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 emissions
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
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ır, 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

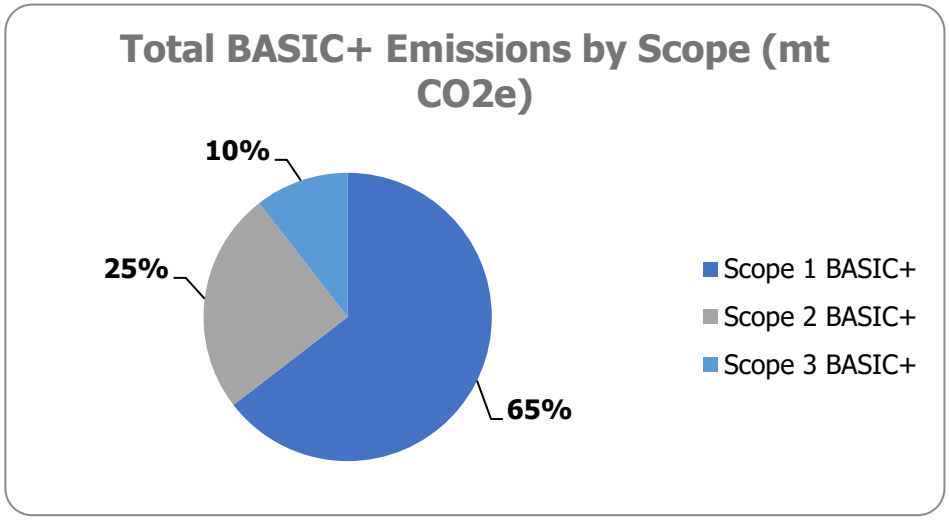
Residential Electricity	65,251	36%
Residential Natural Gas	45,497	25%
Residential Propane	9	0.005%
Commercial Electricity	21,314	12%
Commercial Natural Gas	5,287	3%
Commercial Propane	107	0.1%
Commercial Diesel	302	0.2%
Fugitive Emissions	1,798	1%
Oil & Gas Wells	38,494	21%
Stationary Energy T&D Losses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

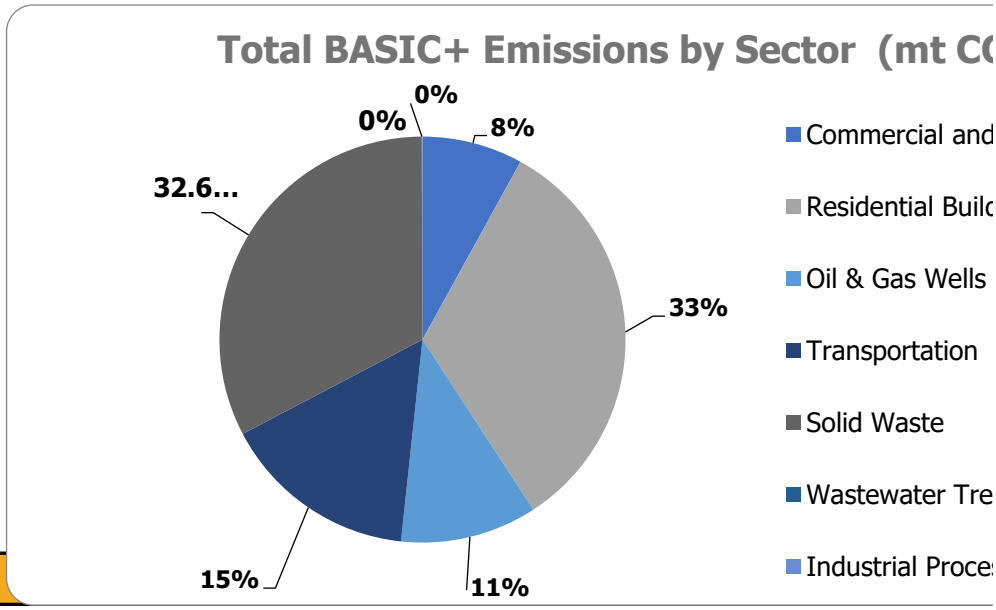
Transportation Emissions Detail

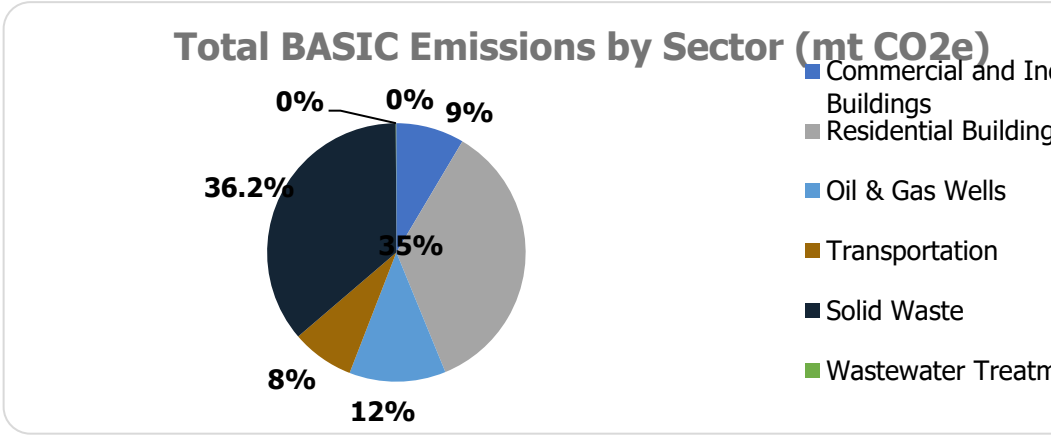
Emission Source	Emissions (mt CO2e)	Percentage of Total
On-road Gasoline	18,457	33%
On-road Diesel	3,511	6%
Transit Diesel	140	0.3%
Electric Vehicles	1,533	2.8%
Transportation T&D Losses	76	0.14%
Off-Road Diesel	7	0.01%
In-Boundary Aviation	1,325	2%
Transboundary Aviation	30,150	55%
Total	**55,198**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

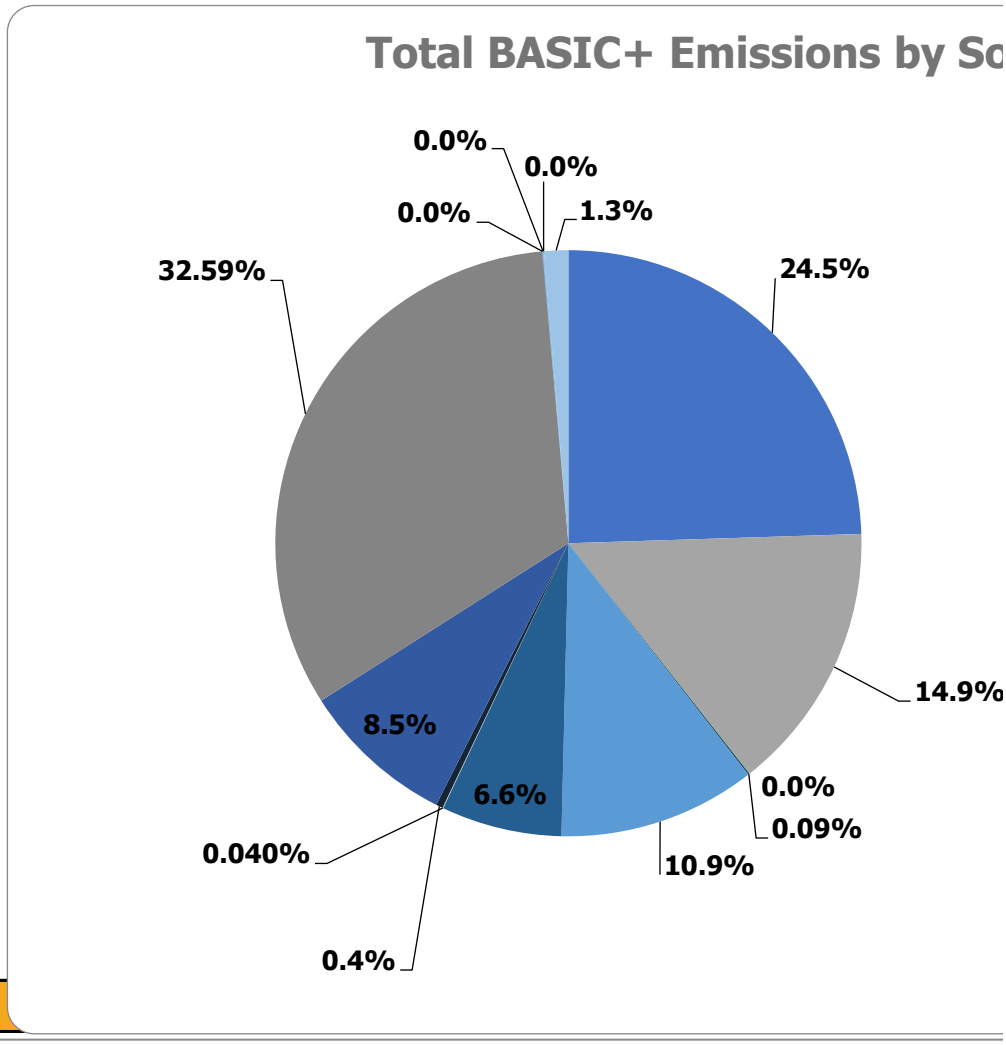
Waste Emissions Detail

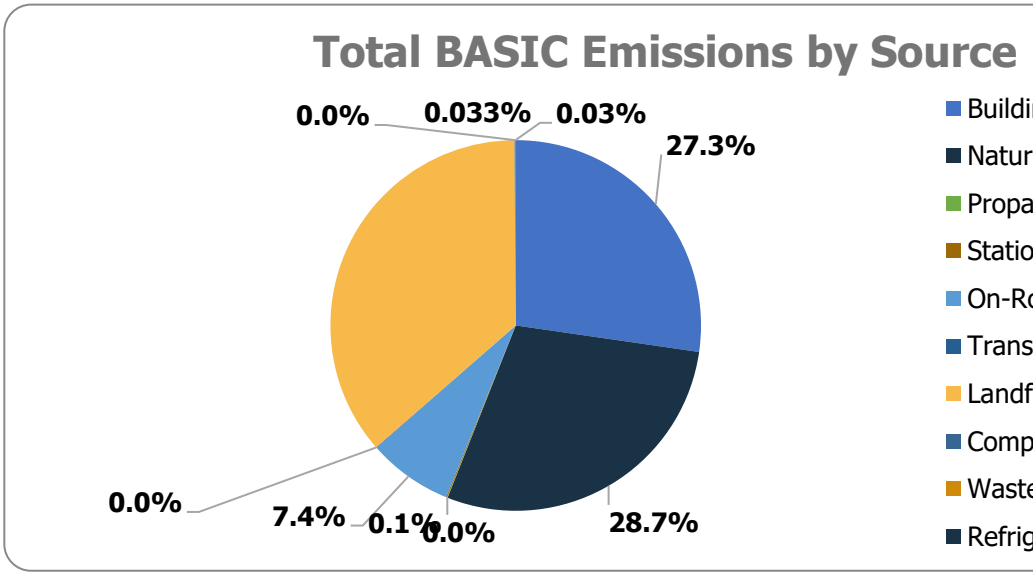
Emission Source	Emissions (mt CO2e)	Percentage of Total
Solid Waste	115,292	99.9%
Wastewater	130	0.1%
Total	**115,421**	**100%**


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

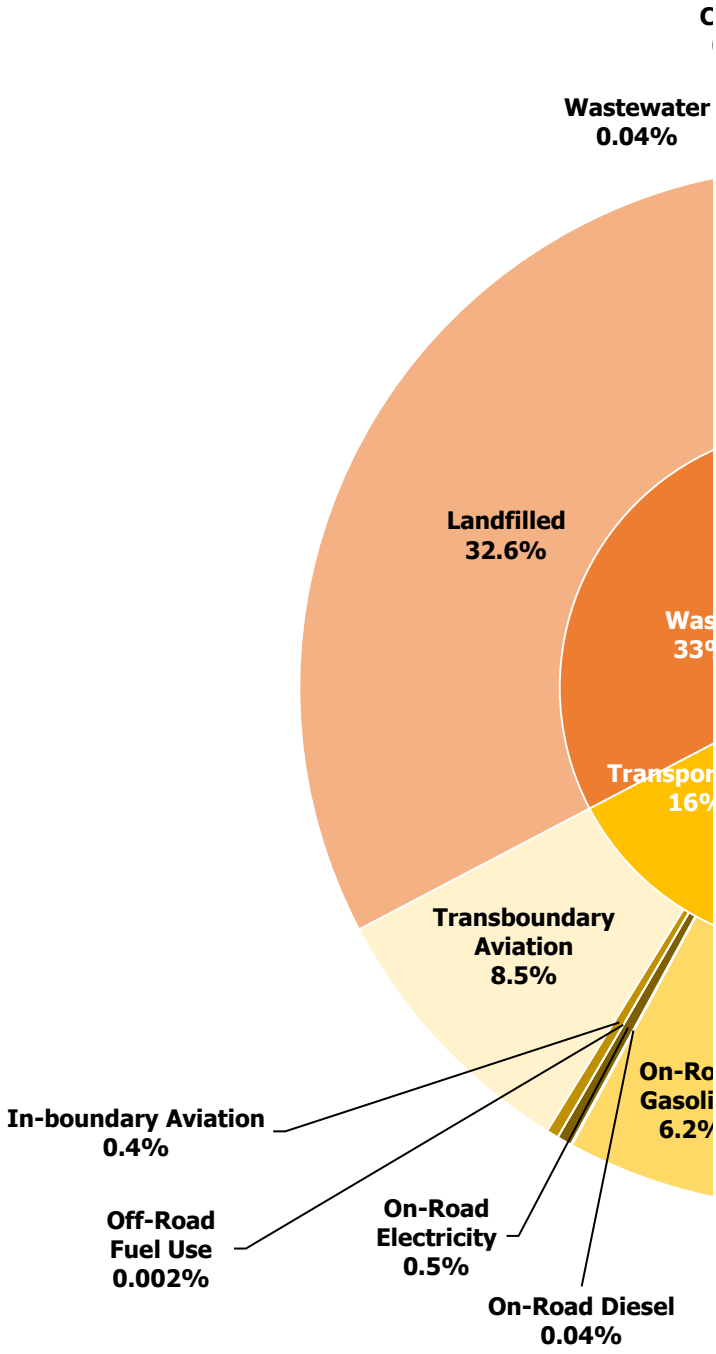




Percent

Total BASIC+ Emissiou

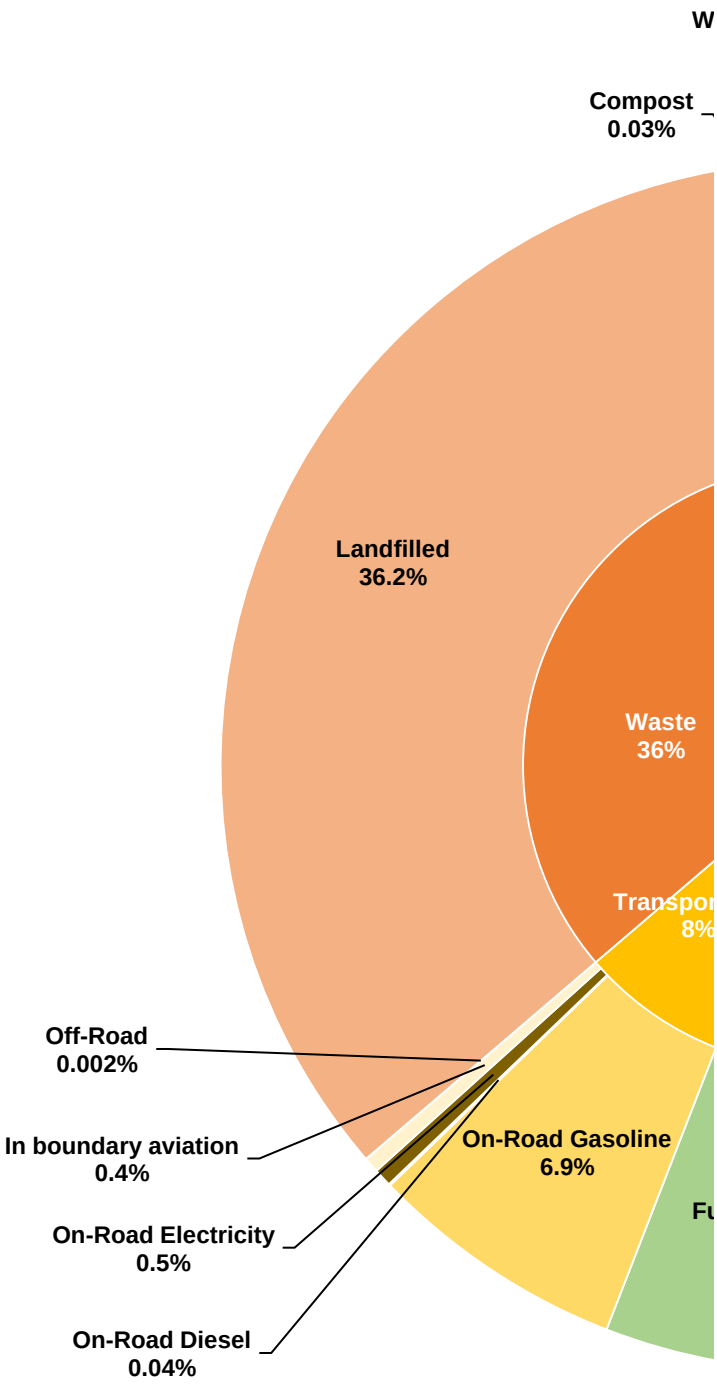
33%
19%
13%
0.002%
0.5%
19%
6%
1%
0.03%
0.09%
11%
16%
6%
0.04%
0.5%
0.002%
0.4%
9%
33%
33%
0.03%
0.04%
0.03%
0.03%



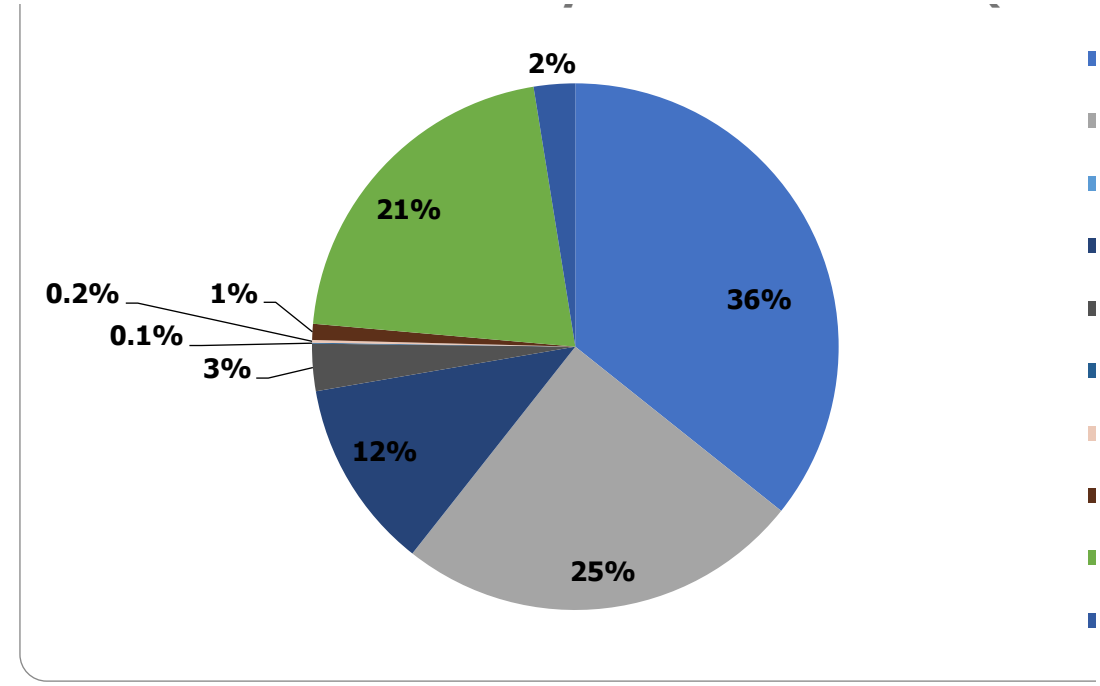
Percent
35%

Total BASIC Emission

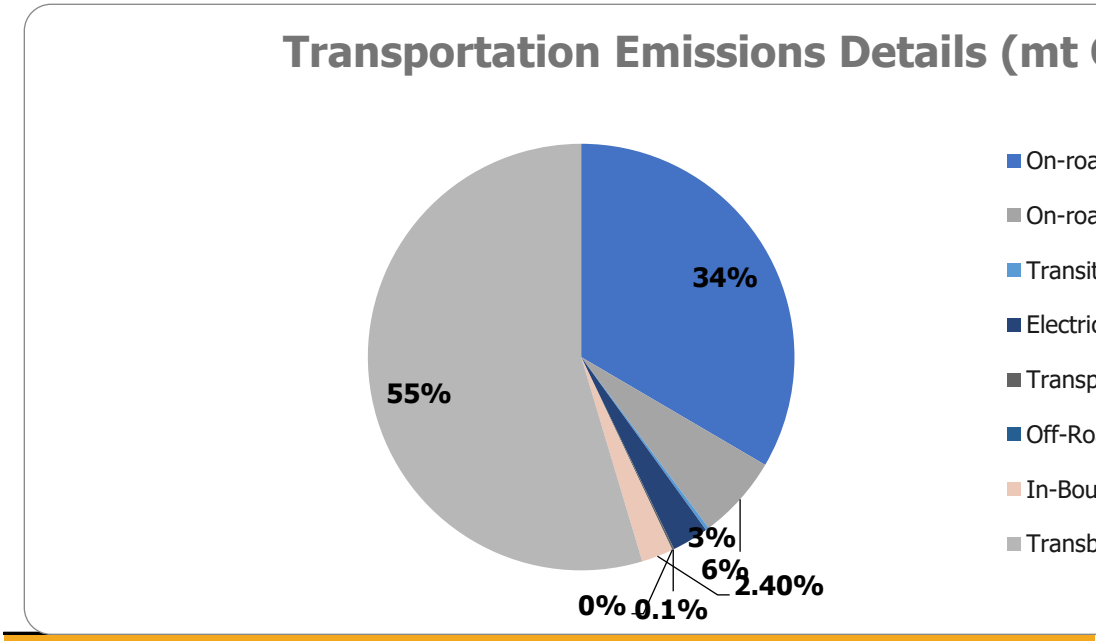
20%
14%
0.003%
1%
21%
7%
2%
0.03%
0.1%
12%
8%
7%
0.04%
0.5%
0.4%
0.002%
36%
36%
0.03%
0.04%
0.03%
0.03%



Stationary Emissions Details (mt C

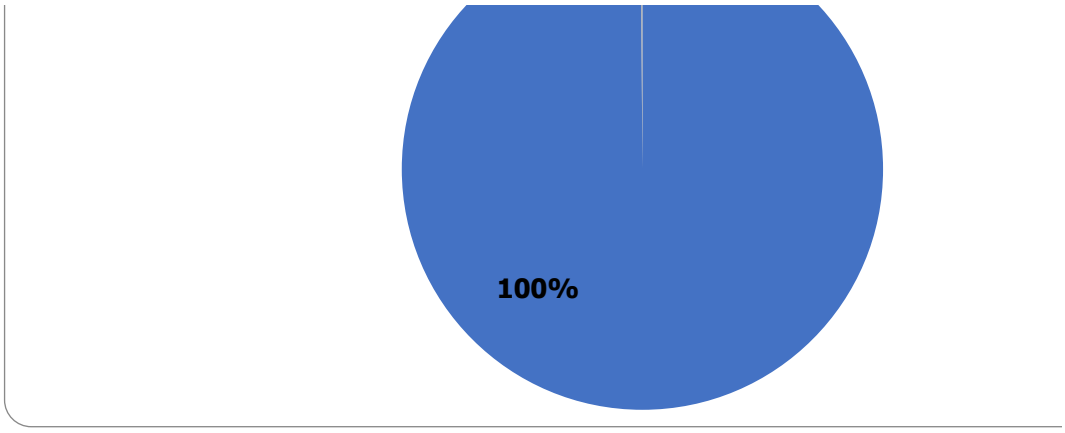


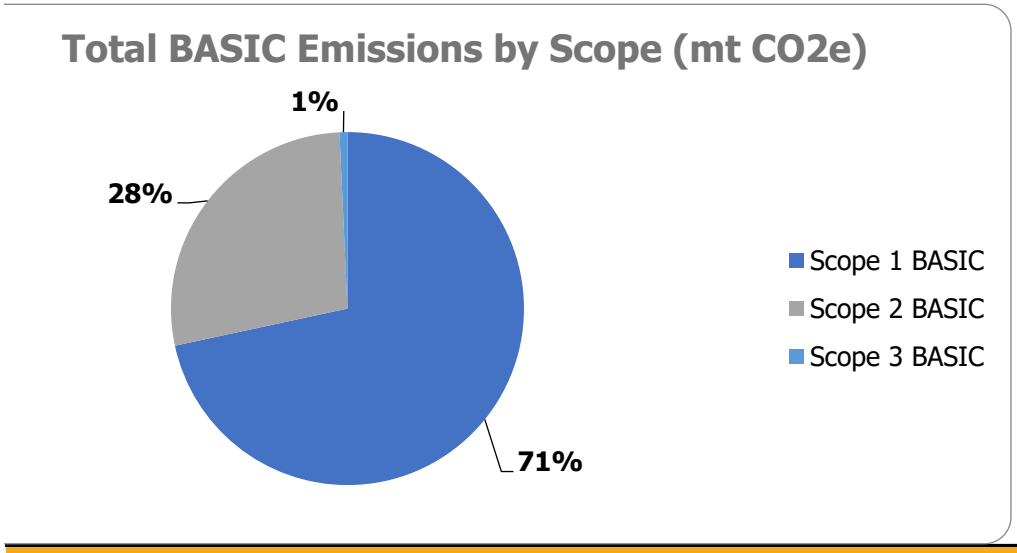
Transportation Emissions Details (mt

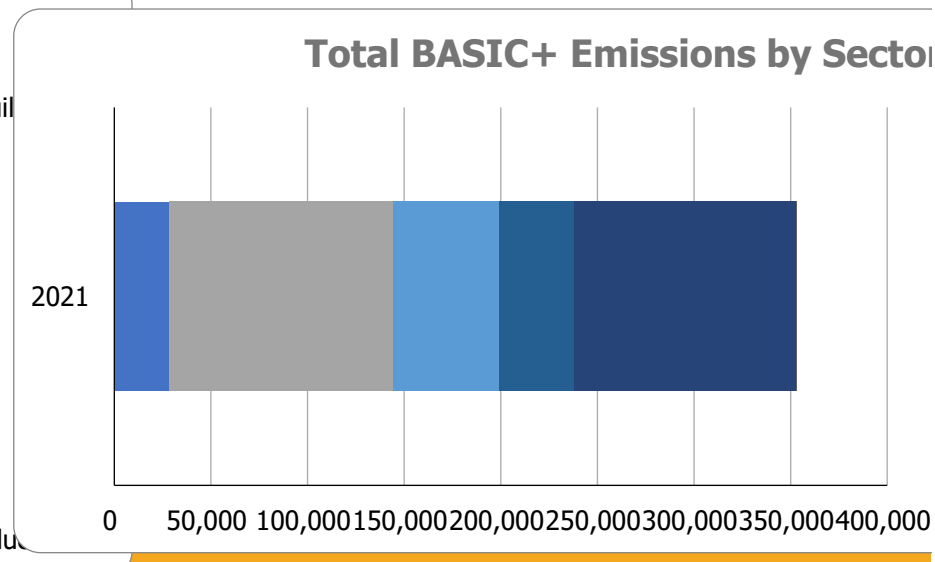


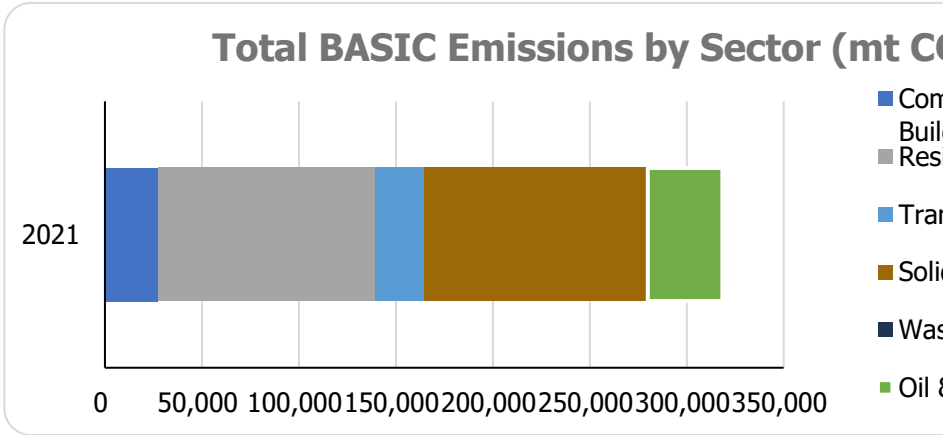
Waste Emissions Details (mt CO2




100%

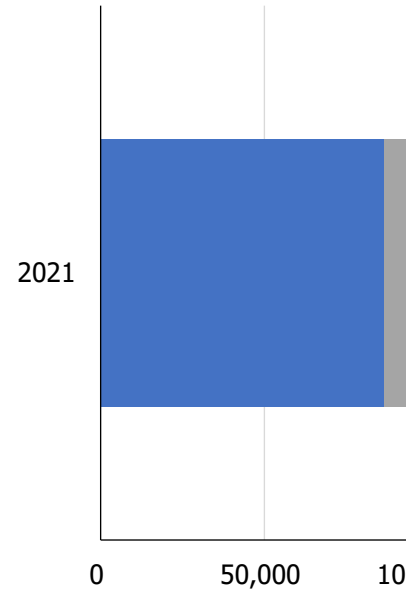

Total BASIC Emissions by Scope (mt CO2e)
1%
28%
71%
Scope 1 BASIC
Scope 2 BASIC
Scope 3 BASIC


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

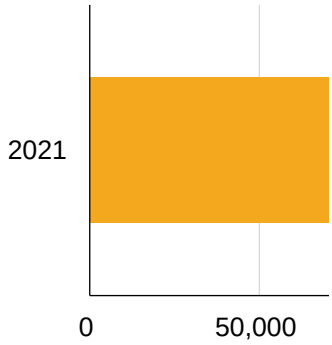
ɔurce (mt CO2e)

- 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

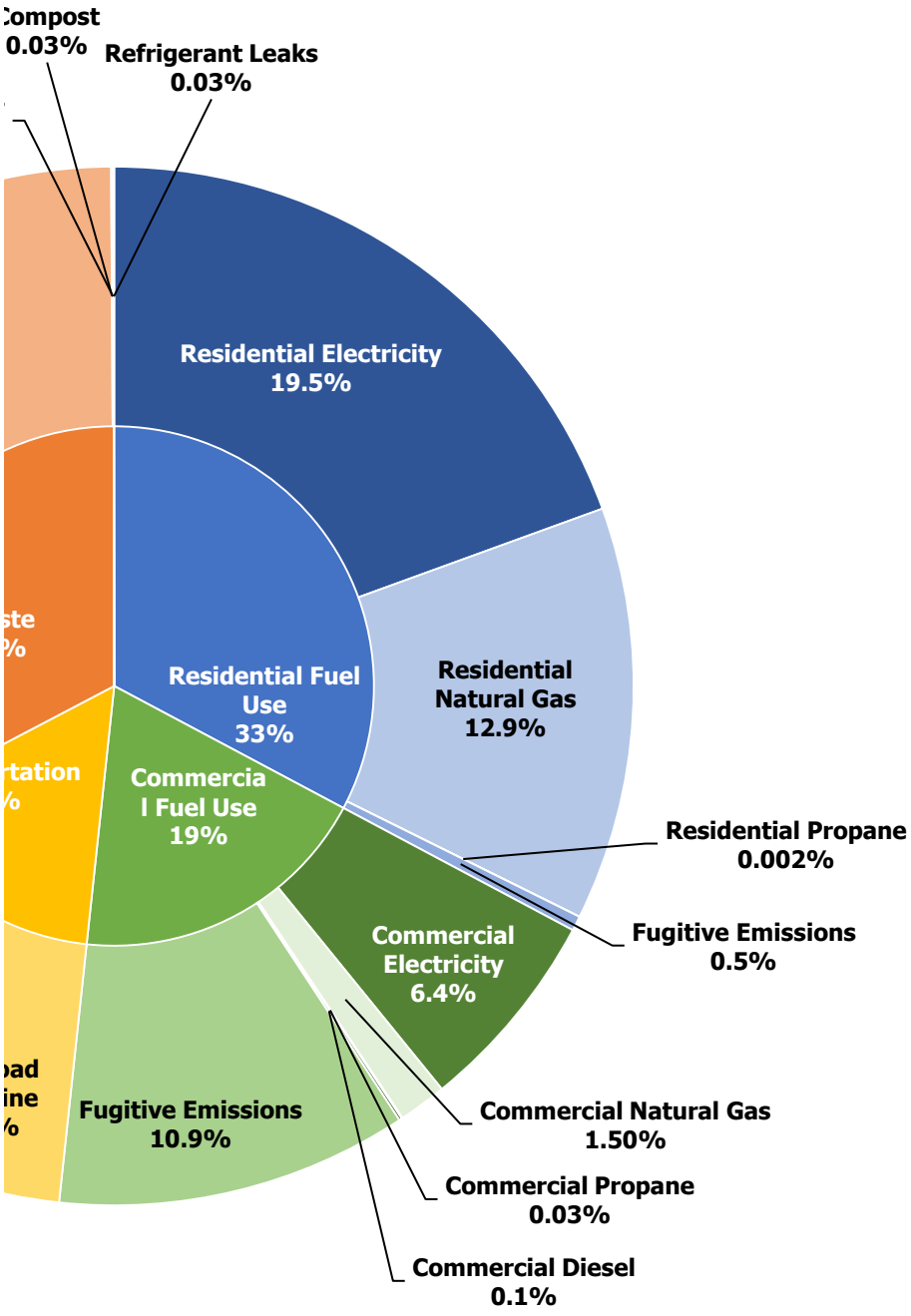


(mt CO2e)

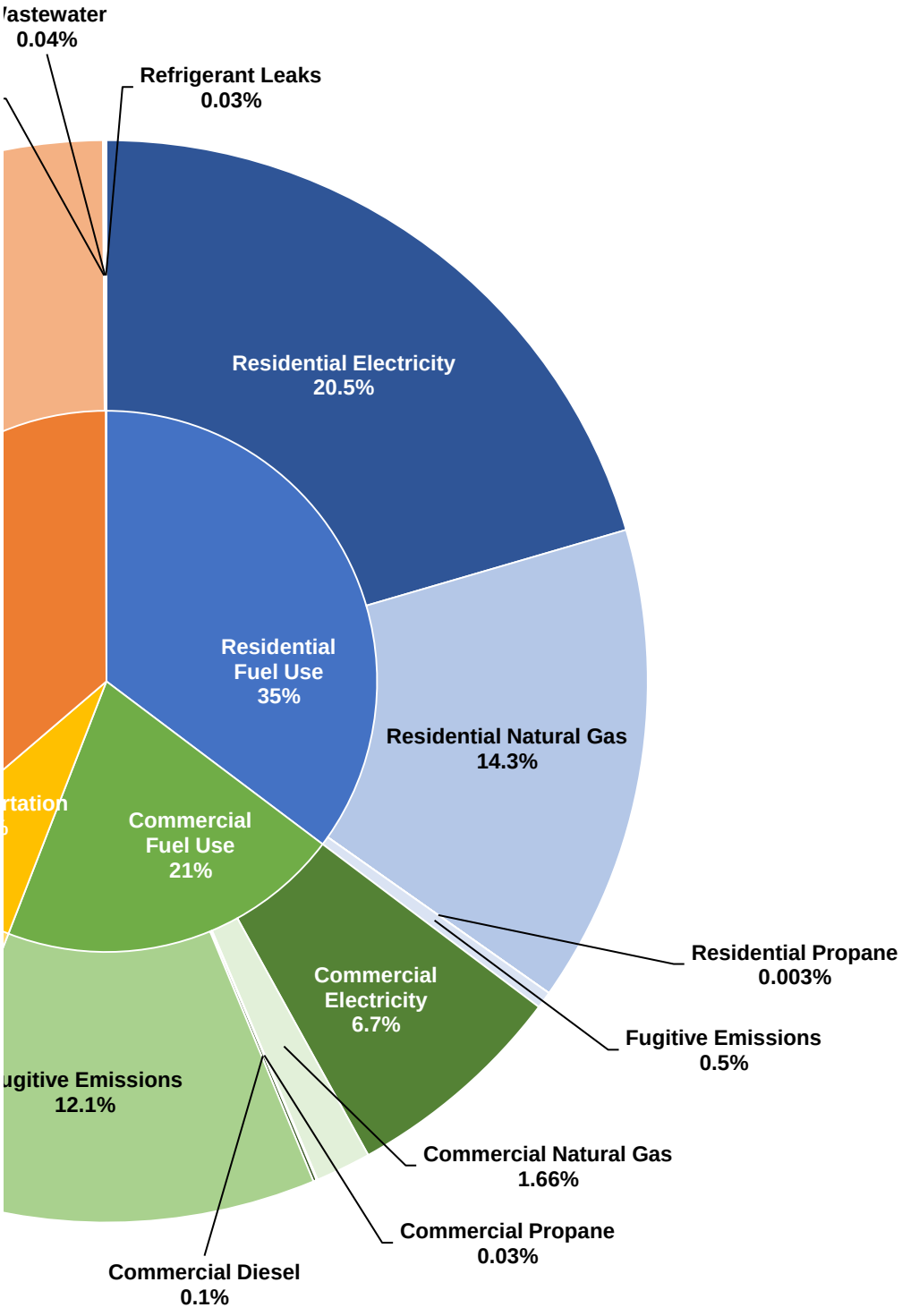
ng Electricity
al Gas (including fugitive emissions)
ıne
ɔnary Diesel
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filled Waste
ɔosted Waste
ewater
gerant Leaks



ns by Source and Sector (mt CO2e)



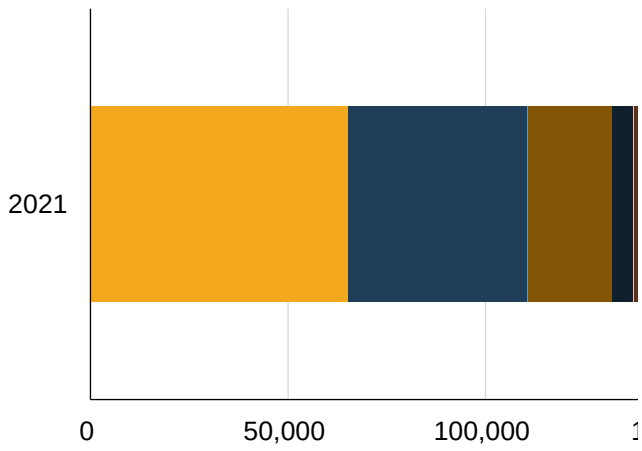
s by Source and Sector (mt CO2e)



CO2e)

Stationary Emissions Details

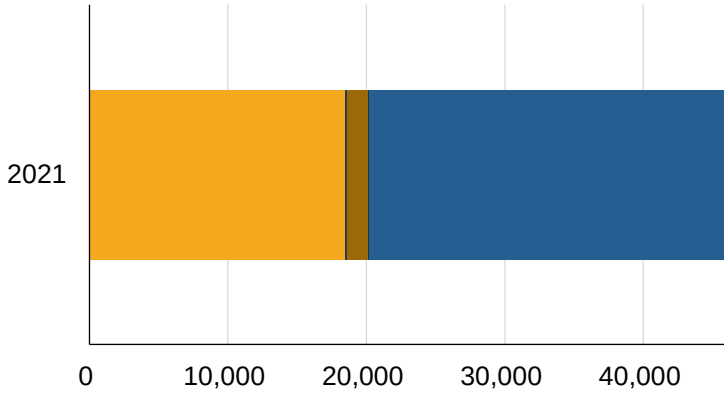
Residential Electricity
Residential Natural Gas
Residential Propane
Commercial Electricity
Commercial Natural Gas
Commercial Propane
Commercial Diesel
Fugitive Emissions
Oil & Gas Wells
Stationary Energy T&D Losses



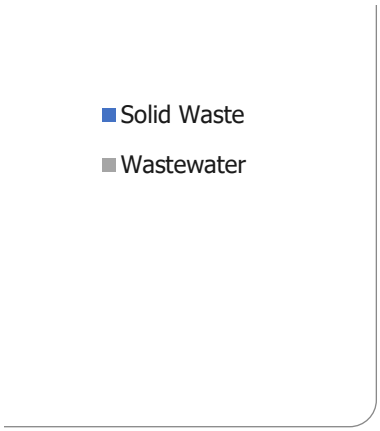
CO2e)

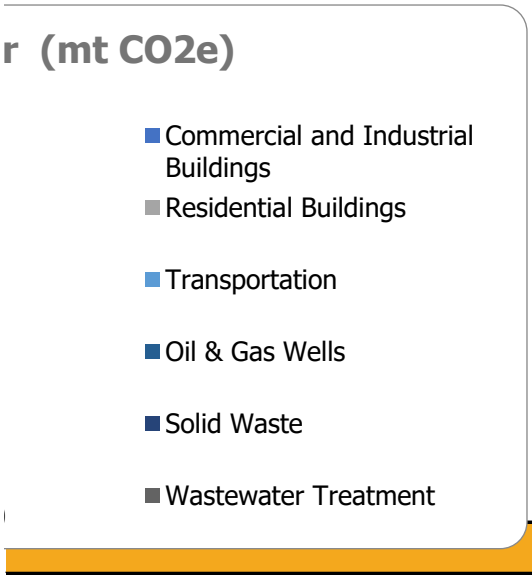
ad Gasoline
ad Diesel
t Diesel
c Vehicles
portation T&D Losses
ad Diesel
ndary Aviation
oundary Aviation

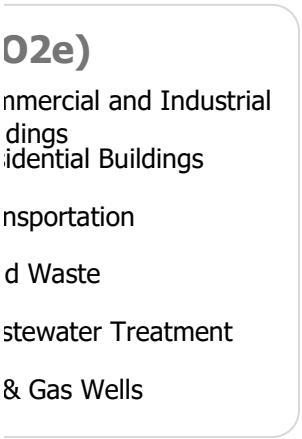
Transportation Emissio



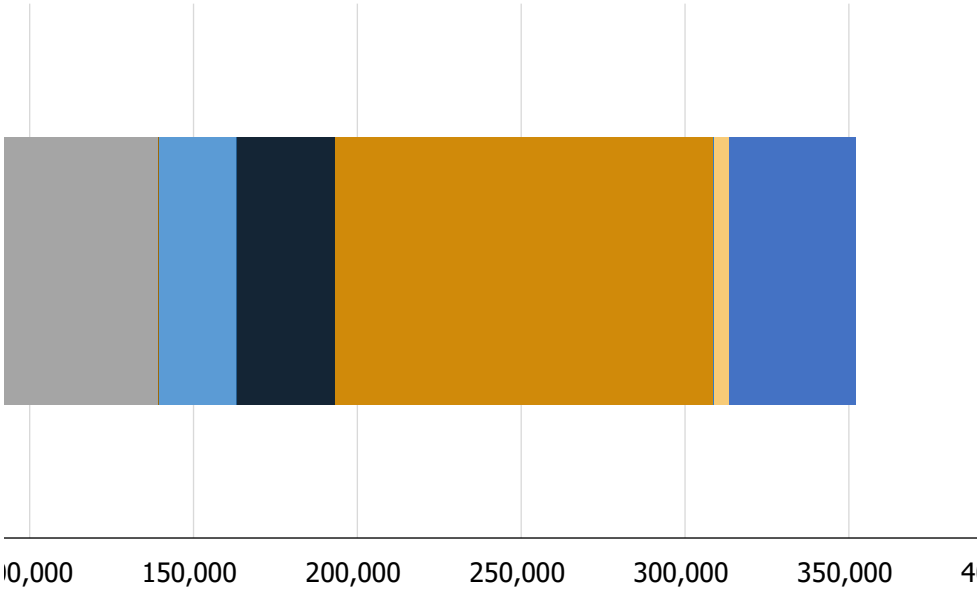
e)


Solid Waste
Wastewater

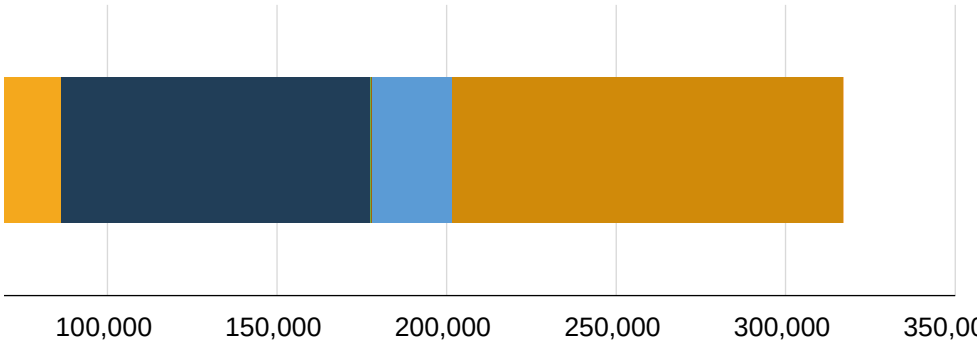

r (mt CO2e)
Commercial and Industrial Buildings
Residential Buildings
Transportation
Oil & Gas Wells
Solid Waste
Wastewater Treatment


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

Total BASIC+ Emissions by Source (m

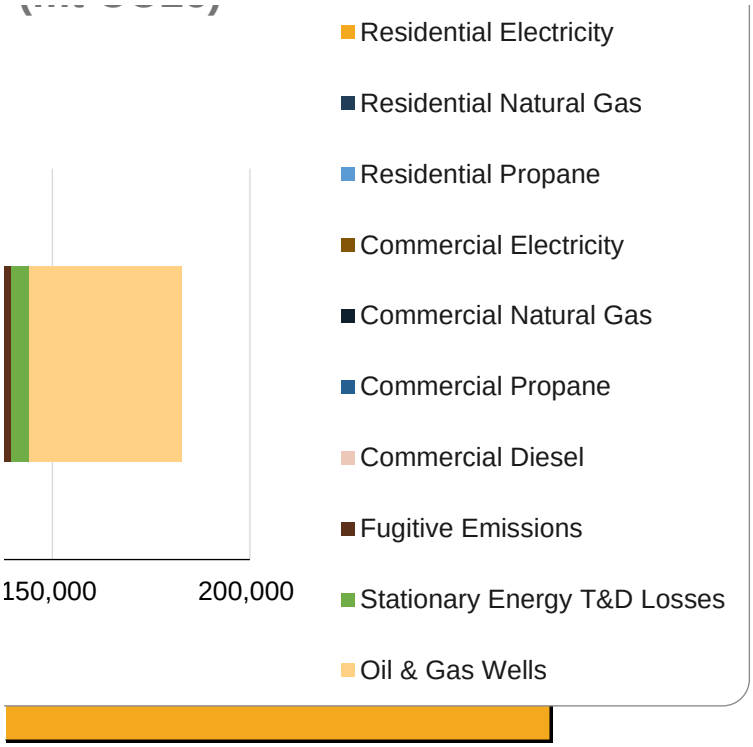


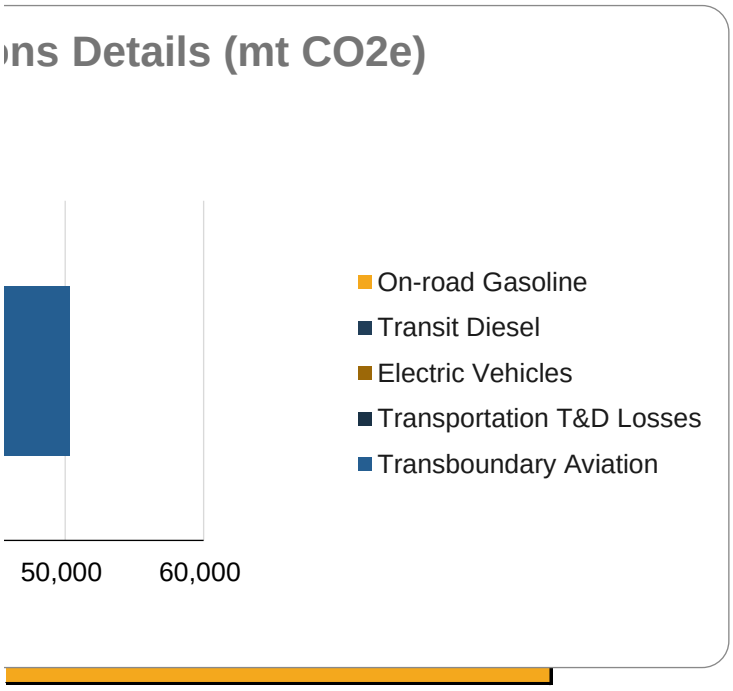
Total BASIC Emissions by Source (mt

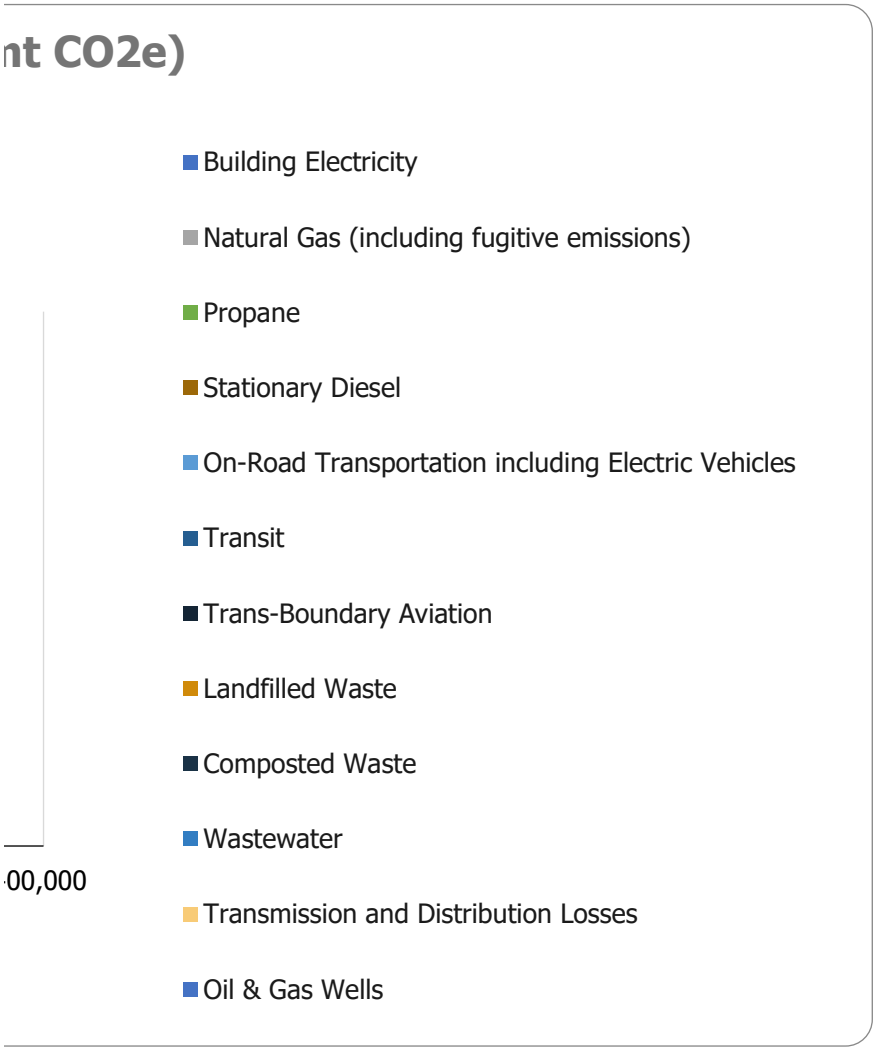


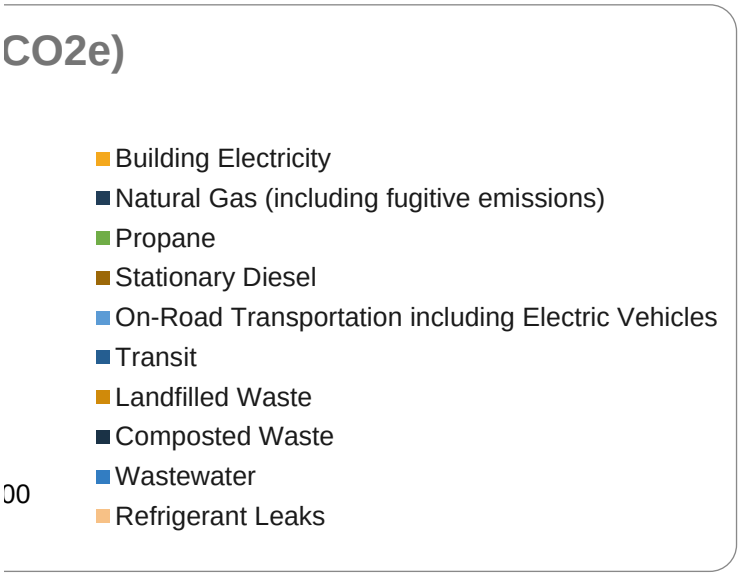


(mt CO2e)


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
150,000
200,000


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


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 CO2/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 t

(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 multip population of Erie living in Weld County (58%) was multiplied by the total popu 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 pro

(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/weati
merica.

rofile/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

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

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

1221.pdf. These data are at the county level. To estimate Erie's GDP, the ber 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 ed to 2021 dollars using the inflation estimator at

her-

on file.

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

hrenheit as the balance point temperature.

page 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 in

(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/in
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. Commit
0.0000010	mt CH_4/gal	Emissions (Com
0.0000001	mt N_2O/gal	Activities and Sour
		Note: CO2 emissior

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 'resid

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

lential.'

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 Wells

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 transm
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. Th
rrels 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 th
and report here - https://energyoffice.colorado.gov/climate-energy/ghg-pollution-reduction-roadm
% 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
rocessing plants	
e compressor stations	
nission 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	

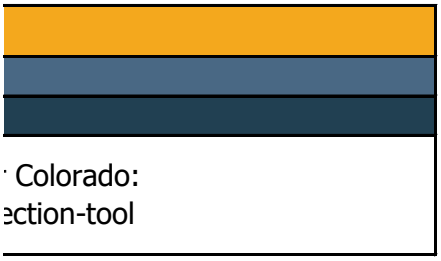
Emissions (mt CO2)	Emissions (mt CH4)	Emissions (mt N2O)
0.1	6	0
1	54	0
1	**60**	**0**



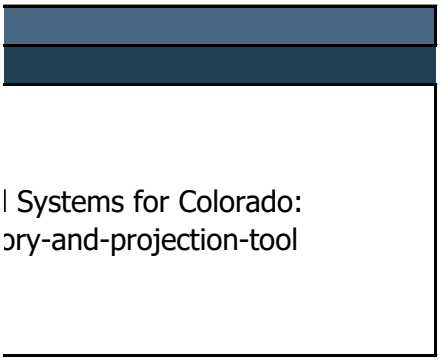


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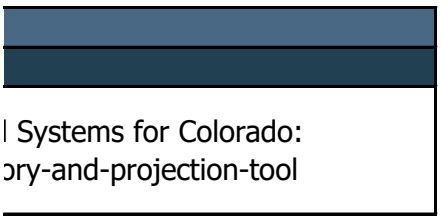
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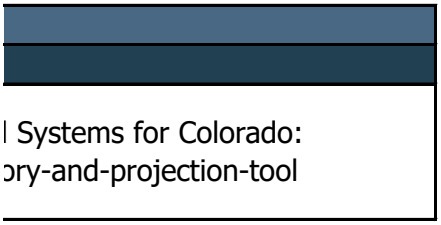
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l Systems for Colorado:
ory-and-projection-tool



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 m
(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/product 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/2003/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

oken out by vehicle type. Email on file. HPMS vehicle type definitions are
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.

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18-
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18-

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/Itinerant
Erie Municipal Airport	Itinerant
Erie Municipal Airport	Itinerant
Denver International Airport	Itinerant
Denver International Airport	Itinerant

Aviation

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

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

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

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

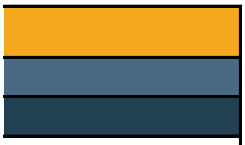
Scope	Jet Fuel-Aviation Gasoline Split	Usage (gallons)	Fuel Type
1	65%	91,772	Jet fuel
1	35%	49,415	Aviation gasoline
3	100%	3,063,497	Jet fuel
3	0%	30	Aviation gasoline

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





sumed that can



CO_2 and Table 2.7

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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 p
(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**

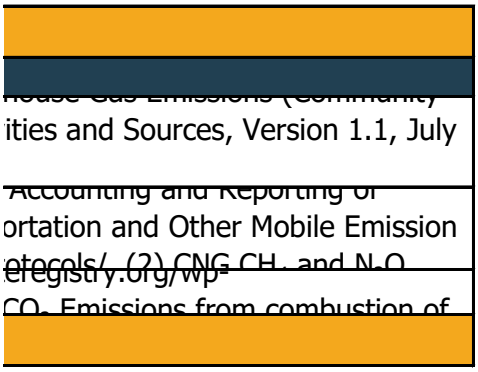
Total Fuel Used
0
680
0
0

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

Source
Protocol) – Appendix D: Transportation and Other Mobile Emission Activ 2013: http://icleiusa.org/ghg-protocols/.
Greenhouse Gas Emissions (Community Protocol) – Appendix D: Transp Activities and Sources, Version 1.1, July 2013: http://icleiusa.org/ghg-pr
content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf,






ities and Sources, Version 1.1, July
ortation and Other Mobile Emission
CO2 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)	

ɔrogram. 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.
'andfill and metric tons of methane produced were collected from the EPA's FLIGHT tool. PDF on file. To

Value	Description	
0.06	mt CH_4/ton waste	
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	ICLEI's U.S. Community Protocol for
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%

nty.
ollection efficiency rate is assumed to be 75% based on EPA estimates.

ons 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

Used in the Waste Reduction Model (WARM): https://www.epa.gov/sites/production
een 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.

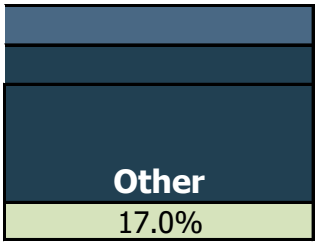
	Organics		
Plastics	Food	Yard Waste	Clean Wood
14.0%	15.8%	2.6%	3.9%

Cardboard/Kraft and Chip/Paperboard	Aseptic Containers	Styrofoam, To-Go Cups, and Contaminants
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 n

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 usir

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**

ithin the City. Square footage provided by Stavan Vanscoy.
g 134a refrigerants.

ial average from the ASHRAE Pocket Guide for Air
n 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 In

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 operatio
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**		

PC 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 method

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)