# Larimer County Community-wide Greenhouse Gas Emissions Inventory Results

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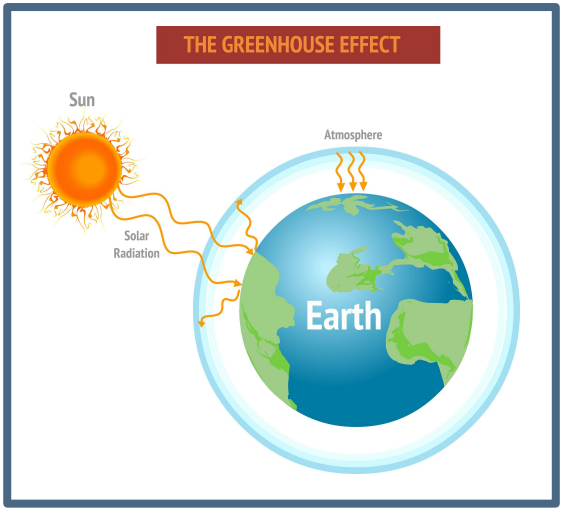
# Agenda

- Introduction to GHG Inventories
- 2022 Larimer County GHG Results
- EnviroScreen and GHG reduction strategies
- Group discussion and breakout rooms
- Closing and next steps

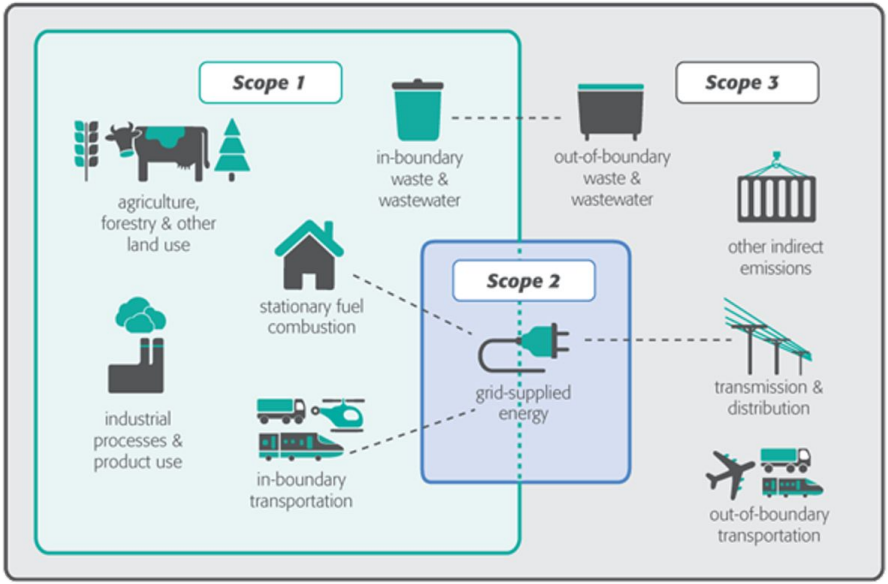
# Introduction to GHG Inventories

# GHGs and Climate Change




- GHGs create a buffer in Earth's atmosphere.
- More GHGs in the atmosphere = more heat trapped in the atmosphere.
- This can lead to increased temperatures and drought year-round, flash floods in the rainy season, and more severe wildfires.
- Decreasing emissions can help mediate these environmental changes.

# What are GHG Inventories?



# GHG Inventory Process

- Met with individual communities to discuss relevant/applicable sources of emissions
- Compiled a list of data contacts
- Reached out to data contacts to collect relevant data
- Performed QA/QC on data that was received
- Input data into inventory workbook
- Did 2 rounds of QA/QC on the inventory
- Benchmarked Larimer County against other comparable counties
- Finalized the inventory

# Key Sources of Data

- Utility electricity and natural gas data
- Vehicle miles traveled data from Google Environmental Insights Explorer and NFRMPO
- Fuel use and mileage data from transit agencies
- Waste data from the landfill and waste haulers
- Wastewater treatment plant data from individual wastewater treatment plants
- Livestock and fertilizer use data from the latest USDA Agricultural Census

# 2022 Larimer County GHG Results

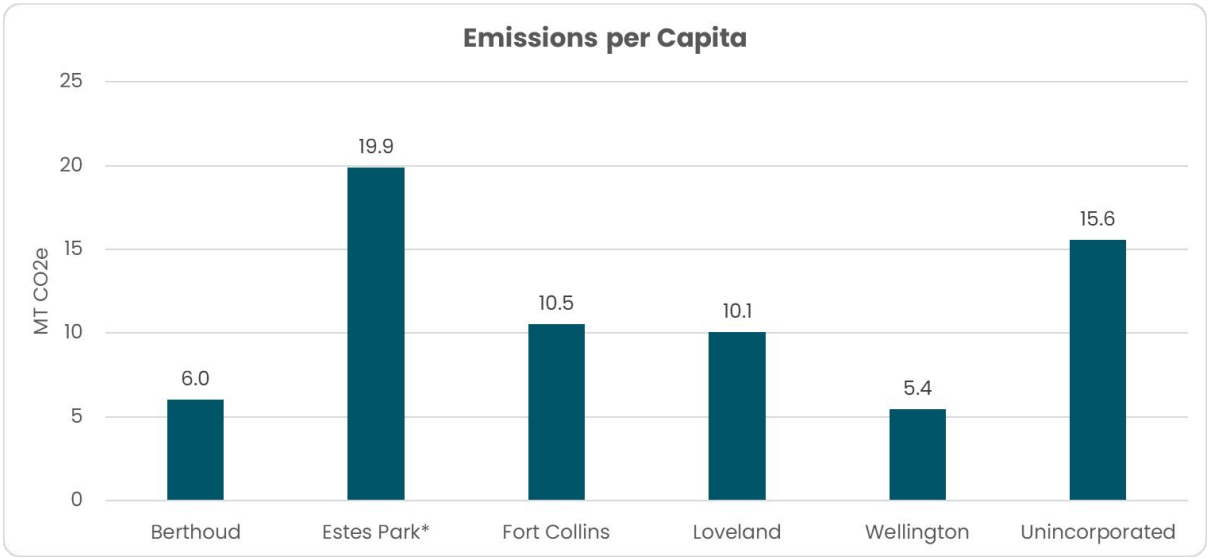
# Total 2022 GHG Emissions

| Total 2022 Emissions | GHG Emissions Equivalent |
|---|---|
| **4,242,532 mt $CO_2e$** | **944,092** gasoline-powered passenger vehicles driven for one year |
| | **10,875,937,858 miles** driven by an average gasoline-powered passenger vehicle |
| | **477,386,295 gallons** of gasoline consumed |
| | **416,751,670 gallons** of diesel consumed |
| | Carbon sequestered from **5,059,294 acres of forest in 1 year** |

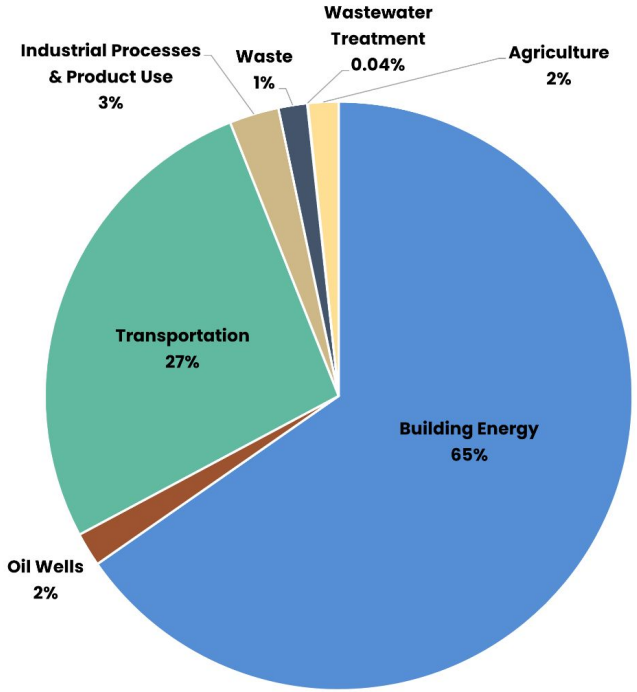
# Emissions by Community

| Municipality | Emissions (mt $CO_2e$) | Percent of Total Emissions | Percent of Larimer County Population |
|---|---|---|---|
| Fort Collins | 1,777,398 | 42% | 46% |
| Unincorporated (inc. Red Feather Lakes, Timnath, Glen Haven, Livermore, and Johnstown) | 1,441,406 | 34% | 25% |
| Loveland | 777,933 | 18% | 21% |
| Estes Park | 117,056 | 3% | 2% |
| Berthoud | 64,961 | 2% | 3% |
| Wellington | 63,778 | 2% | 3% |
| **Total** | **4,242,532** | **100%** | **100%** |

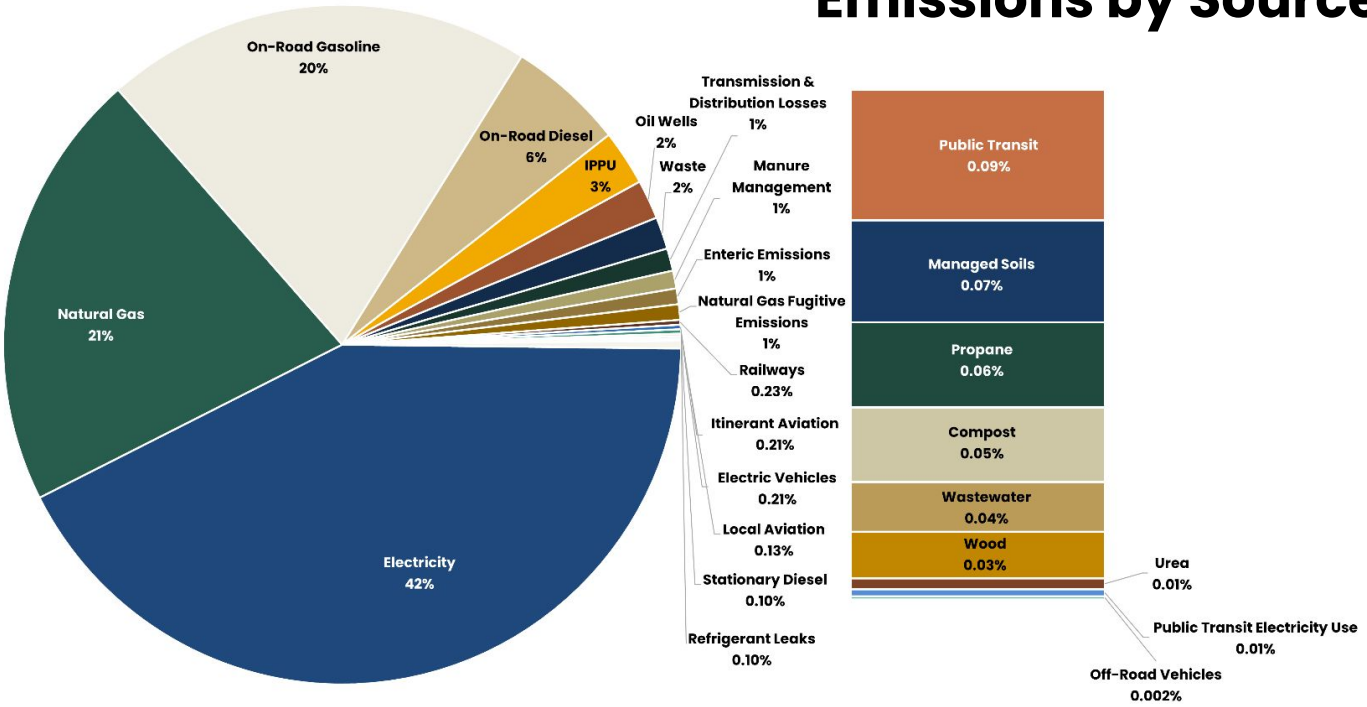
# Emissions Per Capita by Community



# Emissions by Sector



# Emissions by Source



# Utility RPS Goals

| Utility | Current Renewable % | Target Renewable % |
|---|---|---|
| Xcel Energy | 42.3% | 100% carbon free by 2050 |
| Fort Collins Utilities | 48.7% | 100% carbon free by 2030 |
| Loveland Power | 34.7% | 100% carbon free by 2030 |
| Estes Park Power & Light | 34.7% | 100% carbon free by 2030 |
| Mountain Parks Electric | between 40-50% | 60% renewable by 2025<br>80% renewable by 2030 |
| Poudre Valley REA | 33% | 80% carbon free by 2030 |
| High West Energy | 33% | 70% renewable energy by 2030 |

# Benchmarking

| Emissions per Capita and Household | | | | | | |
|---|---|---|---|---|---|---|
| **County** | **Inventory Year** | **BASIC Emissions (mt $CO_2e$)*** | **Total Population** | **Emissions per Capita** | **Total Households** | **Emissions per household** |
| **Larimer County, CO** | 2022 | 4,113,150 | 366,778 | 11.21 | 145,175 | 28.33 |
| **City and County of Denver (CO)** | 2021 | 8,004,008 | 713,252 | 11.22 | 313,926 | 25.50 |
| **Boulder County (CO)** | 2021 | 3,480,483 | 329,793 | 10.55 | 127,365 | 27.33 |
| **Jefferson County, (CO)** | 2018 | 6,600,000 | 576,143 | 11.46 | 236,499 | 27.91 |
| **Santa Fe County (NM)** | 2019 | 1,858,627 | 150,358 | 12.36 | 62,182 | 29.89 |
| **Dane County (WI)** | 2017 | 7,451,000 | 568,203 | 13.11 | 236,036 | 31.57 |

# Benchmarking

| Emissions Breakdown | | | | | | |
|---|---|---|---|---|---|---|
| Sector | County | | | | | |
| | Larimer County | City and County of Denver | Boulder County (CO) | Jefferson County (CO) | Santa Fe County (NM) | Dane County (WI) |
| **Building Energy** | 65% | 67% | 64% | 59% | 43% | 56% |
| **Transportation** | 27% | 30% | 26% | 40% | 46% | 29% |
| **Waste** | 2% | 2% | 2% | 1% | 4% | 1% |
| **Other** | 6% | N/A | 8% | N/A | 7% | 14% |

# Follow up questions

**It should be noted that Lotus' current scope of work does not include a detailed analysis of the impact of strategies on GHGs produced in the community, so these responses are based on Lotus' research and work in similar communities.**

- How can we capture the emissions impact of synergistic strategies that cross different sectors?
  - When we model emissions reductions strategies, we take into account the overlapping GHG impacts. For example, the electrification of the transportation sector is impacted not only by the increased adoption of electric vehicles but also by the greening of the electric grid and the decrease in electricity emission factors over time.

- Do we account for emissions from energy generated in Larimer County but is exported?
  - Our inventory accounts for the energy consumed by the Rawhide Power Plant used to generate electricity. It does NOT account for the electricity that gets exported from the County. The protocol only requires energy used to generate the electricity. The CBEI will take into account the full lifecycle emissions from electricity generation within the County.

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- What is the standard error in the inventory process and in per capita emissions numbers?
  - The protocol used to complete the inventory provides guidance on how to determine the quality of data, of both the activity itself as well as the emissions factor. It indicates that efforts should be made to achieve high quality data where available - the other categories being medium and low. Data related to the built environment typically contains high quality activity data as it's measured via meters and bills and the emissions factors are often reported and verified via a third party. Data sources like transportation historically were medium as they relied on modeled estimates of the activity and assumptions on what types of vehicles were on the road. Transportation activity data has greatly improved with more consistent data capture like Google EIE. Data like waste can gravitate to low quality depending on availability of measured waste and waste characterization. These classifications of data are not meant to cause communities to disregard the lower quality data, but rather provide a sense of where interim steps may be needed before proposing expensive or time intensive strategies or policies. For example, waste diversion programs may need a more recent waste characterization or more information within a specific sector like organics before moving forward. Inventory methods in both protocols take into consideration the many uncertainties and follow the IPCC's General Guidance Chapter 3 on Uncertainties.

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- Are full lifecycle emissions (e.g., from production to waste/end of life) accounted for?
  - Full lifecycle emissions are taken into account in the companion consumption-based emissions inventory. The CBEI will capture both direct and lifecycle emissions from goods and services purchased by residents of a community. Lotus will capture consumption-based emissions produced by seven core provisioning sectors. These sectors include: buildings and materials; energy supply; mobility-connectivity; water supply; waste and sanitation; food supply; green and public space.

# Follow up questions

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- Waste: How might we see the emissions impact of diverting C&D waste toward alternative uses (e.g., in fuel refinery, nat gas collection, reduced VMTs for new construction materials)? What sector would the GHG impact be seen?
  a. C&D waste diversion can help to lower landfilled waste emissions by reducing the quantity of organic material that is being sent to the landfill. Emissions related to the life cycle of the material, otherwise known as embodied carbon emissions, will be addressed as a part of the consumption-based inventory and are not included in the county-wide inventory.
- Natural Gas: What would the emissions impact be of switching from natural gas to biofuels? How would anaerobic digestion of organic waste impact emissions, and what sector of emissions? E.g., if we divert organics from the landfill to create renewable natural gas?
  a. There would be an emissions reduction from switching from natural gas to biofuels, however biofuels do still create GHG emissions. These "biogenic" emissions are considered part of the natural carbon cycle and would not be included in the Community GHG inventory - though they would be noted for informational purposes.
  b. We do account for treated compost in the GHG inventory. Should the landfill begin generating renewable natural gas, that emissions would end up accounted for in the end-use sector rather than the waste sector. For example, if the RNG was eventually used by transit buses, the transit sector would be where those emissions are accounted for. The RNG used by the buses would be subtracted from the waste sector to avoid double counting.

# Follow up questions

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- Agriculture/Transportation: How might increasing local food access impact emissions, and what sector would that impact be seen in? Can we break down agricultural or transportation emissions to see how much comes from agriculture and food delivery related fuel use?
  a. Increasing local food access will reduce transportation emissions. These reductions will be seen in the Transportation sector.
  b. We do not have granular enough data to estimate the proportion of VMT or emissions that can be attributed to agriculture/food delivery.
- Electrification: How will beneficial electrification impact emissions? Will we see a big increase in emissions?
  a. This will vary by community. Initially, there will likely be an increase in emissions. But, as electric utilities increase the proportion of renewable energy resources on the grid and meet their carbon reduction goals, emissions will begin to decrease - something that is already happening in Colorado. Most importantly, for every fossil fuel-based heating system we install "today" we are locking in those emissions with virtually no chance to reduce the emissions per heating output until the unit is replaced again in 15 or 20 years. Once all utilities reach 100% renewable energy resources, emissions will be zero for electricity use. It will be important to pair electrification with energy efficiency measures to minimize the increase in electricity load on the grid.

# Follow up questions

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- Carbon Sequestration: What is the emissions impact of habitat conservation/restoration actions? How can we account for sequestration?
  a. The emissions impact depends on the type of habitat and the type of project. Sequestration can be accounted for through forest sequestration using the US Community Protocol's Appendix J methodology. Accounting for carbon sequestration was outside of Lotus' scope of work.
- Is there an impact on emissions from forest products/forest restoration and reducing wildfire risk through better forest management?
  a. Forest products help to lock in the carbon sequestered by trees over a longer period of time. Forest restoration and management have a negligible impact on emissions in the short term and can *temporarily* increase emissions with the removal of trees via thinning and prescribed burns. However, from a resilience perspective, these activities are critical for maintaining and improving the health of the county's forests in the long term and have many co-benefits like improving air and water quality and reducing the likelihood of catastrophic wildfires, ;and cover change, and post-fire flooding.

# Follow up questions

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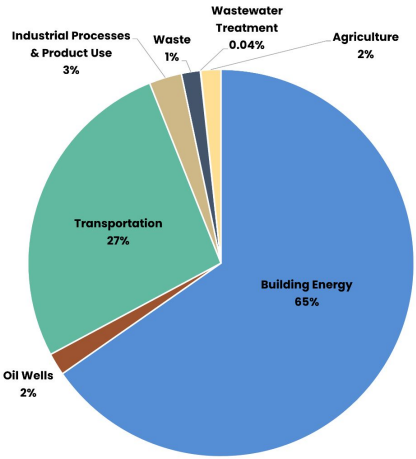
- Building Performance: Is there a difference between building emissions from commercial vs. residential buildings?
  a. In the County: Commercial buildings account for 50.3% of Stationary Energy emissions and residential buildings account for 49.7%.
- Do older buildings perform worse or certain building types/climates/etc.?
  a. Generally speaking, older buildings are more inefficient than newer buildings. Older buildings often lack the adequate level of insulation and have older fixtures and windows.
- How much of electricity is generated from natural gas?
  a. This varies by utility and by the minute. Most recent US EIA data suggests that across Colorado about 27% of electricity generation is from Natural Gas.

**Do we know what the split of energy use and emissions in specific communities (i.e., commercial vs. residential and elec vs. natural gas) is?**

| Community | Commercial Emissions % | Residential Emissions % | Electricity Emissions % | Natural Gas Emissions % |
|---|---|---|---|---|
| Berthoud | 33.0% | 67.0% | 47.3% | 52.7% |
| Estes Park | 59.2% | 40.8% | 69.6% | 30.4% |
| Fort Collins | 58.6% | 41.4% | 65.7% | 34.3% |
| Loveland | 51.4% | 48.6% | 63.2% | 36.8% |
| Wellington | 25.2% | 74.8% | 61.7% | 38.3% |
| Unincorporated | 40.3% | 59.7% | 71.4% | 28.6% |
| Larimer County | 50.3% | 49.7% | 66.7% | 33.3% |

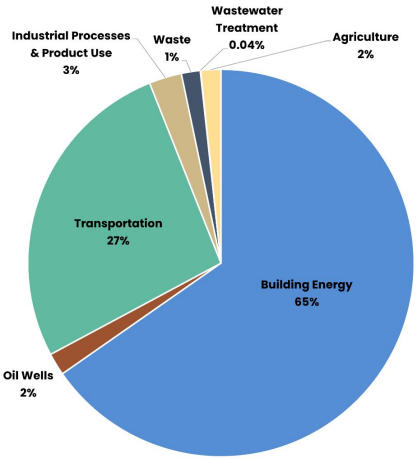
# Emissions by Sector: Building Energy

- Advance energy efficiency of new and existing buildings.
- Electrify new and existing buildings.
- Accelerate installation of renewable energy and energy storage systems.



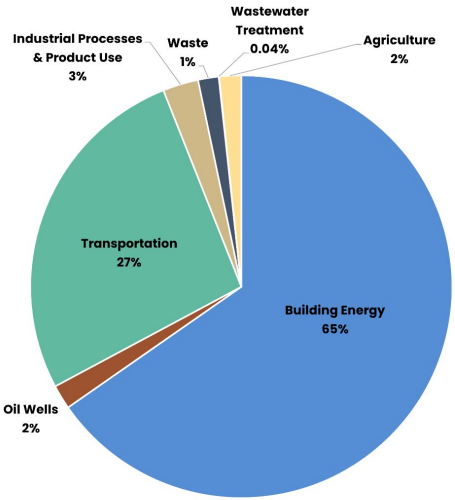
# Emissions by Sector: Transportation

- Enhance and expand regional public transit services.
- Expand non-motorized and active transportation infrastructure.
- Enhance freight efficiency.
- Accelerate infrastructure and adoption of electric vehicles and e-bikes.
- Reduce the need for trips & miles traveled.



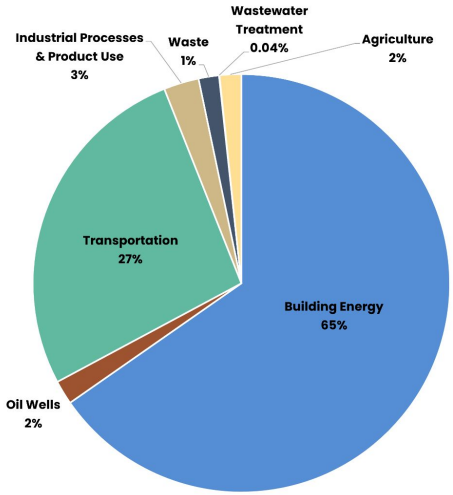
# Emissions by Sector: Agriculture

- Mitigate risk from and adapt to natural disasters and extreme weather.
- Support and expand regional agriculture.
- Maintain and improve health of agricultural soils.
- Support and expand access to local food markets.



# Emissions by Sector: Waste

- Expand the regional capacity to accept and process compost and recycling.
- Decrease the quantity of construction and demolition (C&D) materials sent to landfill.
- Develop end markets for regional materials.



# Keep in Mind

- These strategies are not final.
- There are many factors that come into play when prioritizing these strategies.
  - Equity
  - Available technology
  - Political will
- Your feedback will be combined with additional vetting mechanisms as we continue to refine and prioritize these strategies.

# EnviroScreen

| Larimer County EnviroScreen Scores | |
|---|---|
| Score Percentile (compared to other counties in the state; a higher score indicates greater risk) | 62.5 |
| Score | 39.549 |
| Pollution and Climate Burden Score Percentile | 85.938 |
| Pollution and Climate Burden Score | 58.798 |
| Health and Social Factors Score Percentile | 35.938 |
| Health and Social Factors Score | 35.696 |

# EnviroScreen

Where GHG reduction strategies also reduce ratings on the EnviroScreen tool.

- Energy efficiency
  - Reduction of air pollutants and improved air quality
- Building electrification
  - Reduction in air pollutants from gas equipment
- Renewable energy
  - Reduction in pollutants from producing energy using fossil fuels
- Public transportation
  - Reduction of VMTs and pollution from individual cars
- Ebikes and EVs
  - Reduction in air pollutants from gas cars
- Water quality and wastewater treatment
  - Improved water quality and reduction of ecological impacts from pollutants in the water
- Waste infrastructure and capacity
  - Reduction in pollutants from waste and increased waste diversion

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**Building Energy**

- Advance energy efficiency of new and existing buildings.
- Electrify new and existing buildings.
- Accelerate installation of renewable energy and energy storage systems.

**Transportation**

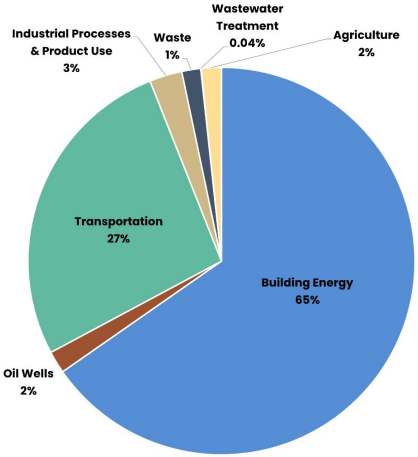
- Enhance and expand regional public transit services.
- Expand non-motorized and active transportation infrastructure.
- Accelerate infrastructure and adoption of electric vehicles and e-bikes.
- Enhance freight efficiency.

**Agriculture**

- Mitigate risk from and adapt to natural disasters and extreme weather.
- Support and expand regional agriculture.
- Maintain and improve health of agricultural soils.
- Support and expand access to local food markets.

**Waste**

- Expand the regional capacity to accept and process compost and recycling.
- Decrease the quantity of construction and demolition (C&D) materials sent to landfill.
- Develop end markets for regional materials.



# Thank You!

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