TOWN OF ERIE

645 Holbrook Street
Erie, CO 80516

Meeting Agenda

Board of Trustees

Tuesday, May 16, 2023 | **6:30 PM** | **Virtual**

Study Session
Link to Watch Virtually: https://bit.ly/BOTSS2023

I. Discussion Items

23-264 Elevate Erie Update: Transportation Mobility Futures and Big Ideas Work Session

Attachments: Transportation Futures Erie_may 16 2023_v2

6:30-8:30 p.m.
Presenter(s): Miguel Aguilar, Town of Erie Senior Transportation Planner
Jeremy Klop, AICP Fehr and Peers Transportation Consultants
Jason Miller, Fehr and Peers Transportation Consultants

23-229 Greenhouse Gas Inventory Review with Lotus Engineering and Sustainability

Attachments: Town of Erie 2021 Community & Municiapal Greenhouse Gas Emissions Invent

Town of Erie Municipal 2021 GHG Inventory

Town of Erie Community 2021 GHG Inventory

Erie_Board_PPT_May_2023

8:30-9:15 p.m.
Presenter(s): Eryka Thorley, Sustainability Manager
Tom Herrod, Managing Director of Greenhouse Gas Accounting, Modeling and Visualization at Lotus Engineering and Sustainability

II. Adjournment

9:15 p.m.

(The Board's Goal is that all meetings be adjourned by 10:30pm. An agenda check will be conducted at or about 10:00 p.m., and no later than at the end of the first item finished after 10:00 p.m. Items not completed prior to adjournment will generally be taken up at the next regular meeting.)

645 Holbrook Street
Erie, CO 80516

TOWN OF ERIE

Board of Trustees

Board Meeting Date: 5/16/2023

File #: 23-264, **Version:** 1

SUBJECT:
Elevate Erie Update: Transportation Mobility Futures and Big Ideas Work Session

DEPARTMENT: Planning and Development

PRESENTER(S): Miguel Aguilar, Town of Erie Senior Transportation Planner
Jeremy Klop, AICP Fehr and Peers Transportation Consultants
Jason Miller, Fehr and Peers Transportation Consultants

TIME ESTIMATE: 120 minutes

POLICY ISSUES: Multimodal transportation planning

STAFF RECOMMENDATION:

Informational Use Only

SUMMARY AND BACKGROUND OF SUBJECT MATTER:
The Town of Erie Transportation Planning staff are working with Fehr and Peers to update the Town of Erie 2018 Transportation Mobility Plan (TMP). The TMP update is occurring in conjunction with the Elevate Erie Comprehensive Plan update. As a precursor to the Elevate Erie visioning sessions next month, Town staff and the consultant will share innovative transportation policy, visionary multimodal network designs, and funding choices peer communities recently adopted in Comprehensive Plans and TMPs. The consultant will provide peer examples, interactive polling, and facilitated conversations. Peer community examples and outcomes from Colorado and Western U.S. communities will be presented and discussed. Biographies of the presenters are provided below.

Jeremy Klop, AICP
Serving as Fehr & Peers' Director of Strategy, Jeremy brings over two decades of experience developing comprehensive and award-winning multimodal transportation plans and inclusive community engagement techniques to solve complex transportation issues. Previously based in Denver, he helped to shape numerous citywide transportation plans along the Front Range. His current work includes mobility concept planning for the LA28 Olympics and Paralympic Games and multiple large scale master plans. As an avid older mountain biker, he loves to tell stories about when he once could go far and fast. Now he uses e-bike power to keep up with his teen-age kids.

Jason Miller

Jason is a Senior Associate and Transit Expert at Fehr & Peers' Denver Office. With over 19 years of transportation planning experience, strategic technology, and emerging mobility concepts such as microtransit. He has recently managed transit planning projects throughout the western US including Fort Collins, CO; Denver, CO; Eagle County (Vail), CO; Lubbock, TX; Jackson, WY; Park City, UT; and Moab, UT. Outside of work, Jason focuses on adventuring in the outdoors. For 14 years and counting, Jason and two other dads have led their kids on an annual backpacking adventure in the Sawtooth Mountains of Idaho.

BOARD PRIORITY(S) ADDRESSED:

- ✓ Attractive Community Amenities
- ✓ Engaged and Diverse Community
- ✓ Prosperous Economy
- ✓ Well-Maintained Transportation Infrastructure
- ✓ Environmentally Sustainable
- ✓ Fiscally Responsible

ATTACHMENT(s):

TOWN OF ERIE
1874

ERIE
COLORADO

ELEVATE ERIE

Planning Our Future Together

Comprehensive Plan & Transportation Mobility Plan

Transportation Futures Work Session | May 16, 2023

TRANSPORTATION FUTURES SHAPING THE PLAN

1. DESIGN FOR LEGACY
2. SAFETY FOR EVERYONE
3. INVESTMENTS THAT GROW

DESIGN FOR LEGACY

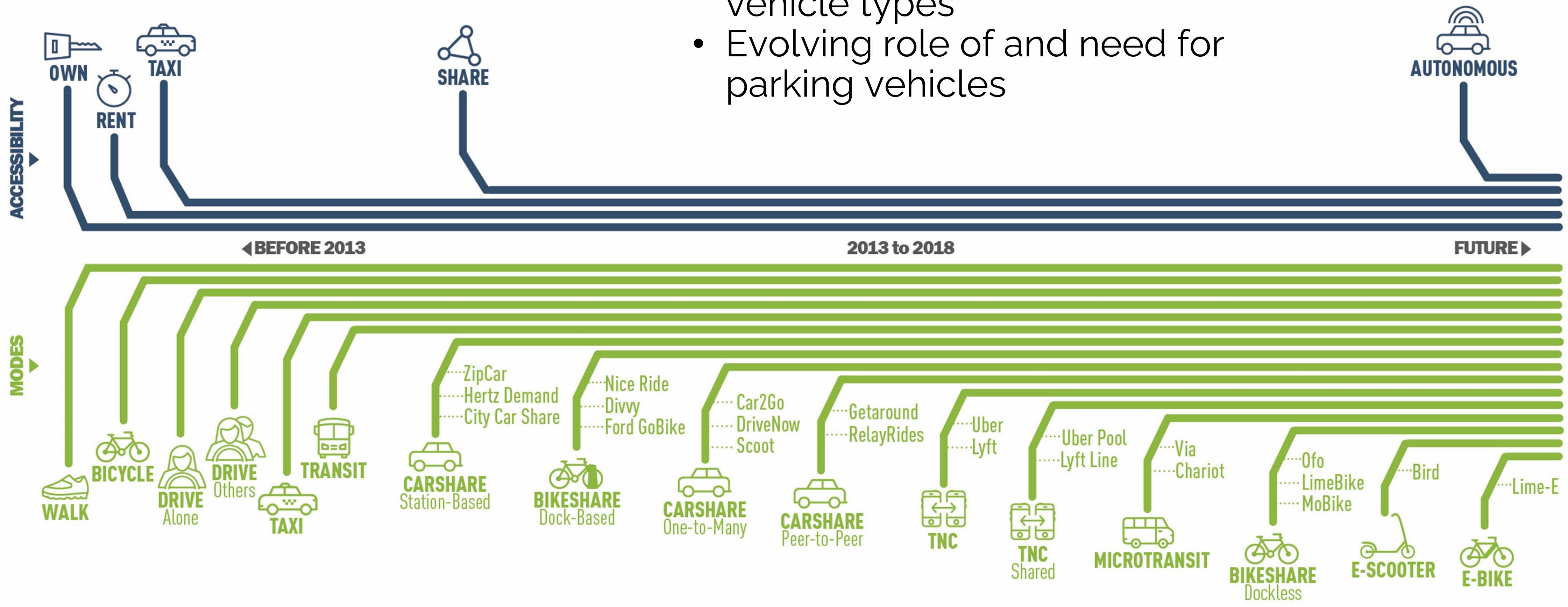
Imagine your favorite street in Erie…

You have a once in a generation opportunity to shape what future residents will experience

DESIGN FOR LEGACY

With streets to serve…

- Durable needs for mobility and freedom to travel
- New travel patterns that are breaking old rules of thumb
- New forms of mobility and vehicle types
- Evolving role of and need for parking vehicles



DESIGN FOR LEGACY

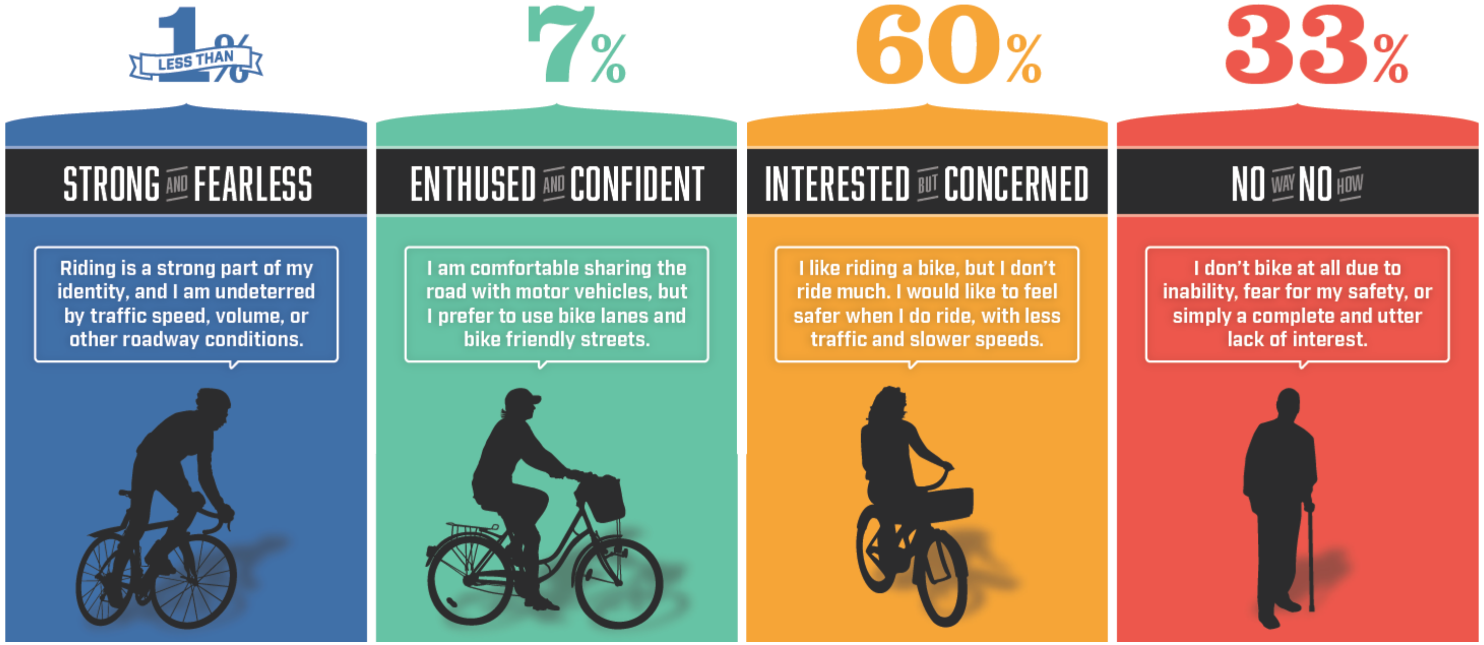
Streets to Serve…

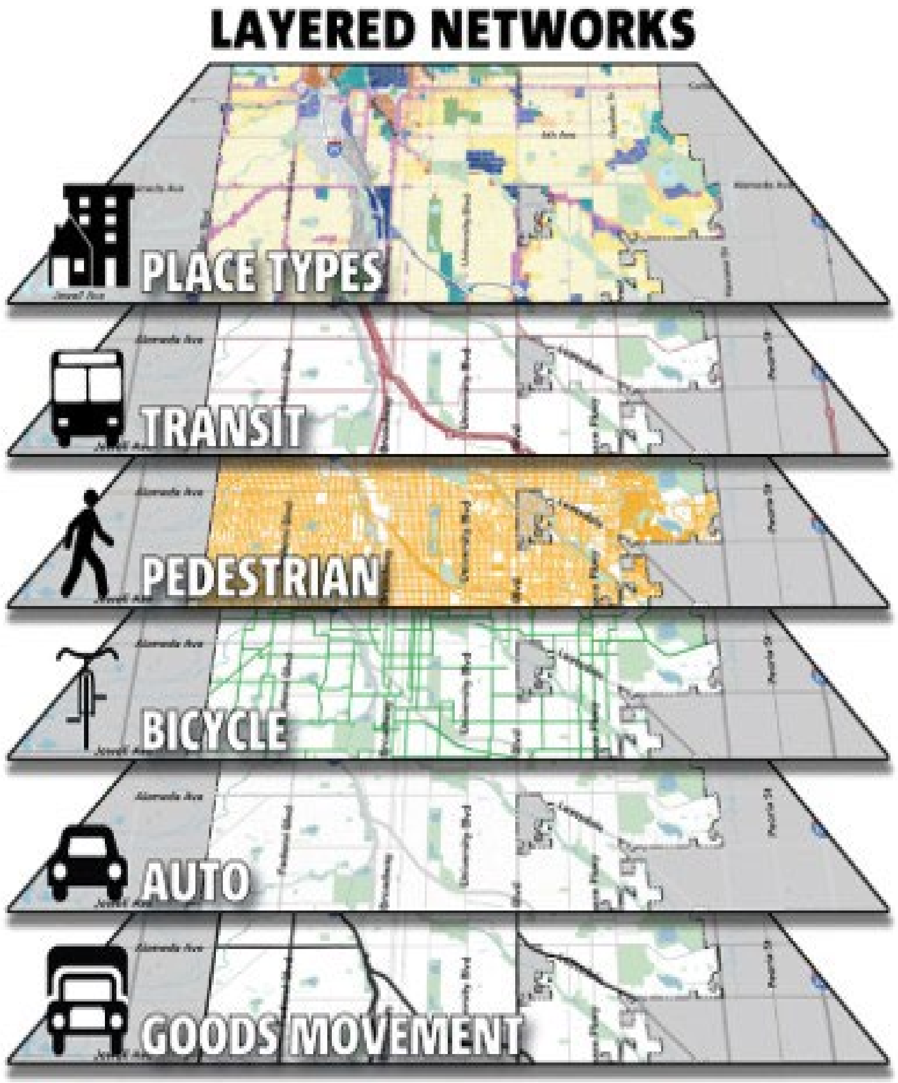
- Human connections
- Community commerce
- Events, parades, protests
- Rambunctious gardens
- Commercial value creation

DESIGN FOR LEGACY

Layered Networks

Different people need different things from the network. We can design for multiple objectives.

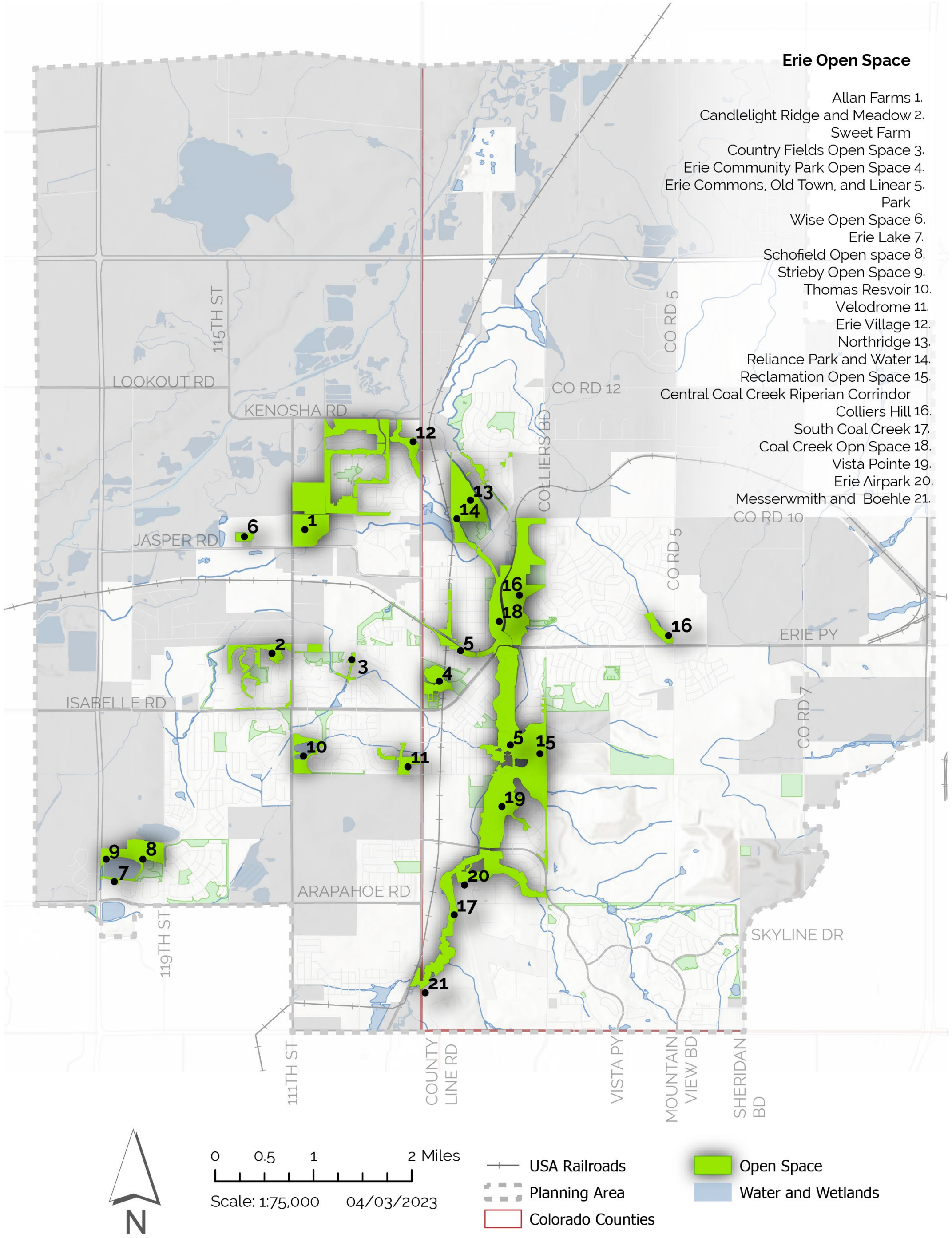




DESIGN FOR LEGACY

Crossings, Trails, and Transit

With much of the network yet to be developed, the current mix of crossing treatments, modal networks, trail access, and transit service can still be optimized for residents and visitors.



DESIGN FOR LEGACY

Walkable Commercial, Curbs and Parking

The best walkable commercial areas also have high demand for parking. Curb management is expected in these high demand locations, and suburban locations are increasingly questioning the need for parking minimums as demand for walkable commercial streets is rising.

DESIGN FOR LEGACY

Leanings Poll

When you think about the transportation system and the designs that Erie could pursue, are you leaning more toward:

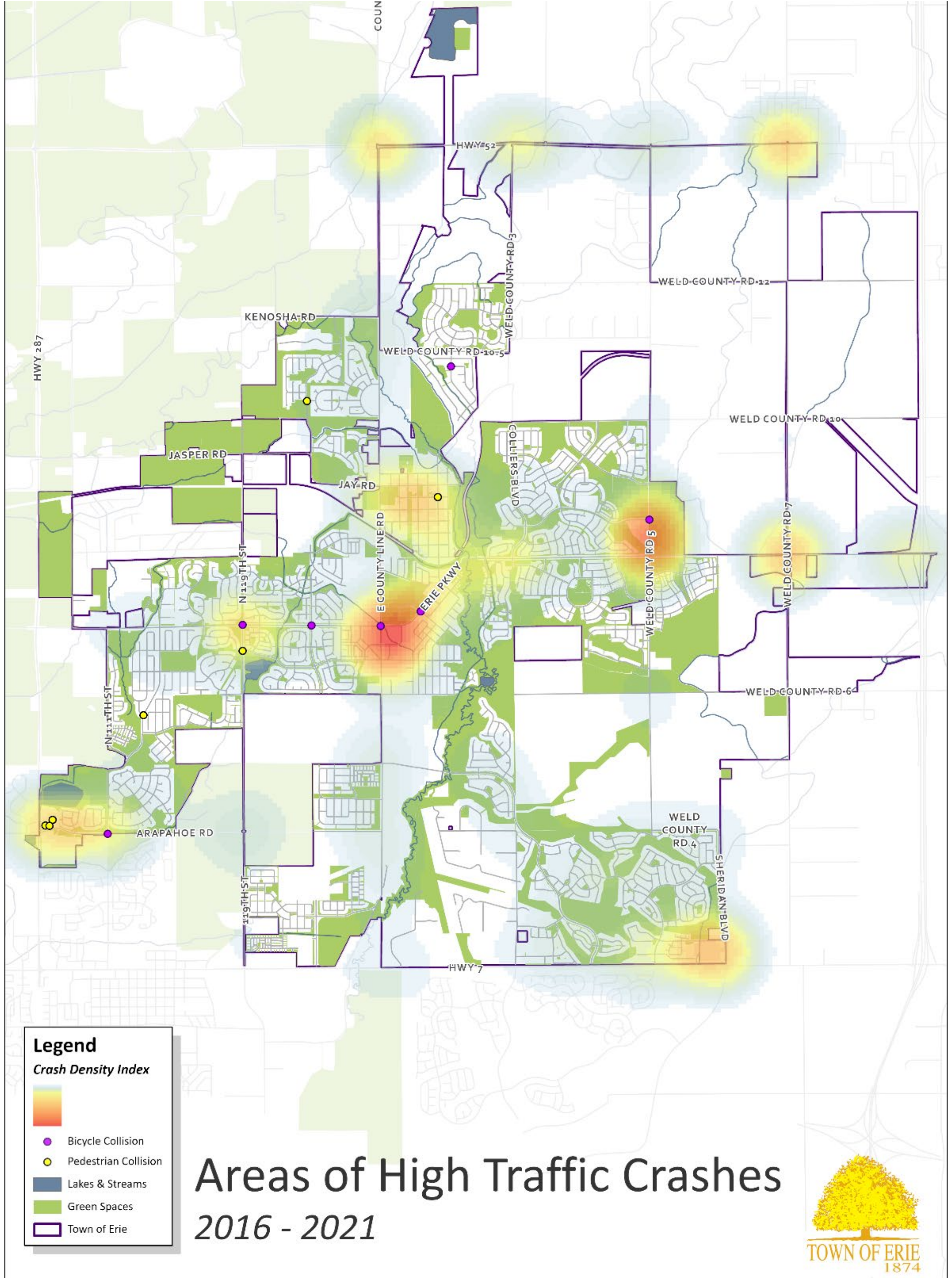
- A new and unique system that is innovating and proving up new concepts
- An efficient implementation of strategies and techniques already proven by others

SAFETY FOR EVERYONE

Vehicle Crash Data

What we are hearing

Traffic volumes are increasing and safety is a challenge for Erie. There is concern and need for regional transportation options, enhanced bike and pedestrian connectivity, and safety improvements along roads. Growth and new development is seen as a primary contributor to traffic congestion and poor road maintenance.



SAFETY FOR EVERYONE

Safe Systems

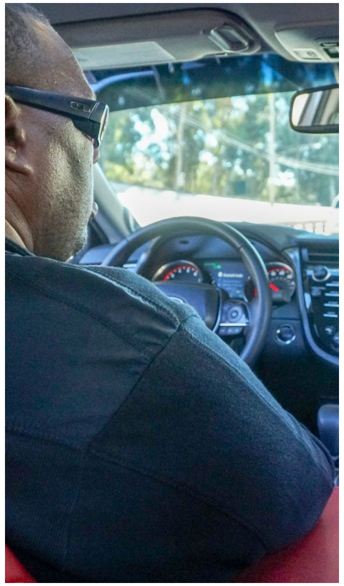
The Safe System approach aims to eliminate fatal and serious injuries for all road users by:

- Accommodating human mistakes
- Keeping impacts on the human body at tolerable levels

SAFE ROAD USERS

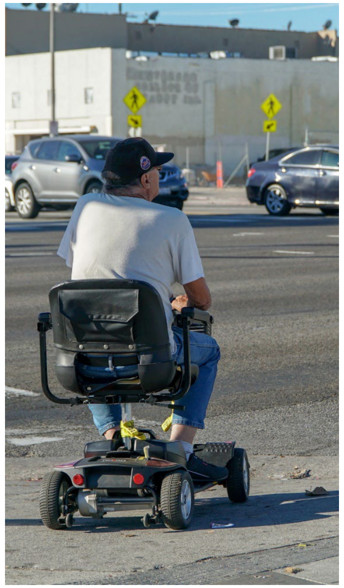
Walk

Bike



Drive

Transit



Other

SAFE ROAD USERS – CONTINUED

Not distracted or impaired

Follow rules

Act within the limits of the road design

SAFE VEHICLES

Active safety

Measures to reduce the chance of a crash occurring

- Lane departure warning
- Autonomous emergency braking

Passive safety

Protective systems for when crashes do occur

- Seatbelts and airbags
- Crash-absorbing vehicle crumple zones

SAFE VEHICLES - CONTINUED

Other road user safety

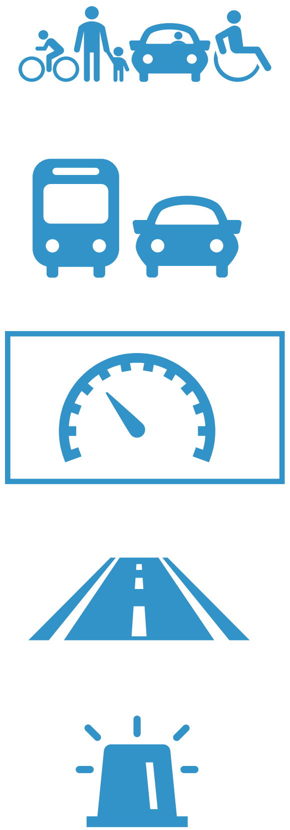
Measures that protect other road users

- Bicyclist and pedestrian detection
- Vehicle size and design

New technology

Leveraging connected and automated vehicle (CAV) technology to improve safety

SAFE SPEEDS



“Speed is at the heart of a forgiving road transport system. It transcends all aspects of safety: without speed there can be no movement, but with speed comes kinetic energy and with kinetic energy and human error come crashes, injuries, and even deaths.”

Organisation for Economic Co-operation and Development

SAFE SPEEDS: REDUCING PEDESTRIAN FATALITIES

Hit by a vehicle traveling at

23 MPH

10% risk of death

Hit by a vehicle traveling at

42 MPH

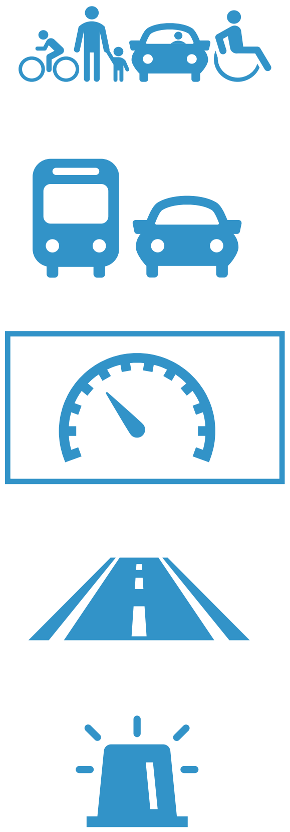
50% risk of death

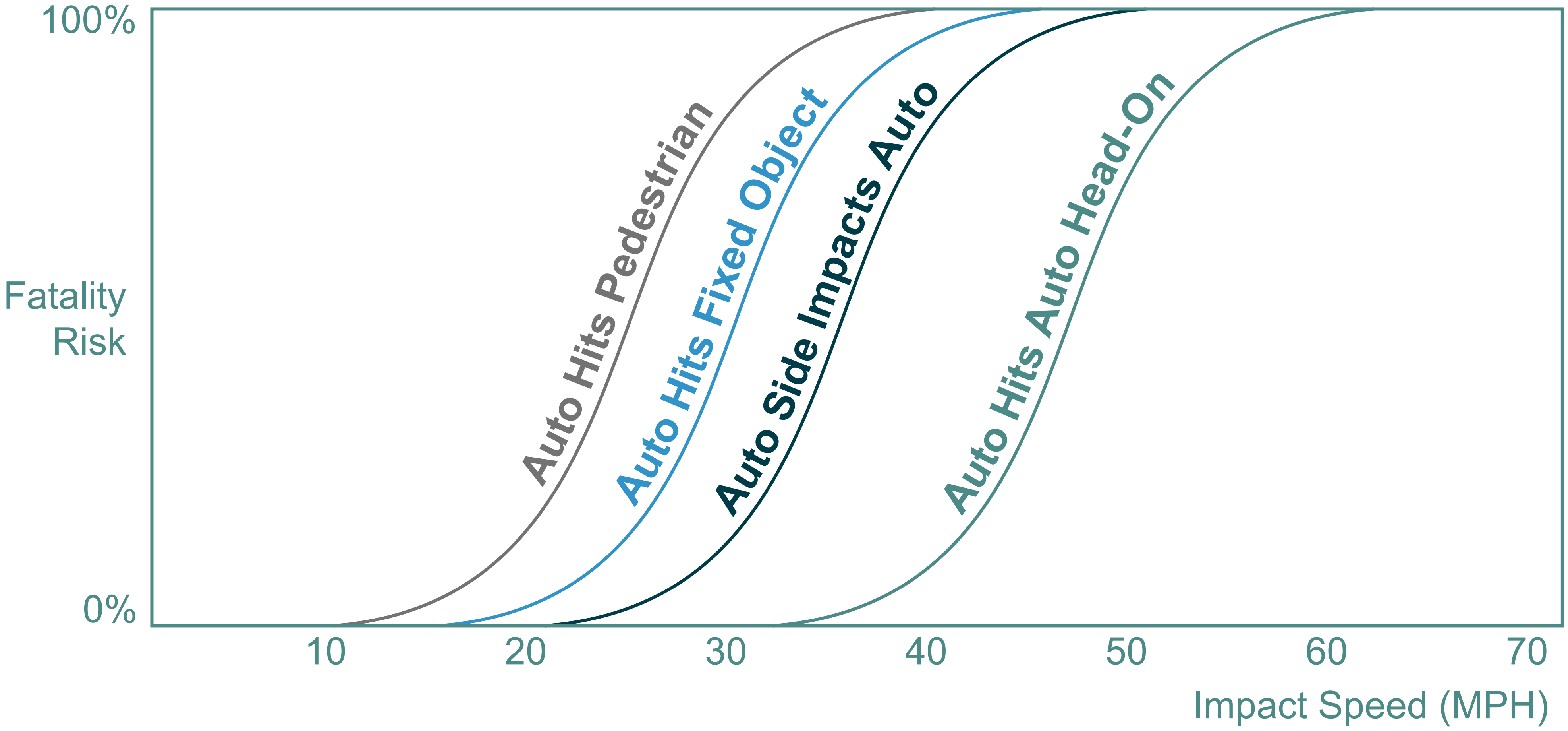
Hit by a vehicle traveling at

58 MPH

90% risk of death

SAFE SPEEDS: FATALITY RISKS





SAFE SPEED: TREATMENTS THAT MINIMIZE INJURIES

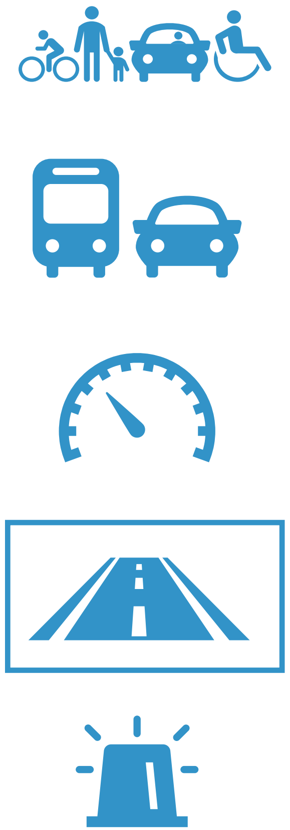
Speed through typical intersection

Source: Fehr & Peers

Speed through Safe System intersection

Source: City of Carmel, IN

SAFE ROADS



Safe roads are designed and operated to:

1. **Prevent crashes**
2. **Keep impacts on the human body at tolerable levels**

SAFE ROADS: AVOIDING CRASHES

Avoiding crashes involves:

Separating users in space

Separating users in time

Increasing attentiveness and awareness

SAFE ROADS: CRASH KINETIC ENERGY

Managing crash kinetic energy involves:

Managing speed

Manipulating mass

Manipulating crash angles

SAFE ROADS: ALL ASPECTS OF THE ROADWAY SYSTEM

Safe roads include all aspects of the roadway system:

- Design
- Construction
- Maintenanc
e
- Operation

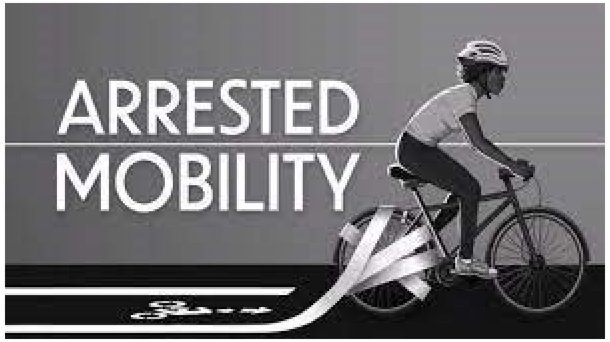
POST-CRASH CARE

Vital post-crash actions include:

- First responders
- Medical care
- Crash investigation
- Traffic incident management
- Justice

SAFETY FOR EVERYONE

Enforcement, Engagement, and Equity



Speeding Countermeasure	Effectiveness	Equity Considerations
Automated Enforcement	High	No contact with officers, fine structure, camera placement
Communications and Outreach Supporting Enforcement	Medium	Low contact with officers, geographic distribution, translation needs
High-Visibility Enforcement	Low	High contact with officers, geographic distribution
Penalty Types and Levels	Low	Variable contact with officers, fine structure

Most effective = 4 or 5 stars on effectiveness, Least effective 1 or 2 stars; effectiveness ratings only shown for crash reduction; Source: Countermeasures that Work: A Highway Safety Countermeasure Guide For State Highway Safety Offices, Ninth Edition 2017 (NHTSA)

DESIGN FOR LEGACY

Leanings Poll

When you think about the safety of the transportation system and the strategies that Erie could pursue, where do you see the greatest need for Town action?

1. Safe road users
2. Safe vehicles
3. Safe speeds
4. Safe roads
5. Post-crash Care

INVESTING FOR GROWTH

What do residents want to see delivered?

How well is the current mix of funding working?

Grants

Sales tax

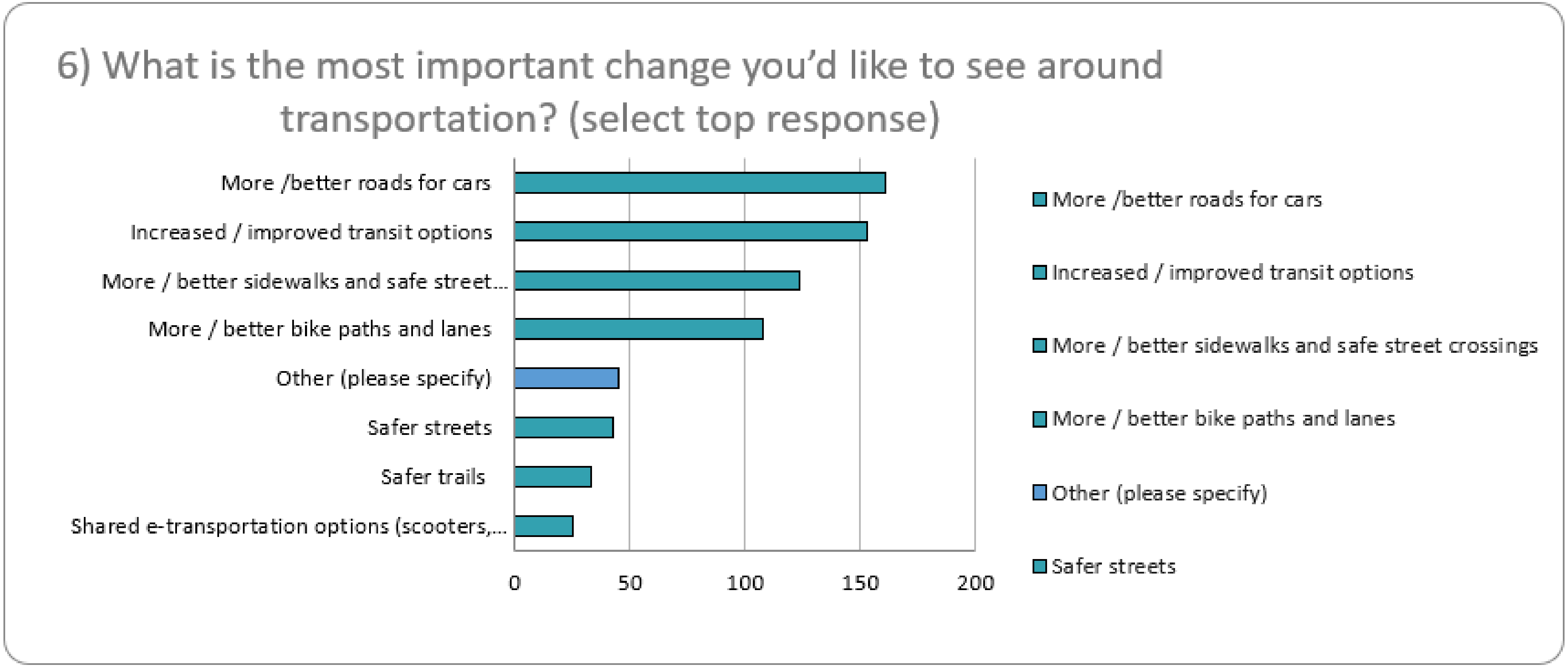
Voter initiatives

User and property fees

Developer fees

INVESTING FOR GROWTH

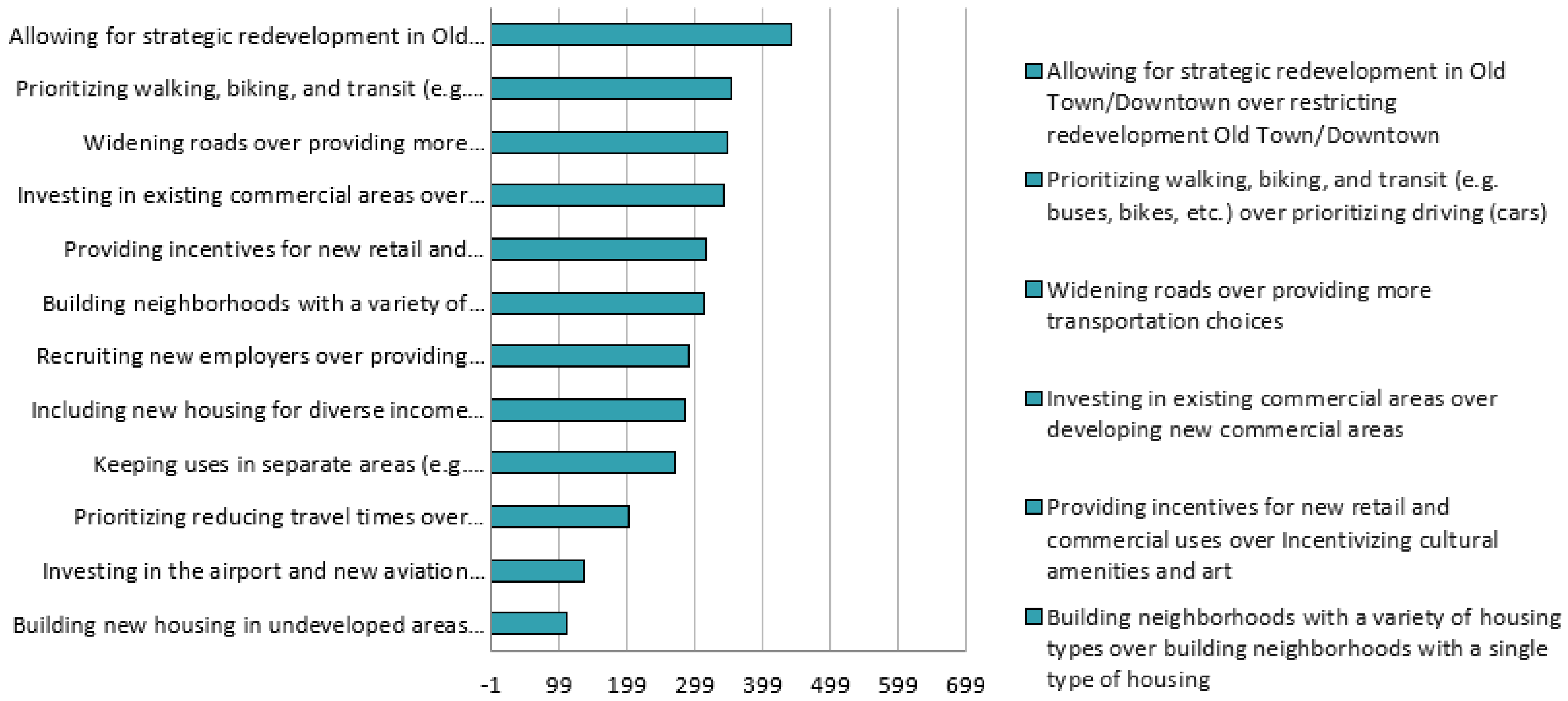
What we are hearing



INVESTING FOR GROWTH

What we are hearing

7) We want to better understand what direction the community wants to go in the future and what topics should be a priority. Which option do you prefer or definitely prefer?



INVESTING FOR GROWTH

Development fees in the region

Erie is charging close to the max supportable fee identified in a 2021 Impact Fee Study and remains an affordable location to develop in the region

Single Family

Communities	Parks & Recreation	Public Facilities	Transportation	Storm Drainage	Water	Raw Water	Sewer	Fire	Police	Other Total	Residential Total
Dacono	$3,829	$965	$4,863	$497	$14,500	$120,000	$8,790	$0	$0	$0	**$153,444**
Frederick	$2,900	$1,500	$0	$977	$20,558	$97,500	$5,650	$0	$0	$4,000	**$129,085**
Firestone	$3,760	$1,881	$3,828	$1,356	$18,200	$68,200	$5,650	$0	$0	$0	**$103,494**
Lafayette	$1,350	$0	$0	$2,258	$9,706	$43,000	$6,360	$0	$0	$7,650	**$70,324**
Louisville	$6,325	$0	$3,052	$0	$14,100	$39,400	$5,500	$0	$0	$149	**$68,526**
Longmont	$7,236	$0	$1,811	$958	$13,400	$31,170	$6,080	$0	$0	$0	**$60,655**
Erie (Proposed)	$2,451	$3,739	$5,598	$1,628	$12,050	$16,243	$8,860	$0	$686	$1,270	**$52,525**
Erie (Existing)	$4,100	$2,009	$6,231	$1,628	$12,050	$16,243	$8,860	$0	$0	$0	**$51,121**
Broomfield	$0	$0	$0	$4,580	$24,756	$0	$12,559	$688	$0	$0	**$43,283**
Superior	$0	$0	$0	$3,170	$24,808	$0	$5,043	$0	$0	$0	**$33,021**

INVESTING FOR GROWTH

External Funding Programs

DRCOG Grants, Federal Grants, and Sales Tax funding are variable year over year, but can be significant project accelerators for major infrastructure projects

Project Funding Request @ DRCOG

State Highway 52 Design

	Total	Percent
DRCOG	$280,000	80%
Weld County	$17,500	5%
Erie	$52,500	15%
Total Project Cost	**$350,000**	**100%**

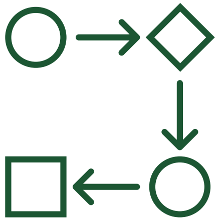
I-25 Multimodal Interchange Study

	Total	Percent
DRCOG	$400,000	80%
Weld County	$25,000	5%
Erie	$75,000	15%
Total Project Cost	**$500,000**	**100%**

INVESTING FOR GROWTH

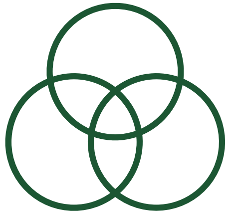
Grant Competitiveness

Grants are extremely competitive and matching local priority projects to the best grant programs takes time and skill.



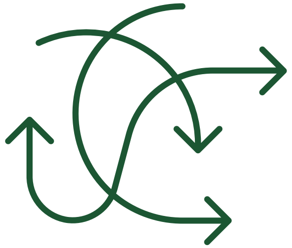
Develop Understanding

Understand the criteria and selection process for grant programs.



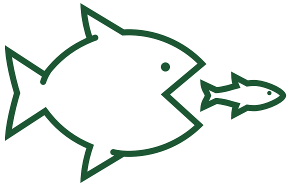
Benchmark Competitiveness

Use this to benchmark how the project/ agency are likely to compete.



Facilitate Hard Conversations

Sometimes a project isn't very competitive. In those situations, resources could best be used to position that project and others for the best grant source.



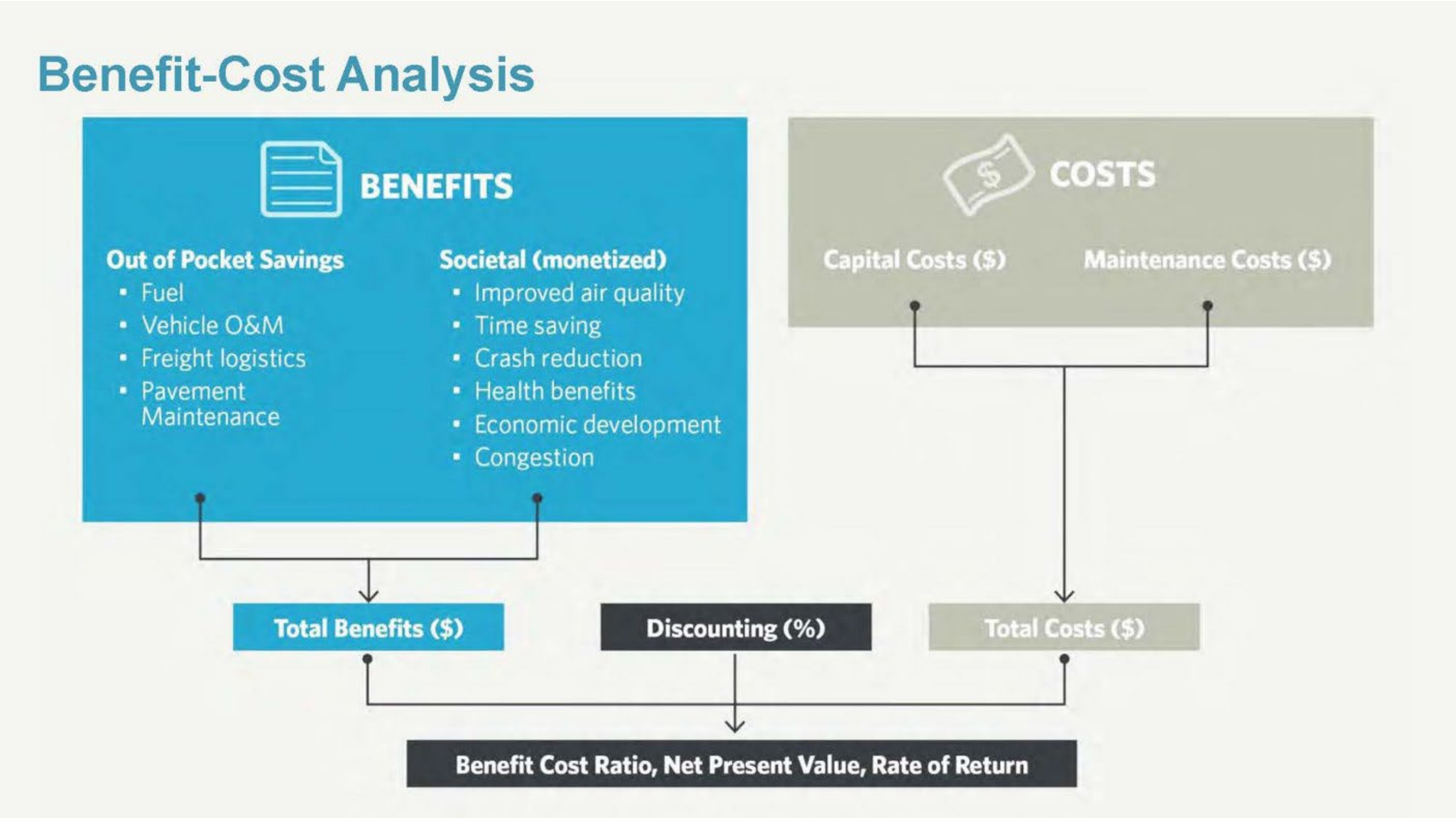
Other Reasons

Sometimes there are other reasons to submit including getting the materials together for another program.

INVESTING FOR GROWTH

Grant Competitiveness

Presenting the benefits and costs in a comprehensive, accurate, and easy to read format will help reviewers and legislative representative understand the project's value to the region and the community.



FUNDING

2019 Town of Windsor Transportation Improvement Projects = $12.7 million*

78%

11%

11%

Transportation reserves and TMP cost not included in $14M total

Future Town of Windsor and External Grant Funding Goals

33%

33%

33%

INVESTING FOR GROWTH

Investment risk and security

Some sources of funding are more durable through the ups and downs of recessionary cycles. Transportation maintenance and operations are critical to community health and well-being and many older cities have built more infrastructure than their annual budget can maintain.

DESIGN FOR LEGACY

Leanings Poll

When you think about the transportation system and the investments that Erie could pursue, are you leaning more toward:

- Sources that maximize external funding potential
- Sources with secure and ongoing self-sufficiency

MICROTRANSIT IN ERIE

1. WHAT IS IT?
2. SOME EXAMPLES AND USE CASES
3. HOW IT COULD BE DEPLOYED IN ERIE

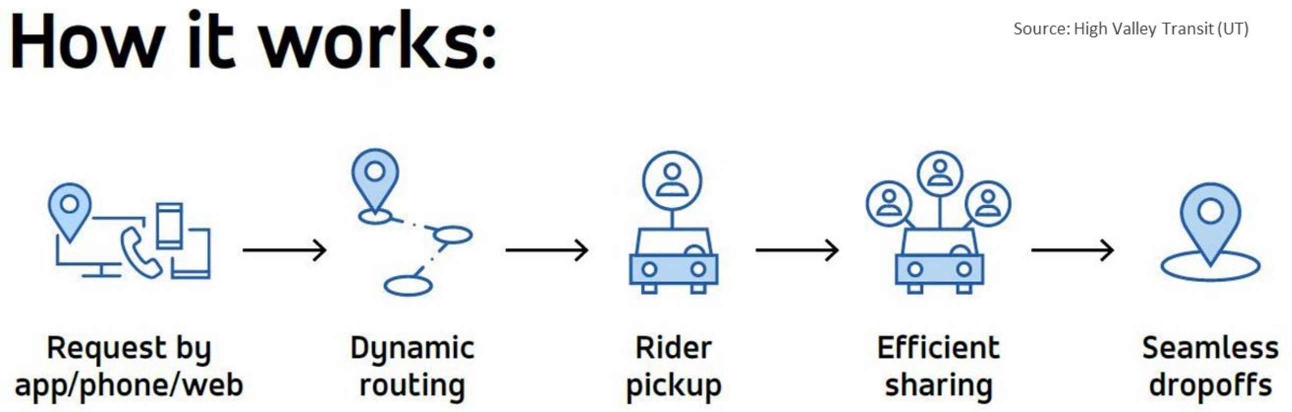
MICROTRANSIT BASICS

Characteristics

- Demand response transit using a smartphone app (or dispatch) to fulfill trips in real-time
- Corner to corner drop off and pick up
- Connects lower to mid-density residential to key activity centers and/or high frequency transit
- Smaller vehicles such as vans or even small electric shuttles

Operational considerations

- Operates as point-to-point within a defined zone or as a flex route with established time points
- Can be contracted turn-key or agency operated with purchased ride-matching technology
- Productivity is generally lower (3-6 passengers per hour) compared to fixed route



Source: High Valley Transit (UT)

MICROTRANSIT USE CASES

1. First-last mile connections to/from high frequency transit
2. Coverage option for areas difficult to serve with fixed route, to replace fixed route or expand connectivity
3. To expand hours of public transit availability
4. Enhancing ADA paratransit or existing demand response services
5. Comingling ADA and general public trips
6. Downtown circulation, parking relief

LESSONS LEARNED

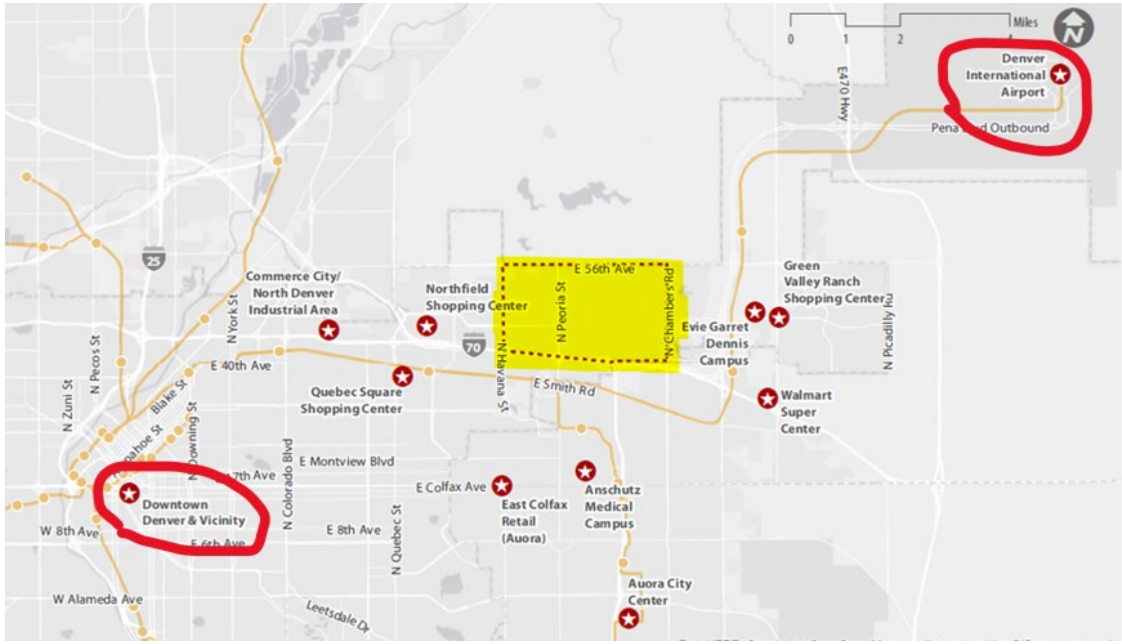
- Riders love it
- Elected officials, board members love it
- Zone size and response time estimates are critical
- Microtransit is not a silver bullet – set expectations early
- Microtransit is not cheap - success often means more funding required
- Most rides are not being shared
- Large #s of riders would have walked if service didn't exist
- Most rides are being booked through the app and not call-in
- Stay flexible and adaptable

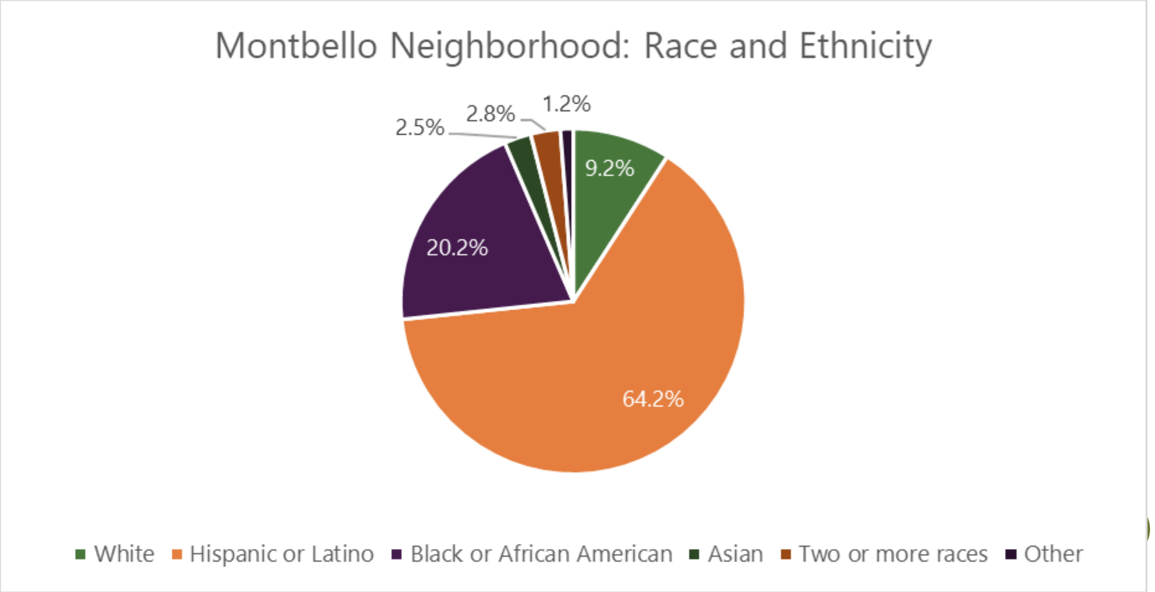
Answer the "why microtransit?" question and how it fits within broader network

VMT reduction benefit limited

DENVER CONNECTOR: MONTBELLO

- Unique aspects
  - Historically disadvantaged community
  - Operated turn-key by microtransit vendor
  - Intra-neighborhood connections and first/last mile
- First Denver neighborhood microtransit service
  - Launched in October of 2021
  - GES neighborhood launched in October of 2022
- Service area of 5 square miles with three vehicles
  - Being extended with more vehicles this fall

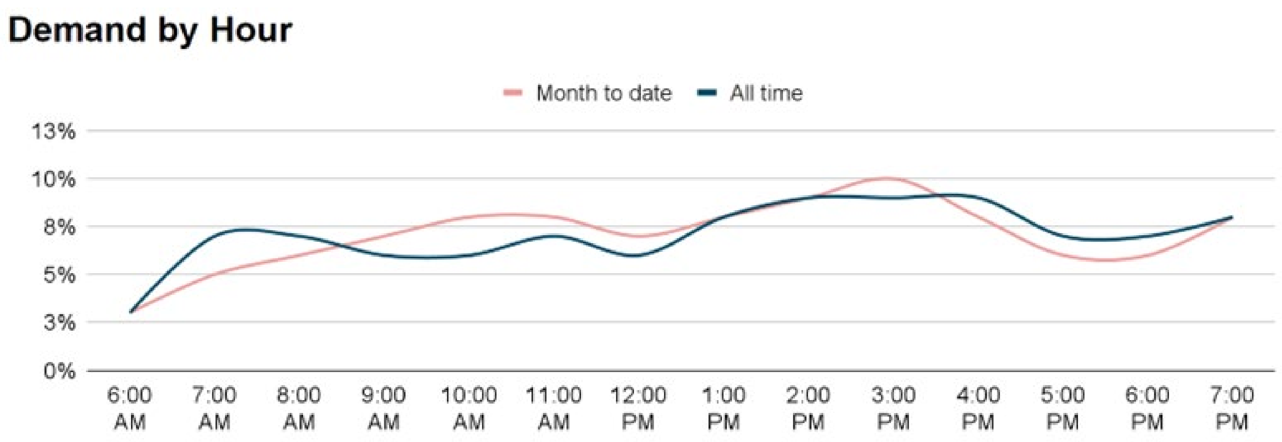




CONNECTOR: MONTBELLO PERFORMANCE YEAR 1

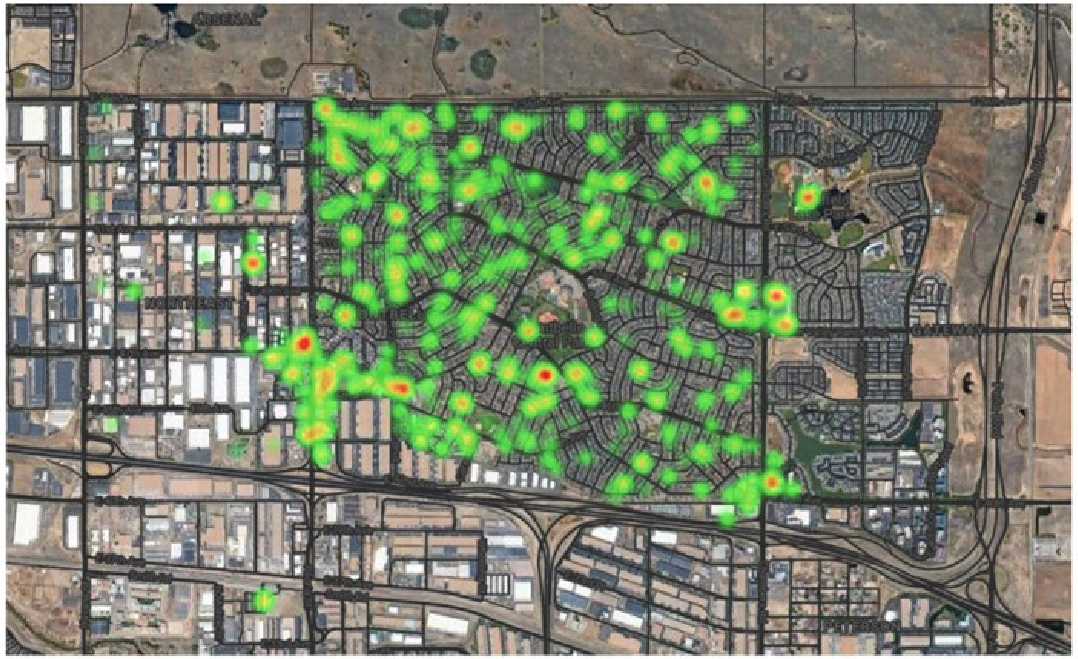
October 2021 through July 2022

- Ridership = 32,000
- Passengers per service hour = 5.7
- Avg. wait time = 19 minutes
- Avg. customer rating = 4.8 out of 5
- Shared rides = 25%
- Call-in rides (dispatch created) = 7%



CONNECTOR: MONTBELLO TRIP TYPES

Pickups Heat Map



- Top destinations
  - Community Rec Center
  - Peoria train station
  - Walmart
  - Boys and Girls Club

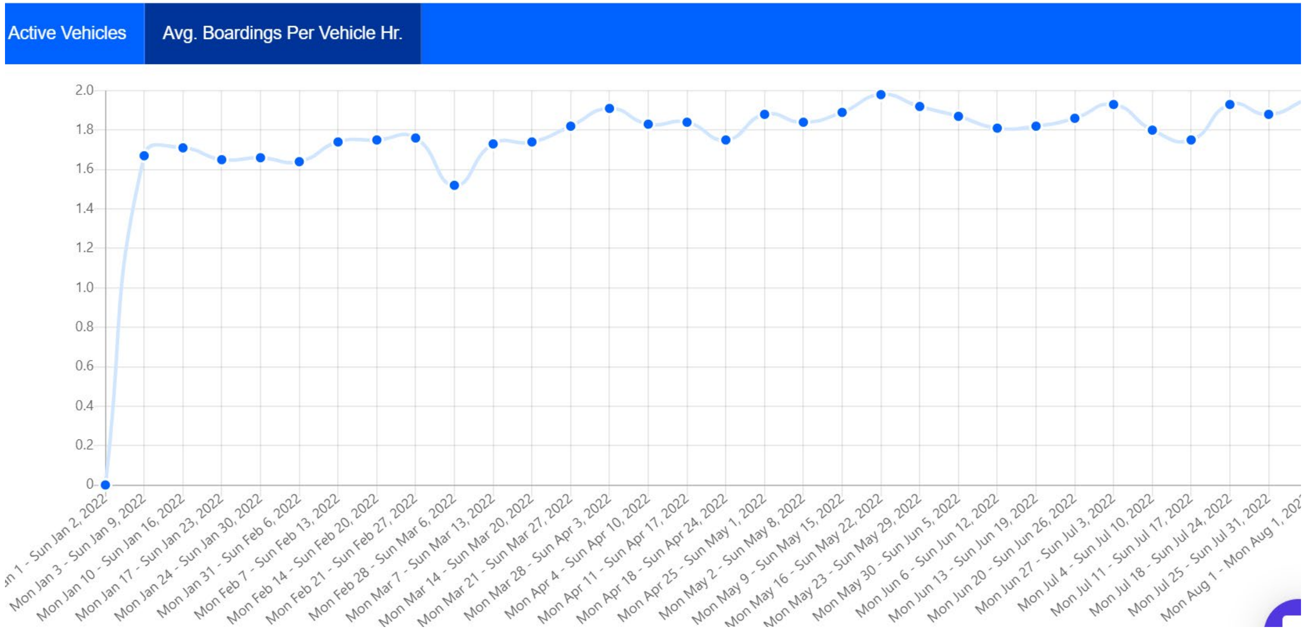
CITIBUS ON-DEMAND IN LUBBOCK, TX

- Unique aspects
  - Full microtransit zone for entire city and beyond
  - Runs in areas where fixed route services also exist
  - Paratransit and microtransit trips are comingled
- Planning started in 2019, implementation in 2020
  - Pushed up in response to COVID and launched May 2020
  - Agency-operated with technology partner for ride-matching platform
- Huge service area of over 100 sq. miles and up to 24 vehicles

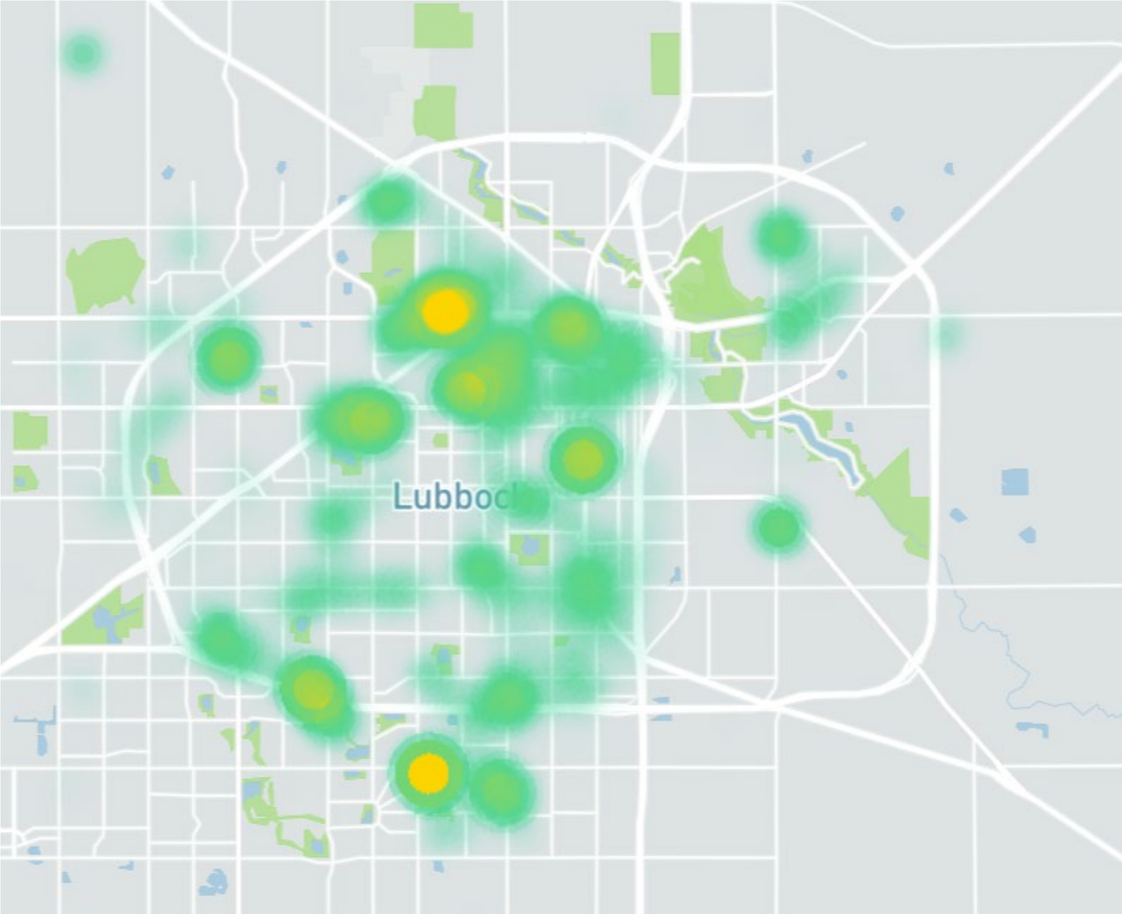
CITIBUS ON-DEMAND RECENT PERFORMANCE

Past 12 months

- Ridership = 69,000
- Passengers per service hour = 1.9
- Avg. wait time = 28 minutes
- Avg. customer rating = 96%
- Avg. requests per rider = 30
- Call-in rides (dispatch created) = 60%
- Shared trips = 53%



CITIBUS ON-DEMAND RECENT PERFORMANCE



- Top destinations
  - Texas Tech
  - Shopping areas
  - Medical services
  - Downtown (incl. transit center)

REGIONAL EXAMPLES

- Link on Demand
- Ride Free Lafayette

57

MICROTRANSIT IN ERIE

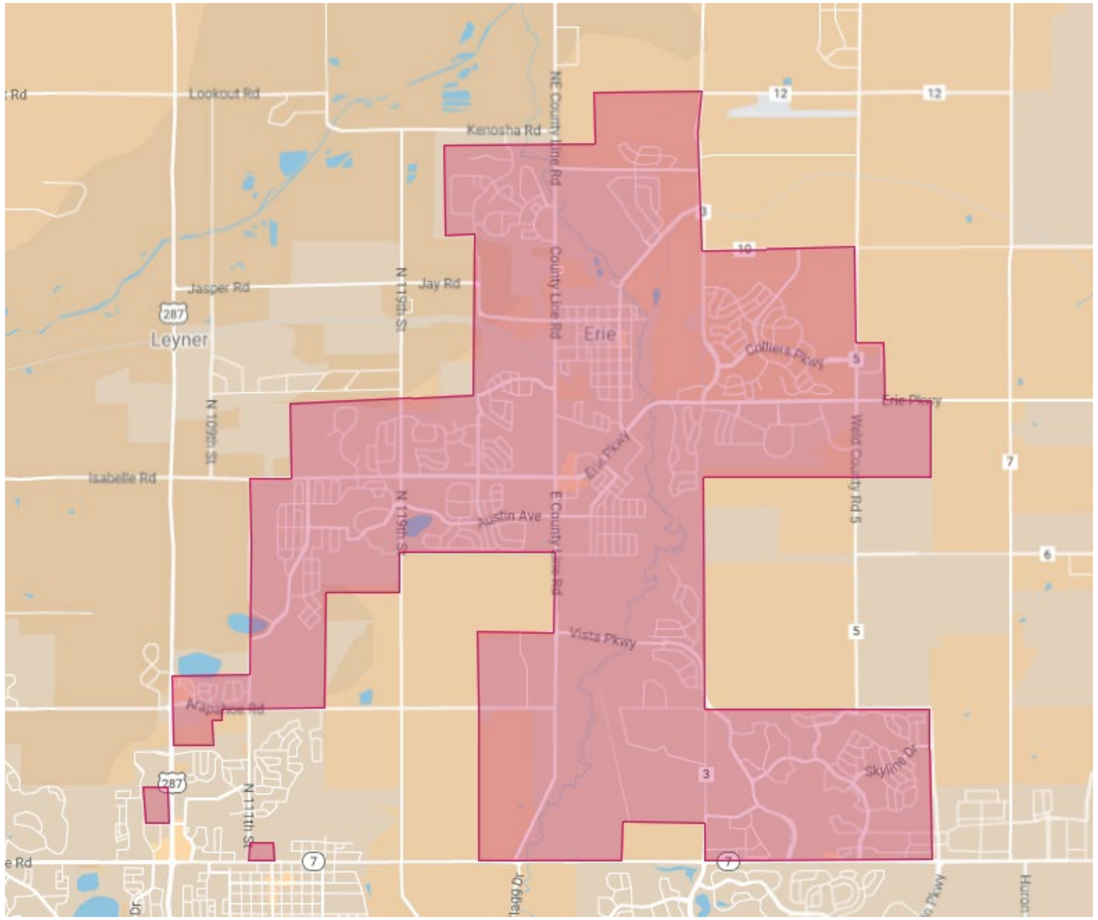
WHAT IT COULD BE

THE OPPORTUNITY

- Improve access for target populations – youth, older adults, commuters
- Connect with broader regional transit network
- Support Erie transportation, sustainability, quality of life goals
- Enable more travel within Erie for community-based trips (shopping, services, recreation)

THE CONCEPT

- Fare free microtransit service
- Service area encompassing all of Erie
- Monday-Friday service
    - 10 hours per day
- Reservations by app, online, or phone
- Responsive and flexible
- Step 1 towards informing future Erie transit options



MICROTRANSIT PILOT PROCESS

Define service
- Service area
- Service parameters
- Fleet needs

Hire turn-key vendor
- RFP process for initial pilot
- Refine service parameters based on additional analysis

Launch
- Marketing
- Community education

Adapt as needed
- Be nimble and ready to make small adjustments
- Listen to feedback from initial users over first 6 months

Monitor and mine data
- Performance based evaluation on-going
- Understand how/who is using

Develop long-term plan based on data
- Continue micro?
- Change to circulator?
- Define who operates and pays long-term

IMPLEMENTATION: TURN-KEY MODEL

PROS

- Fast implementation
- Low capital costs
- Vendor offers expertise and scale

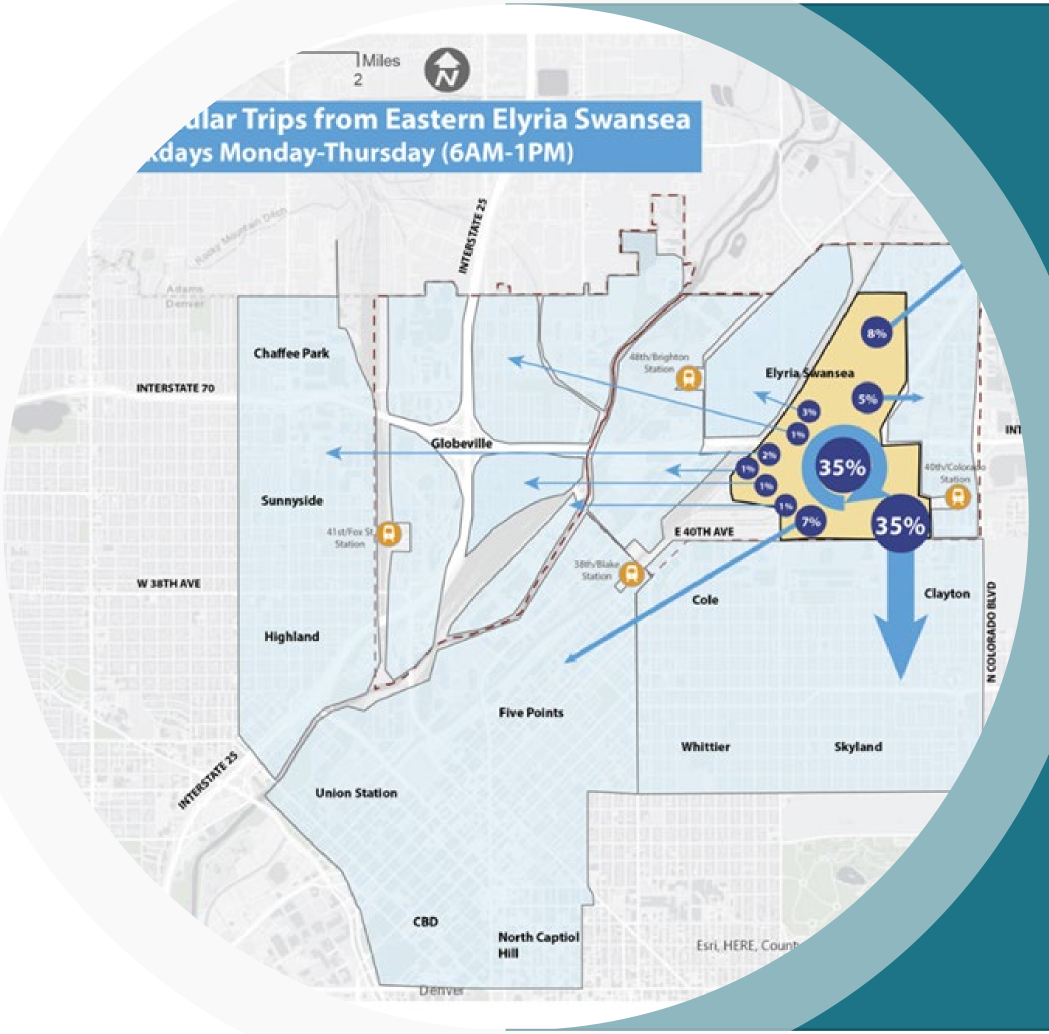
CONS

- Potentially higher ongoing cost
- Less flexibility and control

KEY POINT: Turn-key contractors are responsible for supplying <u>everything</u> necessary to deliver day-to-day operations including: vehicles for operations, spare vehicles, supervision of service, drivers, dispatch function, and necessary smart phone app/ridematching technology, in case of microtransit on-demand solution.

FEHR & PEERS SUPPORT OF MICROTRANSIT

1. Stakeholder outreach including community survey
2. Travel needs assessment to refine traveler market informed by location-based cellphone data
3. Refinement of microtransit configurations and set-up parameters
4. Procurement support
5. Implementation support



2023 IMPLEMENTATION SCHEDULE

May/June

- Information sessions with service providers
- Prepare RFP for pilot service providers
- Identify preliminary service plans, branding and other details
- Community outreach (zoom and pop up at ECC)
- Revise preliminary service plans and branding

July/August

- Issue RFP for a service provider
- Select vendor and begin prelaunch activities

September/October

- Service Launch

POLLING QUESTIONS

Q1 - When thinking about microtransit for Erie, what are the top 1-2 ways you see it being used? 1. To get to/from Erie area services (schools, rec center, library, shopping) 2. To get to/from work within Erie 3. To get to/from areas outside of Erie to access medical services, shopping areas, or other services perhaps not available in Erie 3. To get to/from work outside of Erie 4. To get to/from bus stops in order to make longer distance connections.

Q2 - Could you see yourself using a new microtransit service within Erie? 1. Yes 2. No 3. Not sure

Q3- Q3 - Do you think that Erie should take a more active role in management of microtransit and perhaps other transit services long-term? 1. Yes 2. No 3. Not sure

645 Holbrook Street
Erie, CO 80516

Board of Trustees

Board Meeting Date: 5/16/2023

File #: 23-229, **Version:** 1

SUBJECT:
Greenhouse Gas Inventory Review with Lotus Engineering and Sustainability

DEPARTMENT: Sustainability, Public Works Department

PRESENTER(S): Eryka Thorley, Sustainability Manager, Town of Erie
Tom Herrod, Managing Director of Greenhouse Gas Accounting, Modeling and Visualization at Lotus Engineering and Sustainability

TIME ESTIMATE: 45 minutes

POLICY ISSUES: This is a review of the Town of Erie's 2021 greenhouse gas inventory and may have policy implications as the Town works to establish an updated Climate Action Plan and future greenhouse gas reduction targets.

STAFF RECOMMENDATION: Review and discuss the Town of Erie's 2021 greenhouse gas inventory.

SUMMARY AND BACKGROUND OF SUBJECT MATTER:
The Town of Erie staff and Sustainability Advisory Board (SAB) committed to energy, transportation, and waste sector targets in the 2019 Sustainability Master Plan (SMP). To accomplish these targets, it was important to establish a baseline greenhouse gas inventory to identify where the Town is currently with regard to these gases and be able to track changes over time through implementation and efficiency efforts. Despite a few partial greenhouse gas inventory efforts through the support of Boulder County, the Sustainability Division lacked a comprehensive and complete greenhouse gas inventory until now. See attachments for additional information including a link to the Town of Erie Inventory Dashboard here: <https://arcg.is/08b5Hy0>.

BOARD PRIORITY(S) ADDRESSED:
- ✓ Environmentally Sustainable

ATTACHMENT(S):
1. Town of Erie 2021 Community & Municipal Greenhouse Gas Emissions Inventory Report

2. Town of Erie Municipal 2021 GHG Inventory
3. Town of Erie Community 2021 GHG Inventory
4. Presentation slides

Town of Erie 2021 Community & Municipal Greenhouse Gas Emissions Inventory Report

LOTUS
Engineering & Sustainability

“As the Town of Erie grows and expands, we will become a leader in sustainability by providing outreach and leadership alongside inclusive and accessible opportunities that support the growth of our economy and engage the community while protecting our natural environment.”

- Town of Erie’s Sustainability Plan

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

Executive Summary

The Town of Erie has committed to the following goals to reduce greenhouse gas (GHG) emissions, as outlined in the 2019 Sustainability Plan:

Energy Sector Targets

- Reduce average household electricity use by 3% by 2025.
- Reduce average household natural gas use by 3% by 2025.
- Increase the number of green buildings that are tracked in the community annually.
- Source 25% of community-wide electricity use from renewable resources by 2025.
- Source 25% of commercial electricity use from renewable resources by 2025.
- Source 20% of residential electricity use from renewable resources by 2025.

Transportation Sector Targets

- Determine a baseline and increase transit ridership by 10% by 2025.
- Increase transit serving the community by adding one additional daily bus route by 2025.
- Increase the share of electric vehicles registered in the community by 25% by 2025.

Waste Sector Target

- Establish a waste baseline and set a target for increased diversion by 2022.

Education and Outreach Sector Targets

- Double the number of businesses participating in the Erie Green Business Program by 2025.
- Host or participate in a minimum of five community events annually to educate the community about sustainability.

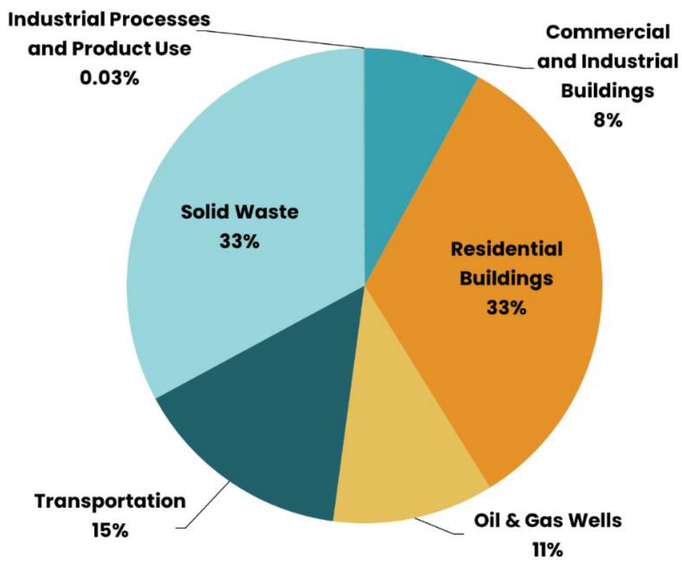


Figure ES 1. Total 2021 community-wide GHG emissions by sector.

Erie developed two 2021 GHG emissions inventories to track progress toward these goals: one for community emissions and one for emissions from municipal operations.

Erie's 2021 community GHG emissions totaled 353,418 metric tons of carbon dioxide equivalent (mt CO_2e) and included all GHG emissions generated in Erie from building energy use, transportation, and waste.

Broken down by sector, emissions from landfilled waste and residential building energy use emissions were the two largest contributors to Erie's GHG emissions, each comprising 33 percent of total emissions. Transportation emissions made up 15 percent, followed by oil and gas well emissions at 11 percent and commercial and industrial building energy usage at 8 percent. Wastewater emissions and emissions from industrial processes and product use were negligible. See Figure ES 1 above. Despite wastewater treatment emissions comprising such a small percentage of overall emissions, Erie's wastewater treatment plant is the largest commercial user of electricity in the Town. Emissions from this electricity use are captured in the stationary energy sector.

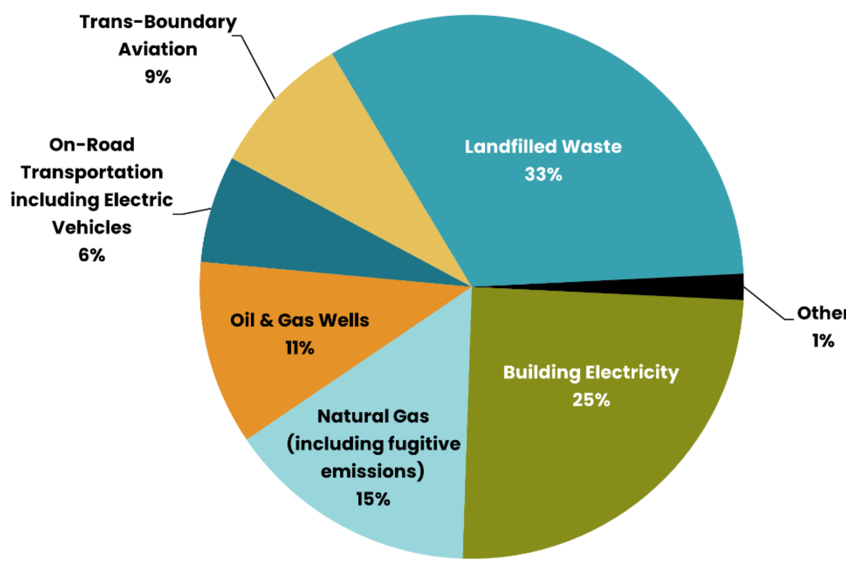


Figure ES 2. Total 2021 community-wide GHG emissions by source.

The largest source of emissions in the Town of Erie in 2021 was landfilled waste.

This includes emissions from waste generated in the community as well as the emissions associated with the Front Range Landfill, which is located in Town boundaries. Other significant sources of emissions in Erie are electricity use (25%), natural gas use (15%), and oil and gas wells (11%). A breakdown of emissions sources can be seen in Figure ES 2.

Erie's 2021 municipal operations GHG emissions totaled 15,338 metric tons (4.3% of Erie's community emissions) of carbon dioxide equivalent (mt CO_2e) and included all GHG emissions generated by Erie's municipal operations, including building energy use, transportation, waste, and consumption. Municipal operations emissions account for less than 5 percent of all community emissions. A detailed breakdown of municipal emissions can be found later in this report.

The 2021 GHG inventories reflect the Town's advancement toward its climate goals. However, continual action is needed to meet the Town's goals and limit environmental impact. These inventories provide a way for Erie to recognize opportunities for emissions reductions and encourage and prioritize sustainable action in future planning and policy.

Overview

To help achieve Erie's goals to reduce greenhouse gas (GHG) emissions and combat the realities and consequences of the changing climate, the Town has completed a community wide GHG inventory to measure and identify the sources of GHG emissions from within its community. A second inventory was completed to identify GHG emission sources from municipal operations. GHG emissions are heat-trapping gases that contribute to climate change through atmospheric warming and are often produced as a result of fossil-fuel combustion and other human activities. This report focuses on the calendar year of 2021.

Lotus Engineering and Sustainability, LLC (Lotus) was hired to complete the 2021 community and municipal GHG emissions inventories alongside Town staff. The community inventory was developed using the methodology outlined in the Global Protocol for Community-Scale GHG Inventories (GPC) for a BASIC inventory. BASIC inventories include emissions generated from building energy, transportation, waste and industrial processes and product use. The municipal operations GHG inventory was developed using the Local Government Operations Protocol (LGOP).

Additional emission sources (sometimes referred to as BASIC+ sources) such as oil and gas wells, electricity transmission and distribution (T&D) losses, and transboundary aviation were calculated for the 2021 community inventory. See the subsection titled BASIC+ Emissions for more information.

The following report reviews 2021 GHG BASIC+ emissions sectors and sources, and progress toward Erie's sustainability goals.

Moving forward, the Town has committed to publicly reporting emissions every other year with the next inventory reflecting 2023.

2021 Community GHG Emissions

Emissions Overview

In 2021, community GHG emissions in Erie totaled 353,418 metric tons of carbon dioxide equivalent (mt CO_2e). Landfilled waste was the largest source of GHG emissions for Erie in 2021, producing 115,187 mt CO_2e or 33 percent of all emissions. This includes emissions from the Front Range landfill, which is located in Town boundaries. Figure 1 (below) shows the percentage of emissions produced by each sector and source, while Table 1 shows the quantity of emissions. Emissions from each sector are described in more detail in the following sections.

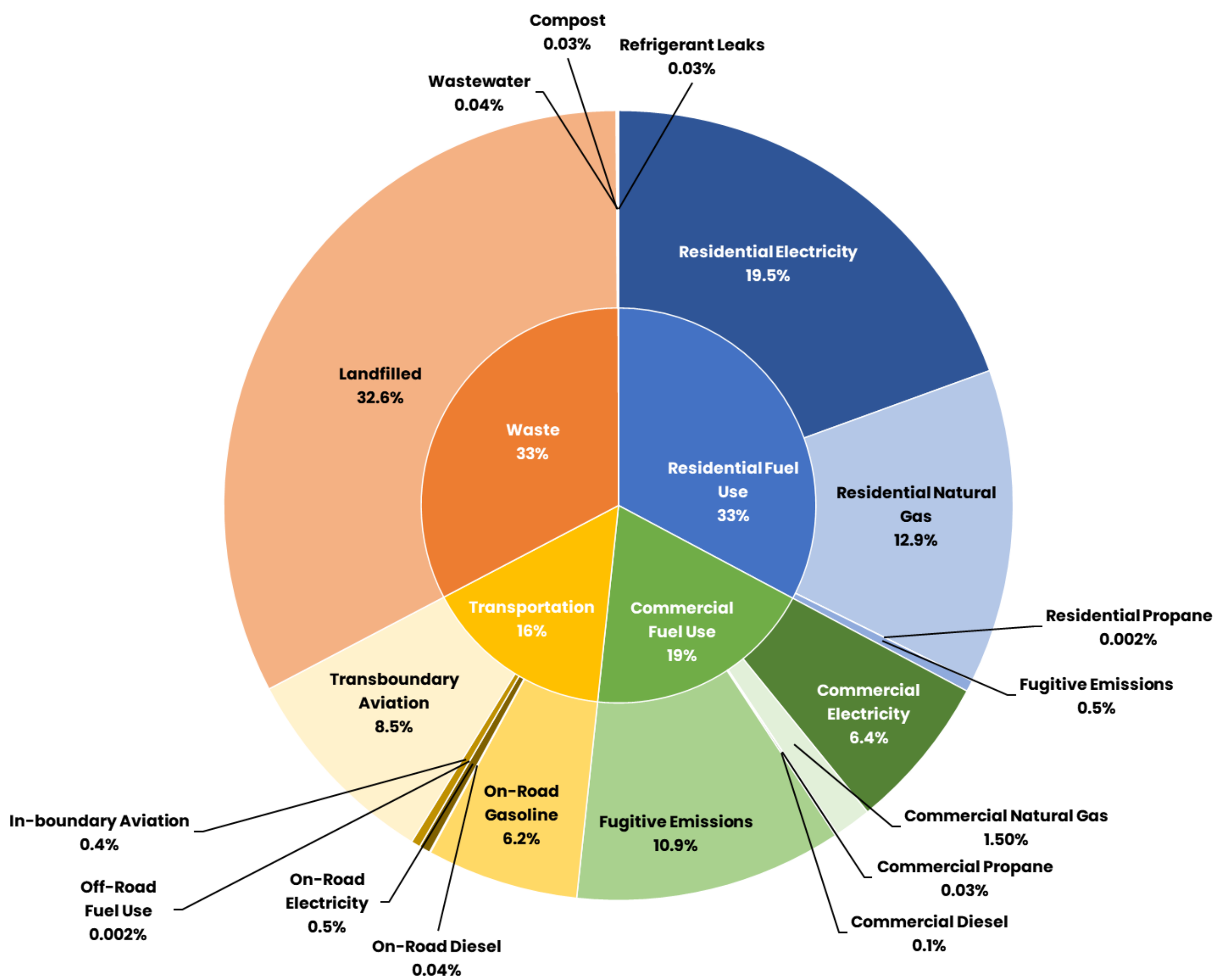


Figure 1. Erie's 2021 community emissions by sector and source.

Table 1. Erie 2021 community GHG emissions by sector and source (BASIC+).

Emissions Sources	Scope	Emissions ($mtCO_2e$)		Percent
Residential Energy	**1, 2,3**	**116,649**		**33%**
Residential Electricity	2		65,251	20%
Residential Natural Gas	1		45,497	13%
Residential Propane	1		9	0.002%
Fugitive Emissions	1		1,611	0.5%
Residential Transmission & Distribution Loss	3		3,504	1.0%
Commercial & Industrial Energy	**1, 2,3**	**66,964**		**19%**
Commercial & Industrial Electricity	2		21,314	6%
Commercial & Industrial Natural Gas	1		5,287	1%
Commercial & Industrial Propane	1		107	0.03%
Commercial & Industrial Diesel	1		302	0.09%
Fugitive Emissions	1		38,681	11%
Commercial Transmission & Distribution Loss	3		1,136	0.3%
Transportation	**1, 2, 3**	**55,198**		**15%**
On-Road Gasoline	1		21,968	6%
On-Road Diesel	1		140	0.04%
On-Road Electricity	2		1,533	0.5%
Off-Road Fuel Use	1		7	0.002%
In-Boundary Aviation	1		1,325	0.4%
Transboundary Aviation	3		30,150	9%
EV Transmission & Distribution Loss	3		76	0.02%
Waste	**1, 3**	**115,421**		**33%**
Landfilled	1		115,187	33%
Compost	3		105	0.03%
Wastewater	1		130	0.04%
Industrial Processes and Product Use	**1**	**101**		0.03%

Refrigerant Leaks	1		101	0.03%
Total		**353,418**		**100%**

Emissions By Scope

Emission sources fall into one of three scope categories.

- **Scope 1** includes GHG emissions from sources within the Town boundary, such as building fuel use (other than electricity; see scope 2 notes below) or vehicle activity within the Town.
- **Scope 2** includes emissions from the use of grid-supplied electricity, heat, steam, and cooling within the Town boundary. The only scope 2 emission source for Erie is grid-supplied electricity.
- **Scope 3** emissions include all other GHG emissions occurring outside the Town as a result of activities within the Town boundary. For example, compost is a scope 3 emission for Erie, as compost generated in Erie is currently taken to be disposed of outside the Town boundary.

Scope 1 emissions accounted for 65 percent of Erie's total emissions (228,150 mt CO_2e). Landfilled waste, residential natural gas usage, and fugitive emissions from oil and gas wells were the three largest contributors to Scope 1 emissions. Scope 2 emissions from grid-supplied electricity made up 25 percent of total emissions from the Town (88,097 mt CO_2e). Scope 3 emissions (landfilled waste and compost) made up 10 percent of Erie's emissions (37,170 mt CO_2e).Figure 2 (below) shows the percentage of emissions from each scope.[1]

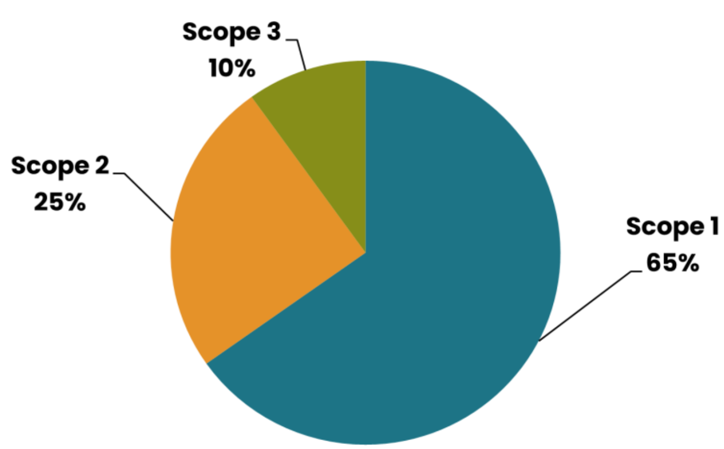


Figure 2. Community emissions by scope.

[1] As noted above, additional Scope 3 emission sources (sometimes referred to as BASIC+ sources) from transmission and distribution (T&D) losses and transboundary aviation were calculated for the 2021 inventory. See the subsection titled BASIC+ Emissions for more information.

Emissions By Sector

Emissions sectors are the broad categories of activities that result in GHG emissions. Erie's inventory is split into the following emissions sectors:

- Stationary Energy (including Residential Fuel Use, Commercial and Industrial Fuel Use, and Oil and Gas Wells).
- Transportation.
- Solid Waste and Wastewater Treatment.
- Industrial Processes and Product Use.

Each emissions sector contains individual sources, which represent the specific activities resulting in the emissions. Emissions sectors and the sources within them are further discussed in the following subsections. A summary of emissions from BASIC+ emissions is included following the emission sector summaries.

With a population of 30,038 in 2021, emissions per resident were approximately 12 mt CO_2e. Other emission intensities are shown in Table 2. Colorado's annual per capita emissions were 16 mt CO_2e in 2019. In the same year, national per capita emissions totaled 18 mt CO_2e and international per capita emissions totaled eight mt CO_2e. Looking at the per capita emissions in Erie's neighboring communities, the City of Boulder totaled 11 mt CO_2e in 2021, the City of Lafayette totaled nine mt CO_2e in 2021, and the City of Longmont totaled 10 mt CO_2e in 2019.

Table 2. Annual emission intensities in Erie.

Metric	Annual Emissions (mt CO_2e)
Erie per capita (2021)	12
Erie per occupied household (2021)	41
Erie per employed person (2021)	16
Colorado per capita[2] (2019)	16
National per capita[3] (2019)	18
International per capita[3] (2019)	8
City of Boulder per capita (2021)	11

[2] Colorado annual per capita GHG emission data are from EIA Energy-Related CO_2 Emissions Data Tables; data are from 2019.

[3] National and international annual per capita GHG emissions data are from WRI's Climate Watch Dashboard; data are from 2019.

City of Lafayette per capita (2021)	9
City of Longmont per capita (2019)[4]	10

STATIONARY ENERGY

The stationary energy sector includes emissions from buildings, primarily from electricity and natural gas usage. Other sources of stationary energy emissions include propane and diesel combustion, electricity for street lighting, irrigation sales, and oil and gas wells. Fugitive emissions, or emissions from the sourcing and transport of natural gas, are also included.

Emissions from stationary energy accounted for 52 percent of Erie's GHG emissions (182,698 mt CO_2e) and, therefore, addressing building emissions is critical to achieving Erie's GHG reduction goals stated in the Sustainability Plan.

Figure 3 (below) breaks down the specific sources of stationary energy emissions. Overall, electricity use, including T&D losses, accounted for 51 percent (91,205 mt CO_2e) of stationary energy emissions, and natural gas, including fugitive emissions, made up 29 percent (52,582 mt CO_2e). Propane and diesel use accounted for less than one percent of stationary energy emissions. Fugitive emissions from oil and gas wells comprised a significant percentage of stationary energy emissions compared to similar communities, coming in at 21 percent (38,494 mt CO_2e).

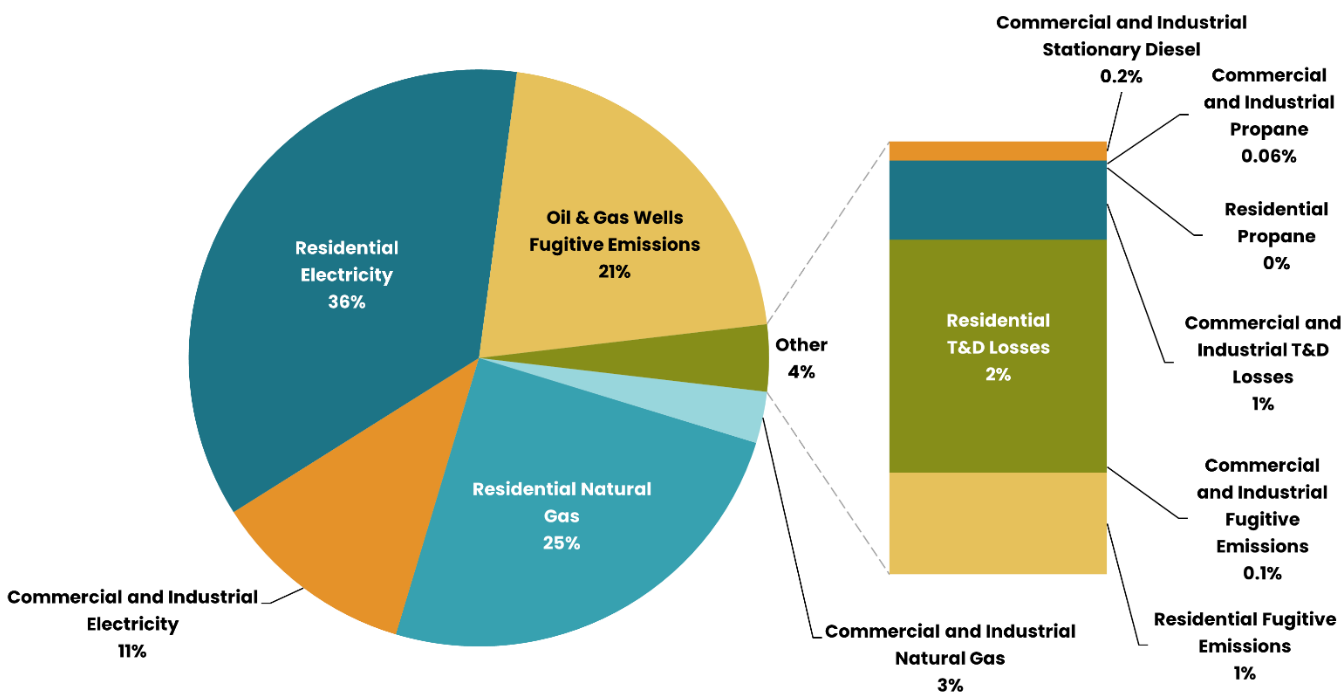


Figure 3. Erie's 2021 community stationary energy use sector emissions.

[4] Boulder, Longmont, and Lafayette emissions per capita taken from previous inventories conducted by Lotus.

Splitting energy use by building type provides a more detailed understanding of the sources contributing to stationary energy emissions. In 2021, commercial buildings (e.g., shops, offices, hotels, warehouses, and other places of business) accounted for 15 percent of Erie's stationary energy emissions (28,145 mt CO_2e), while homes made up 63 percent of stationary energy emissions (114,261 mt CO_2e). Residential electricity use was the largest source of stationary energy emissions (65,251 mt CO_2e). Commercial natural gas emissions, including fugitive emissions (5,474 mt CO_2e), were lower than residential natural gas emissions (47,107 mt CO_2e). Commercial and residential propane usage, as well as commercial diesel usage, were minimal, making up less than one percent of emissions.

TRANSPORTATION

The transportation sector accounted for 15 percent of Erie's total GHG emissions (55,198 mt CO_2e). Figure 4 (below) provides a breakdown of the contributing sources to emissions from the transportation sector. Transboundary aviation emissions were the largest source of emissions in this sector, comprising 56% and totaling 30,150 mt CO_2e. In-boundary aviation by contrast only comprised 2 percent of transportation emissions (1,325 mt CO_2e). Emissions from on-road gasoline (including emissions from ethanol) vehicles made up 34 percent of transportation emissions (18,445 mt CO_2e) and on-road diesel vehicles made up 7 percent (3,522 mt CO_2e). Transit, off-road diesel, and electric vehicles and associated T&D losses together made up just under two percent of total transportation emissions.

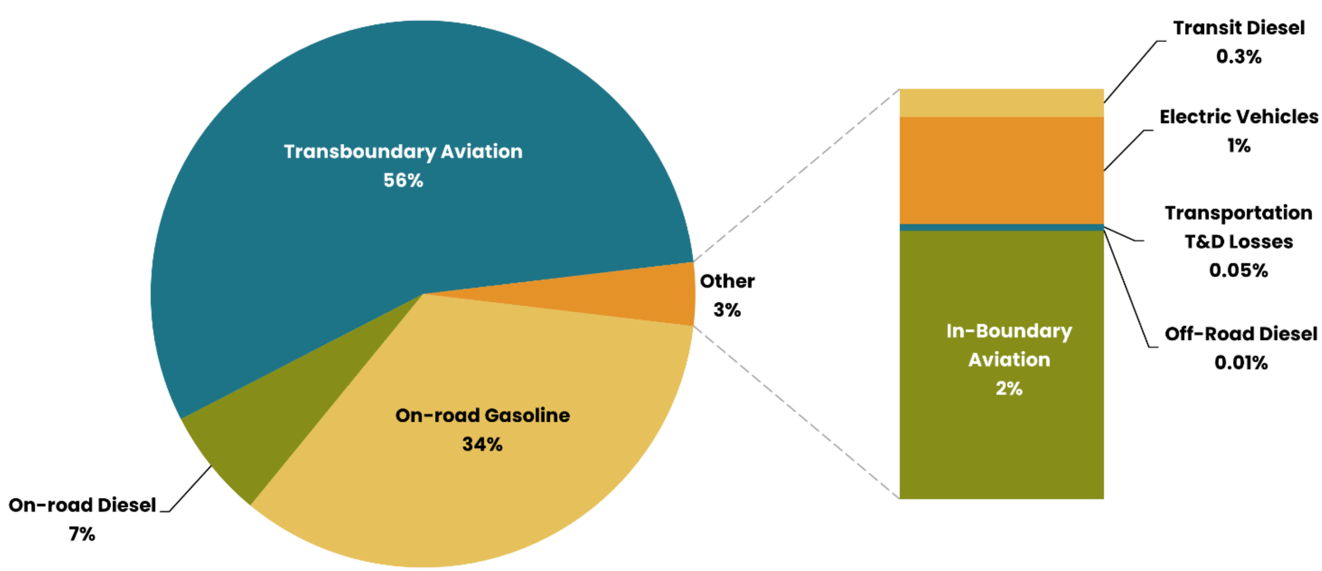


Figure 4. Erie's 2021 community transportation sector emissions.

WASTE & WASTEWATER

Waste and wastewater emissions made up 33 percent of Erie's total 2021 emissions (115,412 mt CO_2e).

The vast majority of solid waste generated in Erie is disposed of within the Town boundary. Compost is taken outside of the Town boundary for disposal. Most waste emissions are attributable to the Front Range Landfill, which is located within Town boundaries. Front Range Landfill collects waste from many of Denver's northern suburbs. Overall, more than 1.7 million tons of landfilled solid waste were deposited at the Front Range Landfill in 2021, which produced 109,280 mt CO_2e or 95 percent of all waste emissions. Town residents produced 13,063 tons of landfilled waste (Figure 5) with the majority coming from residential customers (12,996 tons, or 99%). In 2021, approximately 1.5 tons of landfilled waste per household were produced; this is approximately half the national average.[5]

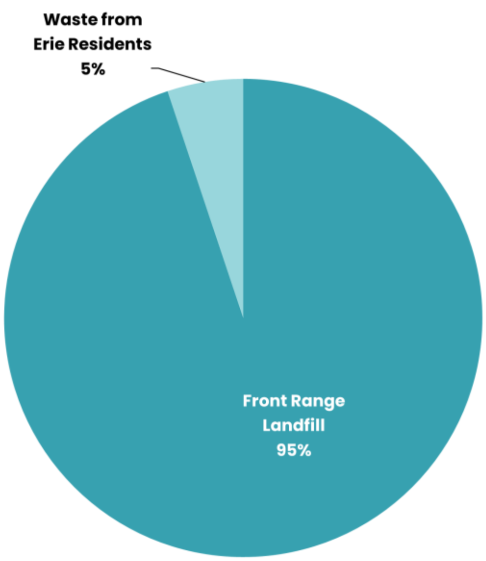


Figure 5. Erie's 2021 waste emissions breakdown.

*More than **1.7 million tons** of solid waste were deposited at the Front Range Landfill in 2021. Town of Erie residents produced **only 13,063 tons** of landfilled waste in the same year.*

Wastewater treatment was negligible in terms of total emissions (130 mt CO_2e). All wastewater produced in Erie is treated at a facility within the Town boundaries. As mentioned previously, while emissions from wastewater treatment make up a small percentage of overall emissions, the wastewater plant itself does contribute significantly to commercial electricity usage. Electricity usage at the wastewater treatment plant comprises

[5] This data point comes from the EPA's National Overview: Facts and Figures on Materials, Wastes, and Recycling. In 2018, each person produced an estimated 4.9 pounds of waste per day. It was assumed that the average national household size is 3.15, there are 2,000 pounds in a US ton, and there are 365 days in one year.

approximately 9% of Erie's total commercial and industrial electricity usage. This value is captured in Erie's stationary energy sector emissions.

Industrial Processes and Product Use

The only source of emissions within this sector is refrigerant leaks. This data point accounts for any emissions that occur from commercial air conditioning leakage. For Erie in 2021, this refrigerant leakage produced 101 mt CO_2e, comprising only 0.03% of Erie's total emissions.

BASIC+ Emissions

As noted in the introduction, the BASIC+ emissions from electricity transmission and distribution (T&D) losses and transboundary aviation were calculated for the 2021 inventory. **Together these sources accounted for 34,790 mt CO_2e, approximately 10 percent of overall emissions.**

Transmission and Distribution Losses

T&D losses represent electricity that is generated but does not reach intended customers due to inefficiencies in the transmission and distribution systems. These losses can range year-to-year and can be reduced through the utility making updates to the grid. In 2021, it was estimated that 5.28 percent of electricity did not make it to the intended customer resulting in approximately 7.8 million kWh being lost on the way to Erie. Total emissions from these losses are 4,640 mt CO_2e.

Transboundary Aviation

Transboundary Aviation emissions take into account the flights taken by Erie residents at Denver International Airport (DEN). It is estimated that 30,150 mt CO_2e were emitted in 2021 by Erie residents flying out of DEN.

2021 Municipal Operations GHG Emissions

Emissions by Sector

Erie's 2021 municipal emissions were broken down into four sectors: stationary energy, transportation, waste and wastewater, and consumption-based sources. The stationary energy sector created the most emissions, making up 85 percent of all municipal emissions (13,011 mt CO_2e). The transportation sector came next, comprising 13% of emissions (1,978 mt CO_2e), which includes both emissions from Town fleet vehicles and equipment as well as employee commuting. Consumption-based emissions made up one percent of emissions (212 mt CO_2e). Waste and wastewater emissions also made up less than one percent of emissions (138 mt CO_2e). See Figure 6.

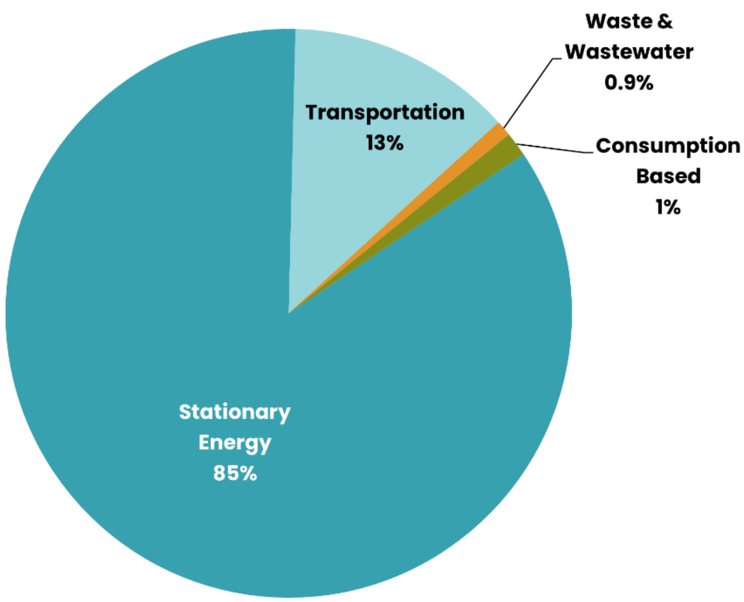


Figure 6. Erie's 2021 municipal emissions by sector.

Emissions by Source

Erie's largest source of municipal emissions in 2021 was stationary and mobile electricity. This includes grid-supplied electricity for Erie facilities and grid-supplied electricity used to charge employee-owned electric vehicles. This category made up 67 percent of municipal emissions (10,287 mt CO_2e). Stationary fossil fuels were the second largest source of emissions, making up 18 percent of emissions (2,276 mt CO_2e). This includes stationary diesel and natural gas used at Town facilities. The third-largest source of municipal emissions was aviation, comprising 9 percent of emissions (1,325 mt CO_2e); these emissions come from jet fuel and aviation gas usage at Erie Municipal Airport. On-road fossil fuel vehicles, or emissions from fossil fuel vehicles used for employee commuting and fossil fuel vehicles in Erie's municipal fleet, made up 3 percent of emissions (510 mt CO_2e). Remaining sources made up one percent or less of total municipal emissions each. See Figure 7 (below) and Table 3.

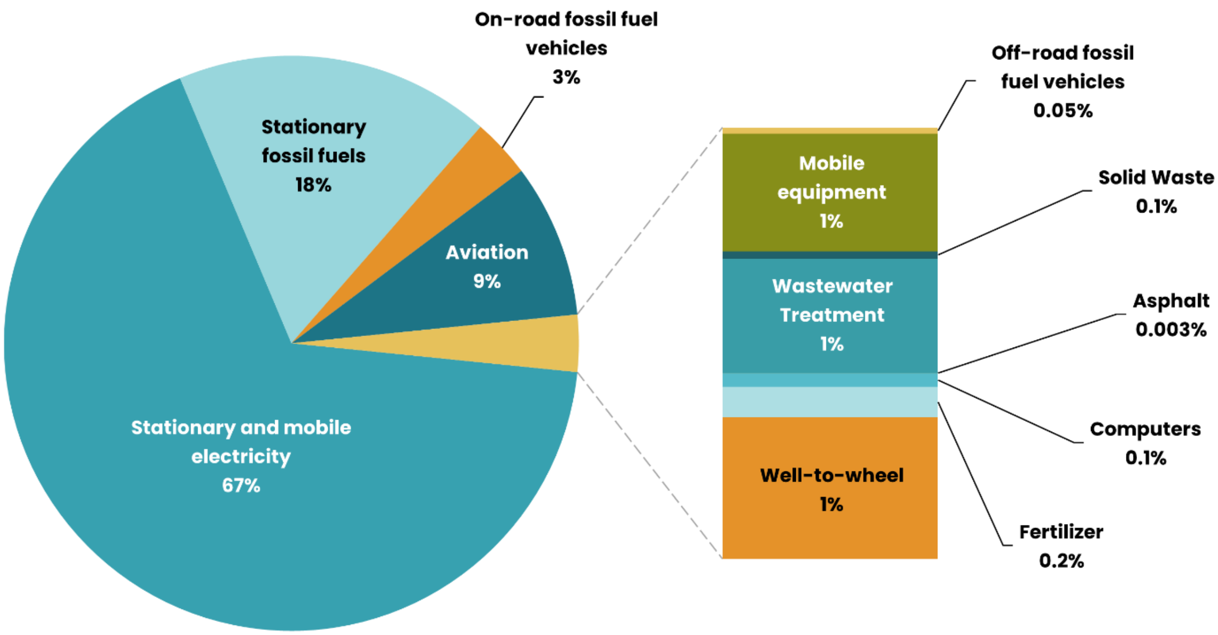


Figure 7. Erie's 2021 municipal emissions by source.

Erie's municipal emissions comprise 4 percent of total community emissions. While small, this amount is not negligible—all emissions have a footprint. As the community of Erie continues to work toward its sustainability goals, the Town will continue to work to reduce its own municipal emissions.

Table 3. 2021 municipal operations GHG emissions by source.

Emission Source	Emissions (mt CO2e)	% of Total
Stationary and mobile electricity	10,287	67%
Stationary fossil fuels	2,726	17.8%
Fossil-fuel powered fleet vehicles	340	2.2%
Electric fleet vehicles	2	1.1%
Employee commuting	170	0.01%
Off-road fossil fuel vehicles	7	0.05%
Mobile equipment	134	0.9%
Erie Municipal Airport	1,325	8.6%
Solid Waste	8	0.1%
Wastewater Treatment	130	1%
Asphalt	0.5	0.003%
Computers	16	0.1%

Fertilizer	34	0.2%
Well-to-wheel	161	1.1%
Total	**15,338**	**100%**

Carbon Sequestration

Biological carbon sequestration is the process by which atmospheric carbon dioxide is taken up by plants through photosynthesis and stored as carbon in biomass and soils. The plants and soil that hold the carbon taken from the atmosphere make up a **carbon sink**. The quantity of carbon stored in the plants and soil is the **carbon stock**. Plants are continually taking in the carbon from the atmosphere and storing it. But when plants burn, are eaten, or land changes from one cover type to another (i.e., from a forest to developments), carbon gets released back into the atmosphere. The annual change to the carbon stock is called the **carbon flux**.

ICLEI's Land Emissions and Removals Navigator (LEARN) tool was used to estimate the annual carbon flux of the land within Erie's town boundary. The LEARN tool uses the National Land Cover dataset to estimate land cover changes over time and the associated changes in carbon stock. Carbon stock changes are divided by the quantity of years in the analysis period to generate an annual carbon sequestration value.

The LEARN tool was run for Erie's town boundary across the time period of 2011-2019, with 2019 being the most recent data available. To analyze the impact of urban trees on Erie's annual carbon sequestration, the City of Golden was selected as a proxy for Erie's geography and climate. Over the eight years analyzed, Erie's land sequestered an average of 105 mt CO_2e per year (Figure 8 below).

	Removals(t CO2e/yr)	Emissions(t CO2e/yr)
Undisturbed Forest	-18	
Forest Disturbances		
Non-Forest to Forest	-1	
Forest to Settlement		
Forest to Grassland		
Forest to other non-forest lands		
Trees outside of forests	-86	
Harvested Wood Products	0	
TOTAL	-105	0
Net GHG balance	**-105**	

Figure 8. Annual carbon sequestration occurring through Erie's land area.

It should be noted that the LEARN tool puts an emphasis on carbon sequestration occurring through trees and forests. This is because this land cover type generates the most carbon sequestration per land area and maintaining or planting additional trees is one of the easiest ways to maintain and increase the amount of carbon sequestered.

Most of Erie's terrestrial carbon sequestration occurs in trees outside of forests, or the Town's urban trees. A small amount of sequestration is occurring in the Town's 52 acres of forest. The majority of the Town's land is classified as Settlement or Croplands. Erie should work to preserve and ultimately expand its urban trees and forests in order to maintain the Town's annual carbon sequestration.

Summary

Erie's 2021 GHG inventories illustrate the Town's progress toward its climate goals stated in its Sustainability Plan. This report identifies all sources of emissions in and attributed to the Town. Coupled with the Town of Erie's Sustainability Plan, the information in this report provides a valuable starting point from which to begin monitoring emissions reductions. Significant emissions reductions are needed to meet the Town's goals and limit environmental impact. With the information provided in this inventory, Erie can identify the greatest opportunities to reduce GHG emissions and encourage and prioritize sustainable action in future planning and policy.

Workbook Introduction and Guide

Legend for Data Entry and Inventory Year

Legend for data entry	Legend for data e
Do not edit	Do not edit; this cell is a
May need to be updated	These cells may need to be updated
Needs to be updated each inventory	These cells require manual entry each y

Lead Coordinator and Lead Consultant

Lead Coordinator	
Jurisdiction	Town of Erie
Name	Tyler Kesler
Title	Sustainability Manager
Telephone	303.926.2880
Email	tkesler@erieco.gov

Spreadsheet Contents

Source/Activity	Worksheet
All	Workbook Intro
	Emission Summary
	Inventory Data Checklist (IDC)
	Conversion Factors and GWP
	Municipal Indicators
Energy Use	Stationary Energy
On-Road Vehicles	Vehicle Fleet Data
	Bus Travel and EMP Commute Data
Aviation	Aviation
Off-Road	Off-Road
Solid Waste Generation	Waste_Recycling Data
Wastewater Treatment	Wastewater Data
Refrigerant leaks	Refrigerant Data
Consumption Data	Consumption Data

ntry
formula.
depending on if new
ear due for data that is

Lead Co
Company
Name
Title
Telephone
Email

Overview of workbook
Provides all summary information for the inventory, including emissior
Identifies required data and provides a place to store contact informat
Provides standard conversion factors and the most recent 100-year Gl
Includes general municipal characteristics used to complete GPC Table
Calculates the total emissions for each source of utility fuels and electr
Estimates mobile fuel consumption and emissions from VMT of munici
Estimates mobile fuel consumption and emissions from VMT of employ
Estimates emissions from the municipal owned airport.
Estimates mobile emissions from fuel use of municipal-owned off-road
Estimates emissions from community generated waste sent to landfill
Estimates total emissions from wastewater treatment processes.
Estimates emissions from refrigerant use.
Estimates emissions from paper use.

Inventory Year
2021

nsultant
Lotus Engineering and Sustainability
Rachel Meier
Senior Associate
612.558.6296
rachel@lotussustainability.com

Description
ns by scope, sector, and source.
tion for relevant community inventory sources and sectors.
obal Warming Potential values.
e 4.1 and to calculate GHG emission metrics.
ricity.
pal-owned vehicles.
yee-owned vehicles and business travel.
l vehicles.
or composting facility and avoided emissions from recycling.

Emissions Summary

Emission Inventory Summary

Scope
Scope 1
Scope 2
Scope 3
Total

Emission Inventory Summary without Co

Scope
Scope 1
Scope 2
Scope 3
Total

All Emissions by Sector

Emission Sector
Stationary Energy
Transportation
Waste + Wastewater
Consumption Based
Total

All Emissions by Sector without Consump

Emission Sector
Stationary Energy
Transportation
Waste + Wastewater
Total

All Emissions by Source

Emission Source
Stationary and mobile electricity
Stationary fossil fuels
On-road fossil fuel vehicles
Off-road fossil fuel vehicles
Mobile equipment
Aviation
Solid Waste
Wastewater Treatment
Paper
Asphalt
Cement
Food
Computers

Fertilizer
Well-to-wheel
Total

All Emissions by Source without Consump

Emission Source
Stationary and mobile electricity
Stationary fossil fuels
On-road fossil fuel vehicles
Off-road fossil fuel vehicles
Aviation
Mobile equipment
Solid Waste
Wastewater Treatment
Total

Detailed Emissions Breakdown by Sector

Stationary Energy
Fuel Combustion within the City Boundary
Grid Supplied Electricity
Total Stationary Energy
Transportation
On-road Vehicles
Emissions from fuel combustion on-road transportation occurring in the city
Emissions from grid-supplied energy consumed in the city for on-road transportation
Emissions from fuel combustion from equipment used in the city
Emissions from aviation
Off-Road
Emissions from off-road vehicle fuel use
Total Transportation
Waste
Community Solid Waste
Landfilled waste
Wastewater Treatment and Discharge
Wastewater Generated and Treated

Total Waste
Consumption Based
Paper
Asphalt
Cement
Food
Computers
Fertilizer
Well-to-wheel
Total Consumption Based
otal Emissions Without Consumption-Based Sources
Total Emissions with Consumption-Based Sources

Information Only Breakdown by Sector
Information Only
Energy Related
Xcel-owned Renewable Energy Credits
Erie-owned Renewable Energy Credits
Total Energy-Related
Refrigerants
Refrigerant Leaks
Total Industrial Processes and Product Use
Recycling
Recycling
Total Recycling
TOTAL INFORMATION-ONLY

Emissions (mt CO_2e)	% of Total
4,661	30%
10,287	67%
391	2.5%
15,338	**100%**

nsumption Based

Emissions (mt CO_2e)	% of Total
4,661	31%
10,287	68%
179	1.2%
15,126	**100%**

Emissions (mt CO_2e)	% of Total
13,011	85%
1,978	12.9%
138	1%
212	1.4%
15,338	**100%**

tion-Based

Emissions (mt CO_2e)	% of Total
13,011	86%
1,978	13.1%
138	1%
15,126	**100%**

Emissions (mt CO_2e)	% of Total
10,287	67%
2,726	17.8%
510	3.3%
7	0.05%
134	0.9%
1,325	8.6%
8	0.1%
130	1%
0	0%
0.5	0.003%
0	0%
0	0%
16	0.1%

34	0.2%
161	1.1%
15,338	**100%**

tion-Based

Emissions (mt CO_2e)	% of Total
10,288	67.1%
2,726	17.8%
510	3.3%
7	0.05%
1,325	8.6%
134	0.9%
8	0.1%
130	1%
15,128	**100%**

Type	GHG Emissions (mt CO_2e)
Erie Facilities	2,722
Erie Facilities	4
Erie Facilities	10,285
	13,011

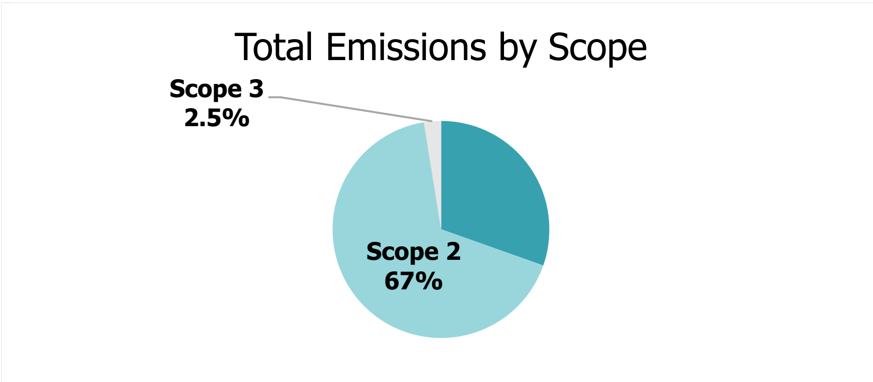
Type	GHG Emissions (mt CO_2e)
Municipal Vehicles	340
Business Travel	0
Employee Commuting (includes travel by bus)	170
Municipal Vehicles	2
Employee Commuting	0
Municipal Equipment	134
Jet Fuel and Aviation Gasoline	1,325
Type	**GHG Emissions (mt CO_2e)**
Airport Equipment	7
	1,978

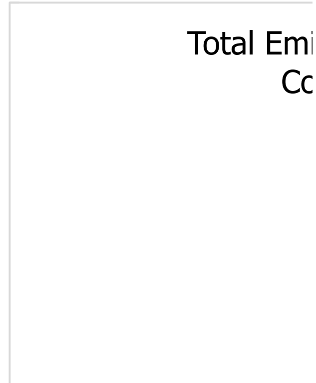
Type	GHG Emissions (mt CO_2e)
Waste	8
Type	**GHG Emissions (mt CO_2e)**
Wastewater Treatment	130

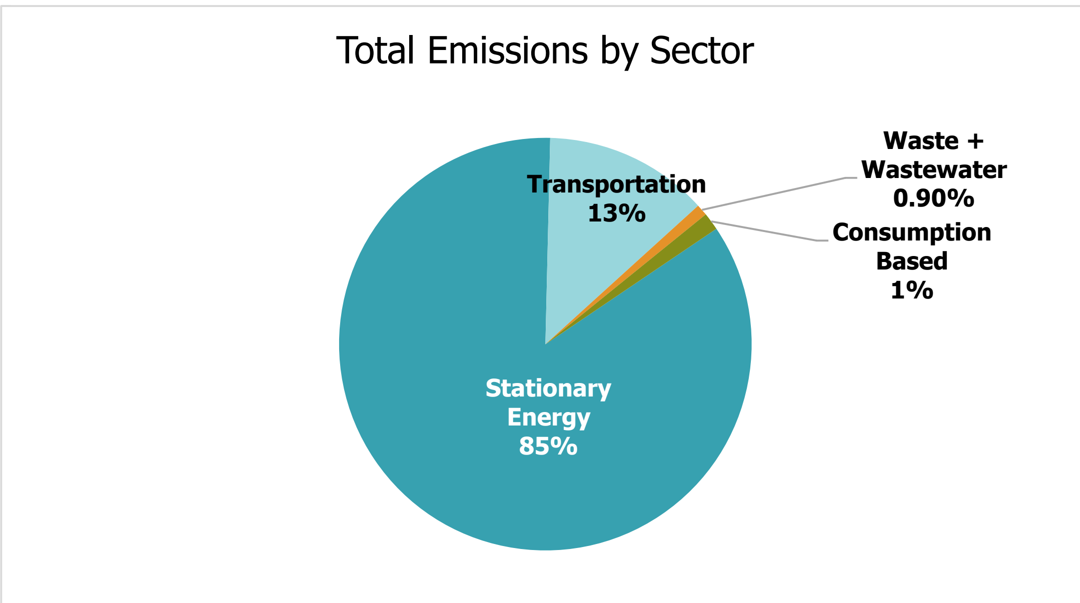
	138

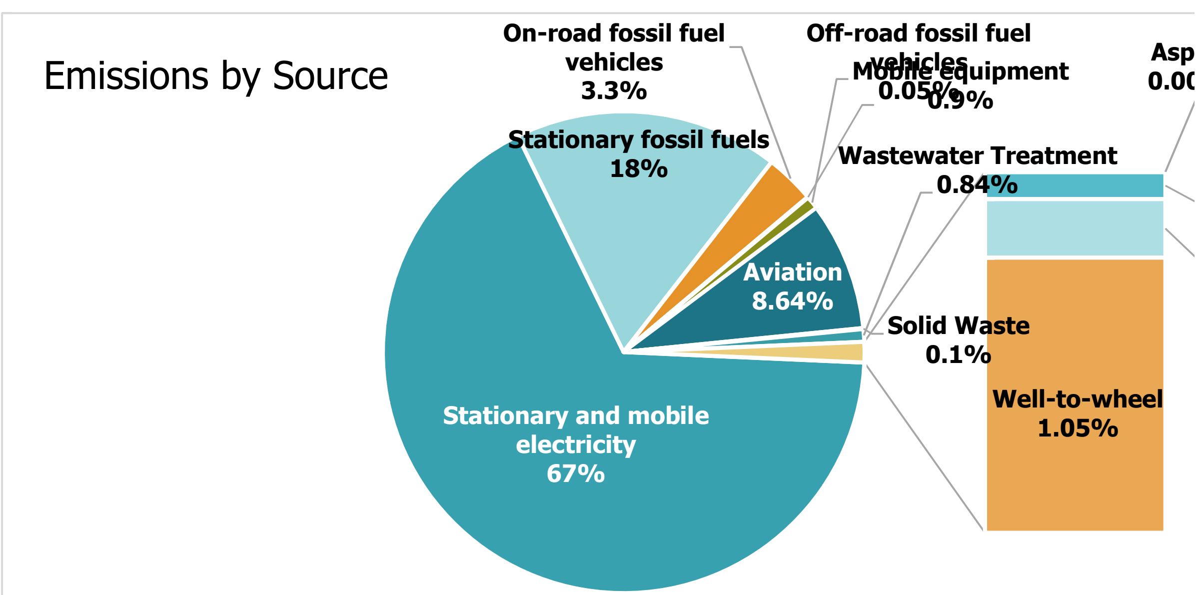
Type	GHG Emissions (mt CO_2e)
Paper	0
Asphalt	0.5
Cement	0
Food	0
Computers	16
Fertilizer	34
Well-to-wheel	161
	212
	15,126
	15,338

Type	Avoided GHG Emissions (mt CO_2e)
Grid Supplied Renewables	0
Renewable*Connect and Rooftop Solar	0
	0
Type	**GHG Emissions (mt CO_2e)**
R-22	67
R-410A	64
	131
Type	**Avoided GHG Emissions (mt CO_2e)**
All	(13)
	(13)
Avoided Emissions	**(13)**
Refrigerant Emissions	**131**


Total Emissions by Scope
Scope 3
2.5%
Scope 2
67%


Total Emi
Co


Total Emissions by Sector
Transportation
13%
Waste +
Wastewater
0.90%
Consumption
Based
1%
Stationary
Energy
85%


Emissions by Source
On-road fossil fuel
vehicles
3.3%
Off-road fossil fuel
vehicles
0.05%
Mobile equipment
0.9%
Asp
0.00
Stationary fossil fuels
18%
Wastewater Treatment
0.84%
Aviation
8.64%
Solid Waste
0.1%
Well-to-wheel
1.05%
Stationary and mobile
electricity
67%

Scope	Value	Unit
1	521,613	therms
1	400	gallons
2	18,284,398	kWh

Scope	Value	Unit
1	913,742	VMT
3	0	VMT
3	443,526	VMT
2	2,240	kWh
3	0	kWh
1	13,032	Gallons of Fuel
1	141,187	Gallons fuel

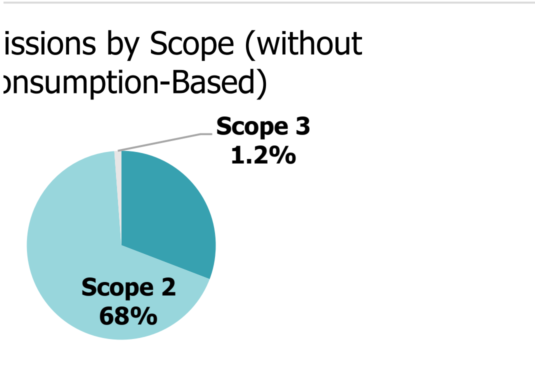
Scope	Value	Unit
1	680	Gallons of fuel

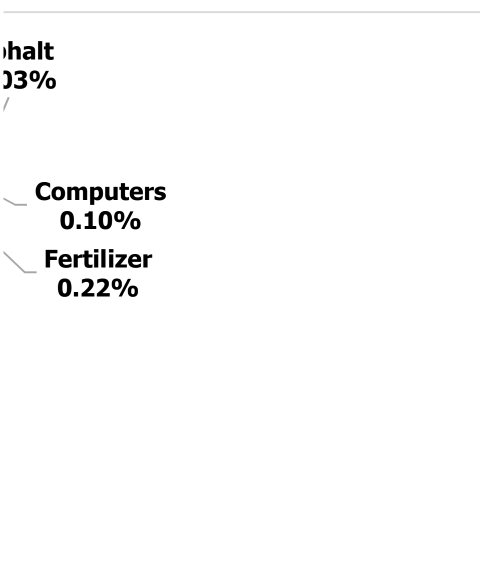
Scope	Value	Unit
3	31	Tons Waste

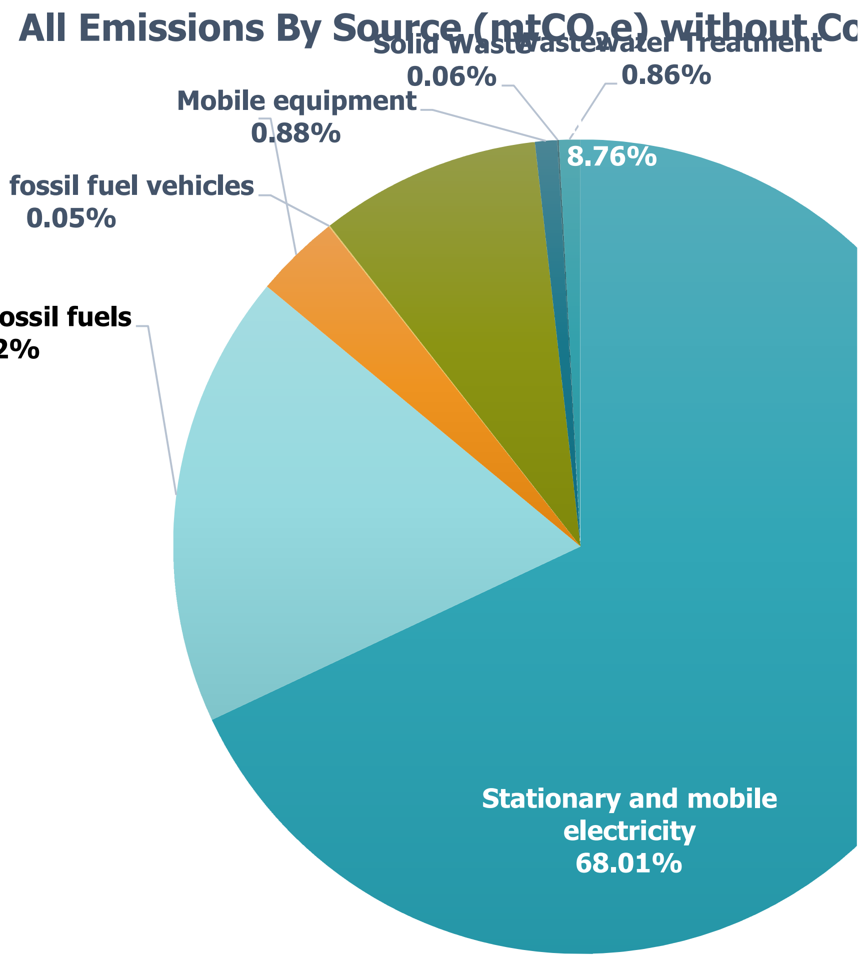
Scope	Value	Unit
1	30,000	Population Served

Scope	Value	Unit
3	0	Pounds purchased
3	4	tons of Asphalt
3	0	yd^3 of cement
3	0	$ spent
3	622	Pounds purchased
3	15,260	lbs applied
3	70,151	gallons consumed

Scope	Value	Unit
N/A	0	kWh
N/A	0	kWh
	0	
Scope	**Value**	**Unit**
1	37	kg
1	31	kg
Scope	**Value**	**Unit**
N/A	5	Tons


issions by Scope (without
onsumption-Based)
Scope 3
1.2%
Scope 2
68%


halt
03%
Computers
0.10%
Fertilizer
0.22%



All Emissions By Source (mtCO2e) without Co
Solid Waste
0.06%
Wastewater Treatment
0.86%
Mobile equipment
0.88%
8.76%
Off-road fossil fuel vehicles
0.05%
Stationary fossil fuels
18.02%
Stationary and mobile electricity
68.01%

onsumption Based

Inventory Data Checklist for Municipal GHG Invento

Data Contacts

Municipal Indicators

Emissions Source	Data Source
Facility square feet	Town of Erie
Number of employees	Town of Erie

Stationary Energy

Emissions Source	Data Source
Electricity	Town of Erie
Natural Gas	Town of Erie
Diesel for facilities	Town of Erie
Propane	Town of Erie

Emissions Source	Data Source
Solar	Town of Erie

Mobile Energy

Emissions Source	Data Source
Fleet fuel consumed or vehicle miles traveled, vehicle details	Town of Erie

Fleet electric vehicles	Town of Erie
Off-road vehicles fuel consumed or vehicle miles traveled [at Municipal Airport]	Town of Erie
Mobile equipment fuel consumed or vehicle miles traveled, equipment type	Town of Erie
Aviation [Municipal Airport]	Town of Erie

Emissions Source	Data Source
Employee commuting	Town of Erie
Business travel	Town of Erie

Solid Waste Facilities

Emissions Source	Data Source
Tons of waste landfilled	Town of Erie

Tons of waste recycled	Town of Erie
Tons of waste composted	Town of Erie
Waste and Wastewater Treatment Facilities	
Emissions Source	**Data Source**
Amount of gas combusted and flared	Town of Erie
Nitrogen discharged	Town of Erie
Service Area Population	Town of Erie
Process and Fugitive Emissions	
Emissions Source	**Data Source**
Type and tons of refrigerant used in buildings	Town of Erie
Type and tons of refrigerant used in vehicle fleet	Town of Erie
Materials	
Emissions Source	**Data Source**
Tons of paper consumed	Town of Erie
Asphalt and cements	Town of Erie
Food purchases	Town of Erie
Fertilizer	Town of Erie
Computers/Hardware	Town of Erie

ry

Contact Information
Dennis Buck dbuck@erieco.gov
Tracy Schoenebeck HR Operations Manager tschoenebeck@erieco.gov 303-926-2745

Contact Information
Bill Meier bmeier@unitedpower.com Lexi Johnson E: alexandra.l.johnson@xcelenergy.com
Lexi Johnson E: alexandra.l.johnson@xcelenergy.com Maria Garduna Maria.Garduna@blackhillscorp.com
Dennis Buck dbuck@erieco.gov
N/A

Contact Information
N/A

Contact Information
Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov

Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov
Todd Fessenden tfessenden@erieco.gov Jason Hurd jason@vectorair.net
Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov
Todd Fessenden tfessenden@erieco.gov Jason Hurd jason@vectorair.net

Contact Information
Tyler Kesler tkesler@erieco.gov Adam Nettesheim anettesheim@erieco.gov Tracy Schoenbeck tschoenebeck@erieco.gov Gabi Rae grae@erieco.gov
Tyler Kesler tkesler@erieco.gov Adam Nettesheim anettesheim@erieco.gov Tracy Schoenbeck tschoenebeck@erieco.gov Gabi Rae grae@erieco.gov

Contact Information
Todd Fessenden

tfessenden@erieco.gov

Contact Information
Jon Coyle jcoyle@erieco.gov

Hydro

Contact Information
Dennis Buck Facilities Division Manager dbuck@erieco.gov 303.926.2560
Rich Lucas rlucas@erieco.gov Kris McDaniel krismc@erieco.gov

Contact Information
Amy Teetzel ateetzel@erieco.gov
Scott Brown sbrown@erieco.gov
N/A
Mike McGill mmcgill@erieco.gov
Denise Jakan djakan@erieco.gov

Town-Wide

Status
On file
On file

Buildings and Facilities

Status
On file
On file
On file
N/A

Renewable Energy

Status
N/A

Vehicle Fleet

Status
On file

On file
On file
On file
On file

Employees

Status
On file
Not available

Municipal Solid Waste

Status

Will estimate

Wastewater Treatment

Status
On file

fluorocarbon and Refrigerants

Status
On file
Not Available

Other

Status
Not Available
On file
N/A
On file
On file

Notes

Notes
No propane used at Erie facilities.

Notes

Notes

Notes

Notes

Notes
Notes
Notes
De minimis

Conversion Factors and Global Warming Potential (G

Constants

Conversion Factors	
2,204.62	lbs
2,000.00	lbs
1,000.00	kWh
1.00	kBTU of electricity
1,000.00	kg
1,000,000.00	g
1.00	MMBtu of electricity
0.1000	MMBtu of natural gas
1,000.00	kBtu of natural gas
12,000.00	BTU of electricity
1.00	kg
Global Warming Potentials	
Common Name	**Formula**
Carbon Dioxide	CO_2
Methane	CH_4
Nitrous Oxide	N_2O
Refrigerants	R-134A
	R-22
	R-11
	R-12
	R514
	R407c
	R410a

1
1
1
0.293071
1
1
1
1
1
1
2.20462
GWP
1
29.8
273
1,526
1,810
4,750
10,900
2
1,774
2,088

metric ton
US ton
MWh
kWh
metric ton
metric ton
MLB Steam
therm
MMBtu of natural gas
Ton-hour chilled water
lbs.
Source
IPCC Sixth Assessment Report; document can be found at: https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/.
https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants

Municipal Indicators

Data Sources and Assumptions

1) Data for number of employees were provided by Tracy Schoenebeck. Email on file.

2) Facility square footage and quantity data were provided by Dennis Buck. Email and PDF on
were removed from the square footage total.

Municipal Indicators

Municipal Indicator	Value
Total facility square feet	219,392
Number of buildings	79
Facilities owned and occupied	*79*
Facilities owned but leased to other organizations	*0*
Full-time employees	206
Part-time employees	260
Temporary/Seasonal	5
Total number of Town employees	471

file. Spreadsheet with calculations on file. Square footage of dugouts, picnic shelters, and other r structures that are not buildings

Stationary Energy Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	2,726
Scope 2	10,285
Scope 3	0
Total	**13,011**
Information-Only Avoided Emissions	0

Data Sources and Assumptions

1) Electricity data was provided in United Power's 2021 Franchise Report for the Town of
2) Natural gas data and additional electricity data were provided by Xcel Energy. Spreads
3) Stationary diesel data were provided by Dennis Buck. Email on file.
4) There are no renewable energy programs in Erie. Confirmed via phone call.
5) Propane is not used in any buildings.
6) The North Water Treatment Facility is serviced by Black Hills Energy for natural gas. T

Emission Factors

Electricity

Utility/Method	Greenhouse Gas
United Power	CO_2
Xcel Energy	CO_2
N/A	CH_4
N/A	N_2O

Natural Gas

Utility	Greenhouse Gas
Xcel Energy	CO_2
N/A	CH_4
N/A	N_2O

Stationary Diesel

Utility	Greenhouse Gas
Various	CO_2
Various	CH_4
Various	N_2O

Emissions Calculations

Energy Consumption

Electricity	Electricity Provided by United Power (kWh)
Facilities	**6,676,693**
Erie Facilities	5,779,502
Irrigation Sales	79,901
Public Street and Highway Lighting	817,290

Total	**6,676,693**
Natural Gas	**Natural Gas Provided by Xcel Energy (th)**
Facilities	**472,318**
Erie Facilities	472,318
Total	**472,318**
Stationary Diesel	**Gallons of Diesel**
Erie Facilities	400
Total	**400**
Renewable Energy Generation and Renewable Energy Credits	
Grid Supplied Renewables (Xcel-owned RECs)	**Total Generation (kWh)**
Erie Facilities	0
Total	**0**
Renewable*Connect and Rooftop Solar (Erie-owned RECs)	**Total Generation (kWh)**
Erie Facilities	0
Total	**0**
TOTAL RENEWABLE ENERGY	**0**

Erie. PDF on file.
sheet on file. Metered streetlight data for Erie owned streetlights and traffic s

hey provided the natural gas usage data for that building. Spreadsheet on fi

Value	Units
0.712	mt CO_2/MWh
0.470	mt CO_2/MWh
0.00006	mt CH_4/MWh
0.00001	mt N_2O/MWh

Value	Units
0.0052	mt CO_2/th
0.0000005	mt CH_4/th
0.00000001	mt N_2O/th

Value	Units
0.0102	mt CO_2/gal
0.0000004	mt CH_4/gal
0.0000001	mt N_2O/gal

Electricity Provided by Xcel Energy (kWh)	Emissions (mt CO_2)
11,607,705	**10,209**
11,600,777	9,567
0	57
6,928	585

11,607,705	**10,209**
Natural Gas Provided by Black Hills (th)	**Emissions (mt CO_2)**
49,295	**2,712**
49,295	2,712
49,295	**2,712**
Emissions (mt CO_2)	**Emissions (mt CH_4)**
4	0.0002
4	**0.0002**
Emissions (mt CO_2)	**Emissions (mt CH_4)**
0	0
0	**0**
Emissions (mt CO_2)	**Emissions (mt CH_4)**
0	0
0	**0**
0	**0**

signals was provided in the Xcel Community Energy Report for the Town of E

le.

Source
Tri-State's Carbon Rate 2021: 1,570 lb/MWh. PDF on file. Pounds converted
Provided in Xcel Energy's 2021 Community Energy Report for Erie https://w
EPA's eGrid: eGRID 2018 summary tables, table 1, sub region RMPA. https:/ 01/documents/egrid2018_summary_tables.pdf.

Source
Xcel Energy's Community Energy Report: https://www.xcelenergy.com/work
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhou Environment Emission Activities and Sources, Version 1.1, July 2013: http://

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhou Environment Emission Activities and Sources, Version 1.1, July 2013: http:// and that diesel is primarily used in generators by the industrial sector.

Emissions (mt CH_4)	Emissions (mt N_2O)
1	**0.2**
0.97	0.16
0.004	0.001
0.05	0.01

1	**0.2**
Emissions (mt CH_4)	**Emissions (mt N_2O)**
0.3	**0.005**
0.3	0.005
0.3	**0.005**
Emissions (mt N_2O)	**Emissions (mt CO_2e)**
0.00004	4
0.00004	**4**
Emissions (mt N_2O)	**Emissions (mt CO_2e)**
0	0
0	**0**
Emissions (mt N_2O)	**Emissions (mt CO_2e)**
0	0
0	**0**
0	**0**

:rie, spreadsheet on file.*

e
to metric tons using unit conversions.
ww.xcelenergy.com/community_energy_reports
//www.epa.gov/sites/production/files/2020-
e
king_with_us/municipalities/community_energy_reports
se Gas Emissions (Community Protocol) – Appendix C: Built /icleiusa.org/ghg-protocols/.
e
se Gas Emissions (Community Protocol) – Appendix C: Built /icleiusa.org/ghg-protocols/. Assumes distillate fuel oil number 2

Emissions (mt CO_2e)
10,285
9,639
57
589

10,285
Emissions (mt CO_2e)
2,722
2,722
2,722

Vehicle Fleet Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	474
Scope 2	2
Scope 3	N/A
Total	**476**

Data Sources and Assumptions

1) Vehicle fleet provided by Richard Lucas. Spreadsheets on file. Vehicles/equipment we
2) Fuel efficiencies were taken from the EPA State Inventory Tool.
3) On a call with Tyler Kesler (11/15), Tyler noted that the Town's 2 electric vehicles ar

Emission Factors

Gasoline

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.009
CH_4	Passenger Vehicle	0.020
CH_4	Light Truck	0.023
CH_4	Heavy Truck	0.033
CH_4	Motorcycle	0.007
CH_4	Heavy Vehicle (bus)	0.030
N_2O	Heavy Vehicle (bus)	0.002
N_2O	Passenger Vehicle	0.017
N_2O	Light Truck	0.025
N_2O	Heavy Truck	0.013
N_2O	Motorcycle	0.068

Gasoline (equipment)

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.009
CH_4	Lawn and Garden Equipment	10.71
N_2O	Lawn and Garden Equipment	3.01

Diesel

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.010
CH_4	Passenger Vehicle	0.001
CH_4	Light Truck	0.001
CH_4	Heavy Truck	0.005
N_2O	Passenger Vehicle	0.001
N_2O	Light Truck	0.002
N_2O	Heavy Truck	0.005

Diesel (equipment)

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.010
CH_4	Lawn and Garden Equipment	0.335
N_2O	Lawn and Garden Equipment	0.466

Ethanol

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.006
CH_4	Light Duty	0.010
CH_4	Heavy Duty	0.075
N_2O	Light Duty	0.009
N_2O	Heavy Duty	0.028

Biodiesel

Greenhouse Gas	Vehicle Type	Value
Biogenic CO_2	All	0.009
CH_4	Light Duty	0.023
CH_4	Heavy Duty	0.009
N_2O	Light Duty	0.014
N_2O	Heavy Duty	0.043

Stationary Diesel

Greenhouse Gas	Vehicle Type	Value
CO_2	Equipment	0.0102
CH_4	Equipment	0.0000004

N_2O	Equipment	0.0000001

Propane (Equipment)

Greenhouse Gas	Vehicle Type	Value
CO_2	Equipment	0.0057
CH_4	Equipment	0.35
N_2O	Equipment	0.41

Propane (Heavy-Duty Trucks)

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.0057
CH_4	Heavy Duty	0.013
N_2O	Heavy Duty	0.026

Liquid CNG (Heavy Duty Trucks)

Greenhouse Gas	Vehicle Type	Value
CO_2	All	0.0045
CH_4	Heavy Duty	3.7
N_2O	Heavy Duty	0.001

Emissions Calculations

Emissions Summary

	Gallons	kWh
Total Vehicles	**42,184**	**2,240**
Gasoline	37,217	
Ethanol	4,135	
Diesel	832	
Biodiesel	0	
Propane	0	
CNG	0	
Electric		2,240
Total Equipment	**13,032**	**0**
Gasoline	2,416	
Ethanol	0	
Diesel	10,617	
Biodiesel	0	
Propane	0	
Total Stationary Diesel	**0**	**0**
Total	**55,216**	**2,240**

Vehicle Fuel Efficiencies

Vehicle Type	MPG
Gas cars	24.1
Gas hybrid vehicles	56.0
Gas light trucks	18.5
Diesel cars	32.4
Diesel light trucks	22.1
Gas freight trucks	7.1

Diesel freight trucks	6.6
Gas single unit truck	7.1
Diesel single unit trucks	6.6
Diesel bus (paratransit)	7.7
Gas bus	14.0

Constants

Vehicle Type	kWh/mile
Electric vehicle	0.32

Emissions Calculations

Gasoline

	Total Gasoline Miles	Gasoline (gals)
Passenger Vehicles	**562,051**	**20,989**
Fleet	562,051	20,989
Light Duty Trucks	**333,557**	**16,227**
Fleet	333,557	16,227
Heavy Duty Trucks	**0**	**0**
Fleet	0	0
Buses	**0**	**0**
Fleet	0	0
Equipment	**0**	**2,416**
Fleet	0	2,416
Total Gasoline	**895,607**	**39,632**

Diesel

	Total Standard Diesel Miles	Diesel (gals)
Light Duty Trucks	**18,029**	**816**
Fleet	18,029	816
Heavy Duty Trucks	**106**	**16**
Fleet	106	16
Equipment	**0**	**10,617**
Fleet	0	10,617
Total Diesel	**18,135**	**11,448**

E-85

	Total E85 Miles	Gasoline (gals)
Passenger Vehicles	**0**	**0**
Fleet	0	0

Total E85	**0**	**0**
CNG		
	CNG Miles	**CNG (gals)**
Heavy Duty Trucks	**0**	**0**
Fleet	0	0
Total CNG	**0**	**0**
Propane		
	Propane (gals)	**Propane (miles)**
Heavy Duty Trucks	**0**	**0**
Fleet	0	0
Equipment	**0**	
Fleet	0	
Total Propane	**0**	**0**
Stationary Diesel		
	Diesel (gals)	**Emissions (mt CO_2)**
Stationary Diesel	**0**	**0**
Fleet	0	0
Total Stationary Diesel	**0**	**0**
Electricity		
	Number of Cars	**VMTs**
Electric Passenger Vehicles	**2**	**7,000**
Fleet	2	7,000
Total Electricity	**2**	**7,000**

ere recategorized based on fuel type and EPA Gross Vehicle Weight Rating (GVWR) to align with emis

e estimated to drive 3,500 miles per year. This information is reported in the electric vehicles calculat

Units	Source
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	2021 Climate Registry, Table 2.4 (https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8) - "EPA Tier 2" category
g N_2O/mile	2021 Climate Registry, Table 2.4 (https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8) - "EPA Tier 2" category
g N_2O/mile	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g N_2O/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors, Tables 2.1 & 2.7: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8. NOTE: An average for gasoline commercial 2-stroke and 4-stroke engines was used.
g CH_4/gallon fuel	
g N2O/gallon fuel	

Units	Source
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	
g CH_4/mile	
g CH_4/mile	
g N_2O/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors, Tables 2.1 & 2.7: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8.
g CH_4/gallon fuel	
g N2O/gallon fuel	

Units	Notes
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	2021 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8. NOTE: An average for Ethanol Flex-Fuel ICE values for light duty cars and light duty
g CH_4/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt biogenic CO_2(b)/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
g CH_4/mile	2021 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd4505fa8. NOTE: An average for Biodiesel for light duty cars, light duty trucks, and medium duty
g CH_4/mile	
g N_2O/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix C: Built Environment Emission Activities and Sources, Version 1.1, July 2013:
mt CH_4/gal	

mt N_2O/gal	Environment Emission Activities and Sources, Version 1.1, July 2013. http://icleiusa.org/ghg-protocols/. Assumes distillate fuel oil number 2 and

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf CO2 Emissions factors source from Table 2.1 for 'Propane'. CH4 and N2O
g CH_4/gal	
g N_2O/gal	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf CO2 Emissions factors source from Table 2.1 for 'Propane'. CH4 and N2O
g CH_4/mile	
g N_2O/mile	

Units	Notes
mt CO_2/gal	2021 Climate Registry Default Emissions Factors: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf CO2 Emissions factors source from Table 2.1 for 'Liquefied Natural Gas'. CH4
g CH_4/mile	
g N_2O/mile	

VMT	Biogenic Emissions (mt CO_2(b))
920,742	**24**
806,047	
89,561	24
18,135	
0	0
0	
0	
7,000	
Not Applicable	**0**
	0
	0
	0
920,742	**24**

Fuel Additives	
% of ethanol in standard gasoline	10%
% of ethanol in E85 gasoline	85%
% biodiesel in standard diesel	0%

Ethanol (gals)	Estimated VMT Gasoline
2,332	**505,846**
2,332	505,846
1,803	**300,201**
1,803	300,201
0	**0**
0	0
0	**0**
0	0
0	
0	
4,135	**806,047**

Biodiesel (gals)	Estimated VMT Diesel
0	**18,029**
0	18,029
0	**106**
0	106
0	
0	
0	**18,135**

Ethanol (gals)	Estimated VMT Gasoline
0	**0**
0	0

0	**0**

Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**
0	0
0	**0**

Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**
0	0
0	**0**
0	0
0	**0**

Emissions (mt CH_4)	Emissions (mt N_2O)
0	**0**
0	0
0	**0**

Electricity (kWh)	Emissions (mt CO_2)
2,240	**2**
2,240	2
2,240	**2**

ssions factors.

tion section of this tab.

Fossil Emissions (mt CO_2)	Emissions (mt CH_4)	Emissions (mt N_2O)	Emissions (mt CO_2e)
336.85	**0.02**	**0.02**	**342.00**
326.76	0.02	0.02	331.66
	0.0009	0.0008	0.23
8.49	0.000019	0.000028	8.50
	0	0	0
0	0	0	0
0	0	0	0
2	0.0001	0.00002	2
129.61	**0.03**	**0.01**	**133.82**
21.21	0.03	0.01	23.97
	0	0	0
108.39	0.004	0.005	109.85
	0	0	0
0	0	0	0
0	**0**	**0**	**0**
466	**0.05**	**0.03**	**476**

Estimated VMT Ethanol	Biogenic Emissions (mt CO_2(b))	Fossil Emissions (mt CO_2)	Emissions (mt CH_4)
56,205	**13**	**184**	**0.011**
56,205	13	184	0.011
33,356	**10**	**142**	**0.007**
33,356	10	142	0.007
0	**0**	**0**	**0**
0	0	0	0
0	**0**	**0**	**0**
0	0	0	0
	0	**21**	**0.026**
	0	21	0.026
89,561	**24**	**348**	**0.044**

Estimated VMT Biodiesel	Biogenic Emissions (mt CO_2(b))	Fossil Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**	**8**	**0.00002**
0	0	8	0.00002
0	**0**	**0.2**	**0.000001**
0	0	0.2	0.000001
	0	**108**	**0.004**
	0	108	0.004
0	**0**	**117**	**0.004**

Estimated VMT Ethanol	Biogenic Emissions (mt CO_2(b))	Fossil Emissions (mt CO_2)	Emissions (mt CH_4)
0	**0**	**0**	**0**
0	0	0	0

0	**0**	**0**	**0**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0	**0**
0	0
0	**0**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0	**0**
0	0
0	**0**
0	0
0	**0**

Emissions (mt CO_2e)
0
0
0

Emissions (mt CH_4)	Emissions (mt N_2O)	Emissions (mt CO_2e)
0.0001	**0.00002**	**2**
0.0001	0.00002	2
0.0001	**0.00002**	**2**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0.009	**187**
0.009	187
0.008	**145**
0.008	145
0	**0**
0	0
0	**0**
0	0
0.007	**24**
0.007	24
0.024	**356**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0.00003	**8**
0.00003	8
0.000001	**0.2**
0.000001	0.2
0.005	**110**
0.005	110
0.005	**118**

Emissions (mt N_2O)	Emissions (mt CO_2e)
0	**0**
0	0

0	0

Business Travel and Employee Commuting Da

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	N/A
Scope 2	N/A
Scope 3	170
Total	**170**

Data Sources and Assumptions

1) Erie full-time and part-time commuting miles were provided by Gabi Rae. To ca office/in person in 2021 and assume all 5 seasonal employees worked in person ir roundtrip commute of 28.88 miles for full time employees and 12.36 miles for par

2) Erie does not track reimbursed business travel via passenger vehicle or airplane

Emission Factors

Public Transit Using Diesel

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Heavy Vehicle
N_2O	Heavy Vehicle

Gasoline

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Passenger Vehicle
CH_4	Light Truck
CH_4	Heavy Truck
CH_4	Motorcycle
N_2O	Passenger Vehicle
N_2O	Light Truck
N_2O	Heavy Truck
N_2O	Motorcycle

Diesel

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Passenger Vehicle
CH_4	Light Truck
CH_4	Heavy Truck
N_2O	Passenger Vehicle
N_2O	Light Truck
N_2O	Heavy Truck

Ethanol

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Light Duty
CH_4	Heavy Duty
N_2O	Light Duty
N_2O	Heavy Duty

Biodiesel

Greenhouse Gas	Vehicle Type
Biogenic CO_2	All
CH_4	Light Duty
CH_4	Heavy Duty
N_2O	Light Duty
N_2O	Heavy Duty

Electric and Hybrid Vehicles

Vehicle Type	Value
Electric Vehicle (EV)	0.320
Hybrid Electric Vehicle (HEV)	44.4
Plug-in-Hybrid Electric Vehicle (PHEV)	0.367

Jet Fuel (Aviation)

Variable	Value
Short-haul travel	0.225
Medium-haul travel	0.136
Long-haul travel	0.166
Short-haul travel	0.004
Medium-haul travel	0.001
Long-haul travel	0.001
Short-haul travel	0.007
Medium-haul travel	0.004
Long-haul travel	0.005

Emissions Calculations

Business Travel and Employee Commuting Breakdown

Passenger Vehicle Fuel Type	Employee Commuting (Passenger and Carpool) (%)
Gasoline	100%
Hybrid	0%
EV	0%
PHEV	0%
Diesel	0%
Total	**100%**

Emissions from Reimbursed Miles for Car Business Travel	
Gasoline Vehicles	
	Total Fuel Used (gal)
Gasoline Vehicles	0
Gasoline	*0*
Ethanol	*0*
Total	**0**
Emissions from Employee Commuting	
Gasoline, Hybrid, and Diesel Vehicles	
	Total Fuel Used (gal)
Gasoline Vehicles	**21,189**
Passenger Vehicles (Gasoline)	*8,282*
Passenger Vehicles (Ethanol)	*920*
Light Duty Trucks (Gasoline)	*10,788*
Light Duty Trucks (Ethanol)	*1,199*
Diesel Bus	**0**
Diesel	*0*
Biodiesel	*0*
Diesel Vehicles	**0**
Diesel	*0*
Biodiesel	*0*
Total	**21,189**
EV and PHEV Vehicles	
	Total kWh
EV	0
PHEV: Electric	0
Total	**0**
Emissions from Air Travel	
Travel Type	**Miles Traveled**

Domestic	**0**
Short-Haul	0
Medium-Haul	0
Long-Haul	0
International	**0**
Short-Haul	0
Medium-Haul	0
Long-Haul	0
Total	**0**
Short-Haul	0
Medium-Haul	0
Long-Haul	0
Total	**0**

alculate employee commuting values, several assumptions were made. L
n 2021; 2) assume all employees who worked in office/in person worked
t time and seasonal employees; and 4) assume a 50/50 split for employ

e, so this number is assumed to be de minimis.

Value	Units
0.010	mt CO_2/mile
0.005	g CH_4/mile
0.0048	g N_2O/mile

Value	Units
0.009	mt CO_2/gal
0.020	g CH_4/mile
0.023	g CH_4/mile
0.033	g CH_4/mile
0.007	g CH_4/mile
0.017	g N_2O/mile
0.025	g N_2O/mile
0.013	g N_2O/mile
0.068	g N_2O/mile

Value	Units
0.010	mt CO_2/gal
0.001	g CH_4/mile
0.001	g CH_4/mile
0.005	g CH_4/mile
0.001	g N_2O/mile
0.002	g N_2O/mile
0.005	g N_2O/mile

Value	Units
0.006	mt CO_2/gal
0.010	g CH_4/mile
0.075	g CH_4/mile
0.009	g N_2O/mile
0.028	g N_2O/mile

Value	Units
0.009	mt biogenic CO_2(b)/gal
0.023	g CH_4/mile
0.009	g CH_4/mile
0.014	g N_2O/mile
0.043	g N_2O/mile

Units	Source
kWh/VMT	US Department of Energy - Energy Efficiency and Renewable Energy, Alternative Fuels Data Center.
mpg	
kWh/VMT	

Units	Source
kg CO_2/passenger mile	Table 8 Business Travel and Employee Commuting: https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf
kg CO_2/passenger mile	
kg CO_2/passenger mile	
g CH_4/passenger mile	
g CH_4/passenger mile	
g CH_4/passenger mile	
g N_2O/passenger mile	
g N_2O/passenger mile	
g N_2O/passenger mile	

Employee Commuting (Bus) (%)	Estimated Employee Commute VMT (Passenger)
0%	443,526
0%	0
0%	0
0%	0
0%	0
0%	**443,526**

Biofuel Percentage	Estimated VMTs
10%	0
	0
	0
	0

Biofuel Percentage	Estimated VMTs
10%	**443,526**
	199,587
	22,176
	199,587
	22,176
0%	**0**
	0
	0
0%	**0**
	0
	0
	443,526

Estimated VMTs	Emissions (mt CO2)
0	0
0	0
0	**0**

% Flights	Emissions (mt CO2)

0%	**0**
0%	0
0%	0
0%	0
0%	**0**
0%	0
0%	0
0%	0
0%	**0**
0%	0
0%	0
0%	0
0%	**0**

.otus worked with Tyer Kesler to form these assumptions: 1) assume 20% of the 2
l the entirety of the 2021 calendar year in person, but subtract a standard 2 weeks
ree vehicles between gasoline passenger vehicles (i.e., sedans) and gasoline light d

Notes
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1.

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.

Notes
ICLEI’s U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
2020 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd450

Notes
ICLEI’s U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transportation and Other Mobile Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
2020 Climate Registry Default Emissions Factors, Table 2.6: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf?mc_cid=4b45d12237&mc_eid=6bd450

Estimated Employee Commute VMT (Public Transit)
0
0
0
0
0
0

Emissions (mt CO_2)	Emissions (mt CH_4)
0	0
0	*0*
--	*0*
0	**0**

Emissions (mt CO2)	Emissions (mt CH4)
167	**0.0090**
73	*0.0040*
--	*0.0002*
95	*0.0046*
--	*0.0002*
0	**0**
0	*0*
0	*0*
0	**0**
0	*0*
0	*0*
167	**0.01**

Emissions (mt CH4)	Emissions (mt N2O)
0	0
0	0
0	**0**

Emissions (mt CH4)	Emissions (mt N2O)

0	**0**
0	0
0	0
0	0
0	**0**
0	0
0	0
0	0
0	**0**
0	0
0	0
0	0
0	**0**

06 full time employees and 20% of the 260 part time employees worked in the
of vacation and 10 standard holidays (240 total work days); 3) assume an average
uty trucks.

Constants

Vehicle Type	Fuel Efficiency (mpg)	Fuel Additives	
Gas cars	24.1	% of ethanol in gasoline	10%
Diesel cars	32.4	% of biodiesel in Blend	0%
Diesel trucks	22.1		
Diesel bus	6.6		
Hybrid Vehicle	44.4		
Gas light trucks	18.5		

Emissions (mt N_2O)	Emissions (mt CO_2e)	Biogenic Emissions (mt CO_2(b))
0	0	0
0	*0*	--
0	*0*	*0*
0	**0**	**0**

Emissions (mt N2O)	Emissions (mt CO2e)	Biogenic Emissions (mt CO2(b))
0.0088	**170.10**	
0.0034	*73.76*	--
0.0002	*0.06*	*5*
0.0050	*96.22*	--
0.0002	*0.06*	*7*
0	**0**	
0	*0*	--
0	*0*	*0*
0	**0**	
0	*0*	--
0	*0*	*0*
0.01	**170**	**0**

Emissions (mt CO_2e)
0
0
0

Emissions (mt CO2e)

0
0
0
0
0
0
0
0
0
0
0
0
0

Aviation Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	1,325
Scope 2	N/A
Scope 3	N/A
Total	**1,325**

Data Sources and Assumptions

1) Aviation data were provided by Jason Hurd with Erie Municipal Airport. PDF on file. Jason estimates tl

Emission Factors

Jet Fuel

Greenhouse Gas	Value	Units
CO_2	0.0098	mt CO2/gal
CH_4	0	mt CH4/gal
N_2O	0.0000003	mt N2O/gal

Aviation Gasoline

Greenhouse Gas	Value	Units
CO_2	0.0083	mt CO2/gal
CH_4	0.000007	mt CH4/gal
N_2O	0.0000001	mt N2O/gal

Data Calculations

Aviation Emissions

Source	Emissions (mt CO2)	Emissions (mt CH4)
Erie Municipal Airport	1,305	0.3

Transboundary Aviation	Local/ Itinerant	Scope
Erie Municipal Airport	Itinerant	1
Erie Municipal Airport	Itinerant	1
		Aviation Gasoline Itinerant
		Jet Fuel Itinerant

hat 65% of fuel was Jet Fuel and 35% was Aviation Gas.

Source
The Climate Registry 22021 Default Emission Factors, Table 2.1 for CO_2 and Table 2.7 for CH_4 and N_2O: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf.

Source
The Climate Registry 2021 Default Emission Factors, Table 2.1 for CO_2 and Table 2.7 for CH_4 and N_2O: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf.

Emissions (mt N2O)	Emissions (mt CO2e)
0.03	1,325

% of all fuel	Total System Usage (gal)	Fuel Type
65%	91,772	Jet fuel
35%	49,415	Aviation gasoline
141,187	**49,415**	
	91,772	

Off-Road Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	7
Scope 2	0
Scope 3	0
Total	**7**

Data Sources and Assumptions

1) Off-road data were provided by Jason Hurd with Erie Municipal Airport. PDF on file.

2) Propane use is reported in pounds used. One gallon of propane weighs 4.2 pounds.

3) CNG use is reported in gallons of gasoline equivalent (GGE). There are 0.877 GGE in one hund

Emission Factors

Fuel	Greenhouse Gas	Vehicle Type
Gasoline	CO_2	All
Diesel	CO_2	All
CNG	CO_2	Heavy Duty Vehicle
Propane	CO_2	All

Data Calculations

Fuel Used (Airport Owned Vehicles)	Emissions (mt CO2)	Emissions (mt CH4)
Gasoline	0	0
Diesel	7	0
CNG	0	0
Propane	0	0
Total	**7**	**0**

Off-Road Vehicle and Equipment Data

Fuel Type	Fuel Used (Airport Owned Vehicles)	Total Fuel Used
Gasoline (gal)	0	0
Diesel (gal)	680	680
CNG (GGE)	0	0
Propane (lbs)	0	0

red cubic feet of CNG (per the U.S. DOE Alternative Fuels Data Center, https://ep

Value	Units	
0.00878	mt CO_2/gal	ICLEI's U.S. Community Protocol for Protocol) – Appendix D: Transportat 2013: http://icleiusa.org/ghg-protoc
0.01021	mt CO_2/gal	
0.000054440	mt CO_2/standard cubic foot	(1) CNG CO2 emission factor from: Greenhouse Gas Emissions (Commu Activities and Sources, Version 1.1,
0.00572	mt CO_2/gal	2020 Climate Registry Default Emiss content/uploads/2021/05/2021-Defa

Emissions (mt N2O)	Emissions (mt CO2e)
0	0
0	7
0	0
0	0
0	**7**

act.energy.gov/fuel-conversion-factors).

Source
Accounting and Reporting of Greenhouse Gas Emissions (Community tion and Other Mobile Emission Activities and Sources, Version 1.1, July ols/
ICLEI's U.S. Community Protocol for Accounting and Reporting of nity Protocol) – Appendix D: Transportation and Other Mobile Emission July 2013; http://icleiusa.org/ghg-protocols/. (2) CNG CH_4 and N_2O
sions Factors: https://www.theclimateregistry.org/wp- ault-Emission-Factor-

Waste and Recycling Data

Emissions Summary

Scope	Emissions (mt CO_2e)
Scope 1	0
Scope 2	N/A
Scope 3	8
Total (Scope 1 and 3)	**8**
Information-Only Avoided Emissions	(13)

Data Sources and Assumptions

1) Erie does not have data on waste and recycling collected at municipal facilities, there
include recycling). (https://www.wastecare.com/usefulinfo/Waste_Generated_by_Indus
employees regularly worked in-office (20% of 240 days). The value for average days in-

2) Recycling diversion rate was taken from the Colorado Department of Public Health &

3) MSW characterization and Materials Recovery characterizations were taken from the

Emission Factors

Landfilled Waste

Waste Component	Value
MSW	0.06
Newspaper	0.043
Office paper	0.203
Corrugated containers	0.12
Magazines/third-class mail	0.049
Food scraps	0.078
Grass	0.038
Leaves	0.03
Branches	0.062
Dimensional lumber	0.062
Oxidization factor	10%
Collection efficiency rate for landfills with gas collection systems	75%

Composted Waste

Value	Description
0.00050	mt CH_4/ton waste
0.00023	mt N_2O/ton waste

Recycled Materials

Waste Component	From using recycled inputs instead of virgin inputs (mtCO2e/short ton)
Paper and paperboard (mixed paper)	3.52
Newspaper	2.78
Office paper	2.85
Magazines/third-class mail	3.07
Glass	0.28
Metals (mixed)	3.97
Plastics (mixed)	0.98
Mixed recyclables	2.80

Data Calculations

Emissions Summary

	Waste Generated
Tons of Waste Landfilled	31
Tons of Waste Composted	0
Tons of Recycling Recycled	5
Totals	**36**

Diversion Rates

Recycling Rate	16%

Emissions from Landfilled Waste

Source	Waste Generated (tons)
Tons of Waste Landfilled	**31**
Avoided Emissions from Tons of Recycling Recycled	5
Total from Landfilled Waste and Recycling	**36**

MSW Characterization

	Paper and Paperb
Newspaper	Office Paper
1.5%	1.7%

Materials Recovery Characterization

Glass Containers	Aluminum

20%	2%

fore estimates were used to calculate waste and recycling data. According to the National Solid
try.htm) The calculated value assumes an office with full-time employees working 5 days a wee
-office was multiplied by municipal square footage and 1lb waste/100 square feet to estimate tc

Environment (CDPHE) webpage on 2021 Colorado recycling totals: https://cdphe.colorado.gov/

2021 Countywide Waste Composition Study for Boulder County.

Description	Sou
mt CH_4/ton waste	ICLEI's U.S. Community Protocol for Accounting and Reporting of Gı Waste Emission Activities and Sources, Version 1
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	
mt CH_4/ton waste	

Source
Documentation for Greenhouse Gas Emissions and Energy Factors Used in the Waste Reductioı 03/documents/warm_v14_management_practices.pdf. Assumes green waste. Values are adjus

Landfill with gas collection but no energy recovery (mtCO2e/short ton)	Total avoided emission factor (mtCO2e/ton recycled)	
0.57	4.09	ICLEI's U.S. Community Protocol for Accounting Recycling and Composting Emissions Protocol, factors represent those for avoided emissions fr
0.24	3.02	
1.00	3.85	
0.27	3.34	
0.04	0.32	
0.04	4.01	
0.04	1.02	
0.47	3.27	

Units	Scope	Emissions (mt CH4)	Emissions (mt N2O)
Tons	3	0.3	0
Tons	3	0	0
Tons	N/A	0	0
Tons		**0.3**	**0**

Scope	Emissions (mt CH_4)	Emissions (mt N_2O)	Emissions (mt CO_2e)
3	0.3	0	8
N/A	0	0	(13)
	0	**0**	**8**

oard			
Magazines and Mixed Paper/Junk Mail	Cardboard/Kraft and Chip/Paperboard	Other Paper (low-grade), To-Go Cups, and Aseptic Containers	Glass
4.4%	5.9%	7.2%	5.5%

Steel/Tin	ttles, Rigid Contain	P	
		Newspaper	Office Paper

2%	11%	7.9%	4.2%

Waste Association, Office Buildings generate 1 lb. of waste per 100 square feet of office space
k for 50 weeks a year with 10 standard holidays deducted (i.e., 240 days). It was assumed tha
otal waste.

/colorado-recycling-totals. Screenshot on file.

rce

reenhouse Gas Emissions (Community Protocol) – Appendix E: Solid
.1, July 2013: http://icleiusa.org/ghg-protocols/.

n Model (WARM): https://www.epa.gov/sites/production/files/2016-
ted to CH_4 and N_2O emission factors.

Source
g and Reporting of Greenhouse Gas Emissions (Community Protocol) – Version 1.0, July 2013: http://icleiusa.org/ghg-protocols/. Emission rom a facility with landfill gas capture but no energy production.

Emissions (mt CO2e
8
0
(13)
8

Metals	Plastics	Orga	
		Food	Yard Waste
2.5%	12.8%	18.6%	16.5%

aper and Paperboard			Styrofoam, To-Go Cups, and Contaminants
Magazines and Mixed Paper/Junk Mail	Cardboard/Kraft and Chip/Paperboard	Aseptic Containers	

15.5%	26.0%	0.7%	10.4%

per day (does not
t 20% of these

...nics		Miscellaneous...	
Clean Wood	Other	Textiles	C&D Debris
0.7%	12.1%	2.9%	4.1%

s Other Waste	
Composites	Other
2.2%	1.4%

Wastewater Data

Emissions Summary

Scope
Scope 1
Scope 2
Scope 3
Total

Data Sources and Assumptions

1) Wastewater treatment plant data were supplied by Jon Coyle with Town of Erie Public Works. Emai
digester gas are not applicable. The plant therefore does not use anaerobic processes, but does use n

2) Septic tanks were not included in this inventory as very few are located in the Town of Erie and the

Emission Factors

Municipal Wastewater Treatment

Source
Process N_2O emissions for WWTPs with nitrification and denitrification
Fugitive N_2O Emissions from Effluent Discharge
Combustion gas
Combustion gas
Days Year
Density of methane
Conversion
Methane Destruction Efficiency
Molecular weight ratio of N_2O to N_2
Industrial Commercial Discharge Multiplier

Data Calculations

GHG Emissions By Process

Process N2O Emissions for WWTPs with Nitrification and Denitrifi
Emissions as mt N_2O
Total Process N_2O from Nitrification and Denitrification Emissions (mt CO_2e)

Fugitive N2O Emissions from Effluent Discharge
Emissions as mt N_2O
Total Process N_2O from Nitrification and Denitrification Emissions (mt CO_2e)

Combustion Gas Emissions
Emissions as mt CH_4
Emissions as mt N_2O
Total Combustion Gas Emissions (mt CO_2e)

Flared Gas Emissions
Emissions as mt CH_4
Total Flared Gas Emissions (mt CO_2e)

Total

Input Data
Municipal Wastewater Treatment
Plant uses nitrification/denitrification
Plant uses anaerobic processes
Erie's population served by the plant
Average total nitrogen discharged by plant (kg N/day)
Digester gas produced (scfd)
Digester gas flared (scfd)
Methane content of digester gas

Emissions (mt CO_2e)
130
N/A
N/A
130

ils on file. The plant does not use digesters, so the values for digester gas produced, digeste
itrification/denitrification.

eir impact would be negligible.

Greenhouse Gas	Value	Units
N_2O	7	g N_2O/person/year
N_2O	0.005	kg N_2O-N/kg sewage-N
CH_4	0.003	kg CH_4/MMBtu
N_2O	0.001	kg N_2O/MMBtu
N/A	365.25	Days
N/A	662	Grams per cubic meter
N/A	0.03	m^3/ft^3
N/A	99%	
N/A	1.57	44/28
N/A	1.25	

cation
0.26
72
0.21
58
0
0
0
0
0

130

Input Data
Yes
No
30,000
73.94
0
0
0%

er gas flared, and methane content of

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix F: Wastewater and Water Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
Standard assumption

Refrigerants Data

Emissions Summary

Scope	Emissions ($mt\ CO_2e$)
Scope 1	0
Total	**0**
Information Only	131

Data and Assumptions

1) Refrigerant data were provided by Dennis Buck and Kim Hervey. Email and PD

2) Erie uses R-22, R-12, R-11, and R-410a refrigerants in its municipal buildings. required to report to TCR because they are either hydrochlorofluorocarbons (HCF under the Montreal Protocol, and as a result, are not classified as GHGs under th

Emissions Calculations

Emissions Summary

Refrigerant Type	Emissions ($mt\ CO_2e$)
R-134A	0
Total	**0**
R-11 (Information Only)	0
R-12 (Information Only)	0
R-22 (Information Only)	67
R407c (Information Only)	0
R410a (Information Only)	64
R514 (Information Only)	0
Subtotal	**131**
Total	**131**

Refrigerant Data Inputs

Refrigerant Type	Weight (kg)
MVAC R-134a use	0
R-134A	0
R-11 (Information Only)	0
R-12 (Information Only)	0
R-22 (Information Only)	37
R407c (Information Only)	0
R410a (Information Only)	31
R514 (Information Only)	0

)F on file. Refrigerants are reported in lbs and converted in this tab to kg.

Common refrigerants R-22, R-12, R-410a, and R-11 are not included in the GHGs
FCs) or chlorofluorocarbons (CFCs), the production of which is being phased out
e Kyoto Protocol.

Weight (Metric Tons)
0
0
0
0
0.037
0
0.031
0

Consumption-Based Calculations

Emissions Summary

Source	Emissions ($mt\ CO_2e$)
Asphalt	0.5
Cement	0
Paper	0
Food	0
Computers	16
Fertilizer	34
Well-to-wheel	161
Total	**212**

Data and Assumptions

1) Asphalt data were provided by Scott Brown. Email on file. Data were provi

2) Erie does not track cement, paper, or food data.

3) Computers and hardware data were provided by Denise Jakan. Email and s
calculated using the total amount Erie spent on each category, the average p

4) Fertilizer data were provided by Mike McGill. Email on file.

5) All emission factors represent the "life-cycle" or "net" impact of materials. (

6) Well-to-wheel emissions for diesel and gas vehicles were calculated using c

Emission Factors

Cement and Asphalt

Variable	Value
Asphalt	0.11
Cement	1.0

Food

Variable	Value
Food consumption	1.60

Computers and Hardware

Variable	Value
Personal computers	50.49

Fertilizer

Variable	Value

tons N_2O-N/tons input-N	0.0117
Molecular Weight Ratio N_2O to N_2O-N	1.57
Leaching/runoff, kg N2O-N/kg N leaching/runoff	0.0075
Fraction of losses by leaching/runoff where irrigation is applied	0.03
Well-to-Wheel	
Variable	**Value**
Diesel Emission Factor	2.30
Gasoline Emission Factor	2.30

Emissions Calculations

Asphalt	
Total Asphalt Purchased (tons)	**Total Emissions from Asphalt ($mtCO_2e$)**
4	0.5
Cement	
Total Concrete Purchased (yd^3)	**Conversion to lb./cubic yard**
0	4,054
Paper	
Paper Type	**% Recycled**
Uncoated Free Sheet	0%
Uncoated Free Sheet	10%
Uncoated Free Sheet	30%
Uncoated Free Sheet	50%
Uncoated Free Sheet	75%
Uncoated Free Sheet	100%
	Total
Food	
Food Purchase ($) 2021	**2021 to 2002 Inflation Rate**
$0.00	-51%
Computers and Hardware	
Computers and Hardware Purchases ($) 2021	**Total lbs Purchased 2021**
$37,550	622.13
Fertilizer	
Location of Fertilizer Application	**% Nitrogen**
Golf Courses	20%
	Total
Well-to-Wheel	
Emissions Source	**Fuel Consumed (gal)**

City-Owned Gasoline Vehicles and Equipment (excluding ethanol)	39,632
City-Owned Diesel Vehicles and Equipment	11,448
Employee Commute--Gasoline Vehicles (excluding ethanol)	19,070
Employee Commute--Diesel Vehicles	0
Business Travel--Gasoline Vehicles (excluding ethanol)	0
Business Travel--Diesel Vehicles	0
Total Gasoline	**58,702**
Total Diesel	**11,448**

ded in pounds and converted to tons.

spreadsheet on file. The following categories were used in the inventory: iPads, Laptops/Computers, r
rice of items in each category, and the average weight of items in each category. Data calculations or

Consumption-based sources are not assigned a "scope".
data provided by Town of Erie regarding fleet and employee commuting activity and a well-to-wheel e

Units	Notes
mt CO_2e/mt asphalt	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix H: Emissions Associated with the Community's Use of Materials and
mt CO_2e/mt cement	

Units	Notes
kg CO_2e/2002 dollar	ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix H: Emissions Associated with the Community's Use of Materials and Services, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.

Units	Notes
mt CO_2e/short ton	Documentation for Greenhouse Gas Emission and Energy Factors Used in the Waste Reduction Model; Durable Goods Materials Chapter. February 2016: https://www.epa.gov/warm/documentation-chapters-greenhouse-gas-emission-and-energy-factors-used-waste-reduction-model. Emissions represent savings from source reduction.

Units	Notes

ton N_2O-N/ton input-N	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Chapter 11.EF1 for N additions from mineral fertilizers, organic amendments and crop residues, and N mineralized from mineral soil as a result of loss of soil carbon.
mol/mol	
kg N_2O-N/kg N leached	
kg N leached/kg N applied	

Units	Notes
kg CO_2/gal	From previous inventories conducted by McKinstry: See Hillman, T. and Ramaswami A. "Greenhouse Gas Emission Footprints and Energy Use Benchmarks for Eight U.S. Cities." Environment
kg CO_2/gal	

metric tons/lb.	Concrete (mt)
0.000453592	0

$ Spent	Weight Purchased (lbs.)
$0.00	0
$0.00	0
$0.00	0
$0.00	0
$0.00	0
$0.00	0
$ -	**0**

2002 Dollars	Total Emissions from Food ($mtCO_2e$)
$ -	0

Total Short Tons Purchased	Total Emissions from Computers & Hardware ($mtCO_2e$)
0.31	16

Fertilizer Applied (lbs.)	Fertilizer Applied (tons)
15,260	8
15,260	**8**

CO_2 Emissions (kg)	CO_2 Emissions (tons)

91,154	91
26,331	26
43,861	44
0	0
0	0
0	0
135,016	**135**
26,331	**26**

Monitors, ReMarkables, and SurfacePros. Computer and hardware purchase amount is reflectiv
n file.

emissions factor drawn from Lotus' experience with previously completed municipal inventories

15% cement (mt)
0

Total Emissions from Paper ($mtCO_2e$)
0.00
0.00
0.00
0.00
0.00
0.00
0.00

Nitrogen in Fertilizer Applied (tons)	Direct N_2O (tons)	Direct N_2O (kg)	Indirect N_2O (run-off) (kg)
2	0.03	123.71	2
2	**0.03**	**124**	**2**

ve of these categories. Total pounds purchased was

s.

Total N_2O (kg)	CO_2e (kg)	Total Emissions from Fertilizer ($mtCO_2e$)
126	34,422	34
126	**34,422**	**34**

Workbook Introduction and Guide

Legend for Data Entry and Inventory Year

Legend for data entry	
Do not edit	Do not edit; this cell is a formula.
May need to be updated	These cells may need to be updated depen
Needs to be updated each inventory	These cells require manual entry each year

Lead Coordinator and Lead Consultant

Lead Coordinator	
Jurisdiction	Town of Erie
Name	Tyler Kesler
Title	Sustainability Manager
Department	Public Works
Telephone	303.926.2880
Email	tkesler@erieco.gov

Inventory Management Spreadsheet Contents

Source/Activity	**Worksheet**
Background	
All	Visual Summary
All	Emission Summary
Data Sources	Inventory Data Checklist
Data Inputs: Supporting Data	
Conversion Factors and GWPs	Conversion Factors and GWPs
Community Indicators	Community Indicators
Data Inputs: Stationary Energy	
Energy Use	Stationary Energy Data
Energy Use	Fugitive Emissions Data
Data Inputs: Transportation	
On-Road Vehicles	On-Road Data
Transit	Transit Data
Aviation	Aviation Data
Off-Road Vehicles	Off-Road Data
Data Inputs: Waste	
Solid Waste Generation	Waste_Recycling Data
Wastewater Treatment Facilities	Wastewater Data
Reporting: GPC Outputs	
Community Indicators	GPC Table 4.1
GPC Table 4.3	GPC Table 4.2
Activity data tabs	GPC Table 4.3
Activity data tabs	GPC Table 4.4

ding on if new emissions factors are released by a protocol, etc. These cells are not
due to data that is updated on an annual basis.

Lead Consultant	
Company	
Name	
Title	
Telephone	
Email	
Website	

Description
Provides summary information, including charts and graphs, for the inventory.
Provides all summary information for the inventory, including emissions by scope, secto
Identifies required data and provides a place to store contact information for relevant c
Provides standard conversion factors used in calculations and Global Warming Potential
Includes general community characteristics used to complete GPC Table 4.1 and to calc
Input raw energy data for stationary fuels and electricity to calculate the total emission
Input key metrics regarding fugitive emission activities, including the number of oil well
Input raw data, including data on VMT and electrical vehicles, to estimate mobile fuel c
Input raw transit data to estimate transit fuel consumption and emissions.
Input raw aviation data used to estimate emissions from airline travel.
Input raw off-road fuel use data to estimate emissions from off-road vehicle fuel use.
Input raw community generated waste data sent to landfill or composting facility and re
Input raw data for wastewater treatment to calculate the total emissions from wastewa
Data is linked from Community Indicators tab. Required for GPC compliance.
Data is linked from GPC Table 4.3. Required for GPC compliance.
Data is linked from activity data tabs into GPC Table 4.3. Required for GPC compliance.
Data is linked from activity data tabs to calculate information-only emissions reductions

Inventory Year
2021

Lotus Sustainability and Engineering
Rachel Meier
Senior Associate
612.558.6296
rachel@lotussustainability.com
www.lotussustainability.com

)r, and source.
ommunity inventory sources and sectors.
s (GWP)
:ulate GHG emission metrics.
s for each source.
s and natural gas consumption, to calculate total fugitive
onsumption and emissions.
ecycling data to calculate emissions for waste disposal.
ter treatment processes.
. Not required for GPC compliance.

Emission Summary

Emission Inventory Summary (BASIC+)

Scope
Scope 1
Scope 2
Scope 3
Total BASIC+
Information only

Emission Inventory Summary (BASIC)

Scope
Scope 1
Scope 2
Scope 3
Total BASIC
Information only

Note: BASIC emissions do not include emissions from trans-boundary aviatio sources.

All Emissions by Sector (BASIC+)

Emission Source
Commercial and Industrial Buildings
Residential Buildings
Oil & Gas Wells
Transportation
Solid Waste
Wastewater Treatment
Industrial Processes and Product Use
Transmission and Distribution Losses
Total

All Emissions by Sector (BASIC)

Emission Source
Commercial and Industrial Buildings
Residential Buildings
Oil & Gas Wells
Transportation
Solid Waste

Wastewater Treatment
Industrial Processes and Product Use
Total

All Emissions by Source (BASIC+)

Emission Source
Building Electricity
Natural Gas (including fugitive emissions)
Propane
Stationary Diesel
Oil & Gas Wells
On-Road Transportation including Electric Vehicles
Off-Road Transportation
Transit
In-Boundary Aviation
Trans-Boundary Aviation
Landfilled Waste
Composted Waste
Wastewater
Refrigerant Leaks
Transmission and Distribution Losses (including electric vehicles)
Total

All Emissions by Source (BASIC)

Emission Source
Building Electricity
Natural Gas (including fugitive emissions)
Propane
Stationary Diesel
On-Road Transportation including Electric Vehicles
Off-Road Transportation
In-Boundary Aviation
Transit
Landfilled Waste
Composted Waste
Wastewater
Refrigerant Leaks
Total

Detailed Emissions Breakdown by Sector

Stationary Energy

Energy

Fuel combustion within the city
Grid-supplied energy (electricity)
Transmission and Distribution Losses
Fugitive Emissions
Fugitive emissions from oil and natural gas systems within the city boundary
Transportation
On-Road Vehicles
Emissions from fuel combustion on-road transportation occurring in the city
Emissions from grid-supplied energy consumed in the city for on-road transportation
Emissions from transmission and distribution losses from grid-supplied energy consumed in the city for on-road transportation
Total On-Road
Off-Road
Emissions from fuel combustion off-road transportation occurring in the city
Total Off-Road
Transit
Transit activities within the city (buses)
Total Transit
Aviation
In-Boundary Aviation
Transboundary LTO Aviation
Total Aviation
Total Transportation
Waste
Community Solid Waste

Landfilled waste treated inside the City
Landfilled waste treated outside the City
Composted waste treated outside the City
Total Solid Waste
Wastewater Treatment and Discharge
Wastewater Generated and Treated in City
Total Wastewater
Industrial Processes and Product Use
Refrigerants
Refrigerant Leaks
Total Waste and IPPU
Total BASIC emissions
Total partial BASIC+ emissions

Information Only Breakdown by Sector
Recycling
Renewable energy
TOTAL INFORMATION-ONLY AVOIDED EMISSIONS

Emissions (mt CO2e)	Percentage of BASIC+ Total
228,150	65%
88,097	25%
37,170	11%
353,418	**100%**
(20,238)	N/A

Emissions (mt CO2e)	Percentage of BASIC Total
228,150	72%
88,097	28%
2,305	0.72%
318,552	**100%**
(20,238)	N/A

n, transmission and distribution losses, or consumption-based

Emissions (mt CO2e)	Percentage of Total
27,197	8%
112,367	32%
38,494	11%
55,122	16%
115,292	33%
130	0.04%
101	0.03%
4,716	1%
353,418	**100%**

Emissions (mt CO2e)	Percentage of Total
27,197	9%
112,367	35%
38,494	12%
24,972	8%
115,292	36%

130	0.04%
101	0.03%
318,552	**100%**

Emissions (mt CO2e)	Percentage of Total
86,565	24%
52,581	15%
116	0.03%
302	0.09%
38,494	11%
23,500	7%
7	0.002%
140	0.04%
1,325	0.4%
30,150	9%
115,187	33%
105	0.03%
130	0.04%
101	0.03%
4,716	1%
353,418	**100%**

Emissions (mt CO2e)	Percentage of Total
86,565	27%
91,075	29%
116	0.0%
302	0.1%
23,500	7%
7	0%
1,325	0%
140	0.0%
115,187	36%
105	0.03%
130	0.04%
101	0.03%
318,552	**100%**

Type	GHG Emissions (mt CO2e)	Scope

Commercial and Industrial	5,287	1
Commercial and Industrial	302	1
Commercial and Industrial	107	1
Residential	45,497	1
Residential	9	1
Commercial and Industrial	21,314	2
Residential	65,251	2
Commercial and Industrial	1,136	3
Residential	3,504	3
Total Buildings	**142,406**	

Type	GHG Emissions (mt CO2e)	Scope
Commercial and Industrial	187	1
Residential	1,611	1
Oil & Gas Wells	38,494	1
Total Fugitive	**40,292**	
Total Stationary Energy	**182,698**	

GHG Emissions (mt CO2e)	Scope	Value
21,968	1	53,935,129
1,533	2	1,992,760
76	3	105,178
23,576		

GHG Emissions (mt CO2e)	Scope	Value
7	1	680
7		

GHG Emissions (mt CO2e)	Scope	Value
140	1	13,723
140		

GHG Emissions (mt CO2e)	Scope	Value
1,325	1	141,187
30,150	3	3,063,527
31,475		
55,198		

GHG Emissions (mt CO2e)	Scope	Value

112,987	1	1,742,151
2,200	3	
105	3	1,400
115,292		
GHG Emissions (mt CO2e)	**Scope**	**Value**
130	1	30,000
130		
GHG Emissions (mt CO2e)	**Scope**	**Value**
101	1	78
115,522		
318,552		
353,418		

GHG Emissions (mt CO2e)	**Scope**	**Value**
(13,506)	N/A	4,453
(6,731)	N/A	14,210,848
(20,238)		

Value	Unit

1,013,206	therms
29,383	gallons diesel
18,961	gallons propane
7,718,075	therms
1,560	gallons propane
36,030,346	kWh
108,428,740	kWh
5,812,270	kWh
1,958,577	kWh
Value	**Unit**
1,013,206	therms
8,723,183	therms
14,967	Barrels of Oil Produced

Unit
VMT
kWh
kWh
Unit
gallons
Unit
gallons diesel
Unit
gallons of jet fuel and aviation gasoline
gallons of jet fuel and aviation gasoline
Unit

tons waste
tons waste
tons compost
Unit
population served
Unit
(kg) of R-134A

Unit
tons recycled waste (life-cycle emissions)
kWh

Visual Summary of Data

All Emissions by Scope

Scope	Emissions (mt CO2e)	Percentage of Total
Scope 1 BASIC	228,150	72%
Scope 1 BASIC+	228,150	65%
Scope 2 BASIC	88,097	28%
Scope 2 BASIC+	88,097	25%
Scope 3 BASIC	2,305	0.72%
Scope 3 BASIC+	37,170	11%
Total Emissions BASIC	**318,552**	**100%**
Total Emissions BASIC+	**353,418**	**100%**

All Emissions by Sector (BASIC+)

Sector	Emissions (mt CO2e)	Percentage of Total
Commercial and Industrial Buildings	28,332	8%
Residential Buildings	115,871	33%
Oil & Gas Wells	38,494	11%
Transportation	55,198	16%
Solid Waste	115,292	33%
Wastewater Treatment	130	0.04%
Industrial Processes and Product Use	101	0.03%
Total Emissions	**353,418**	**100%**

*Note Transmission & Distribution losses are added into the building and transportation emissions totals

All Emissions by Sector (BASIC)

Sector	Emissions (mt CO2e)	Percentage of Total
Commercial and Industrial Buildings	27,197	9%
Residential Buildings	112,367	35%
Oil & Gas Wells	38,494	12%
Transportation	24,972	8%
Solid Waste	115,292	36%
Wastewater Treatment	130	0.04%
Industrial Processes and Product Use	101	0.03%
Total Emissions	**318,552**	**100%**

All Emissions by Source (BASIC+)

Emission Source	Emissions (mt CO2e)	Percentage of Total
Building Electricity	86,565	24%
Natural Gas (including fugitive emissions)	52,581	15%
Propane	116	0.03%
Stationary Diesel	302	0.09%
Oil & Gas Wells	38,494	10.89%
On-Road Transportation including Electric Vehicles	23,500	7%
Off-Road Transportation	7	0.002%
Transit	140	0.04%
In-Boundary Aviation	1,325	0.4%
Trans-Boundary Aviation	30,150	9%
Landfilled Waste	115,187	33%
Composted Waste	105	0.03%
Wastewater	130	0.04%
Refrigerant Leaks	101	0.03%
Transmission and Distribution Losses	4,716	1%
Total	**353,418**	**100%**

All Emissions by Source (BASIC)

Emission Source	Emissions (mt CO2e)	Percentage of Total
Building Electricity	86,565	27%
Natural Gas (including fugitive emissions)	91,075	29%
Propane	116	0.04%
Stationary Diesel	302	0.1%
On-Road Transportation including Electric Vehicles	23,500	7%
Transit	140	0.04%
Landfilled Waste	115,187	36%
Composted Waste	105	0.03%
Wastewater	130	0.04%
Refrigerant Leaks	101	0.03%
Total	**318,552**	**100%**

Emissions by Source and Sector (BASIC+)

Emissions Sources	Emissions (mtCO2e)

Residential Fuel Use	**115,871**	
Residential Electricity		68,755
Residential Natural Gas		45,497
Residential Propane		9
Fugitive Emissions		1,611
Commercial Fuel Use	**66,826**	
Commercial Electricity		22,449
Commercial Natural Gas		5,287
Commercial Propane		107
Commercial Diesel		302
Fugitive Emissions		38,681
Transportation	**55,198**	
On-Road Gasoline		21,968
On-Road Diesel		140
On-Road Electricity		1,608
Off-Road Fuel Use		7
In-boundary Aviation		1,325
Transboundary Aviation		30,150
Waste	**115,421**	
Landfilled		115,187
Compost		105
Wastewater		130
Industrial Processes and Product Use	**101**	
Refrigerant Leaks		101
Total	**353,418**	

*Note Transmission & Distribution losses are added into the electricity emissions totals.

Emissions by Source and Sector (BASIC)

Emissions Sources	Emissions (mtCO2e)	
Residential Fuel Use	**112,367**	

Residential Electricity		65,251
Residential Natural Gas		45,497
Residential Propane		9
Fugitive Emissions		1,611
Commercial Fuel Use	**65,691**	
Commercial Electricity		21,314
Commercial Natural Gas		5,287
Commercial Propane		107
Commercial Diesel		302
Fugitive Emissions		38,681
Transportation	**24,972**	
On-Road Gasoline		21,968
On-Road Diesel		140
On-Road Electricity		1,533
In boundary aviation		1,325
Off-Road		7
Waste	**115,421**	
Landfilled		115,187
Compost		105
Wastewater		130
Industrial Processes and Product Use	**101**	
Refrigerant Leaks		101
Total	**318,552**	

Stationary Energy Emissions Detail

Emission Source	Emissions (mt CO2e)	Percentage of Total

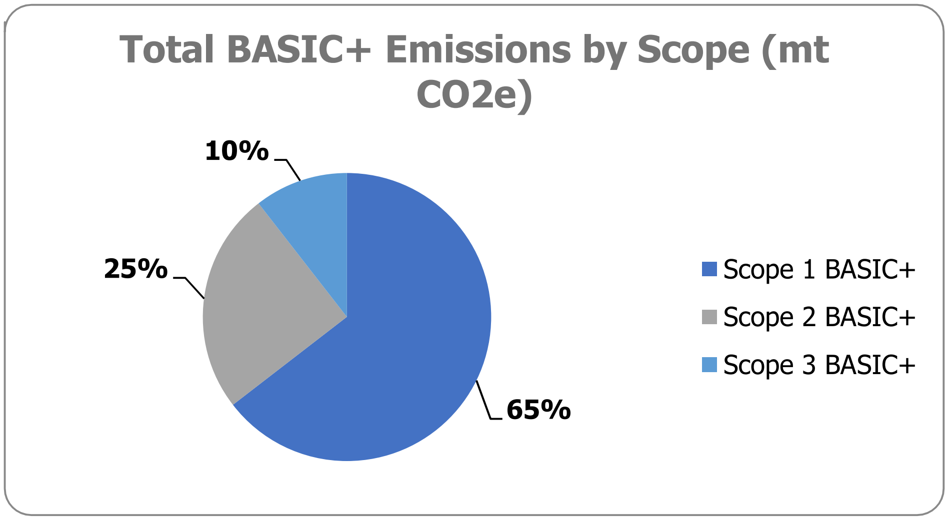
Residential Electricity	65,251	36%
Residential Natural Gas	45,497	25%
Residential Propane	9	0.005%
Commercial Electricity	21,314	12%
Commercial Natural Gas	5,287	3%
Commercial Propane	107	0.1%
Commercial Diesel	302	0.2%
Fugitive Emissions	1,798	1%
Oil & Gas Wells	38,494	21%
Stationary Energy T&D Losses	4,640	3%
Total	**182,698**	**100%**

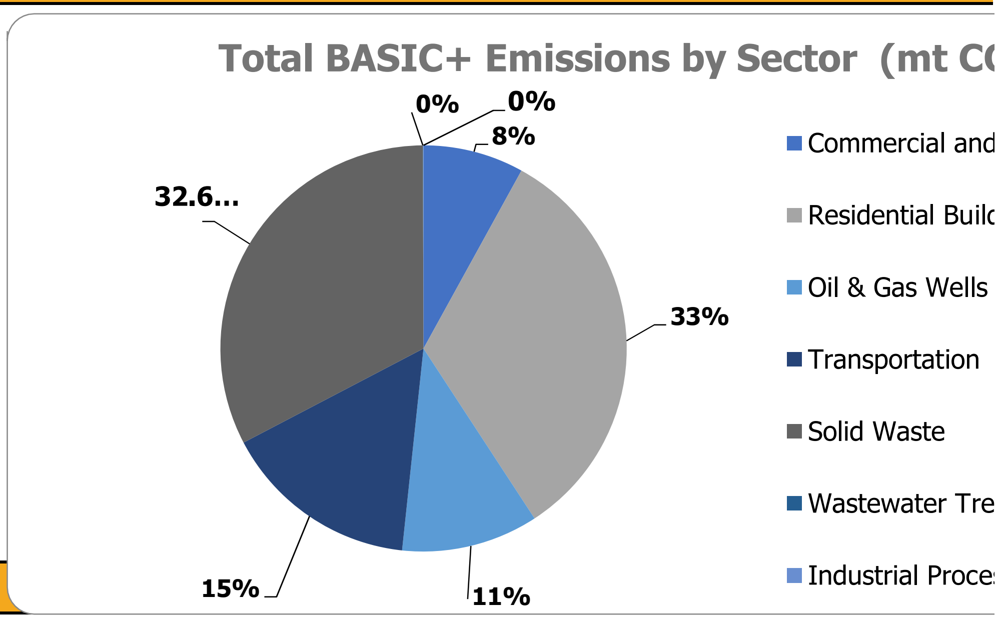
Transportation Emissions Detail

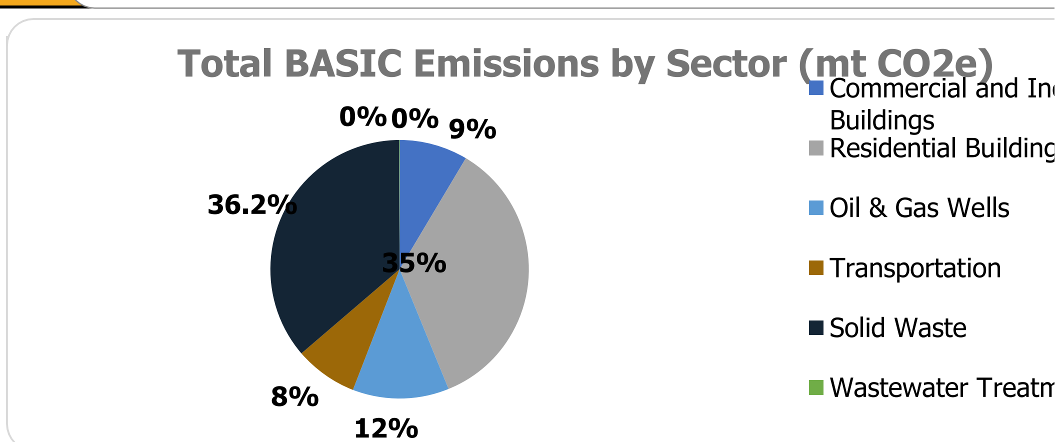
Emission Source	Emissions (mt CO2e)	Percentage of Total
On-road Gasoline	18,457	33%
On-road Diesel	3,511	6%
Transit Diesel	140	0.3%
Electric Vehicles	1,533	2.8%
Transportation T&D Losses	76	0.14%
Off-Road Diesel	7	0.01%
In-Boundary Aviation	1,325	2%
Transboundary Aviation	30,150	55%
Total	**55,198**	**100%**

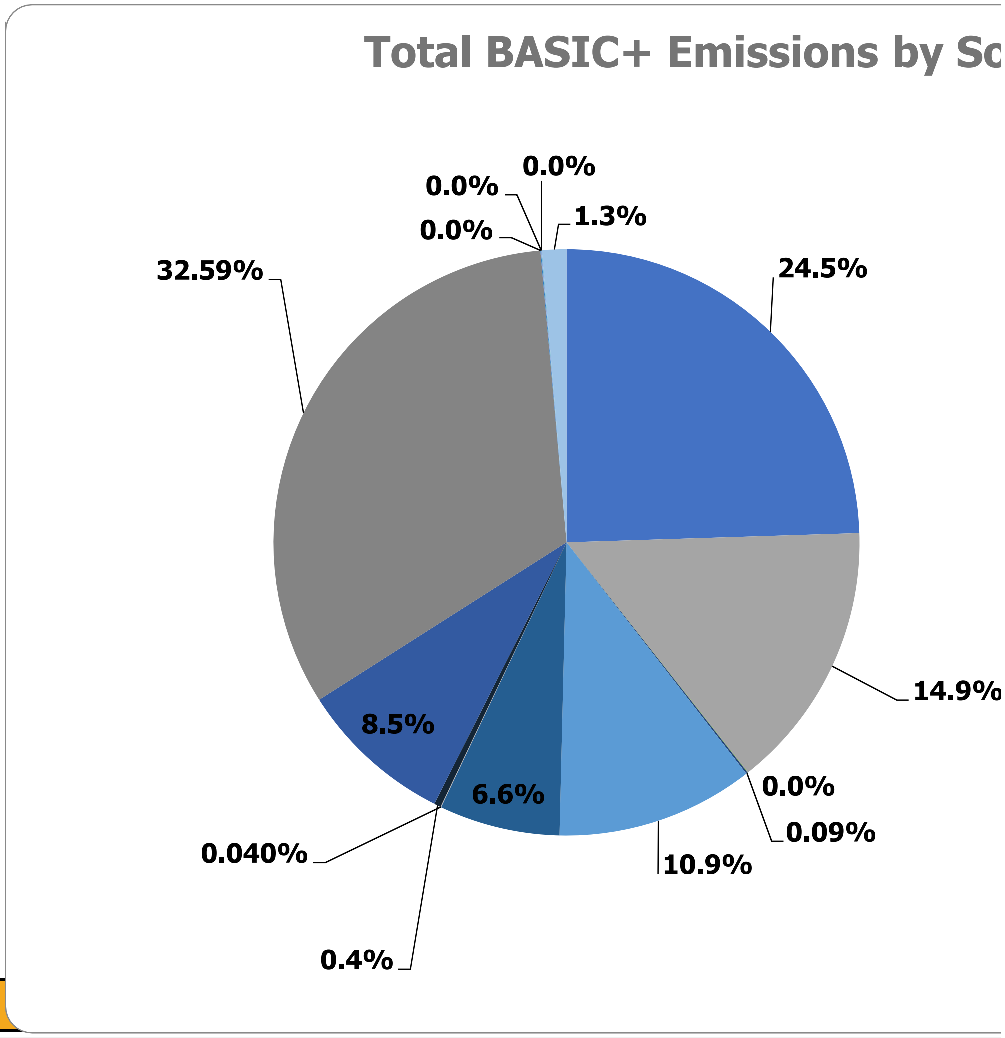
Waste Emissions Detail

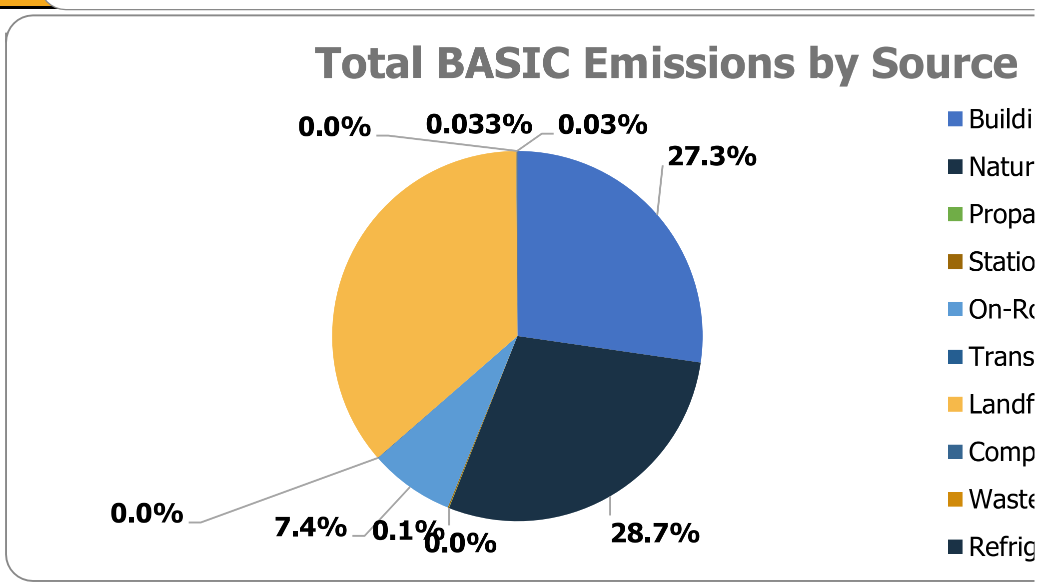
Emission Source	Emissions (mt CO2e)	Percentage of Total
Solid Waste	115,292	99.9%
Wastewater	130	0.1%
Total	**115,421**	**100%**


Total BASIC+ Emissions by Scope (mt CO2e)
10%
25%
65%
Scope 1 BASIC+
Scope 2 BASIC+
Scope 3 BASIC+


Total BASIC+ Emissions by Sector (mt C
0%
0%
8%
32.6...
33%
15%
11%
Commercial and
Residential Build
Oil & Gas Wells
Transportation
Solid Waste
Wastewater Tre
Industrial Proce


Total BASIC Emissions by Sector (mt CO2e)
0%
0%
9%
36.2%
35%
8%
12%
Commercial and In
Buildings
Residential Building
Oil & Gas Wells
Transportation
Solid Waste
Wastewater Treatm

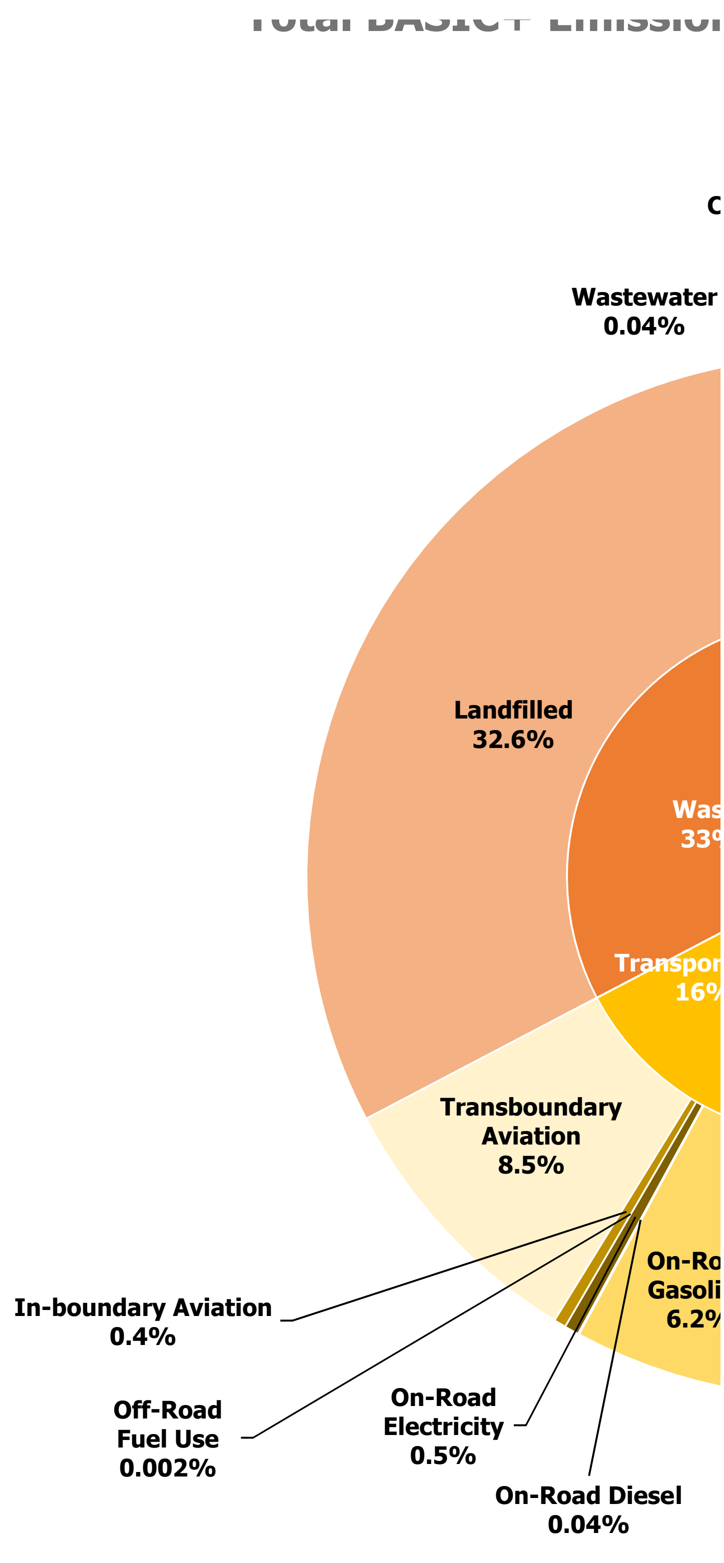




Percent

Total BASIC+ Emissio

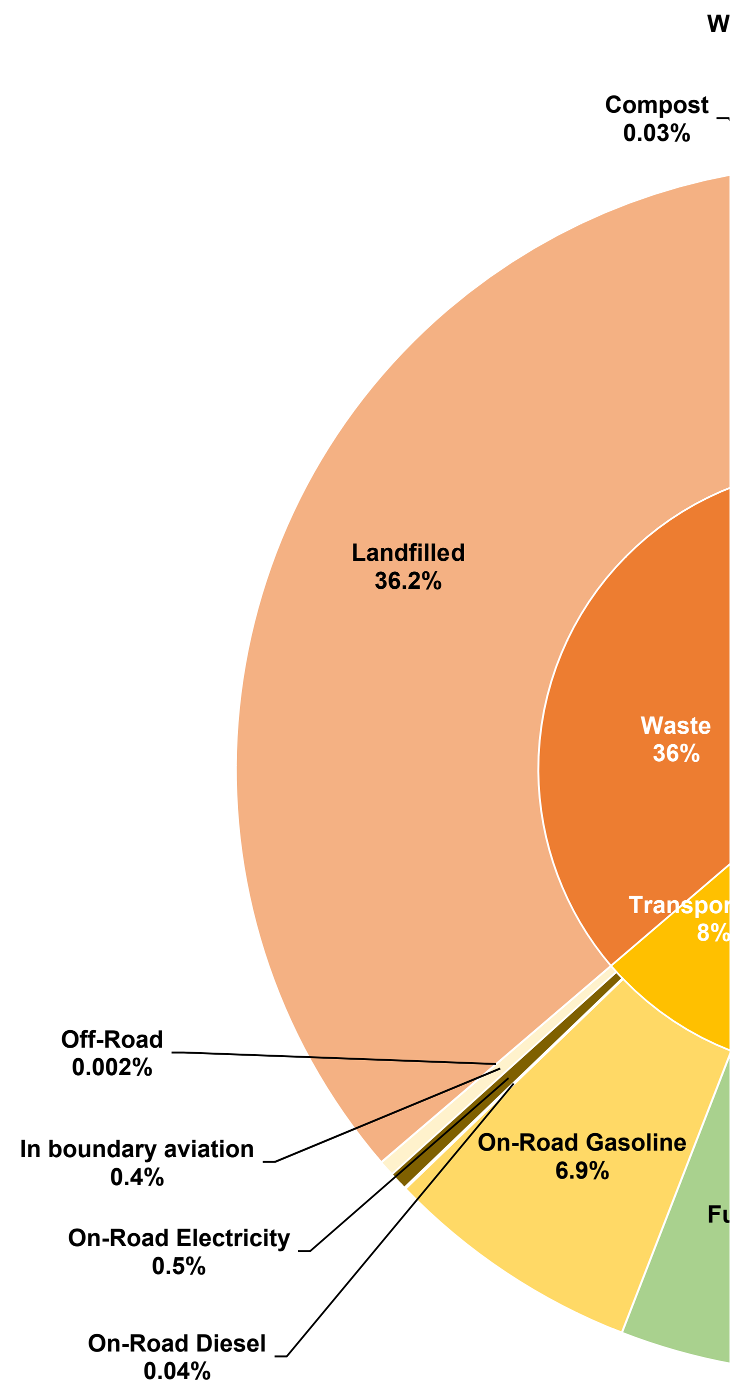
33%
19%
13%
0.002%
0.5%
19%
6%
1%
0.03%
0.09%
11%
16%
6%
0.04%
0.5%
0.002%
0.4%
9%
33%
33%
0.03%
0.04%
0.03%
0.03%



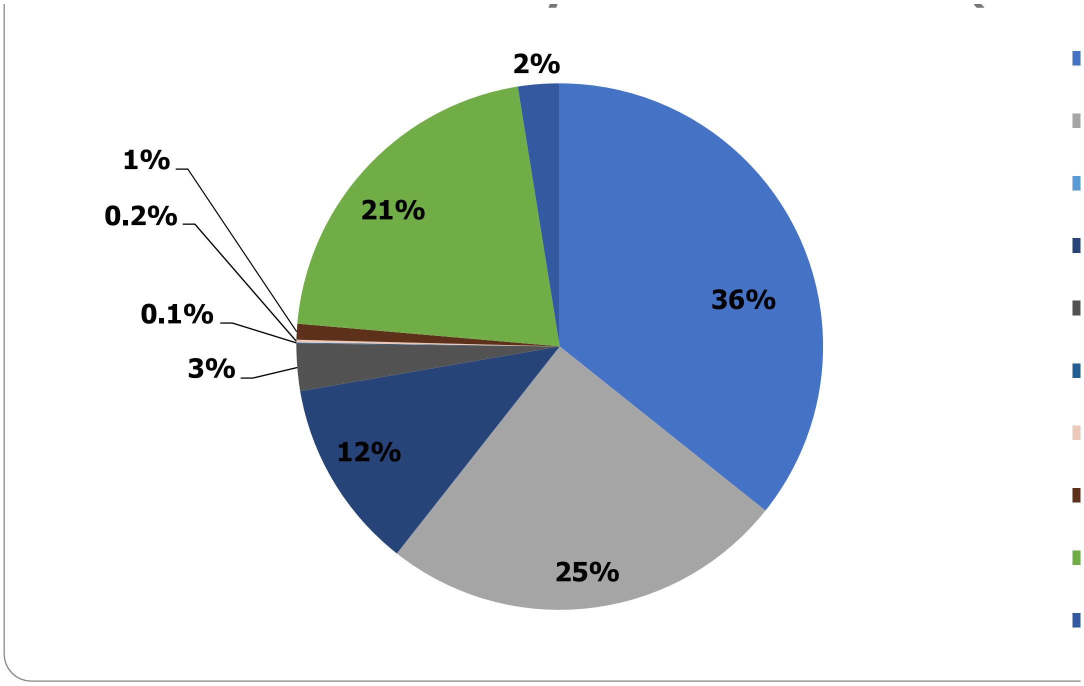
Percent
35%

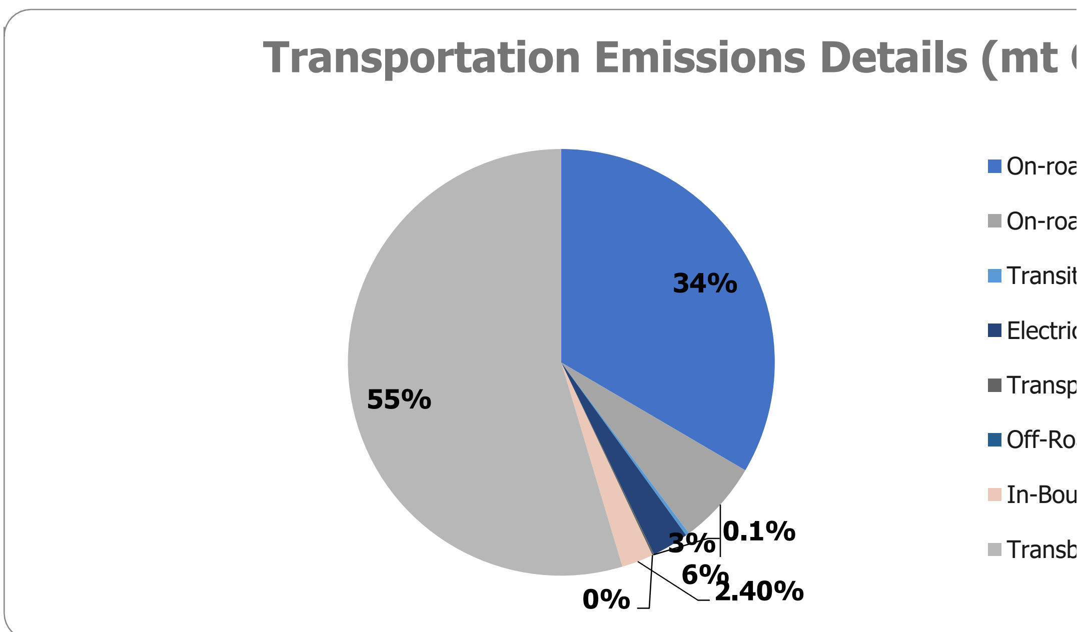
Total BASIC Emission

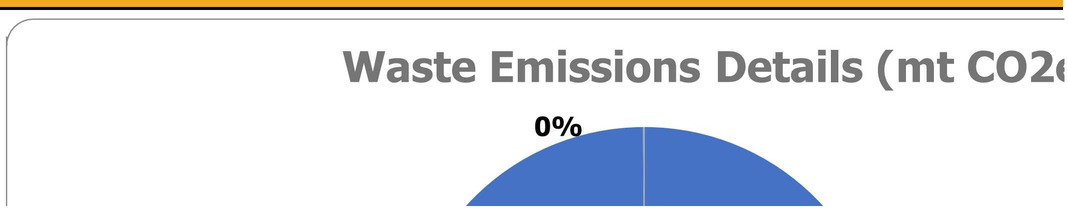
20%
14%
0.003%
1%
21%
7%
2%
0.03%
0.1%
12%
8%
7%
0.04%
0.5%
0.4%
0.002%
36%
36%
0.03%
0.04%
0.03%
0.03%

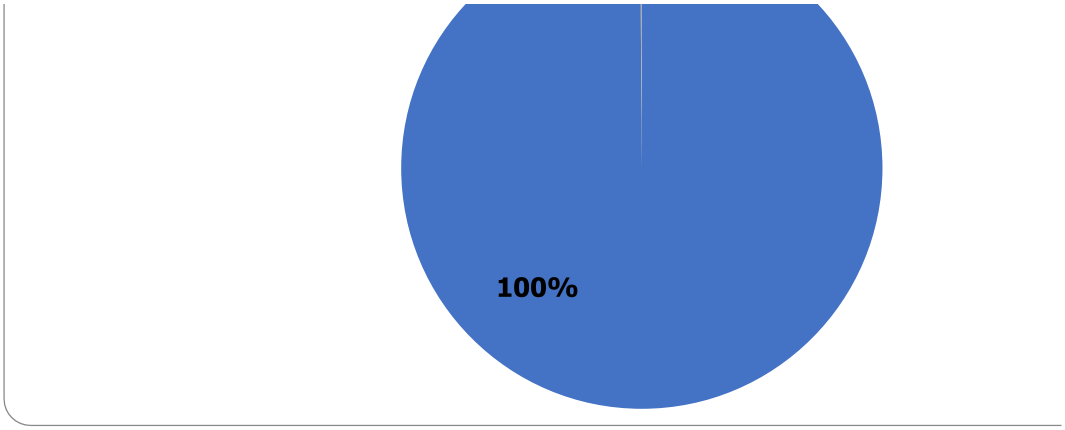


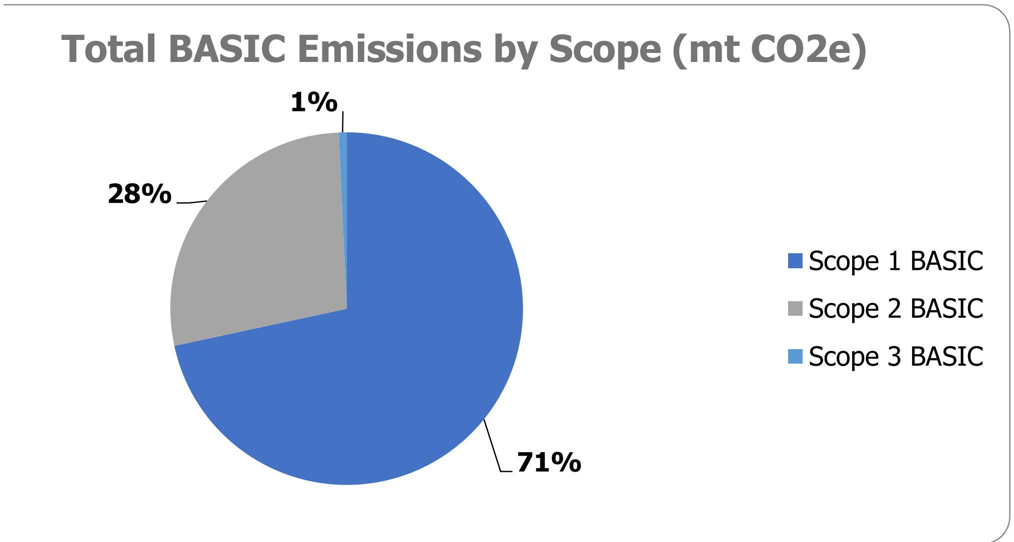
Stationary Emissions Details (mt C

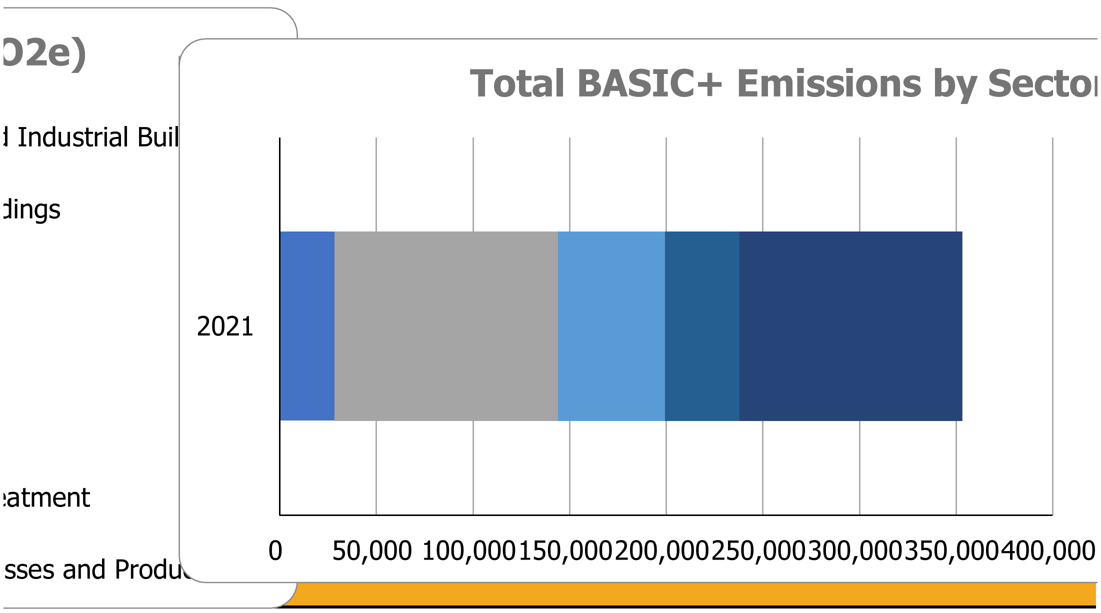

2%
1%
0.2%
0.1%
3%
21%
36%
12%
25%

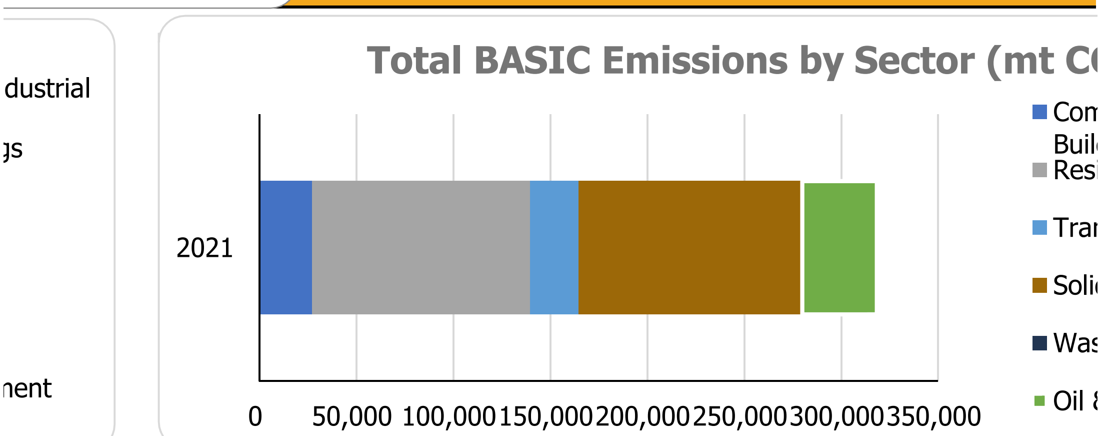

Transportation Emissions Details (mt
34%
55%
0.1%
3%
6%
2.40%
0%
On-roa
On-roa
Transit
Electric
Transp
Off-Ro
In-Bou
Transb


Waste Emissions Details (mt CO2
0%


100%

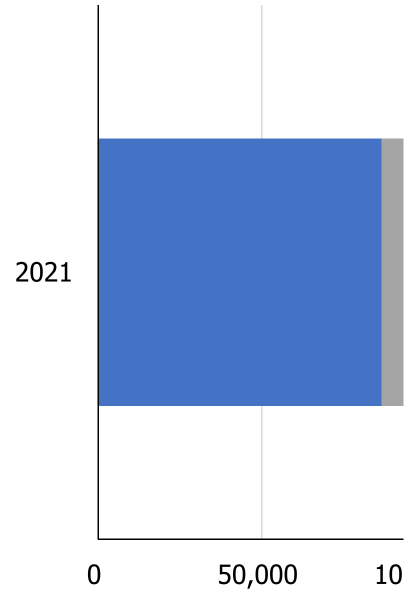

Total BASIC Emissions by Scope (mt CO2e)
1%
28%
71%
Scope 1 BASIC
Scope 2 BASIC
Scope 3 BASIC


Total BASIC+ Emissions by Sector
2021
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000


Total BASIC Emissions by Sector (mt C
2021
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000

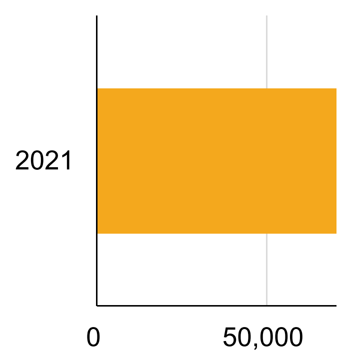
›urce (mt CO2e)

- Building Electricity
- Natural Gas (including fugitive emissions)
- Propane
- Stationary Diesel
- Oil & Gas Wells
- On-Road Transportation including Electric Vel
- Off-Road Transportation
- Transit
- In-Boundary Aviation
- Trans-Boundary Aviation
- Landfilled Waste
- Composted Waste
- Wastewater
- Refrigerant Leaks
- Transmission and Distribution Losses



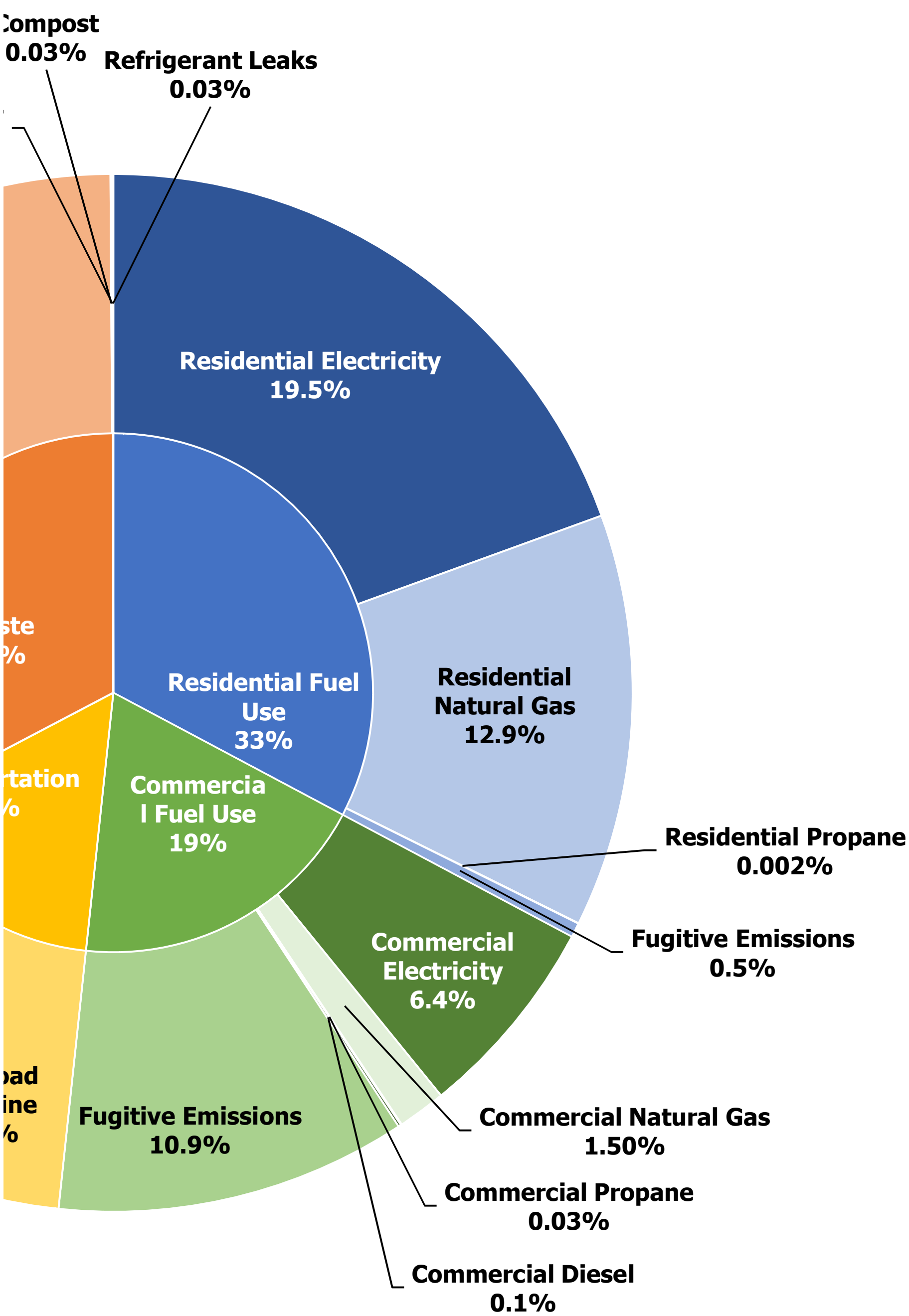
(mt CO2e)

- ng Electricity
- al Gas (including fugitive emissions)
- ıne
- ›nary Diesel
- ›ad Transportation including Electric Vehicles
- ;it
- illed Waste
- ›osted Waste
- ewater
- gerant Leaks

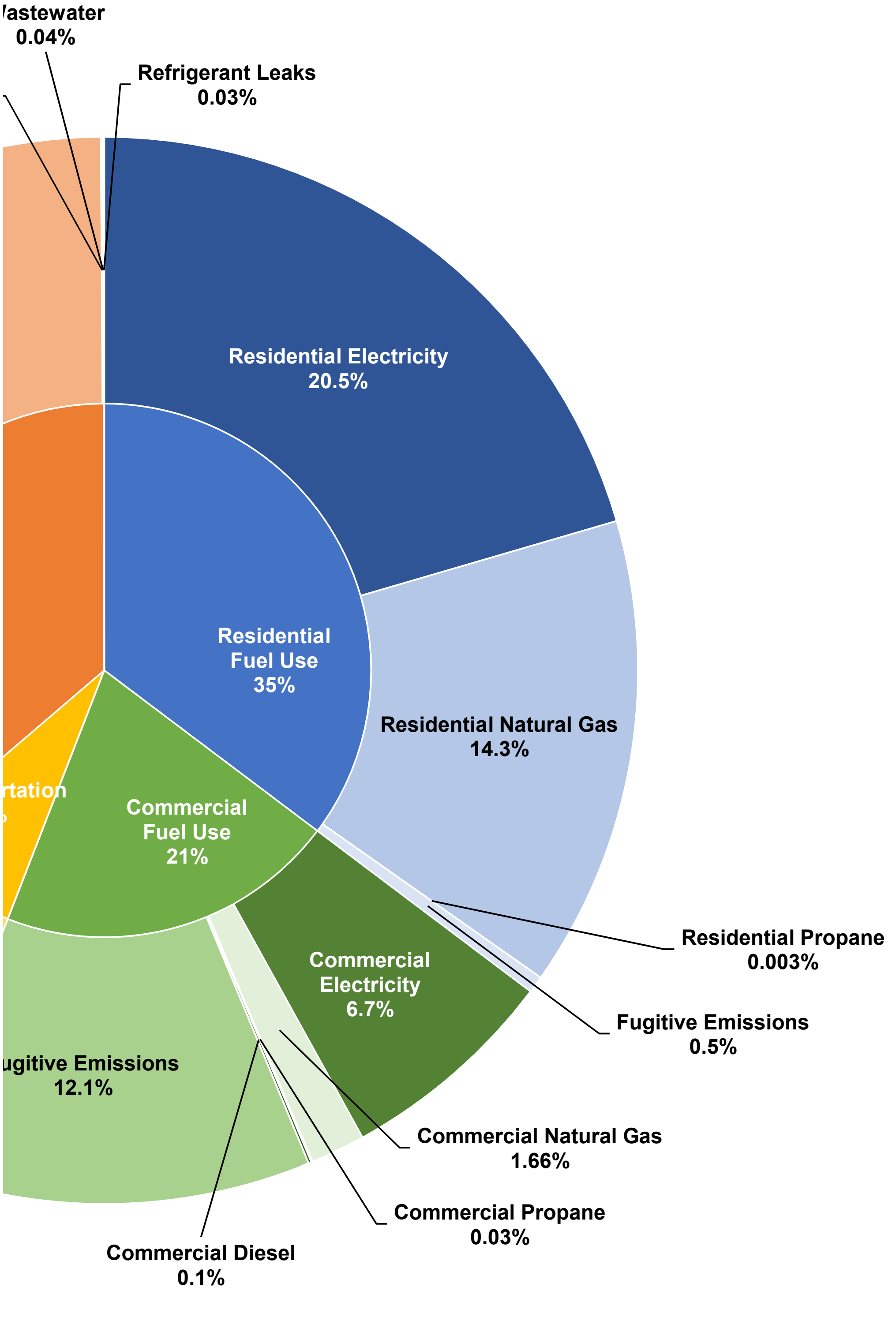


ns by Source and Sector (mt CO2e)

ns by Source and Sector (mt CO2e)

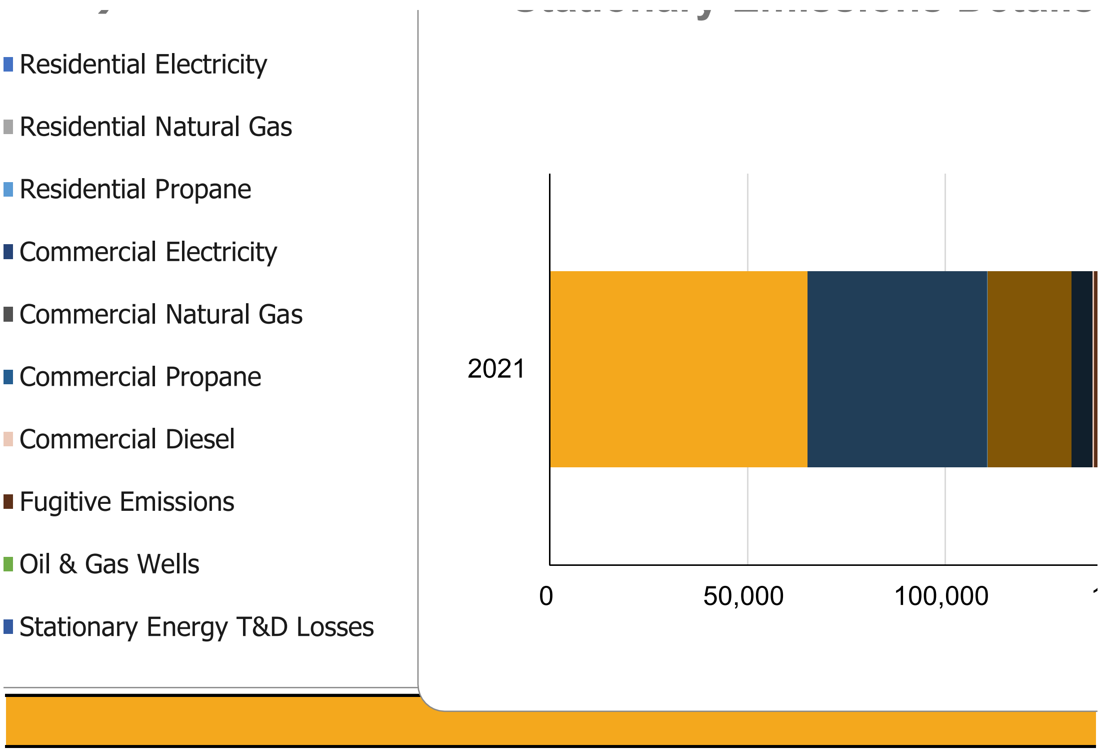


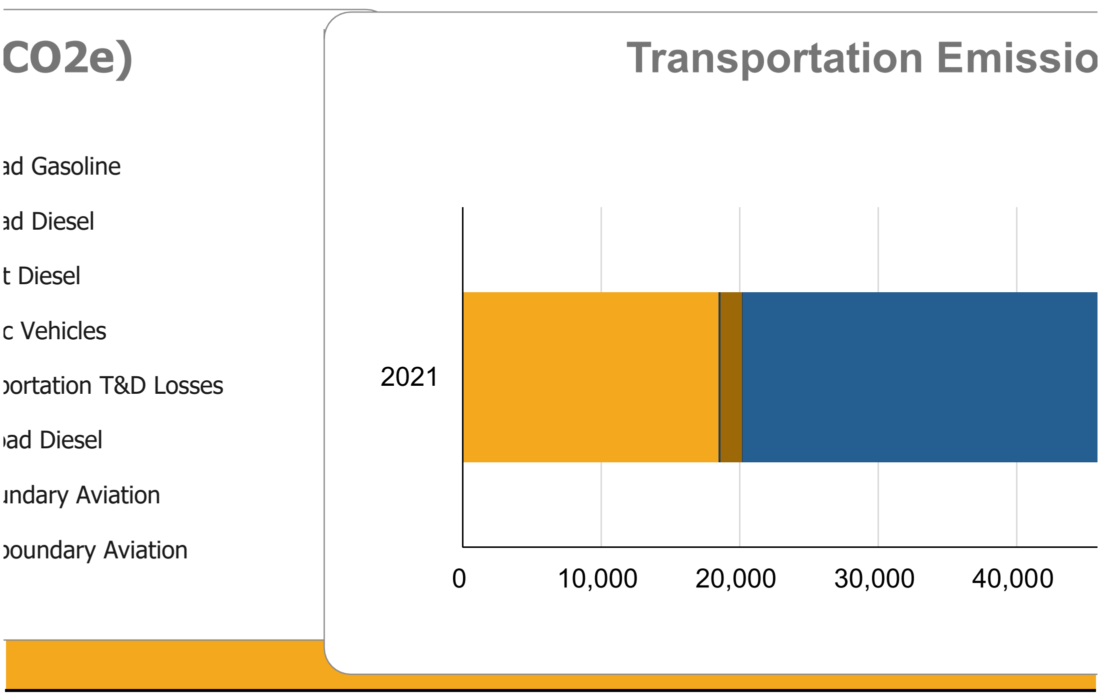
s by Source and Sector (mt CO2e)

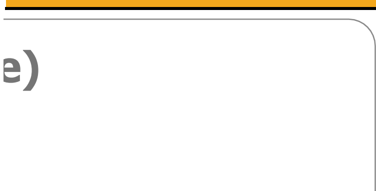


:O2e)

Stationary Emissions Details

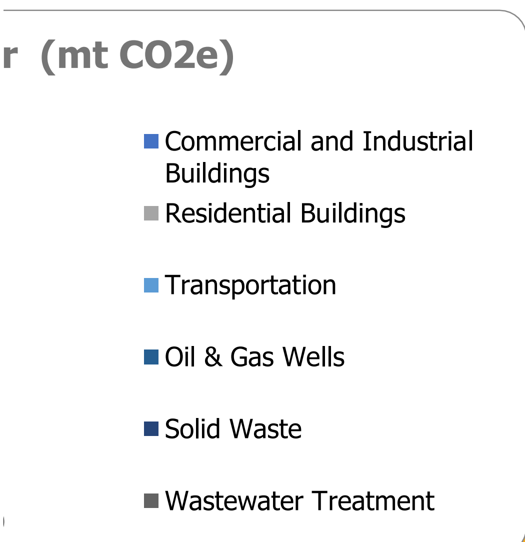

Residential Electricity
Residential Natural Gas
Residential Propane
Commercial Electricity
Commercial Natural Gas
Commercial Propane
Commercial Diesel
Fugitive Emissions
Oil & Gas Wells
Stationary Energy T&D Losses
2021
0
50,000
100,000

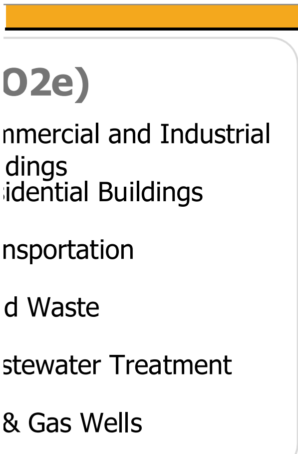

CO2e)
Transportation Emissio
ad Gasoline
ad Diesel
t Diesel
c Vehicles
portation T&D Losses
ad Diesel
undary Aviation
boundary Aviation
2021
0
10,000
20,000
30,000
40,000


e)

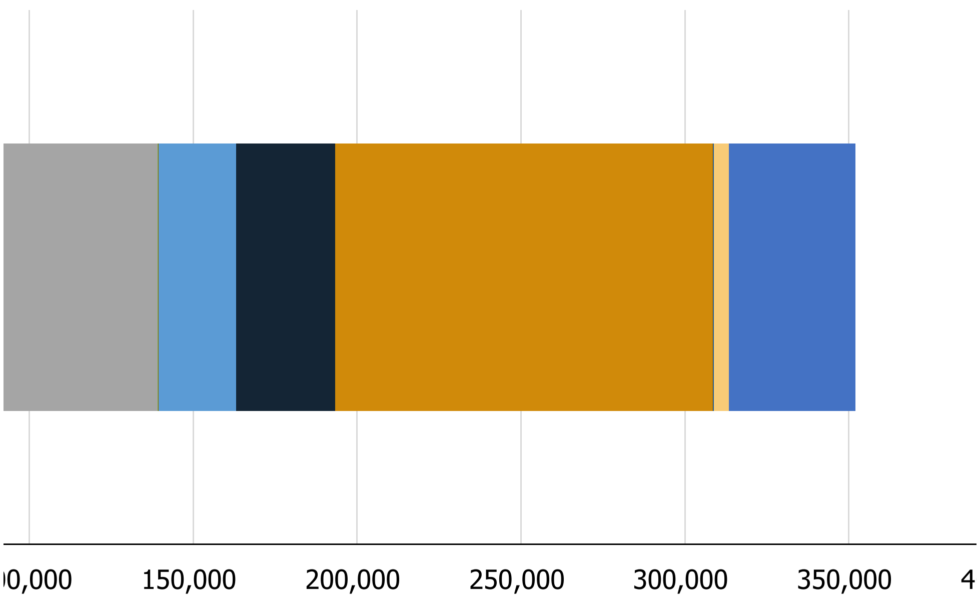
Solid Waste

Wastewater

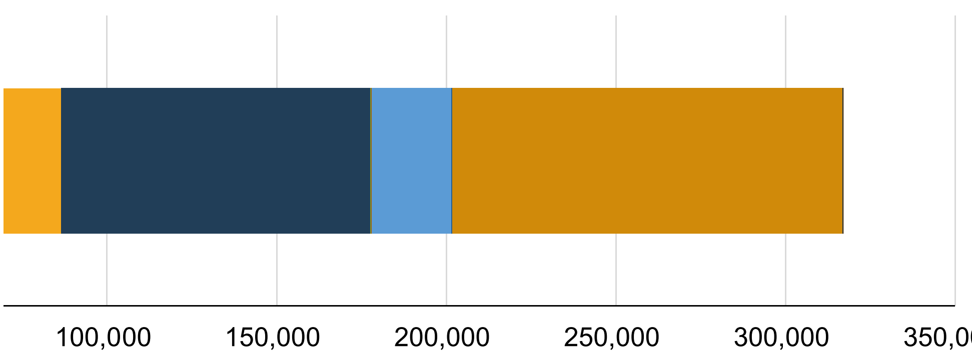

r (mt CO2e)
Commercial and Industrial Buildings
Residential Buildings
Transportation
Oil & Gas Wells
Solid Waste
Wastewater Treatment


O2e)
nmercial and Industrial
dings
idential Buildings
nsportation
d Waste
stewater Treatment
& Gas Wells

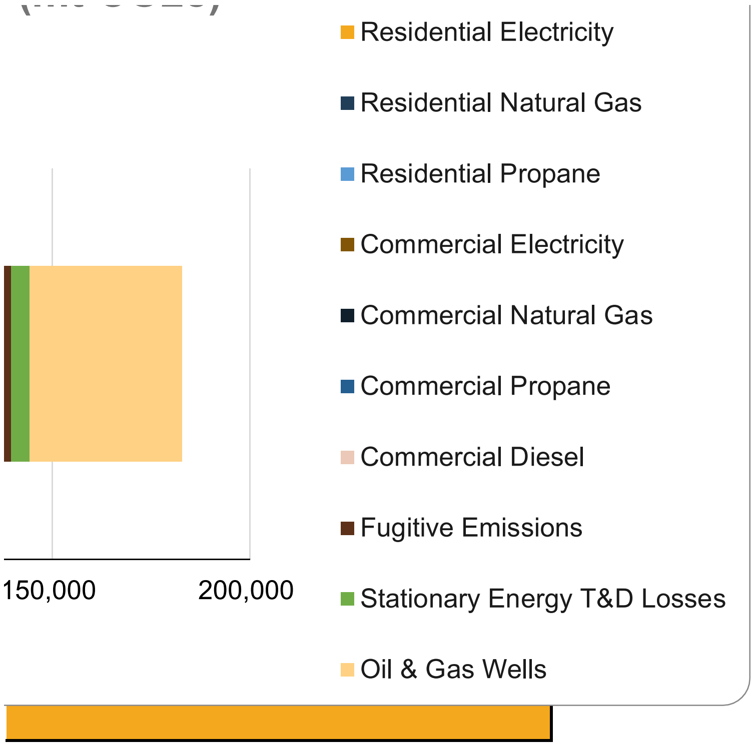
Total BASIC+ Emissions by Source (m

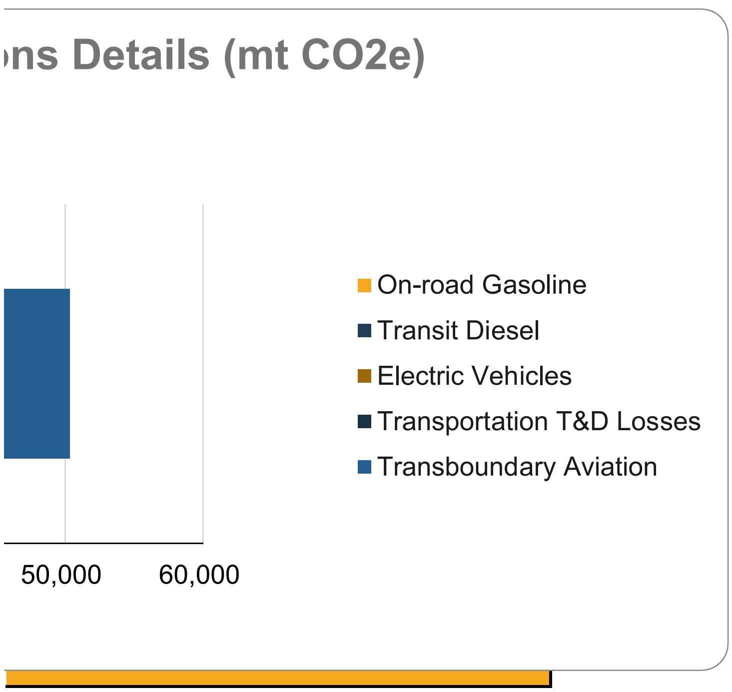


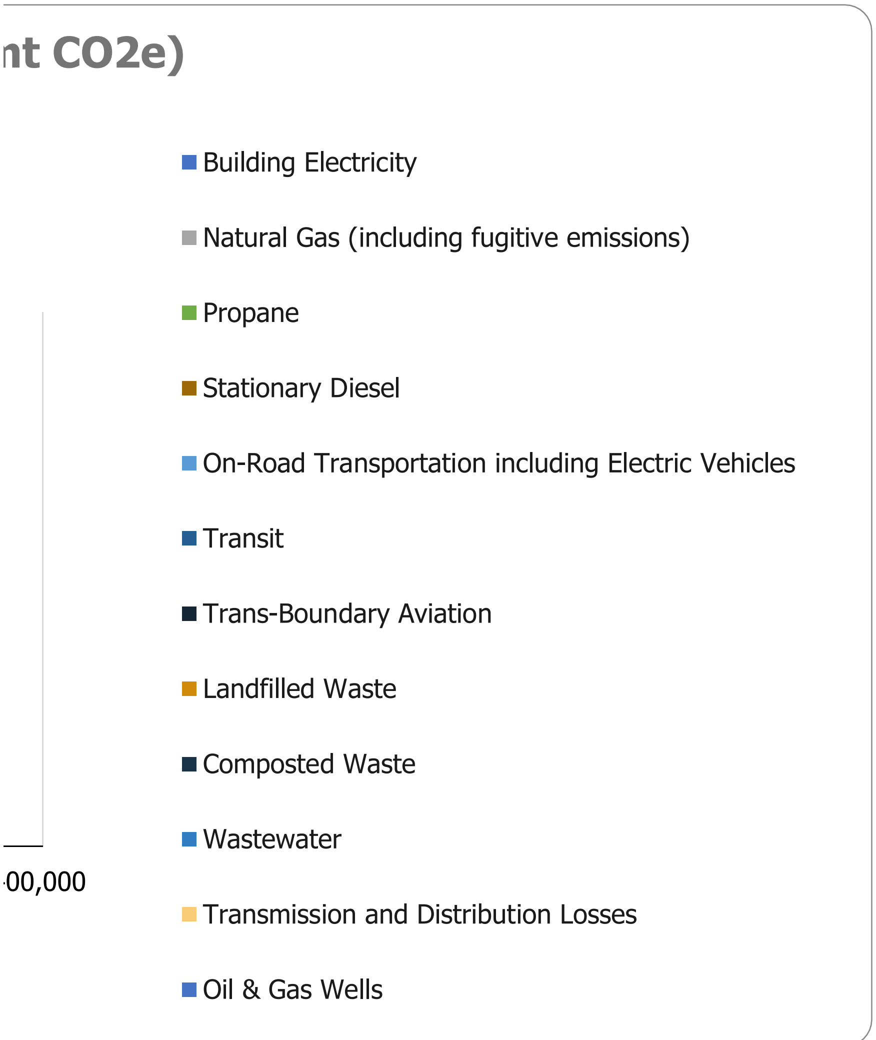
Total BASIC Emissions by Source (mt

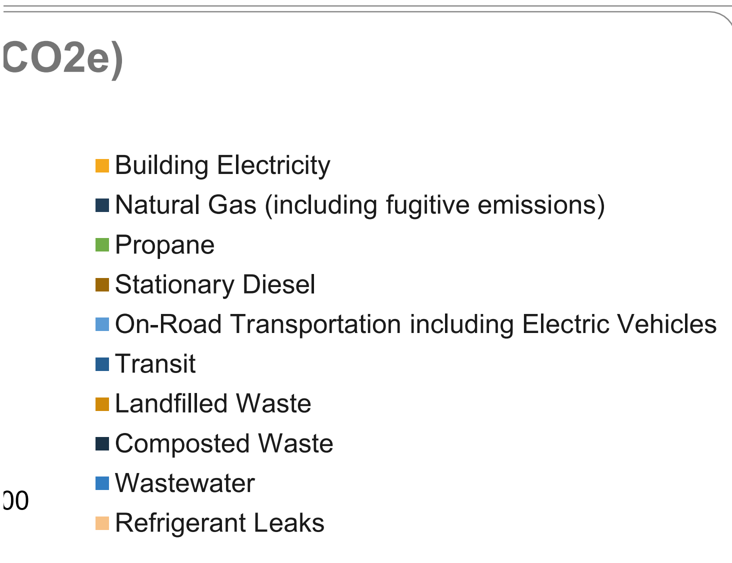


(mt CO2e)


150,000
200,000
Residential Electricity
Residential Natural Gas
Residential Propane
Commercial Electricity
Commercial Natural Gas
Commercial Propane
Commercial Diesel
Fugitive Emissions
Stationary Energy T&D Losses
Oil & Gas Wells


ns Details (mt CO2e)
50,000
60,000
On-road Gasoline
Transit Diesel
Electric Vehicles
Transportation T&D Losses
Transboundary Aviation


nt CO2e)
Building Electricity
Natural Gas (including fugitive emissions)
Propane
Stationary Diesel
On-Road Transportation including Electric Vehicles
Transit
Trans-Boundary Aviation
Landfilled Waste
Composted Waste
Wastewater
Transmission and Distribution Losses
Oil & Gas Wells
00,000


CO2e)
Building Electricity
Natural Gas (including fugitive emissions)
Propane
Stationary Diesel
On-Road Transportation including Electric Vehicles
Transit
Landfilled Waste
Composted Waste
Wastewater
Refrigerant Leaks
00

Inventory Data Checklist for BASIC Inventory

Data Contacts

Stationary Energy

Emissions Source	Required Data	Data units
Utility provided electricity	1. Residential electricity consumption 2. Commercial and institutional electricity consumption 3. Manufacturing industries and construction electricity consumption 4. Electricity emission factors	kWh, MWh, tons CO_2/MWh
Utility provided natural gas	1. Residential natural gas consumption 2. Commercial and institutional natural gas consumption 3. Manufacturing industries and construction natural gas consumption	therms, ccf, MMBtu
Direct access/transport natural gas/stationary diesel	1. Residential consumption 2. Commercial and institutional consumption 3. Manufacturing industries and construction consumption	therms, ccf, MMBtu, gal
Energy Industries	1. Energy production used in power plant auxiliary operations within the city 2. Electricity consumed by energy industries	various fuel units AND kWh, MWh
Agriculture, Forestry, Fishing	1.Agriculture, forestry, fishing electricity consumption	kWh, MWh
Agriculture, Forestry, Fishing	1. Agriculture, forestry, fishing fuel consumption	therms, ccf, MMBtu
Non-specified energy sources	1. Electricity consumed within the city boundary	kWh, MWh

Non-specified energy sources	1. Fuel combustion within the city boundary	therms, ccf, MMBtu
Fugitive emissions from coal	1. Commercial and institutional coal consumption 2. Manufacturing industries and construction coal consumption	tons
Fugitive emissions oil and gas	1. Residential natural gas and oil consumption 2. Commercial and institutional natural gas and oil consumption 3. Manufacturing industries and construction natural gas and oil consumption	therms, ccf, MMBtu AND gallons
Transportation		
Emissions Source	**Required Data**	**Data units**
On-road vehicles	1. Origin destination VMT or In-boundary annual VMT	annual VMT
Transit	1. Origin destination VMT 2. Trans-boundary VMT	annual VMT
On-road vehicles	1. Electricity consumed in the city for on-road transportation	kWh, MWh
Railways	1. Electricity consumed for railway transportation in the city	kWh, MWh
Railways	1. Fuel combustion for railway transportation in the city	various fuel units
Waterborne navigation	1. Electricity consumed for waterborne navigation in the city	kWh, MWh

Waterborne navigation	1. Fuel combustion for waterborne navigation in the city	various fuel units
Aviation	1. Electricity consumed for aviation occurring in the city	kWh, MWh
Aviation	1. Fuel combustion for aviation occurring in the city (including Boulder Municipal Airport and Denver International Airport)	gal of aviation gasoline, gals of jet fuel
Off-road transportation	1. Electricity consumed for off-road transportation in the city	kWh, MWh
Off-road transportation	1. Fuel combustion for off-road transportation in the city	various fuel units

Waste

Emissions Source	Required Data	Data units
Community solid waste generated	1. Residential waste generation 2. Commercial and institutional waste generation 3. Industrial waste generation 4. Location(s) of landfills 5. Types of treatment: traditional landfill, open dump, biological treatment, OR incineration, open burning,	tons of waste, in-boundary and out-of-boundary landfill location(s), types of treatment per waste disposal location
Wastewater generation	1. Residential wastewater generation 2. Commercial and institutional wastewater generation 3. Industrial wastewater generation 4. Location(s) of wastewater treatment	gallons/person/day, in-boundary and out-of-boundary wastewater treatment designation(s)

Wastewater treatment	1. Measured methane and nitrous oxide emissions from waste water treatment facilities under local government's significant influence 2. Aerobic or anaerobic treatment system 3. Nitrification or denitrification system	kg BOD5, tons of nitrogen, aerobic or anaerobic, nitrification or denitrification
Community Indicators		
Indicators	**Required Data**	**Data units**
Population	1. Community population	# residents
Physical size	1. City land area	square miles
Community descriptors	1. GDP 2. Composition of economy 3. Climate	$, text describing composition of economy and climate
Information-Only		
OPTIONAL: Information only	**Required Data**	**Data units**
Recycling	1. Amount of waste recycled 2. Type of waste recycled 3. Distribution of types of waste 4. Location(s) were recycling takes place by amount	tons, % wastes, description
WindSource	1. Subscribed energy	kWh
Rooftop solar - Solar* Rewards	1. Energy production	kWh
Rooftop solar - non-Solar* Rewards (NO KWH PROVIDED)	1. Energy production	kWh
Community solar	1. Subscribed energy	kWh

Is Data Available (Y/N)	GPC Notation Keys	Notation Keys Comments
Y	IE for industrial	Electricity data for manufacturing, industries and construction is lumped together with Commercial data as "Business" in Xcel Energy's Community Energy Report. Municipal street lights are lumped together with Commercial Electricity in Xcel Energy's Community Energy Report.
Y	IE for industrial	Natural gas data for manufacturing, industries and construction is lumped together with Commercial data as "Business" in Xcel Energy's Community Energy Report.
Y	IE for transport natural gas	Transport natural gas is lumped together with Commercial natural gas data as "Business" in Xcel Energy's Community Energy Report.
N	NO	
Y	IE	Included with Xcel Energy's 2021 Annual Community Report for "Business".
Y	IE	Included with Xcel Energy's 2021 Annual Community Report for "Business".
N	NO	There are no known sources.

N	NO	There are no known sources.
N	NO	There is no coal consumption or coal systems in the city.
Y	N/A	N/A

Is Data Available (Y/N)	GPC Notation Keys	Notation Keys Comments
Y	N/A	N/A
Y	N/A	N/A
Y	N/A	N/A
N	NO	Railways do not use electricity.
Y	N/A	Burlington Northern Santa Fe Railroad operates a railroad that travels 6.5 miles through the City of Boulder.
N	NO	There is no waterborne navigation is present.

N	NO	There is no waterborne navigation is present.
Y	IE	Included with Xcel Energy's 2016 Annual Community Report for "Business" for City and County of Denver.
Y	N/A	N/A
N	NO	There are no known significant sources.
N	NO	There are no known significant sources.

Is Data Available (Y/N)	GPC Notation Keys	Notation Keys Comments
Y	N/A	N/A
Y	N/A	N/A

Y	N/A	N/A

Is Data Available (Y/N)	GPC Notation Keys	Notation Keys Comments
Y	N/A	N/A
Y	N/A	N/A
Y	N/A	N/A

Is Data Available (Y/N)	GPC Notation Keys	Notation Keys Comments
Y	N/A	N/A
Y	N/A	N/A
Y	N/A	N/A
Y	N/A	N/A
Y	N/A	N/A

Data Source
2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports United Power
2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports Black Hills Energy
(1) Transport natural gas is provided in the 2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/working_with_us/municipalities/community_energy_reports. (2) Stationary diesel consumption is provided in CDPHE's CACTIS.
N/A
2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports
2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports United Power
N/A

N/A
N/A
2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports Black Hills Energy COGCC Website

Data Source
Google EIE Data CDPHE CO DOR
Regional Transportation District
Atlas EV Dashboard
N/A
(1) DRCOG (2) CDOT
N/A

N/A
2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports United Power
(1) Erie Airport Manager (2) City and County of Denver
N/A
Erie Municipal Airport

Data Source
Town of Erie
Town of Erie

Town of Erie

Data Source
US Census
US Census
US Census

Data Source
Town of Erie
2021 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports United Power
2022 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports United Power
2023 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports United Power
2024 Annual Community Report by Xcel Energy for the Town of Erie https://www.xcelenergy.com/community_energy_reports United Power

Contact Information	Status
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Bill Meier bmeier@unitedpower.com	On file.
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Katie Fleming katie.fleming@blackhillscorp.com	On file.
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Katie Fleming katie.fleming@blackhillscorp.com Adam Wozniak Inventory Unit Supervisor CDPHE adam.wozniak@state.co.us 303.692.3160	On file.
N/A	N/A
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com	On file.
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Bill Meier bmeier@unitedpower.com	On file.
N/A	N/A

N/A	N/A
N/A	N/A
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Katie Fleming katie.fleming@blackhillscorp.com	On file.

Contact Information	Status
Tom Herrod - ICLEI (Google EIE Data) tom.herrod@iclei.org Dale Wells - CDPHE dale.wells@state.co.us Kevin Kihn- CO DOR kevin.kihn@state.co.us	On file
Zach Van Gemert Senior Operations Analyst RTD 303.299.2830 Zachariah.VanGemert@rtd-denver.com	On file
https://atlaspolicy.com/evaluateco/	On file
N/A	N/A
Matthew Harrell Geographic Information Specialist Illinois EPA – Air Quality Planning 217.557.2437 matthew.harrell@illinois.gov	De minimis
N/A	N/A

N/A	N/A
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Bill Meier bmeier@unitedpower.com	On file.
Scott Morrissey Sustainability Manager Denver International Airport 303.342.2636 Todd Fessenden tfessenden@erieco.gov Jason Hurd jason@vectorair.net	On file.
N/A	N/A
Todd Fessenden tfessenden@erieco.gov Jason Hurd jason@vectorair.net	On file.

Contact Information	Status
Todd Fessenden tfessenden@erieco.gov Tyler Kesler tkesler@erieco.gov	On file.
Jon Coyle jcoyle@erieco.gov Bruce Chameroy bchameroy@erieco.gov	On file.

Jon Coyle jcoyle@erieco.gov Bruce Chameroy bchameroy@erieco.gov	On file.

Contact Information	Status
See Community Indicators tab for specific sources	On file.

Contact Information	Status
Todd Fessenden tfessenden@erieco.gov Tyler Kesler tkesler@erieco.gov	On file.
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Bill Meier bmeier@unitedpower.com	In progress
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Bill Meier bmeier@unitedpower.com	In progress
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Bill Meier bmeier@unitedpower.com	In progress
Tyler Carroll Community Energy Report Manager tyler.a.carroll@xcelenergy.com Bill Meier bmeier@unitedpower.com	In progress

Community Indicators

Data Sources and Assumptions

(1) Percentage of occupied housing units and the number of people employed data on file. Data is from July 2021. Number of occupied housing units was ca

(2) The land area, population, and total number of housing units data is from

(3) GDP is estimated using data from the U.S. Bureau of Economic Analysis fo percentage of the population of Erie living in Boulder County (42%) was multi population of Erie living in Weld County (58%) was multiplied by the total pop population, and combined for the total GDP for Erie. PDFs are on file. Data are https://www.usinflationcalculator.com/.

(4) Climate type is defined using the Koppen Climate Classification, which desi summary.php3?s=96427&cityname=Denver,+Colorado,+United+States+of+A

(5) Composition of the economy is defined on DATAUSA (https://datausa.io/pr

(6) Number of municipal buildings data were calculated from Building Detail Re

7) Commercial businesses and instututional units square footage data were pr

(8) Number of industries and Number of commerical businesses & institutions and Weld Counties, then scaled to Erie population and combined.

(9) HDD and CDD data is available for zip code 80026 (assumed to be represe

(10) Data on 2021 sales taxes collected are drawn from Town of Erie's Annual on file. Total retail sales are calculated from total sales taxes and the sales tax

Community Indicators and Corresponding Values

Community Indicator
Land area (mi^2)
Resident population
Number of housing units
Number of commercial businesses and institutions
GDP
Composition of economy
Climate
Number of occupied housing units / households
Number of municipal buildings
Number of industries
Commercial businesses and institutional units area (sq. ft.)

Number of people employed in the city
Heating degree days
Cooling degree days
Sales taxes
Retail sales

in the city are from the U.S. Census QuickFacts for Erie: https://www.censu
lculated from the total number of housing units multiplied by the occupied h

the Town of Erie 2021 Community Profile: https://www.erieco.gov/ArchiveCe

2020 (most recent):https://www.bea.gov/sites/default/files/2021-12/lagdp.
plied by the total population of Erie. This number is assumed to be the numb
ulation of Erie. This number is assumed to be the number of people living in
calculations on file. GDP values are reported in 2020 dollars and are update

gnates a classification of BSk: https://www.weatherbase.com/weather/weat
merica.

ofile/geo/erie-co#economy) under the section titled 'Economy.' Screenshot

eports provided by the Town of Erie. PDF and spreadsheet on file.

ovided by Stavan Vanscoy. Spreadsheet on file.

are from the US Census County Business Patterns chart for 2020: https://da

ntative of the Town) from www.weatherdatadepot.com using 65 degrees Fa

Comprehensive Financial Report, table titled 'Principal Sales Taxpayers' on p
rate (on page 119 of the same report).

Value
20.55
30,038
10,125
889
$2,527,420,745.61
Professional, Scientific, & Technical Services; Health Care & Social Assistance; Manufacturing; Educational Services; and Retail Trade
Semi-arid, with low humidity
8,647
79
1
1,860,686

22,078
5,753
816
$17,397,657
$497,075,914

ıs.gov/quickfacts/fact/table/erietowncolorado,US/PST045221. Screenshots of
ousing percentage.

ɛnter/ViewFile/Item/3121. PDF of data on file.

1221.pdf. These data are at the county level. To estimate Erie's GDP, the
ɔer of people living in Erie and Boulder County. The percentage of the
Erie and Weld County. GDP was then scaled for each county based on
ɛd to 2021 dollars using the inflation estimator at

her-

ɔn file.

ıta.census.gov/cedsci/table. Screenshots on file. Data were taken from Boulder

hrenheit as the balance point temperature.

ɔage 120: https://www.erieco.gov/ArchiveCenter/ViewFile/Item/3134. PDF is

Conversion Factors and Global Warming Potentials

Constants

Unit	Value
2,204.62	lbs.
2,000.00	lbs.
1,000.00	kWh
1,000.00	kg
1,000,000	g
0.1000	MMBtu of natural gas
0.1385	MMBtu of distillate fuel

Global Warming Potentials

Common Name	Formula
Carbon dioxide	CO_2
Methane	CH_4
Nitrous oxide	N_2O
Refrigerants	R-134A

Unit
1
1
1
1
1
1
1

GWP
1
29.8
273
1300

Value
metric ton
US ton
MWh
metric ton
metric ton
therm
gal diesel
Source
IPCC AR6: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf

Stationary Energy Data

Emissions Summary

Scope 1
Scope 2
Scope 3
Total (Scope 1 and Scope 2)
Information-Only Avoided Emissions

Data Sources and Assumptions

(1) Data on electricity and natural gas consumption was provided in Xcel Energy's Commu

(2) The Town of Erie also receives electricity from United Power. This data was provided i

(3) Additional natural gas for the Town of Erie is supplied by Black Hills Energy. Spreadhse

(4) Electricity consumed by electric vehicles was removed from the stationary totals; it was commercial electricity total, as they are accounted for in the on-road tab.

(5) Data on the use of stationary diesel was provided by Adam Wozniak with the Colorado within the community. Because sources are only required to report their use every five yea

(6) Data on propane use was provided by Matt Hanson with FerrellGas. AmeriGas was unr

(7) Note that the natural gas CO2 emissions factor provided in Xcel's CER is different from
(8) The 2021 Xcel CER provided renewable energy content for Erie.
(9) Transmission and Distribution losses were calculated by using 2020 Colorado specific E
(10) United Power was unable to provide renewable energy data.

Emission Factors

Electricity

Utility
Xcel Energy
United Power
Various
Various

Natural Gas

Utility
Xcel Energy
Xcel Energy
Xcel Energy

Diesel
Utility
Various
Various
Various

Propane
Greenhouse Gas
CO_2
CH_4
N_2O

Data Calculations

Utility Data
Electricity
Commercial and Industrial
Residential
Street Lighting - Metered
Street Lighting - Non-Metered/Xcel-Owned
Irrigation Sales
Oil Wells
Total Electricity
Natural Gas
Commercial and Industrial
Residential
Total Natural Gas
Propane
Commercial and Industrial
Residential

Total Propane
Stationary Diesel
Commercial and Industrial
Total Diesel
Transmission and Distribution Losses
Transmission and Distribution Losses
Total
Commercial and Industrial
Residential
Total Losses

Information-Only Renewable Energy
Xcel Windsource/RECs Retained by the Customer
Commercial and Industrial
Residential
Total RECs (Windsource)
Xcel Renewable*Connect/RECs Retained by the Customer
Commercial and Industrial
Residential
Total Renewable*Connect
On-site Solar (Solar Rewards)/RECs owned by Utility
Commercial and Industrial
Residential
Total Solar Rewards
On-site Solar (non-solar Rewards)/RECs Retained by Customer
Commercial and Industrial
Residential
Total On-Site Solar
Community Solar/RECs owned by Utility

Commercial and Industrial
Residential
Total Solar Gardens
Total Information-Only Renewable Energy Avoided Emissions from Customer Owned RECs
Total Information-Only Renewable Energy Avoided Emissions from Utility Owned RECs
Total Information-Only Renewable Energy Avoided Emissions

51,201
86,565
4,640
142,406
(6,731)

nity Energy Report (CER) for 2021 for the Town of Erie. Xcel provide

United Power's 2021 Franchise Report for the Town of Erie. PDF is

et is on file. Black Hills Energy reports residential and commercial/ir

assumed that electricity consumed by electric vehicles was metere

Department of Public Health and the Environment. Spreadsheet is c

rs, this value may not represent the exact usage of stationary diese

esponsive to data requests after multiple attempts. PDF on file.

ICLEI's values used in ClearPath. The value used for calculations be

IA data (https://www.eia.gov/electricity/state/colorado/) and taking

Greenhouse Gas	Value	Units
CO_2	0.470	mt CO_2/MWh
CO_2	0.712	mt CO_2/MWh
CH_4	0.0000531	mt CH_4/MWh
N_2O	0.0000077	mt N_2O/MWh

Greenhouse Gas	Value	Units
CO_2	0.0052	mt CO_2/th
CH_4	0.0000005	mt CH_4/th
N_2O	0.00000001	mt N_2O/th

Greenhouse Gas	Value	Units
CO_2	0.010243	mt CO_2/gal
CH_4	0.00000040	mt CH_4/gal
N_2O	0.000000100	mt N_2O/gal

Value	Units	
0.00559	mt CO_2/gal	ICLEI's U.S. Commu Emissions (Com Activities and Sour Note: CO2 emissior
0.0000010	mt CH_4/gal	
0.0000001	mt N_2O/gal	

Electricity Provided by United Power (kWh)	Electricity Provided by Xcel Energy (kWh)	Total Electricity Minus EVs(kWh)
15,534,170	20,327,389	35,562,645
59,057,670	51,064,916	108,428,740
N/A	6,928	6,928
N/A	460,773	460,773
154,193	N/A	154,193
624,858	N/A	624,858
75,370,891	**71,860,006**	**145,238,137**
Natural Gas Provided by Black Hills Energy (th)	**Natural Gas Provided by Xcel Energy (th)**	**Emissions (mt CO2)**
N/A	1,013,206	5,269
1,005,108	7,718,075	45,361
1,005,108	**8,731,281**	**50,629**
Ferrell Gas (gal)	**AmeriGas (gal)**	**Total Consumption (Gal)**
18,961	N/A	18,961
1,560	N/A	1,560

20,521	**0**	**20,521**
Total Consumption (gal)	**Emissions (mt CO2)**	**Emissions (mt CH4)**
29,383	301	0.01
29,383	**301**	**0.01**
5.28%		
Total Electricity (kWh)	**Total Electricity Minus EVs (kWh)**	**Emissions (mt CO2)**
1,958,577	1,942,800	1,128
5,812,270	5,722,869	3,483
7,770,847	**7,665,669**	**4,612**

Electricity Provided by Xcel Energy (kWh)	**Emissions (mt CO2)**	**Emissions (mt CH4)**
113,702	53	0.006
1,487,271	699	0.08
1,600,973	**752**	**0.08**
Electricity Provided by Xcel Energy (kWh)	**Emissions (mt CO2)**	**Emissions (mt CH4)**
0	0	0
67,897	32	0.004
67,897	**32**	**0.004**
Electricity Provided by Xcel Energy (kWh)	**Emissions (mt CO2)**	**Emissions (mt CH4)**
2,416,578	1,136	0.1
6,056,040	2,846	0.3
8,472,618	**3,982**	**0.4**
Electricity Provided by Xcel Energy (kW)	**Calculated Electricity Provided by Xcel Energy (kWh)**	**Emissions (mt CO2)**
19	0	0
3,913	4,012,347	1,886
3,933	**4,012,347**	**1,886**
Electricity Provided by Xcel Energy (kWh)	**Emissions (mt CO2)**	**Emissions (mt CH4)**

0	0	0
57,013	27	0.003
57,013	**27**	**0.003**
5,681,217	**2,670**	**0.3**
8,529,631	**4,009**	**0.5**
14,210,848	**6,679**	**1**

es CERs on an annual basis. Spreadsheet is on file. Xcel Energy combines commercial and in

on file.

ndustrial natural gas usage as one value. In this inventory, this value is reported under 'resic

d at an adjacent building. Commercial electricity includes electricity consumed by electric ve

on file. Stationary diesel use data reported by CDPHE represents the last 12 months of repor
l in the inventory year, but is assumed to be a very close approximation of total use in the i

elow reflects the value used in ClearPath.

estimated loses divided by total supply for Colorado electricity. Information on file.

Source
Provided in Xcel Energy's 2021 Community Energy Report for Erie https://www.xcelenergy.com/community_energy_reports
Tri-State's Carbon Rate 2021: 1,570 lb/MWh. PDF on file. Pounds converted to metric tons using unit conversions.
EPA's eGrid: eGRID 2021 summary tables, table 1, sub region RMPA. https://www.epa.gov/sites/default/files/2021-02/documents/egrid2021_summary_tables.pdf.

Source
ICLEI’s U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix C: Built Environment Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix C: Built Environment Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/. Assumes distillate fuel oil number 2 and that diesel is primarily

Source
unity Protocol for Accounting and Reporting of Greenhouse Gas munity Protocol) – Appendix C: Built Environment Emission ces, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/. n factors was provided directly from Tom Herrod via email. On file

Emissions (mt CO2)	Emissions (mt CH4)
20,403	2
64,851	6
3	0.0004
217	0.02
110	0.01
445	0.03
86,029	**8**
Emissions (mt CH4)	**Emissions (mt N2O)**
0.5	0.01
3.9	0.08
4	**0.09**
Emissions (mt CO2)	**Emissions (mt CH4)**
106	0.019
9	0.002

115	**0.021**
Emissions (mt N2O)	**Emissions (mt CO2e)**
0.003	302
0.003	**302**

Emissions (mt CH4)	**Emissions (N2O)**
0.10	0.01
0.30	0.04
0.41	**0.06**

Emissions (mt N2O)	**Emissions (mt CO2e)**
0.001	54
0.01	705
0.01	**758**
Emissions (mt N2O)	**Emissions (mt CO2e)**
0	0
0.001	32
0.001	**32**
Emissions (mt N2O)	**Emissions (mt CO2e)**
0.02	1,145
0.05	2,869
0.07	**4,013**
Emissions (mt CH4)	**Emissions (mt N2O)**
0	0
0.2	0.03
0.2	**0.03**
Emissions (mt N2O)	**Emissions (mt CO2e)**

0	0
0.0004	27
0.0004	**27**
0.04	**2,691**
0.1	**4,040**
0.1	**6,731**

dustrial classes if minimum aggregation

dential.'

hicles; this value was subtracted from the

ted stationary diesel use from sources
nventory year.

Emissions (mt N2O)	Emissions (mt CO2e)
0.3	20,535
0.8	65,251
0.0001	3
0.004	218
0.001	110
0.005	447
1	**86,565**

Emissions (mt CO2e)
5,287
45,497
50,783

Emissions (mt N2O)	Emissions (mt CO2e)
0.002	107
0.0002	9

0.002	**116**

Emissions (mt CO2e)
1,136
3,504
4,640

Emissions (mt CO2e)
0
1,901
1,901

Fugitive Emissions

Emissions Summary

Scope 1	40,292
Scope 2	N/A
Scope 3	N/A
Total	**40,292**

Data Sources and Assumptions

(1) Data on active oil and gas wells in Erie is from the Colorado Oil and Gas Information System (
specifically for Erie. Data for barrels of oil produced also comes from COGIS. Data is found in the
"Well_Production_Boulder_Weld_Totals2021" spreadsheet was used to match active wells with ba
(2) Per data from COGIS, there are no natural gas gathering or transmission pipelines, gas proces
(3) Based off information in a report by CO Energy Office, the leakage rate for natural gas assum
system, which is calculated from the amount consumed and the leakage rate. Spreadsheet on file
(4) Assume that the density of natural gas is 0.8 kg per cubic meter and that natural gas is 93.4%

Emission Factors

Fugitive and Process Emissions: Production Emissions from Natural Gas Wells

Greenhouse Gas	Value	Units
CH_4	10.62	mt CH_4/active well

Fugitive and Process Emissions: Transmission Emissions from Natural Gas Well

Greenhouse Gas	Value	Units
CH_4	0.40	mt CH_4/miles of gath
CH_4	1,250	mt CH_4/number of gas p
CH_4	1,185	mt CH_4/number of LNG storag
CH_4	0.62	mt CH_4/miles of transn
CH_4	983.7	mt CH_4/number of gas transmiss
CH_4	964.2	mt CH_4/number of gas storag

Fugitive and Process Emissions: Venting/Flaring Emissions from Natural Gas W

Greenhouse Gas	Value	Units
CH_4	54.71	mt CH_4/million BTU of natural

Fugitive and Process Emissions: Oil Wells

Greenhouse Gas	Value	Units
CH_4	439.43	kg CH_4/1000 barrel
CH_4	6.26	kg CH_4/1000 barr
CH_4	3.85	kg CH_4/1000 barrels

Data Calculations

Leakage Rate for Natural Gas Distribution

Source	Total Therms	Leakage Rate
Commercial and Industrial	1,013,206	0.30%
Residential	8,723,183	0.30%
Total	**9,736,389**	

Oil and Gas Wells

Source	Value
Oil produced (barrels)	14,967
Natural gas wells (number of wells)	121
Number of miles of natural gas gathering pipeline	0
Number of miles of natural gas transmission pipeline	0
Number of gas processing plants	0
Number of LNG storage compressor stations	0
Number of gas transmission compressor stations	0
Number of gas storage compressor stations	0
Million BTU of natural gas vented and flared	0

Natural Gas Production, Transmission, and Venting/Flaring

Source	Emissions (mt CH4)	Emissions (mt CO2e)
Natural gas production	1,285	38,294
Natural gas transmission	0	0
Natural gas venting & flaring	0	0
Total	**1,285**	**38,294**

Emissions from Oil Wells

Source	Emissions (mt CH4)	Emissions (mt CO2e)
Oil production	7	196
Oil refining	0	3
Oil transportation	0	2
Total	**7**	**201**

(COGIS) available at https://cogcc.state.co.us/data.html#/cogis. Data are pulled from Boulder and
"FacilitySearch_1042022_ErieOil&GasFacilities" spreadsheet. This spreadsheet lists active wells. T
arrels of oil produced. Both spreadsheets on file.
ssing plants, or compressor stations in Erie. Natural gas is not vented or flared in Erie. Reports fro
es a 0.3% leakage in the distribution system. Fugitive emissions are based off an assumption of t
and report here - https://energyoffice.colorado.gov/climate-energy/ghg-pollution-reduction-road
% methane and 1% carbon dioxide.

Source
EPA's State Inventory Tool Emissions from Natural Gas and Oil Systems for https://www.epa.gov/statelocalenergy/download-state-inventory-and-proje

s

	Source
ering pipeline	EPA's State Inventory Tool Emissions from Natural Gas and Oil https://www.epa.gov/statelocalenergy/download-state-invento
processing plants	
ge compressor stations	
mission pipeline	
sion compressor stations	
e compressor stations	

ells

	Source
gas vented and flared	EPA's State Inventory Tool Emissions from Natural Gas and Oil https://www.epa.gov/statelocalenergy/download-state-invento

	Source
ls produced	EPA's State Inventory Tool Emissions from Natural Gas and Oil https://www.epa.gov/statelocalenergy/download-state-invento
els refined	
transported	

Emissions (mt CO2)	Emissions (mt CH4)	Emissions (mt N2O)
0.1	6	0
1	54	0
1	**60**	**0**

' Weld counties and filtered
he

m COGIS on file.
he amount supplied to the
nap.

· Colorado:
ection-tool

l Systems for Colorado:
ory-and-projection-tool

l Systems for Colorado:
ory-and-projection-tool

l Systems for Colorado:
ory-and-projection-tool

Emissions (mt CO2e)
187
1,611
1,798

On-Road Data

Emissions Summary

Scope 1	21,968
Scope 2	1,533
Scope 3	76
Total	**23,576**

Data Sources and Assumptions

(1) VMT data was provided by Dale Wells with the Colorado Department of Public Health and Environm
(2) 2021 VMT from Google EIE was provided at the Boulder County level. CDPHE VMT data is for 2020.
(3) Assumptions: a) 10% ethanol in gasoline; b) 0% biodiesel in diesel.
(4) Vehicle efficiencies are from the EPA state inventory tool (on file).
(5) Electric vehicle data were found on Atlas Public Policy's EValuateCO dashboard: https://atlaspolicy.c
(6) Vehicle registrations by County was provided by Kevin Kihn with the Colorado Department of Reven
(7) Based on a report by the Idaho National Laboratory titled Plugged In: How Americans Charge Their
(8) Electric vehicle fuel efficiency from the U.S. DOE: http://www.afdc.energy.gov/fuels/electricity_char
(9) Per email from Mike Salisbury, City and County of Denver, VMT for EVs is estimated around 7,000 n
(10) Transmission and Distribution losses were calculated by using Colorado specific EIA data (https://v

Emission Factors

Electricity

Utility	Greenhouse Gas	Value	Units
Xcel Energy	CO_2	0.470	mt CO_2/MWh
United Power	CO_2	0.712	mt CO_2/MWh
Various	CH_4	0.0001230	mt CH_4/MWh
Various	N_2O	0.0000180	mt N_2O/MWh

Gasoline

Greenhouse Gas	Vehicle Type	Value	Units
CO_2	All	0.00878	mt CO_2/gal
CH_4	Passenger Vehicle	0.01730	g CH_4/mile
CH_4	Light Truck	0.01630	g CH_4/mile
CH_4	Heavy Vehicle	0.03330	g CH_4/mile
CH_4	Motorcycle	0.06720	g CH_4/mile
N_2O	Passenger Vehicle	0.00360	g N_2O/mile
N_2O	Light Truck	0.00660	g N_2O/mile
N_2O	Heavy Vehicle	0.01340	g N_2O/mile
N_2O	Motorcycle	0.00690	g N_2O/mile

Diesel

Greenhouse Gas	Vehicle Type	Value	Units
CO_2	All	0.010210	mt CO_2/gal
CH_4	Passenger Vehicle	0.000500	g CH_4/mile
CH_4	Light Truck	0.001000	g CH_4/mile
CH_4	Heavy Truck	0.005100	g CH_4/mile
CH_4	Heavy Vehicle (Bus)	0.005100	g CH_4/mile

N_2O	Passenger Vehicle	0.001000	g N_2O/mile
N_2O	Light Truck	0.001500	g N_2O/mile
N_2O	Heavy Truck	0.004800	g N_2O/mile
N_2O	Heavy Vehicle (Bus)	0.004800	g N_2O/mile

Ethanol

Greenhouse Gas	Vehicle Type	Value	Units
CO_2	All	0.006	mt CO_2/gal
CH_4	Light Duty	0.055	g CH_4/mile
CH_4	Heavy Duty/Buses	0.197	g CH_4/mile
N_2O	Light Duty	0.067	g N_2O/mile
N_2O	Heavy Duty/Buses	0.175	g N_2O/mile

Data Calculations

Gasoline, Diesel, and Ethanol Vehicles

Source	Emissions from Gasoline (mt CO2)	Emissions from Gasoline (mt CH4)	Emissions from Gasoline (mt N2O)
On-road vehicles	18,275	0.78	0.22

Fuel Additives	
Percent of ethanol in gasoline	10%
Percent of biodiesel in diesel	0%

Source	Gas cars	Gas light trucks	Gas Single Unit trucks
Community VMT	22,147,849	20,673,527	213,046
Gallons of fuel	918,998	1,117,488	30,134

Year	Total Annual VMT	Total Annual VMT with EV VMT Removed	VMT by Gasoline
2021	53,935,129	53,935,129	43,773,219

Fuel Spread by Vehicle Type			
	% Diesel	% Gasoline	Total
Motorcycle	0.00%	100.00%	100%
Passenger Car	7.75%	92.25%	100%
Light Duty	7.75%	92.25%	100%
Bus	100.00%	0.00%	100%
Single Unit Truck	50.00%	50.00%	100%
Combination Unit Truck	100.00%	0.00%	100%

Vehicle Type	MPG
Gas cars	24.10

Gas light trucks	18.50
Diesel cars	32.40
Diesel light trucks	22.10
Diesel combo trucks	6.59
Gas single unit truck	7.07
Diesel single unit trucks	6.59
Diesel bus (paratransit)	7.69
Gas motorcycle	50.00

CDPHE Vehicle Miles Tr			
	Motorcycle (HPMS ID - 10)	**Passenger Car (HPMS ID - 20)**	**Light Truck (HPMS ID - 30)**
Daily VMT	2,249	73,084	68,219
Annual VMT	820,886	26,675,480	24,899,767
% VMT	**1.5%**	**49.5%**	**46.2%**

Registered Vehicles	**Gas**	**Other Vehicle Types**	**Diesel**
Boulder County Number of Vehicles	229,361	24	8,174
Town of Erie Number of Vehicles	9,288	1	331
Weld County Number of Vehicles	277,169	156	34,190
Town of Erie Number of Vehicles	14,950	8	1,844
TOTAL	**24,238**	**9**	**2,175**
Percent Boulder County Vehicles Allocated to Erie	4.05%	Percent Weld County Vehicles Allocated to Erie	5.39%

Estimated electric consumption of battery electric vehicle (kWh/mile)	0.34		% Charging at Home
Estimated electric consumption of plug-in hybrid electric vehicle (kWh/mile)	0.70		% Charging at Commercial Stations

Source	**Emissions (mt CO2)**	**Emissions (mt CH4)**	**Emissions (mt N2O)**
Boulder County Erie Electric Vehicles	0	0.00	0.00
Weld County Erie Electric Vehicles	1,419	0.25	0.036
Total	**1,419**	**0.2**	**0.04**

Source	Estimated Number of Electric Vehicles	Average VMT per Vehicle	Total Electricity Consumption from Battery Electric Vehicles (kWh)
Boulder County Erie Electric Vehicles	0	7,000	0
Weld County Erie Electric Vehicles	512	7,000	1,218,560

ent and through Google EIE data provided by Tom Herrod with ICLEI. Dale also provided daily travel bro
Erie's proportion of Boulder County's 2020 VMT data was applied to the 2021 Google EIE VMT data and

:om/evaluateco/. Screenshots on file. Data was filtered for Erie's zip code (80516).
ue. The electric vehicle data provided by Kevin Kihn groups plug-in hybrid electric vehicles (PHEVs) and
Electric Vehicles (https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf), 85% of
:ging_home.html. Hybrid electric vehicle fuel efficiency from: http://www.mdpi.com/1996-1073/4/3/435/
niles per year. Email on file.
www.eia.gov/electricity/state/colorado/) and taking estimated loses divided by total supply for Colorado e

Source
Provided in Xcel Energy's 2021 Community Energy Report for Erie. https://www.xcelenergy.com/community_energy_reports
Tri-State's Carbon Rate 2021: 1,570 lb/MWh. PDF on file. Pounds converted to metric tons using unit co
EPA's eGrid: eGRID 2018 summary tables, table 1, sub region RMPA. https://www.epa.gov/sites/produc 01/documents/egrid2018_summary_tables.pdf.

Source
Updated using EPA estimates as recommended by ICLEI (https://www.epa.gov/sites/production/files/20 03/documents/emission-factors_mar_2018_0.pdf). Based on vehicles that are 2008 to present or 2009 t Past years utilized ICLEI Appendix D numbers.

Source
Updated using EPA estimates as recommended by ICLEI (https://www.epa.gov/sites/production/files/20 03/documents/emission-factors_mar_2018_0.pdf). Based on vehicles that are 1996 to present. Past yea

ICLEI Appendix D numbers.

Source
Updated using EPA estimates as recommended by ICLEI (https://www.epa.gov/sites/production/files/20 03/documents/emission-factors_mar_2018_0.pdf). Past years utilized ICLEI Appendix D numbers.

Emissions from Gasoline (mt CO2e)	Emissions from Diesel (mt CO2)	Emissions from Diesel (mt CH4)	Emissions from Diesel (mt N2O)	Emissions from Diesel (mt CO2e)
18,359	3,507	0.01	0.01	3,511

Gas motorcycle	Diesel cars	Diesel light trucks	Diesel Single Unit trucks	Diesel Combination Trucks
738,797	2,066,760	1,929,181	236,718	827,517
14,776	63,789	87,293	35,921	125,572

VMT by Diesel	VMT by Ethanol	Gasoline Consumed (gal)	Diesel Consumed (gal)	Ethanol Consumed (gal)
5,298,219	4,863,691	2,081,396	343,529	231,266

aveled			
Bus (HPMS ID - 40)	Single Unit Truck (HPMS ID - 50)	Combination Unit Truck (HPMS ID - 60)	Total
652	1,297	2,267	**147,767**
238,044	473,435	827,517	**53,935,129**
0.4%	**0.9%**	**1.5%**	**100%**

Ethanol / Gas	Plug-in Hybrid	Standard Hybrid	Electric	Butane / Gas
2,323		12,030	5,881	82
94	0	487	0	3
5,771		4,774	1,207	64
311		258	512	3
405	**158**	**745**	**512**	**7**

85%	
15%	

Transmission & Distribution Losses	5.28%

Emissions (mt CO2e)
0
1,533
1,533

Total
Residential - Xcel
Residential - UP
Commercial - Xcel
Commercial - UP
Total

Total Electricity Consumption from Plug-In Hybrid Electric Vehicles (kWh)	Total Residential Electricity Consumption (kWh)	Total Commercial Electricity Consumption (kWh)
0	0	0
774,200	1,693,846	298,914

ɔken out by vehicle type. Email on file. HPMS vehicle type definitions are
I doubled as Erie is split nearly 50/50 between Boulder County and Weld

standard hybrids into the same category (called Electric/Gas). To identify
EV charging is assumed to occur at residences, while 15% of charging is
pdf.

electricity. Information on file.

nversions.

tion/files/2020-

18-
o present.

18-
rs utilized

ı18-

Emissions from Ethanol (mt CO2)	Emissions from Ethanol (mt CH4)	Emissions from Ethanol (mt N2O)	Emissions from Ethanol (mt CO2e)	Emissions from Ethanol (mt CO2(b))	Total Emissions (Biogenic mt CO_2)
0	0.27	0.33	98	1,330	1,330

Diesel Buses	Ethanol passenger cars	Ethanol light trucks	Ethanol Single Unit trucks	Ethanol Motorcycle
238,044	2,460,872	2,297,059	23,672	82,089
30,955	102,111	124,165	3,348	1,642

Bio Diesel	Electric / Diesel	Propane	Natural Gas	Propane / Gas	Ethanol
32	5	79	74	8	4
1	0	3	3	0	0
27	3	8	142	10	5
1	0	0	8	1	0
3	**0**	**4**	**11**	**1**	**0**

Electricity (kWh)	Emissions (mt CO2)	Emissions (mt CH4)	Emissions (N2O)	Emissions (mt CO2e)
0	0	0.000	0.000	0
89,401	64	0.011	0.0016	64
0	0	0.000	0.0000	0
15,777	11	0.0019	0.00028	11
105,178	**75**	**0.01**	**0.002**	**76**

Total Emissions (Fossil Fuel mt CO_2)	Total Emissions (mt CH_4)	Total Emissions (mt N_2O)	Total Emissions (mt CO_2e)
21,782	1.06	0.56	21,968

Total
258,077
10,213
323,526
17,897
28,110

Aviation Data

Emissions Summary

Scope 1	1,325
Scope 2	N/A
Scope 3	30,150
Total with Total Fuel	**31,475**

Data Sources and Assumptions

(1) DEN fuel use data was provided in an email from Scott Morrissey, Senior Vice Presic
(2) The proportion of aviation activity attributed to Erie in the past Boulder County inve
(3) There is current debate related to CH4 emissions from jet fuel as it has been recent
(4) Erie Municipal Airport local/itinerant breakdown found at: http://www.airnav.com/ai
(5) Erie Municipal Airport data for fuel usage and jet fuel-aviation gas split received fro

Emission Factors

Jet Fuel

Greenhouse Gas	Value
CO_2	0.0098
CH_4	0
N_2O	0.0000003

Aviation Gasoline

Greenhouse Gas	Value
CO_2	0.0083
CH_4	0.000007
N_2O	0.0000001

Data Calculations

Aviation Emissions

Source	Emissions (mt CO2)
Erie Municipal Airport (In-Boundary)	1,305
Denver International Airport (Transboundary)	29,899

% of DEN Emissions Attributable to Erie	0.77%
Total fuel used at Erie Municipal Airport	141,187
Total Jet Fuel Used at DEN	397,856,725
Total Aviation Gas Used at DEN	3,911

Transboundary Aviation	Local/Itinera nt
Erie Municipal Airport	Itinerant
Erie Municipal Airport	Itinerant
Denver International Airport	Itinerant
Denver International Airport	Itinerant

Aviation

ɟent of Sustainability for DEN. Email is on file.
entory (0.77%) was multiplied by the DEN fuel use data to estimate gallons of fuel cons
tly suggested that there are no net methane emissions from jet fuel use.
irport/KEIK. PDF also on file.
n Jason Hurd. Email on file.

Units	Source
mt CO2/gal	The Climate Registry 22021 Default Emission Factors, Table 2.1 for C for CH_4 and N_2O.: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pc
mt CH4/gal	
mt N2O/gal	

Units	Source
mt CO2/gal	The Climate Registry 2021 Default Emission Factors, Table 2.1 for CC for CH_4 and N_2O.: https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pc
mt CH4/gal	
mt N2O/gal	

Emissions (mt CH4)	Emissions (mt N2O)	Emissions (mt CO2e)
0.3	0.03	1,325
0.0002	0.9	30,150

Scope	Jet Fuel-Aviation Gasoline Split	Usage (gallons)	Fuel Type
1	65%	91,772	Jet fuel
1	35%	49,415	Aviation gasoline
3	100%	3,063,497	Jet fuel
3	0%	30	Aviation gasoline

Gasoline Total	**3,204,714**	**49,446**
Jet Fuel Total		**3,155,268**

sumed that can
O_2 and Table 2.7
df.
O_2 and Table 2.7
df.

Off-Road Data

Emissions Summary

Scope 1	7
Scope 2	0
Scope 3	0
Total	**7**

Data Sources and Assumptions

(1) Data provided by Jason Hurd with the Erie Municipal Airport. Email on file.
(2) Propane use is reported in pounds used. One gallon of propane weighs 4.2 ,
(3) CNG use is reported in gallons of gasoline equivalent (GGE). There are 0.87
(4) Additional off-road fuel usage may be consumed within the Town boundarie

Emission Factors

Fuel	Greenhouse Gas
Gasoline	CO_2
Diesel	CO_2
CNG	CO_2
Propane	CO_2

Data Calculations

Fuel Used (Erie Airport-Owned Vehicles)	Emissions (mt CO2)
Gasoline	0
Diesel	7
CNG	0
Propane	0
Total	**7**

Off-Road Vehicle and Equipment Data	
Fuel Type	**Fuel Used (Erie Airport-Owned Vehicles)**
Gasoline (gal)	0
Diesel (gal)	680
CNG (GGE)	0
Propane (lbs)	0

pounds.
7 GGE in one hundred cubic feet of CNG (per the U.S. DOE Alternative Fuels Data C
s; however, its contribution is assumed to be negligible and data is difficult to retrie

Vehicle Type	Value	Units
All	0.00878	mt CO_2/gal
All	0.01021	mt CO_2/gal
Heavy Duty Vehicle	0.000054440	mt CO_2/standard cubic foot
All	0.00572	mt CO_2/gal

Emissions (mt CH4)	Emissions (mt N2O)	Emissions (mt CO2e)
0	0	0
0	0	7
0	0	0
0	0	0
0	**0**	**7**

Total Fuel Used
0
680
0
0

enter, https://epact.energy.gov/fuel-conversion-factors).
eve.

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Green Protocol) – Appendix D: Transportation and Other Mobile Emission Activ 2013: http://icleiusa.org/ghg-protocols/.
(1) CNG CO2 emission factor from: ICLEI's U.S. Community Protocol for Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transpo Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-pr
2021 Climate Registry Default Emissions Factors: https://www.theclimat content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf

house Gas Emissions (Community
ities and Sources, Version 1.1, July

Accounting and Reporting of
ortation and Other Mobile Emission
otocols/. (2) CNG CH_4 and N_2O

eregistry.org/wp-
CO_2 Emissions from combustion of

Transit Data

Emissions Summary

Scope 1	140
Scope 2	N/A
Scope 3	N/A
Total	**140**

Data Sources and Assumptions

(1) Data for RTD Activity was provided by Roger Fang with RTD. Bus timet
completed each day. This was multiplied by 365 to get annual totals. These

(2) RTD diesel fuel use data for the Denver region were supplied by Justin

Emission Factors

Diesel

Greenhouse Gas	Vehicle Type
CO_2	All
CH_4	Light Duty (bus)
N_2O	Light Duty (bus)

Data Calculations

Transit Buses

Source	Emissions (mt CO2)
Transit Buses	140
Total Transit Emissions	**140**

RTD Activity

Value	Units
3,347,120	gal (diesel)
26,761,454	miles traveled - diesel

ables were provided for all of 2021. Emails and spreadsheet on file. The len
e data were separated out by municipality and filtered for the Town of Erie.

Mueller with RTD. Emails on file. These data were also scaled to the Town c

Value	Units
0.01021	mt CO_2/gal
0.00100	g CH_4/mile
0.00150	g N20/mile

Emissions (mt CH4)	Emissions (mt N2O)
0.0001	0.0002
0.0001	**0.0002**

Percentage Attributable to Town of Erie	Erie Consumption
0.4%	13,723
0.4%	109,722

gth of each route was multiplied by the frequency each route was

of Erie.

Notes
See On-Road data tab for emission factors. Note that per ICLEI recommendation, we utilized light duty vehicles for buses, not heavy duty.

Emissions (mt CO2e)
140
140

Units
gal (diesel)
miles traveled - diesel

Waste and Recycling Data

Emissions Summary

Scope 1
Scope 2
Scope 3
Total (Scope 1 and 3)
Information-Only Avoided Emissions

Data Sources and Assumptions

1) Waste and recycling data were provided by Cody Lillstrom with Boulder County's ReTRAC p
2) Residential and ICI waste are taken to the Front Range Landfill in Erie. Compost goes to A
3) According to data from the EPA's Landfill Methane Outreach Program (LMOP) (https://www
4) MSW characterization and Materials Recovery characterizations were taken from the 2021
5) The Front Range Landfill falls within Erie town boundaries. Tons of waste collected at the l

Emission Factors

Landfilled Waste

Waste Component
MSW
Newspaper
Office paper
Corrugated containers
Magazines/third-class mail
Food scraps
Grass
Leaves
Branches
Dimensional lumber
Oxidization factor
Collection efficiency rate for landfills with gas collection systems

Composted Waste

Value
0.00047
0.00022

Recycled Materials

Waste Component
Paper and paperboard (mixed paper)
Newspaper
Office paper
Magazines/third-class mail
Glass
Metals (mixed)

Plastics (mixed)
Mixed recyclables

Data Calculations

Emissions Summary

Front Range Landfill
Tons of Waste Landfilled Inside City Limits
Tons of Waste Landfilled Outside City Limits
Tons of Waste Composted Outside City Limits
Tons of Recycling Recycled Outside City Limits
Tons of Yard Waste & Wood Recycled Outside City Limits
Totals

Front Range Landfill

Waste Group
Tons of Waste Landfilled Inside City Limits

Residential and Multifamily Waste

Waste Group
Tons of Waste Landfilled Inside City Limits
Tons of Waste Landfilled Outside City Limits
Tons of Waste Composted Outside City Limits
Tons of Recycling Recycled Outside City Limits
Tons of Yard Waste & Wood Recycled Outside City Limits
Tons of Reuse Inside City Limits
Total

ICI Waste

Waste Group
Tons of Waste Landfilled Inside City Limits
Tons of Waste Landfilled Outside City Limits
Tons of Waste Composted Outside City Limits
Tons of Recycling Recycled Outside City Limits
Tons of Yard Waste & Wood Recycled Outside City Limits
Tons of Reuse Inside City Limits
Total

MSW Characterization

Newspaper
0.6%

Materials Recovery Characterization
Glass Containers
17.6%

112,987
N/A
2,305
115,292
(13,506)

program. Spreadsheet on file.
1 organics which has several locations, none of which are within Erie. Recycling is taken to Boulder Cou
v.epa.gov/lmop/project-and-landfill-data-state), the Front Range Landfill has a gas collection system. C
Countywide Waste Composition Study for Boulder County.
landfill and metric tons of methane produced were collected from the EPA's FLIGHT tool. PDF on file. T

Value	Description	
0.06	mt CH_4/ton waste	ICLEI's U.S. Community Protocol for
0.043	mt CH_4/ton waste	
0.203	mt CH_4/ton waste	
0.12	mt CH_4/ton waste	
0.049	mt CH_4/ton waste	
0.078	mt CH_4/ton waste	
0.038	mt CH_4/ton waste	
0.03	mt CH_4/ton waste	
0.062	mt CH_4/ton waste	
0.062	mt CH_4/ton waste	
10%		
75%		

Description	
mt CH_4/ton waste	Documentation for Greenhouse Gas Emissions and Energy Factors U
mt N_2O/ton waste	03/documents/warm_v14_management_practices.pdf. Assumes gre

From using recycled inputs instead of virgin inputs (mtCO2e/short ton)	Landfill with gas collection but no energy recovery (mtCO2e/short ton)	Total avoided emission factor (mtCO2e/ton recycled)
3.52	0.57	4.09
2.78	0.24	3.02
2.85	1.00	3.85
3.07	0.27	3.34
0.28	0.04	0.32
3.97	0.04	4.01

0.98	0.04	1.02
2.80	0.47	3.27

Waste Generated	Units	Scope
1,733,953	Tons	1
8,198	Tons	1
4,865	Tons	3
426	Tons	3
4,453	Tons	N/A
975	Tons	3
1,748,416	**Tons**	

Units	Tonnage
Tons	1,747,016

Units	Tonnage
Tons	12,996
Tons	3,129
Tons	42
Tons	3,378
Tons	41
Tons	27
Tons	**19,613**

Units	Tonnage
Tons	67
Tons	1,736
Tons	384
Tons	1,076
Tons	933
Tons	8
Tons	**4,203**

Paper and Paperboard		
Office Paper	Magazines and Mixed Paper/Junk Mail	Cardboard/Kraft and Chip/Paperboard
1.3%	4.1%	6.3%

Aluminum	Steel/Tin	#1 PET Bottles, #2 HDPE Bottles, Rigid Containers #1-#7, and Bulky Rigids
1.1%	3.7%	5.1%

ınty.
ɔllection efficiency rate is assumed to be 75% based on EPA estimates.

ɔns disposed of by Erie residences and businesses were subtracted from the tonnag

Source
Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – A Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.

Source
Jsed in the Waste Reduction Model (WARM): https://www.epa.gov/sites/productior ːen waste. Values are adjusted to CH_4 and N_2O emission factors.

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas and Composting Emissions Protocol, Version 1.0, July 2013: http://icleiusa.org/ghg for avoided emissions from a facility with landfill gas capture but no energy produc

Emissions (mt CH4)	Emissions (mt N2O)	Emissions (mt CO2e)
3,667	0	109,280
124.4	0	3,707
73.8	0	2,200
0.2	0.1	32
		(13,579)
0.5	0.2	73
3,866	**0.3**	**115,292**

Other Paper (low-grade), To-Go Cups, and Aseptic Containers	Glass	Metals
9.8%	3.3%	4.7%

	Paper and Paperboard	
Newspaper	Office Paper	Magazines and Mixed Paper/Junk Mail
4.6%	1.4%	9.1%

ge total to avoid double counting.

ppendix E: Solid Waste Emission Activities and

n/files/2016-

Emissions (Community Protocol) – Recycling
g-protocols/. Emission factors represent those
ction.

Plastics	Organics		
	Food	Yard Waste	Clean Wood
14.0%	15.8%	2.6%	3.9%

		Styrofoam, To-Go Cups, and Contaminants
Cardboard/Kraft and Chip/Paperboard	Aseptic Containers	
42.2%	0.7%	15.2%

	Miscellaneous Other Waste		
Other	Textiles	C&D Debris	Composites
2.4%	3.6%	10.6%	0.0%

Other
17.0%

Wastewater Data

Emissions Summary

Scope 1
Scope 2
Scope 3
Total

Data Sources and Assumptions

1) Wastewater treatment plant data were supplied by Jon Coyle with Town of Erie Public Works. Emai
digester gas are not applicable. The plant therefore does not use anaerobic processes, but does use r

Emission Factors

Municipal Wastewater Treatment

Source
Process N_2O emissions for WWTPs with nitrification and denitrification
Fugitive N_2O Emissions from Effluent Discharge
Combustion gas
Combustion gas
Days Year
Density of methane
Conversion
Methane Destruction Efficiency
Molecular weight ratio of N_2O to N_2
Industrial Commercial Discharge Multiplier

Data Calculations

GHG Emissions By Process

Process N2O Emissions for WWTPs with Nitrification and Denitrification
Emissions as mt N_2O
Total Process N_2O from Nitrification and Denitrification Emissions (mt CO_2e)
Fugitive N2O Emissions from Effluent Discharge
Emissions as mt N_2O
Total Process N_2O from Nitrification and Denitrification Emissions (mt CO_2e)
Combustion Gas Emissions
Emissions as mt CH_4
Emissions as mt N_2O
Total Combustion Gas Emissions (mt CO_2e)
Flared Gas Emissions
Emissions as mt CH_4
Total Flared Gas Emissions (mt CO_2e)
Total

Input Data

Municipal Wastewater Treatment

Plant uses nitrification/denitrification
Plant uses anaerobic processes
Erie's population served by the plant
Average total nitrogen discharged by plant (kg N/day)
Digester gas produced (scfd)
Digester gas flared (scfd)
Methane content of digester gas

130
N/A
N/A
130

ils on file. The plant does not use digesters, so the values for digester gas produced, digeste
itrification/denitrification.

Greenhouse Gas	Value	Units
N_2O	7	g N_2O/person/year
N_2O	0.005	kg N_2O-N/kg sewage-N
CH_4	0.003	kg CH_4/MMBtu
N_2O	0.001	kg N_2O/MMBtu
N/A	365.25	Days
N/A	662	Grams per cubic meter
N/A	0.03	m^3/ft^3
N/A	99%	
N/A	1.57	44/28
N/A	1.25	

0.26
72
0.21
58
0
0
0
0
0
130

Input Data

Yes
No
30,000
73.94
0
0
0%

r gas flared, and methane content of

Source
ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (Community Protocol) – Appendix F: Wastewater and Water Emission Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-protocols/.
Standard assumption

Industrial Processes and Products Use Data

Emissions Summary

Scope 1	101
Scope 2	N/A
Scope 3	N/A
Total	**101**

Data Sources and Assumptions

1) All refrigerant information is based upon the quantity of commercial square footage w

2) Lotus used a conservative estimate that 25% commercial space is air conditioned usi

3) Assumptions include: a) 300 sq. ft. per ton of cooling capacity based on the commerc Conditioning, Heating, Ventilation, and Refrigeration; b) 1 kg refrigerant per ton based c the Environmental Impact of HVAC Refrigerants; and c) 5% refrigerant loss per year fro Core Module Guidance from the EPA.

Emission Factors

Refrigerant Emissions from Commercial AC leakage

Variable	Value
Square feet per ton of cooling (sf/ton)	300
Amount of refrigerant (kg) per ton of cooling	1
Estimated refrigerant loss	5%
Estimated % of square footage air conditioned	25%

Data Calculations

Refrigerant Use

	Value
Commercial Square Footage	1,860,686
% Commercial Square Footage Air Conditioned	465,172
Tons of Cooling	1,551
Charge of coolant per ton (kg)	1,551
Refrigerant Loss (kg) of R-134A	78
Total metric tons of CO2e	**101**

vithin the City. Square footage provided by Stavan Vanscoy.
ng 134a refrigerants.

cial average from the ASHRAE Pocket Guide for Air
on a conservative estimate from the Treatment of LEED of
m the Climate Leaders Greenhouse Gas Inventory Protocol

Notes
Source (IPCC): https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html
Lotus estimate

GPC Table 4.1

Notes: (1) Adapted from Global Prot

GPC Table 4.1 - Inventory (
Inventory Boundary
Name of City
State
Country
Inventory year
Inventory date
Geographic boundary
Land area (km2)
Resident population
GDP ($)
Composition of economy
Climate
Other information

tocol for Community-Scale Greenhouse Gas Emission Inventories, WRI, C40 Cities, and ICLEI.

City Information

City Information	
	Town of Erie
	Colorado
	USA
	2021
	October 2021
	City Boundary
	20.6
	30,038
$	2,527,420,746
	Professional, Scientific, & Technical Services; Health Care & Social Assistance; Manufacturing; Educational Services; and Retail Trade
	Semi-arid, with low humidity
	None

GPC Table 4.2

Notes: (1) Adapted from Global Protocol for Community-Scale Greenhouse Gas Emission Ir

GPC Table 4.2 - GHG Emissions Summary

Sector		Scope 1 (mt CO2e)
Stationary Energy	Energy use	51,201
	Fugitive Emissions	40,292
Transportation	All emissions	23,439
Waste	Treated in the City	2,329
	Treated outside the City	
Industrial Processes and Produ	Refrigerants	101
	Total	**117,363**

nventories, WRI, C40 Cities, and ICLEI.*

Scope 1 (BASIC+) (mt CO2e)	Scope 2 (mt CO2e)	Scope 3 (BASIC) (mt CO2e)	Scope 3 (BASIC+) (mt CO2e)
	86,565		4,640
	1,533		30,226
		113,092	
0	**88,097**	**113,092**	**34,866**

BASIC Emissions (mt CO2e)	BASIC+ (mt CO2e)
137,766	142,406
40,292	40,292
24,972	55,198
2,329	2,329
113,092	113,092
101	101
318,552	**353,418**

GPC Table 4.3

Notes: (1) Adapted from Global Pro

GPC Table 4.3 - GHG E

GPC Reference Number	Scope
I	
I.1	
I.1.1	1
I.1.2	2
I.1.3	3
I.2	
I.2.1	1
I.2.2	2
I.2.3	3
I.3	
I.3.1	1
I.3.2	2
I.3.3	3
I.4	
I.4.1	1
I.4.2	2
I.4.3	3
I.4.4	1
I.5	
I.5.1	1
I.5.2	2
I.5.3	3
I.6	
I.6.1	1
I.6.2	2
I.6.3	3
I.7	
I.7.1	1
I.8	
I.8.1	1
II	
II.1	
II.1.1	1
II.1.2	2

II.1.3	3
II.2	
II.2.1	1
	2
II.2.3	3
II.3	
II.3.1	1
II.3.2	2
II.3.3	3
II.4	
II.4.1	1
II.4.2	2
II.4.3	3
II.5	
II.5.1	1
II.5.2	2
II.5.3	3
III	
III.1	
III.1.1	1
III.1.2	3
III.1.3	1
III.2	
III.2.1	1
III.2.2	3
III.2.3	1
III.3	
III.3.1	1
III.3.2	3
III.3.3	1
III.4	
III.4.1	1
III.4.2	3
III.4.3	1
IV	
IV.1	1
IV.2	1
V	
V.1	1
V.2	1
V.3	1
VI	
TOTAL	
TOTAL	

tocol for Community-Scale Greenhouse Gas Emission Inventories, WRI, C40 Cities, and ICLEI.

Emissions Report

GHG Emissions Source (By Sector and Subsector)
STATIONARY ENERGY
Residential buildings
Emissions from fuel combustion within the city boundary
Emissions from grid-supplied energy consumed within the city boundary
Transmission and distribution losses from grid-supplied energy
Commercial and institutional buildings and facilities
Emissions from fuel combustion within the city boundary
Emissions from grid-supplied energy consumed within the city boundary
Transmission and distribution losses from grid-supplied energy
Manufacturing industries and construction
Emissions from fuel combustion within the city boundary
Emissions from grid-supplied energy consumed within the city boundary
Transmission and distribution losses from grid-supplied energy
Energy industries
Emissions from energy production used in power plant auxiliary operations within the city
Emissions from grid-supplied energy consumed by energy industries
Emissions from transmission and distribution losses from grid-supplied energy used in power plant auxiliary operatic
Emissions from energy generation supplied to the grid
Agriculture, forestry and fishing activities
Emissions from fuel combustion within the city boundary
Emissions from grid-supplied energy consumed within the city boundary
Transmission and distribution losses from grid-supplied energy
Non-specified sources
Emissions from fuel combustion within the city boundary
Emissions from grid-supplied energy consumed within the city boundary
Transmission and distribution losses from grid-supplied energy
Fugitive emissions from mining, processing, store, and transportation of coal
Fugitive emissions from mining, processing, storage, and transportation of coal within the city boundary
Fugitive Emissions from oil and natural gas systems
Fugitive emissions from oil and natural gas systems within the city boundary
TRANSPORTATION
On-road transportation
Emissions from fuel combustion on-road transportation occurring in the city
Emissions from grid-supplied energy consumed in the city for on-road transportation

Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use
Railways
Emissions from fuel combustion for railway transportation occurring in the city
Emissions from grid-supplied energy consumed in the city for railways
Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use
Waterborne navigation
Emissions from fuel combustion for waterborne navigation occurring in the city
Emissions from grid-supplied energy consumed in the city for waterborne navigation
Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use
Aviation
Emissions from fuel combustion for aviation occurring in the city
Emissions from grid-supplied energy consumed in the city for aviation
Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use
Off-road transportation
Emissions from fuel combustion for off-road transportation occurring in the city
Emissions from grid-supplied energy consumed in the city for off-road transportation
Emissions from transboundary journeys occurring outside the city, and T and D losses from grid-supplied energy use
WASTE
Solid waste disposal
Emissions from solid waste generated in the city and disposed in landfills or open dumps within the city
Emissions from solid waste generated in the city but disposed in landfills or open dumps outside the city
Emissions from waste generated outside the city and disposed in landfills or open dumps within the city
Biological treatment of waste
Emissions from solid waste generated in the city that is treated biologically in the city
Emissions from solid waste generated in the city but treated biologically outside of the city
Emissions from waste generated outside the city boundary but treated in the city
Incineration and open burning
Emissions from waste generated and treated within the city
Emissions from waste generated within but treated outside of the city
Emissions from waste generated outside the city boundary but treated within the city
Wastewater treatment and discharge
Emissions from wastewater generated and treated within the city
Emissions from wastewater generated within but treated outside of the city
Emissions from wastewater generated outside the city boundary but treated within the city
INDUSTRIAL PROCESSES and PRODUCT USES (IPPU)
Emissions from industrial processes occurring in the city boundary
Emissions from product use occurring within the city boundary
AGRICULTURE, FORESTRY and OTHER LAND USE (AFOLU)
Emissions from livestock
Emissions from land
Emissions from aggregate sources and non-CO2 emission sources on land
OTHER SCOPE 3
BASIC
BASIC+

GPC Notation Keys Legend	
IE	Included elsewhere
NE	Not estimated
NO	Not occurring
C	Confidential

GP
Add'l
Add'l s

Notation Keys	CO2	CH4	N2O	HFC	PFC
	45,369	4	0		
	64,851	6	1		
	3,483	0	0		
	5,676	1	0		
	20,623	2	0		
	1,128	0	0		
IE					
IE					
IE					
IE					
ons					
NO					
NO					
NO					
NO					
NO					
	0.6	1,352.1			
	21,922	1	1		
	1,419	0	0		

	74.9	0.0	0.0		
NO					
NO					
NO					
NO					
NO	1,305.4	0.3	0.03		
NO					
	29,899	0.0002	0.9		
NO	6.9	0.0	0.0		
NO					
NO					
NO		74			
		3,792			
NO					
		0	0		
		0.7	0.3		
NO					
NO					
NO					
NO					
		0.0	0.5		
NO					
NO					
NO					
NO					
NO					
NO					
NO					
	0.0				
	161,174	**5,232**	**3**		
	195,759	**5,232**	**4**		

C Color Legend
BASIC
subsectors for BASIC+
subsectors for Territorial

SF6	NF3	Total CO2e	CO2(b)	Activity Data Quality
		45,505		High
		65,251		High
		3,504		High
		5,696		High
		21,314		High
		1,135.6		High
		40,291.9		Medium
		22,108	1,330	Medium
		1,533		Medium

		75.8		Medium
		1,324.8		
		30,150		Medium
		6.9		
		2,200		
		112,987		High
		0		Medium
		105		High
		130		
		101		
		0		
		318,552	**1,330**	
		353,418	**1,330**	

Activity Data Source	Emission Factors Quality	Emission Factor Source
Xcel Energy, Ferrell Gas	High	ICLEI
Xcel Energy	High	Xcel Energy, EPA eGRID
Xcel Energy, EIA	High	Xcel Energy, EPA eGRID
Xcel Energy	High	ICLEI
Xcel Energy	High	Xcel Energy, EPA eGRID
Xcel Energy, EIA	High	Xcel Energy, EPA eGRID
COGIS, CDPHE	High	EPA
CDR, CDPHE	High	ICLEI
CDR, CDPHE	High	Xcel Energy, EPA eGRID

EIA, City and County of Denver, Idaho National Laboratory	High	Xcel Energy, EPA eGRID
Denver International Airport	High	ICLEI
f Erie, Waste Connections, Republic S	High	ICLEI
City and County of Denver	High	ICLEI
f Erie, Waste Connections, Republic S	High	ICLEI
Town of Erie	High	ICLEI

Comments
Includes industrial electricity as data for commercial and industrial usage was combined by Xcel Energy
Includes industrial electricity as data for commercial and industrial usage was combined by Xcel Energy
Includes industrial electricity as data for commercial and industrial usage was combined by Xcel Energy
Included with commercial electricity use as data for commercial and industrial usage was combined by Xcel Energy
Included with commercial electricity use as data for commercial and industrial usage was combined by Xcel Energy
Included with commercial electricity use as data for commercial and industrial usage was combined by Xcel Energy
No known sources exist within the community.
No known sources exist within the community.
Included within commercial and industrial energy use.
Included within commercial and industrial energy use.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.

This includes only emissions from T&D losses as a result of EV charging
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
Used data for landing and takeoff (LTO).
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
There are no landfills within the community.
There is no waste treatment within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community
No known sources exist within the community
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.
No known sources exist within the community.

GPC Table 4.4

Notes: (1) Adapted from Global Protocol for Community-Scale Greenhouse Gas E

Scope 3 emissions based on market-based methoc

Recycling
Recycling
Total Avoided Emissions from Recycling
Renewable Energy
Renewable Energy with Customer-Owned RECs
Renewable Energy with Utility-Owned RECs
Total Avoided Emissions from Renewable Energy
Total Community Avoided Emissions

mission Inventories, WRI, C40 Cities, and ICLEI.

Value	Units	Emissions (mt CO2e)
4,453	U.S. short tons	(13,579)
		(13,579)
Value	**Units**	**Emissions (mt CO2e)**
5,681,217	kWh	(2,691)
8,529,631	kWh	(4,040)
		(6,731)
		(20,310)

2021 Greenhouse Gas Emissions

Town of Erie, Colorado

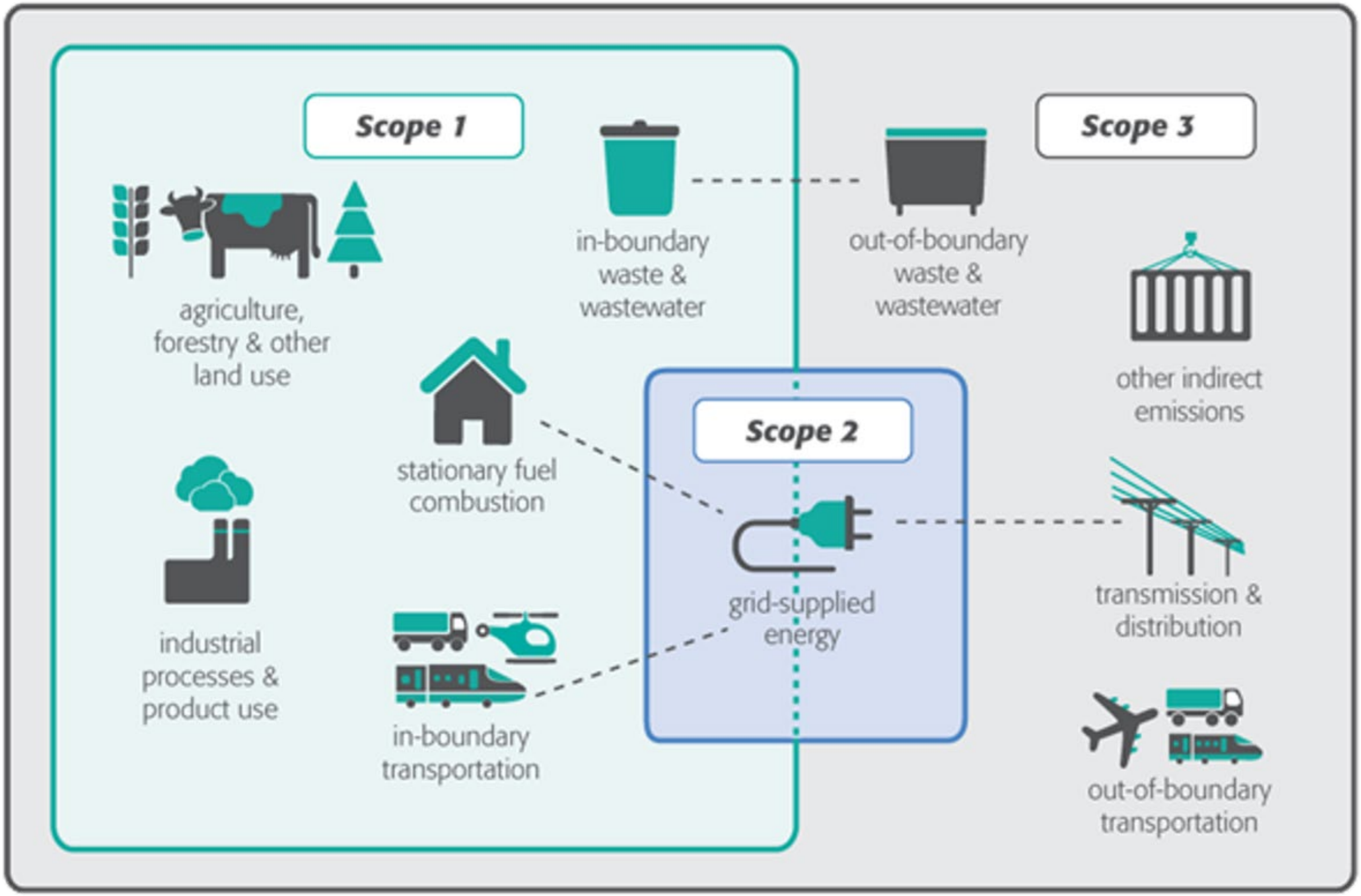
Tom Herrod | Managing Director of Greenhouse Gas Accounting, Modeling, and Visualization

Presentation Overview

- 2021 Community GHG Emissions Overview
  - Total 2021 emissions
  - Sector breakdowns
- Sources of Community GHG Emissions in 2021
  - Stationary Energy sources
  - Transportation sources
  - Waste and Wastewater sources
- 2021 Municipal GHG Emissions Overview
  - Total 2021 emissions
  - Sector/Source breakdowns
- Additional Analysis
  - Carbon Sequestration Analysis

2021 Community GHG Emissions Overview

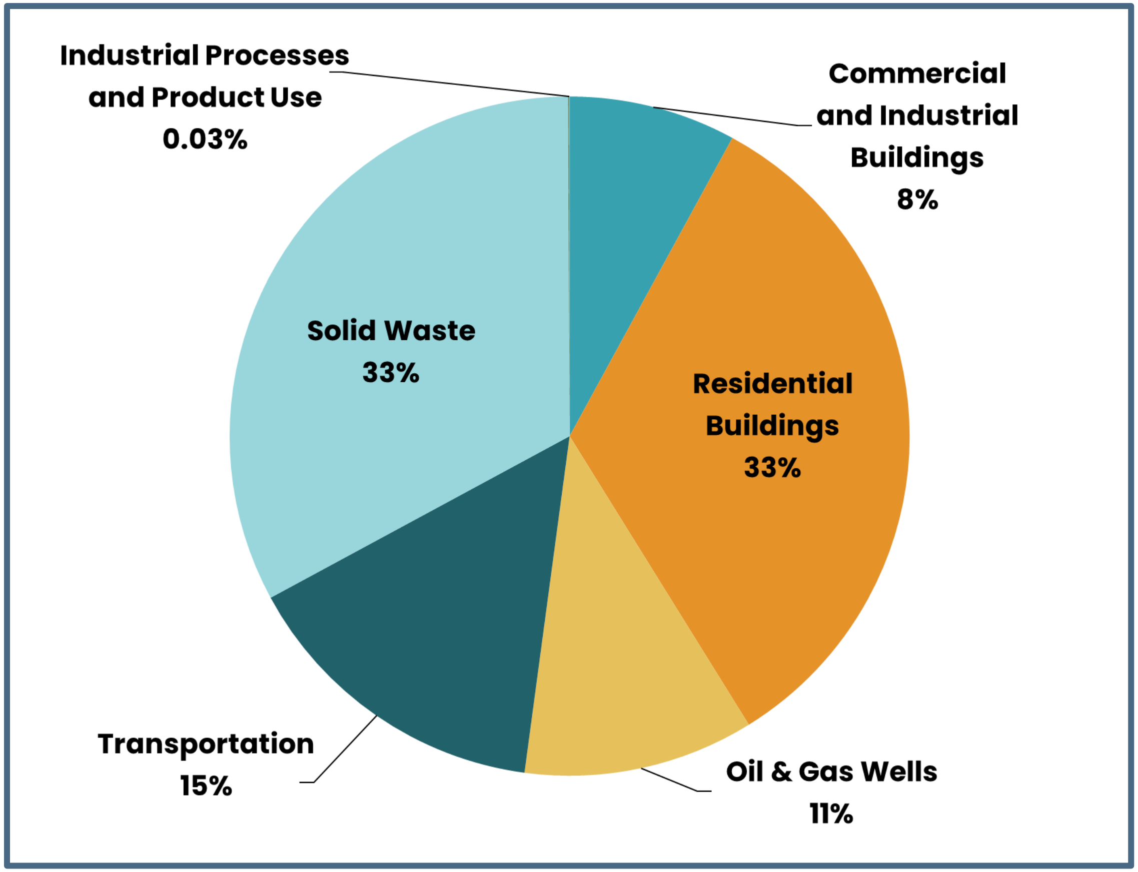
Emissions Sources



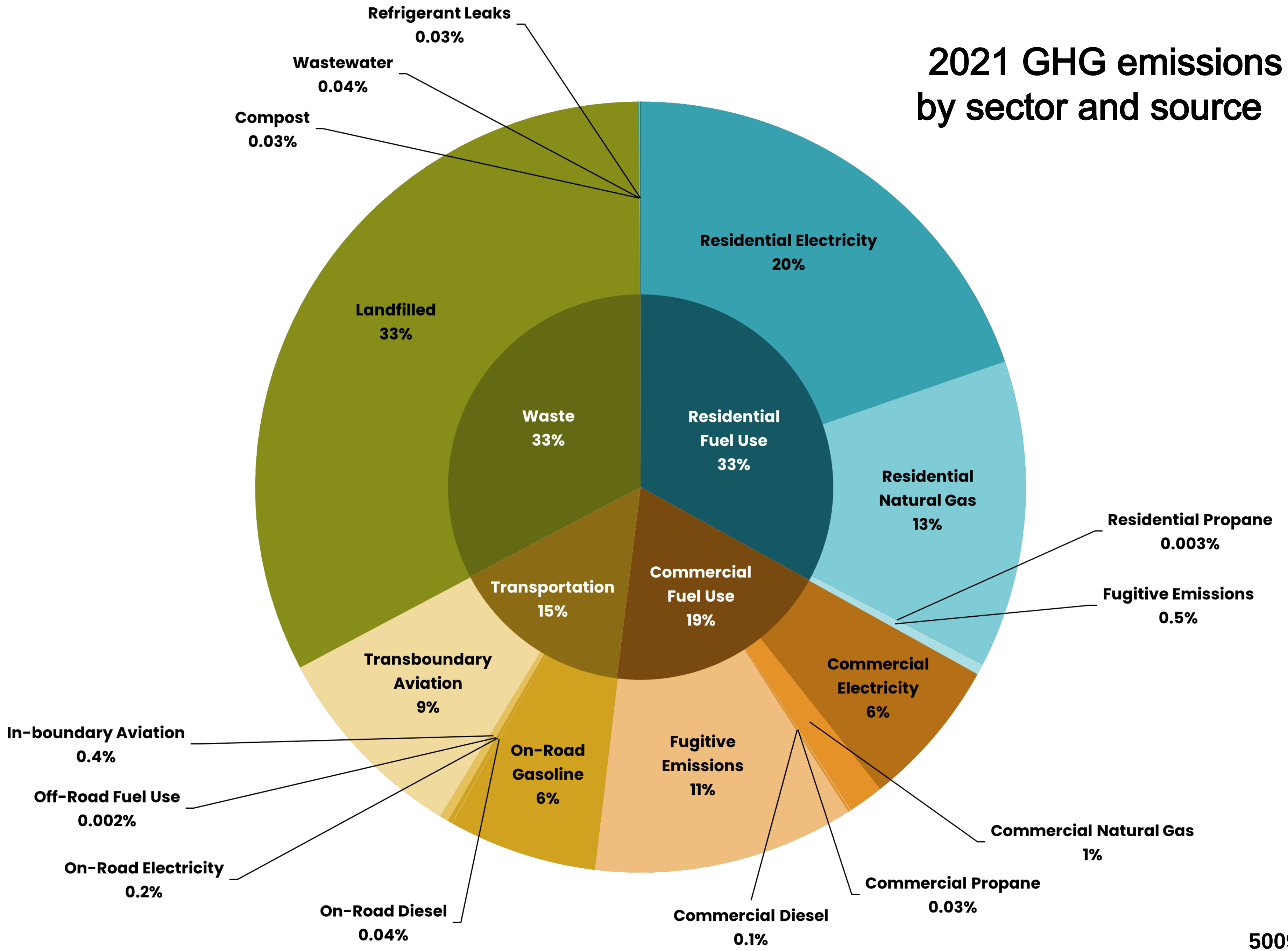
Total 2021 GHG Emissions

353,418

mt CO_2e

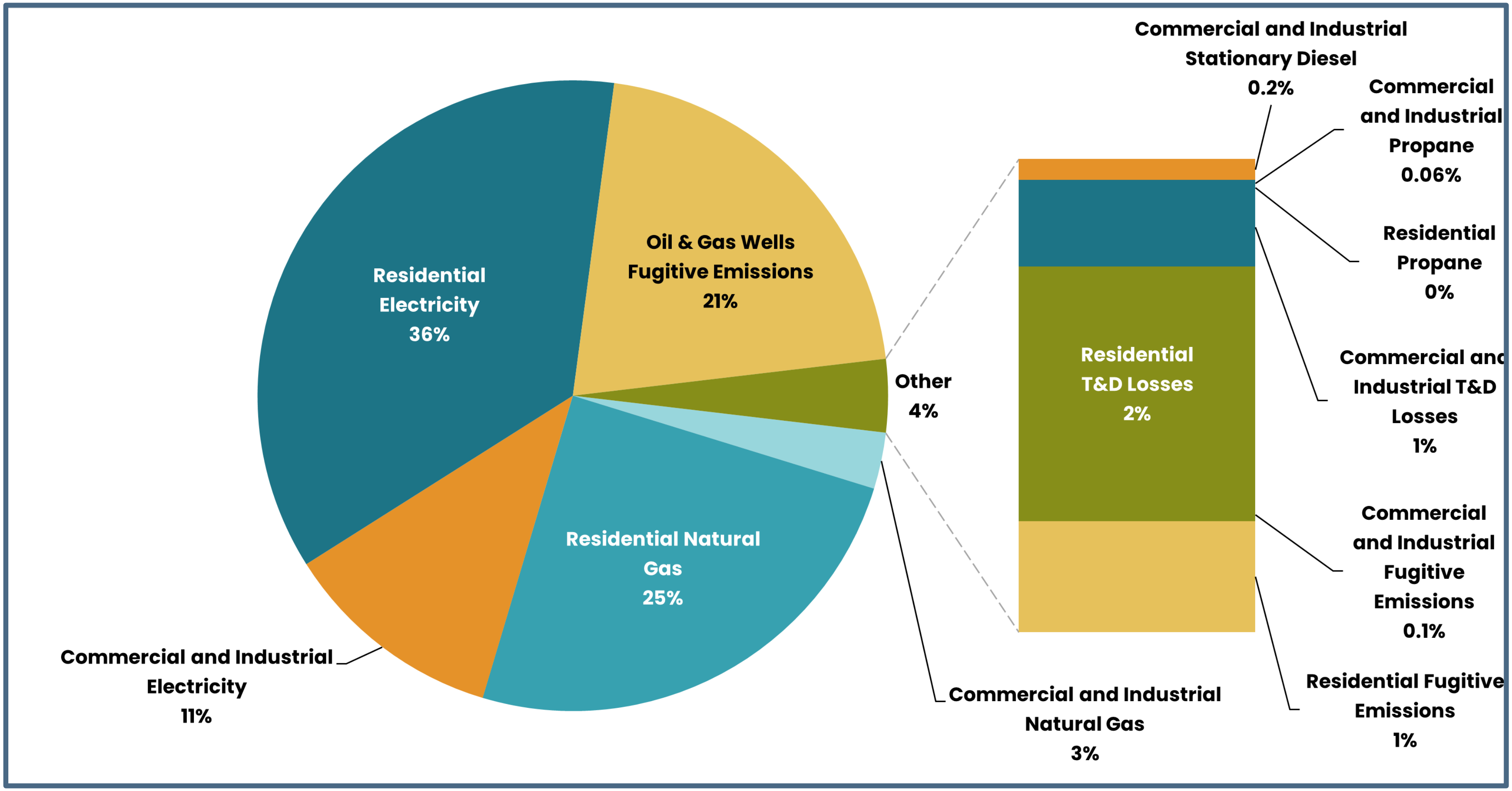


2021 GHG emissions by sector and source

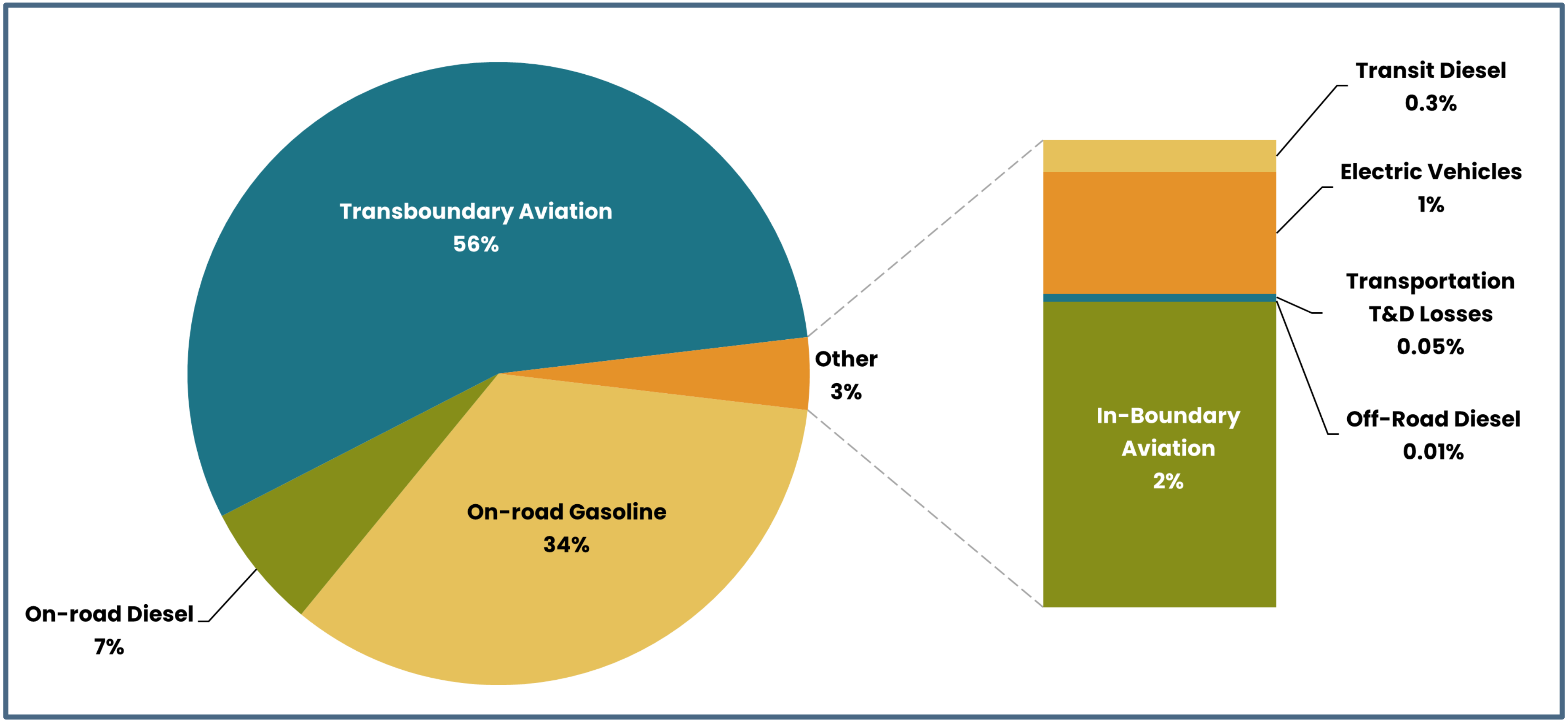


2021 GHG Emissions Sources

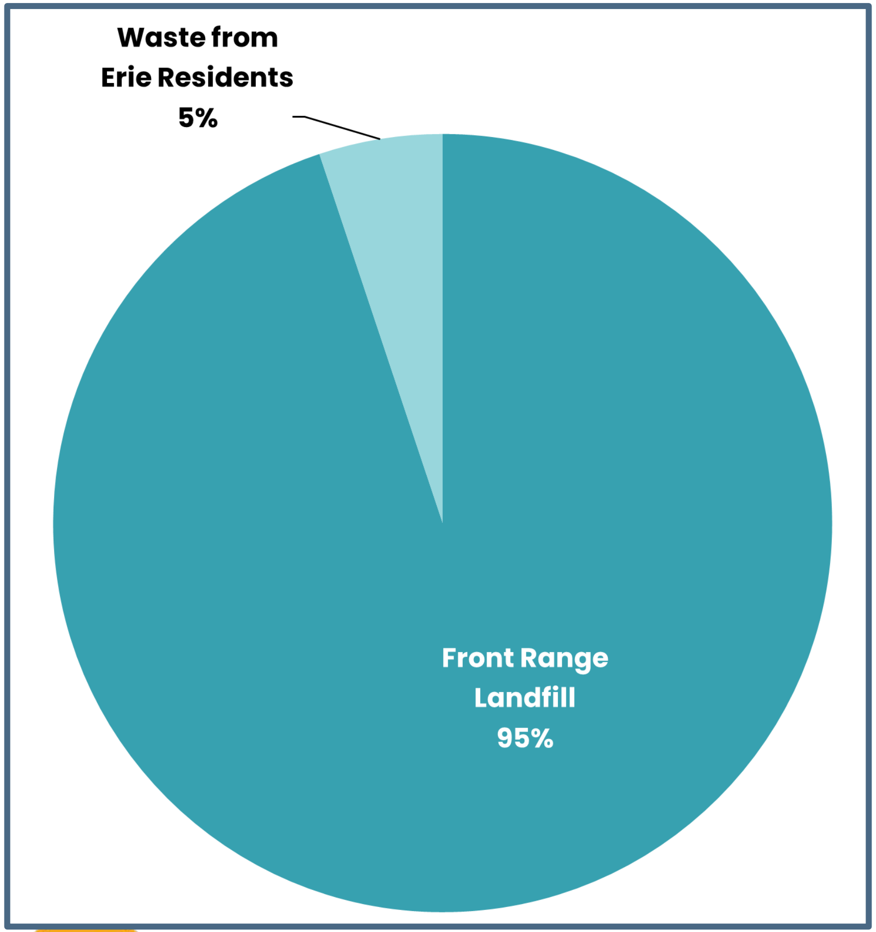
Stationary Energy Sources



Transportation Sources



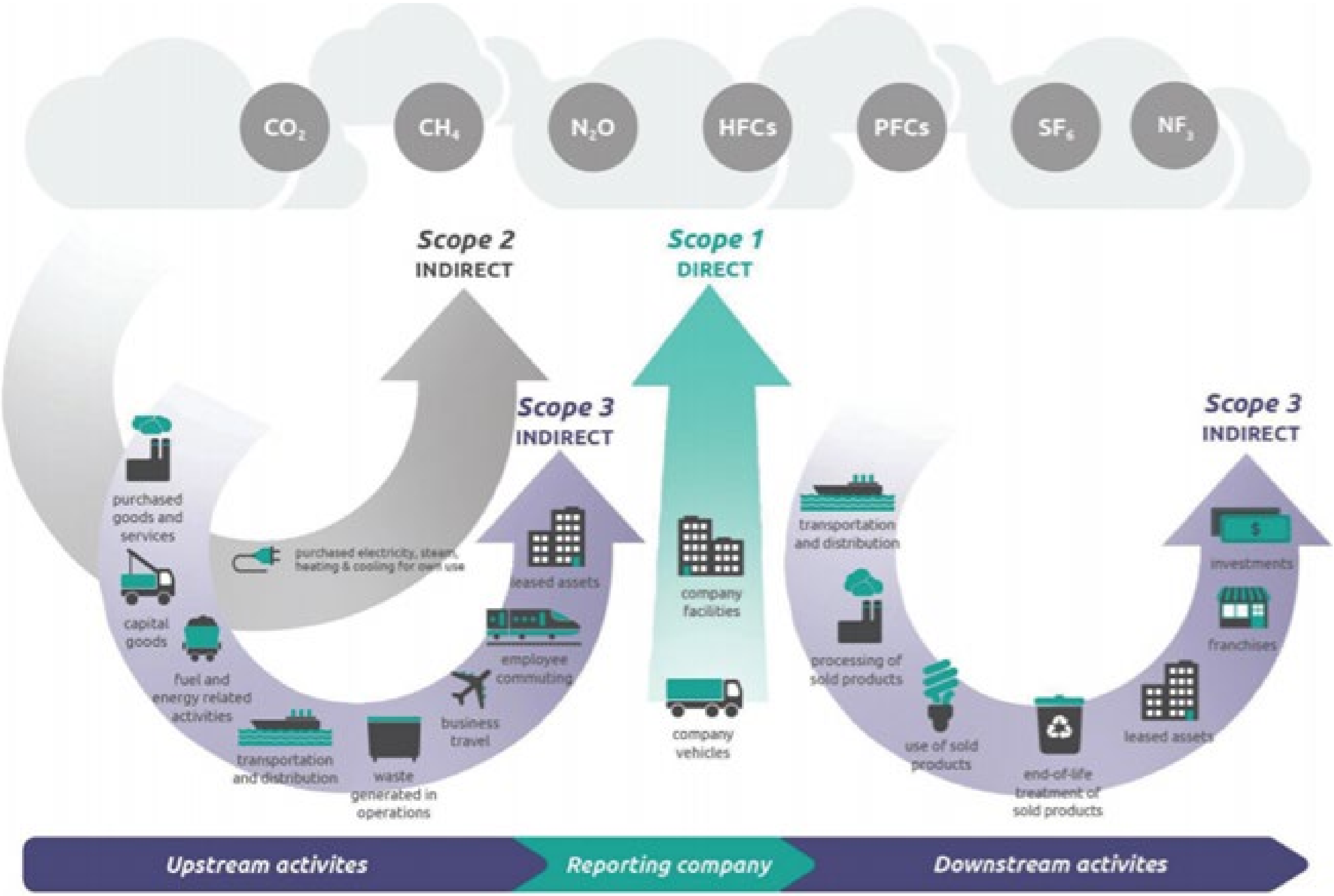
Waste & Wastewater Sources



Emissions Sources (mt CO_2e)	
Front Range Landfill Waste	109,280
Erie Resident Landfill Waste	5,907
Compost	105
Wastewater	130

2021 Municipal GHG Emissions Overview

Emissions Sources

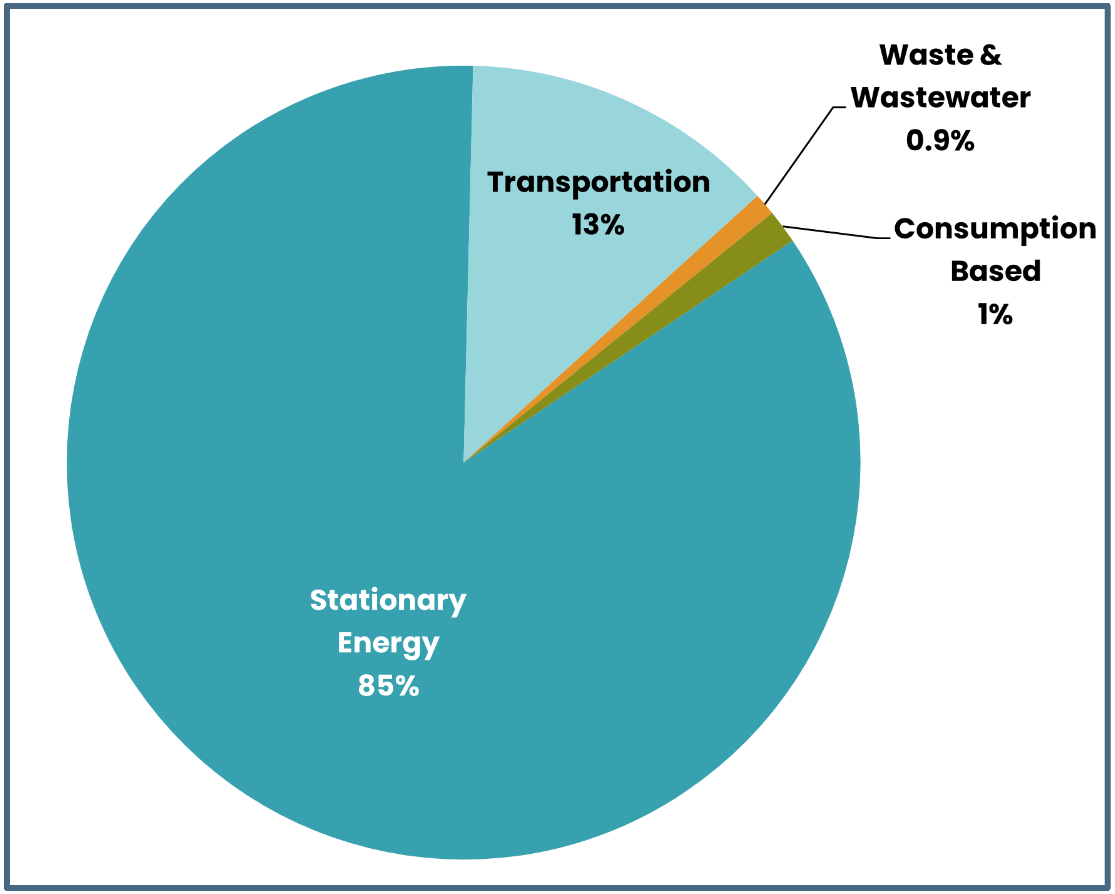


Source: Adapted from WRI/WBCSD *GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard.*

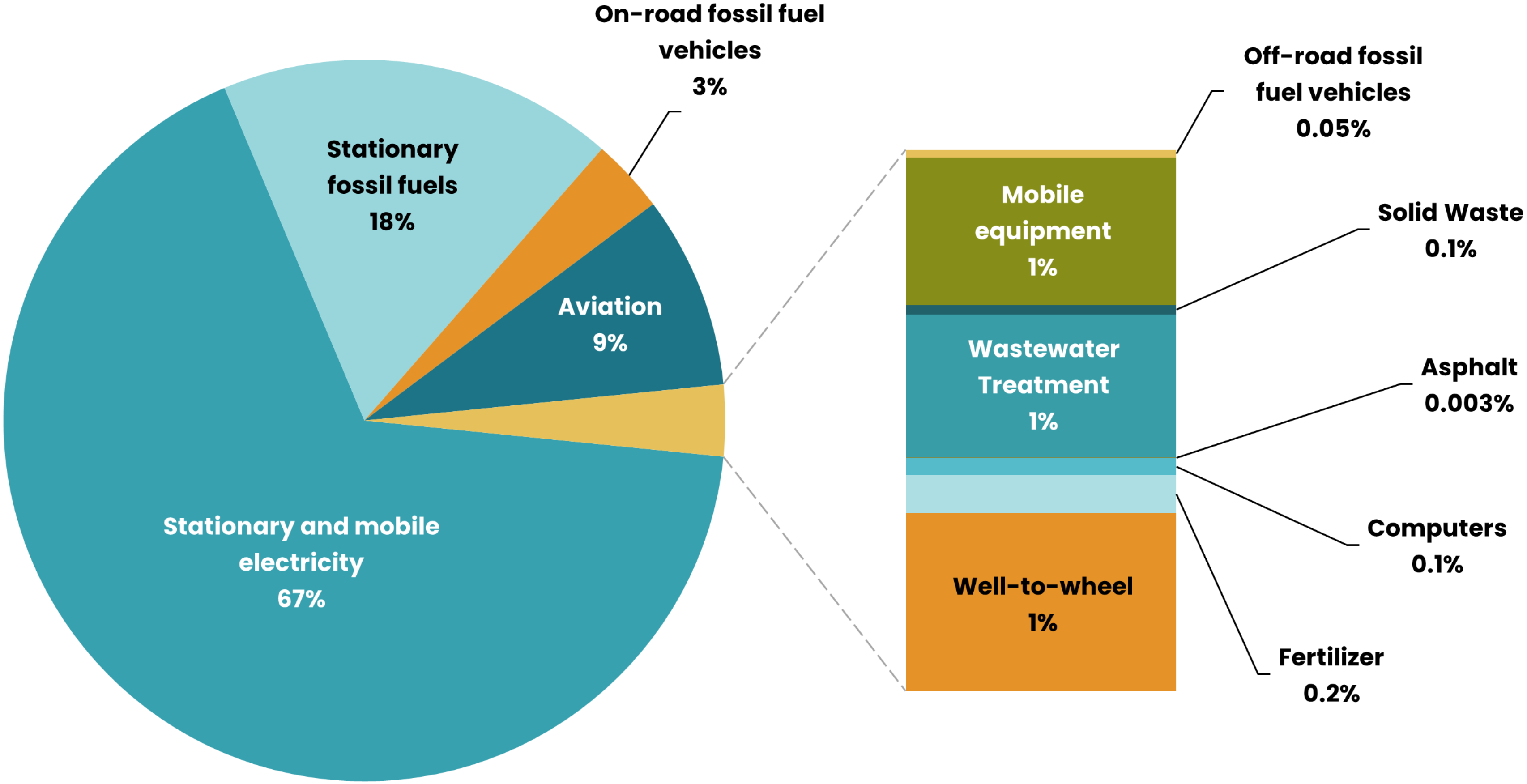
Total 2021 GHG Emissions

15,338

mt CO_2e



2021 GHG emissions by source



Additional Analysis

Carbon Sequestration Analysis

Town Boundary	Total Removals (mt CO_2e/ yr)	Total Emissions (mt CO_2e/ yr)	Net GHG Balance (mt CO_2e/ yr)
Average (2011 - 2019)	- 105	0	- 105
High end range of +45% error	- 152	0	- 152
Low end range of - 45% error	- 58	0	- 58

Questions?

Tom Herrod

tom@lotussustainability.com