie now have a baseline, but this manual will allow the city to monitor its progress by replicating our inventory on a routine schedule – setting a precedent of consistency and accuracy in the city's emissions related data collection.

COVID-19 Limitations

Due to the remote data-oriented nature of this project, we faced few challenges due to COVID-19. Most of our work was already online and consisted of virtual and electronic interaction with necessary stakeholders. The major impediment caused by the pandemic pertained primarily to communications. Instead of meeting with group members on a weekly basis in person, we used Zoom to facilitate these meetings. Our project mentor, Monika Leininger, was able to attend our weekly meetings so we provided updates and discussed any issues during that time. Outside of that, our group utilized text and email to remain on track and to troubleshoot any issues that arose.

One of our project deliverables was also altered due to COVID-19. We had initially planned to present the finding of this project to the Laramie City Council but were unable to do so. alternatively, we will be providing the City Council with copies of this report and other deliverables, such as the manual, for their review.

Conclusion

Overall, the Laramie Community-Wide Greenhouse Gas Inventory was a success. By completing this inventory, the City of Laramie decision makers now have an emissions baseline of data to be referenced moving forward. With the recent passing of the Emissions Reductions and Carbon Neutrality resolution, the community can now make advancements toward the next four ICLEI milestones which include setting goals, developing a strategy for reduction, implementing the climate action plan, and monitoring progress. Laramie has the great opportunity to act as a launching pad for the rest of the state of Wyoming in matters concerning emissions reductions - having this appropriately conducted inventory will be an essential tool in this process. Other communities in the state can conduct their own inventories with the guidance and assistance from the City of Laramie and the information provided in this report to hopefully in the future gain a comprehensive, state-wide inventory.

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Appendix A - Contacts

Name	Organization	Contact	Reason for Contact
Monika Leininger	Powder River Basin Resource Council	Monikal@powderriverbasin.org	Project mentor, ARE connection, and contact facilitation
Darren Parkin	City of Laramie	Dparkin@cityoflaramie.org	Access to city data (solid waste, waste and waste water)
Rachel Allen	Black Hills Energy	Rachel.allen@blackhillscorps.com	Access to energy data (residential, commercial, and industrial)
Sharon Fain	Rocky Mountain Power	Sharon.fain@pacificorp.com	Access to energy data (residential, commercial, and industrial)
Chad Mathews	Wyoming Department of Transportation	Chad.mathews@uwyo.edu	Access to transportation and mobile resource data
UW Transit Staff	Transit Services at the UW	Tps@uwyo.edu	Access to transportation and mobile resource data
Jack Skinner	The Laramie Airport	Skinner@laramieairport.com	Access to transportation and mobile resource data

Appendix B - Laramie GHG Inventory 2019 Manual

Please see additional deliverable attachment for the complete manual.

Laramie Greenhouse Gas Emission Inventory Manual

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Appendix C: ICELI Webinar links 2020

Webinar Title	Link
Climate Science & Scoping	https://vimeo.com/386811928/d7e512cc44
Data Collection for Energy, Waste, Water, and Wastewater	https://vimeo.com/389026584/4cd34ec35c
Data Collection for Transportation Sector	https://vimeo.com/389795914/2958b0ea9e
Data Collection for Airport and Waterborne Emissions	https://vimeo.com/391486819/afe60d7204
Data Entry	https://vimeo.com/395784711/8d088958f5
Quality Assurance Protocol Compliance	https://vimeo.com/404775035/67ed450da7

Appendix D - Environmental Advisory Committee Recommendations

Environmental Advisory Committee Recommendations

Prepared by the EAC Subcommittee on Emission Reduction and Carbon Neutrality for the City of Laramie

February 2020

INTRODUCTION

In this document, we provide recommendations for municipal operations and community efforts to achieve a net zero emissions goal for the City of Laramie. The overall goal of "net zero" means that the city and the community will work to reduce current greenhouse gas emissions as much as reasonably possible, while also working to implement measures and changes to offset the remaining emissions that cannot be completely eliminated. These recommendations will work to make the *net* greenhouse gas emissions—including efforts from reduction, capture, and offset—as close to zero as is possible and feasible. Throughout this document, "emissions" refers to the emissions of the greenhouse gases (GHGe), including carbon dioxide, methane, and nitrous oxide.

We recognize that attaining a goal of net zero emissions is a complex process that will require working towards goals that are both broad and specific, goals that will require large changes in municipal operations and "low hanging fruit," and goals that can be accomplished in the near- and long-term. To that end, we provide hierarchical and multi-faceted recommendations. Our Framework Recommendations consist of (1) establishing emission-related goals, (2) drafting a comprehensive emissions reduction plan, (3) performing regular emission assessments, (4) implementing outreach, (5) providing trainings, and (6) seeking funding. From these Framework Recommendations, we then outline more specific, Targeted Recommendations to better facilitate municipal emissions reductions in the short term.

1 FRAMEWORK RECOMMENDATIONS

Because Laramie currently lacks a protocol for managing emissions, we first recommend that the city government adopt a guiding framework and commit to actions for reaching a goal of net-zero emissions. To that end, our Framework Recommendations provide a structure for overall emission reduction, carbon neutrality, and sustainability.

1. **ESTABLISH GOALS:** We recommend that Laramie publicly establish 10-year (2030), 20-year (2040), and 30-year (2050) goals for municipal operations *and* community emissions reduction. To reach these goals, the municipality may wish to become affiliated with external groups (e.g., climatemayors.org) or adopt the goals of other cities in the U.S. Municipal operations should lead the way over the next two years, efforts that will ideally inspire and facilitate community endeavors. [1] Hundreds of U.S. cities have recognized their role in GHG emissions and have committed to drastic

[1]For example, cities ranging in size from Park City, Utah, to Austin, Texas, have paired emission reduction efforts for municipality with the community. https://www.parkcity.org/departments/sustainability/community-municipal-carbon-footprint and https://www.austintexas.gov/sites/default/files/files/Sustainability/FINAL_-_OOS_AustinClimatePlan_061015.pdf.