# Priority Climate Action Plan: St. Louis MO/IL Metropolitan Statistical Area

## March 2024

EAST-WEST GATEWAY
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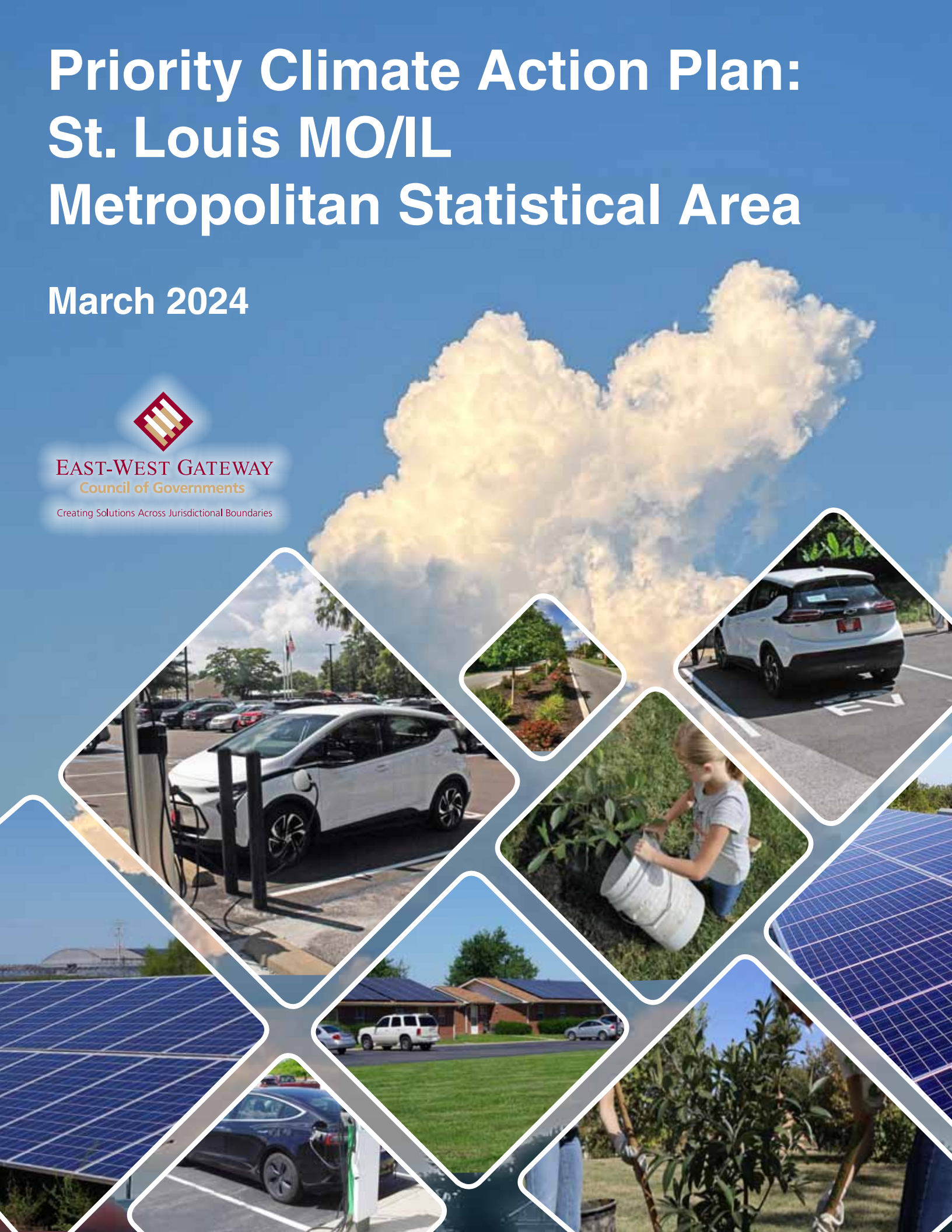
Creating Solutions Across Jurisdictional Boundaries



# Priority Climate Action Plan for the

# St. Louis, MO/IL

# Metropolitan Statistical Area

# In accordance with requirements in the Climate Pollution Reduction Grant

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# Executive Summary

The Priority Climate Action Plan (PCAP) is a required element of the U.S. Environmental Protection Agency (EPA) Climate Pollution Reduction Grant (CPRG) program. The elements of the PCAP are a baseline regional greenhouse gas inventory, a list of measures for consideration for CPRG implementation funding, and research and data supporting the selection of those measures. The PCAP covers the 15-county St. Louis, MO/IL Metropolitan Statistical Area (MSA).

East-West Gateway Council of Governments (EWG) received funding to conduct the planning phase of the CPRG, including the PCAP. While EWG staff were solely responsible for assembling and publishing the PCAP, they worked with and received input from many members of the OneSTL Working Groups, the OneSTL Network, and representatives from various agencies and organizations.

The OneSTL Energy and Emissions Working Group completed a greenhouse gas (GHG) inventory for the St. Louis region for the years 2010 and 2015. For the PCAP, EWG staff accessed the inventory and verified the data collected. According to the inventory, the largest and second largest sources of GHG emissions in the St. Louis MSA are energy used to heat and cool buildings, and the transportation network respectively.

EWG staff held over 100 meetings and interviews with local government agencies and non-profit organizations to discuss the kinds of projects they were working on or planning in the short term that would reduce carbon and other GHG emissions. Below is a reference list of the measures collected and reported by GHG emissions sector as recorded in Section 3. Each measure includes general location, implementing agency and authority to implement, potential for GHG emissions reduction, milestones, metrics, estimated cost, other funding sources, community benefits, low income census tracts impacted, and potential workforce impacts.

**Buildings**

- Measure 1: Weatherization and pre-weatherization for affordable housing
- Measure 2: Electrification and solar for affordable housing
- Measure 3: Green schools and environmental education
- Measure 4: Policies to promote solar energy and reduce energy use
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- Measure 6: Incentive programs for residents
- Measure 7: Energy efficient upgrades and renewable energy for government buildings and nonprofits
- Measure 8: Resilience hubs
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- Measure 1: Electric conversion of municipal, transit, school bus, and other fleets
- Measure 2: Bike and pedestrian infrastructure and connectivity
- Measure 3: Development of a container-on-vessel port facility
- Measure 4: Port truck staging and calling facility
- Measure 5: Signal preemption and priority
- Measure 6: Community mobility hubs
- Measure 7: Gas lawn mower replacement

**Waste Reduction**

- Measure 1: Reducing food waste and expanding collection of composting
- Measure 2: Policies to reduce waste
- Measure 3: Expanding recycling
- Measure 4: Large scale reuse system to reduce single-use plastics
- Measure 5: Reducing illegal dumping
- Measure 6: Anaerobic digestion

**Agriculture, Forestry, and Land Use**

- Measure 1: Solar arrays and orchards for local farms
- Measure 2: Planting trees and native gardens
- Measure 3: Preservation and restoration of forests, prairies, wetlands, and floodplains

Section 4 - Additional Analyses contains an overview of the 155 census tracts in the St. Louis, MO/IL MSA identified by the Climate and Economic Justice Tool, a brief review of Authority to Implement, and a subjective Workforce Development summary. Section 5 - Next Steps briefly describes steps for the CPRG implementation grant, completing the regional Climate Action Plan, and developing regional capacity to implement a Climate Action Plan.

# 1 Introduction

This Priority Climate Action Plan (PCAP) is a requirement of the grant received by East-West Gateway Council of Governments (EWG) under the Climate Pollution Reduction Grant (CPRG) program administered by the Environmental Protection Agency and funded through the Inflation Reduction Act.

## 1.1 Climate Pollution Reduction Grant

In 2023, the U.S. EPA launched the CPRG program with funding from the Inflation Reduction Act and under authority of the Clean Air Act. The CPRG consists of a planning phase that will occur from August 2023 to August 2027 and an implementation phase that will occur from October 2024 to October 2029. EWG received funding through the CPRG to conduct the planning phase, which involves producing a Climate Action Plan for the St. Louis, MO/IL Metropolitan Statistical Area (MSA). EWG staff met with community organizations and local government agencies to document projects and activities intended to be used for the planning phase as well as guiding a collaborative application for the implementation phase.

This Priority Climate Action Plan (PCAP) is presented in accordance with the grant requirements of the CPRG. It is a prerequisite for projects and applications to be eligible for the implementation phase of the CPRG. All the findings from the interviews, meetings, and surveys conducted were intended to meet the requirements of the CPRG and prepare organizations in the region to apply for implementation funding.

## 1.2 OneSTL Context

In 2013, EWG and ten other partners completed a regional plan for sustainable development in 2013 under the Sustainable Communities Partnership, a collaborative grant program organized by the U.S Department of Housing and Urban Development, U.S. Department of Transportation, and EPA. The product of that effort is titled OneSTL, Plan for a Prosperous, Healthy, Vibrant St. Louis Region. The plan is comprehensive and contains many strategies that result in reduction of carbon emissions. Complementary to the plan, OneSTL includes a website (www.onestl.org) with an indicators dashboard, resources tab, and toolkit of sustainable practices; associated social media accounts, email lists, and a newsletter; and six Working Groups. Each Working Group has volunteer leaders and a network of stakeholders that consists of representatives of local governments, non-profits, and related industries. The OneSTL Network includes the Missouri Botanical Garden, the St. Louis Zoo, Missouri Gateway Green Building Council, Washington University in St. Louis, St. Louis University, the American Heart Association, Citizens for Modern Transit, the City of St. Louis and St. Louis County. The network structure and resources of OneSTL were used to engage with regional stakeholders and identify the measures included in the PCAP.

## 1.3 PCAP Overview

This PCAP is a summary of: 1.) The regional GHG inventory completed for 2015; 2.) The GHG reduction measures discovered during engagement conducted between September 2023 and January of 2024 and 3.) Additional analyses of impacts of the PCAP measures and process.

A GHG Inventory was conducted as a collaborative effort of organizations participating in the OneSTL Energy and Emissions Working Group. Data was collected for the 8-county EWG Region for the years 2010 and 2015 (see Figure 2). For the purpose of this PCAP, data was quality checked for the 2015 inventory only. Also, nationally available data was collected for the seven counties within the St. Louis, MO/IL MSA that are not part of the East-West Gateway Region. GHG emissions data is summarized in Section 2.

As a result of engagement meetings, interviews and on-line survey responses, over 120 general project ideas were discovered. Projects were identified and grouped as measures for the PCAP. The original 120 projects were narrowed down to the 25 measures included in this PCAP. Additional data was collected regarding items such as cost, GHG reduction potential, authority to implement, community benefits and low income and disadvantaged community benefits. All information is included in the measure tables in Section 3.

Section 4 contains the additional required analyses, including the Low Income and Disadvantaged Community Analysis and Review of Authority to Implement. Low Income and Disadvantaged Community Analysis contains a description of and outreach that occurred in areas identified as "disadvantaged" in the EPA Climate and Economic Justice Screening Tool. The Review of Authority to Implement describes the status of identified agencies and whether they have the capacity and legal standing to implement the proposed GHG reduction measures.

### 1.3.1 Scope of the PCAP

The geographic area of the St. Louis MO-IL MSA includes Bond County, Calhoun County, Clinton County, Jersey County, Macoupin County, Madison County, Monroe County, St. Clair County (in Illinois); Franklin County, Jefferson County, Lincoln County, St. Charles County, City of St. Louis, St. Louis County, Warren County (in Missouri). In the figure below, the counties shaded light grey are part of EWG's regular planning area. The counties shaded dark grey are in the MSA, but are not in EWG's regular planning area. These counties are referred to as collar counties. Interviews were conducted with county and city governments and non-profits that represent parts and have constituents in all counties in the MSA.

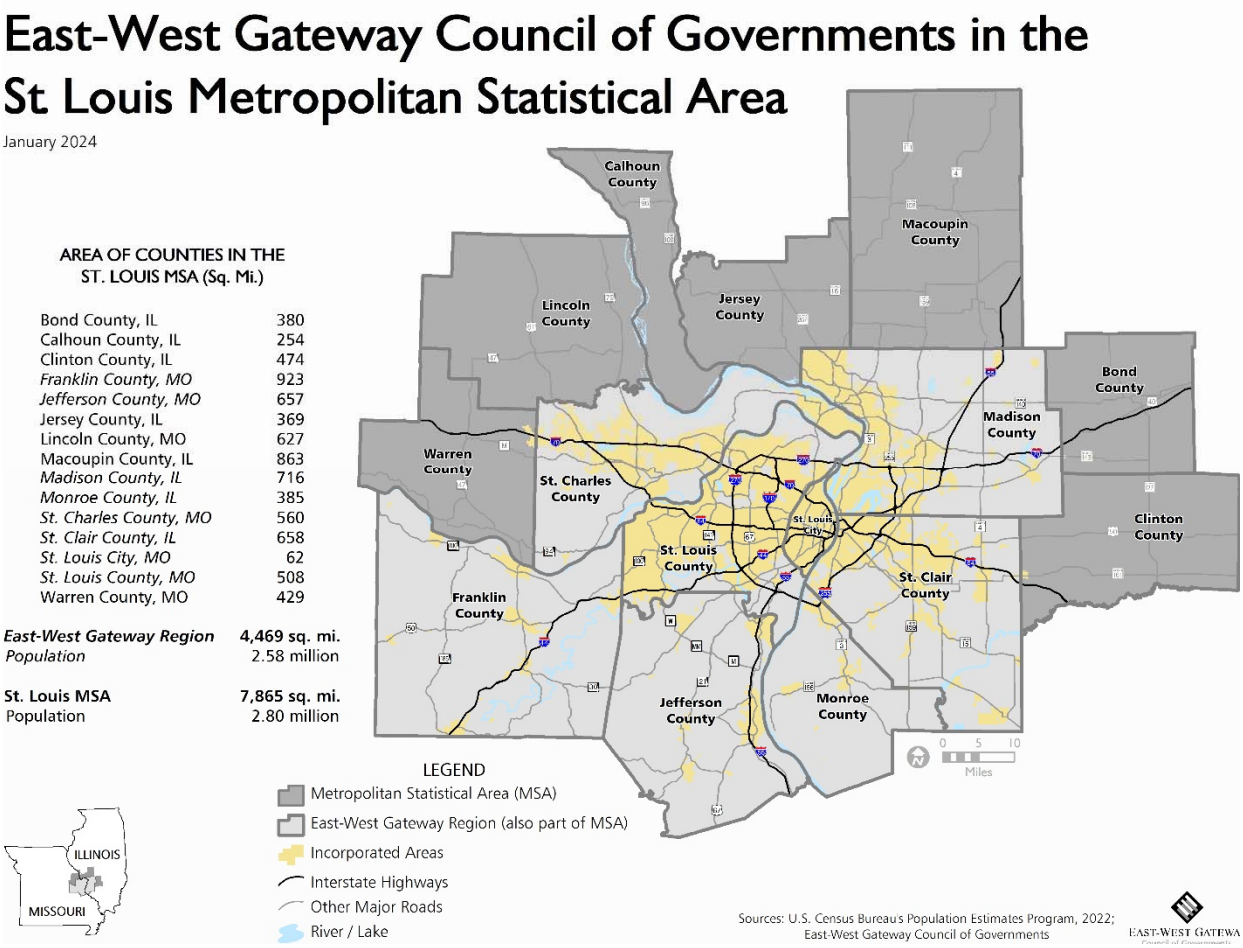


*Figure 1 St. Louis, MO/IL MSA*

### 1.3.2 Approach to Developing the PCAP

The PCAP is an interim report to the full regional Climate Action Plan which is due in August of 2025. The PCAP is part of the regional Climate Action Plan development process and a structure for public engagement and project identification for the CPRG implementation funding opportunity. The PCAP summarizes planning activities occurring between receipt of CPRG planning funding and the PCAP due date of March 1, 2024.

One requirement for the PCAP is a baseline regional GHG inventory. Two inventories were previously completed by the OneSTL Energy and Emissions Working Group in collaboration with Washington University in St. Louis. The inventories were for the years 2010 and 2015, and covered the 8-county planning area of EWG. Those inventories did not include the seven counties. For the purpose of the PCAP, EWG staff verified the data and calculations made for the 2015 inventory and added nationally available data for the collar counties. The 2015 inventory was compiled using locally available data from departments of transportation, utility companies, and calculated estimates. The collar county emissions numbers were obtained through SLOPE, FLIGHT, and NEI (see Section 2.2).

For the purposes of this Priority Climate Action Plan, a "priority" is defined as a "measure" that could be implemented within the time frame of the CPRG, has associated research on the topic that allows for an estimation of GHG emissions reduction, and is eligible to receive implementation funding through the CPRG program. A "measure" can be an individual project, policy or a collection of projects and policies

implemented through a local government agency or non-profit organization. The projects listed as "measures" in this PCAP are not exhaustive and are not intended to be construed as a widely-accepted planning priority for the region or any particular jurisdiction. The "measures" listed in the PCAP were gathered primarily for consideration in the Implementation Phase of the CPRG, but will be considered for inclusion in the final regional Climate Action Plan.

Comprehensive and meaningful public engagement could not happen in the 15-county geography of the St. Louis, MO/IL MSA in the span of a few of months. Therefore, PCAP engagement was conducted through group meetings and one-on-one interviews with government agencies and non-profit organizations that work throughout the MSA. These agencies and non-profits are referred to as stakeholders in this report. Interviews were conducted with stakeholders in every county in the MSA.

Stakeholders interviewed include OneSTL Working Groups and Network Members, and an effort was made to reach additional organizations in Justice40 areas. PCAP agenda items were included in standing Working Group meetings and the PCAP was discussed at the monthly Sustainability Labs @ T-REX. An on-line survey was distributed via social media, the OneSTL monthly newsletter, and the weekly EWG newsletter Local Government Briefings. City and county planning departments, health departments, public works departments, and community action corporations were individually contacted as well. More than 100 stakeholder meetings and interviews were conducted. See Appendix D for a full list of stakeholders interviewed.

Over 120 projects and priorities from stakeholder organizations were discovered during the stakeholder engagement process. A full list can be found in Appendix E. The final list of 25 measures included in this PCAP was crafted to encompass as many of those projects as possible.

# 2 Greenhouse Gas (GHG) Inventory

A regional GHG inventory is an aggregation of data and estimates of emissions of greenhouse gases within a multi-county area. An inventory includes data from designated sources (also referred to as sectors) such as energy production, transportation, industrial processes, agriculture, waste management, and land use. Given the large scale of regional inventories, one must assume a degree of error in evaluating the numbers. Some emissions can be directly calculated using energy consumption from local utilities. Other emissions can only be estimated, such as calculating carbon emitted or sequestration capacity lost from developing farmland or forests. The executive summary of the 2010 and 2015 regional GHG inventory can be found in Appendix B, but more information can be found in the full regional GHG inventory document[1].

## 2.1 Inventory Scope and Methodology

The GHG inventory referenced in this section was originally created for the years 2010 and 2015. That inventory was created over a span of multiple years and involving several individuals from different institutions. EWG staff was not involved in the data collection. For that inventory to be used in the PCAP and CPRG, the data needed to be quality checked and verified. That process involved comparing inventory data to data collected and made available by various federal agencies. Early in the process staff concluded that federal data was not available to quality check the 2010 regional inventory, so the PCAP will only reference the 2015 data and inventory.

[1] http://www.onestl.org/media/site/documents/ghg_invntory_report_2_14_24.pdf

The inventory for the St. Louis Region was compiled following the guidelines provided by the Global Protocol for Community-Scale Greenhouse Gas Inventories, v1.1. This widely-used protocol provides two reporting options: BASIC and BASIC+. In this inventory, the "BASIC+" level is used and covers all BASIC level sectors of stationary energy, in-boundary transportation, and in- boundary generated waste. BASIC+ also covers the additional sectors of industrial process and refrigerant use (IPR), and agriculture, forestry, and other land use (AFOLU). The inventory was compiled using the ClearPath on-line application provided by ICLEI.

The original inventory documents GHG emissions for the EWG bi-state planning area, including five counties in Missouri (Franklin, Jefferson, St. Charles, City of St. Louis, and St. Louis County), three counties in Illinois (Madison, Monroe, and St. Clair), and 196 municipalities. To complete an inventory for the remainder of the collar counties in the St. Louis, MO/IL MSA, only publicly available data was used and the emissions levels are presented in separate graphs.

## 2.2 Verification of 2015 Inventory

The review of the 2015 regional GHG inventory was conducted by comparing inventory results with publicly available sources. The City and County Energy Profiles for 2016, published as part of the State and Local Planning for Energy (SLOPE) program of the National Renewable Energy Laboratory, was used as a point of comparison for the following categories of energy consumption: residential electricity, commercial electricity, industrial electricity, residential natural gas, commercial natural gas. For industrial Scope 1 consumption, the EPA Facility Level information on Greenhouse Gases Tool (FLIGHT) was consulted. For transportation, the inventory was compared to the 2014 National Emissions Inventory (NEI), and to estimates of Vehicle Miles of Travel (VMT) published by the Missouri Department of Transportation and the Illinois Department of Transportation.

For electricity, industrial Scope 1, and transportation, differences between the 2015 inventory and the publicly available sources were not great enough to reject the 2015 inventory. For natural gas, however, the SLOPE estimates were 35 percent higher than the inventory for residential, and 23 percent greater for commercial. To investigate potential causes for this discrepancy, emissions factors entered into ClearPath were compared to emissions factors published by EPA. In addition, staff obtained data files showing natural gas consumption in therms by county that were used to input data into ClearPath. These files were derived from source data from Spire, the natural gas utility in the Missouri portion of the region, and from Ameren Illinois, the natural gas utility in the Illinois portion. No apparent typographical or transcription errors were spotted that could account for potential discrepancies. Staff concluded that data based on information reported by the utilities should be considered more authoritative than modelled outputs from SLOPE, as several factors were identified as potential sources of error in SLOPE estimates.

In summary, staff concluded that the 2015 inventory was sufficient to use as the baseline for the CPRG. A more detailed discussion of data and methods used in this review is available in Appendix F.

## 2.3 Summary of Emissions

The two charts below summarize GHG emissions for the region. Figure 2 shows emissions from the 2015 GHG inventory that included only the eight counties in the EWG planning area. All sectors are included. Figure 3 compares Stationary and Transportation sector emissions for the EWG counties and the MSA collar counties separately. All emissions sectors are not included in this table because public data was not available for all sectors.

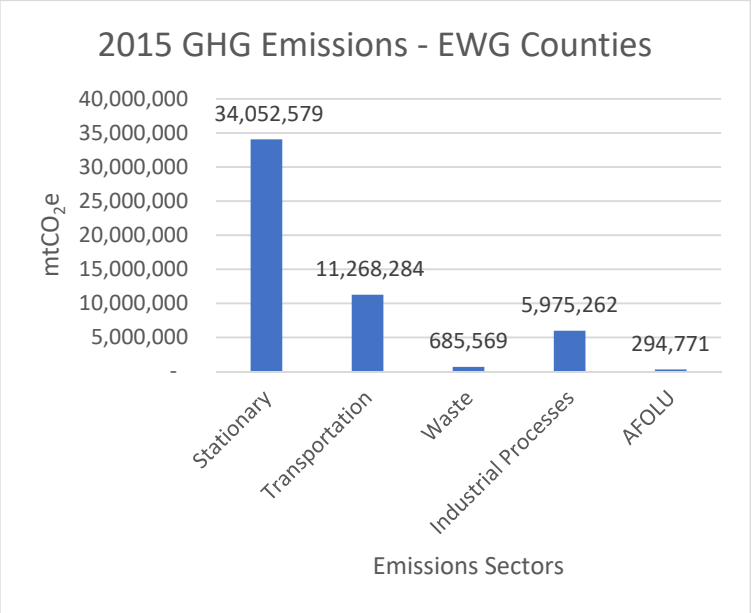


*Figure 2 2015 GHG Emissions - EWG Counties*

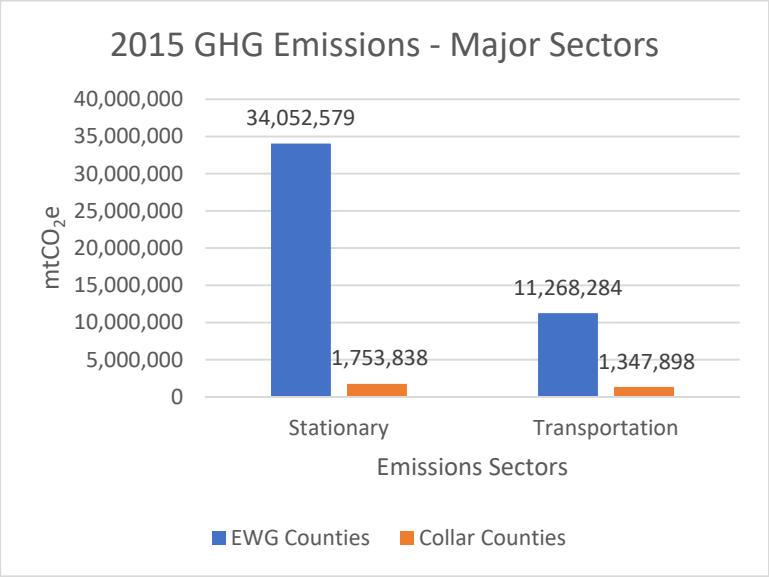


*Figure 3 2015 GHG Emissions - Major Sectors*

### 2.3.1 Stationary (Buildings) Sector

In 2015, the largest source of carbon dioxide ($CO_2$) emissions in the St. Louis Region was stationary energy use, which is the energy consumed by the built environment (buildings). This sector was responsible for 34,052,579 $mtCO_2e$, or 64.2% of the region's total emissions. The majority of emissions in the built environment can be attributed to electricity and natural gas.

### 2.3.2 Transportation Sector

The transportation sector covers all journeys by road, rail, water and air, including intercity travel. Transportation can include the travel of individuals or the movement of goods. GHG emissions are

produced directly by the combustion of fuel or indirectly by the use of grid-supplied electricity. Collecting accurate data for transportation activities, calculating emissions, and allocating these emissions to cities can be a challenging process as transportation emissions are mobile and must be allocated to different locations based on where transportation experts estimate vehicles are travelling to and from.

### 2.3.3 Waste Sector

Waste contributed 1.3% of GHG emissions in 2015. Solid waste disposal accounted for the majority of GHG emissions in the waste sector, followed by wastewater and incineration & open burning. It should be noted that if methane from landfills was used as energy, these emissions were classified under the 'Stationary' (Buildings) sector of the regional GHG inventory. Plans for a gas-to-energy facility and methane-to-natural gas facility at Champ Landfill hope to eventually capture nearly all of the methane from the landfill (Champ Landfill is a solid waste recycling and disposal facility located in St. Louis County that serves the entire St. Louis Region.).

### 2.3.4 Industrial Processes

Industrial Processes chemically or physically transform materials and release GHG emissions. The St. Louis region is home to industries that contribute to these emissions including steel production, oil refining, glass production, cement production, and lead smelting. However, the region has experienced significant de-industrialization over the decades and this as a source of GHG emissions is relatively low when compared to stationary and transportation.

### 2.3.5 Agriculture, Forestry, and Land Use (AFOLU)

Agricultural, Forestry and Other Land Use involves crop and livestock production for food and non-food use. Direct emissions include nitrous oxide from cropped soils (fertilizer application), methane from enteric fermentation, and nitrous oxide and methane from managed livestock manure. The authors of the 2015 inventory recommend further research and reporting on land use, conversions between forest land, cropland, grassland, wetlands, and the built environment within the region.

# 3 GHG Reduction Measures

The measures listed below are a collection of projects and policies implemented through a local government agency or non-profit organization. These measures are not exhaustive and are not intended to be construed as a widely-accepted planning priority for the region or any particular jurisdiction. They were gathered primarily for consideration in the Implementation Phase of the CPRG, but will be considered for inclusion in the final regional Climate Action Plan.

The measures are categorized by the emissions sector they impact the most, although many of them have the potential to lower emissions from multiple sectors. Also listed under each sector are general strategies that the authors believe will help lower emissions. The strategies are listed to give the reader more context on emissions reduction practices.

The individual measures are listed with as much information as could be collected during the PCAP engagement process. The information included is intended to meet the requirements for the PCAP and also present as much information as was collected that would be useful in including in an implementation application under the CPRG or other funding source.

## 3.1 Stationary (Buildings)

In 2015, the largest source of $CO_2$ emissions in the St. Louis Region was stationary energy use, which is the energy consumed by our built environment.

### 3.1.1 Emissions Reduction Opportunities

Stationary emissions are determined by two primary elements: the energy efficiency of buildings, and the energy source used. Thus this PCAP establishes two "sector reduction opportunities" to address each element of stationary emissions.

*Sector Reduction Opportunity 1: Increase energy efficiency in buildings*

Energy efficiency is a cost-effective way to reduce energy use in buildings. Strategies to make buildings more energy-efficient are outlined below.

*Table 1 Strategies to Increase Energy Efficiency in Buildings*

| Strategy | Description |
|---|---|
| **1.1** Weatherization of existing buildings | Weatherization is the process of protecting buildings from the elements, in order to optimize energy consumption. It can include adding more insulation, new windows, weather stripping around doors, and other practices to better seal the exterior envelope of the building. |
| **1.2** Behavior change and demand response | 'Demand response' refers to encouraging customers to shift electricity use to times when demand is lower, for example not during the heat of the day in the summer. Encouraging customers to reduce energy use, particularly during peak times, can reduce the need to build more electricity plants, even as popularity of electric appliances and electric vehicles grows. |
| **1.3** Promote construction of energy-efficient buildings | More than half of the world's anticipated building stock will be constructed over the next 30 years.[2] Therefore, policies that require newly constructed buildings to be energy efficient are critical in bringing the St. Louis Region to Net Zero by 2050. |

*Sector Reduction Opportunity 2: Increase renewable energy use*

Renewable energy refers to energy that is produced from sources that can be replenished. Forms of renewable energy can include solar, wind, hydropower, and geothermal. The discussion of renewable energy in this PCAP is focused on energy that is produced on-site, as opposed to generated at large, utility-scale facilities. However, utility scale solar is also an important way to reduce GHG emissions in the St. Louis Region.

*Table 2 Strategies to Increase Renewable Energy Use*

| Strategy | Description |
|---|---|
| **1.4** Electrification of appliances | Switching from gas to electric appliances allows buildings to take advantage of renewable sources of electricity, in order to achieve Net Zero emissions. |

[2] The climate is changing, so must our homes & how we build them | UN-Habitat (unhabitat.org)

| | |
|---|---|
| **1.5** Expanding onsite renewable energy production | Buildings can install rooftop solar or geothermal systems in order to reduce or eliminate GHG emissions from their electricity use. |

### 3.1.2 Emission Reduction Measures

This section provides a set of GHG reduction measures, which were developed using stakeholder input and focus on achieving significant GHG reductions, while providing other co-benefits such as reduced utility costs.

#### *Measure 1: Weatherization and pre-weatherization for affordable housing*

Inefficient homes result in high utility bills. When residents are unable to afford their bills, it can be life-threatening in extreme weather situations. According to the National Oceanic and Atmospheric Administration, there were 34 deaths and 1,447 injuries in the St. Louis Region in heat waves between 2010 and April 30, 2019.[3] Weatherization measures (such as more insulation or weatherstripping) can result in lower utility bills, reducing this risk. Pre-weatherization measures are 'enabling upgrades' that address barriers to weatherization, for example addressing standing water, wiring issues, and roof deficiencies.

*Table 3 Details of Weatherization and Pre-Weatherization for Affordable Housing*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | • Agencies that receive support from the USDOE Weatherization Assistance Program<br>• Other nonprofits that offer home repair services, such as those that make up the Home Repair Network that serves St. Louis City and St. Louis County[4]<br>• Managers of affordable housing<br>• Municipal governments offering home repair programs |
| **Authority to implement** | These agencies have the authority to implement the projects. |
| **Emissions reduction strategies addressed** | **1.1** Weatherization of existing buildings |
| **Estimate of the quantifiable GHG emissions reductions** | • One metric ton of $CO_2$ emissions per home annually[5] |
| **Implementation milestones** | Most weatherization and pre-weatherization projects can be implemented quickly once identified and funds become available. Final inspections determine project completion. |

[3] St. Louis Regional Hazard Mitigation Plan (ewgateway.org)
[4] Collaborations – North Newstead Association
[5] Weatherization Assistance Program (energy.gov)

| | |
|---|---|
| **Metrics tracking** | • Number of units improved/weatherized. |
| **Cost** | Varies by community per number of homes/buildings weatherized |
| **Other funding sources** | • Weatherization Assistance Program<br>• Incentives and financing from Ameren Missouri[6] and Ameren Illinois[7]<br>• Illinois Energy Efficiency Trust Fund Grant Program (applications will be accepted until funding has been expended)[8]<br>• Community Change Grants (Rolling deadline of Nov 21, 2024. The Environmental Protection Network suggests that applicants who are ready submit by Feb 20, 2024. Initial award announcements will be made as soon as March of 2024.)[9]<br>• Home Energy Rebates[10]<br>• Set the PACE St. Louis provides commercial PACE for businesses located in the City of St. Louis.[11]<br>• The Missouri Energy Savings Program (MOESP), the official St. Louis County PACE Clean Energy Development Board, provides commercial PACE in St. Louis County.[12]<br>• Show Me PACE offers a broad range of benefits to commercial building owners, as well as energy efficiency/renewable energy contractors throughout Missouri.[13]<br>• National Clean Investment Fund[14] |
| **Co-Benefits** | • Reduced utility cost for those with limited resources<br>• Reduced risk of utility shutoff and injuries due to extreme weather |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | This project places a focus on disadvantaged communities and households that experience high energy burden. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis MSA (see Appendix C). |
| **Workforce** | The U.S. Department of Energy's weatherization program supports 8,500 jobs nationwide. Apprenticeship programs are available for training additional weatherization technicians and energy auditors in some areas. |

[6] Residential Energy Efficiency Programs - Ameren Missouri
[7] Home - Ameren Illinois Energy Efficiency Program (amerenillinoissavings.com)
[8] Energy Efficiency Trust Fund Grant (illinois.gov)
[9] Inflation Reduction Act Community Change Grants Program | US EPA
[10] Home Energy Rebates Programs | Department of Energy
[11] Home (setthepacestlouis.com)
[12] Home (mo-esp.com)
[13] Financing for Energy Efficiency Projects & Measures in Missouri | Show Me PACE
[14] National Clean Investment Fund | US EPA

### *Measure 2: Electrification and solar for affordable housing*

Switching from gas to electric appliances allows more appliances in the home to be powered by solar. Rooftop solar, like weatherization, also often results in a decrease in utility bills.

*Table 4 Details for Electrification and Solar for Affordable Housing*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | Managers of affordable housing |
| **Authority to implement** | These agencies have the authority to implement residential and commercial solar projects, although some permitting may be required. Industrial- and utility-scale solar installation may require approval by the Missouri Public Service Commission, and may be subject to environmental permitting laws and regulations. |
| **Emissions reduction strategies addressed** | **1.4** Electrification of appliances<br><br>**1.5** Expanding onsite renewable energy production |
| **Estimate of the quantifiable GHG emissions reductions** | ● **Electrification:** Assuming the electricity were to come from clean sources, electrifying space and water heating in residential and commercial buildings where it is feasible could reduce those buildings' 2016 heating emissions by 20%.[15]<br>● **Solar:** Typical annual $CO_2$ emissions are 14,020 pounds per household, assuming approximately 943 kWh per month.[16] This serves as an estimate of how much emissions would be reduced per household served by solar. |
| **Implementation milestones** | Residential and commercial solar projects can generally be initiated within months of identification as funds become available and can be completed within a five-year timeframe. |
| **Metrics tracking** | ● Number of electric appliances installed.<br>● Number of kWh of solar panels installed. |
| **Cost** | The Missouri Environmental Improvement and Energy Resources Authority estimated in its application for the Solar for All program that a single-family 8.5-kW rooftop solar system would cost $25,500.[17] |
| **Other funding sources** | ● Solar for All[18]<br>● Community Change Grants (Rolling deadline of Nov 21, 2024. The Environmental Protection Network suggests that applicants who are ready submit by Feb 20, 2024. Initial award announcements will be |

[15] How global business could mitigate climate change | McKinsey
[16] Assumptions and References for Household Carbon Footprint Calculator | US EPA
[17] Missouri-Solar-for-All-Grant-Program-Narrative-2.pdf (mo.gov)
[18] Solar for All | US EPA

| | |
|---|---|
| | made as soon as March of 2024.)[19]<br>● Set the PACE St. Louis provides commercial PACE for businesses located in the City of St. Louis.[20]<br>● The Missouri Energy Savings Program (MOESP), the official St. Louis County PACE Clean Energy Development Board, provides commercial PACE in St. Louis County.[21]<br>● Show Me PACE offers a broad range of benefits to commercial building owners, as well as energy efficiency/renewable energy contractors throughout Missouri.[22]<br>● National Clean Investment Fund[23] |
| **Co-Benefits** | ● Reduced utility cost for those with limited resources<br>● Reduced risk of utility shutoff and injuries due to extreme weather<br>● Resilience for the energy grid |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | This project places a focus on disadvantaged communities and households that struggle to afford their utility bills. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Local organizations are working to train those in need of jobs to install solar systems. These organizations include Employment Connection and St. Louis University. |

### *Measure 3: Green schools and environmental education*

Over 30 schools currently participate in the Missouri Green Schools program. In order to reach recognition levels 4 and 5, schools need to develop a plan to track all energy, waste, and water at the school and then begin documenting reductions. Education on energy reduction is needed, including technical assistance for facilities staff and professional development for teachers on how to incorporate energy reduction into their curriculum. In addition to Missouri Green Schools, other green schools programs and environmental education efforts are coordinated by different entities around the St. Louis Region. There are also many opportunities to educate the public about improving air quality and reducing GHG emissions at public events.

*Table 5 Details for Green Schools and Environmental Education*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | ● Missouri Environmental Education Association & Missouri Gateway Green Building Council co-manage Show-Me Green Schools (which |

[19] Inflation Reduction Act Community Change Grants Program | US EPA
[20] Home (setthepacestlouis.com)
[21] Home (mo-esp.com)
[22] Financing for Energy Efficiency Projects & Measures in Missouri | Show Me PACE
[23] National Clean Investment Fund | US EPA

| | |
|---|---|
| | includes the Missouri Green Schools Program)<br>● Nonprofit organizations, such as The Nature Conservancy<br>● Universities, such as Washington University and Harris Stowe<br>● County governments, such as Madison County and St. Louis County<br>● Schools interested in solar, such as Clay Elementary and Lutheran North Middle & High School |
| **Authority to implement** | School districts have the authority to implement environmental education initiatives. Some permitting may be required for solar projects. |
| **Emissions reduction strategies addressed** | **1.2** Behavior change and demand response<br>**1.5** Expanding onsite renewable energy production |
| **Estimate of the quantifiable GHG emissions reductions** | • **Tracking Energy Use:** Based on US EPA data trends, buildings that benchmarked their energy performance saw a total energy savings of 7%.[24]<br>• **Solar for School Buildings:** According to the Avoided Emissions and Generation Tool AVERT Web Edition, one MWh of rooftop-scale photovoltaic results in 1,370 tons of avoided $CO_2$ emissions.[25] |
| **Implementation milestones** | • **Tracking Energy Use:** First, Missouri Green Schools program staff must work with schools to assist in moving up the Recognition Levels to level 4, where they begin to track energy usage. Then they must increase education on energy reduction, including technical assistance for facilities staff and professional development for teachers on how to incorporate energy reduction into their curriculum. It is estimated that schools will have more accurate energy data in 2-3 years.<br>• **Solar for School Buildings:** Solar projects can generally be initiated within months of identification as funds become available and can be completed within a five-year timeframe. |
| **Metrics tracking** | ● Energy benchmarking<br>● kWh of solar panels installed<br>● Number of students engaged |
| **Cost** | The cost to install a solar array is typically $3.75-$4.25 per watt. |
| **Other funding sources** | ● Renew America's Schools Grant (second round to open in Spring of 2024)[26]<br>● EPA's Grant Funding to Address Indoor Air Pollution in Schools (due March 19, 2024)[27]<br>● Environmental Justice Thriving Communities Grantmaking Program (Subgrants through the Grantmakers are expected to become |

[24] DataTrends Benchmarking and Energy Savings (energystar.gov)
[25] AVERT Web Edition | US EPA
[26] Renew America's Schools | Department of Energy
[27] Grant Funding to Address Indoor Air Pollution at Schools | US EPA

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|---|---|
| | available by Summer 2024)[28]<br>● MO Energy Loan Program (applications close June 30, 2024)[29]<br>● Greenhouse Gas Reduction Fund (funding awards to be announced in March of 2024)[30] |
| **Co-Benefits** | Students and faculty will take energy reduction learnings home and implement them in their own households. |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Some schools served by Green Schools programs are in disadvantaged areas. Reaching children at school is also a good way to get information about energy savings to parents in disadvantaged communities. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Schools play a role in training the future workforce. |

### *Measure 4: Policies to promote solar energy and reduce energy use*

Policy change can have a major impact on emissions reductions, compared to individual actions. During the stakeholder engagement process for this PCAP, there was a high interest in changing policy in the state of Missouri to make community solar projects more affordable for participants. It was suggested that modeling a community solar model after Minnesota's could make it possible for developers to build solar gardens that benefit low income customers. Additional policies suggested were 1) expanding energy benchmarking and a building energy performance standard (BEPS) from the City of St. Louis to St. Louis County, 2) an Energy Disclosure Ordinance for the City of St. Louis, 3) streamlined solar permitting, and 4) updated building energy codes.

*Table 6 Details for Policies to Promote Solar Energy and Reduce Energy Use*

| | |
|---|---|
| **Geographic location** | The State of Missouri and the St. Louis bi-state region |
| **Implementing agencies** | Local governments and the State of Missouri |
| **Authority to implement** | Local governments have the authority to implement policies such as energy benchmarking and BEPS, energy disclosure ordinances, streamlined solar permitting, and updated building energy codes. State legislative approval is required for policy change governing community solar projects. |
| **Emissions reduction strategies addressed** | **1.1** Weatherization of existing buildings<br>**1.2** Behavior change and demand response |

[28] The Environmental Justice Thriving Communities Grantmaking Program | US EPA
[29] Energy Loan Program | Missouri Department of Natural Resources (mo.gov)
[30] About the Greenhouse Gas Reduction Fund | US EPA

| | |
|---|---|
| | **1.3** Promote construction of energy-efficient buildings<br><br>**1.5** Expanding onsite renewable energy production |
| **Estimate of the quantifiable GHG emissions reductions** | • **Community solar & streamlined permitting:** Typical annual $CO_2$ emissions are 14,020 pounds per household, assuming approximately 943 kWh per month. [31] This serves as an estimate of how much emissions would be reduced per house that is able to join a community solar program or benefit from streamlined solar permitting.<br>• **Energy benchmarking/BEPS:** Based on US EPA data trends, buildings that benchmarked their energy performance saw a total energy savings of 7%.[32] BEPS will have a much greater impact than benchmarking alone, but it is difficult to calculate without baseline benchmarking data.<br>• **Energy disclosure ordinance:** The purpose of this ordinance would primarily be to avoid high energy burden by giving prospective renters information about the energy efficiency of rental units. However, it could also result in a motivation to make units more efficient and reduce GHG emissions.<br>• **Updated building energy codes:** According to the US Department of Energy, the 2021 International Energy Conservation Code (IECC) can provide GHG emissions savings of 10.2% compared to the 2018 IECC.[33] |
| **Implementation milestones** | • Community Awareness, Education, and Input<br>• Determine Priority Strategies Using Community Input<br>• Continue Education and Encourage Voluntary Behavior Shift<br>• Policy Advocacy<br>• Continued Education to Encourage Compliance |
| **Metrics tracking** | • Number of communities that are designated Solsmart<br>• Number of community solar projects permitted<br>• Number of buildings participating in benchmarking<br>• Number of landlords participating in an energy disclosure program |
| **Cost** | Support for implementation of benchmarking or a Building Energy Performance Standard would cost $15,000-$20,000 to set up and $37,000-$154,000 annually to operate. |
| **Other funding sources** | • Resilient and Efficient Codes Implementation Grant (there may be another round for this grant)[34]<br>• Technical Assistance for the Adoption of Building Energy Codes (Another round has opened for concept papers. The deadline has not been set yet, as of February 20, 2024.)[35] |

[31] Assumptions and References for Household Carbon Footprint Calculator | US EPA
[32] DataTrends Benchmarking and Energy Savings (energystar.gov)
[33] DOE Finds 2021 IECC Commercial Provisions Provide Significant Energy and Cost Savings - ICC (iccsafe.org)
[34] Resilient and Efficient Codes Implementation | Building Energy Codes Program
[35] Technical Assistance for the Adoption of Building Energy Codes | Department of Energy

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| **Co-Benefits** | • Energy independence (for community solar subscribers)<br>• Resilience for the energy grid<br>• Decreased cost of utilities<br>• Improved air quality |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | An energy disclosure ordinance in the City of St. Louis could help address the challenge of overwhelming utility bills for many struggling families, due to poorly insulated homes and underperforming or inefficient HVAC systems and appliances. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Local organizations are working to train those in need of jobs to install solar systems. These organizations include Employment Connection and St. Louis University. There is also a significant opportunity for workforce development with benchmarking and BEPS. |

### *Measure 5: EcoBlocks*

Urban EcoBlock (UEB) is a 501(c)3 organization that has spent years developing an ecoblock model that would fill in vacant lots and renovate existing buildings in North St. Louis and other economically distressed urban areas. An ecoblock would provide numerous community benefits such as reduced energy costs, neighborhood resiliency, vibrancy in high-vacancy areas, improved stormwater management, live-work opportunities, car sharing, and shared community space within the block. UEB also provides a replicable model with built-in metrics tracking that can be used in any dense urban "rust-belt" city.

*Table 7 Details for EcoBlocks*

| | |
|---|---|
| **Geographic location** | North St. Louis City |
| **Implementing agencies** | • National developers, working with local developers and non-profit developers in partnership with Urban EcoBlock<br>• Local Energy, MEP+ Civil Engineering Consultants<br>• Community Development Corporations (CDCs), such as Rise and Park Central Development<br>• National Consultants such as Stantec, Buro Happold, Biohabitat<br>• Local Community Engagement Organizations |
| **Authority to implement** | UEB has worked with the City of St. Louis Planning and Urban Design Agency to develop a Model EcoCode that would be approved as a Planned Development Unit. Developers would have the ability to voluntarily implement this pre-approved code on projects. The block-scale microgrid and ground source heating and cooling system could be owned and operated by Ameren or another third party. UEB's mission is to provide a roadmap for the sustainable redevelopment of city blocks and to remove the roadblocks to their implementation. |

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| **Emissions reduction strategies addressed** | **1.1** Weatherization of existing buildings<br>**1.3** Promote construction of energy-efficient buildings<br>**1.5** Expanding onsite renewable energy production<br>**1.4** Electrification of appliances<br>**2.2** Increase neighborhood connections and promote infill development<br>**2.5** Expand regional electric vehicle charging infrastructure |
| **Estimate of the quantifiable GHG emissions reductions** | Typical annual $CO_2$ emissions are 14,020 pounds per household, assuming approximately 943 kWh per month.[36] For example, the Jeff Vanderlou ecoblock would include 25 homes, so powering this project with renewable energy would be estimated to reduce 350,500 lbs of $CO_2e$, or 156 metric tons, annually. |
| **Implementation milestones** | • UEB has developed a comprehensive zoning code (EcoCode: St. Louis) with support of the William Kerr Foundation.<br>• UEB is currently working with outside consultants to design a block-scale microgrid and ground source heating and cooling system, which could be owned and operated by Ameren or a third party. Once a block site is identified, these designs can be adjusted to accommodate whatever scale is required.<br>• UEB has been working with the City of St. Louis Planning and Urban Design Agency to provide a pre-approved zoning model.<br>• UEB is working with four Neighborhood Associations on establishing a location for an ecoblock and is collaborating with two CDCs to provide neighborhood planning for an ecoblock. |
| **Metrics tracking** | Energy use and solar production on all buildings and common areas in the block will be metered, with the goal of being net zero energy (meaning an equal amount of carbon dioxide is removed from the atmosphere as is released into it). On the energy side, the project gets close to achieving Net Zero Carbon (no carbon dioxide is released at all). |
| **Cost** | The cost for implementing an ecoblock depends on a number of factors including the size of the block, the number of existing buildings to be renovated, the number of new buildings, and the location of the block itself.<br>UEB is working on a Case Study in the Academy Neighborhood which will serve as a sample proforma looking at:<br>• Existing Building Renovation ($/SF)<br>• New Building Construction ($/SF)<br>o (Based on Building Type)<br>• Site Improvements including Central Commons<br>Note: Cost for centralized Geothermal System and Community Solar PV will be by other parties with costs allocated as a "utility cost" to the building occupants. |

[36] Assumptions and References for Household Carbon Footprint Calculator | US EPA

| | |
|---|---|
| **Other funding sources** | • Clean Energy Tax Credits (cover 30% or more of a project's cost, depending on various factors)[37]<br>• Gateway Regional Environment Fund[38]<br>• Foundations such as the Kresge Foundation and William Kerr Foundation<br>• National Clean Investment Fund[39] |
| **Co-Benefits** | • Decreased cost of utilities<br>• Improved air quality<br>• Energy resilience<br>• Job Creation<br>• Health Benefits<br>• Community cohesion |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | • Ecoblocks discussed during the PCAP planning period would be located in Justice40 areas<br>• Incentives for maintaining a minimum of 15-20% low-income housing within the block<br>• Maintaining affordability for low-income residents as a requirement in the economic structure of the ecoblock |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Urban Ecoblock is also working with Dream Builders 4 Equity to develop a tailored workforce for their pre-fabricated efficient homes. In addition, local organizations are working to train those in need of jobs to install solar systems. These organizations include Employment Connection and St. Louis University. |

### *Measure 6: Incentive programs for residents*

An incentive program is a financial offering to encourage adoption of a technology or best practice. For carbon emissions reduction, incentives encourage adoption of a renewable energy source or implementation of a building efficiency practice or appliance. Incentives can be discounts, rebates, tax credits, tax deductions, grants or any other number of mechanisms. Webster Groves, MO, currently offers a solar rebate program for residents, and other cities have expressed interest in similar programs.

*Table 8 Details for Incentive Programs for Residents*

| | |
|---|---|
| **Geographic location** | Cities in the St. Louis Region, including the City of St. Louis and Brentwood |
| **Implementing agencies** | Local governments |

[37] BlueGreen Alliance | Making Clean Energy Tax Credits Deliver for the Public: A User Guide for Governments, Schools, and Nonprofits
[38] GREF-2022-Request-for-LOIs.pdf (stlgives.org)
[39] National Clean Investment Fund | US EPA

| | |
|---|---|
| **Authority to implement** | These agencies have the authority to implement the projects. |
| **Emissions reduction strategies addressed** | **1.1** Weatherization of existing buildings<br><br>**1.5** Expanding onsite renewable energy production |
| **Estimate of the quantifiable GHG emissions reduction** | • **Solar:** Typical annual $CO_2$ emissions are 14,020 pounds per household, assuming approximately 943 kWh per month.[40] This serves as an estimate of how much emissions would be reduced per household served by solar.<br>• **Cool Roofs:** The City of St. Louis estimates that a cool roof incentive program could save approximately 10 tons of $CO_2$ per year. |
| **Implementation milestones** | Final inspections can determine completion of projects, and grant fund recipients can submit reports to track progress. |
| **Metrics tracking** | • Number of incentives issued.<br>• Dollar value of incentives issued.<br>• kWh solar panels installed. |
| **Cost** | $25,000-$50,000 per city, per year |
| **Other funding sources** | • Solar for All (can also be used for enabling upgrades for solar)[41] |
| **Co-Benefits** | • Decreased cost of utilities<br>• Improved air quality<br>• Resilience for the energy grid |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | The City of St. Louis's program would target low-moderate income residents and businesses in Justice40 areas. Their cool roof program is an equitable model because repairing/replacing an inadequate roof poses a major cost-burden and adds to the Urban Heat Island effect. Replacing these roofs would enable more residents to be able to install solar in the future. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Local organizations, including Employment Connection and St. Louis University, are working to train those in need of jobs to install solar systems. |

### *Measure 7: Energy efficient upgrades and renewable energy for government buildings and nonprofits*

Upgrades to buildings owned by government agencies or non-profits are the same that can be done for privately owned property, such as weatherization, electrification, solar panel installation and appliance

[40] Assumptions and References for Household Carbon Footprint Calculator | US EPA
[41] Solar for All | US EPA

upgrades. Such improvements to properties owned by governments and non-profits are called out as a separate measure because financing and incentive structures are different.

*Table 9 Energy Efficient Upgrades and Renewable Energy for Government Buildings and Nonprofits*

| | |
|---|---|
| **Geographic location** | Governments and nonprofits located across the St. Louis Region |
| **Authority to implement** | These agencies have the authority to implement the projects. |
| **Implementing agencies** | Local governments and nonprofits; the following organizations have shovel-ready solar projects:<br>● City of St. Louis<br>● City of Brentwood<br>● Seed St. Louis<br>● Jackie Joyner-Kersee Food Agriculture Nutrition Innovation Center<br>● St. John's United Church of Christ<br>● Emmaus Village of Marthasville<br>● A Red Circle<br>● HOSCO Shift<br>● Confluence Farms<br>● Agriculture for Community Restoration, Economic Justice, and Sustainability (ACRES)<br>● New Roots Urban Farm<br>● Rustic Roots Sanctuary<br>● The Fit and Food Connection<br>● Ujima<br>● Julia's Farm STL<br>● Body N' Soil<br>● Dismas House |
| **Emissions reduction strategies addressed** | **1.1** Weatherization of existing buildings<br>**1.5** Expanding onsite renewable energy production |
| **Estimate of the quantifiable GHG emissions reductions** | According to the Avoided Emissions and Generation Tool AVERT Web Edition, one MWh of rooftop-scale photovoltaic in the Midwest results in 1,370 tons of avoided $CO_2$ emissions.[42] |
| **Implementation milestones** | Final inspections can determine completion of projects, and grant fund recipients can submit reports to track progress. |
| **Metrics tracking** | ● Number of incentives issued.<br>● Dollar value of incentives issued.<br>● kWh solar panels installed. |
| **Cost** | The cost to install a solar array is typically $3.75-$4.25 per watt. |

[42] AVERT Web Edition | US EPA

| | |
|---|---|
| **Other funding sources** | • MO Energy Loan Program (for local governments; applications close June 30, 2024)[43]<br>• Clean Energy Tax Credits (cover 30% or more of a project's cost, depending on various factors)[44] |
| **Co-Benefits** | • Decreased cost of utilities<br>• Improved air quality<br>• Resilience for the energy grid<br>• Many of the nonprofits listed as implementing agencies provide additional community benefits<br>  ○ Improved food access for those in food deserts<br>  ○ Additional emissions reductions from local food production |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Ten of the nonprofits listed as implementing agencies are located in Justice40 communities, and some of the others grow food to be distributed in Justice40 communities. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Local organizations, including Employment Connection and St. Louis University, are working to train those in need of jobs to install solar systems. |

### *Measure 8: Resilience hubs*

Resilience Hubs refers to a facility that is frequented by community members (i.e. a church, food pantry, etc.), where upgrades are made to make it more resilient to climate change. These upgrades can include enhanced sharing of information such as disaster preparedness messages, information about incentives for energy efficient appliances, or information about energy policy awareness; adding solar and battery storage; or adding cold food storage and therefore preventing food waste during power outages. Resilience Hubs could also incorporate many of the other measures in this PCAP, such as improved transit infrastructure, electric vehicle (EV) charging stations, green infrastructure, energy efficiency upgrades, and community gardens.

*Table 10 Details for Resilience Hubs*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | • Churches or other nonprofit organizations<br>• Local governments |
| **Authority to implement** | These agencies have the authority to implement this project. |

[43] Energy Loan Program | Missouri Department of Natural Resources (mo.gov)
[44] BlueGreen Alliance | Making Clean Energy Tax Credits Deliver for the Public: A User Guide for Governments, Schools, and Nonprofits

| | |
|---|---|
| **Emissions reduction strategies addressed** | **1.1** Weatherization of existing buildings<br><br>**1.5** Expanding onsite renewable energy production |
| **Estimate of the quantifiable GHG emissions reductions** | According to the Avoided Emissions and Generation Tool AVERT Web Edition, one MWh of rooftop-scale photovoltaic in the Midwest results in 1,370 tons of avoided $CO_2$ emissions.[45] |
| **Implementation milestones** | Final inspections can determine completion of projects, and grant fund recipients can submit reports to track progress. |
| **Metrics tracking** | • Number of locations that consider themselves resilience hubs |
| **Cost** | The cost to install a solar array is typically $3.75-$4.25 per watt. |
| **Other funding sources** | • Community Change Grants (Rolling deadline of Nov 21, 2024. The Environmental Protection Network suggests that applicants who are ready submit by Feb 20, 2024. Initial award announcements will be made as soon as March of 2024.)[46]<br>• Clean Energy Tax Credits (cover 30% or more of a project's cost, depending on various factors)[47]<br>• Neighborhood Transformation Grants (due March 29, 2024)[48]<br>• Greenhouse Gas Reduction Fund (funding awards to be announced in March of 2024)[49] |
| **Co-Benefits** | • Decreased cost of utilities for organizations that offer community services<br>• Improved air quality<br>• Energy independence and resilience to climate change |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Resilience hubs could be located in and serve Justice40 communities. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Local organizations, including Employment Connection and St. Louis University, are working to train those in need of jobs to install solar systems. |

[45] AVERT Web Edition | US EPA
[46] Inflation Reduction Act Community Change Grants Program | US EPA
[47] BlueGreen Alliance | Making Clean Energy Tax Credits Deliver for the Public: A User Guide for Governments, Schools, and Nonprofits
[48] Neighborhood Transformation Grants (stlouis-mo.gov)
[49] About the Greenhouse Gas Reduction Fund | US EPA

### *Measure 9: Energy efficient rehab of buildings*

Many buildings in the St. Louis Region have fallen into disrepair, presenting an opportunity to renovate them using energy efficient windows, insulation, and efficient electric appliances. When buildings are in need of significant repairs, the scope and scale of a rehab is greater than making only a few small changes. However, other issues with other buildings may need to be addressed in order for renovations to take place, such as the remediation of asbestos or lead paint.

*Table 11 Details for Energy Efficient Rehab of Buildings*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | • Nonprofits, such as the African Diaspora Council<br>• Local governments<br>• Developers |
| **Authority to implement** | These agencies have the authority to implement the projects. |
| **Emissions reduction strategies addressed** | **1.1** Weatherization of existing buildings<br><br>**1.4** Electrification of appliances |
| **Estimate of the quantifiable GHG emissions reductions** | The building envelope can account for approximately 30% of the energy consumed in residential and commercial buildings.[50] Energy efficient upgrades to the building envelope, such as new windows or roofing, can have a significant impact on energy use. |
| **Implementation milestones** | Final inspections can determine completion of projects, and grant fund recipients can submit reports to track progress. |
| **Metrics tracking** | • Square footage of rehabbed space. |
| **Cost** | For energy efficient improvements to an exterior building envelope, including windows, roofing, tuckpointing, and minor interior upgrades for code, it is estimated to be $80 per square foot (plus 7.5% for design fees and 15% for general contractor fees, permits, insurance, and overhead). Additional costs must be factored in for remediation of asbestos or lead paint, which is common in older buildings. |
| **Other funding sources** | • **Environmental assessment:** The MoDNR Brownfields program has the ability to cover phase I/II environmental assessment costs, in addition to asbestos and lead paint materials testing (applications are accepted on a rolling basis). Within St. Louis County, the primary contact for brownfields assessment and remediation is the St. Louis Economic Development Partnership. Within St. Louis City, the primary contact for brownfields assessment and remediation is St. Louis Development Corporation.<br>• **Remediation:** The EPA offers grants that can be used for the |

[50] Building Envelope | Better Buildings Initiative (energy.gov)

| | |
|---|---|
| | remediation of asbestos and lead, among other contaminants (annual grant competitions take place in the fall). Within St. Louis County, the primary contact for brownfields assessment and remediation is the St. Louis Economic Development Partnership. Within St. Louis City, the primary contact for brownfields assessment and remediation is St. Louis Development Corporation. |
| **Co-Benefits** | Increased neighborhood vitality due to decreased vacancy |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Buildings that are vacant, neglected, or in need of significant repairs can be more common in disadvantaged communities. According to the report Environmental Racism in St. Louis, around 90% of the City's vacant properties are in majority-black neighborhoods. Three of those neighborhoods that are each more than 97% black— Wells Goodfellow, Jeff Vanderlou, and Greater Ville— contain about 25% of all the vacant properties in the City.[51] |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | St. Louis University and St. Louis Community College collaborate on a brownfields job training program. |

## 3.2 Transportation

The transportation sector covers all journeys by road, rail, water, and air, including intercity travel. Transportation can include the travel of individuals or the movement of goods. GHG emissions are produced directly by the combustion of fuel or indirectly by the use of grid-supplied electricity. Transportation is a major contributor to carbon pollution, and unless these emissions are mitigated, emissions will grow as the population increases and more goods are shipped. There are many possible strategies to reduce emissions, including increasing the efficiency of vehicle technology combined with using lower carbon fuels, and changing how we travel and transport goods.

### 3.2.1 Emissions Reduction Opportunities

Transportation emissions are determined by two primary elements: the total miles traveled and the efficiency characteristics of the transportation mode (types of fuels used and vehicle operation characteristics). Thus, this PCAP targets both elements to address each component of transportation emissions.

#### *Sector Reduction Opportunity 1. Reduce vehicle miles traveled per capita*

Vehicle miles traveled (VMT) refers to the total number of miles traveled by motor vehicles in a region over a certain period of time, typically measured over a year. As VMT increases, so do GHG emissions. This is due to both tailpipe exhaust and because of energy used to build roads to accommodate more car travel. A reduction in regional VMT will not only reduce GHG emissions, but has other co-benefits such as less congestion, less air and noise pollution, and safer streets. The table below lists strategies to reduce VMT across the region.

[51] 2019-09-30_STL_Env_Racism_Report_REVISED_FINAL_Cropped.pdf (squarespace.com)

*Table 12 Strategies to Reduce Vehicle Miles Traveled Per Capita*

| Strategy | Description |
|---|---|
| **2.1** Increase use of non-single occupancy vehicle travel modes by increasing biking, walking, transit, and carpooling. | Non-single occupancy mode share can be increased through transportation demand management (TDM) strategies which include investment in infrastructure and incentive/pricing programs. Examples include:<br>- Walking and biking: new/upgraded bicycle or pedestrian facilities/connections and low-stress streets, pedestrian oriented street design, complete streets, bike share/scooter share programs, rebates for bicycle purchase, improved wayfinding, public bike repair stations, bike storage and showers, etc.<br>- Transit: upgrading transit assets and bus shelters, improving route frequency, reliability, travel times, geographic coverage, fare policies/transit subsidies, etc.<br>- Carpooling: high occupancy vehicle (HOV) lanes, workplace carpool incentives, ridematching tools, vanpool programs, park-and-ride lots, parking pricing, etc. |
| **2.2** Increase neighborhood connections and promote infill development | Communities across the region can update building and zoning codes to encourage mixed-use and infill development, resulting in daily necessities and services (such as work, shopping, education, healthcare, and leisure) to be reached in a 15-minute walking, biking, or transit trip. Municipalities can also adjust parking minimum requirements for mixed-use developments.<br>In locations near a transit station, transit oriented development (TOD) is a strategy that promotes higher-density mixed-use development focused at transit stations, along with walkable and attractive environments that make it easier to take transit or reach destinations without an automobile. |
| **2.3** Improve efficiency of freight movement | Shifting freight from trucks to rail and waterborne navigation can support significant reduction in VMT and a decrease in emissions. Effective strategies can support development of rail, port, and multimodal transfer station infrastructure to increase volume and types of goods transported by these lower emissions modes. Additionally local freight travel can focus on improving vehicle fleet movement through efficient routing and strategic freight loading/unloading loading zone placement. |

### *Sector Reduction Opportunity 2. Increase fuel efficiency and use of lower carbon fuels*

GHG emissions from transportation are also determined by the types of fuels used and vehicle operation characteristics.

*Table 13 Strategies to Increase Fuel Efficiency and Use of Lower Carbon Fuels*

| Strategy | Description |
|---|---|
| **2.4** Increase share of zero- and low- emissions vehicles (e.g. electric, hybrid, compressed natural gas (CNG), liquefied natural gas (LNG), fuel cell) | Vehicles can include on-road vehicles (e.g. cars, trucks) or off-road vehicles (e.g. construction equipment, agricultural equipment, rail, recreational boats, barges, airplanes). |

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| **2.5** Expand regional electric vehicle charging infrastructure | Public charging infrastructure plays a key role for people without off-street parking and for longer trips. This infrastructure will support increased adoption of electric vehicles and address concerns about electric vehicle range. Private charging infrastructure is also important to support electric vehicle adoption particularly at multifamily housing and private businesses. As most electric vehicle drivers will charge their vehicles at home and at work, increasing the ability for individuals to charge in privately owned locations can support increased adoption of electric vehicles. |
| **2.6** Address key regional bottlenecks and reduce idling | Projects that support minimizing delays on roadways can support emissions reduction. Strategies include intersection improvements (e.g. turn lanes, traffic signals, and roundabouts) and corridor improvements (e.g. traffic signal interconnection and optimization, ITS improvements such as traveler information, and dynamic messaging). However, it is important that these strategies simultaneously support and enhance bicycle, pedestrian, and transit travel. Additionally, municipalities can enforce and educate on existing vehicle idling regulations. Idle reduction, or limiting the amount of time that vehicles idle unnecessarily, can be a key strategy for increasing fuel efficiency and reducing emissions. |

### 3.2.2 Emissions Reduction Measures

This section provides a set of priority GHG reduction measures. Priority GHG reduction measures are based on GHG emissions information and focused on achieving the most significant GHG reductions possible, while considering other relevant planning goals. Priority measures were identified through stakeholder engagement efforts.

#### *Measure 1: Electric conversion of municipal, transit, school bus, and other fleets*

The U.S. government has established goals of electrifying 50% of new light-duty vehicle sales by 2030. In February 2021, Mayor Lyda Krewson signed an executive order that formally began the transition for the St. Louis City fleet, requiring city departments to prioritize acquiring electric vehicles (EVs) over conventional vehicles.[52] Many other municipalities in the region are also looking for opportunities to incorporate EV's into their fleets. Replacing internal combustion engine (ICE) vehicles with EVs will require investment in acquisition and charging infrastructure initially, but will provide substantial savings in fuel and maintenance costs over time while helping achieve emissions reduction goals.

*Table 14 Details for Electric Conversion of Municipal, Transit, School Bus, and Other Fleets*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | • Local governments and transportation agencies, such as St. Clair County Transit, Madison County Transit, the City of St. Louis, the City of Alton, Jefferson County, Bond County, the City of Brentwood, and Lambert Airport.<br>• Nongovernmental organizations, such as the Food Share Network, earthday365, Emmaus Village of Marthasville, and Seed St. Louis |
| **Authority to implement** | All of these implementing agencies have the authority to implement these projects. |
| **Emissions reduction strategies addressed** | **2.4** Increase share of zero- and low- emissions vehicles (e.g. electric, hybrid, CNG, LNG, fuel cell) |

[52] St. Louis Charges Toward Clean Air with Electric Vehicles (nrdc.org)

| | |
|---|---|
| **Estimate of the quantifiable GHG emissions reductions[53]** | Metro Transit revenue fleet:[54]<br>● Metrobus vehicles: 41.2 $tCO_2e$/yr per vehicle<br>● Metro paratransit Call-A-Ride vans: 13.7 $tCO_2e$/yr per vehicle<br><br>Other fleets:[55]<br>● Plug-in hybrid EV (national average): 3.9 $tCO_2e$/yr per vehicle[56]<br>● Transit van: 1.8 $tCO_2e$/yr per vehicle[57]<br>● School bus: 7.5 $tCO_2e$/yr per vehicle<br>● Police vehicle: 7.4 $tCO_2e$/yr per vehicle[58]<br>● Street sweeper: 7.4 $tCO_2e$/yr per vehicle[59]<br>● Refuse truck: 17.9 $tCO_2e$/yr per vehicle[60]<br><br>EV charging infrastructure estimates, from AFLEET's CFI Emissions Tool[61]<br>● 1 Level 3 charger is estimated to reduce 21.3 $tCO_2e$/yr<br>● 1 Level 2 charger is estimated to reduce 4.6 $tCO_2e$/yr |
| **Implementation milestones[62]** | ● Assemble Key Team Members and Set Goals<br>● Identify Electric Vehicle Candidates<br>● Estimate Power and Charging Station Needs<br>● Charging Site Assessment and Planning<br>● Engage with Local Electrical Utility<br>● Engage with Hardware Vendors and Contractors<br>● Finalize Plans for Vehicles, EVSE, and Construction<br>● Complete Procurement Processes<br>● Installation<br>● Implementation: Driver Engagement and O&M |
| **Metrics tracking[63]** | ● Percent share and number of electric vehicles on the road<br>● Miles per gallon equivalent (MPGe) of vehicle fleet<br>● Electricity generation profile<br>● Charging and O+M efficiency - lost/gained time, productivity |

[53] Estimate calculation provided by U.S. Department of Energy: $CO_2$ g/mi = (8,887 grams of $CO_2$ emitted per 1 gallon of gas / MPG) * 1.25 (upstream emissions factor)
Conversion of $CO_2$g/mi to $tCO_2e$/yr: $tCO_2e$/yr = (Annual miles driven * $CO_2$g/mi) / 1,000,000
[54] Model, mileage, and lifespan data from EWG's 2018 Transit Asset Management Plan and Metro Bi-State Director of Quality Assurance/VMD admin Geoffrey Kehr
[55] Model, mileage, and lifespan data from EV Fleet Insights - Electrification Feasibility Assessment for the City of St. Louis, September 8, 2021, prepared by eIQ Mobility
[56] Alternative Fuels Data Center: Emissions from Electric Vehicles (energy.gov)
[57] Compare Cars Side-by-Side (fueleconomy.gov)
[58] Model, mileage, and lifespan data from St. Louis County, Missouri Police Department, "Patrol Cars Changes over the Years 1955-2018", December 31, 2018
[59] Estimate from NYC Sanitation Press Conference, May 6, 2021, assuming a 12 year lifespan
[60]MPG and MPGe data from Transportation Research Record, Quantitative Evaluation of MD/HD Vehicle Electrification using Statistical Data, 2018
[61] AFLEET Tool - Argonne National Laboratory (anl.gov)
[62] Washington Green Transportation Program, Milestones for Electrifying Public Fleets, August 2021, MilestonesPubFleets_final.pdf (wsu.edu)
[63] Massachusetts Clean Energy and Climate Plan for 2025 and 2030, download (mass.gov)

| | |
|---|---|
| **Cost** | • Varies based on fleet size and make/model of vehicles replaced<br>• Battery electric buses provide substantial savings in fuel and maintenance costs – up to $525,000 over the life of each bus, according to Metro Transit.<br>• Light-duty all-electric vehicle operation and maintenance (O&M) averages about 3 cents per mile, according to the U.S. General Services Administration.[64] |
| **Other funding sources** | • Carbon Reduction Program & Congestion Mitigation & Air Quality Improvement Program (applications accepted by East-West Gateway COG for those in the 8-county bi-state region, and by the State for counties in the 15-county MSA outside of the 8-county bi-state region)[65]<br>• Section 30C Alternative Fuel Vehicle Refueling Property Credit[66]<br>• Ameren MO Charging Station Incentives[67]<br>• Clean School Bus Program Rebates[68]<br>• Low- and No-Emission Bus Program/Grants for Buses and Bus Facilities[69]<br>• Volkswagen Trust Settlement from the Missouri Department of Natural Resources[70]<br>• Volkswagen Environmental Mitigation Trust Fund from Illinois EPA[71]<br>• Diesel Emission Reduction Act (DERA) funds[72]<br>• Climate and Equitable Jobs Act (CEJA) funds[73]<br>• Greenhouse Gas Reduction Fund Section 60103[74]<br>• Ameren Missouri Electric Vehicles and Equipment Incentives[75]<br>• Charging and Fueling Infrastructure Discretionary Grant Program[76] |
| **Co-Benefits** | Reduction in particulate matter (PM2.5), Volatile Organic Compounds (VOCs), Nitrogen oxides (NOx), Carbon monoxide (CO), and noise pollution |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | The "SILVERS" Program, (St. Louis Vehicle Electrification Rides for Seniors) was launched in Fall 2021. Senior citizens (aged 60+) interested in receiving rides for medical appointments, shopping trips, social activities, or more can schedule appointments by calling NYSS for North City residents or City Seniors, Inc- for South City residents. |

[64] Alternative Fuels Data Center, Electric Vehicles for Fleets
[65] Congestion Mitigation and Air Quality (CMAQ) Improvement Program
[66] Alternative Fuel Vehicle Refueling Property Credit | Internal Revenue Service (irs.gov)
[67] Charging Station Incentives - Ameren Missouri
[68] Clean School Bus Program Rebates | US EPA
[69] Low or No Emission and Grants for Buses and Bus Facilities Competitive Programs FY2023 Notice of Funding Opportunity | FTA.
[70] Volkswagen Trust Funds | Missouri Department of Natural Resources
[71] VW Settlement (illinois.gov)
[72] Driving a Cleaner Illinois - Driving a Cleaner Illinois
[73] Climate and Equitable Jobs Act - Climate and Equitable Jobs Act (illinois.gov)
[74] About the Office of the Greenhouse Gas Reduction Fund (OGGRF) | US EPA
[75] Electric Vehicles - Incentives & Resources - Ameren Missouri
[76] CFI - Environment - FHWA (dot.gov)

| | |
|---|---|
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | The electrification of fleets may lead to more training and employment opportunities around designing and maintaining electric fleets.<br><br>Youthbuild: Administered by U.S. Department of Labor; a community-based pre-apprenticeship program providing technical skills training for opportunity youth ages 17-24 who left school without a secondary diploma.[77] |

### *Measure 2: Bike and pedestrian infrastructure and connectivity*

Investing in bicycle and pedestrian infrastructure can improve connectivity, making shorter trips by foot or bike an easier and more enjoyable choice for residents. While this infrastructure leads to immediate benefits like increased active travel, reductions in vehicle miles traveled and emissions take longer to materialize. In order to truly address emissions reductions, implementing bicycle and pedestrian facilities should be part of a multi-pronged approach along with other interventions. For the greatest success, a network of bike and pedestrian infrastructure should provide access to a wide array of employment and education opportunities across the city.

*Table 15 Details for Bike and Pedestrian Infrastructure and Connectivity*

| | |
|---|---|
| **Geographic location** | Jefferson County, St. Charles County, St. Louis County, City of St. Louis, St. Clair County |
| **Implementing agencies** | Great Rivers Greenway; Bi-State; City of St. Charles; Jefferson County; St. Louis County; City of St. Louis |
| **Authority to implement** | Pending acquisition of the land by these agencies, the agencies have the authority to implement the projects. |
| **Emissions reduction strategies addressed** | **2.1** Increase use of non-single occupancy vehicle travel modes by increasing biking, walking, transit, and carpooling. |
| **Estimate of the quantifiable GHG emissions reductions** | Depending on the assumed percent of auto trips replaced, reduction estimates can range from 146[78] to 282[79] tCO2e/yr per mile for greenways. The Hodiamont greenway is 3.5 miles in length, and Brickline greenway is 10 miles. |

[77] YouthBuild (stlouis-mo.gov)

[78] Toolkit - CMAQ - Air Quality - Environment - FHWA (dot.gov) - Using CMAQ Bicycle, Pedestrian, and Shared Micro Mobility tool:

- Hodiamont Perpendicular Corridor AADT: 79,925 auto trips[78]
- EWG region bike/ped mode share: 1.9%[78]
- 1.9% of 79,925 = 1,518 estimated daily bike/ped trips currently
- Forecasted share of auto trips replaced: 4 % or 3197 daily bike/ped trips
- Reduction of 1272.3 $kgCO_2e$/day or 511.9 $tCO_2e$/yr
- Hodiamont: 3.5 miles = 146.25 $tCO_2e$/yr reduction per mile, assuming mode share is consistent throughout the year.

[79] Great Rivers Greenway Regional Plan Update 2022, Appendix 6: Measures of Success, prepared by Econsult Solutions, Inc. (ESI)

| | |
|---|---|
| **Implementation milestones** | • Policy or Plan adoption and changes<br>• Set and communicate short and long term mode shift targets<br>• Secure partners<br>• Pilot Program<br>• Secure funding<br>• Program Establishment (Bike and Ped Plan, TDM program, etc)<br>• Fill in Network gaps and do Bicycle and Ped Plan/ Expansion<br>• Community Awareness and Education |
| **Metrics tracking** | • Vehicle distance/miles traveled<br>• Mode shift<br>• Number of users performing an activity (e.g. walking, cycling)<br>• Walk Score index<br>• Level of service/connectivity (survey public perception)<br>• Congestion<br>• Air quality<br>• Reduced traffic injury |
| **Cost** | Hodiamont design/engineering completion: $42,000 - $49,000 |
| **Other funding sources** | • Congestion Mitigation and Air Quality Improvement Program[80]<br>• Safe Streets and Roads for All (SS4A) Grant Program[81]<br>• Active Transportation Infrastructure Investment Program (ATIIP)[82]<br>• Surface Transportation Program - Suballocated (STP-S)[83]<br>• Transportation Alternatives Program (TAP)[84] - Bicycle and Pedestrian Facility Project; Safe Routes to School (SRTS) Non-Infrastructure Project<br>• Surface Transportation Block Grant Program (STBG) – Transportation Alternatives (TA) Set-Aside[85], Recreational Trails Program (RTP)[86]<br>• Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program[87]<br>• Highway Safety Improvement Program – Safe System Approach[88]<br>• Metro East Parks and Recreation District Community Planning Grant Program - Eligible applicants include municipalities, townships, counties, transportation districts and park districts located within St. Clair and Madison Counties in Illinois.[89]<br>• Illinois Transportation Enhancement Program (ITEP)[90] |

[80] CMAQ - Air Quality - Environment - FHWA (dot.gov)
[81] Safe Streets and Roads for All (SS4A) Grant Program | US Department of Transportation
[82] ATIIP - Bicycle and Pedestrian Program - Environment - FHWA (dot.gov)
[83] Surface Transportation Program – Suballocated (STP-S)
[84] Transportation Alternatives Program (TAP) – East-West Gateway Council of Governments (EWGCOG)
[85] Transportation Alternatives - Environment - FHWA (dot.gov)
[86] Recreational Trails - Environment - FHWA (dot.gov)
[87] https://www.transportation.gov/sites/dot.gov/files/2023-11/RAISE%202024%20NOFO%2011.30.23_0.pdf
[88] INTEGRATING THE SAFE SYSTEM APPROACH WITH THE HIGHWAY SAFETY IMPROVEMENT PROGRAM AN INFORMATIONAL REPORT (dot.gov)
[89] MEPRD Community Planning Grant Program
[90] ITEP (illinois.gov)

| | |
|---|---|
| | • Illinois Bike Path Grant Program[91] |
| **Co-Benefits** | • Public health improvements from increased physical activity<br>• Modal switch leading to fewer healthcare costs from traffic crashes<br>• Life extension/life-years saved<br>• Reduces transport costs by reducing car dependence<br>• Less congestion and unproductive time spent in traffic<br>• Cost-effectiveness - leads to a roughly 10x emissions reduction per dollar spent on infrastructure compared to the development of metro rail systems[92] |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Traditionally underserved communities are less likely to own a car, have access to transit, be physically able to drive, or have jobs that operate within transit hours, and therefore may have a greater need for bike/ped facilities compared to other groups.[93] |
| **LIDAC Census Tracts Impacted** | This project would apply to all of the LIDAC census tracts in Appendix C in Jefferson County, St. Charles County, St. Louis County, City of St. Louis, and St. Clair County. |
| **Workforce** | Increased access to employment and education opportunities.<br><br>Transportation enhancement projects create up to 17 jobs per $1 million spent.[94] |

### *Measure 3: Development of a container-on-vessel port facility*

Organizations in the region are working to develop a new container-on-vessel service to efficiently and affordably transport freight along underutilized inland waterways. The plan involves new waterway vessels that will move large volumes of goods and commodities along both the Mississippi River and Missouri River and their tributaries, serving key consolidation ports in St. Louis and Memphis and several other feeder ports, creating an all-water north-south trade lane connecting the Midwest to the lower Mississippi River[95]. The initial effort is focused on upgrading a port in Jefferson County to be able to support container-on-vessel service. The vessels will utilize LNG (liquefied natural gas) power, and will be able to carry a diversity of cargo, including refrigerated containers. One river vessel can replace nearly 2,400 semi-trucks.

*Table 16 Details of Development of a Container-on-Vessel Port Facility*

| | |
|---|---|
| **Geographic location** | Port of Herculaneum, Jefferson County, Missouri |
| **Implementing agencies** | Jefferson County Port Authority |

[91] Bike Path Program (illinois.gov)
[92] The Institute for Transportation and Development Policy, FIA Foundation, "Protected Bicycle Lanes Protect the Climate", 2021
[93] FHWA Pursuing Equity in Pedestrian and Bicycle Planning, April 2016
[94] Study by American Association of State Highway and Transportation Officials (AASHTO) on American Recovery and Reinvestment Act (ARRA); Source: Rails to Trails Conservancy
[95] www.thefreightway.com/container-on-vessel-service-to-the-midwest-moves-closer-to-reality/

| | |
|---|---|
| **Authority to implement** | This agency has the authority to implement the project. |
| **Emissions reduction strategies addressed** | **2.3** Improve efficiency of freight movement<br>**2.4** Increase share of zero- and low- emissions vehicles (e.g. electric, hybrid, CNG, LNG) |
| **Estimate of the quantifiable GHG emissions reductions**[96] [97] | 5436.32 $mtCO_2e$/year (scope 1)<br>264,848.22 $mtCO_2e$/year (scope 3) |
| **Implementation milestones** | ● Construct island container terminal facility in Herculaneum<br>● Begin container-on-vessel service |
| **Metrics tracking** | ● Average annual daily truck traffic (AADTT) on I-55 in Jefferson County<br>● Container-on-vessel tonnage and volume |
| **Cost** | Phase 1 is estimated at $25 million (total cost is $50 million) |
| **Other funding sources** | ● $25 million grant received from State of Missouri (2022)<br>● Clean Ports Program[98] |
| **Co-Benefits** | Reduction in particulate matter (PM), volatile organic compounds (VOCs), nitrogen oxides ($NO_x$), and carbon monoxide (CO) |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | The port is not located in a disadvantaged community as identified through the CEJST tool; however, this project will reduce the number of trucks passing through CEJST communities. |
| **LIDAC Census Tracts Impacted** | This project is not located in a LIDAC census tract, but it would reduce the number of trucks passing through LIDAC tract 29099700605. |
| **Workforce** | Expansion of the port will lead to significant numbers of new port operation jobs |

### *Measure 4: Port truck staging and calling facility*

Idling causes harmful emissions, especially with medium- and heavy-duty trucks. At port facilities, the inefficient processing of trucks leads to increased idling times. Creating a truck staging and calling facility with EV infrastructure and idle reduction technology will allow the port to implement a 5-minute idle policy to move trucks more efficiently through the port and reduce idling time, thereby reducing harmful emissions.

[96] "LINER" container-on-vessel specs. www.americanpatriotholdings.com/american-patriot-container-transport-llc.html
[97] Environmental Defense Fund (EDF), Green Freight Handbook
[98] Clean Ports Program

*Table 17 Details of Port Truck Staging and Calling Facility*

| | |
|---|---|
| **Geographic location** | Madison, Illinois |
| **Implementing agencies** | America's Central Port |
| **Authority to implement** | The implementing agency has the authority to implement. |
| **Emissions reduction strategies addressed** | **2.3** Improve efficiency of freight movement<br>**2.6** Address key regional bottlenecks and reduce idling |
| **Estimate of the quantifiable GHG emissions reductions**[99] [100] | 50% idling time reduction of 1 hr avg. idling time: **51.6 $tCO_2e$/yr reduction**<br>Overall range: **25.2 minimum – 152.4 maximum $tCO_2e$/yr reduction** (25% reduction of 1 hr avg idling time to 75% reduction of 2 hr avg idling time)[101] |
| **Implementation milestones** | • EV Charging and Idle Reduction technology evaluation<br>• Preliminary Engineering<br>• Wetlands delineation study<br>• Engage with communication software vendors<br>• Construction Engineering<br>• Complete procurement process<br>• Construction |
| **Metrics tracking** | • Queue length<br>• Idle time (current avg 1-2 hours, anecdotal, seasonal) |
| **Cost** | $2,000,000 for staging lot, $1,000,000 for technology |
| **Other funding sources** | • Congestion Mitigation Air Quality (CMAQ) Improvement Program (Open) – funds cost-effective reduction of congestion, ozone, carbon monoxide, or particulate matter emissions in non-attainment/maintenance areas.<br>• Clean Heavy Duty Vehicle Program under Inflation Reduction Act – grants and/or rebates to replace HD vehicles and fund zero-emission vehicle infrastructure, workforce development, and planning and technical activities. |

[99] "LINER" container-on-vessel specs. www.americanpatriotholdings.com/american-patriot-container-transport-llc.html

[100] Environmental Defense Fund (EDF), Green Freight Handbook

[101] Method: According to the U.S. Department of Energy (Long-Haul Truck Idling Burns Up Profits (energy.gov), idling a heavy-duty truck consumes about 0.8 gallon of fuel per hour. Calculations made with the assumption of a 25%-75% reduction in average idling time (1-2 hrs).

- To get conservative estimate: 1192 trucks/month, idling for 1 hr on average = 1192 hours idling/month
- 1192 hours idling * 0.8 gallons of gasoline per hour = 953.6 gallons of gasoline spent idling/month
- 953.6 gallons of gasoline = 8.5 metric tons $CO_2$ emitted/month; 102 metric tons $CO_2$ emitted/year (Greenhouse Gas Equivalencies Calculator | US EPA)
- 25% reduction = 25.2 metric tons $CO_2$ reduced annually
- 50% reduction = 51.6 metric tons $CO_2$ reduced annually
- 75% reduction = 76.8 metric tons $CO_2$ reduced annually

| | |
|---|---|
| | • Planning Program and Local Technical Assistance Program FY 21-23 (Applications accepted on an ongoing basis – open) – helps build capacity, guide economic prosperity and resiliency, and create and retain high-quality jobs.<br>• Metropolitan Planning Program through the Fixing America's Surface Transportation (FAST) Act for the Metropolitan Transportation Plan (MTP) (Ongoing – open) – funds used by MPOs for multimodal transportation planning and programming.<br>• Port Infrastructure Development Program (PIDP) (April 30, 2024 – open) – grants support efforts to improve port and related freight infrastructure<br>• National Highway Freight Program (NHFP) (Open) – funds investments in infrastructure and operational improvements that strengthen economic competitiveness, reduce congestion, and reduce the cost and environmental impacts of freight transportation.<br>• National Highway Performance Program (NHPP) (Open) – funds the improvement and construction of new facilities on the NHS to achieve Asset Management Plan performance targets<br>• Transportation Infrastructure Finance and Assistance (TIFIA) (rolling applications – open) – provides federal credit assistance to nationally/regionally significant surface transportation projects with some applicability to port intermodal projects. |
| **Co-Benefits** | • Improved traffic flow through the port for non-truck traffic<br>• Reduced roadway damage from trucks idling on the shoulders of Bissell Street (increased frequency of construction has its own environmental implications)<br>• Safety improvement for non-truck traffic and trucks backing up towards route 3<br>• Improved air quality - reduced emissions of carbon dioxide ($CO_2$), nitrogen oxides ($NO_x$), carbon monoxide (CO), and particulate matter (PM)[102]<br>• NOx pollution from heavy-duty vehicles also causes damage to terrestrial and aquatic ecosystems. |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Pollution from heavy-duty trucks contributes to poor air quality and health across the country, especially in underserved communities. Populations who live, work, or go to school near areas of high truck activity, like ports, experience higher rates of numerous adverse health effects, and are more likely to be low-income or people of color. |
| **LIDAC Census Tracts Impacted** | This project would be in tract 17119400200 and immediately adjacent to tracts 17119400700 and 17119400600. |
| **Workforce** | • Construction employment - CEJA programs prioritize Illinoisans who live in communities that have historically faced economic barriers and environmental damage with the goal of bolstering a diverse workforce in the clean energy industry.<br>• Increased efficiency leads to increased capacity and employment needs |

[102] Learn About Idling Reduction for Locomotives | US EPA

### *Measure 5: Signal preemption and priority*

Traffic signal preemption is defined as the transfer of normal operation of a traffic control signal to a special control mode of operation to give right-of-way to important vehicles, such as emergency vehicles[103]. Transit Signal Priority (TSP) is similar in that it modifies traffic signal timing or phasing when transit vehicles are present. Signal preemption and TSP can be powerful tools to improve both reliability and travel time while reducing overall intersection delay. When properly installed, GHG emissions can be reduced by minimizing overall delay and reducing idling at intersections. In the long-term, TSP can result in encouraging transit ridership.

*Table 18 Details of Signal Preemption and Priority*

| | |
|---|---|
| **Geographic location** | St. Louis City and St. Louis County |
| **Implementing agencies** | Bi-State Development, St. Louis City, St. Louis County |
| **Authority to implement** | Local and state governments that control traffic signals have the authority to implement traffic signal preemption or TSP (in collaboration with transit companies). |
| **Emissions reduction strategies addressed** | **2.4** Increase use of non-single occupancy vehicle travel modes by increasing biking, walking, transit, and carpooling.<br>**2.3** Address key regional bottlenecks and reduce idling |
| **Estimate of the quantifiable GHG emissions reduction** | Very challenging to estimate. Will need data on delay reduction, project scope, and potential ridership impacts. |
| **Implementation milestones** | • Develop a plan to prioritize intersections and corridors for TSP<br>• Identify if existing traffic signal hardware is compatible with TSP hardware and upgrade signals when necessary<br>• Equity emergency vehicles and/or transit vehicles with transponders<br>• Implement signal timing changes to accommodate TSP |
| **Metrics tracking** | • Transit ridership on TSP enabled route<br>• Transit travel times<br>• Intersection vehicle delay |
| **Cost** | TSP transponder costs are estimated at about $839 each, and complete intersection infrastructure costs up to about $50,380. The older the signal, the higher the potential upgrade costs. |
| **Other funding sources** | • Congestion Mitigation and Air Quality Improvement (CMAQ)[104]<br>• Surface Transportation Program – Suballocated (STP-S)<br>• Advanced Transportation Technologies and Innovative Mobility Deployment (ATTIMD) program also known as ATTAIN[105] |
| **Co-Benefits** | Reduction in particulate matter (PM2.5), Volatile Organic Compounds (VOCs), |

[103] Traffic Signal Timing Manual, https://ops.fhwa.dot.gov/publications/fhwahop08024/chapter9.htm
[104] Congestion Mitigation and Air Quality (CMAQ) Improvement Program – East-West Gateway Council of Governments (EWGCOG) (ewgateway.org)
[105] Advanced Transportation Technologies and Innovative Mobility Deployment | US Department of Transportation

| | | | | |
|---|---|---|---|---|
| | Nitrogen oxides (NOx), Carbon monoxide (CO), noise pollution | | | |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | The highest transit ridership routes directly serve disadvantaged communities as identified through the CEJST tool. | | | |
| **LIDAC Census Tracts Impacted** | 29510124200 | 29510127100 | 29510121100 | 29189214200 |
| | 29510105500 | 29510127400 | 29510126700 | 29189210300 |
| | 29510106500 | 29510127500 | 29510106100 | 29189211900 |
| | 29510107500 | 29510105400 | 29510107400 | 29189212500 |
| | 29510108300 | 29510106400 | 29510111300 | 29510108200 |
| | 29510111100 | 29510101800 | 29510126600 | 29510109600 |
| | 29510111500 | 29510106200 | 29510116100 | 29510111400 |
| | 29510115500 | 29510106700 | 29510115300 | 29510115200 |
| | 29510101500 | 29510107200 | 29510115600 | 29510106300 |
| | 29510105300 | 29510107300 | 29510121200 | 29510106600 |
| | 29510107600 | 29189212700 | 29189221800 | 29510111200 |
| | 29510108100 | 29189213400 | 29189210400 | 29510110400 |
| | 29510109700 | 29510125700 | 29189214300 | 29189211500 |
| | 29510110200 | 29510115700 | 29189211102 | 29189212200 |
| | 29510112200 | 29510116400 | 29189212001 | 29189216000 |
| | 29510110300 | 29510118400 | 29189212002 | 29189214100 |
| | 29510110500 | 29510124100 | 29189212101 | 29510110100 |
| | 29510120200 | 29510124600 | 29189212102 | 29510115100 |
| | 29510112300 | 29189210702 | 29189214601 | 29510115400 |
| | 29189210501 | 29189213300 | 29189214602 | 29189216900 |
| | 29189210502 | 29189214700 | 29189213102 | 29189220300 |
| | 29189210703 | 29189210200 | 29189213800 | 29510116302 |
| | 29189210704 | 29189210600 | 29189213900 | 29510126900 |
| | 29189211201 | 29189212600 | 29189213600 | 29510127000 |
| | 29189211801 | 29189213101 | 29189211802 | |
| **Workforce** | Minimal impacts | | | |

### *Measure 6: Community mobility hubs*

Community mobility hubs are places of connectivity, where different modes of travel converge. They include features that support more intuitive and accessible public transit, walking and biking, bikeshare and carshare services, neighborhood electric vehicles, and micro-transit services. Hubs have a larger presence than the standard bus stop, creating safer, more comfortable spaces for riders waiting for bus service, transferring between routes, or connecting to other transit modes[106].

*Table 19 Details of Construct Community Mobility Hubs*

| | |
|---|---|
| **Geographic location** | Delmar Boulevard and Kingshighway Boulevard<br>West Florissant Avenue and Chambers Road<br>St. Charles Rock Road and San Carlos Lane |
| **Implementing agencies** | Bi-State Development, St. Louis City, St. Louis County |

[106] Mobility Hubs Reader Guide

| | |
|---|---|
| **Authority to implement** | Pending acquisition of the land by these agencies, the agencies have the authority to implement the projects. |
| **Emissions reduction strategies addressed** | **2.1** Increase use of non-single occupancy vehicle travel modes by increasing biking, walking, transit, and carpooling.<br>**2.2** Increase neighborhood connections and promote infill development |
| **Estimate of the quantifiable GHG emissions reductions** | Location-specific and challenging to estimate for PCAP. Dependent on population density and number of amenities reachable by hub. A study by the city of Austin attempted to quantify this and is linked.[107] |
| **Implementation milestones** | • Determine typologies based on intended use, location, scale, amenities, and context<br>• Determine connections and mode share<br>• Identify community partners and potential amenities for mobility hubs |
| **Metrics tracking** | • Mode share<br>• Walk Score index<br>• Vehicle turnover<br>• Trips generated |
| **Cost** | Depends on the mobility needs being addressed at each location, but can range from $250,000 to $2,000,000 |
| **Other funding sources** | • Reconnecting Communities and Neighborhoods Grant Program (RCN)[108]<br>• Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program[109]<br>• Transportation Infrastructure Finance and Innovation Act (TIFIA)[110]<br>• Urbanized Area Formula Funding Program (49 U.S.C. 5307)[111]<br>• Small Transit Intensive Cities (STIC) (49 U.S.C. 5336) funds under Fixing America's Surface Transportation (FAST) Act – for urbanized areas of 50,000 to 199,999 in population[112]<br>• Pilot Program for Transit-Oriented Development Planning – Section 20005(b)[113] |
| **Co-Benefits** | • Maximize connectivity and access for transit riders to destinations reachable by transit |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | • At least $15 million in RAISE funding is guaranteed to go towards projects located in Areas of Persistent Poverty or Historically Disadvantaged Communities, and projects in these areas will be eligible for up to 100 percent federal cost share. |

[107] https://rmi.org/wp-content/uploads/2018/12/rmi-mobility-hub-report-2018.pdf
[108] Reconnecting Communities and Neighborhoods Grant Program | US Department of Transportation
[109] RAISE Discretionary Grants | US Department of Transportation
[110] TIFIA Credit Program Overview | Build America (transportation.gov)
[111] Urbanized Area Formula Grants - 5307 | FTA (dot.gov)
[112] FAST-Act-A-Guide-to-Public-Transportation-and-Rail-Related-Provisions.pdf (apta.com)
[113] Pilot Program for Transit-Oriented Development Planning – Section 20005(b) | FTA (dot.gov)

| | |
|---|---|
| | • Areas of Persistent Poverty Program[114] assists in planning, engineering, or development of technical or financing plans for improved transit services; new transit routes; engineering for transit facilities and improvements to existing facilities; innovative technologies; planning for low or no emission buses; planning for a new bus facility or intermodal center that supports transit services; integrated fare collections systems; or coordinated public transit human service transportation plans to improve transit service in an Area of Persistent Poverty or Historically Disadvantaged Community, as well as increase access to environmental justice populations. |
| **LIDAC Census Tracts Impacted** | The project would be located at the edge of tracts 29510112200, 29510112300, 29189211802, 29189212500, 29189213300, and likely benefit people from additional surrounding LIDAC areas who take transit. |
| **Workforce** | Increased access to employment and education opportunities. |

### *Measure 7: Gas lawn mower replacement*

The environmental impact of gas-powered lawn and garden equipment (GLGE) is often overlooked despite significant contributions to air pollution and greenhouse gas emissions. GLGE emits several pollutants, including carbon dioxide ($CO_2$), nitrogen oxides (NOx), and volatile organic compounds (VOCs). Exposure to GLGE emissions can introduce fine particulate matter deep into the lungs, worsening respiratory and cardiovascular problems and causing early death. Additionally, GLGE operate at noise levels sometimes exceeding 80 decibels, disrupting neighborhoods. Native plantings can serve as an alternative to lawns, eliminating the need for mowing and providing many additional benefits, such as increasing local biodiversity and improving stormwater management. For more details on native plantings, see the Agriculture, Forestry, and Land Use Section: Measure 2 (Planting trees and native gardens). In cases where lawn alternatives are not possible, electric lawn and garden equipment (ELE) offers a cleaner and quieter alternative to GLGE, producing zero emissions during operation and significantly reducing air pollution and noise levels.

*Table 20 Details of Gas Lawn Mower Replacement*

| | |
|---|---|
| **Geographic location** | St. Louis County |
| **Implementing agencies** | St. Louis County |
| **Authority to implement** | County governments have the authority to implement this project. |
| **Emissions reduction strategies addressed** | **2.4** Increase share of zero- and low- emissions vehicles (e.g. electric, hybrid, CNG, LNG, fuel cell) |
| **Estimate of the quantifiable GHG emissions reductions** | 0.111 $tCO_2e$/mower/year[115] |

[114] Areas of Persistent Poverty Program | FTA (dot.gov)

[115] United States Environmental Protection Agency Greenhouse Gas Equivalencies Calculator

| | |
|---|---|
| **Implementation milestones**[116] | • Develop an implementation plan.<br>• Prepare educational materials and conduct outreach.<br>• Develop and update as needed a user-friendly public webpage to provide general information about mower exchange events.<br>• Conduct one or more public lawn mower exchange events.<br>• Provide a final report with documentation accounting for proper expenditure of funds. |
| **Metrics tracking** | • Total number of equipment replaced or exchanged<br>• Cost per piece of equipment, cost share for customer, and cost share for area<br>• Air pollution levels<br>• Noise pollution levels<br>• Public health benefits |
| **Cost** | $300 voucher per mower; $400 voucher per mower for identified CEJST areas |
| **Other funding sources** | Tax credits under Inflation Reduction Act - 30% per vehicle/lawn mower, up to $7500[117] |
| **Co-Benefits** | Reduction in particulate matter (PM), volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon monoxide (CO), and noise pollution. Reduced risk of respiratory harm (worsened asthma, worsened COPD, inflammation), cardiovascular harm (heart attacks, strokes, heart disease, congestive heart failure), central nervous system harm, reproductive and developmental harm, cancer, and early death.[118] |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Workers and other vulnerable populations are exposed close to the emitting sources. |
| **LIDAC Census Tracts Impacted** | 29189210501 29189214602 29189210702 29189213600<br>29189210502 29189213102 29189213300 29189214100<br>29189210703 29189213800 29189214700 29189216900<br>29189210704 29189213900 29189210200 29189220300<br>29189211201 29189214200 29189210600 29189212700<br>29189211801 29189210300 29189212600 29189213400<br>29189211802 29189211900 29189213101 29189212102<br>29189212001 29189212500 29189211500 29189214601<br>29189212002 29189221800 29189212200 29189214300<br>29189212101 29189210400 29189216000 29189211102 |
| **Workforce** | Unable to determine impact to workforce |

[116] California EPA Air Resources Board, DRAFT Implementation Manual for the Lawn and Garden Equipment Replacement (LGER) Project, Appendix B, Oct 22, 2009

[117] Inflation Reduction Act Gives Tax Credit for Commercial Grade Mowers - New Hampshire Landscape Association (NHLA)

[118] US EPA, National Lawn and Garden Equipment Emissions, April 16, 2015

## 3.3 Waste Reduction

Solid waste disposal, incineration, and wastewater treatment are all contributors to the St. Louis Region's GHG emissions. Methane is a potent greenhouse gas that is generated when solid waste decays in landfills over time. Reducing waste, composting, and managing waste in other ways such as anaerobic digestion can drastically reduce GHG emissions from waste.

### 3.3.1 Emissions Reduction Opportunities

Because solid waste disposal is the main contributor to GHG emissions from waste, the primary goal to reduce emissions is to decrease the amount of waste deposited in traditional landfills. However, during stakeholder engagement for the PCAP, illegal dumping was emphasized as an important challenge the region faces. Because of the major improvement in quality of life and the harder-to-quantify benefit of reducing emissions from cleanup of illegal dumping sites, reducing illegal dumping was also included as a second goal in this PCAP.

#### *Sector Reduction Opportunity 1: Decrease amount of waste deposited in traditional landfills*

This opportunity emerged as a priority in the PCAP stakeholder engagement process. Strategies to decrease the amount of waste decomposing in landfills will not only reduce GHG emissions, but can also provide other co-benefits such as improved food access and healthy soil. The table below lists strategies to reduce the amount of waste entering traditional landfills across the region.

*Table 21 Strategies to Decrease Amount of Waste Deposited in Traditional Landfills*

| Strategy | Description |
|---|---|
| **3.1** Expand organic material collection programs | Increasing composting will enhance soil health for local food production. |
| **3.2** Promote donation of excess food for human and animal consumption | According to the EPA's Wasted Food Scale, feeding animals is the 3rd priority out of 6, after Source Reduction & Reuse and Feed Hungry People.[119] |
| **3.3** Reduce single-use products | The reduction of single-use products can be achieved by offering reusable alternatives (for example, through a large-scale reuse system for live events) or through policy (for example, Extended Producer Responsibility policy). |
| **3.4** Promote effective recycling systems | Recycling systems can become less contaminated and more profitable using source separation, education, policy such as beverage bottle deposit laws, and other measures. |
| **3.5** Investigate technologies for harnessing energy from waste | Anaerobic digestion takes the methane released from the decomposition of organic material and uses it as energy. |

[119] Wasted Food Scale | US EPA

### *Sector Reduction Opportunity 2: Protect the environment from illegal dumping*

Illegal dumping is a major concern for residents in disadvantaged communities in the St. Louis Region. Most often, the residents in areas where illegal dumping occurs are not the perpetrators, but they experience the consequences. Common items dumped in large quantities include mattresses, tires, and construction debris. Additionally, household solid waste can collect in alleys, right-of-ways, and private property if the surrounding areas appear to be unkempt and neglected. Simply cleaning up affected areas is insufficient. Efforts to clean up illegal dumping sites should be accompanied by other neighborhood improvements, public education, and community-based activities.

*Table 22 Strategies to Protect the Environment from Illegal Dumping*

| Strategy | Description |
|---|---|
| **3.6** Promote free or low-cost waste disposal opportunities, especially for hazardous and hard to recycle materials | The cost and inconvenience of landfill tipping fees can play a role in encouraging illegal dumping. Offering well-advertised free or low-cost disposal opportunities provides an incentive to dispose of these items correctly. |
| **3.7** Encourage cleanup efforts, alongside anti-litter and anti-dumping education | Community cleanups can help build support behind anti-dumping education campaigns and keep areas clean to prevent future dumping. In order to better advise prevention efforts, it is also important to investigate the reasons people are dumping illegally in the areas in question. |
| **3.8** Beautify areas to prevent dumping | Keeping areas neatly mowed and landscaped discourages illegal dumping. The use of native plants in landscaped areas can have additional benefits such as enhancing local biodiversity and managing stormwater. |

## 3.3.2 Emissions Reduction Measures

This section provides a set of priority GHG reduction measures based on stakeholder input, with a focus on achieving GHG reductions and providing other community co-benefits, such as food access.

### *Measure 1: Reducing food waste and expanding collection of composting*

Reducing food waste and expanding composting were widely-held priorities among stakeholders in the Waste Sector for the PCAP. In 2023, earthday365 completed a Food Waste Challenge which culminated in a City of St. Louis Mayoral Proclamation from Mayor Tishaura Jones naming November 17th Food Waste Awareness Day.[120] The City of St. Louis also made a commitment to work towards a Food Waste Strategy Plan by December 2024.

*Table 23 Details of Reducing Food Waste and Expanding Collection of Composting*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | • Nonprofits that work in environmental education, such as earthday365 and the Missouri Botanical Garden |

[120] 2023 St. Louis Food Waste Challenge | earthday365 (earthday-365.org)

| | |
|---|---|
| | • Nonprofits that direct food donations to people in need, such as the Food Share Network and Operation Food Search<br>• Composting businesses<br>• Farms and community gardens<br>• City of St. Louis |
| **Authority to implement** | These agencies have the authority to implement the projects. |
| **Emissions reduction strategies addressed** | **3.1** Expand organic material collection programs<br><br>**3.2** Promote donation of excess food for human and animal consumption |
| **Estimate of the quantifiable GHG emissions reductions** | • In 2015, it was estimated that waste accounted for 1.3% of the St. Louis Region's GHG emissions, and solid waste disposal accounted for the majority of these emissions, at 612,819.48 metric tons of $CO_2$. The EPA estimates that 24% of material in municipal solid waste is food. 24% of the St. Louis Region's solid waste emissions in 2015 would be 147,076.675 metric tons of $CO_2$.<br>• Composting one ton of residential food waste instead of landfilling it would result in 0.59 metric tons of $CO_2$ equivalent avoided, according to ReFED's Impact Calculator.[121]<br>• The Food Share Network has diverted approximately 195,000 lbs of food each year from landfills by transporting them to people or animals. According to ReFED's Impact Calculator, this translates to approximately 200 metric tons of $CO_2$ equivalent per year. [122]<br>• Earthday365 runs a Green Dining Alliance program that diverted 6,552 tons of food waste from the landfill in 2023. Due to reductions in lifecycle emissions outside of the St. Louis Region, earthday365 estimates that this reduction is equivalent to 11,293,361.36 tons of $CO_2$ equivalent. |
| **Implementation milestones** | • Completion of a Food Waste Reduction Plan that prioritizes and coordinates actions<br>• Step 1. Assemble Key Team Members and Set Goals<br>• Step 2. Identify Partners, Projects, and Contacts<br>• Step 3. Break Into Groups to Determine Needs and Strategies<br>• Step 4. Collaborate on Application for Funding from USDA's Composting and Food Waste Reduction Cooperative Agreement program<br>• Step 5. Hold Public Meetings Focused on Strategies (composting, food rescue, industrial, etc.)<br>• Step 6. Produce White Paper/Outline of Regional Food Waste Reduction Plan<br>• Step 7. (If funding is available) Create Comprehensive Food Waste Reduction Plan<br>• Step 8. Implementation: Educate Stakeholders and the Public about Strategies in the Plan |

[121] ReFED - Impact Calculator

[122] ReFED - Impact Calculator

| | |
|---|---|
| **Metrics tracking** | • Tonnage of food waste diverted from landfills<br>• GHG emissions avoided<br>• Gallons of water saved<br>• Meals recovered |
| **Cost** | • Earthday365 could expand their Green Dining Audit program statewide with $10,000 for the entire state to have a license.<br>• The Food Share Network could vastly expand their capacity for food waste diversion by getting a brick-and-mortar location, estimated at $500/month, or $6,000 annually. An electric van ($48,350) and paid driver ($15,600 annually) would also help them to expand their food waste diversion efforts. |
| **Other funding sources** | • Composting and Food Waste Reduction Cooperative Agreement (NOFO opens in March)<br>• USDA Solid Waste Management Grants (application window is open from Oct 1-Dec 31 each year)[123] |
| **Co-Benefits** | Reduction in<br>• Landfill space needed<br>• Water use<br>• Hunger |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Healthy Food Access is a challenge in low-income communities, and the Food Share Network and Operation Food Search help direct excess food to those who need it. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Minimal impacts |

### *Measure 2: Policies to reduce waste*

Policies to reduce waste from single-use products include Extended Producer Responsibility policies and increasing landfill tipping fees. Policies can also be implemented to improve the efficiency of recycling. These policies include statewide beverage container deposit laws and legislation to require electronics to be recycled, rather than landfilled.

*Table 24 Details of Policies to Reduce Waste*

| | |
|---|---|
| **Geographic location** | Statewide |
| **Implementing agencies** | State Governments |
| **Authority to implement** | States have the authority to implement Extended Producer Responsibility |

[123] Solid Waste Management Grants | Rural Development (usda.gov)

| | |
|---|---|
| | policies, beverage container deposit laws, electronics recycling laws, and landfill tipping fees. |
| **Emissions reduction strategies addressed** | **3.3** Reduce single-use products<br><br>**3.4** Promote effective recycling systems |
| **Estimate of the quantifiable GHG emissions reductions** | • Nine out of the 10 states with the highest recycling rates for packaging (excluding fiber and flexible plastics) are states with beverage container deposit laws. In 2021 it was estimated that nationally, 79 million metric tons of $CO_2$ equivalent is avoided through recycling. Enacting Extended Producer Responsibility for packaging and paper products alongside beverage container deposit laws will maximize the materials recycled.[124] |
| **Implementation milestones** | • Community Awareness, Education, and Input<br>• Determine Priority Strategies Using Community Input<br>• Continue Education and Encourage Voluntary Behavior Shift<br>• Policy Advocacy<br>• Continued Education to Encourage Compliance |
| **Metrics tracking** | • Number of policies passed to reduce waste<br>• Tonnage of waste entering landfills<br>• Regional recycling contamination rate[125] |
| **Cost** | Varies, depending on many factors |
| **Other funding sources** | Information not known |
| **Co-Benefits** | • Reduction in landfill space needed<br>• Reduction in costs and emissions associated with hauling and recycling waste<br>• Reduction in water use for production of single-use products<br>• Reduction in litter<br>• Reduces in costs for businesses for single-use products |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | According to the report Environmental Racism in St. Louis, most complaints of illegal dumping of trash in the City of St. Louis occurred in majority-black neighborhoods. |
| **LIDAC Census Tracts Impacted** | All LIDAC census tracts in Appendix C in Missouri |
| **Workforce** | According to the Recycling Economic Information Report, in a single year, recycling and reuse activities in the United States accounted for 681,000 jobs, $37.8 billion in wages, and $5.5 billion in tax revenue. This equates to |

[124] 50-STATES_2023-V14.pdf (ball.com)
[125] OneSTL - Indicator: Recycling Contamination Rate

| | |
|---|---|
| | approximately 0.5% of all employment, 0.6% of wages, and 0.8% of tax revenue.[126] |

### *Measure 3: Expanding recycling*

A 2018 City of St. Louis waste audit indicated that roll carts have significantly less contamination than alley recycling dumpsters. With proper recycling education and outreach, contamination can be reduced even further. High contamination in the City of St. Louis has led to stories of contaminated recycling being landfilled and resulted in a lack of faith in recycling throughout the St. Louis Region. Therefore, this project would help restore faith in recycling and increase recycling tonnage throughout the entire region. Unlike alley recycling dumpsters, rollcarts help prevent illegal dumping of large items and reduce water contamination. Designated set out days for rollcarts ensure that residents' recycling are picked up only on recycling days. Currently, only about 20% of St. Louis City residents utilize rollcarts for recycling pickup. This proposal to reduce GHG emissions by switching more residents to rollcarts would also include incorporating one electric City of St. Louis refuse truck, further reducing emissions.

*Table 25 Details of Expanding Recycling*

| | |
|---|---|
| **Geographic location** | Regionwide, with a focus on recycling contamination issues in the City of St. Louis |
| **Implementing agencies** | Municipal governments, such as the City of St. Louis |
| **Authority to implement** | The implementing agencies have the authority to implement these projects. |
| **Emissions reduction strategies addressed** | **2.4** Increase share of zero- and low- emissions vehicles (e.g. electric, hybrid, CNG, LNG, fuel cell)<br><br>**3.4** Promote effective recycling systems |
| **Estimate of the quantifiable GHG emissions reductions** | • The City of St. Louis estimates that switching 16,000 households to rollcarts in place of alley dumpsters in the City of St. Louis could result in a reduction of approximately 1,280 tons of readily recyclable material avoided from the landfill, resulting in approximately 4,200 metric tons of $CO_2$ equivalent avoided. These estimates were made using the U.S. EPA Waste Reduction Model (WARM).[127]<br>• Switching to an electric refuse truck is estimated to result in a reduction of 17.9 tons of $CO_2e$/yr, or 16.2 metric tons $CO_2e$/yr.[128] |
| **Implementation milestones** | Final inspections can determine completion of projects, and grant fund recipients can submit reports to track progress. |
| **Metrics tracking** | Grant fund recipients can submit reports to track progress. |

[126] 2020 Recycling Economic Information Report (epa.gov)
[127] Waste Reduction Model (WARM) | US EPA
[128] Quantitative Evaluation of MD/HD Vehicle Electrification using Statistical Data (ornl.gov)

| | |
|---|---|
| **Cost** | The estimate for an electric refuse truck and roll cart pilot program for the City of St. Louis is $3,318,000. |
| **Other funding sources** | • Solid Waste Infrastructure for Recycling Grant Program (another round may open around April of 2024)[129]<br>• St. Louis-Jefferson Solid Waste Management District Grants (due annually in December)[130]<br>• USDA Solid Waste Management Grants (application window is open from Oct 1-Dec 31 each year)[131] |
| **Co-Benefits** | • Reduction in landfill space needed<br>• An electric refuse truck would result in a reduction in co-pollutants.<br>• Reduction in illegal dumping in recycling bins in the City of St. Louis |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | The northern half of the City of St. Louis is almost entirely identified as a disadvantaged area on the Climate and Economic Justice Screening Tool, as well as some areas in the southern half.[132] |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | According to the Recycling Economic Information Report, in a single year, recycling and reuse activities in the United States accounted for 681,000 jobs, $37.8 billion in wages, and $5.5 billion in tax revenue. This equates to approximately 0.5% of all employment, 0.6% of wages, and 0.8% of tax revenue.[133] |

### *Measure 4: Large scale reuse system to reduce single-use plastics*

Large scale reuse emphasizes setting up a situation where containers (primarily food and beverage) are filled, distributed, used, returned, cleaned, and reused within a closed system. Reusable cups are preferable over single-use cups across all environmental metrics, including carbon emissions.[134] A study from the University of Michigan found, "Depending on the single-use container being replaced…reusable alternatives, which initially use more energy to make and generate more climate-altering greenhouse gases, can break even with single-use containers after four to 13 uses."[135] Due to their environmental benefits, reusable options are growing in popularity for live events and dining on college and company campuses. In addition, it is important to encourage 'bring your own' reusables programs to reduce waste from disposable containers. Many coffee shops offer an incentive for bringing a reusable cup, and

[129] Solid Waste Infrastructure for Recycling Grant Program | US EPA
[130] Grants - St. Louis - Jefferson Solid Waste Management District (swmd.net)
[131] Solid Waste Management Grants | Rural Development (usda.gov)
[132] Explore the map - Climate & Economic Justice Screening Tool (geoplatform.gov)
[133] 2020 Recycling Economic Information Report (epa.gov)
[134] Reuse Wins at Events — Upstream (upstreamsolutions.org)
[135] U-M study finds reusable take-out food containers can significantly reduce plastic waste, emissions, costs (umich.edu)

many local businesses offer opportunities to refill reusable containers with grocery items, bath and body products, and beverages.[136]

*Table 26 Details of Large Scale Reuse System to Reduce Single-Use Plastics*

| | |
|---|---|
| **Geographic location** | Regionwide, starting with interested venues |
| **Implementing agencies** | • Earthday365<br>• Mississippi Rivers Cities and Towns Initiative<br>• City of St. Louis<br>• Private companies, such as r.World or TURN |
| **Authority to implement** | In collaboration with interested event venues, these agencies have the authority to implement these projects. |
| **Emissions reduction strategies addressed** | **3.3** Reduce single-use products |
| **Estimate of the quantifiable GHG emissions reduction** | Based on the impact of single-use cups vs. the impact of manufacturing, shipping, operations, and end-of-life, switching to 300,000 reusable cups per month at live events (or 3.6 million cups a year) would divert around 23,000 lbs of $CO_2$ a month (275,000 lbs of $CO_2$ a year), or 125 metric tons of $CO_2$/yr, according to estimates from r.World.[137] |
| **Implementation milestones** | • Identify enough venues interested in switching to reusables in order to justify building a shared 'wash hub' (at least 300,000 units/month)<br>• Identify a suitable location for a wash hub, such as a vacant/underutilized building<br>• Attract a private company to build the wash hub<br>• Continued community awareness and education |
| **Metrics tracking** | • Reduction in litter<br>• Reduction in plastic waste<br>• Tonnage of waste diverted from landfills<br>• Gallons of water saved |
| **Cost** | The cost of a wash hub is estimated to be $500,000 - $1,000,000. |
| **Other funding sources** | • Solid Waste Infrastructure for Recycling Grant Program[138]<br>• St. Louis-Jefferson Solid Waste Management District Grants (due annually in December)[139] |
| **Co-Benefits** | • Reduction in litter<br>• Reduction in landfill space needed<br>• Reduction in costs and emissions associated with hauling and |

[136] World Refill Day | earthday365 (earthday-365.org)
[137] Eliminate single-use waste with r.World reusable serveware system (rworldreuse.com)
[138] Solid Waste Infrastructure for Recycling Grant Program | US EPA
[139] Grants - St. Louis - Jefferson Solid Waste Management District (swmd.net)

| | |
|---|---|
| | recycling waste<br>● Reduction in water use for production of single-use products<br>● Reduces in costs for businesses for single-use products |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | According to an article from the University of Michigan, "Minority and low-income neighborhoods and communities in transition are disproportionately targeted by industries that follow the path of least resistance when deciding where to locate hazardous waste sites and other polluting facilities." Reusable options decrease the need for landfills and plastic manufacturing facilities, which are often sited in these communities.[140] |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | It is estimated that a wash hub would provide 7-10 full-time jobs. |

### *Measure 5: Reducing illegal dumping*

Addressing illegal dumping emerged as a priority among stakeholders in low-income and disadvantaged communities. Illegal dumping causes unnecessary GHG emissions because large, inefficient bulk pickup trucks (and sometimes pest control trucks) need to be sent to clean up illegal dumping sites. While illegal dumping is a difficult problem to solve, a variety of strategies together can help reduce dumping, such as offering low-cost and convenient options for bulk waste disposal, organizing community cleanups and raising awareness. Also, beautifying areas can reduce the likelihood of illegal dumping and the use of native plants in landscaped areas can provide additional benefits, such as enhancing local biodiversity and managing stormwater. For more details about beautifying areas to prevent illegal dumping, see the Agriculture, Forestry, and Land Use Section: Measure 2 (Planting trees and native gardens).

*Table 27 Details of Reducing Illegal Dumping*

| | |
|---|---|
| **Geographic location** | Regionwide, although certain areas experience greater illegal dumping |
| **Implementing agencies** | ● Nonprofits that hold cleanups, such as Empire 13 and earthday365<br>● St. Louis Economic Development Partnership |
| **Authority to implement** | These agencies have the authority to implement these projects. |
| **Emissions reduction strategies addressed** | **3.6** Promote free or low-cost waste disposal opportunities, especially for hazardous and hard to recycle materials<br>**3.7** Encourage cleanup efforts, alongside anti-litter and anti-dumping education<br>**3.8** Beautify areas to prevent dumping |

[140] Targeting minority, low-income neighborhoods for hazardous waste sites | University of Michigan News (umich.edu)

| | |
|---|---|
| **Estimate of the quantifiable GHG emissions reductions** | Bulk pickup trucks are very inefficient, with an average mileage of around 3 mpg. [141] According to EPA's Greenhouse Gas Equivalencies Calculator, 100 gallons of gasoline results in the emissions of 0.9 metric tons of $CO_2$ equivalent.[142] Therefore, reducing illegal dumping and the need for large trucks to drive to and idle at illegal dumping sites can have a sizeable impact on GHG reductions. |
| **Implementation milestones** | • Hold monthly cleanups, to encourage community awareness and keep areas clean, preventing further dumping<br>• Hold regular recycling events, especially for hazardous or hard-to-recycle items |
| **Metrics tracking** | • Reduction in litter<br>• Reduction in other illicit activities beyond illegal dumping<br>• Reduction in GHG emissions from bulk pickup trucks |
| **Cost** | Depends on the strategy to address illegal dumping |
| **Other funding sources** | • Community Change Grants (Rolling deadline of Nov 21, 2024. The Environmental Protection Network suggests that applicants who are ready submit by Feb 20, 2024. Initial award announcements will be made as soon as March of 2024.)[143]<br>• Environmental Justice Thriving Communities Grantmaking Program (Subgrants through the Grantmakers are expected to become available by Summer 2024)[144] |
| **Co-Benefits** | • Improved soil and water quality<br>• Improved quality of life for neighborhood residents |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | According to the report Environmental Racism in St. Louis, most illegal dumping occurred in majority black neighborhoods, based on complaints to the City's Citizens' Service Bureau.[145] |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Unable to determine impacts to workforce |

[141] Quantitative Evaluation of MD/HD Vehicle Electrification using Statistical Data (ornl.gov)
[142] Greenhouse Gas Equivalencies Calculator | US EPA
[143] Inflation Reduction Act Community Change Grants Program | US EPA
[144] The Environmental Justice Thriving Communities Grantmaking Program | US EPA
[145] 2019-09-30_STL_Env_Racism_Report_REVISED_FINAL_Cropped.pdf (squarespace.com)

### *Measure 6: Anaerobic digestion*

New technology can utilize waste in a more efficient way than landfilling. For example, methane digesters, also known as anaerobic digesters, collect the methane released from the decomposition of organic material to be used as energy.[146]

*Table 28 Details of Anaerobic digestion*

| | |
|---|---|
| **Geographic location** | Across the St. Louis Metropolitan Statistical Area. Emmaus Village of Marthasville, in Warren County, is interested in using anaerobic digestion to more efficiently manage sewage. |
| **Implementing agencies** | • Technical advisors, such as Energy Resources Group<br>• Local governments<br>• Nonprofit organizations, such as Emmaus Village of Marthasville<br>• Metropolitan St. Louis Sewer District |
| **Authority to implement** | With proper permitting, these agencies have the authority to implement these projects. |
| **Emissions reduction strategies addressed** | **3.5** Investigate technologies for harnessing energy from waste |
| **Estimate of the quantifiable GHG emissions reductions** | According to ReFED's Impact Calculator, processing one ton of food waste through anaerobic digestion would avoid 0.82 metric tons of $CO_2$ equivalent, compared to landfilling.[147] |
| **Implementation milestones** | Final inspections can determine completion of projects, and grant fund recipients can submit reports to track progress. |
| **Metrics tracking** | • Tons of waste diverted from landfills<br>• GHG Emissions reduced |
| **Cost** | Depends on the size of the operation and technology used |
| **Other funding sources** | Businesses may be interested in anaerobic digestion without grant funding, because they can sell the energy created. |
| **Co-Benefits** | Anaerobic digesters have numerous benefits, including producing renewable energy. They also improve air quality by reducing greenhouse gas emissions and odors from the manure. Anaerobic digester owners can sell the energy generated and qualify for carbon credit payments. The leftover manure is actually a better fertilizer for crops, and the manure can even be further processed into bedding for farm animals.[148] |

[146] OneSTL - Solution: Methane Digesters
[147] ReFED - Impact Calculator
[148] OneSTL - Solution: Methane Digesters

| | |
|---|---|
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Anaerobic digesters can be an additional source of revenue for farmers in rural communities. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Unable to determine impact to workforce |

## 3.4 Agriculture, Forestry, and Land Use (AFOLU)

Land use changes influence GHG emissions either as carbon "sinks" (by carbon sequestration through forests and wetlands) or act as "sources" (for example, when forests and wetlands are removed for development). Projects that sequester carbon, such as planting and maintaining trees and green infrastructure, can provide many co-benefits, including improved air quality, stormwater management, shade and reduced utility costs, and increased food access, in the case of orchards.

### 3.4.1 Emissions Reduction Opportunities

Priorities for carbon sequestration include increasing local agriculture, incorporating more trees and other green infrastructure into urban spaces, and protecting natural areas to maintain their carbon sequestration and flood mitigation benefits

#### *Sector Reduction Opportunity 1. Increase Local Agriculture*

According to the international nonprofit GRAIN, the global food system can be considered responsible for 44-57% of all greenhouse gas emissions, due to associated factors such as deforestation, transportation, processing and packing, freezing and retail, and waste.[149] Local agriculture production can help reduce GHG emissions from the transportation of food, as well as provide additional benefits such as increasing access to fresh, healthy food.

*Table 29 Strategies to Increase Local Agriculture*

| Strategy | Description |
|---|---|
| **4.1** Incorporate energy efficiency and solar energy for low-emission food production | Solar power and other technologies can help reduce emissions generated from food production. |
| **4.2** Expand access to community gardens | Community gardens provide many benefits in addition to sequestering carbon, such as local food access. |
| **4.3** Demonstration & education about climate-smart food production | The Food and Agriculture Organization of the United Nations defines Climate Smart Agriculture as agriculture that sustainably increases productivity, enhances resilience, reduces and removes GHG emissions where possible, and |

[149] Food Sovereignty - Climate Justice Alliance

| | |
|---|---|
| | enhances achievement of food security and development goals.[150] |

### *Sector Reduction Opportunity 2. Plan for and invest in green infrastructure*

Green infrastructure refers to the use of vegetation, soils, landscape features, and often simple technologies that mimic natural processes to provide amenities and benefits to the communities in which they are located.

*Table 30 Strategies to Plan for and Invest in Green Infrastructure*

| Strategy | Description |
|---|---|
| **4.4** Infrastructure improvements for street trees | Trees and other green infrastructure along streets and at bus stops provide shade and help mitigate the urban heat island effect. |
| **4.5** Employ community members to maintain trees | Due to lack of maintenance, trees often do not survive the first two years. Employing communities to maintain the trees helps guarantee their survival and creates jobs in the community. |
| **4.6** Replace paved surfaces with native plantings | One example of replacing paved surfaces would be turning paved school play areas into native gardens. |

### *Sector Reduction Opportunity 3. Protect the quality of natural resources and the environment*

Natural resources can refer to materials or substances that occur naturally in the environment, such as wind or sunshine for conversion to electricity, and minerals and ores that are used in batteries, glass and many manufactured items. However, natural resources are also referred to when evaluating in-tact or well-functioning eco-systems and natural areas such as forests, grasslands, and wetlands.

*Table 31 Strategies to Protect the Quality of Natural Resources and the Environment*

| Strategy | Description |
|---|---|
| **4.7** Restore natural areas | Restoration of natural areas can be achieved through land acquisition and preservation and conservation easements. Restoring wetlands and floodplains has the added benefit of preventing damage to property and lives due to flooding. |
| **4.8** Implement community forest projects in watershed plans | Watershed plans are in place for many watersheds in the region, and they often prioritize where to incorporate trees and natural spaces to reduce flooding. |

[150] What is climate-smart agriculture? | Climate-Smart Agriculture Guide (cgiar.org)

### 3.4.2 Emissions Reduction Measures

This section provides a set of priority GHG reduction measures. Priority GHG reduction measures are based on stakeholder input and focused on achieving significant GHG reductions, while considering other relevant planning goals.

#### *Measure 1: Solar arrays and orchards for local farms*

Solar can help local farmers save on utility bills, supporting their work to provide local, healthy food, particularly in disadvantaged areas without access to grocery stores.

*Table 32 Details of Solar Arrays and Orchards for Local Farms*

| | |
|---|---|
| **Geographic location** | Local farms across the St. Louis Metropolitan Statistical Area |
| **Implementing agencies** | Local farms, including those run by Seed St. Louis, Jackie Joyner-Kersee Food Agriculture Nutrition Innovation Center, A Red Circle, HOSCO Shift, Confluence Farms, Agriculture for Community Restoration, Economic Justice, and Sustainability (ACRES), New Roots Urban Farm, Rustic Roots Sanctuary, The Fit and Food Connection, Ujima, Julia's Farm STL, Earthdance Farms, Emmaus Village of Marthasville, Earthdance Organic Teaching Farm, and Body N' Soil |
| **Authority to implement** | With proper permitting, these agencies have the authority to implement these projects. |
| **Emissions reduction strategies addressed** | **4.1** Incorporate energy efficiency and solar energy for low-emission food production<br>**4.2** Expand access to community gardens<br>**4.3** Demonstration & education about climate-smart food production |
| **Estimate of the quantifiable GHG emissions reductions** | • **Solar:** According to the Avoided Emissions and Generation Tool AVERT Web Edition, one MWh of rooftop-scale photovoltaic in the Midwest results in 1,370 tons of avoided $CO_2$ emissions.[151]<br>• **Orchards:** According to iTree's Planting Calculator, one apple tree could sequester approximately 29.9 lbs of $CO_2$ between 2027 and 2030.[152] If the tree were planted within 60 ft of a building, additional emissions reductions could be seen from building energy savings. |
| **Implementation milestones** | • Installation of solar<br>• Planting of fruit trees during an appropriate time in the spring or fall |
| **Metrics tracking** | • kW of solar installed<br>• Number of trees planted<br>• Pounds of fruit produced from orchards |

[151] AVERT Web Edition | US EPA

[152] Home - i-Tree Planting Calculator (itreetools.org)

| | |
|---|---|
| **Cost** | • **Solar:** The cost to install a solar array is typically $3.75-$4.25 per watt.<br>• **Orchards**: The cost is estimated at $200 per tree. |
| **Other funding sources** | • Clean Energy Tax Credits (cover 30% or more of a project's cost, depending on various factors)[153]<br>• REAP (for rural farmers and small businesses only)[154] |
| **Co-Benefits** | • Decreased cost of utilities for local farms<br>• Improved air quality<br>• Resilience for the energy grid<br>• Increased access to healthy food in food deserts<br>• Additional emissions reductions from local food production |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Many of the farms above are located in Justice40 communities and areas without many grocery stores. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Local organizations, including Employment Connection and St. Louis University, are working to train those in need of jobs to install solar systems. |

### *Measure 2: Planting trees and native gardens*

Trees and other green infrastructure along streets, such as native plantings, emerged as a priority among stakeholders giving input for this PCAP. These projects can provide many benefits, such as improved stormwater management. A regional tree master plan could be instrumental for successfully expanding and maintaining urban tree canopy, because it would prioritize where funding is needed most. It was also noted that any infrastructure improvements for street trees should be made with pedestrians and cyclists in mind.

*Table 33 Details of Planting Trees and Native Gardens*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | • Local governments, such as the City of St. Louis<br>• Neighborhood organizations<br>• Community improvement districts<br>• Nonprofits, such as Forest ReLeaf, Heartlands Conservancy, The Nature Conservancy, and Emmaus Village of Marthasville<br>• State Government Agencies, such as the Missouri Department of Conservation and Missouri State Parks |

[153] BlueGreen Alliance | Making Clean Energy Tax Credits Deliver for the Public: A User Guide for Governments, Schools, and Nonprofits

[154] Rural Energy For America Program (REAP) | Rural Development (usda.gov)

| | |
|---|---|
| **Authority to implement** | These agencies have the authority to implement these projects. |
| **Emissions reduction strategies addressed** | **4.4** Infrastructure improvements for street trees<br>**4.5** Employ community members to maintain trees<br>**4.6** Replace paved surfaces with native plantings |
| **Estimate of the quantifiable GHG emissions reduction** | A mature tree will absorb more than 48 pounds of $CO_2$ from the atmosphere per year.[155] |
| **Implementation milestones** | Planting projects can be implemented quickly once identified and funds become available. Final inspections can determine project completion. |
| **Metrics tracking** | • Percent of land with tree canopy cover<br>• Number of native gardens certified by programs such as Bring Conservation Home, Conservation At Home, or the Wildlife Habitat Council |
| **Cost** | Around $150 per tree, or $1.2 million to establish a City Tree Farm to provide trees for projects around the region, with a focus on LIDAC communities |
| **Other funding sources** | • Neighborhood Transformation Grants (due March 29, 2024) [156]<br>• Section 319 Nonpoint Source Grant Program (due May 1, 2024)[157] |
| **Co-Benefits** | • Improved stormwater management<br>• Improved air quality<br>• Mitigation of urban heat island effect |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | Many of the areas in the St. Louis region that lack tree canopy are also those identified as underserved by the Climate and Economic Justice Screening Tool. |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Employment Connections and Missouri Department of Conservation collaborate on a Green Jobs Program that trains individuals for jobs in native landscaping maintenance. |

[155] USDA, The Power of One Tree –the Very Air We Breathe. The Power of One Tree - The Very Air We Breathe | USDA

[156] Neighborhood Transformation Grants (stlouis-mo.gov)

[157] Section 319 Nonpoint Source Subgrants | Missouri Department of Natural Resources (mo.gov)

### *Measure 3: Preservation and restoration of forests, prairies, wetlands, and floodplains*

Forests, prairies, and wetlands can act as carbon "sinks." Because trees take a long time to grow, protecting mature trees is even more beneficial for carbon sequestration than planting new trees. Carbon sequestration can be achieved through land acquisition and preservation through conservation easements and restoration of natural areas. Public and private land acquisition and preservation can help retain carbon sinks and prevent development that would result in a loss of carbon sequestration capacity. Restoration of natural areas removes invasive species to allow for native species to grow and thrive and absorb more carbon over time. Replanting native grasslands and restoring drained wetlands can reduce carbon emissions by recapturing atmospheric carbon into soil and plant communities. Restoring wetland and floodplain areas has the added benefit of preventing potential damage to property and lives due to flooding. Buyouts and preventing construction in floodplains are also important considerations to keep property and people safe from flood, as the National Climate Assessment confirms that across most of the United States, the heaviest rainfall events have become heavier and more frequent.[158]

*Table 34 Details of Preservation and Restoration of Forests, Prairies, Wetlands, and Floodplains*

| | |
|---|---|
| **Geographic location** | Regionwide |
| **Implementing agencies** | • Local governments<br>• Nonprofits, such as Open Space STL and Emmaus Village of Marthasville |
| **Authority to implement** | Pending acquisition of the land by these agencies, the agencies have the authority to implement the projects. |
| **Emissions reduction strategies addressed** | **4.5** Employ community members to maintain trees<br>**4.7** Restore natural areas<br>**4.8** Implement community forest projects in watershed plans |
| **Estimate of the quantifiable GHG emissions reductions** | • **Forests:** A mature tree will absorb more than 48 pounds of $CO_2$ from the atmosphere per year.[159] Forests typically have 100 - 200 trees per acre, therefore one acre of planted mature forest can sequester approximately 2.4 - 4.8 tons $CO_2$ per year.<br>• **Prairies:** Various studies of the potential for tallgrass prairie carbon storage have shown that the storage rates vary between .30 and 1.7 metric tons per acre per year.[160] |
| **Implementation milestones** | Projects can be implemented quickly once identified and funds become available. Final inspections can determine project completion. |

[158] Heavy Downpours Increasing | National Climate Assessment (globalchange.gov)
[159] USDA, The Power of One Tree –the Very Air We Breathe. The Power of One Tree - The Very Air We Breathe | USDA
[160] Carbon Sequestration – Tallgrass Ontario

| | |
|---|---|
| **Metrics tracking** | • Acres of land in conservation |
| **Cost** | Depends on various factors |
| **Other funding sources** | • Environmental Quality Incentives Program[161]<br>• Section 319 Nonpoint Source Grant Program (due May 1, 2024)[162] |
| **Co-Benefits** | • Preventing damage to property and lives due to flooding |
| **Low Income and Disadvantaged Community (LIDAC) Benefits** | A study published in Nature Climate Change notes that white and low-income communities are currently the most strongly impacted by flooding in the US. However, in the coming decades, black communities will face the largest increase in flood risk.[163] |
| **LIDAC Census Tracts Impacted** | This project would apply to all 155 LIDAC census tracts across the St. Louis Metropolitan Statistical Area (see Appendix C). |
| **Workforce** | Employing members of the community to maintain trees and natural areas can help guarantee their survival and create jobs in the community. |

# 4 Additional Analyses

## 4.1 Low Income Disadvantaged Communities Benefits Analysis

The EPA maintains a tool to identify Low Income and Disadvantage Communities (LIDACs). The tool is called the Climate and Economic Justice Screening Tool (CEJST). Through CEJST, census tracts are identified that have characteristics such as:

- Persons living in poverty
- Unemployment rate
- Expected loss of agricultural productivity
- Expected loss of buildings
- Expected loss of population
- High flood risk
- High wildfire risk
- High energy costs
- High levels of air pollution
- High rates of asthma, diabetes or heart disease
- Low life expectancy
- Historic underinvestment
- High housing costs
- Lack of green space
- Lack of indoor plumbing
- Presence of lead paint
- Near abandoned mines
- Near former national defense sites
- High traffic volumes
- Barriers to transportation
- Presence of underground storage tanks
- Near wastewater discharge
- Linguistic isolation

[161] Environmental Quality Incentives Program | Natural Resources Conservation Service (usda.gov)
[162] Section 319 Nonpoint Source Subgrants | Missouri Department of Natural Resources (mo.gov)
[163] US flooding increase will 'disproportionately' impact black and low-income groups - Carbon Brief

CEJST groups the above characteristics above into eight categories including: climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development. If a census tract meets the criteria for any single characteristic in a category, the tract is identified as disadvantaged. For a full description of the characteristics and categories that define a "disadvantaged" community and to see the locations of census tracts, visit the CEJST website[164].

### *Identify LIDACs and Climate Impacts and Risks*

The map below shows the location of census tracts in the St. Louis MSA that meet the EPA CEJST criteria.

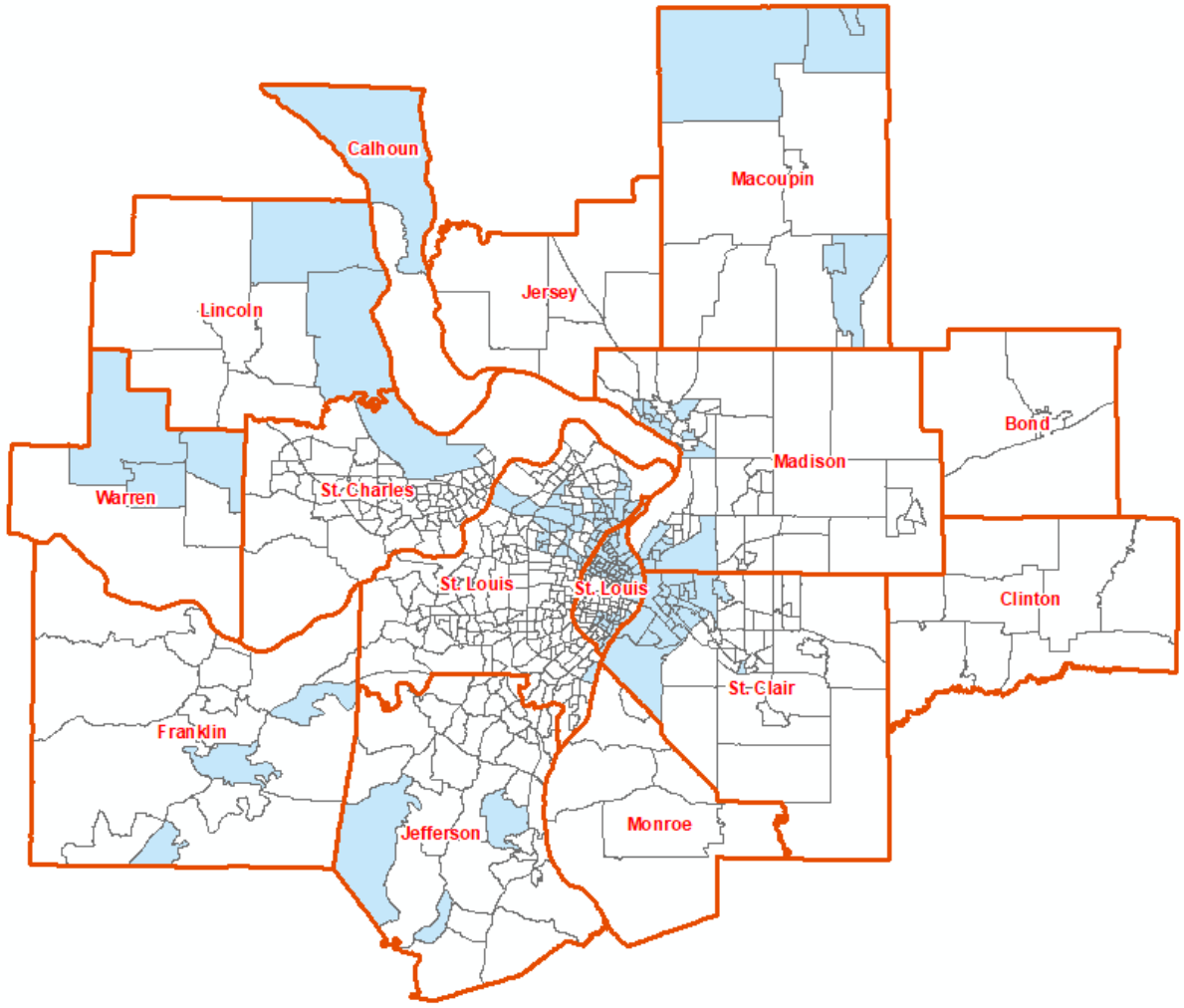



*Figure 4 St. Louis MSA CEJST*

There are 155 census tracts in the St. Louis MSA that meet the CEJST criteria with a total of 532,000 people living in them. The table below illustrates the number of census tracts that meet the qualifications of one or more CEJST characteristics. Most census tracts meet the qualifications of more than one characteristic and category, so the number of tracts in the table will be greater than 155.

[164] //screeningtool.geoplatform.gov/en/

*Table 35 Number of CEJST Census Tracts*

| CEJST Category | Number of Census Tracts |
|---|---|
| **Climate Change** | 119 |
| **Energy** | 90 |
| **Health** | 115 |
| **Housing** | 98 |
| **Legacy Pollution** | 71 |
| **Transportation** | 40 |
| **Water and Wastewater** | 45 |
| **Workforce Development** | 106 |

### *Engage with LIDACs to understand community priorities*

Engagement in LIDAC areas was approached thoughtfully and intentionally. EWG staff, OneSTL partners, and planning agencies have been doing targeted outreach in these areas for years and are encountering recurring issues. Engagement for the PCAP was conducted to avoid contributing to these issues. As EWG staff considered different approaches to engaging LIDAC areas, these issues guided the selected approach:

- Residents in LIDAC areas and particularly in predominantly African American communities have expressed a general distrust of government and skepticism of public engagement processes. They feel that even when they give input, their wishes and preferences are ignored.
- Many government agencies from city, to county, to regional, to state are doing engagement in the same areas. Residents express confusion and exhaustion at being asked to participate in so many engagement meetings. Sometimes the same questions are asked by different agencies at different meetings.
- Local governments are already engaged in neighborhood, strategic, and comprehensive planning in LIDAC areas. Inserting engagement for a regional plan into neighborhoods where engagement was already under way created a high probability of disrupting the local government planning processes.
- EWG's workplan for the CPRG includes hiring an engagement consultant to design an engagement plan for the full St. Louis, MO/IL MSA, but that consultant would not be hired in time to conduct engagement for the PCAP. Therefore EWG staff decided to conduct early engagement through grass-roots organizations so as to avoid confusion on the part of residents.

*Estimate potential benefits of GHG emission reduction measures to LIDACs*

Engagement in LIDAC areas occurred through stakeholder meetings and interviews. A full list of the stakeholder meetings can be found in Appendix D. To ensure that input from represented LIDAC areas, EWG staff met with:

- *Community Action Corporations (CAC) in rural areas*. CACs are often responsible for weatherization programs for low income residents.
- *Non-profit organizations in Justice40 areas*. Non-profits were identified that work in Justice40 areas across the region, including many that work in North St. Louis County and North St. Louis City. Climate-related projects identified by these organizations included a heavy focus on energy efficiency of affordable housing to reduce utility costs, food sovereignty and urban agriculture, green infrastructure and urban forests, illegal dumping, flood mitigation, environmental education, workforce development, renewable energy generation, and other concerns. To the greatest extent possible, the issues discussed were incorporated into the measures in this PCAP (except for workforce development, which is discussed separately in Section 4.3).
- *Local government and government district staff in Justice40 areas*. Outreach was prioritized to governments located in Justice40 areas, and findings about local issues were collected from those who responded to requests for meetings. Energy efficiency of affordable housing and flood mitigation were also identified as issues in these interviews, as well as green transportation access and low-carbon mobility, and other concerns. To the greatest extent possible, the issues discussed were incorporated into the measures in this PCAP.

For specific impacts in LIDAC areas, impacted LIDAC census tracts are included in the measures tables in Section 3.

## 4.2 Review of Authority to Implement

Measures identifies in Section 3 were selected based upon whether the individual projects could be implemented in a short time span. The majority of measures include implementable projects. Some policies are recommended measures and the status of Authority to Implement is stated in the individual measure tables.

## 4.3 Workforce Development: The Foundation of a Just Transition

A full workforce planning analysis was not conducted for the PCAP; however, EWG staff and OneSTL partners met during the stakeholder engagement period to discuss workforce issues. The following initial considerations were developed based on interactions with stakeholders and informal reporting on workforce conditions and experiences.

***Need:*** In order to electrify and weatherize homes, build new solar arrays, install batteries, address waste and litter issues, repair electric vehicles, drive buses, and green up existing and new infrastructure, a trained workforce is needed to build the new green economy. This need presents a great opportunity for the St. Louis Region to address income inequality, a long history of systemic racism, pollution burden, and unemployment. Without a well-paid, well-trained workforce to implement the strategies and measures in this PCAP, they cannot be achieved.

***Obstacles:*** Currently, the region has a deficit of trained workers who are ready to do the work that is necessary to build a just transition. There is a limited supply of HVAC workers who are knowledgeable about installing heat pumps, landscapers with green infrastructure and native plant experience, Electric Vehicle repair technicians, and bus drivers. Although there may be enough trained solar installers to

meet current demands, there may not be enough to meet the demands of a transition to renewables. Many of the jobs that will need to be filled are currently not paying competitive wages, limiting the number of qualified applicants. Traditionally marginalized populations have many barriers to participating in the green economy, but these problems can be addressed by targeted training opportunities for youth; apprenticeship programs; creating green job trainings for inmates; retraining opportunities for existing practitioners; strong, well-advertised recruiting programs; and partnerships with existing programs, schools, and community colleges.

**Partnerships**: There are many existing programs that could scale up to meet the growing, urgent need for trained workers. These programs include, but are not limited to: Employment Connection's Solar Workforce Development[165], Dream Builders 4 Equity[166], Environmental Job Training[167] with St. Louis University and St. Louis Community College, and more. Partnerships with the business community, including Cortex, Greater St. Louis Inc., and local Chambers of Commerce, should be encouraged. Funding can be amplified by utilizing other Inflation Reduction Act programs, such as Community Change Grants, and local funding programs, such as Arch Grants, to fortify existing programs and build new programs. Other avenues for partnerships include community colleges, community service organizations, Bi-State Development, and more. Additional partnerships could be formed with municipalities, unions, solar installers, landscaping companies, HVAC companies, and other employers to incentivize hiring workers trained through new and existing green workforce programs.

# 5 Next Steps

The next phase in the CPRG process is to submit an implementation grant. At the time of completing this document, no entities in the St. Louis, MO/IL MSA have expressed interest in applying directly for CPRG implementation funding. EWG staff is coordinating with staff at Missouri Department of Natural Resources and Illinois Environmental Protection Agency to include measures from the St. Louis PCAP into their state-wide applications. While funding for these PCAP measures through the CPRG is uncertain, the exercise to list and describe these measures was useful in preparation for future funding.

This PCAP is also a precursor to a complete regional Climate Action Plan. With staff at EWG being the coordinators, a Climate Action Plan will be completed by August of 2025. EWG staff will be working with Southern Illinois University at Edwardsville to complete the regional greenhouse gas inventory for the year 2022. Staff will also be working with a consultant team to develop a public engagement strategy and to complete the plan document.

In parallel with the planning process, OneSTL partners will continue to meet and discuss needs and opportunities to develop a regional structure or collaboration by which a regional Climate Action Plan can be implemented. The OneSTL Network and Working Groups is a positive start, but additional capacity will need to be developed.

[165] Programs | EmploymentConnection (employmentstl.org)
[166] Dream Builders 4 Equity
[167] Center for Environmental Education and Training : SLU

# Appendix A Definitions and Acronyms

**Agriculture, Forestry and Other Land Use (AFOLU):** a category of greenhouse gas emissions that refers to activities related to land use, agriculture, forestry and how those activities are conducted.

**ClearPath:** The web-based application offered to ICLEI member organizations to assemble greenhouse gas inventories.

**Compressed Natural Gas (CNG):** a fuel comprised primarily of methane ($CH_4$) that is compressed to less than 1% of its volume at normal atmospheric pressure.

**Carbon Dioxide ($CO_2$):** a chemical compound made up of one molecule of carbon bonded to two molecules of oxygen. CO2 is the primary carbon source for life on earth, but is also the most abundant greenhouse gas.

**Comprehensive Climate Action Plan (CCAP):** a narrative report that provides an overview of the grantees' significant GHG sources/sinks and sectors, establishes near-term and long-term GHG emission reduction goals, and provides strategies and identifies measures that address the highest priority sectors to help the grantees meet those goals.

**East-West Gateway Council of Governments (EWG):** The St. Louis Metropolitan Planning Organization and Council of Governments. EWG received the CPRG planning grant to complete the PCAP and CCAP.

**Ecoblock:** In the context of the PCAP, an ecoblock is the development or redevelopment of an urban block that incorporation elements such as a central commons, shared Net Positive Energy and Water Infrastructure, and a socially-responsible ownership and management structure, all while maintaining contextual urban design consistency with its surroundings.

**Electric Vehicle (EV):** a vehicle that uses a large traction battery pack to power the electric motor

**Facility Level Information on Greenhouse gases Tool (FLIGHT):** on-line data set that includes information about greenhouse gas emissions from large facilities that are required to report annual data about emissions to the Environmental Protection Agency.

**Gas-Powered Lawn and Garden Equipment (GLGE):** Lawn equipment powered by an internal combustion engine such as lawn mowers, trimmers, and leaf blowers.

**Greenhouse gas (GHG) Inventory:** a list of emission sources and sinks and the associated emissions quantified using standard methods. The PCAP must include a "simplified" inventory (see Section 2.1). The CCAP must include a comprehensive inventory of emissions and sinks for the following sectors: industry, electricity generation/use, transportation, commercial and residential buildings, agriculture, natural and working lands, and waste and materials management.

**Internal Combustion Engine (ICE):** an engine that utilizes the ignition and combustion of fuel within the engine itself to convert the energy from the combustion to a moving piston, which in turn rotates a crankshaft.

**ICLEI:** a.k.a Local Governments for Sustainability, is an international network of local and regional governments committed to sustainable development. The name "ICLEI" originally stood for "International Council for Local Environmental Initiatives."

**Kilowatt hour (kWh):** a unit of energy consumption that equates to 1,000 watts of electricity used in an hour.

**Liquefied Natural Gas (LNG):** a fuel comprised primarily of methane ($CH_4$) that is cooled to -259$^{o}$F which reduces its volume to less than 1% of its volume at normal atmospheric pressure.

**Low Income / Disadvantaged Communities (LIDACs):** communities with residents that have low incomes, limited access to resources, and disproportionate exposure to environmental or climate burdens. LIDACs are identified by assessing indicators for categories of burden: air quality, climate change, energy, environmental hazards, health, housing, legacy pollution, transportation, water and wastewater, and workforce development.

**Missouri Energy Savings Program (MOESP):** a Clean Energy Development District and associated Board to administer a PACE program established by an ordinance within St. Louis County.

**Methane ($CH_4$):** a.k.a natural gas, a hydrocarbon compound that is colorless and odorless gas under normal conditions. Methane is a potent greenhouse gas.

**Metropolitan Statistical Area (MSA):** a geographic region defined by the United States Office of Management and Budget for statistical and administrative purposes including demographic and economic analysis and allocation of federal funds and resources.

**National Emissions Inventory (NEI):** a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants from air emissions sources. NEI is published by the EPA

**Nitric Oxide ($NO_X$):** shorthand for nitric oxide (NO) and nitrogen dioxide ($NO_2$). These gases contribute to the formation of smog and acid rain, as well as affecting tropospheric ozone.

**OneSTL:** The St. Louis Regional Plan for Sustainable Development.

**Property Assessed Clean Energy (PACE):** an mechanism for financing energy efficiency and renewable energy improvements on private property that allows the owner to repay the improvement costs over a set time period through property assessments.

**Priority Climate Action Plan (PCAP):** a narrative report that includes a focused list of near-term, implementation-ready measures to reduce GHG pollution and an analysis of GHG emissions reductions.

**Rust-belt city:** a city located in “the Rust-Belt”, a term used to describe the geographic region stretching from New York through the Midwest that was once dominated by coal extraction, steel production, and manufacturing.

**State and Local Planning for Energy (SLOPE):** an online platform to support state and local energy and decarbonization planning through scenario planning and a data viewer.

**Transit Oriented Development (TOD):** a planning and design approach to creating mixed-use, pedestrian-friendly communities centered around public transportation stations.

**Transit Signal Priority (TSP):** the practice of modifying traffic signal timing or phasing when transit vehicles are present.

**Vehicle Miles Traveled (VMT):** the total miles driven by all the cars and trucks on a given set of roadways over a pre-specified period of time.

**Volatile Organic Compound (VOC):** a group of organic chemicals that contain carbon compounds and may pose potential health and environmental concerns.

## Appendix B Executive Summary of 2015 St. Louis Regional Greenhouse Gas Inventory

### WHAT IS A GREENHOUSE GAS INVENTORY?

A regional greenhouse gas (GHG) inventory identifies emission sources within a geographic area and is used to develop targeted strategies and policies for emission reduction. Inventories are measured by combining all of the GHGs into a single measurement, presented as millions of metric tons of carbon dioxide equivalent (mmtCO2e). Several organizations partnered to conduct a GHG emissions inventory for the St. Louis region. This is an executive summary of the report created for that inventory.

### GEOGRAPHIC AREA

This report documents GHG emission inventories completed for the years 2010 and 2015 for the St. Louis bi-state region, including five counties in Missouri (Franklin, Jefferson, St. Charles, City of St. Louis, and St. Louis County), three counties in Illinois (Madison, Monroe, and St. Clair), and 196 municipalities.


*Map 1: This map represents the geographic area of the GHG inventory.*

2010 EMISSIONS | 58,415,579 mtCO2e

2015 EMISSIONS | 53,065,499 mtCO2e

11% ↓

### WHY A REGIONAL INVENTORY?

A regional GHG emissions inventory quantifies emissions in the St. Louis region and establishes a baseline to track the progress towards reducing GHG pollutants that contribute to climate change. The federal government set a national goal to reduce GHG emissions by 50% by the year 2030 and to achieve "net-zero" emissions by 2050*. Local partners are working to achieve that same goal for the St. Louis region. Developing this inventory provides a compelling, data-driven narrative, which aims to spark action amongst the region's residents, community groups, utility companies, businesses, and government agencies.

### KEY FINDINGS

The main sources of GHG emissions come from building energy use, transportation, waste management, industrial processes, and agricultural activities.

In 2010, the region was responsible for the emissions of 58.4 mmtCO2e, and in 2015 emissions went down to 53.1 mmtCO2e. This represents an 11% reduction (-6.4 mmtCO2e).

**U.S. White House Executive Order 14057*

# KEY FINDINGS & EMISSION TRENDS

» In **2010, the largest source of CO2 emissions was from stationary energy, which produced 41,602,003** million metric tons of CO2e, or nearly **70% of all emissions** in the region.

» In **2015, stationary energy accounted for 64.2% of the region's total emissions** at 34,052,579 mtCO2e, nearly a 6% reduction in stationary emissions from 2010.

» In 2010, the second largest percentage of regional emissions is generated by the transportation sector, with 11,268,285 mtCO2e, or nearly 19% of the total emissions.

» Transportation emissions for **2015 increased by 6.4%** from 11,268,284 mtCO2e (2010 emissions) to 12,057,316 mtCO2e (2015 emissions). However, emissions from air travel decreased over the five-year period.

» Emissions increased from Vehicle Miles Traveled (VMT), rail, waterborne navigation, and industrial processes between 2010 and 2015.

» Sectors that experienced a decrease during the five-year period include: stationary, waste emissions, agriculture emissions, and livestock emissions.

» When considering 2015 stationary emissions by source, electricity is largest source of emissions, followed by natural gas (Figure 3).

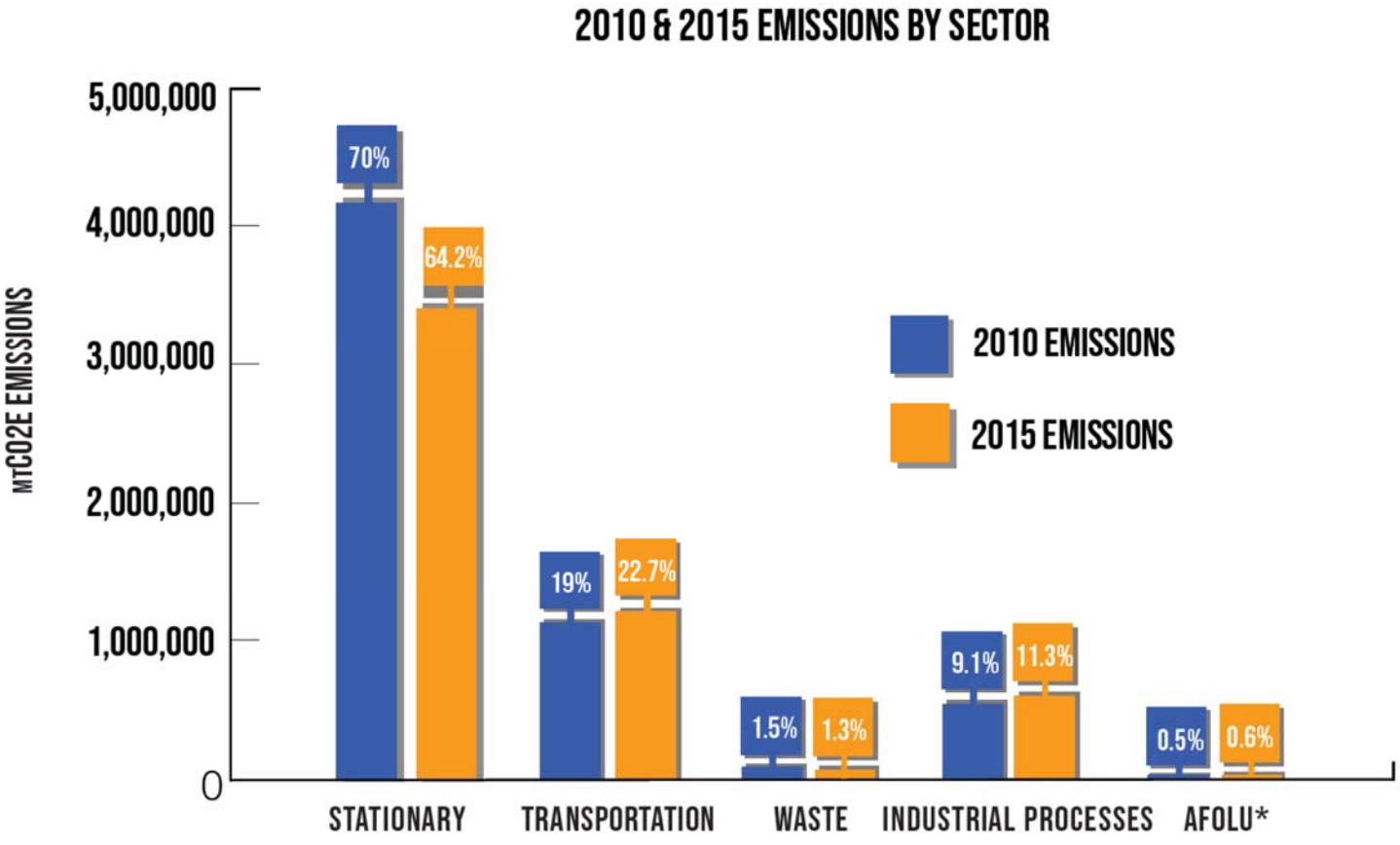
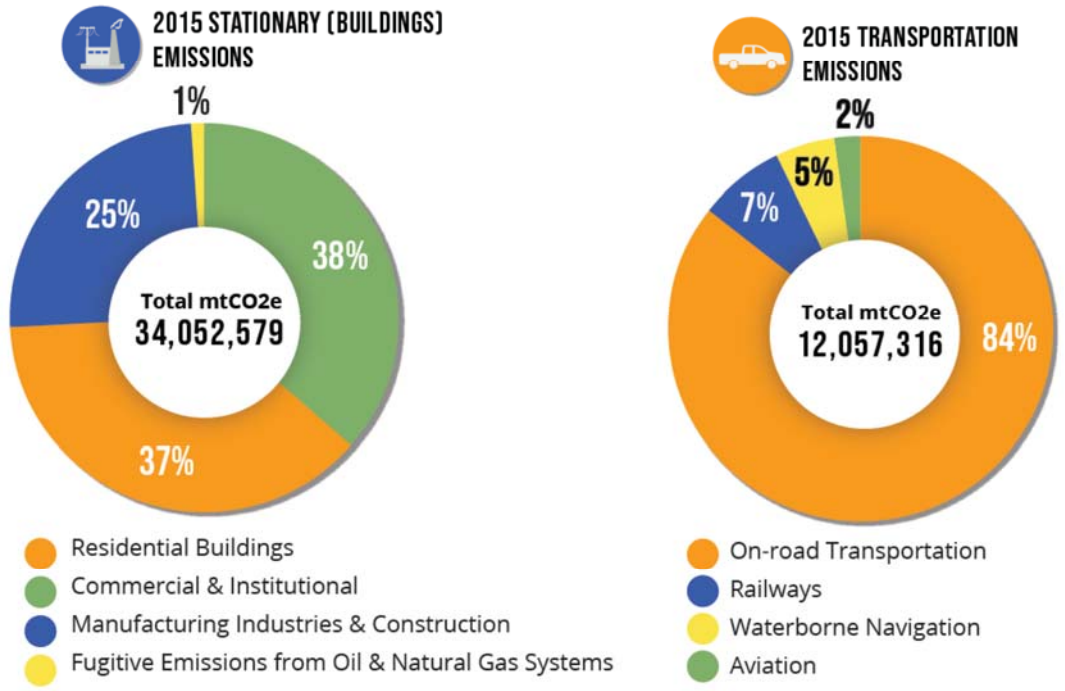



*Figure 1: Bar chart comparing 2010 and 2015 St. Louis regional emissions by sector. *AFOLU stands for Agriculture, Forestry, and Other Land Use. The percentages included are the percentage of total emissions for the respective year.*

# BREAKDOWN OF 2015 EMISSIONS BY SECTOR



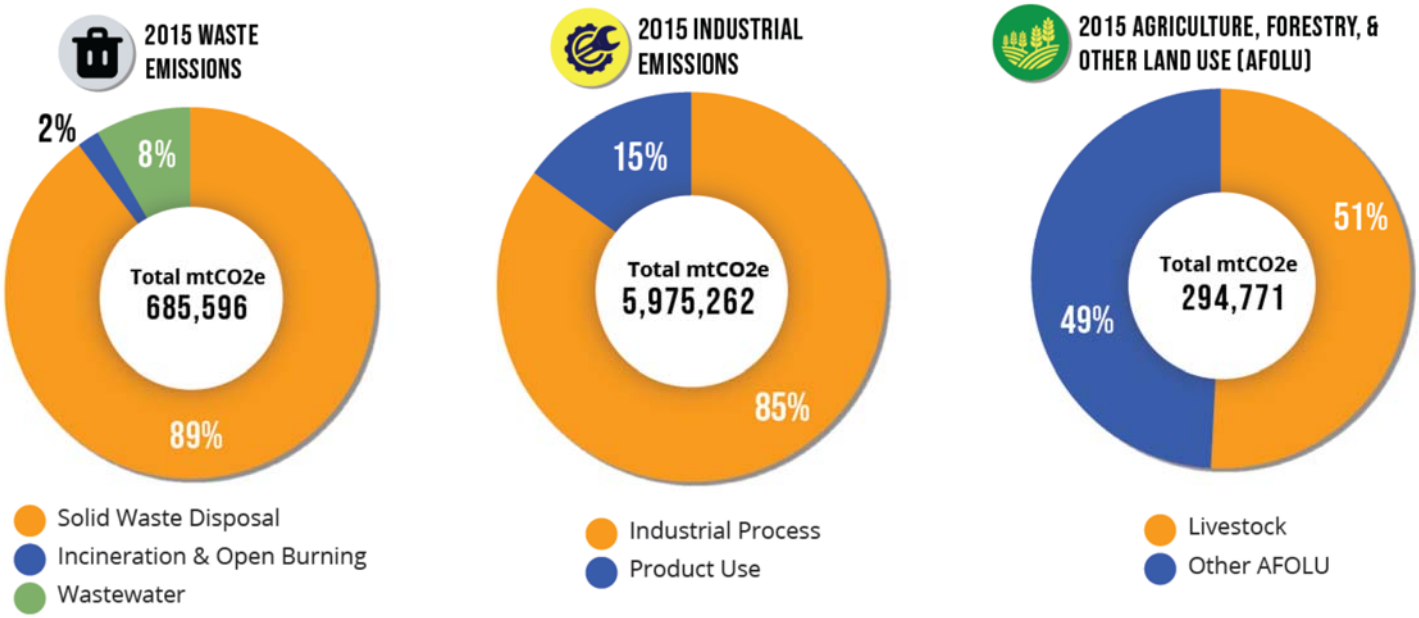




*Figure 2: Pie charts of 2015 emissions broken down by the following sectors: stationary, transportation, waste emissions, industrial emissions, and agriculture, forestry, and other land use. Industrial Processes are emissions from chemical processes such as oil refineries, making cement, and or glass. Product Use relates to estimates of leaked refrigerants and chlorofluorocarbons.*

# 2015 EMISSIONS BY SOURCE

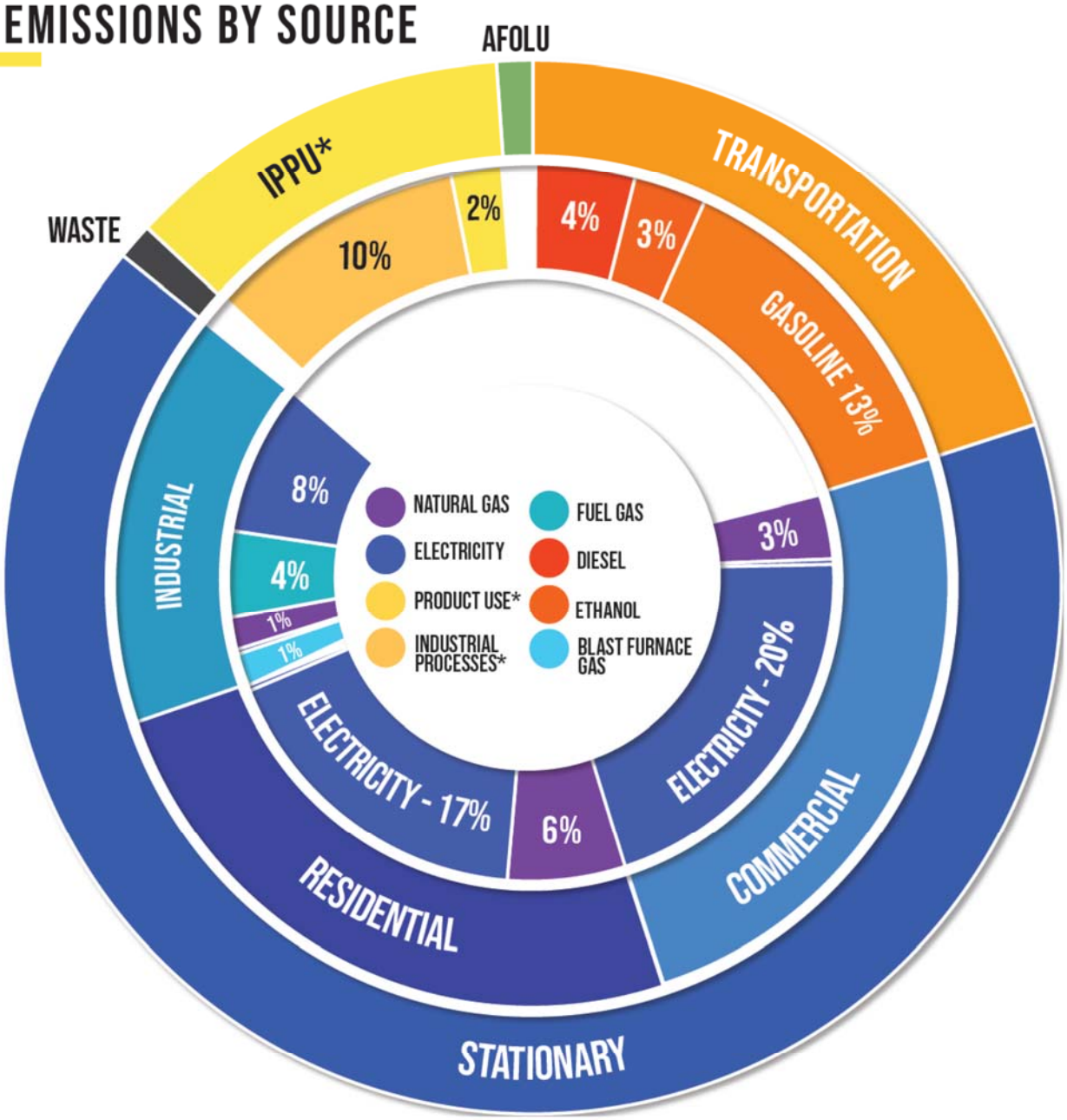



*Figure 3: This stacked pie chart represents 2015 emissions by sector and source. Not all sources are included in this chart due to very small percentages of the sources. IPPU is 'INDUSTRIAL PROCESSES & PRODUCT USE'. The sub-source 'INDUSTRIAL PROCESSES' relates to emissions from chemical processes such as oil refineries, making cement, and or glass. 'PRODUCT USE' relates to estimates of leaked refrigerants and chlorofluorocarbons.*

This report was conducted under the collaborative regional effort of OneSTL, a network of organizations that supports greater sustainability across the St. Louis region.

In addition to OneSTL and its Energy & Emissions Working Group, there are many entities working hard to reduce our greenhouse gas emissions. They include local governments, businesses, higher education institutions, and non-profits both large and small. If you would like to get involved, reach out to onestlsustainability@gmail.com and we can help you figure out where to get connected!

reNEW ONESTL Washington University in St. Louis Missouri Gateway Green Building Council

## Appendix C List of LIDAC Census Tract IDs

17163502100, 17163502401, 17163502603, 17119401000, 17119401701, 17119402200, 17119400903, 17163502404, 17013951200, 17163504600, 17163502800, 17163501200, 17163502900, 17163500500, 17163500900, 17163501400, 17163502300, 17163502700, 17163503411, 17163501300, 17163502200, 17163502500, 17163504500, 17119404000, 17117956200, 17117956100, 17117956900, 17117956000, 17117957000, 17119400102, 17119400200, 17119400600, 17119402100, 17119402400, 17119402500, 17119402600, 17163500400, 17163501100, 17163501700, 17163502602, 17163503100, 17119400700, 17119401100, 17119401500, 29510124200, 29510105500, 29510106500, 29510107500, 29510108300, 29510111100, 29510111500, 29510115500, 29510101500, 29510105300, 29510107600, 29510108100, 29510109700, 29510110200, 29510112200, 29510110300, 29510110500, 29510120200, 29510112300, 29219820102, 29219820101, 29219820103, 29099700605, 29189210501, 29189210502, 29189210703, 29189210704, 29189211201, 29189211801, 29189211802, 29189212001, 29189212002, 29189212101, 29189212102, 29189214601, 29189214602, 29183311500, 29189213102, 29189213800, 29189213900, 29189214200, 29071800902, 29071801101, 29189210300, 29189211900, 29189212500, 29510108200, 29510109600, 29510111400, 29510115200, 29510106300, 29510106600, 29510111200, 29510110400, 29510121100, 29510126700, 29510106100, 29510107400, 29510111300, 29510126600, 29510116100, 29510115300, 29510115600, 29510121200, 29099701102, 29099701200, 29189221800, 29189210400, 29189214300, 29113810100, 29113810400, 29189211102, 29189211500, 29189212200, 29189216000, 29510125700, 29510115700, 29510116400, 29510118400, 29510124100, 29510124600, 29189210702, 29189213300, 29189214700, 29189210200, 29189210600, 29189212600, 29189213101, 29189213600, 29189214100, 29510110100, 29510115100, 29510115400, 29071800701, 29189216900, 29189220300, 29510116302, 29510126900, 29510127000, 29510127100, 29510127400, 29510127500, 29510105400, 29510106400, 29510101800, 29510106200, 29510106700, 29510107200, 29510107300, 29189212700, 29189213400

## Appendix D Stakeholder Interviews

| DATE | ORGS REPRESENTED | GEOGRAPHY |
|---|---|---|
| 4/5/2023 | City of STL Planning Department | City of STL |
| 4/24/2023 | St. Louis City, St. Louis County | STL City, STL Co |
| 5/10/2023 | Cortex | Cortex footprint |
| 5/11/2023 | SIUE | N/A |
| 5/15/2023 | Sierra Club - Piasa Pallisades Chapter | IL |
| 5/16/2023 | Sierra Club - MO Chapter | MO |
| 5/19/2023 | Heartlands Conservancy | IL |
| 6/1/2023 | Beyond Housing | 24:1 |
| 6/12/2023 | Community Builders Network | North County/City |
| 6/28/2023 | City of Clayton | Clayton, MO |
| 7/11/2023 | MO Green Building Council, Ameren, SLU, Missouri Botanical Garden, Renew MO, Tower Grove CDC, IL Alliance for Clean Transportation | N/A |
| 07/13/2023 | City of St. Louis | City of STL |
| 07/21/2023 | St. Charles County | St. Charles County |
| 07/26/2023 | St. Louis City | STL City |
| 08/08/2023 | Metropolitan Congregations United | St. Louis City and St. Louis, St. Charles, and Jefferson Counties |
| 08/14/2023 | OneSTL Energy and Emissions Working Group | N/A |
| 08/15/2023 | Community Builders Network, Elevate | STL Metro |
| 08/21/2023 | Northeast Community Action Corporation, Missouri Botanical Garden | St. Charles, Warren, and Lincoln Counties |
| 08/25/2023 | Employment Connections | STL County, STL City, East St. Louis, parts of Granite City |
| 8/30/2023 | St. Charles City | St. Charles City |
| 8/31/2023 | SIUE, SIUC | NA |
| 9/1/2023 | RenewMo | Rural Mo |
| 9/7/2023 | Jersey County | Jersey County |
| 9/11/2023 | OneSTL Energy and Emissions Working Group | St. Louis Region |
| 9/11/2023 | City of St. Charles | St. Charles City |
| 9/15/2023 | Forest ReLeaf | Missouri |
| 9/25/2023 | JJK FAN | East St. Louis |
| 9/26/2023 | Wide audience, including many on outreach list | St. Louis MSA |
| 9/27/2023 | SeedSTL | STL City |
| 9/28/2023 | Clayton | Clayton |
| 9/28/2023 | Sierra Club, Ameren, general public | Eastern MO |
| 10/2/2023 | ~20 organizations | St. Louis region |
| 10/4/2023 | St. Louis County | St. Louis County |
| 10/4/2023 | Municipal League, and many more organizations | EWG region |
| 10/5/2023 | Missouri Department of Conservation | Missouri |

| | | |
|---|---|---|
| 10/9/2023 | OneSTL Energy and Emissions Working Group | EWG region |
| 10/10/2023 | Metropolitan Congregations United | St. Louis County & City, St. Charles County |
| 10/16/2023 | De Soto Citizens' Committee for Flood Relief | De Soto |
| 10/16/2023 | Bi-State Development | St. Louis Metro |
| 10/17/2023 | Energy Resources Group | 24:1 |
| 10/19/2023 | SIU, JJK FAN, Landsdowne UP, McCormack Baron Salazar, EWG, Health Department, Heartlands Conservancy, Madison County Transit | Metro East |
| 10/20/2023 | Great Rivers Greenway | St. Louis Metro |
| 10/20/2023 | St. Louis County | St. Louis County |
| 10/23/2023 | St. Louis Economic Development Partnership, SLU, MO Green Building Council | St. Louis County & City |
| 10/23/2023 | SIUE | NA |
| 10/25/2023 | St. Clair County Intergovernmental Grants | St. Clair County |
| 10/25/2023 | St. Clair County Transit and Madison County Transit | St. Clair & Madison County |
| 10/26/2023 | Missouri Coalition for the Environment | State of MO |
| 10/26/2023 | City of St. Louis | City of St. Louis |
| 10/26/2023 | Bi-State Development | Bi-state region |
| 10/27/2023 | MoDOT | State of MO |
| 10/27/2023 | Madison County Community Development | Madison County |
| 10/27/2023 | City of De Soto | De Soto |
| 10/30/2023 | St. Louis Regional Freightway | St. Louis Region |
| 10/30/2023 | Empire 13; Clean City Coalition | East St. Louis area |
| 11/02/2023 | Blackrock Consulting; Redbud Foundation; Homes 4 All | St. Louis Metro |
| 11/02/2023 | Urban Ecoblock | St. Louis City |
| 11/03/2023 | Lambert St. Louis International Airport | St. Louis City & County |
| 11/03/2023 | Jefferson County administration office | Jefferson County |
| 11/03/2023 | Academy Sherman Park Neighborhood Association | Academy Sherman Park Neighborhood |
| 11/06/2023 | Central Library | City of St. Louis |
| 11/06/2023 | Macoupin County | Macoupin County |
| 11/06/2023 | Bond County | Bond County |
| 11/07/2023 | Clinton County | Clinton County |
| 11/07/2023 | Madison County Building & Zoning | Madison County |
| 11/07/2023 | City of St. Louis, Elevate | St. Louis City/Region |
| 11/08/2023 | Alton Works | Alton |
| 11/08/2023 | EWG Bike & Pedestrian Advisory Committee | EWG region |
| 11/09/2023 | City of St. Louis, Mississippi River Cities and Towns Initiative | St. Louis City |
| 11/09/2023 | Open Space STL | St. Louis Metro |
| 11/09/2023 | North Newstead Association/Home Repair Network | St. Louis City & County |
| 11/13/2023 | OneSTL Energy and Emissions Working Group | STL Region |
| 11/17/2023 | Dream Builders 4 Equity | Hyde Park |

| | | |
|---|---|---|
| 11/17/2023 | St. Louis City, St. Louis County, Bi-State Development | STL region |
| 11/21/2023 | Lambert St. Louis International Airport | St. Louis City & County |
| 11/21/2023 | Bi-State, Urban Ecoblock, Redbud Foundation, MO Green Building Council, Institute for Market Transformation | St. Louis City & County |
| 11/27/2023 | Calhoun County Extension Office | Calhoun County |
| 11/29/2023 | Urban Ecoblock | Promise Zone |
| 11/29/2023 | Webster Groves | Webster Groves |
| 12/01/2023 | Academy Sherman Park Neighborhood Association | Academy Sherman Park Neighborhood |
| 12/08/2023 | Connecting Points | St. Louis City |
| 12/11/2023 | Food Share Network | St. Louis City |
| 12/12/2023 | Interested resident/architect | North City |
| 12/12/2023 | Jubilee Community Church | North City |
| 12/12/2023 | New Earth Farms | North City |
| 12/13/2023 | STL Mutual Aid | St. Louis County |
| 12/13/2023 | James Verde | St. Louis Region |
| 12/14/2023 | Metropolitan Congregations United | St. Louis, MO region |
| 12/14/2023 | St. Louis Environmental Justice Fund | St. Louis Region |
| 12/15/2023 | St. Louis Environmental Justice Fund, SIUE, Elevate | St. Louis Region |
| 12/15/2023 | St. Louis County | St. Louis County |
| 12/18/2023 | Heartlands Conservancy | Metro East |
| 12/18/2023 | MODOT | St. Louis Region |
| 12/19/2023 | St. Louis Environmental Justice Fund | St. Louis bi-state region |
| 12/20/2023 | Beyond Housing, Urban Ecoblock, Beverly Hills Mayor/24:1 Leader, SLEDP | North City & County |
| 12/20/2023 | Food Share Network, Mutual Aid, earthday365, James Verde | St. Louis City/County |
| 12/20/2023 | Operation Food Search & New Earth Farms | St. Louis Region |
| 1/2/2024 | Emmaus Village of Marthasville | Warren County |
| 1/2/2024 | Tower Grove CDC | Tower Grove Neighborhood |
| 1/3/2024 | Operation Food Search | St. Louis Region |
| 1/3/2024 | Metropolitan Congregations United & St. John's UCC/MO Green Schools | North City |
| 1/3/2024 | Wellston & Energy Resources Group | Wellston |
| 1/3/2024 | City of Beverly Hills | Beverly Hills |
| 1/3/2024 | TNC & Ujima Farms | St. Louis Region |
| 1/3/2024 | Interested resident/architect | Fairgrounds Park |
| 1/4/2024 | All stakeholders that suggested transportation projects were invited | St. Louis Region |
| 1/4/2024 | All stakeholders that suggested building projects were invited | St. Louis Region |

| | | |
|---|---|---|
| 1/5/2024 | All stakeholders that suggested tree/carbon sequestration projects were invited | St. Louis Region |
| 1/5/2024 | All stakeholders that suggested waste projects were invited | St. Louis Region |
| 1/8/2024 | Urban Ecoblock | City of St. Louis |
| 1/8/2024 | African Diaspora Council | Pagedale |
| 1/9/2024 | St. Clair County Transit | St. Clair County |
| 1/10/2024 | Lutheran North, Metropolitan Congregations United | North County |
| 1/10/2024 | Community Builders Network | City of St. Louis |
| 1/11/2024 | STL Regional Freightway | St. Louis Region |
| 1/11/2024 | St. Louis County | St. Louis County |
| 1/16/2024 | JJK FAN | East St. Louis |
| 1/18/2024 | City of Brentwood | Brentwood |
| 1/18/2024 | City of Alton | Alton |
| 1/18/2024 | Missouri Department of Conservation | St. Louis Region + Missouri |
| 1/18/2024 | Forest ReLeaf | Missouri |
| 1/19/2024 | St. Louis Environmental Justice Fund, Emmaus Village, Elevate, Food Share Network, earthday365 | St. Louis MSA |
| 1/22/2024 | Emmaus Village, New Melle Food Coop | St. Louis MSA |
| 1/31/2024 | City of St. Louis | City of St. Louis |
| 2/9/24 | OneSTL Materials & Recycling Working Group | St. Louis Region |
| 2/12/2024 | OneSTL Energy and Emissions Working Group | St. Louis Region |
| 2/12/2024 | Urban Ecoblock | St. Louis City |
| 2/12/2024 | JJK FAN | East St. Louis |
| 2/14/2024 | OneSTL Biodiversity Working Group leadership team | St. Louis Region |
| 2/15/2024 | Dismas House | City of St. Louis and Farmington |
| 2/15/2024 | Earthdance Farms, Open Space STL | Ferguson |
| 2/16/2024 | America's Central Port | Madison, IL |

## Appendix E All Projects Identified

***This list is derived from conversations/meetings and submissions from an online form for ideas to include in the Priority Climate Action Plan.***

| Measure | Source |
|---|---|
| **Buildings/Energy Efficiency** | |
| Weatherization for affordable housing | North Newstead Association, Community Builders Network, Tower Grove CDC, discussion at E&E Meeting, St. Clair County Intergovernmental Grants |
| Weatherization for low-income residents/renters | North East Community Action Corporation, A Red Circle, St. Clair County Intergovernmental Grants, Madison County Community Development, note from Oct 2 meeting, City of St. Louis |
| Preweatherization (Indoor air quality/'Healthy homes' - bedbugs, asbestos, lead paint remediation, etc. - A Red Circle has a project promoting homemade filters made with a box fan and HVAC filters) | Madison County Community Development, SLEDP, A Red Circle, East Side Health District |
| Policies: Expanding Benchmarking/BEPS in the region (to St. Louis County, smaller square footage, etc.) | Mid-County Sustainability Consortium, MO Green Building Council, City of St. Louis |
| Policies: Energy disclosure ordinance | Renew MO (E&E meeting Sept 11) |
| Policies: Community solar | City of St. Louis, Sierra Club |
| Policies: (May be more for conversation with County/CCAP) streamlined solar permitting for the County, potentially Solsmart certification | City of Clayton/Mid-County Sustainability Consortium, note from Oct 2 meeting |
| Address state barriers (i.e. LIHTC $) | Note left at Oct 2 Meeting |
| Weatherization/solar for renovation of apartments; rehabilitation, electrification+solar installation ready at other apartments; existing solar repairs | McCormack Baron Salazar, St. Clair County Intergovernmental Grants |
| Ecoblocks | Urban Ecoblock, Sunni Hutton |
| Green energy project in 24:1 community - including District-wide ground source heat pump | Energy Resources Group |
| Incentives for energy efficiency upgrades for homes/cool roof incentive program | City of St. Louis |
| Solar array / solar rebate program for residents | City of Brentwood, City of St. Louis |
| Energy efficiency programs at utilities | Representative of Missouri Energy Efficiency Advisory Collaborative - Low-Income Work group |
| Looking at ways to use less energy in greenhouse. New greenhouse is modeled after another successful project elsewhere, to grow substantial food without energy in the winter. Energy efficiency for their new indoor kitchen could also be a potential project. | Jackie Joyner-Kersee Food Agriculture Nutrition Innovation Center |

| | |
|---|---|
| A nitrification plant (EPA superfund site) is part of their footprint, and will become a track and field house. They could use solar here (solar is already on some of the buildings on the site). | Jackie Joyner-Kersee Food Agriculture Nutrition Innovation Center |
| Solar + EVs for nonprofits | Emmaus Village of Marthasville |
| Energy efficient rehab for building for African Cultural Center | African Diaspora Council |
| Electrification of buildings/incentives | Sept 26 event attendee, City of St. Louis |
| New HVAC system in county courthouse | Macoupin County |
| (Maybe for CCAP) Lack of workforce for energy efficiency/home repairs is a huge concern | North Newstead Association |
| Free energy audits | Webster Groves |
| Expanding St. Louis County's Home Improvement Program to allow energy efficient home upgrades | St. Louis County |
| Passive solar design + use of adobe and insulated concrete blocks for construction, to be more resilient to climate change and reduce embodied carbon | Energy Resources Group |
| Upgrades to City Greenhouse to make it more efficient | City of St. Louis |
| Resilience Hubs | Sunni Hutton, Institute for Market Transformation |
| Solar panels, energy efficiency, or green roofs for government buildings | Madison County Transit, City of St. Charles, City of St. Louis |
| Solar for low-income homes | Missouri Coalition for the Environment and Webster Groves |
| Ground source heat exchange utility for the City | Energy Resources Group |
| Vehicle to Home (+solar) =Resiliency | Note from Oct 2 meeting |
| Green Schools programs/environmental education | Metropolitan Congregations United, Madison County, St. Louis County, MO Environmental Education Association, Connecting Points |
| Hydroponic food production facilities with passive solar | Energy Resources Group |
| % of bills covered for extreme temperature times | City of St. Louis |
| indoor air quality monitor distribution program | City of St. Louis |
| Home is Where Our Health Is: Strategic & Supportive Housing Code Enforcement | Sunni Hutton |
| Energy Burden Report | Sunni Hutton |

| **Transportation** | |
|---|---|
| Trail connectivity/expanding trails | City of St. Charles and Jefferson County |
| Road diets and intersections for safer bike and pedestrian pathways and reduction of emissions | City of St. Charles |
| Potential planned greenways, possibly the Hodiamont, Maline, or Brickline Greenways | Great Rivers Greenway |
| Sidewalks and bike lanes, particularly in Belleville | Clean Cities Coalition/Empire 13 |
| Action Plan for Walking and Biking (AP) Design Build | St. Louis County |
| Multi-modal bridges | MoDOT |
| Scenario planning | MoDOT |

| | |
|---|---|
| increased protected bike lanes, trails, and public education program about bike/vehicle safety | City of St. Louis |
| Completion of Brickline Greenway | City of St. Louis |
| City/county fleet electrification | City of Alton, Jefferson County, Bond County, City of Brentwood |
| Mobility Hubs | Bi-State |
| Micro mobility (such as vehicles, e-bikes, etc.) | City of St. Charles |
| School zone no-idling | SIUE |
| School Bus Fleet Electrification | Highland Fleet |
| District Resiliency Plan | MoDOT |
| Free bus passes; incentives to increase transit ridership | City of St. Louis; note from Oct 2 meeting |
| Hydrogen for public buses | St. Clair County Transit District |
| Placement of EV chargers on public property | City of St. Charles, note from Oct 2 meeting |
| EV charging stations at churches and schools | Metropolitan Congregations United |
| Regional Medium Duty + HD Charging Depot for independent operators → Site Acquired → Minority Owned Businesses | Note from Oct 2 meeting |
| Developing a port to handle container-on-vessel ships, to replace semi-trucks | STL Regional Freightway |
| Port project to reduce idling | America's Central Port |
| Electrified parking shuttle buses | Lambert St. Louis International Airport |
| Lambert is building a new aircraft maintenance facility, and they are considering going after a LEED platinum certification | Lambert St. Louis International Airport |
| High efficiency central utility plan for the airport | Lambert St. Louis International Airport |
| Pilot for eventual County-wide Signal Pre-emption/Prioritization | St. Louis County |
| Hereford-Chambers space reallocation, roundabout, and bike facility | St. Louis County |
| Publicly owned bike share program | City of St. Louis |
| E-bike rebates | City of St. Louis |
| Employer transit pass program | City of St. Louis |
| Public education program on public transit, reduce idling, carpooling, keeping tires filled | City of St. Louis |
| More MetroLink access/lines | City of St. Louis |
| Maybe for CCAP: Keeping workers on hybrid/remote schedules to lower VMT | Madison County Community Development |
| Gas lawn mower replacement | St. Louis County, JJK FAN |
| | |
| **Forestry/Carbon Sequestration** | |
| Community/urban forest projects in Heartlands watershed plans | Heartlands Conservancy |
| Wetland/floodplain restoration; reforestation | City of St. Charles, City of Alton, Alton Works, Open Space STL, Calhoun County Extension Office |

| | |
|---|---|
| Tree planting/woodland restoration; MDC's Community Forestry Cost-Share Program; Next phase of tree planting along Delmar (planted 100 that are maintained by a great volunteer); City Tree Farm | Forest ReLeaf of MO, Open Space STL, City of Alton, MO Department of Conservation, McCully Heritage Project, City of St. Louis, Beyond Housing |
| Expand Forest Releaf's canopy project, provide stipends to community members for outreach efforts; support for tree maintenance; tree preservation | Notes from Oct 2 meeting |
| Green Infrastructure on streets / sidewalk infrastructure improvements for trees (with pedestrians/cyclists in mind) | Sunni Hutton, City of De Soto, Academy Sherman Park Neighborhood Association, Forest ReLeaf of MO, City of St. Louis |
| Local agriculture projects | St. Louis Environmental Justice Fund, representing 10 urban farms |
| Ujima's orchard | Nick Speed |
| Community garden project in Warren County | Emmaus Village of Marthasville |
| Shade and native plants at bus/Metro stops | Note from Oct 2 meeting |
| Funding for members within communities to maintain trees planted in Justice40 communities/Expand Forest ReLeaf's Canopy Crew | MO Department of Conservation, Forest ReLeaf of MO, City of St. Louis |
| Great Rivers National Park | Alton Works, Calhoun County Extension Office |
| Replacing school blacktops with rain gardens (starting with pilot at Frewell Elementary) | The Nature Conservancy and MO Department of Conservation |
| An app that calculates the climate impact of local food | Emmaus Village of Marthasville, New Melle Food Coop |
| Native Prairie Restoration | City of St. Louis |
| Demonstrating and teaching about climate-smart food production | EarthDance Organic Farm School |
| Promote a local food economy to lower food miles (GDA, Known + Grown) | Note from Oct 2 meeting |
| Land acquisition and preservation, conservation easements | Open Space STL |
| Map Priority Tree Planting Locations / Regional Tree Canopy Master Plan | Forest ReLeaf of MO |
| Ward 12 Heat Island Reversal using tree planting | Forest ReLeaf of MO |
| Green Living Walls' to combat air pollution along highways | Webster Groves |
| Grants for buyouts along Creeks | City of De Soto, City of Berkeley |
| Flooding issues in East STL | Clean Cities Coalition/Empire 13 |
| West Florissant Great Streets landscaping | St. Louis Economic Development Partnership, St. Louis County |
| | |
| **Waste** | |
| Food waste diversion | MO Botanical Garden, earthday365, City of St. Louis, Food Share Network, James Verde |
| EVs for food waste diversion | earthday365, Food Share Network |

| | |
|---|---|
| Food Waste Collection & composting | New Earth Farm, City of St. Louis, Jubilee Community Church, Webster Groves, Operation Food Search, Energy Resources Group |
| Divert waste from landfills in general (A Red Circle had funding to drive food to people, but it ran out after Covid) | A Red Circle, Sunni Hutton, City of St. Louis |
| Roll cart expansion in City of St. Louis | Sunni Hutton, Mississippi River Cities and Towns Initiative, City of St. Louis |
| Large scale reuse system (ie. r.Cup/r.World) | Mississippi River Cities and Towns Initiative, City of St. Louis |
| Trash free waters efforts (reducing plastic pollution) | Sunni Hutton, City of St. Louis |
| Illegal dumping in East STL and STL City (would reduce emissions from bulk trucks, idling, pest control trucks, etc.) | Clean Cities Coalition/Empire 13, City of St. Louis |
| (Maybe for CCAP) Source separation at dropoff sites, so buyers can collect materials directly, to make it more economically feasible. Ie. Ripple Glass/Replenish | Mississippi River Cities and Towns Initiative, City of St. Louis |
| Green energy project in 24:1 community - including anaerobic methane digester and generation of RNG and biochar | Energy Resources Group |
| Policies mentioned at Oct 2 meeting: Statewide bottle/can deposit; electronics recycling legislation to keep them out of landfills; EPR; plastic bag fees; styrofoam ban | notes from Oct 2 meeting |
| Waste-to-energy and other plants in Wellston | Energy Resources Group, City of Wellston |
| | |
| **Other Projects** | |
| Community closet | Connecting Points, STL Mutual Aid |
| Unhoused Union | Connecting Points, STL Mutual Aid |
| Public awareness program of outdoor air quality (monitors - installation and monitoring) | City of St. Louis |
| Neighborhood planning | Sunni Hutton |
| In St. Charles County there are no PM 2.5 monitors, so there is a need there. | Metropolitan Congregations United |
| updating the City of Brentwood's Climate Action Plan | City of Brentwood |
| Workforce development specifically for energy efficiency upgrades, solar panel installation, tree planting/maintenance, green infrastructure design/installation | City of St. Louis |

# Appendix F Review and Data Verification of 2015 Greenhouse Gas Inventory

## Introduction

In 2015, a greenhouse gas (GHG) inventory was conducted under the collaborative regional effort of OneSTL. In 2022, the East-West Gateway Council of Governments (EWG) received a Climate Pollution Reduction Grant (CPRG) from the U.S. Environmental Protection Agency. The CPRG program requires the completion of a baseline GHG inventory. To determine whether the 2015 inventory is adequate for the purposes of the CPRG baseline, a high-level review of the 2015 inventory was conducted. This review compared findings from the 2015 inventory with information available from public sources.

The core findings of the 2015 inventory are shown on Table 2.10 of the inventory. This table has columns for Scope 1, Scope 2 and Scope 3 emissions. Scope 1 consists of combustion that occurs at a given site to meet the energy needs of that site. The main types of Scope 1 emissions in St. Louis are 1) industrial facilities that burn their own fuel as part of the manufacturing process, and 2) natural gas consumption by homes and businesses. Scope 2 emissions are those emissions that derive from consumption of energy that is produced elsewhere. Electricity consumption by homes and businesses is the main type of Scope 2 emissions in St. Louis. Scope 3 includes emissions that are caused by consumption in a region but that occur outside of that region. For example, the carbon footprint of a shirt made in Mexico, shipped to St. Louis, and worn by a local consumer would contribute to Scope 3 emissions. In the 2015 report, Scope 3 emissions make up less than 1 percent of total emissions, and hence are not further discussed in this review.

Table 2.10 in the inventory shows estimated 2015 emissions for five sectors: stationary, mobile, industrial processes, waste, and agriculture and land use. Stationary is further divided into sub-sectors, of which the largest are residential, commercial, and industrial. Transportation is divided into on-road, off-road, aviation, air and water. The categories of residential, commercial, industrial (including industrial processes) and on-road transportation made up nearly 95% of total emissions. Therefore, this review focused on these categories.

## Data and Methods

For residential and commercial, both Scope 1 and Scope 2, the State and Local Planning for Energy (SLOPE) tool, produced by the National Renewable Energy Laboratory (NREL) was used. SLOPE provides 2016 estimates of natural gas and electricity consumption by county, with differentiation between residential and commercial. SLOPE is also used for Scope 2 industrial emissions. It should be noted that there is a one year difference in reporting periods between the inventory and SLOPE. As SLOPE does not offer 2015 estimates, this difference is unavoidable. In comparing the two sources, staff did not expect precise agreement, but considered the results broadly consistent if they varied by less than 10 percent.

For Scope 1 industrial emissions, the Facility Level Information on Greenhouse Gas Emissions Tool (FLIGHT) produced by EPA was used.

For transportation, the 2015 inventory was compared to the 2014 National Emissions Inventory (NEI). The NEI releases estimates every three years, and the 2014 release is the nearest in time

to the 2015 inventory. Similarly to the SLOPE data discussed above, staff does not expect precise agreement with NEI estimates due to the one year difference. However, they considered aggregate results broadly consistent if they varied by less than 10 percent. In addition, estimates of Vehicle Miles of Travel (VMT) were compared to estimates produced by the Missouri Department of Transportation (MODOT) and the Illinois Department of Transportation (IDOT).

Given differences in sources and methods, an exact match between the 2015 inventory and the public sources was not expected. This review therefore only assesses broad consistency between the sources. The standard used was whether observed discrepancies were great enough to challenge the validity of the 2015 survey.

**Electricity**

Table 1 summarizes estimates for emissions related to electricity consumption in SLOPE and the 2015 Inventory:

**Table 1: Comparison of SLOPE and 2015 Inventory: Electricity Consumption (MT $CO_2e$)**

| | 2015 Inventory | 2016 SLOPE | Pct Diff |
|---|---|---|---|
| Residential | 8,859,768 | 9,198,989 | 3.8% |
| Commercial | 10,334,621 | 11,332,633 | 9.7% |
| Industrial | 4,038,572 | 4,197,578 | 3.9% |
| Total | 23,232,961 | 24,729,200 | 6.4% |

The estimates from the two sources align fairly closely. The residential and industrial estimates differ by less than 5 percent, within a reasonable tolerance given the one year difference in the data sets. The commercial estimates differed by more, but the discrepancy was still less than 10 percent. Overall, the difference in estimated emissions between SLOPE and the inventory was 6.4 percent. Staff conclude that SLOPE estimates do not provide cause to reject the inventory.

**Industrial**

For Scope 1 industrial emissions, the 2015 inventory distinguishes between "manufacturing industries" and "industrial process." Staff interpret the first category to include primarily consumption of natural gas from a utility, and the second to include any fuel shipped to an industrial facility and consumed at that site. The EPA FLIGHT tool offers comparable estimates. However, in FLIGHT it is not possible to distinguish between the two types of industrial emissions. Therefore, to compare the 2015 inventory, staff combined the two categories from the 2015 inventory and compared to the total number from FLIGHT. The results are shown in Table 2.

**Table 2: Comparison of FLIGHT and 2015 Inventory: Industrial Scope 1 (MT $CO_2e$)**

| | 2015 Inventory | 2015 FLIGHT | Pct Diff |
|---|---|---|---|
| Manufacturing Industries | 4,281,439 | - | - |
| Industry Process | 5,072,421 | - | - |
| Total | 9,353,860 | 8,337,470 | -10.9% |

Estimates for the inventory totaled about 10 percent higher than the FLIGHT estimates. It must be noted that FLIGHT generally only includes emitters that produce more than 25,000 tons of emissions. Therefore, the inventory would be expected to be somewhat larger than the FLIGHT estimates, as turned out to be the case. Given the difference in emitters covered by the data sources, staff conclude that the difference is not large enough to reject the inventory.

**Transportation**

The Transportation Energy sector covers GHG emissions due to all on-road vehicle usage. This includes personal vehicles, commercial vehicles, and public transportation. Emissions due to on-road vehicles are directly dependent on the annual vehicle miles of travel (VMT). As such, the first step in reviewing the on-road emissions data in the inventory is to review the VMT data. Table 3 compares VMT estimates between the 2015 inventory and the DOT estimates.

**Table 3: Annual Vehicle Miles of Travel**

| | 2015 Inventory | 2015 DOT | Pct Diff |
|---|---|---|---|
| Missouri | 22,781,669,180 | 22,327,566,475 | -2.0% |
| Illinois | 6,054,484,581 | 6,054,484,581 | 0.0% |
| Total | 28,836,153,761 | 28,382,051,056 | -1.6% |

The Illinois VMT numbers from the inventory are identical to those from IDOT. The Missouri VMT numbers in the inventory are broken down into three categories: Franklin County, St. Louis County, and MO (presumably, the remaining three EWG Missouri counties). While the inventory's VMT estimates vary considerably from MODOT's for each county or group of counties, the sum of all five Missouri counties is fairly close. The total Missouri VMT from the inventory is 22.78 billion, compared to 22.33 billion from MODOT, a difference of less than 2%. Likewise, for the eight county EWG region, the VMT estimates from the inventory are 28.84 billion, compared to 28.38 billion from the state DOTs, a difference of 1.6%.

For on-road emissions, the inventory distinguishes between three different fuel types: gasoline, diesel, and ethanol. However, most sources only distinguish between gasoline and diesel, which are the two most common fuel types.

EWG staff did discover a typographical error in the 2015 inventory inputs. ClearPath requires users to enter estimates of the percentage of VMT that should be attributed to ethanol for each of three vehicle types: heavy truck, light truck, and passenger vehicle. In ClearPath, the number entered were as follows: passenger: 0%; light truck: 6.1%; heavy truck: 3.2%. In fact, passenger vehicles should have had the 6.1% figure, light trucks 3.2%, and heavy trucks 0%.

Table 4 compares the 2015 inventory and estimates from the 2014 National Emissions Inventory.

**Table 4: Comparison of On-Road Emissions Estimates (MT $CO_2e$)**

| | 2015 Inventory | 2014 NEI | Pct Diff |
|---|---|---|---|
| Gasoline | 10,076,353 | 9,868,532 | -2.1% |
| Diesel | 2,560,651 | 4,937,396 | 92.8% |
| Ethanol | 2,080,474 | - | - |
| Total | 14,717,478 | 14,805,928 | 0.6% |

The closeness of the original 2015 inventory and the NEI supports the validity of the 2015 inventory approach. Staff recommend accepting the 2015 inventory estimates for transportation.

**Natural Gas**

Table 5 compares the 2015 inventory and SLOPE with respect to natural gas emissions:

**Table 5: Comparison of Natural Gas Consumption Estimates (MT $CO_2e$)**

| | 2015 Inventory | 2016 SLOPE | Pct Diff |
|---|---|---|---|
| Residential | 3,129,981 | 4,231,549 | 35% |
| Commercial | 1,964,245 | 2,421,673 | 23% |
| Total | 5,094,226 | 6,653,222 | 31% |

For total emissions, SLOPE estimates are 30 percent greater than the 2015 inventory. This is a sufficient difference to question the estimates from the inventory. To investigate potential causes for this discrepancy, emissions factors entered into ClearPath were compared to emissions factors published by EPA. In addition, staff obtained data files showing natural gas consumption in therms by county that were used to input data into ClearPath. These files were derived from source data from Spire, the natural gas utility in the Missouri portion of the region, and from Ameren, the natural gas utility in the Illinois portion. No apparent typographical or transcription errors were spotted that could account for potential discrepancies.

Staff concluded that data based on information reported by the utilities should be considered more authoritative than modelled outputs from SLOPE. For residential consumption, SLOPE estimates are derived from the 5-year American Community Survey (ACS) which asks residents about heating costs. As with all surveys, ACS is subject to sampling and response error. Expenditures are also a reasonable, but still imperfect, proxy for consumption. In addition, ACS does not report the month of the year in which the survey is taken, which can lead to a potential bias in survey responses. Finally, NREL eliminates ACS responses that report no energy expenditures, which they acknowledge may create an upward bias in estimates. For commercial energy, estimates are derived from state-level consumption reported by the Energy Information Administration (EIA). EIA estimates are then allocated down to the tract level through the use of a mathematical model. The absence of a comprehensive national commercial building database requires NREL to combine several different data sources, which introduces other potential sources of error. While the assumptions made by NREL are reasonable, estimates based on local observations are preferable to those based on a model. In the absence of a clear reason to reject the information derived from local utilities, staff recommend accepting the 2015 inventory estimates.

**Sources Consulted:**

City and County Energy Profiles: National Renewable Energy Laboratory, State and Local Planning for Energy platform.
https://catalog.data.gov/dataset/city-and-county-energy-profiles-60fbd/resource/1689583f-2be3-4722-b803-5b62ed4804b9

EPA Facility Level Information on Greenhouse Gases Tool (FLIGHT)
https://ghgdata.epa.gov/ghgp/main.do?site_preference=normal

National Emissions Inventory (NEI)
https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data

Missouri Department of Transportation Data Zone
https://www.modot.org/modatazone

Illinois Travel Statistics, Illinois Department of Transportation
https://idot.illinois.gov/content/dam/soi/en/web/idot/documents/transportation-system/reports/opp/travel-stats/2015_its.pdf

2015 Inventory
https://www.onestl.org/media/site/documents/reports/ghg_invntory_report_FINAL_FINAL.pdf

SLOPE Methodology
https://www.nrel.gov/docs/fy19osti/72748.pdf